ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

HOMEGARDENS AND SPICES OF BASKETO AND KAFA (SOUTHWEST ETHIOPIA): PLANT DIVERSITY, PRODUCT VALORIZATION AND IMPLICATIONS TO BIODIVERSITY CONSERVATION

By
Feleke Woldeyes

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Biology (Botanical Sciences)


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DEDICATION

This thesis is dedicated to the Basket and Kafecho peoples who, through innovative agricultural practices for generations, developed such a sustainable crop production system - Homegardening.

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ACRONYMS

AMU	Arba Minch University
ARDO	Agriculture and Rural Development Office
BIODIVALLOC	Biodiversity and Valuation Tools for Localized Productions
CI	Conservation International
CSA	Central Statistical Agency
EEPA	Ethiopian Export Promotion Agency
EHGP	Ethiopian Homegarden Project
EPA	Environmental Protection Authority
FAO	Food and Agricultural Organization
GIs	Geographical Indications
IBC	Institute of Biodiversity Conservation
IFATPC	International Food and Agricultural Trade Policy Council
IPR	Intellectual Property Right
IRD	the French Institute of Development Research
MTI	Ministry of Trade and Industry
PDO	Protected Designation of Origin
PGI	Protected Geographical Indications
PGRFA	Plant Genetic Resources for Food and Agriculture
SNNPRS	South Nations, Nationalities and Peoples Regional State
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Program
USAID	United States Agency for International Development
WTO	World Trade Organization

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ABSTRACT

Traditional agricultural landscapes support an important level of biological and cultural diversity. Significant components of such landscapes are homegardens which represent sustainable farming systems. In this study, homegardens of Basketo Special Woreda and Kafa Zone in the South Nations Nationalities and Peoples Regional State (SNNPRS) of Ethiopia, with a special emphasis on spice-yielding plants, have been investigated. The study aimed at understanding local peoples' role in maintenance of biological resources and also the impact of ongoing homegarden related changes on the conservation of biological diversity. In the study, local resource perception, classification, management, and use norms were assessed; plant biological diversity at different levels of the landscape was measured; and also trends in the commercialization of local spices were analyzed. Qualitative data were collected through interviews, group discussions, garden tour, guided field walks and observation methods. Some of the data collected through interviews were analyzed using preference ranking and paired comparison. Measurements on quantitative traits of ***kororima*** (*Aframomum corrorima*) were made; biological diversity at garden section, whole garden and landscape levels were evaluated using different diversity measurement indices. Laboratory studies were conducted to determine chemical compositions of ***kororima*** seeds and ***kororima*** growing soils, and also seed germination potential. Data were analyzed using descriptive statistics, one way analysis of variance (ANOVA), independent sample T-test, and Pearson correlation. Computer programs SPSS, PAST and R were used for data analysis. A total of 280 species were recorded from the managed landscapes of the two areas. Infraspecific diversity was recorded in a number of crop plants with ***enset*** (*Ensete ventricosum*) exhibiting the maximum number of local varieties/clones (26 in Basketo and 70 in Kafa). Existence of local worldview related resource use norm, elaborate and adaptive resource management, and well developed classification systems which take different forms are also observed.

The homegardens of Basketo and Kafa, beyond their role as the main source of household subsistence, serve as central element around which other components of the landscape are organized. Biodiversity is cultivated in these farming units as a result of the framers' innate perception of the values of biodiversity and also the characteristic organization of the gardens that promoted concentration of plant diversity. Spice-yielding plants, whose products are of major importance for household consumption and commercial exchange, constitute vital components of the gardens. Twenty four species of spice-yielding plants are encountered in each of the study areas and these account for 16.11% and 12.44% of total species composition of Basketo and Kafa gardens respectively. Although local spices are used for both household consumption and income generation, correlation analysis indicated that spice-yielding plants are raised in the garden primarily for household use. However, as the current trend shows, spices are increasingly becoming market-oriented with ***kororima*** (*Aframomum corrorima*) being the most-commercialized of all the spices produced in the two areas. ***Kororima***, an indigenous spice which has been traded for long, is of major importance in terms of socio-economic and ecological perspectives. Currently, homegardens are undergoing an unusual dynamics because of agricultural development intervention activities and also market driven factors. Some crops like coffee (*Coffea arabica*) which bring better economic return are expanding at the expense of ***enset*** that forms the basic element of the garden and other indigenous crops. Drastic alteration of these crop production units could lead to unwanted impacts including disruption of local livelihoods and serious deterioration of biological diversity. Valorization of spices and other products originating from the homegardens, by securing better financial benefits to farmers, can aid in slowing down the rate of change thereby contributing to the maintenance of the agro-ecosystems and the interlinked components of the local environment.

Keywords: homegardens, spices-yielding plants, ***kororima***, valorization, biodiversity, emic categorization, Basketo, Kafa

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DECLARATION

I, the undersigned, declare that this thesis is my own original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

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1. INTRODUCTION

Biological diversity, as defined by the Convention on Biological Diversity, is “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part” It is this variety and variation occurring in nature which has sustained the harmonious existence of life on earth (Reddy 1994). Biological diversity is extremely important to humankind since its very existence is inextricably linked to the invaluable elements of biodiversity.

The variety of life, which is highly complex, has changed over time and is not evenly distributed through space. Recognition of such variation has led to the development of concepts of biodiversity hotspot and coldspot (Gaston and Spicer 1998). Biodiversity hotspots are defined as biogeographic regions of the world with exceptional concentrations of endemic species (a minimum of 1500 species of vascular plants) and which are undergoing serious loss of habitat (Myers *et al.* 2000, CI 2007a). One of the regions of the world designated as a biodiversity hotspot is the Eastern Afromontane Hotspot that stretches from Saudi Arabia and Yemen in the north to Zimbabwe in the south (CI 2007b). Ethiopian highlands, which cover the largest portion of the country, belong to this hotspot, thus showing the wealth the country is endowed with in terms of biological diversity (which at the same time is endangered, however).

The high biological diversity of Ethiopia, as expressed by its high floral, faunal and microbial diversity and also high degree of endemism (Ensermu Kelbesa *et al.* 1992, IBC 2005, EPA 2008, USAID 2008), is associated to natural and also anthropogenic causes. The natural factor is associated to the country’s broad geological, climatic, altitudinal and latitudinal variations which resulted in the observed ecological diversity within which multitude of organisms arose. The human factor relates to the diverse ethnolinguistic groups who lived for millennia inhabiting these diverse environmental settings thereby exerting impact on the already available diversity through a variety of cultural practices, one of which being agriculture.

Agriculture is a long-standing practice in Ethiopia going back to 7000 years (Ehret 1979); and the contribution of the practitioners in terms of both domesticating indigenous crop plants and also diversifying introduced ones has been mentioned since the time of Vavilov (Vavilov 1951, Harlan 1969, Westphal 1975). Nevertheless, this is only one facet of the full account as far as the role agriculture played in connection to biodiversity conservation in this country. As pointed out by Frison (2005), agriculture covers not only genetic and specific diversity but also the diversity of landscapes in the many and varied ecosystems that human beings make use of. This is particularly true when viewed in the context of Ethiopian agriculture.

In Ethiopia, cultural diversity coupled with ecological diversity, has resulted in various farming systems the different developmental stages of which are still evident in some parts of the country. These diverse farming systems, despite modifying the natural setting to some extent, have resulted in a mosaic of landscapes that harbor a significant level of biodiversity. One such land use system is the homegarden system. Ethiopian homegardens, like other similar gardens, serve diverse functions that range from satisfying household needs through biodiversity conservation to landscape stability. Nevertheless, these and other traditional farming systems were once targets of conversion because they were unjustifiably being judged as primitive and less productive (Tadesse Kippie 2002). Conservationists, who used to collect germplasm from these systems for decades, did not seem to bother about these source habitats of their precious collections; and this is a clear manifestation for the then lack of awareness and the consequent neglect. The residual effect of such malconceptions partly accounts for the apparent lack of attention to the system on the part of modern agriculture in Ethiopia.

The situation, however, has changed in recent years in Ethiopia and beyond following the Convention on Biological Diversity in 1992. Since then, the role of human-managed ecosystems in conservation is being recognized; and the deeply rooted notion that biodiversity conservation is possible only within protected areas is increasingly being criticized (Berkes and Davidson-Hunt 2007). Going further, it is argued that long-lasting conservation of biological diversity can not be achieved only through reserves that are often small, fragmented, isolated, poorly-protected and in most cases embedded within an agricultural landscape (Harvey *et al*. 2008). Therefore, the approach of conserving biodiversity while sustaining agricultural productivity, indigenous cultures, and rural livelihoods is increasingly being advocated. At the heart of this new approach is establishing an incentive system such as, for example, creating markets for products that are intimately linked to local biological resources and know-how so that local people would sustainably use and maintain their resource base (BIODIVALLOC 2005, Oliva 2008, Garcia *et al.* 2009). It is in this context that the present study focuses on traditional homegardens and one of their important components, i.e. spices.

In the last couple of decades, some studies have been undertaken on southwest Ethiopian homegardens (Zemede Asfaw and Ayele Nigatu 1995, Feleke Woldeyes 2000, Zemede Asfaw 2001a, Tesfaye Abebe 2005, Tesfaye Abebe *et al.* 2010). These studies mainly emphasized on documenting garden characteristics and roles in subsistence, management practices, and to some extent on the dynamics of the system. In the present study, an attempt is made to analyze these systems in a broader perspective, i.e. in the context of the entire landscape. Spices, which constitute an important functional group in homegarden and that create a linkage to other land use systems, are treated with greater emphasis. Commercialization trend and the possible impact of their valorization on local livelihoods and biodiversity are analyzed. In addition, the local belief systems, resource perceptions and classification systems are assessed as these have implications on resource use norms and conservation.

The selection of homegardens as the main study focus is based on the socio-economic and environmental role these crop production units play in the South Nations Nationalities and Peoples Regional State (SNNPRS) of Ethiopia where this study is conducted. In this regional state with a total population size of 15,042,531 people (20.4 % of the national total) (CSA 2008) and where most of the inhabited areas exhibit high population density, homegardens constitute the main subsistence means for the largest portion of the population. Although homegardening is practiced well over the region, Basketo and Kafa gardens and also the indigenous communities were found to share some features that allow cross-cultural comparisons. It was on this ground that the two study sites were selected for the study.

Since the study was conducted through an ethnobotanical approach, a combination of methods originating from diverse disciplines (botany, ecology, anthropology, economics, linguistics and chemistry) was employed. As main body of the thesis, the study results and discussion are presented following a literature review section while concluding remarks and recommendations are made at the end.

2. LITERATURE REVIEW

2.1 Local worldviews and resource use norms

2.1.1 Local worldviews

The term 'Worldview' is a loan translation of the German 'Weltanschauung' which is composed of two words i.e. 'Welt' (world) and 'Anschauung' (view or outlook). As Degh (1994) indicates, worldview is an obscure, vague and general term. Jones (1972) also regards the term as innately misleading for it implies passiveness when taken literally, i.e. it suggests the picture one gains in looking at the world rather than an act of creation yielding a construct. Different terms such as 'cosmovision, 'cosmology', 'ultimate cosmology', 'cognitive map' and 'climate of opinion' have been used to denote the concept represented by worldview. Jones (1972) associates the cause for applying such multiple names to vagueness of the concept itself.

Worldview is the way in which the members of a particular culture perceive their environment, the world or universe (Howard 1989, Slikkerveer 1999). It is a socio-cultural concept that encompasses people's beliefs and understandings about the origins of the universe, and the place of humans in it (Brockelman 1997, Olugbile *et al.* 2009). It is a framework of ideas and attitudes about the world and oneself, and it is associated with answers to fundamental questions of existence. Worldview gives shape to cultural values, ethics, and the basic norms and rules of a society; and it also structures observations that produce knowledge and understanding (Berkes *et al.* 2000).

Alhough there had been a trend to classify worldviews into traditional and western types (Howard 1989), it has been recognized in recent decades that there exist a great multiplicity of worldviews among and within the globe's cultural groups (Descola 1996, Cocks 2006, Mathez-Stiefel *et al.* 2007). Ellen (1996), commenting on developments in recognizing the diversity of worldviews, mentions that variations in conceptions of nature - both historically and ethnographically – have become so widely asserted matter and self-evident anthropological truth.

The different ways of conceptualizing and understanding nature, which provide a diversity of frameworks of interaction with the natural world, are dynamic products of historical and cultural contexts (Ellen 1996, Mathez-Stiefel *et al.* 2007). Accordingly, every traditional culture known to anthropology has had its own way of viewing the universe and absence of a worldview in such societies, therefore, is as inconceivable as the absence of language (Abrams and Primack 2001). Worldviews of many 'traditional' or 'local' people, i.e. communities which represent a socially and geographically defined group of people who live close to the natural resources on which they depend and who formed their own ways of relating to one another and to other things (Cocks 2006), are known to be holistic in contrast to the dualistic view of the universe as reflected by the western scientific tradition (Descola 1996, Ellen 1996, Slikkerveer 1999).

Some peculiar features that reflect the holistic nature of local worldviews have been reported from studies conducted in different parts of the world. One such feature relates to the way local communities view nature. Many Hawaiian people, for example, believe themselves to be part of nature and nature to be part of them; and this unity of humans, nature and the gods formed the core of their worldview (McGregor 1999). The native inhabitants of the Marovo Lagoon in the Solomon Islands, in their part, do not see organisms and non-living components of their environment as constituting a distinct realm of nature separated from human society (Hviding 1996). Among Amerindians of the Amazon, the notion of 'nature' is contiguous with that of 'society', and humankind is thus seen as a particular form of life participating in a wider community of living beings (Arhem 1996). While Andean people do not view humans as independent subjects opposed to an objective world (Mathez-Stiefel *et al.* 2007), the Australian aboriginal peoples believe that there is a direct connection between themselves and their country through their connection to their ancestral beings who are particular to that land and inseparable from it (Bennet 1999).

The respect dedicated to earth and its components is the other important aspect associated with local worldviews. Balick and Cox (1996), discussing the issue, assert that many indigenous cultures perceive the earth as existing not in the realm of the profane but in the realm of the sacred. Therefore, the need for protecting the earth is emphasized. This is of course not because the earth is useful to humans but because it is sacred. The respect shown by these societies is not limited to the earth as a whole but also to components of the local environment. Harmony and equilibrium among components of the cosmos are central concepts in most traditional worldviews (Posey 1999). The tradition of conceptualizing humans and other living and nonliving entities of the physical world on equal terms as practiced by Australian aborigines (Howard 1989), and the Andean philosophy of reciprocity (Gonzales *et al.* 1999) are expressions of the commitment to attain such harmony. As Gonzales *et al.* (1999) assert, harmony is not given but it has to be procured. In the Andes, harmony is achieved through reciprocal nurturing of the three principal components of the Andean living world: nature, humans and deities.

An additional feature inherent to local worldviews is the animistic belief system - the belief that all natural things have spirits – as held by the Altai people in Siberia (Klubnikin *et al.* 2000). According to these authors, landscape features and natural entities are central elements in the animistic spiritual belief system of these indigenous people, and components of the landscape are understood to have spirit owners who need to be acknowledged and honored. Negotiations are made between the natural and the spiritual world through the shaman (a wise man who has a special power to do so) on behalf of the community.

Berkes (1999), who stresses the need for analysis of local knowledge and management systems in a hierarchical manner, places worldview at a fourth level with local environmental knowledge, management systems and social institutions occupying first to third level in the given order, and one enveloping the other. According to his framework, worldview – that includes religion, ethics, and more generally belief systems - rounds out the knowledge-practice-belief complex that describes local knowledge.

Local worldviews have often been seen by outsiders as an impediment to progress in the past although such attitudes are changing (Curry 2000). The recent focus on the construction of meanings associated with rural landscapes and social constructions of rurality, as a result of dissatisfaction with the traditional emphasis on population and landscape-related research topics in rural geographic study, is cited as supportive evidence for this claim. Included in this paradigm shift is a willingness to consider the concept of worldview. Understanding worldviews of local people is getting increased attention, particularly in light of acquiring insight into local knowledge and practice that result in sustainable outcomes. This is what Cunningham (2001) remarks “If we are to understand people’s conservation behavior, we have to understand the ‘worldview’ that people have”.

2.1.2 Local resource use norms and management practices

There has been a polarized debate concerning the existence of conservation ethic among indigenous peoples and other small-scale societies. While some authors (Alvard 1993, Smith and Wishnie 2000, Hames 2007) questioned the existence of deliberate conservation among these societies, others (Alcorn 1993, Posey 1998, Maffi 2004) acknowledge its presence. As to the skeptics, the kind of conservation observed in small-scale societies is not a genuine one but it is epiphenomenal conservation which arises as a by-product of practices designed to enhance livelihood or can be explained as side effects of factors such as low population density, simple technology use, and lack of external markets. Alvard (1993) attributes the tendency to regard traditional people as conservationist to imprecise understanding of what constitutes conservation (i.e. a failure to make a distinction between epiphenomenal and genuine conservation), and therefore underlines the need for a non-ambiguous definition of conservation.

Those who believe that there exist intentional conservation practices by local people (Alcorn 1993, Posey 1998, Maffi 2004) assert that such communities are aware of the need for conservation, undertake environmentally sustainable practices, and their commitment to conservation is complex and very old. As Alcorn (1993) points out, indigenous people demonstrate a concern for maintaining the ecological processes and the species that mediate those processes; and also show a keen interest in the locations of rare plant species and frequently bring them into cultivation. Posey (1998) also asserts that indigenous, traditional and local communities have sustainably utilized and conserved a vast diversity of plants, animals and ecosystems since early times and, in the process, have molded environments through their conscious and unconscious activities.

The validity of the term conservation – as it is used in the present context - for judging practices of local people is questioned by promoters of the idea of indigenous conservation. While Posey (1998) regards the use of scientific measuring yardstick to judge the conservation behavior and practices of indigenous and traditional peoples as inappropriate, Alcorn (1993) argues that the western notion of 'conservation' is strange and inapplicable to many traditional societies where the word 'conservation' is generally translated as 'respecting nature', 'taking care of things', or 'doing things right.'

Despite the ongoing debate on the prevalence of deliberate conservation among local societies, and in spite of calls for caution from romanticizing local practices (MacDonald 2004, Cocks 2006), sustainable resources utilization and maintenance of biodiversity (Beltran 2000, Persic and Martin 2008) and sometimes deliberate conservation or enhancement of species and habitats (Smith and Wishnie 2000) are recognized to be practiced by these societies. The exhibited tradition of wise utilization of environmental resources by many traditional communities may be explained in terms of two important aspects: their environmental outlook or perception (worldview) and their ecological knowledge.

As noted by different authors (Degh 1994, Berkes 1999, Slikkerveer 1999, Curry 2000) worldviews structure observations of the environment, frame individual actions, regulate peoples' interactions with their environment, and also shape social institutions. The environmental perception of traditional people is a product of their strong link with and dependence on the land and all of its resources. Their relationship to land constitutes an important part of their identity; and its components which they live with underpin the foundation of their very survival (Christie and Mooney 1999). As a consequence, the land, including all its physical elements, is considered as sacred (Balick and Cox 1996, Posey 1999, Klubnikin *et al.* 2000) and also perceived as alive (Adimihardja 1999, Gonzales *et al.* 1999). The philosophy of inseparability between component entities (living things and the land that nurtures them, the innumerable uses of natural resources and culture, and culture and land) is well-founded (Christie and Mooney 1999). Among this “community of beings”, conversation takes place in a reciprocal manner in every form of expression (feelings, emotions or others) since they are equivalents and able to understand one another (Gonzales *et al*. 1999).

Such environmental perception of traditional people led to the development of wise resource use and sustainable management. Notable examples in this connection include: Siberian Altai people’s strong rule against taking more than what is needed (Klubnikin *et al.* 2000); little interest for new knowledge that might be used for exploiting more environmental resources than that actually needed by the Tukano Indians of the Colombian Northwest Amazon (Reichel-Dolmatoff 1976); and the Adivasi peasants’ (inhabitants of Jharkhand region, India) norm of viewing forests as a ‘frontier’ not to be won but as extensions of the farmed landscape that serve as source of additional resources (Parajuli 1999). The concept of ownership that prevails in such communities is of crucial importance in shaping the demonstrated behavior. The earth and nature are used and managed but are neither exclusively owned nor considered a commodity (Balick and Cox 1996, Christie and Mooney 1999, McGregor 1999). While the kind of ownership is communal or collective, a community’s resources are understood to belong to the ancestors, the spirits, and the unborn, as well as to the living people of that community (Alcorn 1999). Therefore, monopoly control over the use and exploitation of environmental resources is an alien concept to any traditional society (Christie and Mooney 1999).

In many local communities, members are required to care for and protect the land for future generations. Their main duty is recognized to be maintaining the balanced relationships that exist between the various components (Adimihardja 1999). They are not entitled to possess or own the land or its abundant resources but maintain stewardship over it (McGregor 1999). People are reminded of their duty of sustaining the elements of the earth and related principles through myths, rituals and ceremonies (Adimihardja 1999, Mahale and Soree 1999).

The other aspect responsible of wise utilization and sustainable management of environmental resources by local societies relates to the latter's environmental knowledge. They are equipped with skills which enable them to sustainably manage very complex ecological systems (Lertzman and Vredenburg 2005). As these authors mention, the ethics of local land use and resource practices is inseparable from local ecological knowledge. Indigenous people possess a detailed knowledge of their environment which is generated through acute observation and experimental learning (Altieri 1999), and handed down across generations by cultural transmission (Berkes *et al.* 2000).

An important aspect of local knowledge which is emphasized by different authors (Reichel-Dolmatoff 1976, Berkes *et al.* 2000, Colding and Folke 2001, Lertzman and Vredenburg 2005) is its adaptive nature. As Colding and Folke (2001) indicate, successful management and conservation rest on the capacity to understand and adapt to environmental feedback over time as well as space. Traditional people acquire such knowledge which is holistic in outlook and adaptive by nature, and whose use is critically associated with the lives of the people who generated it (Berkes *et al.* 2000). The motive behind generating such knowledge system is the great deal of interest displayed by the people to accumulate more factual knowledge with the aim of understanding what the physical world requires from humans. In other words, they have an inherent drive to acquire knowledge which enables people to bring themselves into harmony with nature, allowing survival (Reichel-Dolmatoff 1976).

Being guided by peculiar environmental perception and through a detailed ecological knowledge base, local people developed wise resource use norms and successful management practices. Appropriate behavior towards nature which is based on shared cultural values and social rules has been cultivated (Alcorn 1999). In some of these societies, resource use is limited to one's own sustenance allowing natural resources to reproduce; members share with neighbors what they gathered; and they plan and adjust their subsistence activities on the basis of understanding such aspects as abundance and distribution (McGregor 1999, Mathez-Stiefel *et al.* 2007). Laws that prohibit use of limited recourses and those that proscribe overuse and destruction of resources have been developed in such societies (Balick and Cox 1996, Plenderleith 1999).

There exist different types of local resource management practices that are based on ecological knowledge. While some of these practices are also used in conventional resource management, some are rarely used, whereas some others are largely abandoned (Berkes *et al.* 2000). Management practices that belong to the first category include: monitoring resource abundance and change in ecosystems, total protection of certain species, protection of vulnerable life history stages, protection of specific habitats, and temporal restrictions of harvest (Berkes *et al.* 2000, Colding and Folke 2001).

Monitoring resource status and changes in ecosystems is common in many groups of local recourse users, and the close situation of the users to the resources provides the opportunity to observe day-to-day changes either by the whole community or by selected individuals (Berkes *et al.* 2000). Total protection of certain species involves the banning of killing and detrimental use of specific species in both time and space offering total protection to threatened, endemic, and keystone species. Protection of vulnerable life history stages is achieved by restraint from using certain vulnerable stages of a species' life history based on its age, size, sex, or reproductive status (Colding and Folke 2001). Northeastern Brazil's inhabitants' restraint from hunting during the months of December and March to avoid killing the pregnant and caring females (Mourao *et al*. 2006) constitutes a good example.

Protection of specific habitats is among the common and conspicuous traditional management practices as demonstrated by maintenance of sacred sites. Some traditional societies regulate both access to and use of resources from particular habitats (Posey 1999, Colding and Folke 2001). Protection provided to habitat patches including pools along river courses, sacred ponds, sacred mountains, meadows and forests by local farmers in Jharkhand region of India (Parajuli 1999); the respect and protection given to forested holly hills and their components by the Dai of Yunan Povince of China (Shengji 1999); the banning of certain sites (termite mounds, graveyards, the thick woods of evil spirits, bone caves, etc.) for swidden among the Hanunoo-Mangyan people of the Philippines (Miyamoto 1988); and protection and preservation of forest pockets and water bodies (including the sea, rivers, lagoons, lakes) that are considered to be abodes of gods and sprits by various Ghanaian ethnic groups (Kobina and Kofi 2009) can be cited as examples in this connection. Such practices are recognized to have contributed to the maintenance of biological diversity and the associated ecological services (Colding and Folke 2001).

The above-mentioned resource use norms and management practices call for an appropriate social behavior expressed in the form of restraint in resource exploitation and respect for nature. This is achieved by compliance of individual members with the cultural requirements to informal institutions, i.e. rules and norms that structure human interaction (Colding and Folke 2001). Social taboos, which these authors describe as subsets of informal institutions, are considered particularly important in determining human behavior. Although a number of authors (Cotton 1996, Bharucha 1999, Laird 1999, Masinde and Tavera 1999, Parajuli 1999, Cunningham 2001) mentioned the role of taboos in maintaining social discipline with respect to resource use and management, it is Colding and Folke (2001) who presented a wider treatment of the issue.

Colding and Folke (2001) synthesized information on nature-related social taboos which they referred to as Resource and Habitat Taboos. They identified six categories of Resource and Habitat Taboos: segment taboos, temporal taboos, method taboos, life history taboos, specific-species taboos, and habitat taboos (Table 1). The different classes of taboos are recognized to be important in resource conservation by their roles that range from protection of vulnerable stages of a species' life history through local protection of species and ecosystems to promotion of local conservation of subsistence resources.

According to this synthesis, there exists no satisfactory explanation why Resource and Habitat Taboos exist in traditional societies. However, it is well-recognized that taboos and other customary practices have contributed to the conservation of environmental resources through their role in bringing coherence and shared community values to resource use and management (Laird 1999, Masinde and Tavera 1999).

Table 1 Features and conservation functions of Resource and Habitat Taboos applied by local people (source: Colding and Folke 2001)

Category	Feature	Conservation functions
Segment taboos	Involve banning of the utilization of particular species by certain members of society for specific time periods	Reduce hunting and harvesting pressures by regulating resource withdrawal
Temporal taboos	Involve banning of access to resources during certain time periods	Reduce hunting and harvesting pressures by regulating access to resources in time
Method taboos	Involve banning of the use of certain methods and techniques for withdrawal of species	Reduce hunting and harvesting pressures by regulating methods of resource withdrawal
Life history taboos	Involve banning of the use of certain vulnerable stages of a species' life history	Maintain stock recruitment of species by protecting vulnerable stages in a species' life history
Specific-species taboos	Involve total banning of the killing and detrimental use of specific species in both time and space	Offer total protection to threatened, endemic, and keystone species
Habitat taboos	Involve regulating both access to and use of resources from particular habitats in space and time	Maintenance of biodiversity and ecological services

2.1.3 Potential contributions of local resource management systems to sustainability beyond the local level

As it could be understood from the discussion so far, traditional resource use norms and management practices are intimately linked to the local worldview that shapes behavior and actions of individuals in a society. However, such world outlooks and associated practices have either been neglected or discouraged as they are considered impediments to progress (Curry 2000).

Because of such attitude, local resource management systems have suffered considerable erosion, and continue to face significant threat. Alcorn (1999) describes factors which he considers as major threats to local management systems through their direct or indirect impact. These include: formal schooling and loss of local language that contribute to loss of cultural values that support indigenous management systems and replacement by new ones; increasing influence of the market economy that transforms non-monetary values into monetary values and introduces the idea that labor and nature are commodities; loss of authority of local decision-makers such as wise men and elders due to imposition of new laws by central governments; and influx of migrants, contract laborers, or re-settlers who may not be aware of local norms of resource use and management.

Fortunately, however, the role indigenous knowledge and practices play in conservation are more and more being recognized, and their possible contribution in achieving sustainable development is advocated. This is evident from the writings of Lertzman and Vredenburg (2005) who argue that global sustainable development will not be achieved in a cultural vacuum. As the authors assert, indigenous peoples can play a significant role in the cross-cultural dialogue on sustainable development with their long-standing use and knowledge of ecosystems.

An important point worth considering here is that traditional resource management systems exhibit some basic differences from conventional ones. The difference pertains to their content, i.e. their nonspecific nature conservation - intent and purposes behind rules are not specified (Colding and Folke 2001). However, traditional conservation measures also resemble contemporary measures of conservation. Colding and Folke (2001) describe the similarity as ‘resemblance in form’ since many of the local rules have functions similar to those of formal conservation measures: preservation of ecologically vulnerable species, habitats and subsistence resources.

Growing awareness about local knowledge and resources management systems appears to have led to increased interest in exploring them more, and also to envisaging their use at a larger scale. While Cunningham (2001) suggests to develop thorough understanding of factors that contribute to peoples sustainable resource management systems, Colding and Folke (2001) recommend that due consideration should be given to local informal institutions in conservation planning. There is a growing belief that development programs and projects should be linked up with local worldviews and their related principles of resource use and management if they are to be successful (Adimihardja

1999). Generally, traditional management systems are suggested to form the basis of sustainable ecosystems and biodiversity conservation; and this is especially considered relevant in light of the pressing need to re-think and reconstruct a new resource management science (Laird 1999). The possibility of complementing scientific knowledge by local knowledge that can provide practical experience in living within ecosystems and responding to ecosystem changes is also proposed by Berkes *et al.* (1998).

2.2 Systems of local classification

2.2.1 Ethnotaxonomy

The tendency to organize and classify perceived phenomena or experience is universal to all human cultures (Seymour-Smith 1986 cited in Cotton 1996); and the propensity to classify and carefully observe the natural environment has been key to human thinking since ancient times as expressed by Lévi-Strauss (Maybury-Lewis 1988). Traditional societies, sometimes also referred to as non-literate or pre-scientific people (Berlin 1973, 1992), often developed highly systematic classification systems of their biological universe. Such local classification systems have been studied through 'Ethnotaxonomy' which is concerned with the investigation of the principles that underlie local peoples classification, naming, and identification of living things and other components of their environment (Berlin 1973, Harris 2008).

Despite the fact that scholars have been preoccupied by the idea of understanding organisms and the relationship among them for millennia and have hence developed scientific taxonomy, the alternative classification systems have not been given appropriate attention until relatively recently (Cotton 1996). As Cotton mentions, however, a considerable proportion of cognitive research which focused on how different cultures classify and name the natural world has been taking place since the 1960s. This new interest in comprehending the ways in which the components of given biological environments are locally perceived and categorized is an important development in relation to the expansion in scope of ethnobiology beyond its traditional limits (Hays 1979).

Local community taxonomic systems are not only restricted to plants and animals but extend to other components of the physical environment such as soils, vegetation zones, seasons, meteorological phenomena and even diseases (Cotton 1996, Plenderleith 1999, Holman 2005). As Ettema (1994) and Cotton (1996) point out, however, major research attention was given to local systems of biological classifications, and this led to a number of publications discussing ethnobiological classifications developed by local communities. Classification systems of indigenous people, specifically those on plants, are now recognized to be complex; and Hays (1979) attributes this to their intimate and constant contact and interaction with the botanical surroundings.

Different systems of local plant classification can be encountered in a single community. One such categorization is a general purpose system where plant taxa are categorized largely according to perceived morphological similarities. This will be dealt in detail in the next section. The other system is a special purpose classification where taxa are delimited by such criteria as plant use or humoral property (i.e. properties other than use). Groupings formed by such categorization are called cross-cutting categories because they often include plants of different lifeforms (Martin 1995, Cotton 1996, Atran 1999).

2.2 2 Principles of ethnobiological classification

There exist two opposing views in anthropological theory with implications on ethnobiological classification. These are the view of cultural particularism and relativism (the relativist approach), and the view of cross-cultural generalization and comparison (the comparativist approach) (Berlin 1992). According to the relativist view, cultures are regarded to be different in many ways; the search for the specific cultural and social factors at work in any particular human group's construction of biological reality is essential; description of the ethnobiological knowledge of some particular society is possible but an attempt to make scientific comparison among cultures is a futile exercise. On the other hand, the comparativist view, while recognizing the great variation among and within cultures of human societies, encourages discovery of what portions of the biological reality in any local habitat are cognitively recognized in any particular folk biological systems and why; and advocates comparison and examination of the different systems so as to discover cross-cultural similarities.

Associated to these two views are two arguments that pertain to ethnobiological classification and naming: the ‘intellectualist’ and the ‘utilitarian’ approach (Berlin 1992, Maffi 1999, Medin and Atran 1999). While the intellectualist approach argues for the prevalence of perceptual factors over practical ones, as presented by Berlin (1992), to underlie the naming and categorization of biological organisms, the utilitarian argument stresses a selective process based on utility (Hunn 1982 cited in Berlin 1992, Ellen 1993).

Berlin explained the principles of folk biological classification in his early work (Berlin 1973) by suggesting that recognition of morphological similarities and differences is the basis for categorization although classification can rarely be based on functional considerations. However, he gave a detailed account of the issue in his latter work (Berlin 1992).

As Berlin (1992) argues, emic classification of natural things is based on perceptual recognitions of groupings that suggest themselves to the human observer as perceptual givens – well-defined clusters and clumps that can be recognized. He asserts that human beings everywhere are constrained by nature’s basic plan, basically in the same manner, in their conceptual recognition of the biological diversity of their natural environments. This is believed to have resulted in human beings’ similar perceptual and largely unconscious appreciation of the natural affinities among grouping of plants and animals in their environment. This, in turn, is considered to be the fundamental reason for the observed similarities, in both structure and content, between systems of biological classification across different traditional societies.

Berlin’s view of cross-cultural similarity of local classification systems is supported by other workers. While Atran (1985) suggested that ethnobiological classifications are universal, spontaneous, and orderly, Cotton (1996) presents significant features of folk systems which appear to be universal. Hiepko (2006), in his part, states that the findings of the study on Eipo (people of New Guinea) botany confirm the existence of universals in folk classification systems.

Berlin (1992), based on evidence from comparative analyses of ethnobiological classification systems from different parts of the world, proposed principles that specify regularities of ethnobiological categorization and that refer to patterns of ethnobiological nomenclature. Berlin's work, which Maffi (1999) describes as "the most comprehensive treatment of ethnobiological categorization and naming to date", which Ellen (1994) acknowledged to be a further benchmark for continued research in the area, and which Martin (1995) recognizes as a useful scheme for comparison of the biological categories of local people, has gained general acceptance among researchers.

Berlin (1992) organized seven general principles in relation to ethnobiological categorization and five that pertain to ethnobiological nomenclature. The seven principles of categorization may be divided into two: those dealing with the conceptual organization of plants and animals into a coherent cognate structure, and those that pertain to nature of folk taxa. Accordingly, the first four principles state that traditional societies exhibit a system of ethnobiological classification where groups of plants and animals (taxa) are formed primarily on the basis of observed morphological and behavioral affinities and differences. The recognized taxa are organized into a hierarchic system of six levels with the ranks, in order of decreasing inclusiveness being the *kingdom, lifeform, intermediate, generic, specific,* and *varietal*. The remaining three principles discuss about: the existence of systematic similarities - in terms of relative numbers and biological content -among taxa of each rank across all folk systems of ethnobiological classification; the peculiar internal structure of taxa of some ranks; and the significant correspondence that exists between taxa recognized by local classification systems and formal scientific taxonomy.

The *kingdom*, which was also labeled as *unique beginner* earlier (Berlin 1973), is the most general category which is implicitly recognized by local people, and which incorporates all taxa of lesser rank. *Lifeforms* are distinctive classes (such as trees, vines or grasses) that are recognized by their morphological features and associated ecological adaptation features. *Intermediates* are small groupings of several *generics* that are perceived to be similar in some way. They are placed between *lifeforms* and *generics* and often go undetected. Therefore, they are usually unnamed and hence called “covert categories”. *Generics* are the most distinctive and the most numerous taxa. They are the first to be learned by children in the process of acquiring the local classification system. While the majority of *generics* are monotypic, some are polytypic – i.e. partitioned into taxa of lesser rank. Taxa of this sub-*generic* level are *specifics* which in turn are subdivided into *varietals*. *Specific* taxa are known to be less numerous than those at *generic* level, and taxa of *varietal* level occur only very rarely. The conceptual recognition of sub-*generic* taxa is suggested to be partly associated to specific subsistence modes (Berlin 1973, Hays 1979, Berlin 1992, Martin 1995).

In his five principles of ethnobiological nomenclature, Berlin (1992) addressed patterns that underlie the naming of organisms in different systems of ethnobiological classification. In summary, the principles state that: taxa at the rank of *kingdom* and *intermediate* rank are generally not named; when taxa are named, the names can be distinguished either into primary name or secondary name that can further be analyzed; named taxa at and above *generic* level are generally labeled by a primary name while those below *generic* level are labeled by a secondary name; and names commonly reflect features of the taxa they are attached to. The situation that a sub-*generic* taxon may sometimes be labeled with a primary name constitutes the only exception to the rules. This occurs under two conditions: when a sub-*generic* taxon is thought of as being the prototype of the particular *generic* with which it shares the same name – such name is called polysemous; or when the sub-*generic* taxon is of major cultural importance and therefore designated by a name linguistically distinct from that of the higher level taxon in which it is included.

As noted above, plant names are of two basic types: primary name (semantically unitary) and secondary name (semantically binary expression). Two forms of primary names are recognized: simple (composed of a single constituent) and complex (composed of two or more constituents). Complex primary names can again be subdivided into either productive or unproductive categories (Berlin 1992, Martin 1995).

As Martin (1995) points out, striking similarities are detected in the ways plants are named by local people around the world although there exist no written nomenclatural rules that guide the process. The existence of a close relationship between the linguistic structure of plant names and the taxonomic rank of the named taxa presents a good example in this regard (Hays 1979, Martin 1995). Berlin (1992) attributes this relationship to the fact that the rank of a taxon predictably governs the ways in which that taxon gets named. This in turn makes clear the necessity for analyzing the structure of plant names when attempting to understand folk taxonomic structure. It should, however, be noted that local names are of additional benefits since they provide a clue on how people perceive and classify organisms in their surroundings and thereby aid in understanding the detailed knowledge that local peoples possess about local biota (Diamond and Bishop 1999).

Although the general principles of ethnobiological classification apply to all systems of local classification, there exists some difference in meeting all the stated conditions. This specifically refers to taxonomies of hunters-gatherers (or foragers) that are shallower than those of small-scale agriculturists. In foraging societies, taxa of *specific* rank are limited in number or completely lacking whereas taxa of *varietal* rank are nonexistent. As a result, their biological folk taxonomies are known to be less binomialized (Brown 1985, Berlin 1992).

2.2.3 Correspondence between local and scientific classification

The existence of a structural and substantive correspondence between folk and scientific classification systems has been suggested already some decades ago (Berlin 1973); and evidence showing a clear relationship between the two systems has been discovered by researchers (Martin 1995). As Martin (1995) proposes, the easiest way to characterize and measure local people’s knowledge of the local flora and fauna is to describe the correspondence between folk and scientific categories. Nevertheless, one problem in making comparisons between the two systems concerns the units of analysis to be considered, i.e. defining which folk and scientific categories are to be compared. Most comparisons are made between folk *generics* and botanical species although it is possible to make comparisons at any rank (Berlin 1973).

Berlin (1973) recognized three types of correspondence between the two systems: one-to-one correspondence, over-differentiation, and under-differentiation. One-to-one correspondence is a situation where a single local *generic* taxon refers to one and only one scientific species, whereas over-differentiation refers to a condition where two or more local *generic* taxa refer to a single scientific species. Under-differentiation is recognized to be of two types: the one that occurs when a single local *generic* taxon refers to two or more scientific species of the same genus, or to the condition where a single local *generic* refers to two or more species of two or more scientific genera. The existence of the three aforementioned types of correspondence between the two systems of classification is supported by research findings such as the one on the ethnotaxonomy of Eipo people of New Guinea (Hiepko 2006).

Over-differentiation and under-differentiation are mentioned to be associated to salience or conspicuousness of the taxa concerned. While species of great cultural significance are split into more than one category by local people, those that are less important culturally or less distinctive in appearance are usually lumped into a single *generic* (Martin 1995). The fact that crop plants are over-differentiated and wild plants of no apparent value are under-differentiated (Hiepko 2006), and also the frequent occurrence across cultures to lump small organisms (Harris 2008) stands in favor of this argument.

Although a substantial majority of ethnobiological taxa closely corresponds in content with scientific taxa, it is at the *generic* rank that the highest degree of correspondence occurs (Berlin 1992). A frequently cited example in this regard comes from a study on the classification system of the Tzeltal of Highland Chiapas, Mexico (Berlin 1973). Out of 471 *generic* taxa recognized by the local system, about 62 % showed one-to-one correspondence, some 3.5 % were found to be over-differentiated while about 34.5 %

were under-differentiated. Such high correspondence between the two different systems is an indication that human observers are highly constrained by nature's plan that allows little variation in its perception (Berlin 1992). However, it is worth mentioning that important differences exist between local and scientific taxonomic systems, and this is particularly true with respect to taxonomic levels of the two systems.

2.3 Traditional farming systems

2.3.1 Origin of agriculture

Agriculture is a level or type of behavior (Rindos 1980) that might be mentioned as one of the topmost accomplishments of the human species (Wadley and Martin 1993). Though it is estimated that the shift from hunting-gathering to cultivation started some 10,000 years ago, the transformation of human foragers into agriculturally-based societies remains an enduring problem for scholars conducting studies in the area (Cowan and Watson 2006). As Rindos (1980) mentions, the origins of agriculture and its subsequent spread have caught attention of scientists from diverse fields for more than a century. Nevertheless, the current understanding how agriculture arose is known to be unsatisfactory.

Associated to this lack of generally accepted explanation that accounts for the origin of agriculture, a number of theories that attempt to tackle the issue form different perspectives have been proposed. Some of the theories or models include: the Population Pressure theory which asserts that population growth forced foragers to adopt agriculture as wild resources became scarce (Binford 1968 cited in Blumler and Bryne 1991); the Environmental Pressure model that attributes initiation of cultivation to environmental changes particularly the development of strongly seasonal rainfall regimes during the Pleistocene/Holocene transition (Blumler and Bryne 1991); the Coevolution hypothesis which holds that agriculture is a co-evolutionary adaptation of plants and humans that began with domestication by protection of wild plants (Rindos 1980, 1984); and the hypothesis that suggests chemical rewards from cereals and dairy foods as incentive for the initial adoption of cereal agriculture (Wadley and Martin 1993).

It is generally assumed that agriculture arose several times in various independent centers of agricultural origin (Rindos 1984, Cowan and Watson 2006), and constituent agricultural practices co-occurred extensively across the landscape since the early Holocene (Denham 2005). Even though new forms of farming systems have developed through the process of intensification, earlier forms still continued to exist in some parts of the world. Even today it is possible to find farming systems that represent all stages of intensification at varying distance from a settlement in areas where land pressure is low (Ker 1995).

2.3.2 Features of traditional farming systems

In very broad terms, two types of agricultural systems can be recognized: traditional, and industrial or green revolution agriculture. Traditional farming systems can be distinguished from the other category by a number of features with the major ones being optimum utilization of locally available resources, minimized risk of crop failure, and better sustainability of the production methods (Cotton 1996). Traditional farming systems, which are closely tied to local worldviews (Curry 2000), are highly complex structures especially in the humid tropics (Ker 1995). They are the main source of household livelihood and therefore an abrupt change in production methods is unlikely (Beets 1990). In most cases, traditional farming practices are place-specific, evolving in time in a particular habitat and culture, and this is considered to be the reason behind their success (Altieri 2004).

A great variety of traditional farming systems (agricultural and fallow fields, raised fields, terraces, polycultures, complex homegardens, agroforestry plots) have evolved under an enormous diversity of environmental, ecological, and socio-economic conditions (Ker 1995, Cotton 1996, Altieri 1999). However, the development of these systems has not been a random process but has rather been based on a thorough understating of the elements of the environment and their interactions (Altieri 1999). Indigenous agriculturalists, using local ecological knowledge and concentrating on key ecological principles, have developed a myriad of complex agricultural systems. Therefore, these systems, which are the result of a complex coevolutionary process between natural and social systems, represent centuries of accumulated experience of interaction with the environment (Altieri and Merrick 1987, Altieri 1999 2004).

A feature of traditional farming systems, that clearly distinguishes them from their conventional counterparts, is the plant diversity they harbor. These systems, particularly those in developing countries, contain toady's great diversity of plant and animal germplasm that arose over millennia, and can therefore be portrayed as the world's largest repositories of crop and livestock genetic diversity (Beets 1990, Miller *et al.* 1995, Altieri 1999). The diversity observed in the traditional agricultural landscape is comprised not only of cultivated plants but also includes wild or weedy relatives of crop plants within or around cropping systems that have coexisted and coevolved over a long period of time (Altieri and Merrick 1987).

Plenderleith (1999) describes local communities' practice of simultaneously raising diverse resources in the farm as a holistic, adaptive and innovative approach to the land. While the overarching objective of maintaining high plant diversity in the farm system may be identified as attaining sustainable production system, there exist a number of reasons that make farmers adhere to the practice. Virtues of these highly biodiverse agro-ecosystems and the services they provide are described by several authors (Capistrano and Marten 1986, Altieri *et al.* 1987, Cotton 1996, Plenderleith 1999, Altieri 2004) with the major ones being:

- sustained provision of food and other products for household use;
- better harvest security even under unpredictable environmental conditions;
- heightened resistance to diseases and pest attacks resulting in less crop loss;
- improved productivity because of efficient use of available resources through a sustained exploitation of a range of microclimates; and
- improved soil conditions.

As Capistrano and Marten (1986) mention, the crop diversity of traditional systems shapes the ways farmers perceive the resources available for production, structures their management decisions and influences the way how labor is organized. This centuries' old interaction between small-scale farmers and local diversity resulted in development of extensive and complex knowledge which is passed down through generations, and which is fundamental in maintaining the observed diverse agro-ecosystems (Cotton 1996, Plenderleith 1999, Altieri 2004).

Altieri (2004), who argues that much can be learnt from traditional farming methods with regard to successful agricultural management, suggests some key principles which he regards to underlie the sustainability of these systems. These include: maintenance of high biodiversity, soil organic matter accumulation, enhanced recycling of biomass and nutrients, and minimization of resource losses. Besides the long existing role of supporting local livelihoods from around the world, these sustainable agro-ecosystems and adjacent lands significantly contributed to the conservation of crop and related species genetic diversity (Altieri and Merrick 1987).

However, there has been decades long trend of agricultural modernization that promoted monoculture and the use of external inputs; and which had unwanted impacts that went beyond natural resources degradation. It is in this light that Altieri (2004), who attributes the problem associated to agricultural development endeavors partly to a lack of understanding ecological principles, strongly recommends for a closer assessment of the local knowledge framework and resource management practices used by rural communities. As he asserts, local management practices represent a rich resource for understanding the mechanisms at work in complex agro-ecosystems. Therefore, sufficient comprehension of the range of local strategies, cultural processes, and associated belief systems that foster adaptive natural resource management will significantly help in developing successful contemporary systems.

2.3.3 Farming in Ethiopia

Agriculture in Ethiopia is quite an ancient practice going back to more than 7000 years (Ehret 1979). Harlan (2006), despite mentioning that agriculture on the Ethiopian plateau is based primarily on crops of a Near Eastern complex (such as barley, wheat, some pulses and oil crops), asserts that an indigenous agriculture was already in place at the time these crops arrived. According to Ehret (1979), two ancient inventions of agriculture took place independently: cereal cultivation in the grassier, drier northern and eastern fringes of the Ethiopian plateau, and ***enset*** cultivation in the humid and once densely forested highland zones, particularly the southwest. He also recognizes the raising of livestock to be an equally ancient practice in Ethiopia and the Horn.

Ethiopia, being a country of ecological and cultural diversity, allowed the emergence of a wide variety of ways of using natural resources as demonstrated by the occurrence of diverse agricultural practices. The country is known to be the origin of some important crop plants including ***t'ef*** (*Eragrostis tef*), coffee (*Coffea arabica*), ***noug*** (*Guizotia abyssinica),* safflower (*Carthamus tinctorius*), ***enset*** (*Ensete ventricosum*); and a center of genetic diversity of cultivated crops such as sorghum, barley, chickpeas, linseed and cowpea (Vavilov 1951, Harlan 1969, Westphal 1975, Brandt 1984, Engels and Hawkes 1991, IBC 2008). Mountainous parts of the country have become a breeding ground for landraces of cereals, pulses and other crop plants (Westphal 1975).

Similar to those in other regions of the tropics, Ethiopian agro-ecosystems are characterized by high crop diversity. This feature of the agriculture forced an early traveler to the country to note: "……Hence the astonishing number of distinguishable kinds is cultivated in a small compass of ground under certain established appellations and brought into use for very different purposes. " (Harris 1844 cited in Westphal 1975). This tradition of maintaining high degrees of intra and inter-specific crop diversity across time and space is associated with the farmers' strategy of sustaining yield through efficient utilization of locally available resources.

Westphal (1975) categorized farming systems in Ethiopia into four types: the seed-farming complex, the ***enset***-planting complex, shifting cultivation, and the pastoral complex. However, he noted that because of great diversity within each of these systems and also existence of many transitional forms, clearly distinguishing each form may not always be possible. Despite diffusion of practices because of increased movement of people and agriculture-related development interventions, the mentioned four systems are still in existence.

What Westphal (1975) describes as the ***enset***-planting complex, and which he divided into subtypes based on the extent to which the staple crop is substituted by other crops, is mainly found in the South Nations Nationalities and Peoples Regional State. ***Enset***, being a highly nutrient requiring plant and also used for a variety of purposes on daily bases, is commonly cultivated close to the house in mixture with diverse plants of all lifeforms, forming a complex. This complex constitutes the unique and sustainable production system of the region – the homegarden.

2.4 The homegarden system

2.4.1 Characteristic features of homegardens

Homegardens are production units that usually occupy small plots of land surrounding the house; and which consist of a mixture of perennials and annual crops and also animals (Christanty 1990, Fernandes and Nair 1990, Power and Flecker 1996, Godbole 1997, Peyre *et al.* 2006). Homegardens represent one of the oldest farming practices and found throughout the world, varying greatly with climate and local custom (Capistrano and Marten 1986, Soemarwoto and Conway 1992, Ali 2005). It is possible to come through different names (kitchen gardens, compound farms, homestead gardens, mixed gardens, dooryard gardens, etc.) referring to these land use systems. However, the term ‘homegarden’ is frequently used in the relevant literature and is becoming a standard one.

Homegardening is believed to be an age-old practice with its origin, depending on the region, estimated to have occurred soome 5-10,000 years (Leach 1982, Terra 1948 cited in Soemarwoto and Conway 1992). According to Spencer and Stewart (1973), dooryard garden planting is an immediate continuation of shifting cultivation and these two mark the beginning of crop growing. A widely held opinion concerning the origin and evolutions of homegardens relates to resource constraints (Fernandes and Nair 1990, Thaman 1990, Hoogerbrugge and Fresco 1993, Rugalema *et al*. 1994). These multi-story agroforestry plots are argued to have evolved from shifting cultivation under the influence of resource constraints such as population pressure and the consequent reduction in available land, labor and capital. Physical limitations such as remoteness of locations that compelled inhabitants to be self-sufficient are also mentioned as additional reasons.

This explanation, however, is not found to be fully satisfactory and therefore alternative hypotheses were made. Rocheleau *et al*. (1988), who point out that farmers may be motivated to adapt and develop homegardening under situations where access to land is not a problem, associate the issue to land tenure. As these authors argue, there are instances in which farmers concentrate on homegardening while they have access to plenty of land. They attribute this tendency of intensifying production on limited land to farmers' desire to define and secure land rights.

Although homegardens around the world vary considerably, they share some features. This is particularly true for tropical homegardens that evolved under the specific environmental conditions of the region through intensive household care. The unique nature of the homegarden system can be best expressed by describing three interrelated features: architecture, diversity, and sustainability.

Homegardens acquire a complex architecture which may not be detected at first sight but becomes increasingly revealed through closer inspection. Despite its appearance as a disordered unit, the homegarden is intelligent in its basic pattern and carefully structured (Fernandes and Nair 1990, Gillespie *et al*. 1993). The structure and function of homegardens are closely linked and therefore structure varies in space and time influenced by environmental features (such as climate, soil type, altitude) and socio-cultural factors (owner's needs, status, cultural background) (Abdoellah 1990, Karyono 1990).

Homegarden plants, that are integrated into the system based on an understanding of the specific requirements of the species and with the intention of getting maximized yield (Abdoellah 1990), are arranged both in horizontal and vertical fashion. The herbaceous and woody components of the garden form a vertically-stratified structure favorably placed to exploit both above and below ground environmental conditions (Adegbehin and Igboanugo 1990). Although clear-cut stratification does not exist in the vertical dimension, it is possible to recognize different layers: the upper layer that consists of fully grown tall and medium- sized trees species; the intermediate layer consisting of shrubs and herbaceous perennials; and the lower layer which is composed of different vegetables, medicinal and other food plants. In addition, prostrate and crawling species cover the surface forming the ground layer (Sommers 1982, Fernandes and Nair 1990, Caballero 1992, Jensen 1993, Feleke Woldeyes 2000).

In the multilayered canopy configuration of homegardens, plant density and species richness decline from the lower to the upper strata creating a gradient of light intensity and quality throughout the lower strata (Fordham 1983). Different species flourish within these strata where the light condition suits them (Millat-e-Mustafa *et al*. 1996). A relation between garden size and vertical space use has also been observed: intensity of vertical space use is found to be greater (i.e. more plants of different height and habit are grown per unit area) in smaller holdings as compared to that of larger ones; and this inverse relation is interpreted in terms of farmers' attempt to maximize productivity from small gardens through optimum space exploitation (Jose and Shanmugaratnam 1993).

The horizontal arrangement of plants in the homegarden is recognized to follow a certain pattern being determined by such factors as light, water and fertility requirements; micro-environmental adaptation; habit, use, and crop protection; and aesthetics (Christanty 1990, Okigbo 1990). Accordingly, while leafy vegetables and spices which are constantly harvested for daily cooking are usually planted close to the kitchen or at the backyard; ornamentals and vegetables are grown in front or side parts where there is sufficient light, and also for security and aesthetic purposes; high moisture-requiring plants are raised in the moist part of the garden, and those with high nutrient requirements are grown near livestock pens and garbage dumps. Trees with large crown are often placed well apart near the margin with trailing and climbing crops planted close to them or to the fence which is mainly made up of live plants (Budowski 1990, Christanty 1990, Okigbo 1990, Gillespie *et al*. 1993, Jensen 1993, Jose and Shanmugaratnam 1993, Zemede Asfaw and Ayele Nigatu 1995, Feleke Woldeyes 2000).

Diversity, as expressed by occurrence of different life forms, species and infraspecific variations, is a key trait of homegardens that led to their recognition as production systems with the highest biological diversity and complexity among agro-ecosystems (Brownrigg 1985, Soemarwoto 1987, Okigbo 1990). Studies conducted on homegardens in different parts of the world yielded a significantly high number of species incorporated into the system. For example, while a total of 476 species were reported from homegardens of Kerala, India (Mohan 2004), 223 species were reported from Veracruz, Mexico (Angel-Perez and Mendoza 2004), and 170 plant species were reported from Kafa, Ethiopia (Feleke Woldeyes 2000).

In addition to plant species, the homegardens also contain an animal component consisting of livestock, poultry, bees and some wildlife such as birds, bats, insects, and civet cats, which play an essential role in biological processes such as pollination, natural hybridization and seed dispersal (Michon and Mary 1994). Some homegardens, like those in Vietnam, are also known to contain ponds that support a number of fish species, and other small animal and plant types (Nguyen 1995).

Farmers' reasons for maintaining high biological diversity in homegardens are several. Generally, it can be put as a deliberate strategy aimed at producing harvest throughout the year, controlling pests and diseases, using natural resources such as light, water and soil nutrients efficiently and risk aversion (Sathees-Babu *et al*. 1992). Even though homegardens are generally praised for their high diversity, one should not expect this to occur in all cases. This is because variations exist among gardens and geographical regions as a result of differences in ecological, socio-cultural, socio-economic, individual and political factors (Christanty 1990, Caballero 1992, Esquivel and Hammer 1992, Gessler *et al*. 1997).

The other feature of homegardens which is associated with the above mentioned two features is their sustainability. Sustainable land use is a system of production which maintains an acceptable level of production and simultaneously conserves the basic resources on which production depends (Millat-e-Mustafa 1997). The two main dimensions of sustainability, ecological sustainability which is time-independent and social sustainability which involves the notion of agroforestry systems adjusting in a timely fashion to changing local conditions (Peyre *et al.* 2006), are implied here. Homegardening is one of the agricultural practices that best fits the two dimensions; and that is why Sommers (1982) describes homegardens as the most environmentally appropriate farming systems operating in the tropics.

The stability and sustainability of homegardens is understood to be associated with their structure and composition. Mature homegardens share characteristics of a climax ecosystem to varying degrees (Soemarwoto and Conway 1992, Jose and Shanmugaratnam 1993) and are therefore classified by some (Fordham 1983, Brownrigg 1985, Okigbo 1990, Jose and Shanmugaratnam 1993) as human ecosystems which mimic the natural tropical forest. Factors that contribute to the sustainability of homegardens include: 1) efficient utilization of available resources and use of local inputs; 2) minimal rate of soil erosion due to the multi-layered structure and an almost completely closed biogeochemical cycling of minerals – the combination of which insures maintenance of soil fertility; 3) minimum loss of products that could be caused by pests, diseases and weeds because of rich genetic diversity (Sommers 1982, Abdoellah 1990, Adegbehin and Igboanugo 1990, Immink 1990, Mettrick 1993, Rugalema *et al*. 1994).

2.4.2 Role of homegardens and management practices

Traditional homegardens serve a number of functions to the household. Even though their contribution may vary depending on a host of factors, they are primarily meant to provide food for the household. High diversity of crops with different flowering, fruiting and harvesting seasons allow these land use systems an almost year-round production of foods that provide a substantial proportion of the nutritive requirements of households (Christanty 1990, Fernandes and Nair 1990, Karyono 1990).

Homegardens are also a sources of other resources such as medicinals, construction materials, fuel and beauty aids. Existence of diverse species with medicinal value has led to their nicknaming as ‘medicine cabinets’ (Finerman and Sackett 2003). Homegardens are also important in generating income for the household thorough the selling of plant products and also animals associated with the system (Angel-Perez and Mendoza 2004). In addition, homegardens make use of local labor thereby making people engaged (Wezel and Bender 2003).

Social-related functions of homegardens are also worth mentioning. Homegardens strengthen social bond within communities since products form these gardens are shared on a regular basis (Soemarwoto and Conway 1992) or because planting materials are freely exchanged between neighbors and relatives (Bizuayehu Tesfaye 2008). Homegardens function as a symbol of status (Feleke Woldeyes 2000) and a well-established garden lends the owner a reputation as skilled gardener (Finerman and Sackett 2003). Homegardens are valuable sites for agro-biodiversity conservation. They constitute an experimenting ground to try out undomesticated or newly introduced plants, and reduce destructive pressure on the few small nature reserves (Nguyen 1995, Zemede Asfaw 2001b, Finerman and Sackett 2003).

Based on knowledge accumulated over generations, various management practices that pertain to soil, light and space management, and crop selection and protection are performed in homegardens. Soil fertility is usually maintained with farmyard and pen manure, household refuse, kitchen waste, compost and crop residues. With the aim of providing the undergrowth with sufficient light, increased fruit and timber production, and for ease of harvesting of fruits, gardeners prune taller trees (Millat-e-Mustafa 1997). Farmers also practice companion planting of crops that complement each other to make maximum use of available land through intensive cropping of the garden both vertically as well as horizontally with the aim of securing a sustained yield (Sommers 1982).

The homegarden, of course, is a place where crop selection is performed by farmers. Generally, land race selection by farmers is based on gastronomic criteria (such as taste, storage, cooking time, and other processing opportunities) and agronomic criteria (that include length of maturity period, drought tolerance, resistance to pest, disease and bird damage, and ability to compete with weeds) (Hailu Mekbib 1995). Although diseases, pests and weeds are not a serous threat, such measures as weeding, eradication of infected individuals, use of scarecrows and scaring sounds, and fencing are used (Zemede Asfaw and Ayele Nigatu 1995, Feleke Woldeyes 2000). Generally, homegardens are cared intensively, and their situation close to the house is thought to be one reason for this (Capistrano and Marten 1986). The ecological "philosophy" behind homegardens is directing succession rather than fighting it (Jose and Shanmugaratnam 1993), and management practices mostly remain simple, occasional, and hardly interfere with natural processes (Michon and Mary 1994).

One aspect of homegarden management worth noting is the disparity observed in gender distribution of labor. Even though all members of the household participate in the day to day working of homegardens, the latter remain the main responsibility of women with contribution of men being limited to assisting in more labor demanding activities (Brownrigg 1985, Ninez 1990, Zemede Asfaw 1997, Mohan 2004, Vogl-Lukasser and Vogl 2004, Ali 2005). As Finerman and Sackett (2003) indicated, Saraguro women of Ecuador are the most knowledgeable about their garden and its contents. Moreover, they also haven the authority to decide on planting and product exploitation activities. Observation of such high involvement of women in maintaining homegardens led Soemarwoto and Conway (1992) to speculate that these systmes might have developed first in matriarchal societies, at least in some parts of the world.

2.4.3 Ethiopian homegardens

Since Ethiopia is characterized by diverse climatic, altitudinal and socio-cultural conditions, it is not difficult to envisage existence of various types of homegardens. Homegardens in Ethiopia may broadly be categorized into two types (Zemede Asfaw 2001a, Tesfaye Abebe 2005). The first category of homegardens are small-sized gardens in which vegetables, spices, oilseeds and fruits are cultivated to supplement cereals and pulses raised in adjoining fields. This type of gardens is characteristic of cereal crop-based farming areas of the country and is also found in urban centers. The other type of homegardens, which is characterized by a diverse mixture of crop plants with ***enset*** (*Ensete ventricosum*) making the basic framework, is that found in the south and southwestern part of the country. These medium to large-sized gardens are the main source of livelihood for households in the area.

Though there is lack of reliable evidence on the origin of homegardening in Ethiopia, a long history – as old as agriculture in the country – is suggested (Zemede Asfaw and Ayele Nigatu 1995, Zemede Asfaw 2001b). The fact that ***enset,*** whose cultivation is proposed to have begun 7000 years ago in the highlands of the southwest (Ehret 1979, Brandt 1996), is an important component of homegardens of the region provides the ground for speculating that the practice has been there since antiquity. Unlike their origin, establishment and evolution of Ethiopian homegardens are better-explained (Zemede Asfaw 2001a, Tesfaye Abebe 2005). Establishing a homegarden occurs in one of the following two ways depending on the region. In forested areas of the southwest, farmers clear the undergrowth leaving some of the upper story trees, introduce different plants from various sources (***enset*** being the first), and the homegardens gradually evolve to maturity. In other parts of the country, following the construction of a house on an open field, different types of plants are planted around the house beginning with medicinals and annual crops and with gradual introduction of perennial plants of different use.

Ethiopian homegardens are of high significance in fulfilling household needs to the largely agrarian population of the country. This is particularly true for the homegarden system of the southwest which Westphal (1975) described as the ***enset***-complex, and which is characterized by the concurrent cultivation of various tubers, legumes, cereals, oil crops, vegetables, spices and stimulants. The system, which supports the lives of the largest proportion of the more than 15 million inhabitants of the region, is praised to be sustainable; and this is evident from the absence of any serious food shortage-related humanitarian crisis in the area.

The tremendous importance of Ethiopian homegardens did not gain proper attention until recently; and there have been research and development activities geared towards transforming them into modern conventional farming systems with the aim of attaining increased yields (Tadesse Kippie 2002). However, growing interest in acquiring insight into these farming systems (both at national and international level) has stimulated research in the area. Accordingly, a number of ethnobotanical and related studies that focus on homegardens have been conducted in the last two decades with a good proportion of these being on homegardens of the southwest (Feleke Woldeyes 2000, Tadesse Kippie 2002, Belachew Wassihun *et al.* 2003, Tesfaye Abebe 2005, Bizuayehu Tesfaye 2008, Mathewos Agize 2008). Furthermore, a project entitled "Ethiopian Home Gardens" that works towards establishment of a system of Geographical Indications with an ultimate objective of bringing economic security and development to the rural communities together with conserving gardens, their associated biodiversity and local know-how is currently under way (EHGP 2004).

2.4.4 Changes, threats and opportunities associated with homegardens

Homegardens are not static but evolve through time. Changes occur with respect to plant composition and management practices (Vogl-Lukasser and Vogl 2004, Peyre *et al.* 2006, Bizuayehu Tesfaye 2008), and in some cases successional developments directed towards a more stable system can be envisaged (Zemede Asfaw 2001b). Gardeners are receptive to new cultigens and techniques, and a very high introduction rate has been witnessed in the last few decades with a wide range of vegetable species, fruit trees, spices and ornamental plants forming the bulk (Finerman and Sackett 2003, Vogl-Lukasser and Vogl 2004).

Modification of homegarden composition and management practices can be caused by biophysical, demographic, socio-economic, technological and changing climatic factors. However, two processes, i.e. growth of commercialization and population, are recognized to be of major impact (Soemarwoto and Conway 1992, Finerman and Sackett 2003, Ali 2005, Tesfaye Abebe 2005). Expanding market demand and consequent increased commercialization of garden products motivate farmers to introduce income-generating crops. This has an obvious consequence since it stimulates looking for those varieties with high market demand, and growing them in larger quantities. The use of external inputs is also a most likely next step. Declining landholding size due to population growth leads to intensifying cultivation by growing more staple foods in homegardens. The overall outcome of this will be major alteration in the composition and nature of the homegarden with impacts that range from failure to satisfying households' dietary requirements to loss of biological diversity and associated knowledge.

Despite fear that rapid and market-driven changes would drastically modify traditional homegardens, there is a hope that this farming system has a potential for improvement. As Soemarwoto and Conway (1992) note, complete understanding of the system which is based on a detailed analysis of all its features can contribute towards that end. Lessons learned from the homegarden system can also be employed in development of other farming systems or conservation activities. For example, homegardens offers the opportunity to study and design improved conservation plans such as soil management practices specific to regional conditions (Angel-Perez and Mendoza 2004); and it is a potential area for implementing biodiversity conservation, food security and sustainable development-oriented programs (Zemede Asfaw 2001b).

2.5 Spices: invaluable items that lack universal definition

Different terms (spices, herbs and condiments) have been used to refer to classes of items or products that are used to flavor food. The fact that the meanings denoted by these three terms overlap to some extent appears to have led to a lack of a unanimously-agreed definition of the items. Although the distinction between the three terms is admitted to be not clear (Jansen 1981), it is the words 'spice' and 'herb' that are frequently used interchangeably (Snider 2007).

Definitions of spices are proposed by different authors (Morrow 1951, Borget 1993, Billing and Sherman 1998, Farrington 1999, Weiss 2002, Snider 2007) based on three basic criteria that are used either singly or in combination. These defining criteria include quantity of item consumed, source region or origin, and resource plant's habit.

Accordingly, spices are considered to be seasonings used in small amounts; they are understood to originate from tropical areas; and they can be from the bark, berries, flower buds, roots, or seeds of woody plants. On the other hand, herbs are traditionally defined as aromatic leaves of plants which grow only in the temperate zone (Morrow 1951, Ensminger *et al.* 1995, Snider 2007). The word condiment is a more inclusive term. Even though it originally meant seasoned, pickled, or preserved foods in Latin, it now is broadly applied to a variety of foods, including spices, herbs, sauces, seasonings, flavorings, colorings, and even beverages, such as tea, coffee, and alcoholic drinks (Smith 2010).

Nevertheless, it seems that the above-mentioned criteria are not sufficient either for correctly describing spices or making distinction between them and herbs. This is because some spices such as onion, ginger, garlic or red or long chilli pepper are used in large quantities in recipes; and also the traditional spices and herbs are now occurring in regions of the world wider than they used to grow. As Hulse (1996) indicates, therefore, any distinction between spices and other aromatic plants is arbitrary today. In addition, in some languages the equivalent word for spice has a wide meaning as is the case of the Hindi term 'Masala' that includes articles like common salt and souring agents. Therefore, using wider definitions such as that of the US Food and Drug Administration which describes a spice as "aromatic vegetable substances in the whole, broken, or ground form … whose significant function in food is seasoning …" (Francis 2000) appears to be both convenient and of practical necessity.

2.5.1 History of spice use and trade

Spices are known to have been used for various purposes since ancient times. This goes back to the age of prehistoric man who used leaves of certain plants to enhance the flavor of half-cooked foods as revealed by archaeological excavations (Borget 1993). Hieroglyphics at the Great Pyramid indicate that workers ate garlic for strength (Farrington 1999), whereas an Egyptian queen used cinnamon as an aromatic as early as 3500 B.C. (Ensminger *et al.* 1995). A number of spices have long been known in India and the Far East, and were important to add flavor to the staple diet, rice (Purseglove *et* *al.* 1981). While cinnamon is mentioned in a Chinese herbal dating back to 2700 B.C. (Morrow 1951), Confucius (551-479B.C.) is mentioned to have noted about ginger (Purseglove *et al.* 1981). Spices like black pepper, cinnamon, turmeric and cardamom have been known in India for thousands of years; and excavations in the Indus valley have evidenced spices that were used before 1000 B.C. (Purseglove *et al.* 1981). Appreciation of spices as flavoring for rice is suggested to have led to the cultivation of aromatic trees and shrubs the Orientals met within the forests (Ridley 1999).

Unlike today, spices were once highly valued commodities. They had a value similar to that of precious metals (Purseglove *et al.* 1981, Farrington 1999). This is evident from the inclusion of pepper among riches demanded by Alaric, king of the Visigoths, who threatened to sack Rome unless his demands were met (Borget 1993). Spices were extremely expensive during the Middle Ages and only some could afford to use them (Purseglove *et al.* 1981). For example, a pound (0.45 kg) of ginger was worth more than a sheep in Mediaeval England (Morrow 1951).

A number of factors contributed to the costliness of spices in those days: their rarity because of difficulties of transportation; monotony of diet for there were no diverse food items; their use to camouflage odor and taste of foods which had been stored for longer period; and also some additional perceived functions of spices such as regarding them as potent aphrodisiacs (Morrow 1951, Purseglove *et al.* 1981, Farrington 1999). Because of the high importance given to them, spices stirred the imagination of kings and ambitious adventurers (Hayes 1961). This in turn, made people travel the globe, make explorations, fight wars, and win and lose fortunes (Farrington 1999) with an eventual outcome of discovering the new world and also establishment of colonial empires (Purseglove *et al.* 1981, Weiss 2002).

A significant aspect of spices, which is frequently stressed in the relevant literature, is the role they played in trade. The spice trade has been the world's oldest continuous business (Morrow 1951), and spices were among the first objects of commerce between the East and the West (Purseglove *et al.* 1981). The spice trade had been dominated by only few countries or states until the 19th century, and the history is summarized as presented below based on the work of different authors (Lane 1940, Fischel 1958, Hayes 1961, Purseglove *et al.* 1981, Borget 1993, Balick and Cox 1996, Farrington 1999, Weiss 2002).

The spice trade was the domain of the Arabs, particularly in the second and first millennia B.C. The Romans brought an end to Arab monopoly in the spice trade in the first AD. Nevertheless, Roman spice trade was disrupted following the fall of the Roman Empire (by about the sixth century), and the Arabs re-gained control of the trade though this was only short-lived. In the centuries that followed, there was almost no westward flow of spices until the Mediterranean was reopened in the 12th century. During the Middle Ages, Arab traders, who brought spices from the Orient to Cairo or Alexandria traded with Venetian and Genoan (Italy) merchants who transported the commodities further into Europe. Venice became the spice capital of the world where traders bought and sold at hefty prices. Venice's monopoly on spice shipping ended when Portugal found new sea routes to the East.

The desire to control the most valuable spice trade led to struggle between powerful seafaring nations: Portugal, Spain, Netherlands and England (Boxer 1969, Borget 1993, Farrington 1999, Weiss 2002). The Portuguese were the first to control the trade, beginning from the 16th century, and they struggled to block the red sea spice trade route. The Dutch, who replaced the Portuguese within a century, controlled a wide spice growing area in the Indonesian region, and are known for their strict protectionist measures and also burning excess produce with the intention of maintaining prices and controlling the trade. The English, who had taken hold in India during the 1800s, played a major role in the spice trade up to the mid 1800s. However, their monopoly crumbled during this period. Planting of the major spice-producing plants in French and British-controlled interests all over the world broken all spice related monopolies for ever.

At present, spices are used in quite larger amounts and by a greater number of consumers as compared to the Middle Ages but they are not as expensive as they used to be. This is because of the expanded production of these commodities around the world and also because of improved transportation which made possible plentiful supplies (Borget 1993, Farrington 1999). However, there still is a great difference between the prices paid for unprocessed products in developing countries and that paid for packaged ground spices in North America and Europe. According to Hulse (1996), the processed product is often sold at prices 15 to 20 times higher than the unprocessed goods. Even though this situation may be viewed as an opportunity for value addition by source countries, quality-related requirements in recipient courtiers present a serious constraint to exporting processed spices. This is one reason for the observed great disparity in volume between the export amount of whole (unprocessed) spices and ground products (Hulse 1996, UNCTAD/WTO 2006).

World trade in spices is reported to have nearly tripled in volume in the four decades up to 2000 (Weiss 2002). In 2004, it consisted of 1.547 million tons valued at US $ 2.97 billion (UNCTAD/WTO 2006). Capsicum, ginger, black pepper, and cinnamon are the major spices accounting for about two-third of world trade; China, India, Madagascar and Indonesia are the principal exporters; and EU (with Germany being the leader), the USA, Japan and Singapore are the four largest importers (Weiss 2002, UNCTAD/WTO 2006).

2.5.2 Human spice uses

The answer many would provide, if asked about the use of spices, would be their role in enhancing the flavor of food. However, as Billing and Sherman (1998) underline, such an answer is only a proximate explanation for it does not satisfactorily elucidate functions beyond enhancing taste such as their preservative roles. It is well-recognized that, historically, spices have been used for various purposes.

Food related benefits of spices can be viewed from different perspectives: flavoring, nutrition, preservation and other additional uses. Flavoring foods and drinks is the principal use of spices. As analysis results on 4578 meat-based recipes from 36 countries indicated, 4241 (93%) recipes called for at least one out of the 43 spices included in the study (Billing and Sherman 1998). This is informative of how much spices became part of the human diet. According to this study, onion, pepper, garlic, capsicum, and ginger are the most frequently used spices participating in 65% to16% of the recipes.

Sufficient information is lacking on micronutritional values of most spices (Billing and Sherman 1998). Those studied spices are known to contain proteins, carbohydrates, vitamins and minerals in tiny quantities; and this coupled with their use in small amounts makes them of a little nutritive value (Billing and Sherman 1998, Snider 2007). Their food-preserving role, instead, recognized to be very important. Spices achieve this function through their antimicrobial and antioxidant property. Variation in potency of spices in their antimicrobial effect was also reported with garlic, onion, allspice and oregano found to inhibit every bacterium they were tested on (Billing and Sherman 1998). As reported by a related study (Oiye and Muroki 2002), rosemary and sage were also found to be very inhibitory, exhibiting the greatest activity against gram positive bacteria.

Spices are known to have antioxidant properties, and this is of particular interest with respect to ensuring high quality of lipids and lipid-containing products and prolonging their storage time (Oiye and Muroki 2002, Yanishlievaa *et al.* 2006). As Yanishlievaa *et al.* (2006) mention, lipid oxidation that occurs in food products is a major concern in food technology. This is because, the formation of secondary compounds results in unpleasant odors and flavors and also deteriorates the nutritional quality and safety of the product. Currently, extracts from leaves of rosemary and sage are used as antioxidative spice additives; and such uses of spices and herbs are regarded as a promising alternative to the use of synthetic antioxidants (Oiye and Muroki 2002, Yanishlievaa *et al.* 2006).

Spices are used for additional purposes: they are used as coloring agents and may replace or reduce the use of salt and sugar in foods; they have been important in traditional medicine; and are used in the manufacturing of perfumes, soap, incense, toothpastes, and dyes (Hayes 1961, Purseglove *et al.* 1981, Billing and Sherman 1998, Ridley 1999, Snider 2007).

2.5.3 Spices in Ethiopia

Ethiopia is a country with a long history of using spices. The country is believed to have established contacts with the Arab world and India probably since the dawn of history; and traded with them for centuries (Pankhurst 1999, Pankhurst 2002). Spices were among the commodities mentioned to have been traded in those days. Some spices of South Asian origin are suggested to have been introduced into Ethiopia following the relations established with Portugal by the early 16th Century (Harlan 1969).

The tradition of using spices is well-established in Ethiopia as can be seen from the food cultures that use elaborate spicing across the diverse nationality groups of the country. As Jansen (1981) mentions, the significance of spices to Ethiopians can hardly be overestimated for they are used every day in preparation of main dishes. Harlan (1969), on his part, noted that long chilli peppers and chilies became absolutely basic to Ethiopian cuisine to the extent that it is hard for most Ethiopians to believe that their ancestors had to do without them. As Billing and Sherman (1998) indicated, Ethiopia is one of the 10 countries (out of the 36 included in the study) where every meat-based recipe called for at least one spice.

Wot', a highly seasoned stew or sauce served with a delicate fermented bread ***injera,*** is one of the preparations that calls for many spices. One ingredient of ***wot', berbere,*** is a mixture of up to 12 spices with red pepper making the largest proportion of the condiment. A hot condiment called ***daatta*** in Gamo-Gofa, ***dusha*** in Basketo or ***dok'o/naaʔo*** in Kafa is prepared from a mixture of up to 16 spices (Feleke Woldeyes and Roussel 2008).

While some of the spices used in Ethiopia are imported, a number of them are cultivated locally. Jansen (1981) described in detail 12 spices cultivated in the country. Even though some spices such as black cumin *(Nigella sativa)*, long chilli pepper (*Capsicum annuum*), Bishop's weed (*Trachyspermum ammi)* and coriander *(Coriandrum sativum)* are cultivated as field crops, others are mainly grown as homegarden crops. Some spices such as ***kororima*** (*Aframomum corrorima*) and ***timiz*** (*Piper capense*) in Kafa, and

kororima and ginger (*Zingiber officinale*) in Dawro grow under wild conditions (Feleke Woldeyes 2000, Mathewos Agize 2008). Chili pepper is occasionally collected from outside cultivated areas such as the Arba Minch forest (personal observation).

Despite the long-standing tradition of using spices and their importance in the day-to-day life of Ethiopians, sufficient information on distribution, production and trade structure of these commodities is lacking. Since the last decade, however, changes are taking place with the intention of increasing the benefit from the agricultural sector. A policy direction of optimizing international trade earnings is being pursued (MTI 1995), and the chosen approach is to diversify agricultural exports of which spices constitute one of the top priority high value crop groups (EEPA 2003).

According to EEPA (2003), in 2001, a total area of 79,552 hectares was covered by spices in the three main regional states of the country (SNNPRS, Oromiya and Amhara). A total of 89, 299 tons of spices was produced from this area and generated 389,576,489 Birr income to farmers. Ginger, pepper, cumin, ***kororima*** and fenugreek were the top five spices accounting for 94% of total production and 95% of income obtained. Both the volume of spice export and the revenue generated from the export have steadily been increasing over the last four years at an average annual rate of 23.35% and 6.21% respectively (Fig. 1).

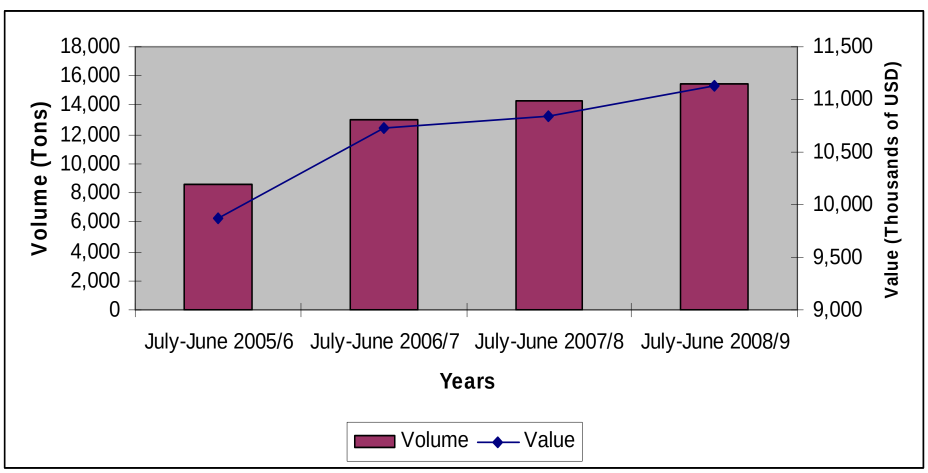


Fig. 1 Trend in spice exports and associated earning (source: Unpublished Data from Agricultural Marketing and Inputs Sector, Ministry of Agriculture and Rural Development)

2.6. Valorization of origin based-products: an option for biodiversity conservation and local development

Products from specific geographical localities are named differently: local products, terroir products, regional products, origin products, localized products (Bérard and Marchenay 2006, Sautier and Van de Kop 2006, Van de Kop and Sautier 2006, Bérard and Marchenay 2007, Bérard and Marchenay 2008a, Giovanni and Andrea 2009). Nevertheless, Bérard and Marchenay (2007, 2008a) make a distinction between products issued from a place (simple provenance) and those originating at a place (origin). These latter types are referred to as localized products. Localized products are those products whose relationship with a place is rooted both in time and shared local knowledge (Bérard and Marchenay 2007, 2008a). Implicit from this definition is that space, time and shared knowledge are important criteria in defining localized products. Localized products have a particular relationship with locality as defined by their history and shared know-how on which they are built. Linking of historic roots to collective practices of social groups helps to understand what makes local products special and different (Bérard and Marchenay 2007, 2008a).

Localized products are derived from a local resource of either plant or animal origin in a certain landscape. They may be in the form of raw materials or transformed. Some localized products are based on complex systems capable of maintaining various forms of biodiversity that range from a landscape to a microbial ecosystem. Local knowledge and practices, which are associated with these products, are important factors with significant bearing on local biodiversity (Bérard and Marchenay 2006). As these authors underscore, four factors: local biodiversity, accumulated knowledge and practices, nature of the product, and local social and environmental conditions are interlinked; and combination of these factors underpins and organizes distinct levels of biological complexity.

However, such systems are being threatened by the rapid globalization that promotes standardization and uniformity instead of diversity (IFATPC 2003). Some efforts are being made to counteract or at least slow down the effects of such developments that erode biological diversity and the associated traditional knowledge (IFATPC 2003). One such approach is valorization of localized products, resources and biodiversity as a whole with the aim of bringing local development through sustainable utilization and management of biological resources.

Valorization is the act or process of attempting to give an arbitrary market value or price to a thing by intervention of governmental or other agents. The intention of protecting cultural and biological diversity through valorization of local resources is a recent development (Garcia *et al.* 2009); and this shows widening of the approaches used in conservation endeavors as indicated by Teyssèdre *et al.* (2004). As the latter authors underlined, it will not be possible to achieve conservation objectives setting aside 10 to 20% of national territories – as it has been hoped for long. Instead, widening the scope to include territory inhabited or exploited by humans is required so as to allow both humans and biodiversity to flourish together. But, since conservation incurs costs, it is believed that the only viable strategy for attaining the objective is associating biodiversity with the economic and social development of local populations.

Two key activities in valorization of biological diversity are placing value on biological resources and linking them to economic activities, in particular new markets (Cunningham 2001, Bann 2002, Teyssèdre *et al.* 2004). Economic evaluation of biological biodiversity is recognized to be difficult. However, estimating monetary worth of some values (e.g. direct use values) is possible; and doing so is understood to be extremely important since this will form the ground for appreciating the value of biodiversity (Bann 2002).

Different methods can be employed for economically valorizing ecological goods and services (Teyssèdre *et al.* 2004). These include;

- subsidizing the support of ecological goods and services; and this can take different forms: supporting financially the presence of rare species on private or collective lands; supporting low-polluting farming methods; financing research, training, and awareness creation activities that work towards conservation; and implementing a remuneration scheme for the role of vegetation cover as carbon sink.

- Taxing activities or processes (such as the dumping of fertilizers and other toxic substances in the soil, emission of hydrocarbons) that degrade ecological services and goods.
- Strengthening already existing markets or creating new ones that use ecological goods and services, for the benefit of biodiversity and human societies.

This last approach is about valorizing local resources through product commercialization so that local people appreciate the economic value of their environment through cultivation and processing activities. As Krucken (2005) indicates, the demand for local resource-based products is increasing very fast both because of economic motives related to business potential and increasing consumer demand for more natural and safer products. This situation is judged to be promising on the ground that the bio-businesses, if managed properly, could generate tangible economic benefits for populations whose livelihoods depend on biodiversity. This, in turn, will provide an incentive to use biodiversity in a sustainable way.

In the process of valorization that involves commercialization of localized products, a range of promotion and protection tools such as eco-certification and eco-labeling, park trademarks, fair trade labels and contracts or biodiversity collaboration agreements can be used. However, these origin-based products, in many cases, bear the name of the locality where they come from; and because of their quality and reputation it is quite tempting to others to use the same names (Bérard and Marchenay 2006, 2008b). The harmful impacts of such practices are manifold: the consumer, who is willing to pay a premium price for an authentic product, is deceived; the genuine producers lose a significant portion of the benefit because of unfair competition; and maintenance of the biological resources that form the base for the unique products and the associated local knowledge will be at stake.

This clearly shows the need for a mechanism that protects the rights of legitimate owners. Protecting property rights of local producers through Intellectual Property Right (IPR) system has been considered in recent years. However, the conventional Property Right tools such as patents, copyright and trademarks are found to be either not applicable or of limited relevance for the purpose (Posey and Dutfield 1996). One of the protection tools, which is believed to properly address the question of protecting names of local products and thereby contribute to valorization of traditional knowledge and associated biodiversity is Geographical Indications (GIs). Geographical Indications are, of course, not classified as IPR instruments traditionally even though their inclusion in the Agreement on Trade related Aspects of Intellectual Property Rights (TRIPS agreement) (WTO 1994) changed that notion.

GIs are most usually proper names, which identify a good as originating in the territory of a particular country, or region or locality in that country, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin. They are indications of origin that are used to identify agricultural, natural or manufactured goods originating in the said area (WTO 1994, Posey and Dutfield 1996, Bérard and Marchenay 2006). Geographical Indications are probably the most ancient distinctive signs to be found in commerce. The use of places of origin to identify products and to signal their quality has a long history, going back to the period of ancient Egypt (Van de Kop and Sautier 2006). However, protection against illegitimate use of indications was offered from the beginning of the 20thcentury in countries like France.

Two schemes of protecting Geographical Indications exist: Protected Designation of Origin (PDO) and Protected Geographical Indications (PGI). To be eligible for a PDO, a product must have quality or characteristics which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; and the production, processing and preparation of the item or good must take place in the same geographical area. On the other hand, a product can be eligible for a PGI by possessing a specific quality, reputation or other characteristics attributable to that geographical origin; and if its production and/or processing and/or preparation take place in the defined geographical area. While PDO guarantees a closer link between quality, reputation, territory, resources and culture, PGI represents a looser association to a place since it is not obligatory for all the characteristics to be attributable to a location nor that all operations must take place in that single zone (Van de Kop and Sautier 2006, Larson 2007, Bérard and Marchenay 2006, Roussel and Verdeaux 2007).

GIs, that are well-practiced in Europe, are increasingly being considered as appropriate tools for improving local livelihoods and protecting traditional knowledge and biological resource. Their practice has been expanding throughout the world over the last decade (Larson 2007) despite some implementation-related problems. The main problem is mentioned to emanate from context difference - in terms of social, institutional as well as environmental characters - between the region where the system was started and has evolved (Europe) and the countries where it is tried to be introduced (Roussel and Verdeaux 2007, Bérard and Marchenay 2008).

Ethiopia, a country that offers an exceptionally good ground (because of its diverse ecosystems and cultural groups) for setting up such a mechanism as GI (Roussel and Verdeaux 2007), is actively working towards instituting a legal and institutional mechanism for the recognition and protection of geographic indications and marks of quality. As component part of the project “Ethiopian Home Gardens” (EHGP 2004), a GI regulation is being drafted through the Federal Environmental Protection Agency (EPA). In parallel, the task of identifying potential GI products has been carried resulting in the selection of 12 pilot local products (EHGP 2009) of which 8 are spices (Table 2).

Table 2 List of products identified as candidates for GI registration (source: EHGP 2009)

No.	Product name		Spice	Regional state
1	*ye-Masha nec’ mar*	Masha white honey		SNPPRS
2	*ye-Marek’o berbere*	*Capsicum annuum*	√	SNPPRS
3	*ye-Basketo kororima*	*Aframomum corrorima*	√	SNPPRS
4	*ye-Gumer-Ghet’o koseret*	*Lippia adoensis* var. *koseret*	√	SNPPRS
5	*ye-Mekoy tiringo*	*Citrus medica*		Amhara
6	*ye-Jeldu Dendi nec’ shinkurt*	*Allium sativum*	√	Oromiya
7	*ye-Bonga timiz*	*Piper capense*	√	SNPPRS
8	*ye-Kambata-Bambe jinjibl*	*Zingiber officinale*	√	SNPPRS
9	*ye-Gidole habesha k’ey shinkurt*	*Allium cepa*	√	SNPPRS
10	*ye-Amaro mitmita*	*Capsicum frutescens*	√	SNPPRS
11	*ye-Limu bunna*	*Coffea arabica*		Oromiya
12	*ye-Amaro bunna*	*Coffea arabica*		SNPPRS

3. OBJECTIVES

3.1 General objective

The general objective of the present study is to investigate the use and management of local resources, and the link between local resource valorization and biodiversity conservation with a focus on homegardens in general and spices of Basketo and Kafa in particular.

3.2 Specific objectives

The specific objectives of the study are to

- identify local people's perceptions, naming and categorization of local resources;
- assess local resource usage and management practices;
- conduct a comparative assessment on the nature and organization of homegardens of Basketo and Kafa;
- investigate the role of local spices as a component of homegarden systems and livelihoods of the local people;
- undertake a deeper analysis of a local spice known as ***kororima*** (*Aframomum corrorima*), Ethiopian cardamom, so as to determine its role in the local economy and ecology;
- examine the mechanisms used to valorize local resources;
- assess the status of biodiversity in homegardens and associated land use systems, and analyze the dynamics of these systems; and
- assess the impact of valorizing local resources on conservation of biodiversity, maintenance of traditional ecological knowledge, and local livelihoods.

4. DESCRIPTION OF THE STUDY AREAS

The study has been conducted in two areas of the South Nations, Nationalities and Peoples Regional State (SNNPRS), namely Basketo Special Woreda and Kafa Zone (Fig. 2). SNNPRS is one of the nine regional states of Ethiopia. The administrative hierarchy in the Regional States of Ethiopia, from top to bottom, consists of the Region, Zones, Woredas and K'ebeles. Moreover, in SNNPRS there are administrative units called Special Woredas that consist of K'ebeles and are directly accountable to the Regional State. SNPPRS is the fourth largest region in land area (112,343.19 km^2), and inhabited by 15,042,531 people accounting for 20.4% of the country's total (CSA 2008). The region, which is home to more than fifty ethnic groups, is known for its rich cultural and biological diversity.

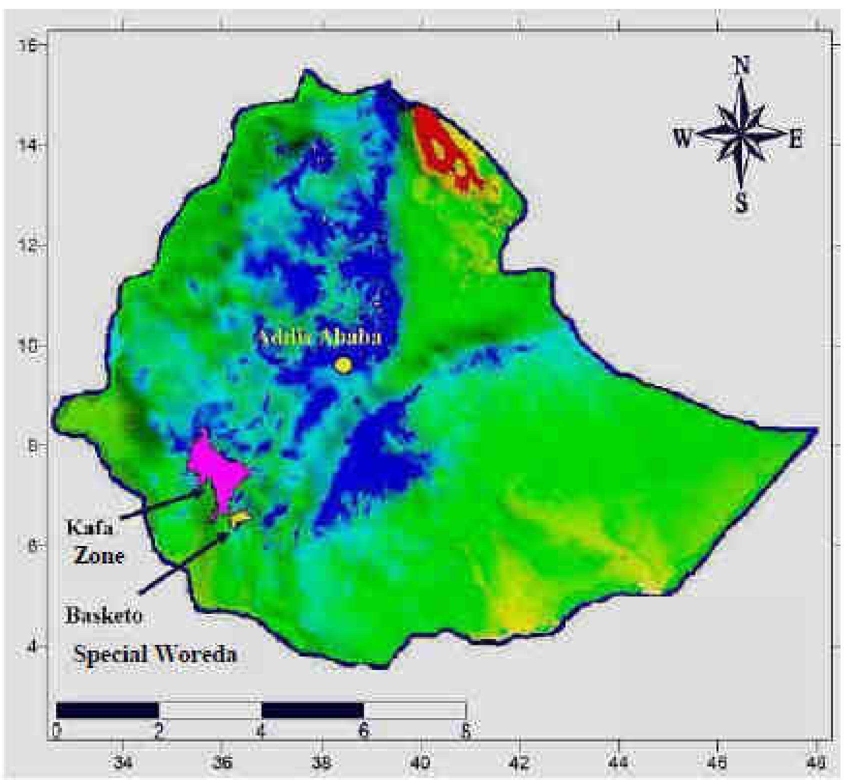


Fig. 2 Map of Ethiopia and the two study sites, Basketo and Kafa

The study sites, Basketo Special Woreda and Kafa Zone, were selected on the basis of an earlier personal study (in the case of Kafa) and preliminary observation (in the case of Basketo). The sites were assumed to be convenient for the study, particularly in light of making cross-cultural comparisons, since they share some features. The indigenous people of the two areas (the Basket and the Kafecho) belong to the Omotic language group; homegardening is the major farming activity with ***enset*** making the basic framework; tuber crops such as ***enset***, yam and taro constitute the major staple; the two areas produce coffee and are the main suppliers of ***kororima*** to the national market; and both areas also show some similarity in land features and climatic conditions. However, each community has specific attributes of its own.

4.1 Basketo Special Woreda

4.1.1 Physical setting

Basketo Special Woreda is one of the eight administrative units in SNPPRS that are designated with a special status in the organization of the regional state. Its main town, Laska, ($06^0$18' N, $36^0$37'E; 1860 m.a.s.l.) is located at 581 km southwest of Addis Ababa. Total land area of Basketo is 2382.35km^2 with altitudes ranging from 700 to 2200 m.

The topography of Basketo is characterized by undulating surfaces with steep slopes on the eastern and western parts and ending in two rivers: Irgino in the east and Usino in the west. In Ethiopia, two types of agro-ecological zone classification systems are used (MOA 2000). The first type is the customary system of five zones (***bereha***, ***k'olla***, ***woinadega***, ***dega***, and ***wurc'***), the classification of which is mainly based on ambient heat intensity; and the second type is the formal scientific scheme which is based on temperature and moisture regimes and recognizes 18 major zones and 49 sub-zones. Following the customary scheme, Basketo Special Woreda may be recognized to consist of two agro-ecological zones; ***k'olla*** (which is characterized by a warm, semi-arid climate) and ***woinadega*** (cool, sub-humid climate). Similarly, the Special Woreda may be classified under ***tepid to cool sub-humid mid highlands*** sub-zone following the modern scheme which is characterized by fertile soils and conducive climate for plant and animal growth.

Local people, however, distinguish only two agro-ecological zones that do not coincide with the customary five adopted at national level or the 49 proposed by the new scheme. The two zones recognized by the people in Basketo are ***geze*** (higher altitude areas characterized by cooler temperature) and ***zara*** (lower altitude areas with warm to hot temperature). The identification of areas of mid-altitudes (between 1500 - 1900 m) into one of these two zones depends on the particular elevation at which an informant is situated. That is, while a person who lives at ***geze*** describes the zone at lower altitude than where he/she is (i.e. mid-altitude and low-altitude areas) as ***zara***, inhabitant of ***zara*** recognizes the area at higher altitude than his/her zone (i.e. mid-altitude and high-altitude areas) as ***geze***.

According to Daniel Gemachu (1977), Ethiopia exhibits six climatic (moisture) regions: perhumid, humid, moist sub-humid, dry sub-humid, semi-arid and arid. Accordingly, climatic conditions of Basketo can be classified as moist sub-humid. The same author recognizes two main types of rainfall regimes in the country: Type I (which is characterized by contiguous distribution of rainy months) and Type II (which is characterized by existence of two rainy seasons). The precipitation pattern in Basketo coincides with the Type I regime. According to data obtained from the National Meteorological Agency, the mean annual rainfall at Laska is 1376 mm with the highest being 1578 mm. Temperature data is not available for Basketo, and therefore the climate diagram (Fig. 3A) is plotted using data of Bonga station since this is the closest in a locality of comparable weather condition.

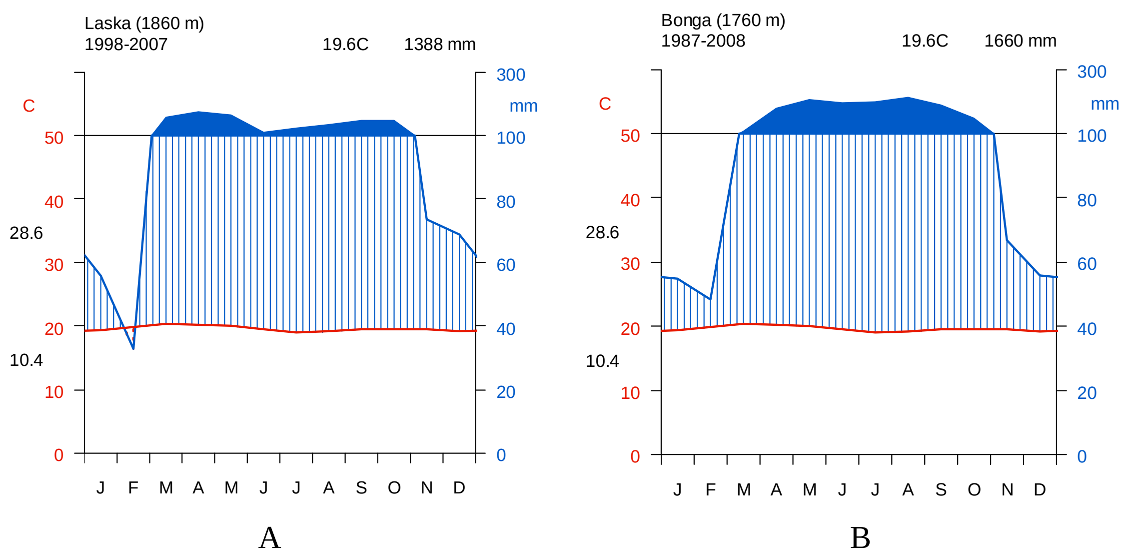


Fig. 3 Climate diagram of Laska, Basketo (A) and Bonga, Kafa (B)

4.1.2 Plant cover

Almost the whole Basketo land is transformed into an agricultural landscape. The natural vegetation of the area is represented by patches of sacred groves, and trees and shrubs in homegardens, crop fields, and hedges on mid and high altitudes. Conspicuous species of this vegetation include *Podocarpus falcatus, Dracaena steudneri, Milletia ferruginea* subsp. *darassana, Olea welwitschii, Croton macrostachyus, Albizia schimperiana, Cordia africana, Polyscias fulva, Syzyygium guineense* subsp. *afromontanum, Macaranga capensis* and *Sapium ellipticum.* From the species composition, it can be recognized that the vegetation of Basketo hills represents a transition from Dry to Wet Montane Evergreen Forest type (Sebsebe Demissew, personal communication). Lowlands are covered by species of *Combretum collinum, Terminalia brownii, Syzygium guineense* subsp. *guineense, Annona senegalensis, Faurea speciosa* and also several tall grasses; and following current vegetation classification schemes (Sebsebe Demissew and Friis 2009, Friis *et al.* 2010), this vegetation can be recognized as *Combretum-Terminalia* Woodland vegetation type.

4.1.3 Socio-cultural aspects

Basketo Special Woreda is inhabited by 56,678 people (CSA 2008) with Basket ethnolinguistic group being the major one. Basket and Amharic are languages mainly used in the Special Woreda. Basket people claim that they are descendants of a Gamo group that arrived in the area around the 15th century and who gradually diluted small autochtonus groups (Kaati Mazgo Garda, personal communication). Similarities observed in socio-political organization, cultural practices and locality names with the Gamo of Gamo highlands constitute the ground for this claim.

Basket people are subdivided into more than 50 ***k'omma*** (lineage groups). The smallest spatial unit is the ***aal-bess*** or ***aal-oos-gad*** (living quarter and the garden) that belongs to a household. A group of ***aal-bess*** that belong to ***aal-ase*** (a family consisting of households of the father and his married sons) form a ***muura*** (a family's holding). Aggregates of ***muura*** make a ***dootse*** (neighborhood) which used to be inhabited only by members of a single lineage. The traditional leadership consists of a hierarchy of posts that descends from the ***kaati*** (chief) to the ordinary person. Seven ***kaati*** function simultaneously, each is in charge of his respective area, with the eighth, ***ira kaati,*** being a rain chief (***ira*** means rain).

The Basket people trace descent through male lines, and hence they are a patrilineal society. When considering system of labeling kin, on the other hand, their system can be classified as the Hawaiian type which is characterized by labeling all relatives of the same sex in the same generation by the same term (Howard 1989). Marriage between members of the same lineage is prohibited, intermarriage is possible only between members of lineages of equivalent status. Even though almost all of the Basket people are christians, traditional religious practices are also occurring side by side. The important ritual in this connection is ***kaasha,*** a thanksgiving ceremony**,** which is performed at different occasions.

Agriculture is the major subsistence activity on which the largest proportion of the population directly depends for its livelihoods. The homegarden is the major place of production; and additional cereals are produced in adjoining land and lowland crop fields. While tuber crops (***enset***, yam, taro, and sweet potato), cereals (maize, sorghum, barley), pulses and vegetables are the major food crops; coffee, ***t'eff*** (*Eragrostis tef*), maize, and ***kororima*** (*Aframomum corrorima*) constitute the chief cash crops. Cattle and small farm animal are also raised by households; and these serve as sources of food, generate income to the household, are used for cultivating the land, whereas their manure is used for maintaining soil fertility.

4.2 Kafa Zone

4.2.1 Physical setting

Kafa Zone is within SNPPRS and covers a total land area of 10,610.39 km^2. Bonga (7^{0}16' N, 36^{0}14'E; 1760 m.a.s.l.), the capital of Kafa Zone, is situated at 415 km southwest of Addis Ababa.

The Kafa landscape is dissected by numerous small to large rivers and exhibits highly diverse topography including flat plateaus, undulating to mountainous terrain and very steep slopes. The altitudes of the zone range between 900 and 3300 m.a.s.l. Gojeb, Weshi, and Dincha are the main rivers in the region and belong to the Omo River drainage system. Soils in Kafa Zone and other parts of southwest Ethiopia are known to be very similar despite having different parent materials (Trap series volcanic and felsic and metamorphic Precambrian materials) (FAO, 1984). This is attributed to high rainfall up to greater than 2220 mm that has had a masking effect on other soil forming factors. Therefore, dystric Nitisols, orthic Acrisols and dystric Cambisols are predominant soil types of the area (FAO, 1984).

Three customary agro-ecological zones, ***k'olla***, ***woinadega*** and ***dega*** (cool humid), can be recognized in Kafa. According to the modern agro-ecological classification scheme (MOA 2000), Kafa Zone belongs to the tepid to cool sub-humid mid highlands sub-zone. Locally, however, three agro-ecological zones are recognized: ***angesho*** (which is characterized by higher elevation, more rainy months, and a lower temperature), ***worefo*** (a region of lower altitude, fewer months of rainfall), and ***guddifo*** (which occupies an intermediate position between the other two in terms of altitude, length of rainy season and temperature). This local classification corresponds to that customarily used at the national level in that ***angesho*** is equivalent to ***dega***, ***worefo*** to ***k'olla*** and ***guddifo*** to ***woinadega***. According to Daniel Gemachu (1977), Kafa Zone is of humid climatic conditions; and with Type I (i.e. with contiguous rainy months) precipitation pattern. According to data obtained from National Meteorological Agency, mean annual rainfall at Bonga is 1660 mm with the maximum being 2068 mm; and the average yearly maximum temperature is 27.1^{O}C and the mean average yearly is 12.1 ^{O}C (Fig. 3B).

4.2.2 Plant cover

Kafa Zone and the adjoining areas are of the few places in Ethiopia endowed with a relatively good forest cover although habitat conversion into new land use systems is posing a threat. The forests of southwest Ethiopia have long been studied, classified and labeled differently as, for example, Upland Rainforest by Friis *et al.* (1982) and Humid Broad-leaved type of the Wet Evergreen Forest by Ensermu Kelbesa *et al.* (1992). In a recent treatment in the Flora of Ethiopia (Sebsebe Demissew and Friis 2009, Friis *et al.* 2010), the vegetation of the area is characterized as Moist Evergreen Montane Rainforest occurring between 1500 and 2600 m.a.s.l. The characteristic species include *Pouteria adolfi-friederici*, *Albizia schimperiana*, *A. grandibracteata*, *Ilex mitis*, *Prunus africana*, *Ocotea kenyensis*, *Polyscias fulva*, *Sapium ellipticum*, *Syzygium guineense* subsp. *afromontanum*, *Olea welwitschii*, *Allophylus abyssinicus*, *Schefflera abyssinica*, and *Milletia ferruginea* subsp. *darassana*.

4.2.3 Socio-cultural aspects

According to the 2007 national population census, the total population of Kafa zone is 880,251 (CSA 2008); and the Kafecho constitute the largest portion of this. Kafinoono is the main language of the area with Amharic being the second widely used language. Within the Kafecho group, there is a minority group called Manja. The Kafecho society, beside the division into Manja and non-Manja, is also classified into a large number of ***yaro*** (lineage groups).

According to Bekele Woldemariam (2004) and also from oral tradition (Ogarasha Haile Keto, Ato Woldemichael Keto, personal communication), two accounts exist with regards to the origin of the Kafecho. While the first account holds that all the Kafecho (including the Manja) immigrated to the area, the other version is that the Manja were the autochtonous group until they were invaded and dominated by those who arrived from the north. Bekele Woldemariam (2004), based on the writings of different historians and some societal features, suggests that the Kafa kingdom is among the oldest in the country and existed from the fourth century up to the end of the 19th century. The socio-political structure of the Kafa kingdom is known to be complex with a hierarchy that descends from the king down to the village leader. A typical feature of the administration is the ***mikrecho*** (the consultative council) which consisted of seven to eight members (Bekele Woldemariam 2004).

In Kafa, marriage among members of the same lineage is not allowed, and intermarriage is also limited to some lineages. Kafecho people have a patrilineal descent system; and their system of labeling kin is close to the Sudanese system that uses different terms when referring to relatives of the same sex in the same generation (Howard 1989).

However, the Kafecho use identical terms when referring to cousins and siblings. Besides Christianity and Islam, traditional religious practices are performed in Kafa. ***Deejjo*** or ***k'oolle-deejjo*** is one such practice which is performed as thanksgiving ceremony in the presence of a large crowd.

The livelihoods of the Kafecho people are mainly based on agriculture. The homegardens (***daadde-goyo***), which are integrated with the forest system, are the major place of production with additional cultivation of cereals in adjacent fields. While ***enset*** is the major source of food in highland areas, cereals such as maize and sorghum constitute the main food in lowlands. In addition, different tuber crops (yam, taro, and ***ajjo*** (*Coccinia abyssinia*)), cereals (barley, millet), pulses and vegetables are used. Coffee, maize, ***kororima*** and sorghum are the main cash crops. Cattle and small farm animals are raised for household uses and also for income generation. Beekeeping is an important activity to the Kafecho people since it contributes significantly to households' income; whereby this traditional honey production is intimately linked to the forest.

5. MATERIALS AND METHODS

Field work was conducted during the period from November 2006 to May 2009. Each site was visited five times including the reconnaissance survey. Investigations were conducted by employing ethnobotanical methods the details of which are presented below. Ethical considerations pertinent to ethnobotanical research were made from the beginning of the study as this is crucial in such undertaking (Alexiades 1996, Cunningham 1996). Accordingly, all concerned bodies along the administrative hierarchy, i.e. Zonal, Woreda and K'ebele officials and also other community members were informed about the research and prior consent was obtained. It was assured that the results would be used only for academic purposes and that there were no commercial interests; and the results of the study would be brought back, at least copies of the PhD thesis, so that the local people would be able to use the research outputs. All necessary precautions were made to avoid unnecessary undertakings that would either harm local people or jeopardize future research.

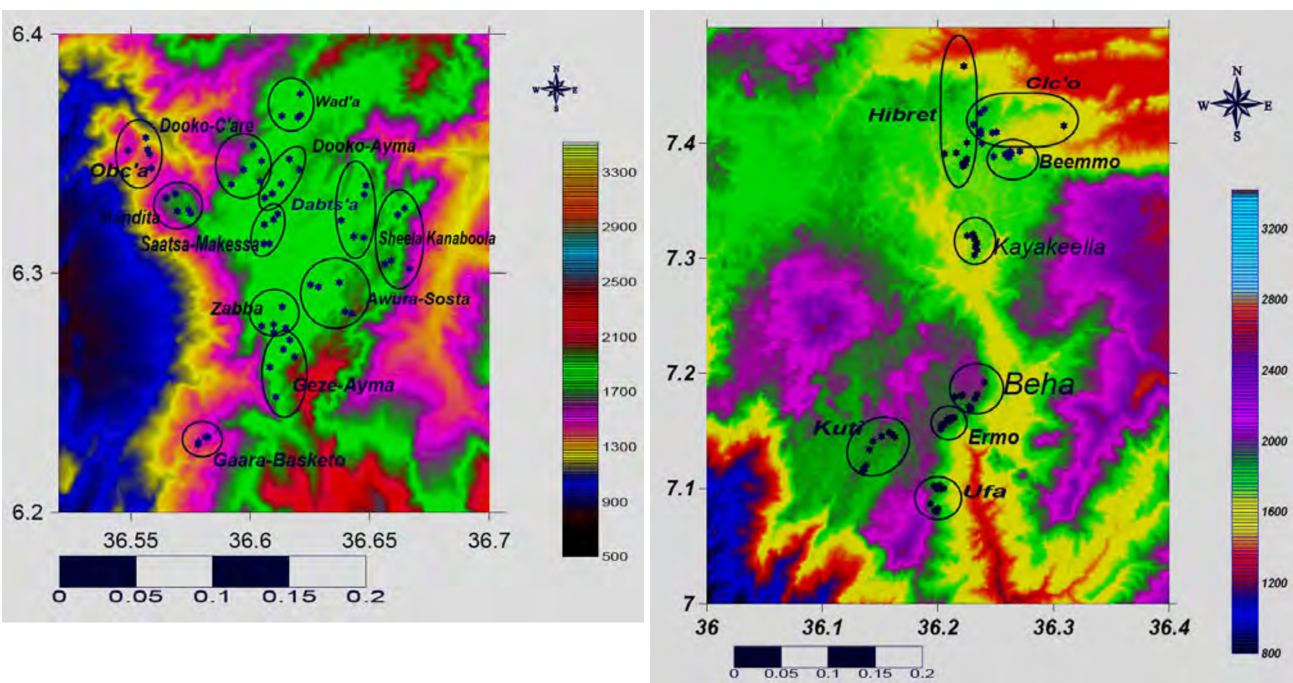
5.1 Investigation of local resource perception, categorization, use and management

5.1.1 Homegardens study

The study was begun by selecting K'ebeles. In Basketo, of the total 30 K'ebeles in the Special Woreda, 12 K'ebeles were selected. These include: Obc'a, Gaara-Basketo, Zabba-Ela, Satsa-Makessa, Dookko-Ayma, Dookko-C'are, Wad'a, Shella-Kanboola, Dabts'a-Dalk'intsa, Mandita, Geza-ayma and Awra-Sosta (Fig. 4A). K'ebeles were sampled from three altitudinal zones, i.e. lower altitude areas (less than 1500 meters), medium altitude areas (between 1500 and 1900 meters), and higher altitude areas (above 1900 meters). In Kafa Zone, four Woredas, out of the total 10, were identified as appropriate for the study amongst which two Woredas (Gimbo and Dacha) were selected. The study was conducted in 4 K'ebeles of each Woreda: Hibret, Kic'o, Beemmo, and Kayakeella K'ebeles from Gimbo woreda and Ufa, Kuti, Ermo, and Beha K'ebeles from Decha woreda (Fig. 4B). The K'ebeles of Decha are at a higher average elevation when compared to those of Gimbo. The intention of sampling K'ebeles from different altitudinal levels was to capture possible variations in nature of homegarden and other aspects. Selection of K'ebeles, in all cases, was done after having discussion with experts from Agriculture and Rural Development offices.

A total of 140 homegardens (households) were sampled (i.e. 60 from Basketo and 80 from Kafa). Selection of the gardens was done by employing a combination of purposive and stratified sampling methods. All of the homegardens were visited during the three major fieldworks with a few also visited during the reconnaissance and the supplementary field work.

The garden survey at each household was started by a brief introduction of the researcher and the intention of the study. Once consent of the owners was obtained, which was always the case, plant species in the garden (including the live fence) that were mentioned to have any use to the household were recorded. Samples of plant species that were described to be used in flavoring food wre picked for latter discussion with household members. Voucher specimens of plants were collected and some were photographed.



A B

Fig. 4 Digital Elevation Model showing Basketo (A) and Kafa (B) K'ebeles included in the study

5.1.2 Household interviews

During the different visits to the households semistructured interviews (Appendix 10) with both household heads (whenever possible) were conducted on different aspects: categories of use of plants in the garden; planting, harvesting, processing, consumption, and source habitats of spicy plants; history of the garden, observed change in homegarden composition; perception and valuing of diversity; local resource use pattern and categorization; and local religious practices. Information obtained was recorded and coded for latter analysis.

5.1.3 Focus group discussion

To consolidate information obtained on some of the issues through the work at household level and also to generate new data, discussions were held with groups of people of different age and sex. Two approaches were followed in selecting participants for discussion. In the first case, snowball sampling (Bernard 2002) was used. This involved identifying an informant through an assistant in a K'ebele, and then to ask this informant to suggest other informant(s). When a sufficient number of people (five or more) was obtained, the discussion was held. The second approach was used in Basketo where village markets are frequent and people from neighboring K'ebeles converge. People from different villages and of different age groups and sexes were asked to take part in group discussions to which most of them volunteered.

Because time was a limiting factor in discussions of the second type, mainly resource perception and classification-related issues were discussed. On the other hand, broad aspects of issues that range from socio-political aspects to religious practices were covered in the K'ebele group discussions. Information was recorded following consensus.

5.1.4 Preference ranking and pair wise comparison

Following the garden survey, household heads were asked to enumerate the spices they use. Discussions were carried further by using specimens of spicy plants collected during the garden survey by asking such questions as 'what kind of preparation are the spices used in?' This was followed by asking respondents to rank the products on their relative importance for household consumption (consumption value); and then on the basis of relative importance in generating income to the household (market value). The paired comparison test with respect to the two values, on the other hand, was performed on spices selected based on the preference ranking results. During the preference ranking and paired comparison, all family members were allowed to involve but women turned to be principal respondents most often. Sometimes, differences in opinion occurred, and under such circumstances response was recorded when consensus on relative importance of the products was reached. Interruption by others such as neighbors, which is more problematic than one may expect, was tactfully controlled as much as possible.

5.2 Investigation of product commercialization and resource valorization

5.2.1 Market survey

Local markets in Basketo (i.e. Laska, Donki and Gazda markets) and those in Kafa (Bonga, Gimbo, C'iiri and Wushwush markets) were surveyed. The organization of each market in terms of items marketed was observed; products of plant origin were recorded; and information on spices such as source areas and consumer demand was collected through discussions with vendors. Spices encountered in the markets were photographed and samples of some were collected.

5.2.2 Market chain assessment

After identifying spices commercialized beyond the respective study area level (i.e. ***kororima*** in case of Basketo, and ***kororima*** and ***timiz*** in case of Kafa), market points from local to national and then to international were assessed. Traders of different types all along the market chain were interviewed; observations on product nature, quality and prices were made. Official archives that pertain to production and commercialization aspects were consulted.

5.2.3 Assessment of spice commercialization and resource valorization methods and agents

Institutions that are thought to have a role in spice production, commercialization and also valorization of local resources were visited. These include federal institutions

(Ministry of Trade and Industry, Ministry of Agriculture and Rural Development, Quality and Standards Authority), Regional, Zonal and Woreda Agriculture and Rural Development Offices (ARDOs), agricultural research centers, enterprises in the spice trade section, non-governmental institutions, and local associations. Information was collected through interviews, field observations, and also from official documents.

5.3 Investigation on quantitative, biological and chemical aspects of ***kororima***

Kororima (*Aframomum corrorima*) was found to be the most commercialized spice of Basketo and Kafa. It is emblematic product of these areas and an important ingredient of contemporary Ethiopian cuisine (Roussel and Feleke Woldeyes 2009). By taking the product's contribution to local and national economy and culture and also the resource plant's role in local ecology into account, its various aspects were studied.

5.3.1 Observation on flowering and fruiting pattern

Six permanent quadrats (4 m x 4 m) were laid out in ***kororima*** plots of Basketo farmers. Each plot was visited every third day. At the first observation, information on the number of the leafy shoots, number of fruits and inflorescences in the quadrat, and number of fruits per inflorescences were recorded. The pattern of distribution of fruits in the quadrats was noted. Inflorescences encountered during the first visit and afterwards were tagged by using code numbers printed on sliced bamboo; and observations were made on development and maturation of flowers and fruits for seven weeks.

5.3.2 Quantitative analysis of physical traits

Kororima fruits of different provenances i.e. ***ye-Basketo kororima, ye-Malo kororima, and ye-Gelila kororima*** from Basketo and its neighboring Woredas Malo and Gelila; and ***ye-Decha kororima*** and ***ye-T'ello kororima*** from Kafa were collected. Quantitative features (number of fruits per kilogram; fruit weight, length, and circumference; weight of fruit wall and seeds per fruit; number of seeds per fruit) were extracted from randomly selected fruits and indirect values (length-circumference ratio, weight ratio of seeds to fruit wall) were derived from measured traits.

5.3.3 Germination experiment

With the objective of evaluating germination potential of ***kororima*** seeds, germination experiment was conducted at Arba Minch University Botany Laboratory using seeds of five provenances of ***kororima*** (Basketo, Malo, Gelila, Dechcha and T'ello). Standard germination procedure (Sweet and Bolton 1979, Wondyifraw Tefera 2004) was employed. In the process of seed surface decontamination, seeds were placed in test tubes with screw caps, and washed several times using laboratory detergent and tap water. Then the seeds were dipped in 70% ethanol for 3 minutes and this was followed by treating seeds with 6% sodium hypochlorite v/v added with 2 ml l^{-1} Tween-80 for 5 minutes. Treated seeds were then rinsed four times with sterilized distilled water. The subsequent task of sowing surface-sterilized seeds on two kinds of substrata was undertaken under laminar flow bench.

In the first case, seeds were transferred to moistened sterile filter papers in autoclaved petridishes. A total of 100 seeds of each provenance was planted on four petridishes with each petridish containing 25 seeds. Sand was the second type of substratum on which seeds were planted. Sand of less than 2 mm in diameter was used after washing it with tap water so as to get rid of any organic matter, soluble salts, clay and fine silt. Purified sand was sterilized by autoclaving. Twenty-five seeds of each provenance were placed on a level layer of sand and were then covered by uncompressed sand to a depth of 10 to 20 mm. As a control, an equal number of unsterilized seeds of each provenance were planted on the two types of substrata. In all cases, planted seeds were periodically irrigated with distilled water, and the experiment was run for 67 days at room temperature.

5.3.4 Seed chemical analysis

Chemical analysis of ***kororima*** seeds was carried at Addis Ababa University Organic Chemistry Laboratory, and involved two major steps:

A) Isolation of essential oils

The whole ***kororima*** fruit samples were decorticated to yield seeds, which were then ground for distillation. The ground samples were subjected to hydro-distillation in a

Clevenger apparatus for three hours. The essential oils were dried over anhydrous sodium sulphate and stored at 4°C before analysis.

B) Essential oil analysis

Essential oil samples were analyzed by a DANI GC 1000 DPC Gas Chromatograph (GC) equipped with an ECTm-5 fused silica capillary column, with nitrogen as a carrier gas at a flow rate of 0.7mL/min, and with a split ratio of 50. The column temperature was programmed from 70°C (5min) at 5°C/min to 180°C at 10°C/min to 240°C (20 min). An FID detector was used at a temperature of 260°C and the injection temperature was 210°C.

The GC/MS analysis was carried out with a Gas Chromatograph coupled with a Mass Spectrophotometer equipped with a DB-1 fused silica capillary column and with the same temperature program as used for GC analyses.

Identification of components in the oil was based on computerized matching of the acquired mass spectra with NIST MS search 2.0 library and by comparison of the fragmentation patterns of the mass spectra with those reported in the literature (Berhanu Abegaz *et al.* 1994). Quantitative data were obtained by flame ionization detection and electronic integration without using FID response factors.

5.3.5 Analysis of ***kororima*** growing soils

Composite soil samples were taken at a depth of 0–30 cm from 10 ***kororima*** plots in Basketo and 5 plots in Kafa. Soil physical and chemical property analysis was made at the National Soil Research Laboratory (NSRL) in Addis Ababa, according to the standard soil analysis procedures provided by Sahlemedhin Sertsu and Taye Bekele (2000).

5.4 Data collection on floristic composition

Data on floristic composition was collected from the 140 homegardens of the two study areas(60 in Basketo and 80 in Kafa); and also from other land use systems, i.e. bamboo lands, woodlands developed from abandoned farmlands and sacred groves (in Basketo) and bamboo lands, grazing and bush lands, and the managed forest (in Kafa).

5.4.1 Homegardens survey

Data on plants occurring in homegardens were collected by following two approaches. First, the entire homegarden was taken as a study unit and plant species which were mentioned to be useful by the household were recorded by their local names. Then the arrangement and diversity of plants in the garden was studied systematically by laying a 4 m x 5 m quadrat in each of the two sections of the garden and three such quadrats along the length of the third and longest lower section of the garden. Plant species and varieties present in each quadrat were recorded and percentage cover was estimated; and these in turn converted into cover-abundance values according to the modified Braun-Blanquet scale (van der Maarel 1979). The vertical arrangement of plants in the gardens was observed by taking note of the height of plants making the different layers.

5.4.2 Survey of other land use systems

Information on plants of other land use systems, i.e. land used for other purposes than cultivation (bamboo lands, woodlands and sacred groves in Basketo whereas bamboo lands, grazing and bush lands, and the managed forest in Kafa), was collected through guided field interview – i.e. holding discussions with informant community members while walking in and around these land use systems. Then, ten 10 m x 20 m quadrats were laid in each land use type to sample the floristic composition. Names of all woody species and some herbaceous forms that were described to have local use were recorded; and species abundance and the pattern of stratification were noted. Voucher specimens of plants encountered during the survey were collected except for few. The specimens whose names could not be determined in the field were identified and all those that could be identified were reconfirmed at the National Herbarium (ETH). Predetermined specimens that are stored at the herbarium and Flora of Ethiopia and Eritrea (Volume 1-8) were used as principal aids in identification. All collected specimens were labeled and deposited at the National Herbarium (ETH).

5.5 Data analysis

5.5.1 Data organization and presentation

Microsoft Office Excel 2003 was used for organizing the data collected from the field into analyzable form and also for presenting data in tables and graphs. Descriptive statistical analyses were also performed using this program.

5.5.2 Preference ranking

Preference ranking exercise was carried out, in all sampled households, with the aim of assessing the relative role of a spice for household use and income generating. The test was conducted following Martin (1995) but with some modifications. In this study, spices encountered in each garden were ranked by the household members. The rank values were then converted into scores with the most preferred spice, i.e. that ranked first, attaining the highest value and vice versa. For assigning a spice with a score the following equation:

$S = (Ns - R s) + 1$ was used, where

S = Score attained by a spice at a garden,

Ns = Number of spice-yielding plant species in the garden, and

Rs = Rank of a particular species (1^{st} =1, 2^{nd} = 2, 3^{rd} = 3 etc.)

Since there existed variations in number of spice yielding plant species across gardens in a study site, the scores attained by spice plants in gardens with lesser number of species than the maximum (i.e. 14 for Basketo and 15 for Kafa) are corrected using the equation:

$(Sm*S)/Ns$, where

Sm = maximum score in a study site (which is equal to the maximum number of spice plant species per garden in the study site, i.e. Basketo or Kafa),

S = score attained by a spice at a particular garden, and

Ns = number of spice yielding plant species in that particular garden.

Scores attained by a spice in different households are then summed, and based on total scores, spices are ranked for their household use and importance in generating income.

5.5.3 Paired comparison

Paired comparison test was conducted, as suggested by Martin (1995), for the two use types. Six top ranking spices of the preference ranking test were used for the comparison which was conducted in 24 households of Basketo and 32 households of Kafa that were randomly selected from all households sampled in the study. The scores attained by each spice were totaled, and based on this the six spices are ranked for their role in household use and income generation.

5.5.4 Diversity and floristic similarity analysis

Different measures of diversity were used to assess the level of biological diversity at different scales. Alpha diversity, i.e. species richness, was determined by recording plant species in a study unit whereas gamma diversity was obtained by summing all species encountered at a study area level. Beta diversity, a measure of the extent to which the diversity of two or more spatial units differs, was determined through Whitaker's (Whitaker 1972) method:

$$\beta W = \frac{Sc}{S} - 1 ,$$

where, β_W is Whitaker's beta diversity, Sc is the number of species in the composite sample, and S is the average species richness in the entire set.

Shannon diversity index (H'), evenness (E), and Sorensen's similarity index (for measuring floristic similarity between two land use types) were calculated following Magurran (2004) through equations:

$$H' = -\sum p_i \ln p_i ,$$

where, p_i is the proportion of individuals of the i^{th} species;

$$E = \frac{H'}{H_{max}} = \frac{H'}{\ln S} ,$$

where, H_{max} is the maximum level of diversity possible within a given population, and S is number of species; and

$$Sc = \frac{2C}{(A+B)},$$

where, C is the number of species common to both land use types while A and B are number of species recorded from each land use type.

5.5.5 Statistical analysis

In addition to descriptive statistics, statistical tests were used either to compare results or to determine relationships. Accordingly, one way ANOVA was used to test the variation in: germination rate and fruit quantitative features of ***kororima*** from different provenances, garden species richness of the two study sites, and diversity of garden sections. Independent sample T-test was used to analyze soil chemical analysis results and Pearson's correlation was used to determine the relation between frequency of a spice's occurrence in the sampled gardens and preference given to it by the households. The statistical software package SPSS version 15.0 was employed for the analyses.

6. RESULTS

6.1 Emic categorizations of the Basket and Kafecho peoples

6.1.1 Categorization of the landscape and its components

The mosaic landscapes and local resources of Basketo and Kafa are perceived and classified in a specific way by local peoples in both areas.

6.1.1.1 Landscape categorization in Basketo

In Basketo, the landscape is divided into several parts: ***aal-oos-gad*** (homegarden), ***oos-gad/wot-gadi*** (crop field), ***ts'oose*** (sacred grove), ***maata*** (grazing land), ***wooshi-gad*** (bamboo land), ***duufa*** (burial ground), and ***c'oc'a*** (wetland). ***Dubashe***, an under tree gathering site to entertain various social issues such as settling disputes among neighbors, is also a component of the landscape. Local characterization of space categories based on traditional criteria is given in Table 3.

Table 3 Characterization of Basket space categories

Space categories	Local characterization
Aal-oos-gad	Cultivated land, planted with diverse crops, has permanent crop cover, divided into sections, the living house is placed within it
Oos-gad/wot-gadi	Cultivated land, used mainly for cereal cultivation, covered with crops only for some part of the year, sometimes fallowed
Ts'oose	Uncultivated land, covered by spontaneously growing trees, respected, place for rituals, only men are allowed to enter
Maata	Uncultivated land or fallowed land, covered with grass and some bush
Wooshi-gad	Cultivated land, covered by bamboo trees, wetter land
Duufa	Uncultivated land, covered by spontaneously growing trees, respected, resting place for sprits of ancestors
C'oc'a	Uncultivated land, wetland
Dubashe	Open space with a large-crowned tree, adjacent to an elder's house

The ***aal-oos-gad*** (homegarden) is the major food production unit owned by every household. ***Oos-gad/wot-gadi*** (crop field) provides supplementary produce to the household. This land use system can be situated either close to the living quarter or at distant lowland places. In the latter case, it is referred to as ***zara-wot-gadi*** (lowland crop field)**.** The crop fields that are situated close to the house have in common a number of cultivated crops including tubers with the homegardens. They are most likely convertible into homegardens. Most households but not all have crop fields. ***Ts'oose*** is a sacred grove consisting of remnant forest species. ***Ts'oose*** is found in each ***muura*** - a family's holding (a family, in this case, consists of households of the father and his married sons). It is the place where the bodies of senior deceased members of the muura are rested, and is a sacred site where offerings are presented to ancestors (their spirits) through ***kaasha*** ceremony. ***Kaasha*** ritual is performed twice a year: June-July (when crops like yam and maize become ready for harvest) and November-December (after harvesting cereals like ***t'ef,*** sorghum and barley) with the intention of sacrificing the first portion (the 'tip') of the harvest to ancestors and the creator. During ***kaasha*** prayer, names of ancestors are chanted (i.e. they are informed about the offerings), and asked for their blessings so that every good thing will happen to the community. Cutting trees from ***ts'oose*** and grazing cattle there are strictly prohibited. Households to which the sacred forest belongs are allowed to collect fire wood only during some occasions such as annual ceremonies.

Duufa is a burial ground showing structural similarity to ***ts'oose*** since it shares similar plant species whilst differing functionally. Fallowed lands and abandoned farm lands serve as grazing land (***maata***), and they may belong to a family or a neighborhood. Since the landscape is characterized by hillocks, wetlands (***c'oc'a***) that stretch between hills adjoin different villages. ***Wooshi-gad*** (bamboo land) is located at the margins of wetlands, usually bordering the homegarden. ***Dubashe***, the public gathering site marked by a big tree (usually *Podocarpus falcatus*) is found at neighborhood (***dootse***) level. The above-mentioned landscape organization is characteristic of mid and high altitude areas of Basketo since the lowlands have largely been used as crop fields. Permanent settlement in lowlands is only a recent phenomenon. Fig. 5 shows the entirely human-managed Basketo landscape.

Fig. 5 View of Basketo landscape (Photo: Feleke Woldeyes)

6.1.1.2 Landscape categorization in Kafa

The Kafa landscape, unlike that of Basketo, still retains a significant part of its original forest (Fig. 6). The landscape is categorized into ***daadde-goyo*** (homegarden), ***gaddi-goyo/buddi-goyo*** (crop field), ***tusho*** (bush land), ***gaddo/bakko*** (grazing land), ***shinaata*** (bamboo land), ***koho*** (wetland), ***kubbo*** (managed forest), and ***guudo*** (less-disturbed forest). The sites once used as burial ground (***maasho***) are no longer present in the area since their role has been taken over by churchyards. Rituals are conducted in the forest; no sacred grove is maintained for the purpose. Table 4 gives Kafecho local space categories and their characterization.

The ***daadde-goyo*** (homegarden) is the main unit of food production. The ***gaddi-goyo*** (crop field) which normally starts from the back part of the homegarden leads, in most cases, into the forest. ***Tusho*** (bush land) makes part of the garden and then comes ***gaddo*** (grazing land) which may belong to a household (***kechi-asho***), a group of households predominantly of a single lineage (***gafo***), or neighborhood (***giyo***). ***Bakko*** is a larger-sized grazing area at the periphery of the village and used by the whole community. Wetlands (***koho***) are less frequent in the open landscape but are important common property areas that provide diverse services. ***Shinaata*** (bamboo land) is restricted to wet places in lowland areas, but encountered at different points in the landscape at higher altitude areas.

Table 4 Characterization of Kafecho space categories

Space categories	Local characterization
Daadde-goyo	Cultivated land, planted with diverse crops, has permanent crop cover, divided into sections, the living house is placed within it
Gaddi-goyo/ buddi-goyo	Cultivated land, used for cereal cultivation, covered with crops only for some part of the year, sometimes fallowed
Tusho	Uncultivated land, covered by bushy shrubs
Gaddo/bakko	Uncultivated land or fallowed land, covered with grass and some bush
Shinaata	Cultivated land, covered by bamboo trees
Koho	Uncultivated land, wetland
Kubbo	Forest, coffee land, located in gorges, individual or common land
Guudo	Forest, dense, occupies elevated locations, belongs to the government

The forest component of the landscape is classified into two types: ***kubbo and guudo.*** ***Kubbo*** (the managed forest) occupies land that descends from the crop field down to streams at bottom of gorges. This forest type is usually owned by a household or descendents of a family. In areas where land and forest resources are becoming scarce, there is a growing trend of exploiting it at communal level. ***Guudo*** (the less-disturbed forest) is located at the outermost part of the settlement (next to ***kubbo***) occupying a gradually rising terrain. ***Kubbo*** and ***guudo*** are sites where Kafecho people conduct the ritual ceremony, ***K'oolle-deejjo***, in order to thank the sprit of a locality or area of land. ***K'oolle-deejjo*** is performed twice a year: when maize is ready for harvest (July-August) and at the time of threshing ***t'ef*** (December). The reason for holding the ritual at the specified juncture is to present the first portion of the harvest to the owner of the land (sprit of the land). Cutting trees from ritual sites in the forest and also having cattle graze there are strictly prohibited.

Fig. 6 A view of a common landscape in Kafa (Photo: Feleke Woldeyes)

6.1.2 Categorization of plants

6.1.2.1 Plant classification systems of the Basket people

One way the Basket people classify plants is on the basis of use plants give to humans. Accordingly, nine plant categories of Basket people were identified, and these include: ***Fiishi*** (Food), ***Sawubaz*** (Spice), ***Gaalla*** (Medicine), ***K'oysisandabo*** (Ornamental/ Beautifying agent), ***Sawk'sandabo*** (Perfume), ***Kaashabo-shiishire*** (Thanksgiving offering), ***Inni-mahazinddo*** (Thirst-quenching/Stimulant/Beverage), ***Keets'andabo-wogintsine*** (Construction material), ***Mella*** (Others). Table 5 gives description of these categories.

Table 5 Description of use-based plant categories of the Basket people

Category	Description
Fiishi	Edible plants or plants used as source of food
Sawubaz	Plants added to food to make it tastier, or used in preparation of condiments
Gaalla	Plants that are used in treating both human and animal illnesses; those used as poison, insect and pest repellents; and also those used for fattening cattle or stimulating lactation
K'oysisandabo	Plants that are used as ornamentals, those that lend charisma to the homestead, and those indicative of social status of the household.
Sawk'sandabo	Plants whose sweet smelling fresh leaves are put on the body or in fresh butter which is used as body cream, and also those used to wash or smoke household utensils to obtain a typical smell
Kaashabo-shiishire	Plants that are used in rituals and other religious ceremonies
Inni-mahazinddo	Plants that are used for satisfaction of certain habits or addictions such as smoking
Keets'andabo-wogintsine	Plants that are used for construction purposes
Mella	Plants that have functions other than the above-mentioned. Plants that function as fuel, washing brush, coloring agent, cattle feed, farm implements, shade, fence, windbreak, large animals repellent, beauty aid, and protection from evil spirits or bad luck; those used for making household furniture and utensils, straw carpets; and for income generation

One hundred forty eight local *generic* taxa were recorded from Basketo homegardens and found to belong to the different use-based categories in various proportions (Appendix 1a, Table 6, and Fig.7). Fig. 7 shows the distribution of local *generic* taxa of Kafa in use-based local categories the detail of which will be presented later.

Table 6 Distribution of Basket local *generic* taxa in use-based local categories of plants

	Local category name in Basket language	English equivalent	No. of local *generics* in a category	%
1	***Fiishi***	Food	49	33.11
2	***Sawubaz***	Spice	24	16.22
3	***Gaalla***	Medicine	32	21.62
4	***K'oysisandabo***	Ornamental	7	4.73
5	***Sawk'sandabo***	Perfume	13	8.78
6	***Kaashabo-shiishire***	Thanksgiving offering	3	2.03
7	***Inni-mahazinddo***	Thirst-quenching/Stimulant	3	2.03
8	***Keets'andabo-wogintsine***	Construction material	29	19.59
9	***Mella***	Others	113	76.35

NB: Some local *generics* are assigned in more than one category

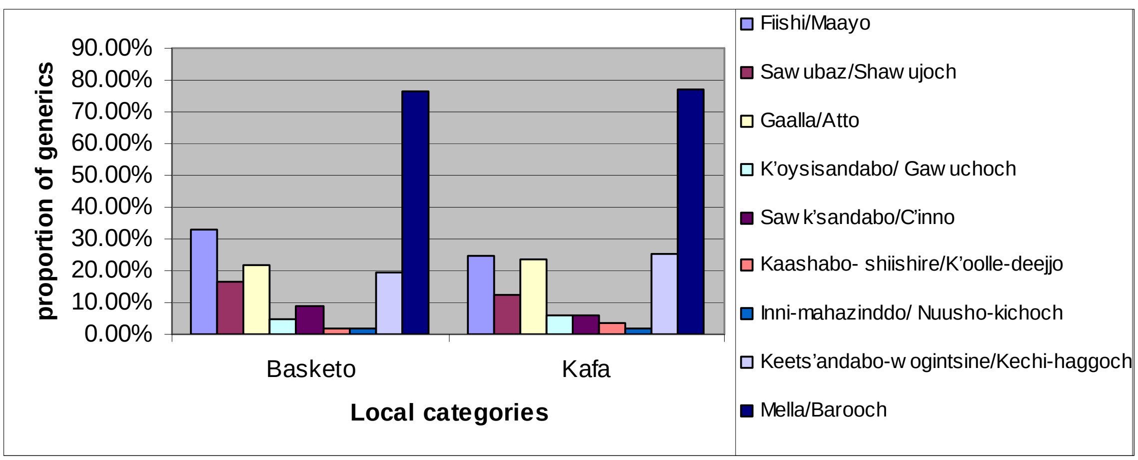


Fig. 7 Proportion of local *generics* assigned to use-based local categories of the Basket and Kafecho peoples

Besides classifying plants into use-based categories, Basket people also classify plants hierarchically (Table 7) based on such features as morphology, habit, stature and color. The plant world is differentiated from that of animals, but there is no collective name labeling the group. Plants are recognized to be of different *lifeforms*: ***mits/mitsi*** (tree), ***tura*** (climber), and ***maata*** (grass, herb); and these *lifeforms* consist of local *generic* taxa. A total of 148 local *generics* were recorded from Basketo homegardens (Appendix 1a). While 11 of the local Basketo *generics* are found to be polytypic, i.e. subdivided into local *specific* taxa, two local *specifics* are further subdivided into *varietal* level (Table 8, Appendix 2a).

Table 7 Hierarchical plant classification of the Basket people

Category	No. of taxa recorded	Nomenclature
Kingdom	1	Taxon not named
Lifeform	3	Taxa named
Generic	148	Taxa named
Specific	87	Taxa named
Varietal	5	Taxa named

Table 8. Polytypic *generics* recorded from Baskto homegardens

Name of *Generics*	English Equivalent	No. of *Specifics*
Uuts/Uutsa	***Enset***	26
Buuy	Yam	20
Moss	Sorghum	12
Sherkka	Taro	12
Shetera	Beans	5
Botaya/Botay	Pumpkin	4
Mayts'	Cabbages	4
Buna	Coffee	3
Muuza	Banana	3
Dona	Sweet potato	2
Shonkkora	Sugarcane	2

The recorded local Basketo *generics* exhibited correspondence to scientific species to various degrees: one to one correspondence, overdifferentiation and underdifferentiation (Table 9).

Table 9 Degree of correspondence of local Basketo *generics* to scientific species

One-to-one correspondence (1 *generic* = 1 scientific species)	Overdifferentiation (> 1 *generics* = 1 scientific species)	Underdifferentiation (1 *generic* = > 1 scientific species)
141	4	3
	K'aysira + ***K'ost'a*** = *Beta vulgaris* ***Bakra*** + ***Dunkka*** = *Ocimum basilicum*	***Mayts'*** = *Brassica oleracea* + *Brassica carinata* ***Sherkka*** = *Colocasia esculenta* + *Xanthosoma saggitifolium* ***Shetera*** = *Phaseolus vulgaris* + *Phaseolus lunatus* + *Vigna unguiculata*

6.1.2.2 Plant classification systems of the Kafecho people

The Kafecho people also classify plants into categories based on their use. Accordingly, nine plant categories of Kafecho are identified, and these include: ***Maayo*** (Food), ***Shawujoch*** (Spice), ***Atto*** (Medicine), ***Gawuchoch*** (Ornamental/Beautifying agent), ***C'inno*** (Perfume), ***K'oolle-deejjo/Baare-k'oc'o*** (Thanksgiving offering), ***Nuusho-kichoch*** (Thirst-quenching/Stimulant/Beverage), ***Kechi-haggoch*** (Construction material), ***Barooch*** (Others). Table 10 gives a description of these categories.

Table 10 Description of use-based plant categories of the Kafecho people

Category	Description
Maayo	Edible plants or plants used as source of food
Shawujoch	Plants added to food to make it tastier, or used in preparation of condiments
Atto	Plants that are used in treating both human and animal illnesses; those used as poison, insect and pest repellents; and also those used for fattening cattle or stimulating lactation
Gawuchoch	Plants that are used as ornamentals, those that lend charisma to the homestead, and those indicative of social status of the household.
C'inno	Plants whose sweet smelling fresh leaves are put on the body or in fresh butter which is used as body cream, and also those used to wash or smoke household utensils to obtain a typical smell
K'oolle-deejjo (Baare-k'oc'o)	Plants that are used in rituals and other religious ceremonies
Nuusho-kichoch	Plants that are used for satisfaction of certain habits or addictions such as smoking.
Kechi-haggoch	Plants that are used for construction purposes
Barooch	Plants that have functions other than the above-mentioned. Plants that function as fuel, washing brush, coloring agent, cattle feed, farm implements, shade, fence, windbreak, large animals repellant, beauty aid, and protection from evil spirits or bad luck; those used for making household furniture and utensils, straw carpets, bee-hives ; and those used for climbing beehive and for income generation

One hundred eighty five local *generic* taxa which were recorded from Kafa homegardens are assigned to the nine use-based categories in various proportions (Table 11, Fig. 7 and Appendix 1b).

Kafecho people also classify plants hierarchically (Table 12) on the basis of some traits like morphology, habit, stature and color. The plant world is distinguished from that of animals, but there is no term that is used as a label for the group. Plants are recognized to be of different life forms: ***mit'o*** (tree), ***k'ombbo*** (climber) and ***shuyo/moc'o*** (grass, herb). The 185 local *generic* taxa recorded from Kafa homegardens (Appendix 1b), belong to these 3 *lifeforms*. While 15 of the local Kafa *generics* are found to be polytypic, i.e. subdivided into local *specific* taxa, five local *specifics* are further subdivided forming the lowest level of local taxa – the *varietals* (Table 13, Appendix 2b).

Table 11 Distribution of Kafecho local *generic* taxa in use-based local categories of plants

	Local category name in Kafecho language	**English equivalent**	**No. of local *generics* in a category**	**%**
1	***Maayo***	Food	46	24.86%
2	***Shawujoch***	Spice	23	12.43%
3	***Atto***	Medicine	44	23.78%
4	***Gawuchoch***	Ornamental	11	5.95%
5	***C'inno***	Perfume	11	5.95%
6	***K'oolle-deejjo (Baare-k'oc'o)***	Thanksgiving offering	6	3.24%
7	***Nuusho-kichoch***	Thirst-quenching/Stimulant	3	1.62%
8	***Kechi-haggoch***	Construction material	47	25.41%
9	***Barooch***	Others	143	77.30%

NB: Some local *generics* are assigned in more than one category

Table 12 Hierarchical plant classification of the Kafecho people

Category	No. of taxa recorded	Nomenclature
Kingdom	1	Taxon not named
Lifeform	3	Taxa named
Generic	185	Taxa named
Specific	118	Taxa named
Varietal	23	Taxa named

Table 13 Polytypic *generics* recorded from Kafa homegardens

Name of *Generics*	English Equivalent	No. of *Specifics*
Uut'o	***Enset***	70
Yango	Sorghum	7
Gobbo	Beans	5
Ooc'ino	Yam	5
Shaano	Cabbages	5
Ababo	Flowers	4
Buk'o	Pumpkin	3
Dok'o	Potatos	3
Muuzo	Banana	3
K'iiddo	Taro	3
Shonkooro	Sugarcane	3
Baro	Long chilli pepper	2
Duuk'isho	Onions	2
Sheetto	*Indigofera arrecta, Sida rhombifolia*	2
Dicho	*Aeollanthus densiflorus*	1

The local *generics* of Kafa also exhibited correspondence to scientific species to various degrees (Table 14).

Table 14 Degree of correspondence of local Kafa *generics* to scientific species

One-to-one correspondence (1 *generic* = 1 scientific species)	Over differentiation (> 1 *generics* = 1 scientific species)	Under differentiation (1 *generic* = > 1 scientific species)
171	7	7
	Diik'o + ***Shiip'o*** + ***Yango*** = *Sorghum bicolor* ***Diiroo*** + ***Kefo*** = *Ocimum basilicum* ***K'aysiro + K'ost'o*** = *Beta vulgaris*	***Ababo*** = *Euphorbia cotinifolia* + *Iresine herbstii* + *Datura innoxia* ***Dok'o*** = *Ipomoea batatas* + *Solanum tuberosum* ***Duuk'isho*** = *Allium cepa* + *Allium sativum* ***Gobbo*** = *Phaseolus vulgaris* + *Phaseolus lunatus* + *Cajanus cajan* + *Vigna unguiculata* ***K'iiddo*** = *Colocasia esculenta* + *Xanthosoma saggitifolium* ***Shaano*** = *Raphanus sativus* + *Brassica oleracea* + *Brassica carinata* ***Sheetto*** = *Indigofera arrecta* + *Sida rhombifolia*

6.2 The Homegardens

6.2.1 Organization of homegardens

Homegardens of Bakseto and Kafa are organized following a pattern that is consistently reflected in each garden.

In Basketo, where the landscape is characterized by rolling hills, the homegarden (***aal-oos-gad***) stretches from the top, level part of the hill down to the lowest point between hills. It is usually oblong, i.e. longer than it is wide. The homegarden is divided into four parts relative to the living house placed at the top of the slopping land (Fig. 8). The elevated part of the garden above the house and which stretches up to the fence bordering the road is called ***aldira***; the area below the house and that descends down to the wetland is ***alts'ana***; the front part of the house is ***alkara***/***kara***; whereas that at the backside is ***alwumppa/wumppita***. Each garden section has specific characteristics and functions (Table 15).

Table 15 Characteristic features and functions of Basketo homegardens

Garden section	Features	Characteristic plants	Function
Alkara*/ *kara	- level land - open and clean space at the front of the house	- left unplanted	- place for social activities (wedding, mourning) - site for product processing (threshing crops, drying) - place to feed and rest cattle temporarily
Aldira	- elevated portion of the garden - dominated by ***enset***, some big trees and coffee - men's corner (until recently)	- high quality ***enset*** (*Ensete ventricosum*) varieties, coffee, *Podocarpus falcatus*, *Syzyygium guineense*, *Ficus ovata*, *F. vasta*, *Pycnostachys abyssinica*	- place for conducting rituals (***kaasha***) - site for maintaining high quality ***enset*** varieties - sign of the strength (virility) of the owner
Alwumppa/ wumppita	- backyard - planted mainly with spices and vegetables - women's corner	- *Ocimum basilicum*, *Capsicum frutescens, Ruta chalepensis, Coriandrum sativum*, *Zingiber officinale*, cabbage, pumpkin	- the spice corner - site for propagating ***enset*** seedlings
Alts'ana	- slopping land - cropping pattern changes along its length - consists of dry and wet parts	- Coffee, yam, cereals, pulses, **kororima** *(Aframomum corro-rima), Colocasia esculenta, Arundinaria alpina*	- place for production of food and cash crops and materials for construction

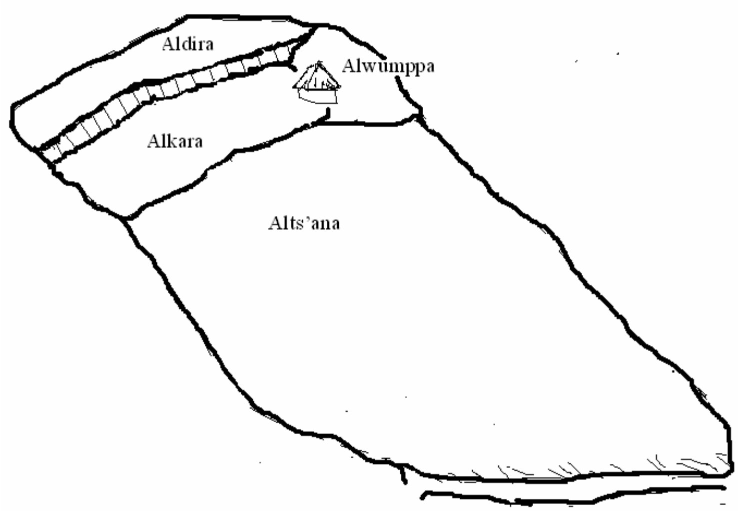


Fig. 8 Sketch showing organization of Basketo homegarden

In Kafa also the homegarden is divided into four sections. Relative position to the house and the adjoining forest and land elevation are put into account when recognizing parts.

The garden sections are ***dambbak'ach***, **deshk'ach**, ***daaddo*** and ***bortto***/***Kello*** (Fig. 9), and their characteristic features and functions are presented in Table 16

Table 16 Characteristic features and functions of Kafa homegardens

Garden section	Features	Characteristic plants	Function
Bortto or ***Kello***	- level land - clean space in front of the house with planted strips of land on either side	- pulses, ornamentals	- place for social activities (wedding, mourning) - site for post-harvest processing (threshing, drying)
Dambbak'ach	- elevated portion of the garden - planted with ***enset***, vegetables & cereals	- ***enset*** (*Ensete ventricosum*), varieties, cabbage, cereals (maize, sorghum)	- place for food crop production
Daaddo	- backyard - planted mainly with spices, vegetables, yam - women's corner	- cabbage, *Capsicum annuum*, *Ruta chalepensis*, *Coriandrum sativum*, *Ocimum basilicum*, *Zingiber officinale*, *Curcuma domestica*, yam, pumpkin	- the spice and vegetable corner - site for propagating ***enset*** seedlings
Deshk'ach	- slopping land - ***Enset*** dominates close to the house - cropping pattern changes along its length	- ***Enset***, cereals (maize, sorghum), *Colocasia esculenta*	- place for production of Food and cash crops

Among the garden sections of Kafa, ***Daaddo*** (the backyard) is the most distinct corner both in terms of cultivated crops and gender domain. Some crop plants are placed at this corner with the intention of avoiding trampling by cattle and also to keep them out of sight so as to avoid a consequent rotting.

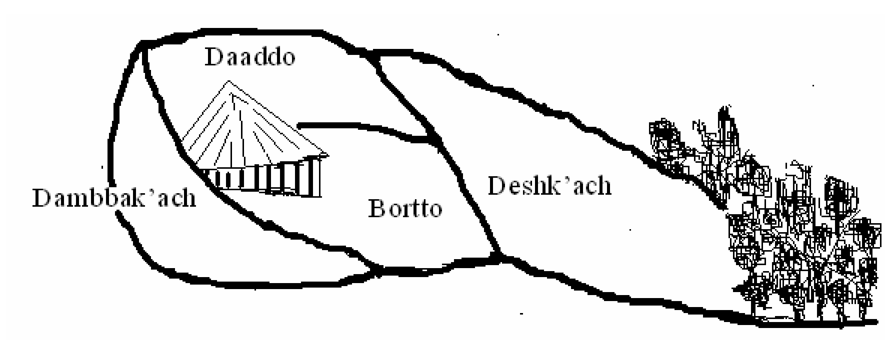


Fig. 9 Sketch showing organization of Kafa homegarden

6.2.2 Plant composition of homegardens

Diverse plant species that belong to different habits (i.e. trees, shrubs, herbs and climbers) are maintained in the homegardens of Basketo and Kafa. Survey of the homegardens of the two areas yielded a total of 224 species of which 149 species belonged to Basketo gardens while 192 were recorded from Kafa gardens (Appendix 3).

In gardens of both areas, herbaceous forms dominate the vegetation (Table 17, Appendices 4a and 4b). While the proportion of trees, shrubs, herbs and climbers for Basketo gardens is 29.53%, 25.50%, 42.28% and 2.68% respectively, that for Kafa is 32.29%, 22.92%, 38.54% and 6.25%. Homegarden species in both areas are either cultivated or spontaneous (i.e. growing in their own right but tolerated for their actual or perceived use) (Table 18, Appendices 4a and 4b). While 77.85% homegarden species of Basketo are cultivated, in Kafa gardens this figure amounts to 53.13.

Table 17 Habit of Basketo and Kafa homegarden species

		Habit				Total
		Tree	Shrub	Herb	Climber	
Basketo	No. of species	44	38	62	5	149
	% Total	29.53%	25.50%	41.61%	3.36%	
Kafa	No. of species	62	44	74	12	192
	% Total	32.29%	22.92%	38.54%	6.25%	

Table 18 Cultivation status of homegarden species of Basketo and Kafa

		Cultivation status		Total
		Cultivated	Spontaneous	
Basketo	No. of species	116	33	149
	% Total	77.85%	22.15%	
Kafa	No. of species	102	90	192
	% Total	53.13%	46.88%	

Component plant species of the homegarden are arranged in a multilayered fashion. About three strata (lower, middle, upper) may be identified although the distinction between these layers may not be difficult to sometimes. Species composition of the different layers is very much similar in the two areas (Table 19). However, in the forest-looking homegardens of Kafa, emergent trees attain greater height and are more abundant. Moreover, additional species such as *Erythrina brucei*, *Pouteria adolfi-friederici*, *Elaeodendron buchananii* and *Schefflera abyssinica* occur.

Table 19 Plant species forming the different layers of Basketo and Kafa homegardens

Ground layer	Lower layer	Middle layer	Upper layer	Emergent species
Cucurbita pepo, *Ipomoea batatas*, *Aframomum corrorima*, *Zingiber officinale*, *Lagenaria sicerasia*	*Colocasia esculenta*, *Xanthosoma saggitifolium*, *Capsicum frutescens*, *Brassica* spp., *Coriandrum sativum*, *Ruta chalepensis*	*Coffea arabica*, *Zea mays*, *Musa paradisiaca*, *Helianthus annuus*, *Rhamnus prinoides*, *Saccharum officinarum*, *Ricinus communis*, *Persea americana*, *Manihot esculenta*	*Ensete ventricosum*, *Vernonia amygdalina*, *Solanecio mannii*, *Mangifera indica*, *Persea americana*, *Carica papaya*	*Ficus vasta*, *Croton macrostachyus*, *Albizia schimperiana*, *Cordia africana*, *Milletia ferruginea*, *Macaranga capensis*, *Erythrina abyssinica*, *Prunus africana*, *Ficus palmata*

6.2.3 Use of homegardens

The functions of Basketo and Kafa homegardens are diverse; and range from providing food and other necessary materials for subsistence to serve as a place to live and maintain traditional lifestyle, cultural values and social relations.

Except for some supplementary produce coming from the crop fields, the household relies on homegarden plants for its food supply. Diverse crops with different flowering, fruiting and harvesting seasons and household animals fulfill this requirement. ***Enset*** (*Ensete ventricosum*) is the major staple food which is supplemented by additional tuber crops (taro, yam, sweet potato), vegetables, cereals and spices. The other function of Basketo and Kafa homegardens is related to health. Of the total plant species recorded from the homegardens, 32 (21.48%) species in Basketo and 44 (22.92%) species in Kafa are used for medicinal purposes (Appendices 1a and 1b). Homegardens are also a source of construction materials, fuel and beauty aids. An ever-growing role of homegardens of the areas, which may have a significant impact with regards to the nature of this systems, is income generation. This role of homegardens to the household is important, particularly to Basketo farmers, whose cash crops (i.e. coffee and *Aframomum corrorima*) are cultivated in the homgardens instead of coming from the forest as it is in Kafa.

The role of homegardens goes beyond providing material and monitory benefits. They also have a number of social-related functions. In the first place, they signal the status of the household. A well-managed homegarden, for example, is known to belong to a respected person of high status or a strong and clever person even by a passerby. A young man who owns a good homegarden has a better chance of success while soliciting for a spouse. Since cultural activities such as religious rituals, wedding ceremonies, mourning and reconciliations take place within the homegarden area, these systems constitute a place for cultural exchange, teaching of rules and transmission of traditions from generation to generation.

Homegardens resources that range from produce to seedlings are shared, to a limited extent, among community members since such resources are perceived to belong to the household and at the same time to the community. The exchange of resources is based on the principle of reciprocity and the intention of ensuring the perpetuation of the resource in the landscape. In other words, resources (usually planting materials) are offered to others with the recognition that the household will, someday, require resources in the same manner. Because of this, maintaining a plant resource in several gardens is encouraged for this allows regaining a resource lost from a farmer's plot.

Homegardens of Basketo and Kafa provide ground for experimentation and learning. While farmers try new crops by planting in their homegardens; some make observations on such aspects as the growing of different ***enset*** varieties from the seeds of one ***enset*** type, whereas still others experiment as some farmers did with germination of ***kororima*** seeds and established that it takes a longer time. It is in the homegarden that youngsters (both girls and boys) learn about cultivating crops, harvesting and processing which is crucial for their later life.

6.2.4 Management of homegardens

Diverse management practices that range from designing the spatial (vertical and horizontal) structure of the garden and maintaining soil fertility to planting and harvesting are performed in the homegarden. While most of the activities can be carried out by any household member, some are gender-centered because of religious and labor requirements. In Basketo, only men used to work in the ***aldira*** (the elevated garden section where ***kaasha*** ceremony is performed); and women were prohibited from entering into this part. This is a norm even today in some households of the elderly. In both Basketo and Kafa, part of the garden at the back of the house (***alwumppa/daaddo***) is a women's corner where men rarely enter. The remaining garden sections are parts where all family members work.

There are no gender-related planting restrictions as such. However, it is generally women who plant vegetables and spices while men do the planting of ***enset*** and yam that involves laborious digging of the ground. Maintaining soil fertility is mainly the responsibly of Basket and Kafecho women. For this purpose, cattle manure and household rubbish are used. However, the application of these inputs depends on the type of garden section and the kind of crop planted. While the backyard and lower part of the garden are fertilized with cattle manure and household garbage, the upper garden part is kept clean of these inputs or sometimes fertilized with ash. Exchange of homegarden resources also takes place between women except for seeds and crops such as *Aframomum corrorima* that are considered to be a man's domain.

Extraction (and also use) of products from the homegarden is performed according to an established norm; and only after conducting rituals in case of some seasonal crops. In Basketo, for example, maize, yam, ***t'ef***, sorghum and barley are harvested after conducting a thanks giving ceremony (***kaasha***). Similarly, in Kafa, ***t'ef*** and maize are harvested and used after conducting the ***k'oolle-deejjo*** ceremony. In Basketo, where ***enset*** is grown mainly for its tuber, some varieties of the crop are harvested during limited occasions: during festivals, when a guest is received, during the rainy season, and when there is shortage of food. Otherwise, even the dry leaves of these plants are not stripped off but wrapped around the pseudostem. In Kafa, leaves of the herbs *Ruta chalepensis* and *Artemisia absinthium* are cut only by the housemother for it is said that the plants discriminate between hands, and will dry if touched by other people.

Basket and Kafecho peoples avoid harvesting resources under some circumstances. During the dry period, for example, harvesting of ***enset*** and coffee leaves is either reduced or totally prohibited; ginger and yam are not harvested at all; and entering into the *Aframomum corrorima* stand is forbidden. The Basket refrain from cutting bamboo when the moon is alive; i.e. harvesting takes place only during moonless days (i.e. during the period from the old moon set to the time when the new moon rises). The reason for doing so is said to avoid weevil attacks that would occur if the bamboo is cut outside the prescribed period. Farmers avoid harvesting bigger ***enset*** individuals and also large corncobs, letting them stay for later use.

6.2.5 Pattern of homegarden development and evolution

Basketo and Kafa homegardens exhibit similarities and differences with respect to their establishment and development. Similarities include: beginning to establish one's own garden at the stage of adolescence, constructing a hut right at the beginning of garden establishment, and gradual introduction of crops during the garden's development. The situation that Basketo gardens are established on a sloping hill instead of in crop fields or forests, the requirement that a garden should preferably include wetland in Basketo, and the fact that homegardens of Basketo are almost exclusively started on privately-owned land (the father's garden) unlike the possibility of establishing gardens on forested non-private lands in Kafa constitute the differences.

In Basketo where only limited land is available, a youngster starts his garden on his father's plot (Fig. 10). ***Enset*** is the first to be planted in the different parts of the garden. This is followed by planting coffee at intervals under the shade provided by leaves of the growing ***enset***. Vegetables, tubers, pulses, spices, cereals, fruit crops, and other trees are gradually incorporated into different parts of the garden. As older ***enset*** individuals are harvested, coffee gradually takes over the space. During the second round of planting, ***enset*** is placed on the lower part of the garden next to the coffee stand. In a mature garden, therefore, coffee dominates areas close to the house except at the backyard; and ***enset***, the relatively short-lived perennial, keeps moving away from the house. This, in turn, may necessitate moving the house to a new location closer to the ***enset*** stand.

Fig. 10 Basketo youngster constructing a hut on the lower portion of his father's garden. Note that the recently planted ***enset*** is at the lower side. Such rectangular house is temporary and eventually to be replaced by a circular one (Photo: Feleke Woldeyes)

In Kafa, the homegarden may be started by clearing the forest and preserving some trees. However, the common practice at the present time is to start the gardens on a plot of land that has been used as a crop field. Here again, ***enset*** is the first crop to be grown with the construction of the youngster's hut. ***Enset*** is planted in all three sections of the garden (backyard, elevated and lower sides) except in the small area left at the backyard for cultivating vegetables. Since coffee is harvested from the forest, only few are maintained in the garden. A variety of other crops are subsequently added. It had been a norm to plant two ***enset*** seedlings at the site where one mature individual was harvested. Mature gardens consist of a grove of ***enset*** interplanted with various crops and encircling the house. Cereals or tubers are raised in monoculture or in a mixture further away; and shade providing large-crowned trees that are mostly located at the garden margin constitute part of the live fence.

Noticeable changes have already started to occur with respect to the structure and composition of the homegardens of Basketo and Kafa. Out of 149 Basketo homegarden species 30 (20.13%) were introduced into the garden system during the last 10-15 years (Appendix 5). By the same token, 34 (17.71%) of the 192 species of Kafa homegardens were incorporated into the system within the same period (Appendix 5). Fruits, ornamentals and spices account for the largest introductions into gardens of the two areas. Except for a few species (*Vepris dainellii*, *Fagaropsis angolensis* and *Catha edulis* in case of Basketo, and *Aframomum corrorima* and *Piper capense* in Kafa) that were incorporated into the garden from the local natural vegetation, the rest were obtained from external sources.

Enset and coffee are best indicators for the changes that have been occurring in the homegarden systems of Basketo and Kafa. In both areas, as explained by informant farmers, the amounts of ***enset*** in the garden are diminishing. Although bacterial wilt, attack by moles and prolonged dry periods are known to have had their own contributions, the major reason behind this is the deliberate expansion of coffee. Being attracted by its better economic return, farmers are planting coffee in larger amounts; and this is happening even in Kafa. ***Enset*** is also being pushed out of the system by *Xanthosoma saggitifolium* (a recently introduced kind of taro) which aggressively expands in the garden, and also competes at household level sharing the staple food role of ***enset***. Yam and *Colocasia esculenta* (the taro that has been cultivated for long) are among the declining crops. On the other hand, sugar cane, ginger, new varieties of banana, *Aframomum corrorima*, and *Piper capense* are expanding.

6.3 Spices of the Basket and the Kafecho peoples

Any plant product that is used for flavoring or enhancing the taste of food is a spice for Basket and Kafecho people, and designated by the word s***awubaz*** in Basket and **s*hawujoch*** in Kafinono languages. Spices of the local communities are derived from seeds, fruits, leaves or aerial shoots, rhizomes or bulbs of plants of different lifeforms that are cultivated in the homegardens or grow spontaneously in associated land use systems.

6.3.1 Diversity of spice-yielding plants in Basketo and Kafa

An Inventory of Basketo and Kafa homegardens yielded 24 spice-yielding species in each of the study areas; and this accounts for 16.11% of total species composition of

Basketo homegardens and 12.44% of that of Kafa. In combination, the total number of spices recorded from the two areas is 31 (Table 22).

6.3.1.1 Diversity of spice-yielding plants in Basketo

Twenty four plant species whose parts are used as seasonings were recorded from the homegardens of Basketo (Table 20). These species are distributed into 11 plant families with Asteraceae, Lamiaceae, Rutaceae, Zingiberaceae and Apiaceae containing three species each; Brassicaceae, Solanaceae and Alliaceae two species; and Fabaceae, Poaceae, and Ranunculaceae a single species.

Table 20 Spice yielding plants of Basketo (Freq.=Frequency)

N0.	Local name	English gloss	Scientific name	Family	Freq.*
1	***Mits'mits'a***	Chilli	*Capsicum frutescens*	Solanaceae	**56**
2	***Ts'altta***	Rue/Herb of grace	*Ruta chalepensis*	Rutaceae	**52**
3	***Z'almma***	Ginger	*Zingiber officinale*	Zingiberaceae	**41**
4	***Deebba***	Coriander	*Coriandrum sativum*	Apiaceae	**39**
5	***Barbara***	Long chilli pepper	*Capsicum annuum*	Solanaceae	**38**
6	***Okasha*/*Koroorima***	False cardamom	*Aframomum corrorima*	Zingiberaceae	**34**
7	***Tuumma***	Garlic	*Allium sativum*	Alliaceae	**34**
8	***Irdda***	Turmeric	*Curcuma domestica*	Zingiberaceae	**32**
9	***Shunkurtta***	Onion/Shallot	*Allium cepa*	Alliaceae	**23**
10	***Bakra***	Basil/Sweet basil	*Ocimum basilicum* var. *basilicum*	Lamiaceae	**22**
11	***Sibikka*/*Feets'a***	Garden cress	*Lepidium sativum*	Brassicaceae	**17**
12	***Dawri-naatir***	African wormwood	*Artemisia afra*	Asteraceae	**12**
13	***Zimpad'a***	Thyme	*Thymus schimperi*	Lamiaceae	**9**
14	***Katkaalla*/*Insilaala***	Fennel/Spingel	*Foeniculum vulgare*	Apiaceae	**8**
15	***Naana***	Mint	*Mentha spicata*	Lamiaceae	**6**
16	***C'uk'un'a***	Wormwood/Mugwort	*Artemisia abyssinica*	Asteraceae	**5**
17	***Dek'etsa***	–	*Fagaropsis angolensis*	Rutaceae	**2**
18	***Mahmacha***	Lemongrass	*Cymbopogon citratus*	Poaceae	**2**
18	***Shuk'a* /*Abusha***	Fenugreek	*Trigonella foenum-graecum*	Fabaceae	**2**
20	***Boots-gaalla***	Bishop's weed	*Trachyspermum ammi*	Apiaceae	**1**
21	***C'awla***	–	*Vepris dainellii*	Rutaceae	**1**
22	***Karets-gaalla***	Black cumin	*Nigella sativa*	Rnunculaceaea	**1**
23	***Sanaafic'***	Mustard	*Brassica nigra*	Brassicaceae	**1**
24	Unnamed I	Wormwood	*Artemisia annua*	Asteraceae	**1**

* Frequency refers to the number of homegardens in which the specific spice occurred out of the total (60) studied in Basketo

The richness of spice-yielding plant species of homegardens (i.e. number of spices per garden) ranged from 1 to 14, with the average value being 7.32 (Fig. 11). On the other hand, frequency of occurrence of spices ranged from 56 to only one garden (Table 20). Accordingly, while chilli, rue and ginger were found to be the most frequent spices occurring in 56 (93.33%), 52 (86.67%) and 41 (68.33%) homegardens, bishop's weed, black cumin, mustard, ***c'awla*** (*Vepris dainellii*) and *Artemisia annua* were recorded only from 1 (1.67%) garden (Fig. 12).

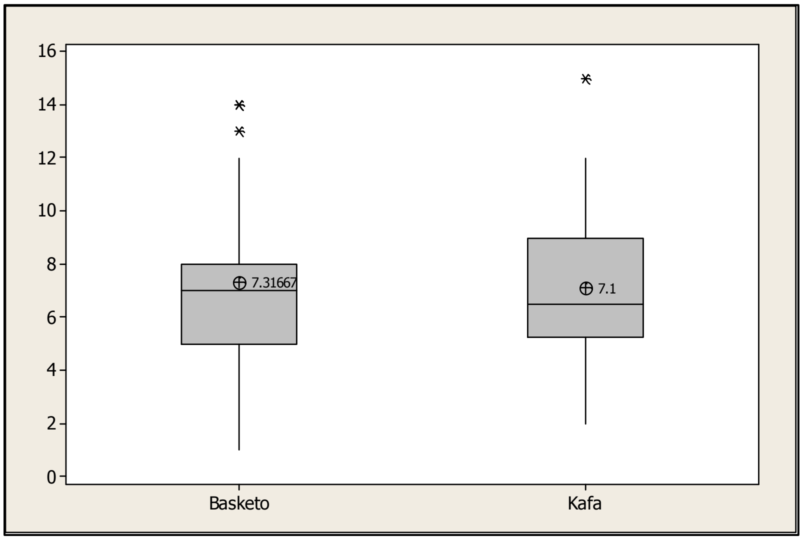


Fig. 11 Box plot showing richness of spice yielding plant species in Basketo and Kafa homegardens

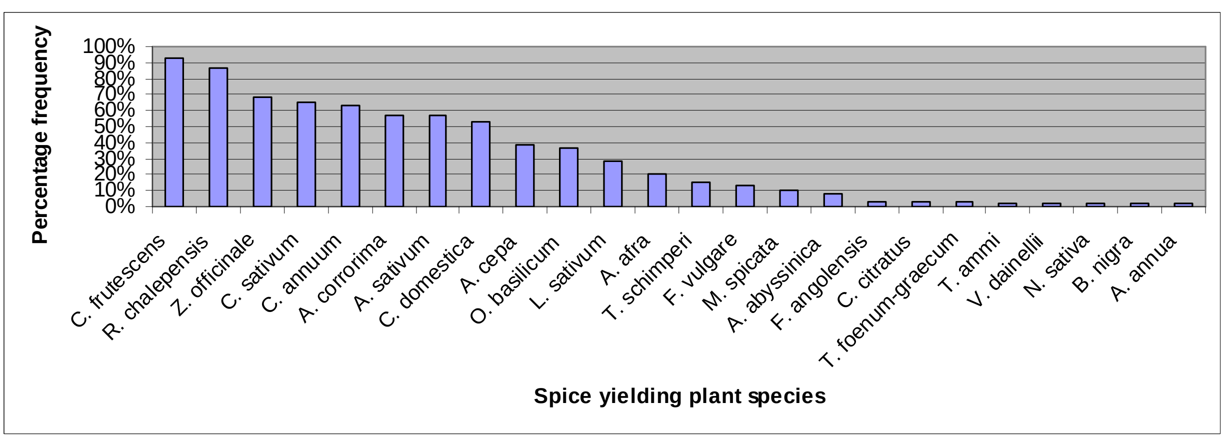


Fig. 12 Graph showing occurrence frequency of spice yielding plant species in Basketo homegardens

6.3.1.2 Diversity of spice-yielding plants of Kafa

In Kafa, 24 plant species belonging to 12 families are used as source of spices (Table 21). While 5, 4, and 3 species belong to Lamiaceae, Zingiberaceae and Solanaceae in the respective order; Alliaceae and Rutaceae contain two species each; whereas Anacardiaceae, Apiaceae, Asteraceae, Brassicaceae, Piperaceae, Poaceae, Ranunculaceae and Verbenaceae are represented by only one species each.

Table 21 Spice yielding plants of Kafa (Freq.=Frequency)

N0.	Local name	English gloss	Scientific name	Family	Freq.*
1	***Baro***	Long chilli pepper	*Capsicum annuum*	Solanaceae	**70**
2	***Kefo***	Basil/Sweet basil	*Ocimum basilicum* var. *basilicum*	Lamiaceae	**66**
3	***C'addiraamo***	Rue/Herb of grace	*Ruta chalepensis*	Rutaceae	**63**
4	***Yanjiballo***	Ginger	*Zingiber officinale*	Zingiberaceae	**44**
5	***Oofiyo*/*Oogiyo***	False cardamom	*Aframomum corrorima*	Zingiberaceae	**42**
6	***Toochco***	Lemongrass	*Cymbopogon citratus*	Poaceae	**39**
7	***Irddo***	Turmeric	*Curcuma domestica*	Zingiberaceae	**38**
8	***Deebbo***	Coriander	*Coriandrum sativum*	Lamiaceae	**32**
9	***Hup'icho* I**	–	*Laggera crispata*	Asteraceae	**30**
10	***Nac'e-duuk'isho***	Garlic	*Allium sativum*	Alliaceae	**24**
11	***Woc'o***	Thyme	*Thymus schimperi*	Lamiaceae	**21**
12	***Koshereto***	–	*Lippia adoensis* var. *koseret*	Verbenaceae	**20**
13	***Turfo***	–	*Piper capense*	Piperaceae	**19**
14	***C'elle-duuk'isho***	Onion/Shallot	*Allium cepa*	Alliaceae	**17**
15	***Mit'mit'e / Mit'o***	Chilli	*Capsicum frutescens*	Solanaceae	**13**
16	***Naanayo***	Mint	*Mentha spicata*	Lamiaceae	**7**
17	***Mac'ollaaggo***	Fennel/Spingel	*Foeniculum vulgare*	Apiaceae	**6**
18	***Yaayo***	–	*Fagaropsis angolensis*	Rutaceae	**5**
18	***Bare-ak'ayo***	–	*Solanum pseudo-capsicum*	Solanaceae	**4**
20	***Aaʔafo***	Black cumin	*Nigella sativa*	Ranunculaceae	**2**
21	***Rozmaro***	Rosemary	*Rosmarinus officinalis*	Lamiaceae	**2**
22	***Heelo***	Cardamom	*Elettaria cardamomum*	Zingiberaceae	**1**
23	***K'undobarbaro***	Peppercorn tree	*Schinus molle*	Anacardiaceae	**1**
24	***Shenaafo***	Mustard	*Brassica nigra*	Brassicaceae	**1**

* Frequency refers to the number of homegardens in which the specific spice occurred out of the total (80) studied in Kafa

The number of spice-yielding plant species in Kafa varied among homegardens with the maximum number being 15, the minimum 2, and mean richness 7.1 (Fig. 11). With regards to frequency of occurrence of the species in the studied homegardens, the maximum value is 70 while the minimum is 1 (Table 21). The three top species in terms of frequency are long chilli pepper, basil, and rue which were recorded from 70 (87.50%), 66 (82.50%), and 63 (78.75%) gardens respectively. Those with rare occurrence are black cumin and rosemary which occurred in 2 (2.50%) gardens and cardamom, peppercorn tree and mustard which were recorded from only 1 (1.25%) garden (Fig. 13).

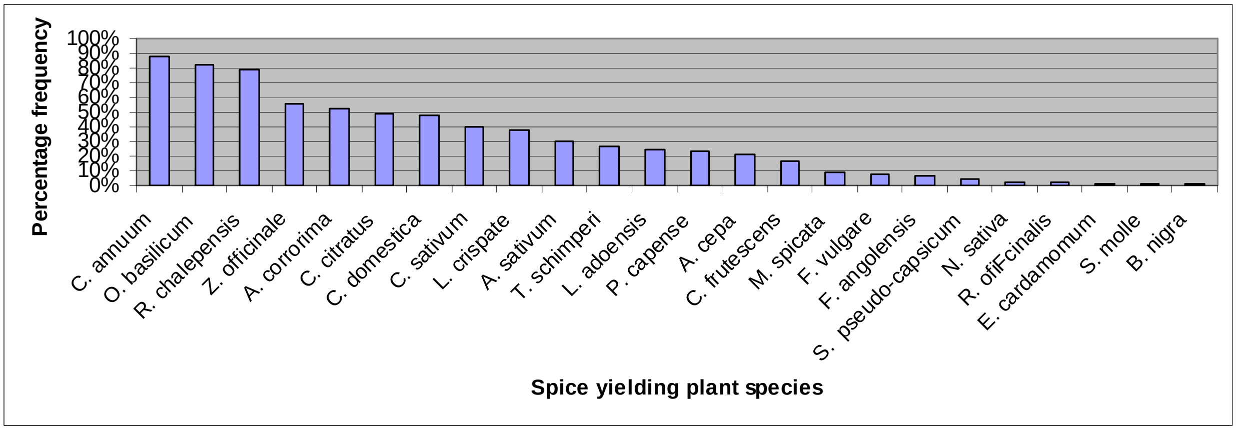


Fig. 13 Graph showing occurrence frequency of spice yielding plant species in Kafa homegardens

Table 22 The 31 spice-yielding plant species of Basketo and Kafa

	Scientific name	Recorded from			Scientific name	Recorded from	
		Basketo	Kafa			Basketo	Kafa
1	*Aframomum corrorima*	√	√	17	*Lepidium sativum*	√	
2	*Allium cepa*	√	√	18	*Lippia adoensis* var. *koseret*		√
3	*Allium sativum*	√	√	19	*Mentha spicata*	√	√
4	*Artemisia abyssinica*	√	√	20	*Nigella sativa*	√	√
5	*Artemisia afra*	√		21	*Ocimum basilicum* var. *basilicum*	√	√
6	*Artemisia annua*	√		22	*Piper capense*		√
7	*Brassica nigra*	√		23	*Rosmarinus officinalis*		√
8	*Capsicum annuum*	√	√	24	*Ruta chalepensis*	√	√
9	*Capsicum frutescens*	√	√	25	*Schinus molle*		√
10	*Coriandrum sativum*	√	√	26	*Solanum pseudo-capsicum*		√
11	*Curcuma domestica*	√	√	27	*Thymus schimperi*	√	√
12	*Cymbopogon citratus*	√	√	28	*Trachyspermum ammi*	√	
13	*Elettaria cardamomum*	√	√	29	*Trigonella foenum-graecum*	√	
14	*Fagaropsis angolensis*		√	30	*Vepris dainellii*	√	
15	*Foeniculum vulgare*	√	√	31	*Zingiber officinale*	√	√
16	*Laggera crispata*		√				

Spices used in Basketo and Kafa are not only those produced locally. As the market survey results revealed, different spices are brought either from markets in neighboring areas or from the national capital, Addis Ababa (Table 23). Some of these spices are imported ones. The spices that are obtained from outside markets are either those that are not cultivated locally or those produced in a quantity not sufficient to satisfy local needs.

Table 23 Spices that are brought from outside markets and sold in markets of Basketo and Kafa

No.	**Local name in**		**Scientific name**	**Family**	**Encountered in**	
	Basket	Kafinoono			Basketo	Kafa
1	***Boots-gaalla***	***Nac'aafo***	*Trachyspermum ammi*	Apiaceae	√	√
2	***Hel***	—	*Elettaria cardamomum**	Zingiberaceae	√	
3	***Irdda***	***Irddo***	*Curcuma domestica*	Zingiberaceae	√	√
4	***Karets-gaalla***	***Aaʔafo***	*Nigella sativa*	Ranunculaceae	√	√
5	***K'urunfud***	***K'urunfudo***	*Eugenia caryophyllus**	Myrtaceae	√	√
6	***Shuk'a/Abusha***	***Giraaro***	*Trigonella foenum-graecum*	Fabaceae	√	√
7	***T'imiz***	***Faranji Turfo***	*Piper longum**	Piperaceae	√	√
8	—	***Kefo***	*Ocimum basilicum* var. *basilicum*	Lamiaceae		√
9	—	***Koshereto***	*Lippia adoensis* var. *koseret*	Verbenaceae		√
10	—	***K'arafa***	*Cinnamomum zeylanicum**	Lauraceae	√	√
11	—	***K'undobarbaro*** II	*Piper nigrum*	Piperaceae		√
12	—	***Shenaafo***	*Brassica nigra*	Brassicaceae		√
13	—	***Woc'o***	*Thymus schimperi*	Lamiaceae		√

* Spices imported from international market

6.3.2 Use of spices

Basket and Kafecho people have a long tradition of using spices for different purposes. Spices are used for flavoring food, as coloring agent, for medicinal use, to generate income, and also in religious practices. However, it is in the preparation of two local condiments (***dusha*** and ***bunaytsi-gaalla***) in Basketo and one (***dok'o*** or ***naaʔo***) in Kafa that spices are mainly used. ***Dusha*** and ***dok'o***/***naaʔo*** are closely similar preparations, green or orange-red in color, and made from a crushed mixture of up to 16 spices (Appendix 6). The main ingredient of these condiments is chilli (*Capsicum frutescens*) or long chilli pepper (*Capsicum annuum*) the fruit color of which determines that of the eventual condiments. The condiments are used in preparation of some foods and also consumed with prepared foods like bread, boiled tubers and meat.

Bunaytsi-gaalla (literally meaning coffee medicine) has basically the same constituent as ***dusha***, except for some additional spices, but a smaller proportion of chilli or long chilli pepper is used when it is prepared. This spice mixture is crushed in wooden mortar, unlike that of ***Dusha*** or ***dok'o*** which is mashed using a stone mill, and therefore acquires a coarser texture. The condiment is used for making a hot drink made from coffee leaves called ***Bunaytsi***. Although ***bunaytsi*** is a regular drink of Basket people, its equivalent, ***c'emo***, is not known as such by the larger Kafecho except by the minority Manja group.

Additional uses of local of Basketo and Kafa spices as food seasonings include: spicing coffee, tea, butter, ***k'oc'o*** (fermented product of ***enset***), ***besso*** (mash made of barley), ***berbere*** (powdered long chilli pepper), ***shiro*** (mash made of peas), ***wot'*** (a kind of sauce), cooked cabbage, and bread; flavoring milk, cheese, water, roasted corn, ***harek'e*** (locally made alcoholic drink); and coloring ***berbere*** and bread. Categories and regularity of use of spices in the study area are presented in Tables 24 and 25, and specific uses in Appendix 7.

Table 24 Use categories and home use frequency of Basketo spices (S=Spice, Ca=Coloring agent, M=Medicinal, Or=Ornamental, I=Income, Re=Regular, O=Occasional)

N0.	Scientific name	Use category					Frequency of use	
		S	Ca	M	Or	I	Re	Oc
1	*Ocimum basilicum* var. *basilicum*	√		√		√		√
2	*Capsicum annuum*	√				√	√	
3	*Trachyspermum ammi*	√				√		√
4	V*epris dainellii*	√		√		√		√
5	*Artemisia abyssinica*	√		√		√		√
6	*Artemisia afra*	√		√		√	√	
7	*Coriandrum sativum*	√				√	√	
8	*Fagaropsis angolensis*	√		√		√		√
9	*Curcuma domestica*	√	√			√		√
10	*Nigella sativa*	√		√		√		√
11	*Foeniculum vulgare*	√		√		√	√	
12	*Cymbopogon citratus*	√		√	√		√	
13	*Capsicum frutescens*	√				√	√	
14	*Mentha spicata*	√				√	√	
15	*Aframomum corrorima*	√		√		√		√
16	*Brassica nigra*	√		√				√
17	*Allium cepa*	√				√		√
18	*Trigonella foenum- graecum*	√		√		√		√
18	*Lepidium sativum*	√		√		√		√
20	*Ruta chalepensis*	√		√	√	√	√	
21	*Allium sativum*	√		√		√	√	
22	*Zingiber officinal*e	√		√		√	√	
23	*Thymus schimperi*	√				√	√	
24	*Artemisia annua*	√						√
Total		24	1	15	2	21	11	13

Table 25 Use categories and home use frequency of Kafa spices (S=Spice, Ca=Coloring agent, M=Medicinal, Or=Ornamental, I=Income, Ri=Ritual, Re=Regular, O=Occasional)

N0.	Scientific name	Use category						Frequency of use	
		S	Ca	M	Or	I	Ri	Re	Oc
1	*Nigella sativa*	√		√		√			√
2	*Solanum pseudo-capsicum*	√	√						√
3	*Capsicum annuum*	√				√		√	
4	*Ruta chalepensis*	√		√	√	√	√		√
5	*Allium cepa*	√		√		√		√	
6	*Coriandrum sativum*	√		√		√			√
7	*Elettaria cardamomum*	√				√		—	—
8	*Laggera crispata*	√						√	
9	*Curcuma domestica*	√	√	√		√			√
10	*Ocimum basilicum* var. *basilicum*	√				√			√
11	*Lippia adoensis* var. *koseret*	√				√	√		√
12	*Schinus molle*	√							√
13	*Foeniculum vulgare*	√				√	√		√
14	*Capsicum frutescens*	√		√		√			√
15	*Mentha spicata*	√				√			√
16	*Allium sativum*	√		√		√	√	√	
17	*Aframomum corrorima*	√		√		√			√
18	*Rosmarinus officinalis*	√		√					√
18	*Brassica nigra*	√		√		√			√
20	*Cymbopogon citratus*	√		√	√	√			√
21	*Piper capense*	√		√		√			√
22	*Thymus schimperi*	√		√		√			√
23	*Fagaropsis angolensis*	√		√		√			√
24	*Zingiber officinal*e	√		√		√		√	
Total		24	2	15	2	20	4	5	18

Preference ranking and pairedwise comparison tests which were conducted with the aim of determining local spices' importance with respect to household use and income generation yielded results presented in Tables 26, 27, 28 and 29, 30, 31.

Table 26 The top ten ranking spices of Basketo as determined by preference ranking

Household Use Rank				Income Generation Rank		
N0.	*Scientific name*	Total score	Rank	*Scientific name*	Total score	Rank
1	*Capsicum frutescens*	718.8	1st	*Aframomum corrorima*	460.8	1st
2	*Zingiber officinale*	495.6	2nd	*Capsicum frutescens*	450.2	2nd
3	*Ruta chalepensis*	443.4	3rd	*Zingiber officinal*e	405.0	3rd
4	*Allium sativum*	389.5	4th	*Allium sativum*	314.3	4th
5	*Capsicum annuum*	305.0	5th	*Capsicum annuum*	246.7	5th
6	*Coriandrum sativum*	304.7	6th	*Allium cepa*	240.5	6th
7	*Allium cepa*	190.5	7th	*Ruta chalepensis*	192.9	7th
8	*Aframomum corrorima*	158.5	8th	*Coriandrum sativum*	174.8	8th
9	*Lepidium sativum*	113.0	9th	*Curcuma domestica*	151.1	9th
10	*Curcuma domestica*	102.5	10th	*Lepidium sativum*	70.4	10th

Table 27 The top ten ranking spices of Kafa as determined by preference ranking

Household Use Rank				Income Generation Rank		
N0.	Scientific name	Total score	Rank	Scientific name	Total score	Rank
1	*Capsicum annuum*	971.3	1st	*Capsicum annuum* L.	638.2	1st
2	*Ocimum basilicum* var. *basilicum*	587.0	2nd	*Aframomum corrorima*	521.1	2nd
3	*Zingiber officinal*e	526.7	3rd	*Zingiber officinal*e	329.3	3rd
4	*Ruta chalepensis*	428.9	4th	*Allium sativum* L.	207.5	4th
5	*Allium sativum*	340.1	5th	*Piper capense*	183.6	5th
6	*Coriandrum sativum*	290.1	6th	*Allium cepa*	155.0	6th
7	*Curcuma domestica*	279.9	7th	*Curcuma domestica*	144.5	7th
8	*Aframomum corrorima*	247.0	8th	*Ocimum basilicum*	144.3	8th
9	*Cymbopogon citratus*	220.0	9th	*Ruta chalepensis*	99.2	9th
10	*Allium cepa*	208.5	10th	*Coriandrum sativum*	91.3	10th

Table 28 The top ten ranking spices of Basketo and Kafa based on averaged preference ranking scores of household use and income generation

Basketo				Kafa		
N0.	*Scientific name*	Total score	Rank	*Scientific name*	Total score	Rank
1	*Capsicum frutescens*	584.51	1st	*Capsicum annuum*	804.75	1st
2	*Zingiber officinal*e	450.28	2nd	*Zingiber officinal*e	427.98	2nd
3	*Allium sativum*	351.90	3rd	*Aframomum corrorima*	384.04	3rd
4	*Ruta chalepensis*	318.17	4th	*Ocimum basilicum*	365.63	4th
5	*Aframomum corrorima*	309.67	5th	*Allium sativum*	273.77	5th
6	*Capsicum annuum*	275.82	6th	*Ruta chalepensis*	264.04	6th
7	*Coriandrum sativum*	239.74	7th	*Curcuma domestica*	212.22	7th
8	*Allium cepa*	215.50	8th	*Coriandrum sativum*	190.69	8th
9	*Curcuma domestica*	126.78	9th	*Allium cepa*	181.76	9th
10	*Lepidium sativum*	91.68	10th	*Cymbopogon citratus*	128.50	10th

Table 29 The top six ranking spices of Basketo as determined by paired comparison

Household Use Rank				Income Generation Rank		
N0.	Scientific name	Total score	Rank	Scientific name	Total score	Rank
1	*Capsicum frutescens*	114	1st	*Aframomum corrorima*	120	1st
2	*Zingiber officinal*e	98	2nd	*Capsicum frutescens*	85	2nd
3	*Allium sativum*	64	3rd	*Zingiber officinal*e	71	3rd
4	*Ruta chalepensis*	50	4th	*Allium sativum*	50	4th
5	*Capsicum annuum*	26	5th	*Allium cepa*	19	5th
6	*Coriandrum sativum*	8	6th	*Capsicum annuum*	15	6th

Table 30 The top six ranking spices of Kafa as determined by paired comparison

Household Use Rank				Income Generation Rank		
N0.	Scientific name	Total score	Rank	Scientific name	Total score	Rank
1	*Capsicum annuum*	154	1st	*Aframomum corrorima*	147	1st
2	*Zingiber officinal*e	121	2nd	*Capsicum annuum*	132	2nd
3	*Ocimum basilicum*	99	3rd	*Zingiber officinal*e	95	3rd
4	*Allium sativum*	59	4th	*Allium sativum*	60	4th
5	*Ruta chalepensis*	38	5th	*Allium cepa*	26	5th
6	*Coriandrum sativum*	9	6th	*Piper capense* L	20	6th

Table 31 The top six ranking spices of Basketo and Kafa based on pooled paired comparison scores

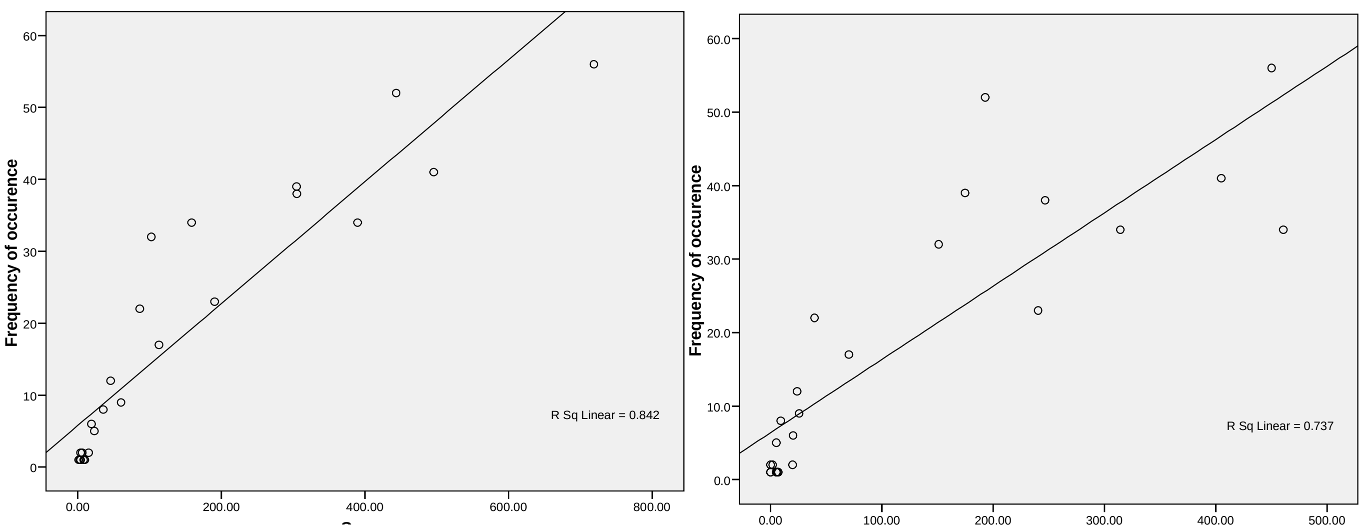
Basketo				Kafa		
N0.	Scientific name	Total score	Rank	Scientific name	Total score	Rank
1	*Capsicum frutescens*	199	1st	*Capsicum annuum*	286	1st
2	*Zingiber officinal*e	169	2nd	*Zingiber officinal*e	216	2nd
3	*Aframomum corrorima*	120	3rd	*Aframomum corrorima*	147	3rd
4	*Allium sativum*	114	4th	*Allium sativum*	119	4th
5	*Ruta chalepensis*	50	5th	*Ocimum basilicum*	99	5th
6	*Capsicum annuum*	41	6th	*Ruta chalepensis*	38	6th

Pearson's correlation analysis using frequency of spice occurrence values and preference ranking score of each use type (household use and market use) revealed that there exists a positive correlation at 1% level of significance (Table 32) even though the degree of correlation between the variables varied depending on the type of use and the specific study area.

Table 32 Level of correlation between frequency of spice occurrence in gardens of Basketo and Kafa and preference ranking scores of household and market uses (PRS=Preference Ranking Score, r= correlation coefficient)

	Basketo	Kafa
PRS of household use v Frequency of occurrence	r (0. 918)	r (0. 895)
PRS of market use v Frequency of occurrence	r (0. 858)	r (0. 668)

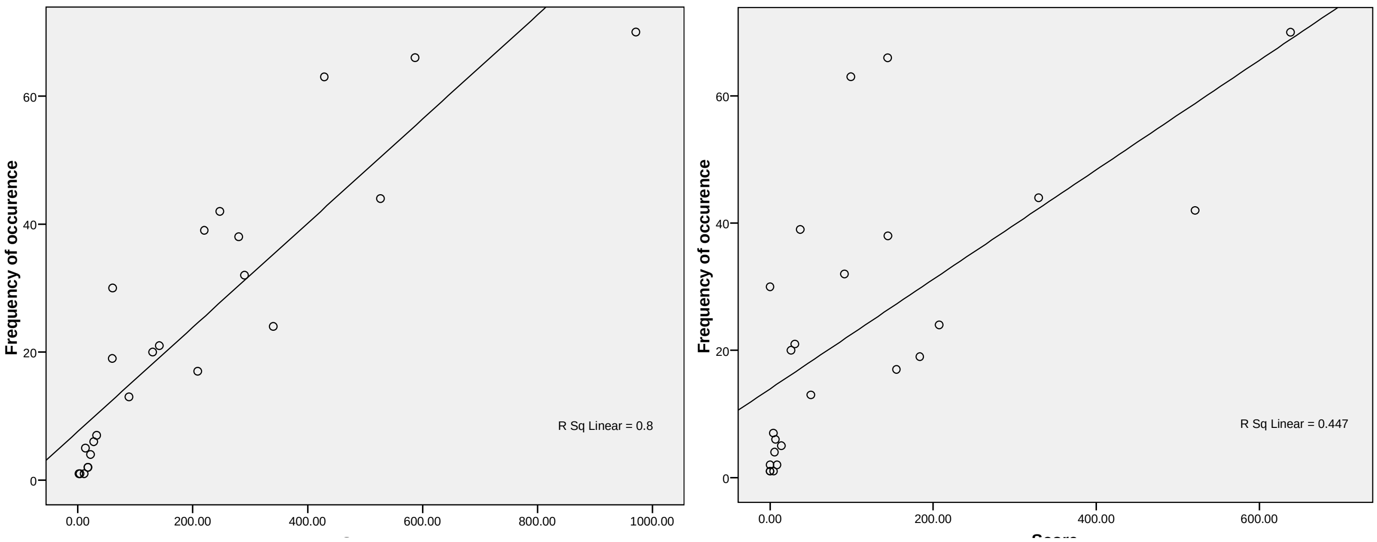
On the other hand, linear regression analysis (Fig. 14 and 15) also showed the existence of a correlation between frequency of spice occurrence and preference in both Basketo and Kafa.



Preference ranking score | Preference ranking score

A | B

Fig. 14 Scatter-plot showing the correlation between frequency of spice occurrence in Basketo gardens and preference for household use (A) and market use (B). (A: $R^2 = 0.842$; B: $R^2 = 0.737$)



Preference ranking score　　　　Preference ranking score

A　　　　B

Fig. 15 Scatter-plot showing the correlation between frequency of spice occurrence in Kafa gardens and preference for household use (A) and market use (B). (A: R^2 = 0.8; B: R^2 = 0.447)

6.3.3 Management practices

Spice yielding plants of Basketo and Kafa are systematically placed in each of the garden sections of Basketo and Kafa and also in the immediate area around the house named as ***albugud*** *(*in Basketo) and ***tago*** or ***tageto*** (in Kafa). A spice-yielding plant species can be encountered in more than one quarter in the garden but there exists a discernible pattern which indicates that the resource plants are deliberately raised in some corners. As the result on the household interview on corner of planting indicated, out of 17 Basketo spices, 5 (29.41%) are primarily planted in the elevated section (***aldira***), a similar amount are planted around the house (***albugud***), 4 (23.53%) are planted in the backyard (***alwumppa***), and 3 (17.65%) in the lower side (***alts'ana***). On the other hand, out of 16 Kafa species, 14 (87.50%) are primarily planted in the backyard (***daaddo***) while 2 (12.50%) are placed in the elevated part (***dambbak'ach***). This shows that while Basketo spices mainly occur in all parts of the garden close to the house, Kafa spices are concentrated in the backyard. Tables 33 and 34 give list of species planted in the different corners in Basketo and Kafa homegardens.

Table 33 Distribution of spices in the different garden sections of Basketo

	Corner of planting			
	Aldira (elevated side)	***Alts'ana*** (lower side)	***Alwumppa*** (backyard)	***Albugud*** (around house)
Primary planting site	*Artemisia afra* *Mentha spicata* *Ruta chalepensis* *Allium sativum* *Thymus schimperi*	*Capsicum annuum* *Capsicum frutescens* *Aframomum corrorima*	*Curcuma domestica* *Allium cepa* *Trigonella foenum-graecum* *Zingiber officinale*	*Ocimum basilicum var. basilicum* *Artemisia abyssinica* *Coriandrum sativum* *Foeniculum vulgare* *Lepidium sativum*
Secondary planting site	*Ocimum basilicum var. basilicum* *Capsicum frutescens* *Aframomum corrorima* *Trigonella foenum-graecum* *Lepidium sativum*	*Artemisia abyssinica* *Coriandrum sativum* *Curcuma domestica* *Mentha spicata* *Allium cepa* *Zingiber officinal*	*Capsicum annuum* *Foeniculum vulgare* *Allium sativum*	*Artemisia afra* *Ruta chalepensis* *Thymus schimperi*

Table 34 Distribution of spices in the different garden sections of Kafa

	Corner of planting			
	Dambbak'ach (elevated side)	***Deshk'ach*** (lower side)	***Daaddo*** (backyard)	***Tago*** (around house)
Primary planting site		*Aframomum corrorima* *Piper capense*	*Capsicum annuum* *Ruta chalepensis* *Allium cepa* *Coriandrum sativum* *Curcuma domestica* *Ocimum basilicum* var. basilicum *Lippia adoensis* var. *koseret* *Foeniculum vulgare* *Capsicum frutescens* *Mentha spicata* *Allium sativum* *Cymbopogon citratus* *Thymus schimperi* *Zingiber officinal*e	Not a primary site for any of the spice yielding plants
Secondary planting site	*Capsicum annuum* *Ruta chalepensis* *Allium cepa* *Coriandrum sativum* *Lippia adoensis* var. *koseret* *Capsicum frutescens* *Mentha spicata* *Allium sativum* *Cymbopogon citratus* *Thymus schimperi* *Zingiber officinal*e	Not a primary planting site for any of the spice -yielding plants	*Aframomum corrorima* *Piper capense*	*Ocimum basilicum* var. *basilicum* *Curcuma domestica* *Foeniculum vulgare*

The placing of spice-yielding plants in respective corners is based on an ecological and social rationale. In Basketo, for example, *Thymus schimperi* and *Mentha spicata* are planted in the upper garden section so that they can creep luxuriously on the sloping rocky and well-drained ground. The planting of *Artemisia afra* and *Ruta chalepensis* in this elevated section goes beyond meeting biological requirements, i.e. it has a protection objective and also using the plants as ornamental. *Capsicum frutescens* is grown in the first part of the lower side under coffee shade where it flourishes well. *Aframomum corrorima* is cultivated at the wet margin since it is a moisture-loving crop. *Ocimum basilicum* and *Coriandrum sativum* germinate around the house from seeds that fall down from the roof (from where the uprooted mature plants are temporarily stored). The relatively high moisture content at this site at the beginning of the rainy season is suitable for the early establishment of these bushy herbs. In Kafa, *A. corrorima* and *Piper capense* are planted at the margin of the lower part of the garden under-large crowned shade trees. On the other hand, a majority of spices are raised at the small clean area in the backyard where the shading effect of taller plants is less, and where these resources are kept out of sight and protected from trampling.

The fact that most spices are planted in the backyard suggests that these plant resources are mainly managed by women. Except for *Laggera crispata* which grows spontaneously in gardens of Kafa, all spice-yielding plants are planted. *Ocimum basilicum* var. *basilicum*, *Artemisia abyssinica*, and *Foeniculum vulgare* regrow from fallen seeds of the previous season. Planting materials are mainly obtained from neighboring gardens and also from crop fields (e.g. *O.basilicum* var. *basilicum* in Basekto and *Capsicum annuum* in Kafa), markets, and nurseries of the agricultural departments or agricultural research plots. Spices are resources most exchanged among neighbors on the bases of the principle of reciprocity. However, the exchange takes place only among women, and men do not ask for or offer the items unless that resource is required for a medicinal purpose. Almost all spices are planted, harvested, processed and sold by women except for *Aframomum corrorima*. *Piper capense* is the other spice which women are less involved in its management. This spice, which grows spontaneously at margins of Kafa gardens or introduced from the forest, has become an agricultural commodity only in recent years. Harvesting and marketing of this spice are done largely by children.

Nevertheless, changes are taking place with respect to gender role in managing spices and this relates to increased commercialization of some spices. *Capsicum annuum*, *Allium cepa*, *A. sativum*, *Lepidium sativum*, *Zingiber officinale* and *Curcuma domestica* are becoming important income generating crops. As a consequence, men are increasingly involved in planting, harvesting and selling of these spices. Appendices 8a and 8b present management role and planting materials of spices.

6.3.4 Commercialization trends

The largest proportions of Basketo and Kafa spices are marketed (Tables 24 and 25) although the amount of income they generate for the household varies. Accordingly, 21 (87.50%) spices of Basketo and 20 (83.33%) of Kafa are sold at different locality levels. Spices that are not sold or bought are *Cymbopogon citratus*, *Brassica nigra* and *Artemisia annua* (in Basketo) and *Laggera crispata*, *Schinus molle*, *Rosmarinus officinalis* and *Solanum pseudo-capsicum* (in Kafa). *L. crispata* is not marketed because it grows spontaneously in abundance. Most of the remaining spices (*Artemisia annua, Rosmarinus officinalis, Solanum pseudo-capsicum, Schinus molle*) are recent introductions and will probably join the market soon.

While commercialization of most of the spices of the two areas is limited to the local level (i.e. at Special Woreda level in Basketo and Zonal level in Kafa), some are traded well beyond these boundaries. Spices of the latter category are ***kororima*** (*Aframomum corrorima*) and chilli (*Capsicum frutescens*) in case of Basketo and ***kororima***, ***turfo*** (*Piper capense*) and long chilli pepper in case of Kafa. Trading of chilli, ***turfo*** and long chilli pepper at this scale is a very recent phenomenon and therefore their marketing is not well-established. On the other hand, ***kororima*** has been traded for long and therefore it is a well-commercialized product.

Marketing of spices in the two areas studied is organized in a more or less similar manner. The products are sold at different points: farm gate, road side, and market place. What is sold at a particular point depends on the type of spice. Accordingly, in Basketo, long chilli pepper, chilli, coriander, onion/shallot, garden cress (*Lepidium sativum*), garlic, rue and ginger are sold at the farm gate level. ***Kororima*** is sold both at farm gate and roadside on market days. It is villagers who buy all spices (except ***kororima***) that are sold at farm gate level for household consumption. ***Kororima*** is bought by farmer traders who pool the product from villages and provide to collectors in town. Similarly in Kafa, long chilli peeper, chilli, onion, garlic, ginger, mustard, ***kororima***, ***turfo*** (*Piper capense*), and ***yaayo*** (*Fagaropsis angolensis*) are sold at the farmer's place. Turmeric and all spices sold at the farm gate (except mustard) are marketed at the road side. Here again, in most cases, those who buy are villagers who want the spices for household use. ***Kororima*** and ***turfo*** are bought by farmer traders who supply bigger collectors in towns; and long chilli pepper, chilli, and garlic are bought by vendors who retail the products at market level. All marketed spices of Basketo and Kafa are available at markets. In these markets, spices are sold in a particular corner - usually two: the corner where farmers sell fresh spice products (Fig. 16) and the quarter where retailers sell both unprocessed and processed spices in their stalls.

Fig. 16 The spice corner in Laska Market, Basketo (Photo: Feleke Woldeyes)

When trading spices, local people use different measurement units as it suits the item in question. It can be number (e.g. in case of ***kororima***), pile (e.g. in case of ginger), bundle (e.g. in case of onion), cup (e.g. in case of chilli) or kilogram (e.g. in case of long chilli pepper). Products sold take different forms: usually the harvested part of the plant (fruit, seed, rhizome, bulb, flower or leaf), sometimes a processed product (e.g. powdered turmeric or long chilli pepper), and also seedlings (e.g. ginger).

According to information obtained from discussions held with farmers, traders and other stakeholders, local spices of Basketo and Kafa are increasingly being commercialized. The long-prevailing notion that selling (most of) the spices is a dishonor to the household is largely being changed. Men's involvement in the production and marketing of these commodities is improving. Spices are more valued by households and there is a growing trend of exchanging these products through purchase. Donations are becoming limited to planting materials or to those used for medicinal purposes and hence required in smaller quantities.

6.3.5 Valorization-related undertakings

Surveys conducted from national up to study area levels and also field observations revealed that different institutions (governmental and non-governmental, federal and regional, public) and research projects are undertaking activities that are related to valorization of spices and associated local resources. Methods involved in the valorization process include: enhancing commercialization and production of spices, regulating quality of spice products, promoting these products by using their market reputation, conducting research on spices and provision of planting materials, and protecting names of local spice products through a legal mechanism. List of those involved in the valorization process and summary of their activities are presented in Table 35.

Table 35 Stakeholders involved in valorization of spices and activities being undertaken

Institution/Project	Activities undertaken or being undertaken
Ministry of Trade and Industry	- engaged in spice export promotion activities
Ministry of Agriculture and Rural Development	- identified spices as products with comparative advantage - developed product profile of spices - undertaking awareness creation activities down to farmer level
Quality and Standards Authority	- controls quality and assures standard with respect to spices and condiments
Agriculture and Rural Development Office (SNNPRS)	- identified areas within the SNNPRS that have suitable Agro-ecology for spice production - designed a strategy on production enhancement - undertaking awareness creation activities down to farmer level
Market Promotion and Product Control Agency (SNNPRS)	- monitors marketing of spices - undertakes awareness creation activities down to farmer level
Agriculture and Rural Development Offices at Woreda level	- engaged in multiplication of long existing spice species (ginger, turmeric, ***kororima***, *Piper capense*) and adaptation of newly introduced ones (cinnamon and cardamom) - consults farmers on production and product quality related matters -monitors the marketing of spices
Bonga Agricultural Research Center	- conducts research on spices (turmeric, ginger and coriander were observed at the center's demonstration site at Gimbo, Kafa).
Kafa Non-timber Forest products Producers and Exporters Association	- promotes sustainable production of high quality spices (and also coffee and honey)
Kafa Forest Coffee Producer Farmers Cooperative Union	- planning to employ tools similar to those currently used to valorize forest coffee ('Fair trade' and 'Organic coffee') for the purpose of valorizing spices
Farm Africa, SOS Sahel, Action Aid Ethiopia	- involved in the task of enhancing production and value of local resources including spices
Ethiopian Home Garden Project	- conducts studies on some spices as part of the process to establish Geographical Indications system in the country

6.4 *Aframomum corrorima*: the most-commercialized spice of Basketo and Kafa

Aframomum corrorima is an important spice-yielding plant of Ethiopia. While both the resource plant and the product are widely known in the country as ***kororima***, Basket people call it ***okasha*** and Kafecho ***oofiyo*** or ***oogiyo***. Names like kororima cardamom, nutmeg cardamom, false cardamom, Ethiopian cardamom and Ethiopian malaguetta pepper are also used when referring to the plant beyond national level.

As presented in the previous section, ***kororima*** is one of the few spices of Basketo and Kafa that is traded beyond the local level; and is also among the top in generating income to the household. It differs from the rest since it has been traded in a longer commercial chain. Therefore, its marketing system is well-established. Its different features are dealt in the following subsections.

6.4.1 Flowering and fruiting pattern

Aframomum corrorima belongs to Zingiberaceae family. Two other species of *Aframomum* also occur in Ethiopia, *A. alboviolaceum* and *A. zambeziacum* (Lock 1997). *A. zambeziacum* is named as ***shet'-oofiyo*** (literally mean monkey ***kororima***) by Kafa people. According to field observations and measurements, the leafy shoots of ***kororima*** grow up to 2.5 meters high. The leafy shoot arises from a soft vegetative bud on the rhizome. The floral bud is situated just above the rhizome on a swollen region of a mature shoot. The peduncle (the stalk of the inflorescence) is 2-7 cm long and that of the mature flower is 10–15 cm.

In Basketo and Kafa, ***kororima*** starts flowering from April-May but the main flowering period is during the months of June to September. Data that relates to flowers and fruits was collected from permanent quadrats laid in gardens of Basketo farmers (Table 36).

Table 36 Data on flower and fruit related aspects of ***kororima*** in quadrats

	Plot					
	1	**2**	**3**	**4**	**5**	**6**
No. of fruits at 1st visit	19	18	50	23	59	47
No. of inflorescences at 1st visit	3	4	4	3	3	4
No. of inflorescences developed during observation period	15	23	8	12	25	16
Maximum no. of flowers per inflorescence	5	5	5	5	6	5
Maximum no. of fruits per inflorescence	3	4	4	3	3	4

Since the observation was started in the second week of August (about three months after the beginning of flowering), a higher number of fruits than inflorescences were recorded in five of the six quadrats. In quadrats that were laid from the margin towards the centre of the ***kororima*** stand, a greater concentration of fruits was observed away from the margin and a higher concentration of flowers at the margins where the rhizome expands.

As observed from the plots, most leafy aerial shoots bear only one inflorescence while a few bear two. A flower opens from a floral bud and weathers away within a span of 2 to 3 days. A kind of tiny insects, that might be the main pollinating agents, roams around the flower. Concerning fruit development, the first trace of fruit becomes evident in 15-20 days; the fruit assumes its normal shape and size in 30-35 days, whereas maturing fruit starts to change into its characteristic brilliant red colour in 40-45 days after the first flower has opened. Aerial shoots die after setting fruit and new ones develop from the rhizome. Fig. 17 shows ***kororima*** plant and fruits**.**

Fig. 17 Plate showing ***kororima*** plant together with maturing and ripe fruits
(Photo: Feleke Woldeyes)

6.4.2 Quantitative features of fruit and seed

Measurements on different features of fruit and seed were made with the intention of making a comparison among ***kororima*** products coming from different localities in Basketo and Kafa areas: ***ye-Basketo kororima***, ***ye-Gelila kororima***, ***ye-Malo kororima***, y***e-Decha kororima*** and ***ye-T'ello kororima*** (Table 37).

Table 37. Quantitative fruit and seed features of ***kororima***

	Basketo category			Kafa category		Sig. dif*
	ye-Basketo kororima	*ye-Gelila kororima*	*ye-Malo kororima*	*ye-Decha kororima*	*ye-T'ello kororima*	
Average number of fruits per kg	162	225	285	223	206	
Average Fruit weight (g)	**6.01**	**4.46**	**3.47**	**4.44**	**4.85**	**1 > 2,3,4,5; 2 > 3; 4 > 3; 5 > 3**
Average Fruit length (cm)	4.6	4.38	4.11	4.43	4.54	
Circumference (cm)	7.66	7.21	6.56	6.82	7.13	
Length-circumference ratio	**0.5995**	**0.6079**	**0.6261**	**0.6499**	**0.6366**	**1 < 3,4,5; 2 < 4,5**
Weight ratio of seeds to fruit wall	**74.45:25.55**	**75.75:24.25**	**72.45: 27.55**	**72.09: 27.91**	**70.45: 29.55**	**1 > 4,5; 2 > 4 ,5**
Average number of seeds per pod	198	216	171	187	197	
Average individual seed weight (g)	0.024	0.019	0.018	0.019	0.018	

* Significantly different (p = <0.05). Traits whose values are given in bold are those on which the ANOVA test was carried out. Numbers in the last column indicate provenances: 1 = Basketo, 2 = Gelila, 3 = Malo, 4 = Decha and 5 = T'ello

As the result in Table 37 shows, ***kororima*** fruit from Basketo is bigger, heavier, rounder,, and with fewer seeds that are also heavier than Kafa's. No pattern is evident from the data to compare the two main categories of provenance except the length-circumference ratio that suggests Basketo group fruits are rounder.

6.4.3 Germination potential

The germination experiment yielded two kinds of results for the two substrata types, filter paper and sand. While ***kororima*** seeds sown on filter papers exhibited germination, those planted in sand failed to do so. First germination was recorded on the 24th day after sowing for surface-sterilized seeds and on the 30th day for untreated seeds (the control). Average proportion of germinated seeds was found to be 22.86 % for treated seeds and 6.58% for control. The proportion of germination exhibited by treated seeds according to provenance was, in decreasing order, 30% for Gelila, 28% for T'ello, 20.3% for Basketo, 18 % for Malo and 18% for Decha (Fig. 18). However, no significance difference is observed (p >0.05) in germination rate of seeds among the five provenances.

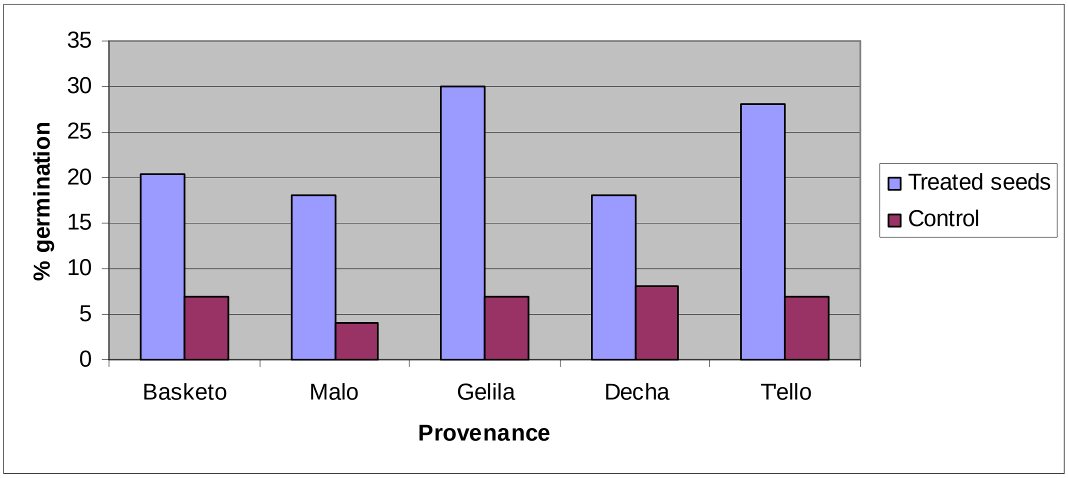


Fig. 18 Germination potential exhibited by ***kororima*** seeds of five provenances

6.4.4 Seed chemical composition

Kororima of different provenances exhibited variation in their essential oil yield. The yield, which is obtained by hydro-distillation of the ground ***kororima*** seeds, ranged from 3.85 to 4.97% (v/w) with Basketo samples giving the highest yield and T'ello's the least (Table 38).

Table 38 Essential oil yield of ***kororima*** seeds of five provenances

Provenance	% essential oil yield (v/w)
Basketo	4.97
Gelila	4.17
Malo	4.32
Decha	4.67
T'ello	3.85

Eighteen chemical compounds were identified after chemical analysis of essential oil from ***kororima*** seeds. The major constituents of the oil were found to be 1,8-cineole (33.7 - 45.8%), sabinene (10.8 - 22.8%), nerolidol (3.9 - 10.1%), β-pinene (5 – 9.1%), limonene (4.7 - 7.4%), geraniol (3.6 - 7.3%), terpinyl acetate (3.1 - 7%) and neryl acetate (2.4 - 5.3%). Basketo samples exhibited the highest percentage for six of these eight major chemical compounds. Table 39 gives the chemical composition of ***kororima*** samples from Basketo and Kafa, whereas Fig. 19 portrays the average chemical composition of ***kororima***.

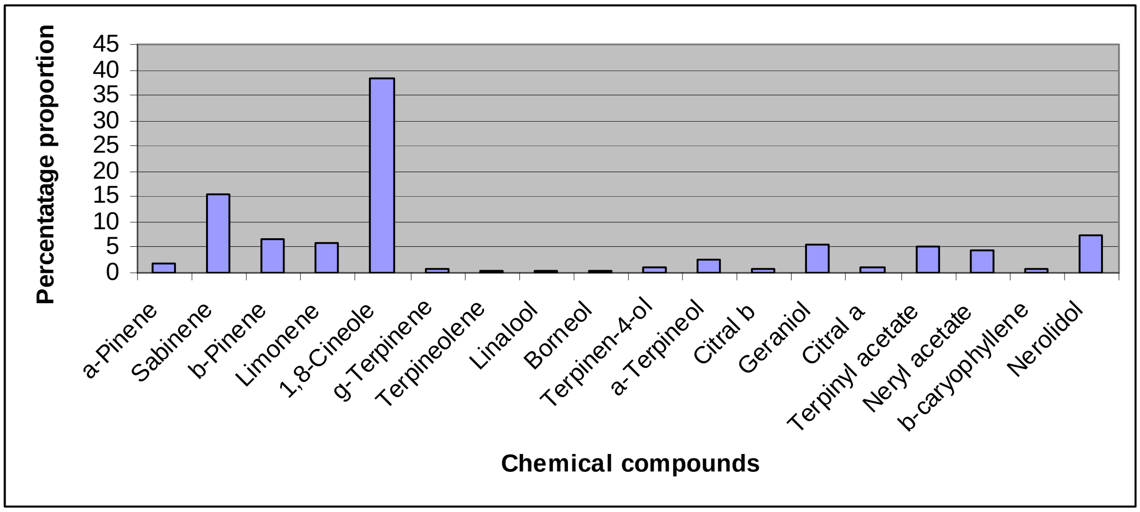


Fig. 19 Average chemical composition of ***kororima*** seed samples from Basketo and Kafa

Table 39 Chemical composition of essential oils extracted from ***kororima*** seed samples from Basketo and Kafa

No.	Compound	Content (%)											
		Basketo										Kafa*	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**T'ello**	**Decha**
1	α-Pinene	1.4	1.4	1.5	2.3	1.4	2.3	1.4	1.6	**2.9**	1.5	1.3	2.6
2	Sabinene	14.4	13.7	13.5	19.3	15.4	21.4	14.8	15.7	**22.8**	14.1	10.8	21.5
3	β-Pinene	5.8	6.7	6.3	7.6	6.2	7.4	6.1	6.7	**9.1**	5.0	5.9	8.4
4	Limonene	5.6	5.2	6.4	5.6	5.7	4.7	**6.6**	6.5	6.3	4.8	6.1	5.2
5	1,8-Cineole	35.8	35.2	35.9	40.8	36.1	43.3	35.3	33.8	40.0	**45.8**	38.0	42.9
6	γ-Terpinene	1.1	**1.3**	**1.3**	0.2	1.0	1.1	1.2	1.2	0.9	0.7	1.1	0.2
7	Terpineolene	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.4	**0.7**	0.4	0.5
8	Linalool	0.2	**0.3**	**0.3**	0.1	0.2	0.2	**0.3**	**0.3**	0.1	0.2	**0.3**	0.2
9	Borneol	**0.5**	**0.5**	0.4	**0.5**	0.4	**0.5**	**0.5**	**0.5**	0.3	0.1	0.4	**0.5**
10	Terpinen-4-ol	1.6	**2.2**	2.1	1.1	1.0	1.0	1.7	1.6	0.5	1.0	1.9	0.9
11	α-Terpineol	3.1	3.2	3.0	2.3	2.9	2.0	**3.3**	3.1	1.9	2.9	3.1	1.9
12	Citral b	**0.7**	0.6	0.5	0.4	0.6	0.4	0.6	0.6	0.3	0.3	0.6	0.3
13	Geraniol	**7.3**	7.2	5.8	4.6	6.1	3.7	6.6	6.6	3.6	3.9	6.3	3.8
14	Citral a	**1.3**	1.2	1.0	0.9	1.2	0.9	1.2	1.2	0.5	**1.3**	1.0	0.7
15	Terpinyl acetate	5.3	5.8	6.1	4.0	5.9	3.3	5.6	5.6	3.2	5.7	**7.0**	3.1
16	Neryl acetate	**5.2**	5.1	**5.2**	3.1	4.7	3.2	4.7	4.6	2.5	4.8	4.9	2.4
17	β-caryophyllene	0.9	0.9	0.7	0.6	**1.1**	0.4	0.9	1.0	0.5	0.3	0.9	0.4
18	Nerolidol	8.5	8.9	8.9	5.8	9.2	4.4	8.2	8.4	3.9	7.2	**9.3**	4.2

NB. Numbers in bold are maximum values for the particular chemical constituent.

* Only 2 samples were collected from Kafa: from a trader at C'iri town (Decha sample) and one at Bonga (T'ello sample). This option was taken because of the distant location of T'ello and difficulty to obtain samples from farmers in Decha at the moment.

6.4.5 Soil properties

Soil analysis results indicated that ***kororima*** in Basketo grows on four textural soil classes: clay, clay loam, sandy clay loam, and loam. Similar textural classes were obtained from analysis of Kafa samples except for sandy clay loam. The independent sample t-test result revealed that ***kororima*** soils of Basketo and Kafa showed significant difference ($p < 0.05$) for five of the twelve parameters tested (Table 40).

Table 40 Result of chemical analysis of ***kororima*** growing soils of Basketo and Kafa
(EC=electrical conductivity, CEC=cation exchange capacity, Bas.Sa=base saturation, T.N= total nitrogen, O.C=organic carbon, C/N=carbon-nitrogen ratio, Av.P=available phosphorus)

Study area	pH·H_2O	EC	Na	K	Ca	Mg	CEC	Bas.Sa	T.N	O.C	C/N	Av.P.
Basketo	6.08	0.07	0.21	0.68	8.41	2.38	22.37	53.30	0.19	1.96	10.70	12.59
Kafa	5.14	0.16	0.18	1.58	12.40	3.60	37.92	39.40	0.40	3.30	8.40	14.57
Sig. dif.*	1>2	1<2					1<2		1<2	1<2		

* Significantly different ($p < 0.05$), 1 = Basketo, 2 = Kafa

6.4.6 Commercial aspect

Dried ***kororima*** fruit is the main product of *Aframomum corrorima* that is marketed. In the past few years, however, whole ***kororima*** seeds and the powdered form are also being sold in urban centres (Fig. 20 shows different types of ***kororima*** products).

Fig. 20 Different types of ***kororima*** products (Photo: Feleke Woldeyes)

Drying ***kororima*** fruits (Fig. 21) is an essential process with a significant bearing on the quality of the product and also in determining the distinctiveness of the two main provenances, i.e. Basketo/Gofa and Kafa. In Basketo, where fruits are sun-dried, remnant parts of the flower at the tip and bottom of the fruit are cut off right after harvest. Fruits are dried by spreading them on the ground, plastic sheet or bamboo carpet under the sun for about 20 to 25 days. In Kafa, where it is more humid, drying is achieved mainly through smoking by hanging strings of fruits over the fire place. The temperature of the house is maintained warm by constantly making fire, and fruits become sufficiently dry in about 30 days. Some drying is also carried out in stores of bigger merchants with the aim of achieving uniform drying. Upon drying, ***kororima*** fruits become flask-shaped, the wall turns fibrous and strong exhibiting irregular ribs and furrows due to shrinkage, and assumes brown to grey-brown colour (in case of Basketo) and shiny black (in case of Kafa).

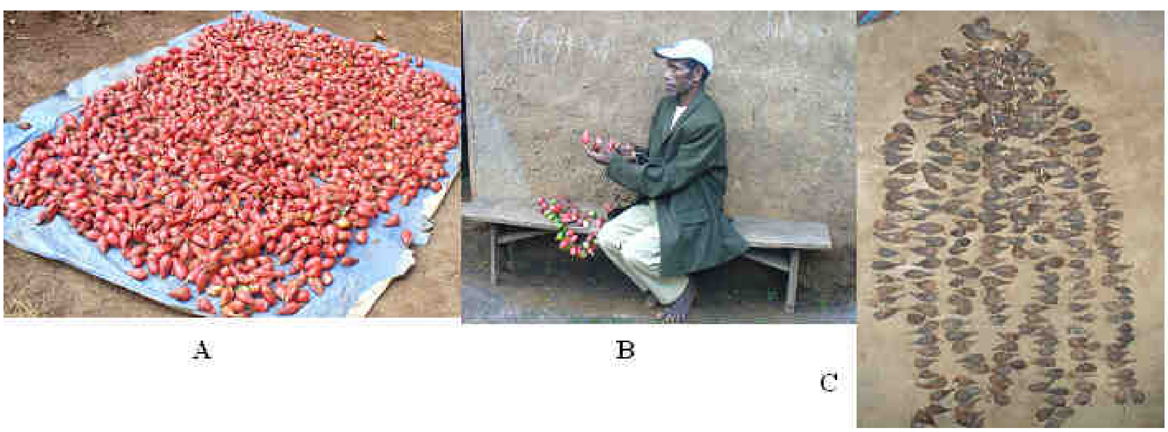


Fig. 21 Drying process of ***kororima***: sun drying in Basketo (A); making strings of the fruits for smoke drying (B); and strings of smoke-dried ***kororima*** in Kafa (C) (Photo: Feleke Woldeyes)

Dry fruits are marketed starting from the local all along the chain up to the national level. The market is organized in Basketo/Gofa and Kafa in a more or less similar pattern. Farmers sell ***kororima***: at the farm gate or the road side, on market days, to ***cherchari*** (small collector from town) or ***ye-gebere negade*** (farmer trader); at the market place to ***negade*** (smaller buyer), ***jimla negade*** (bigger buyer) or ***shemachoch*** (consumers). Small collectors and smaller buyers sell the product to bigger buyers who transport the product to the national market (Addis Ababa) and other destinations. Bigger collectors in towns (Laska, the capital of Basketo and Bonga, the capital of Kafa) are few in number, not exceeding five. Unlike Kafa, where vendors sell ***kororima*** to consumers, the product is not retailed in the markets of Basketo except some seasonal selling of small amounts of fresh or dried fruits by women.

On national market, Merkato of Addis Ababa, ***kororima*** is recognized by two major provenance types: ***ye-Gofa/Basketo kororima*** and ***ye-Kafa kororima***. These are products arriving at the national market via two routes, i.e. Shashemene and Jimma, constituting two separate commercial chains. However, at production area level more provenance types are recognized for there are additional producing areas other than Basketo Special Woreda and Woredas of Kafa Zone (Decha, T'ello and Gimbo). These include Malo and Kamba Woredas of Gamo Gofa Zone, Gelila and Gazer Woredas of South Omo Zone, and Bench-Maji Zone. Provenance names change along the commercial chains from areas of production to the national marker as indicated in Tables 41 and 42.

Table 41 Provenances and name changes in the ***ye-Gofa kororima*** chain

<table>
<tr><th>Mar-ket</th><th>Laska</th><th colspan="2">Bulki & Sawla</th><th>Soddo & A\Minch</th><th>Shashemene & Awassa</th><th>Addis Ababa</th><th colspan="2">National</th><th>International</th></tr>
<tr><td rowspan="7">Provenance</td><td>ye-Basketo kororima</td><td>ye -Basketo kororima</td><td rowspan="3">Ye - Basketo kororima</td><td rowspan="4">ye -Gofa kororima</td><td rowspan="5">ye -Gofa kororima</td><td rowspan="5">ye -Gofa kororima</td><td rowspan="5">ye -Gofa kororima</td><td rowspan="7">ye -Addis kororima</td><td rowspan="7">Korarima
Kororima cardamom
Nutmeg cardamom
False cardamom
Ethiopian cardamom
Ethiopian malaguetta</td></tr>
<tr><td>ye -Malo kororima</td><td>ye-Malo kororima</td></tr>
<tr><td>ye -Gelila kororima</td><td>ye -Gelila kororima</td></tr>
<tr><td></td><td colspan="2">ye -Gazer kororima</td></tr>
<tr><td colspan="3"></td><td>ye -Kamba Kororima</td></tr>
<tr><td colspan="5"></td><td>ye –Bonga/ Kafa kororima</td><td rowspan="2">ye -Kafa kororima</td></tr>
<tr><td colspan="5"></td><td>ye -Bench-Maji kororima</td></tr>
</table>

Table 42 Provenances and name changes in the ***ye-Kafa kororima*** chain

<table>
<tr><th>Mar-ket</th><th>Bonga</th><th>Jimma</th><th colspan="2">Addis Ababa</th><th colspan="2">National</th><th>International</th></tr>
<tr><td rowspan="5">Provenance</td><td>ye -Telo/ Gaballa kororima</td><td rowspan="3">ye-Bonga kororima</td><td rowspan="3">ye-Bonga/ Kafa kororima</td><td rowspan="4">ye-Jimma kororima</td><td rowspan="4">Ye-Kafa kororima</td><td rowspan="5">ye-Addis kororima</td><td rowspan="5">Korarima
kororima cardamom
Nutmeg cardamom
False cardamom
Ethiopian cardamom
Ethiopian malaguetta</td></tr>
<tr><td>ye-Decha kororima</td></tr>
<tr><td>ye-Gimbo kororima</td></tr>
<tr><td></td><td>ye-Bench-Maji kororima</td><td>ye-Bench-Maji kororima</td></tr>
<tr><td></td><td></td><td colspan="2">ye-Gofa kororima</td><td>ye-Gofa kororima</td></tr>
</table>

In Basketo, bigger buyers buy ***kororima*** coming from Basketo K'ebeles and also from Gelila and Malo Woredas. ***Kororima*** from Laska is supplied to different markets, the main destination being Addis Ababa. Other areas where the product is sold include Soddo, Shashamane, Hawassa, and Nazreth (Adama). ***Kororima*** from Gazer and Kamba join Basketo/Gofa product along the chain. In Addis, the product is sold under the name ***ye-Gofa/Basketo kororima*** (the name ***ye-Gofa/Basketo kororima*** is used because Basketo was under Gofa province together with Gelila and Malo in the past). In Kafa, on the other hand, ***kororima*** is concentrated by traders in Woreda centers of that produce the product and is then sold to bigger buyers in Bonga. Kafa ***kororima*** is supplied to Jimma and Addis Ababa markets from where it is redistributed to different places. In Addis, where Kafa product is mixed with that coming from Bench-Maji, the name ***ye-jimma kororima*** is also used. Fig. 22 shows market centers along the commercial chain of the two main provenance types.

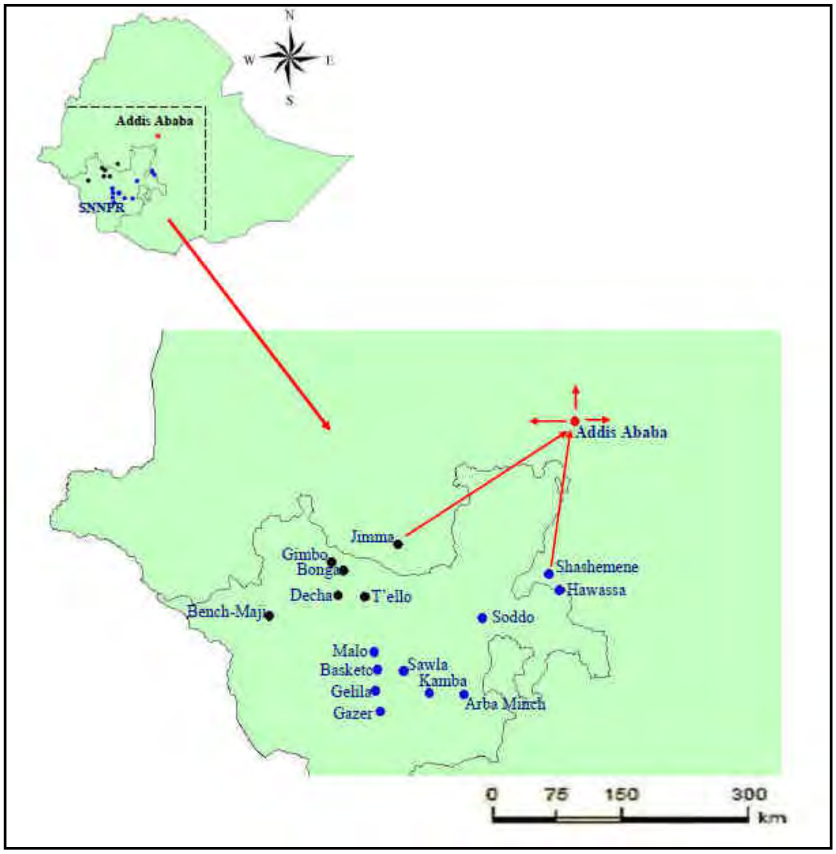


Fig. 22 Market centres in the commercial chain of ***kororima***

The biggest buyers in Addis are ***balemegazen negade*** (store-owning big traders). They are situated at Merkato, the major market place in the city, and they sell the product to: retailers in Merkato and those coming from markets in other locations in the capital, to retailers coming from different towns in the country, and to ***baltena*** shop owners (***baltena*** shops are shops specialized in the trading of spices, condiments and related products). Merkato retailers sell whole fruits and rarely extracted seeds to consumers and cooperatives who own smaller ***baltena*** shops. ***Baltena*** shops sell the product in transformed form - rarely seeds but mainly powder either in pure form or added to different products (***berbere*** - powdered long chilli pepper, ***besso*** - mash made of barley, ***shiro*** - mash made of peas, etc.). Customers who buy these products are local consumers, supermarkets and Ethiopians living abroad. The ***baltena*** are well-organized and growing enterprises, i.e. they have headquarters, production center, branch shops and agents in other towns.

According to information obtained from the Agricultural Marketing and Inputs Sector (Ministry of Agriculture and Rural Development), ***kororima*** is exported to different countries: Yemen, Saudi Arabia, Israel and USA. ***Baltena*** shops have also started to export the product particularly to countries such as USA and countries of the Middle East where a sizeable community of Ethiopians lives. Fig. 23 shows the flow of ***kororima*** along the market chain and the actors involved.

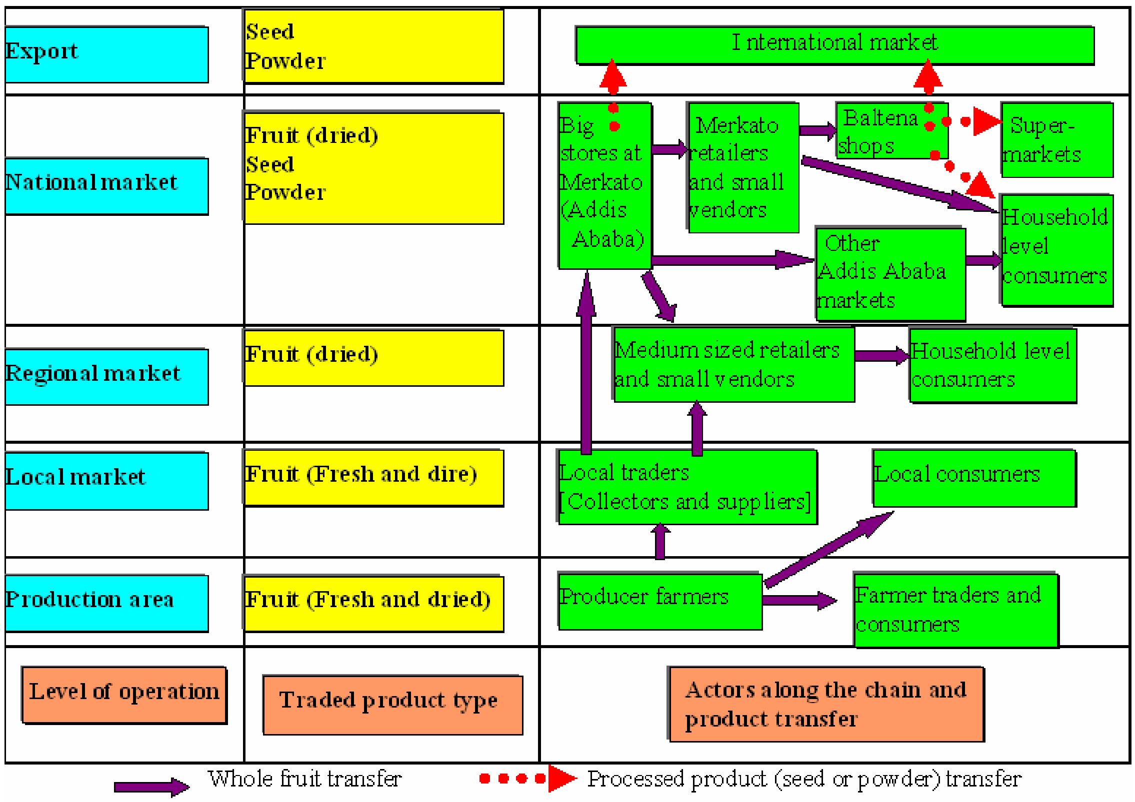


Fig. 23 Diagrammatic representation of the commercial chain of ***kororima***

Product quality is an aspect which is emphasized by all stakeholders along the chain. Customarily, product quality is checked by visual, hand and teeth inspection, whereas quality criteria employed include size, extent of drying, color, appearance, firmness and weight of fruit; quantity, size and aroma of seed; and powder aroma (Table 43). Based on these traits, products of different provenances - particularly of the two major categories (i.e. Gofa/Basketo and Kafa) – are easily recognized as distinctive products. The Addis Ababa traders, for example, easily distinguish the pale brown and round-shaped

kororima of Gofa/Basketo from that of Kafa which is shiny black in color and bears a hole at the tip of the fruit.

Table 43 Distinctive characteristics of the two main types of ***kororima***, as assessed by traders

Plant part	Criteria	***ye-Basketo kororima***	***ye-Kafa kororima***
Whole dried fruit	Colour and appearance	♦ pale brown, ♦ "circumcised" (appendages removed)	♦ shiny black, with smoky smell ♦ with a hole at the tip of the fruit ♦ with minute appendages remaining
	Size and shape	♦ bigger, spherical with a slight depression at the base	♦ smaller, elongated
	Weight	♦ heavier	♦ lighter
	Firmness	♦ firm	♦ resistant fruit envelope, but easy to hull to extract the seeds
Seeds	Colour and aroma	♦ brown and shiny ♦ strong aroma	♦ black and dull ♦ mild aroma

Market surveys conducted at different levels and discussions held with traders revealed that ***kororima*** of the two main provenance types are recognized to be of different qualities and hence differ in price. Accordingly, Gofa/Basketo product is rated as first in terms of quality and that of Kafa as second. On this basis, Gofa/Basketo product is sold consistently at higher prices than Kafa's. In 2007, for example, while Gofa/Basketo ***kororima*** was sold at 20-25 Birr per kg in Addis Ababa, Kafa type was sold at 17–20 Birr per kg (at a 20% lower price). The difference in price of the two main provenance types is well-recognized by traders even at the lowest level in the market chain. Nevertheless, one can find ***kororima*** of different qualities that are sold at various prices. This is because there is some mixing of ***kororima*** of the two main provenance groups by the last retailers.

According to information collected through discussions with traders, the price of ***kororima*** has evolved over the decades. In Basketo, for instance, one hundred pairs of fruit (an amount taken as equivalent to one kg) used to be sold for ten cents in the 1960s. The price rose to 3-5 Birr per kg in 1970s and 1980s, whereas it reached 10 Birr per kg in 1990s. The highest price was recorded in the early 2000s during which a kg of the product was sold at 60 Birr. The dramatic rise in price was mentioned to be associated with increased demand for the product by foreign markets. Change in price was observed even within the duration of this study as market survey results indicated. In 2008, for example, one kg of ***kororima*** fruit was sold at 20-25 Birr at Basketo and 30-35 Birr at Addis Ababa market. Currently (2010), however, the same amount is worth 60 Birr in Addis.

An additional price-related aspect which is noted through market surveys is that the price of ***kororima*** significantly increases when value is added to the product. For instance, while a kg of seed of Basketo ***kororima*** is sold at 115 Birr currently (2010) in Addis Ababa market, a similar quantity in powder form is sold at 160 Birr (a 39% price increase) .

As the result of a market survey conducted in 2010 showed, ***kororima*** is among the most expensive spices locally produced. It ranked only second to rue in terms of price at Merkato (Fig. 24). However, as explained by traders, prices are highly variable depending on the season, i.e. prices are stable during the main ***kororima*** supply period (December to April) to the national market and increase afterwards.

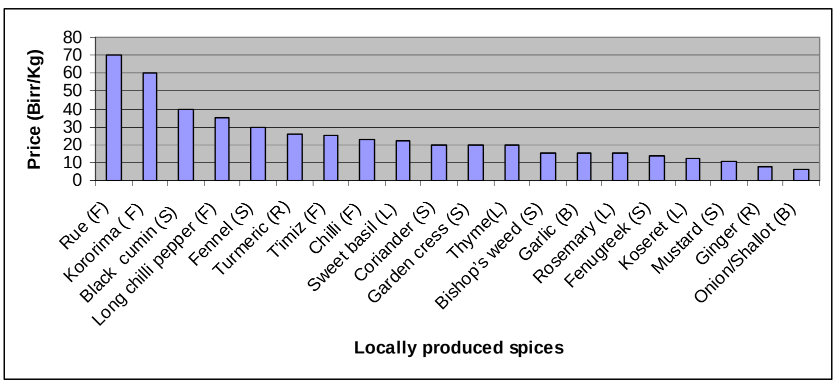


Fig. 24 Price (Birr/kg) of locally produced spices at the main market of Addis Ababa
(B= Bulb, F = Fruit, L= Leaf, R= Rhizome, S = Seed)

6.5 Biological diversity

6.5.1 Floristic composition

The floristic survey on homegardens and associated land use systems (i.e. bamboo lands, woodlands developed from abandoned farmlands and sacred forests in Basketo; and bamboo lands, grazing lands and bushlands, and the managed forest in Kafa) in the two study areas yielded a total of 280 plant species (Appendix 3). Plant species recorded from Basketo accounted for 73.93% (207) while those recorded from Kafa amounted to 76.07% (213) of total species recorded. In both Basketo and Kafa, the number of species recorded from homegardens exceeded that from other land use systems; i.e. the ratio of species recorded from homegardens to other land use systems is 149:104 in Basketo whereas it is 192:92 in Kafa.

The plant species recorded from the two areas are distributed into 227 genera and 84 families. While species from homegardens of Basketo and associated land use systems fell into 67 families and 170 genera, species of Kafa are distributed into 75 families and 183 genera (Table 44).

Table 44 Number of plant families, genera, and species recorded from managed landscapes in Basketo and Kafa

	Homegardens		Other land-use systems		Total
	Basketo	Kafa	Basketo	Kafa	
No. of Families	58	71	43	47	84
No. of Genera	127	165	91	87	227
No. of Species	149	192	104	92	280
Family:Genera	0.46	0.43	0.49	0.54	0.37
Genera:Species	0.85	0.86	0.88	0.95	0.81

The species richest family of both Basketo, Kafa and the combined flora is Fabaceae contributing 23, 21 and 28 species respectively. Families with more than five species (Table 45) contribute 48% (in case of Basketo), 45.4% (in case of Kafa) and 63.4% (at the two areas level) species to total species composition.

Table 45 Plant families with more than five species in Basketo and Kafa

	Basketo		Kafa		Combined	
	Family	No. of spp.	Family	No. of spp.	Family	No. of spp.
1	Fabaceae	23	Fabaceae	21	Fabaceae	28
2	Asteraceae	15	Asteraceae	15	Asteraceae	20
3	Lamiaceae	12	Solanaceae	13	Lamiaceae	15
4	Rubiaceae	10	Lamiaceae	10	Solanaceae	14
5	Euphorbiaceae	9	Poaceae	9	Rubiaceae	13
6	Rutaceae	9	Euphorbiaceae	8	Euphorbiaceae	10
7	Solanaceae	9	Rubiaceae	8	Poaceae	9
8	Poaceae	7	Rutaceae	8	Rutaceae	9
9	Celastraceae	6	Moraceae	6	Celastraceae	7
10					Combretaceae	6
11					Moraceae	6

6.5.2 Plant diversity

At the two study areas level, average species richness of homegardens was found to be 46.22 with the minimum being 21 and maximum 72. However, Kafa homegardens exhibited higher species richness (51.43) than average richness of Basketo gardens (40.88) (Fig. 25). Difference is also observed between homegardens of Basketo and Kafa in the magnitude of beta diversity, i.e. the change in species composition among sampling units in the areas. Accordingly, while homegardens of Kafa achieved a beta diversity value of 2.75, the value recorded from Basketo gardens is 2.61.

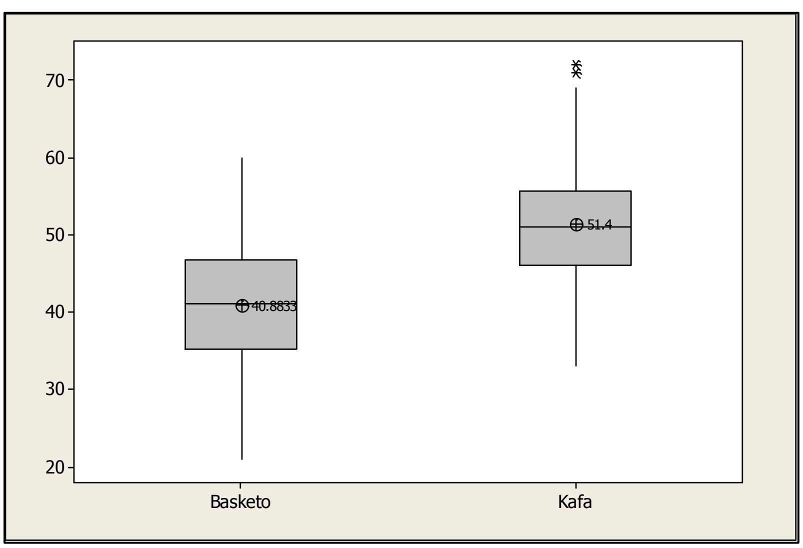


Fig. 25 Box plot showing species richness of Basketo and Kafa homegardens

Species richness of garden sections (elevated side, backyard, lower sides) ranged from 2 to 17 in Basketo with the backyard (***alwumppa***) exhibiting the highest mean species richness (7.52). In Kafa garden sections, richness varied from 2 to 21 and in this case also the highest mean richness (10.95) was recorded from the backyard (***daaddo***). Similarly, disparity was observed in Shannon's Index value among homegarden sections. While the highest index value is attained by the vegetation of the first part of the lower side (***alts'ana*** 1) in Basketo gardens, it is the backyard (***daaddo***) of Kafa gardens that exhibited the highest Shannon's Index value. Table 46 and Fig. 26 summarize species richness and diversity of plant species in homegardens of Basketo and Kafa.

Table 46 Species richness and plant diversity in homegarden sections of Basketo and Kafa (lower side 1, 2, and 3 represent close to house, middle and margin parts of the lower side garden section respectively)

	Species richness		Shannon's Index		Evenness	
	Basketo	Kafa	Basketo	Kafa	Basketo	Kafa
Elevated side (*aldira*/*dambbak'ach*)	6.72	8.28	1.33	1.35	0.63	0.52
Backyard (*alwumppa*/ *daaddo*)	**7.52**	**10.95**	1.28	**1.50**	0.54	0.45
Lower side 1 (*alts'ana* 1/ *deshk'ach* 1)	7.10	7.51	**1.43**	1.26	**0.66**	0.55
Lower side 2 (*alts'ana* 2/ *deshk'ach* 2)	5.88	6.61	1.22	1.25	0.65	**0.59**
Lower side 3 (*alts'ana* 3/ *deshk'ach* 3)	5.33	6.73	1.08	1.22	0.63	0.57
Sig. dif*			1 > 5; 3 > 4, 5	2 > 3, 4, 5		

* Significant difference ($p < 0.05$); 1=Elevated side, 2=Backyard, 3=Lower side 1, 4=Lower side 2, 5=Lower side 3

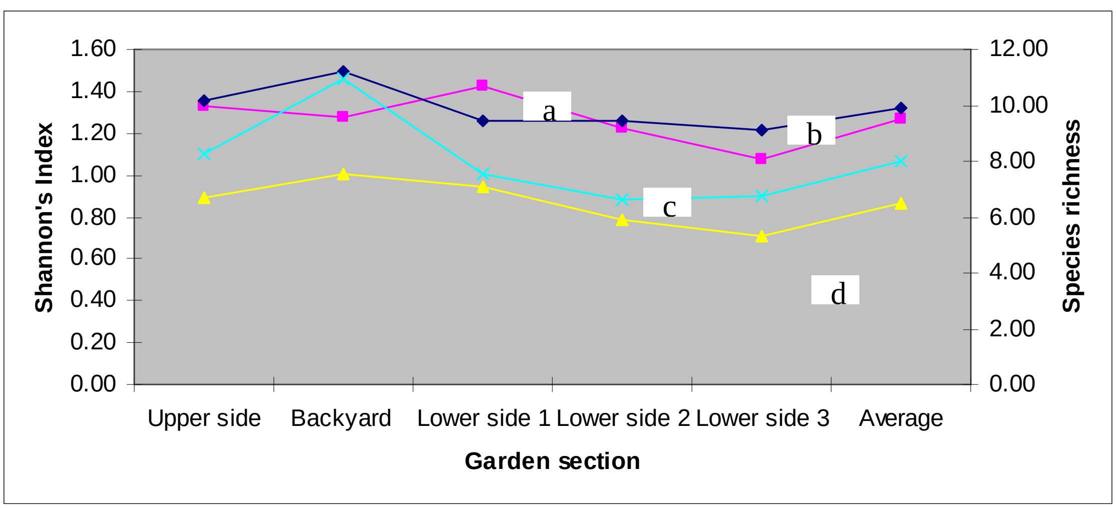


Fig. 26 Shannon's index values (a=Basketo, b=Kafa) and species richness (c=Kafa, d=Basketo) of Basketo and Kafa gardens

6.5.3 Floristic similarity

Sorensen's similarity coefficient is computed to assess the floristic similarity among the different land use systems from the two areas, i.e. homegardens and associated land use systems of the two study sites. The similarity coefficient is found to lie between 0.29 and 0.69 (Table 47) for the compared pairs. The highest floristic similarity is observed between the two homegarden systems while the lowest value is that between the homegardens of Basketo and other land use systmes of Kafa

Table 47 Similarity in species composition between different land use systems of Basketo and Kafa as expressed in terms of Sorensen's similarity coefficient (HG = Homegarden, OLUS = Other land use system)

		Basketo		Kafa	
		HG	OLUS	HG	OLUS
Basketo	HG	-	0.36	0.69	0.29
	OLUS		-	0.33	0.50
Kafa	HG			-	0.51
	OLUS				-

Through a cover-abundance estimation exercise, it was found that 9 species of Basketo and 10 species of Kafa homegardens attained a mean cover abundance value ≥ 1 (Table 48). In both cases, *Ensete ventricosum* is the species with the highest cover-abundance value whereas *Coffea arabica* ranks second. This shows dominance of these two species in the homegarden systems. Furthermore, of the species with cover-abundance value greater than 1, seven species are common to homegardens of the two areas.

Table 48 Homegarden species with cover abundance value greater than one

	Basketo		Kafa	
	Plant species	C-A value	Plant species	C-A value
1	*Ensete ventricosum*	5.2	*Ensete ventricosum*	4.7
2	*Coffea arabica*	4.5	*Coffea arabica*	3.7
3	*Zea mays*	3.8	*Xanthosoma saggitifolium*	2.5
4	*Brassica carinata*	1.9	*Brassica carinata*	2.2
5	*Colocasia esculenta*	1.6	*Zea mays*	2.1
6	*Aframomum corrorima*	1.3	*Brassica oleracea*	2
7	*Capsicum frutescens*	1	*Colocasia esculenta*	1.4
8	*Phaseolus lunatus*	1	*Capsicum annuum*	1.2
9	*Xanthosoma saggitifolium*	1	*Phaseolus lunatus*	1.1
10			*Milletia ferruginea*	1.1

7. DISCUSSION

7.1 Emic categorization

Categorization of the landscape by the local peoples of Basketo and Kafa is basically similar as seen from the hierarchical pattern they exhibit. Following schemes proposed to explain local resource classifications (Berlin 1992, Holman 2005), four hierarchical levels of landscape classification (levels 0, 1, 2 and 3 from top to bottom) are recognized in the most divide branch and only two levels in the least divided branch (Figs. 27 and 28). While level 0 is the landscape, lower categories are either named or unnamed.

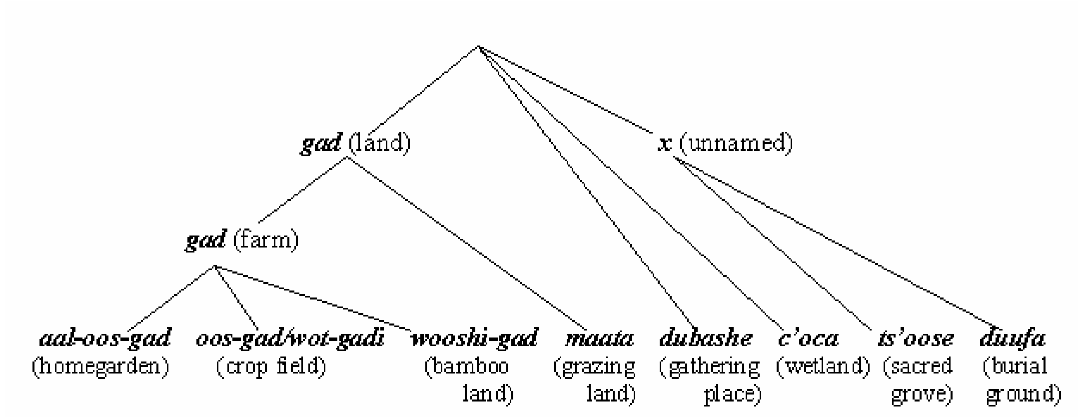


Fig. 27 Schematic representation of emic landscape categorization by the Basket people

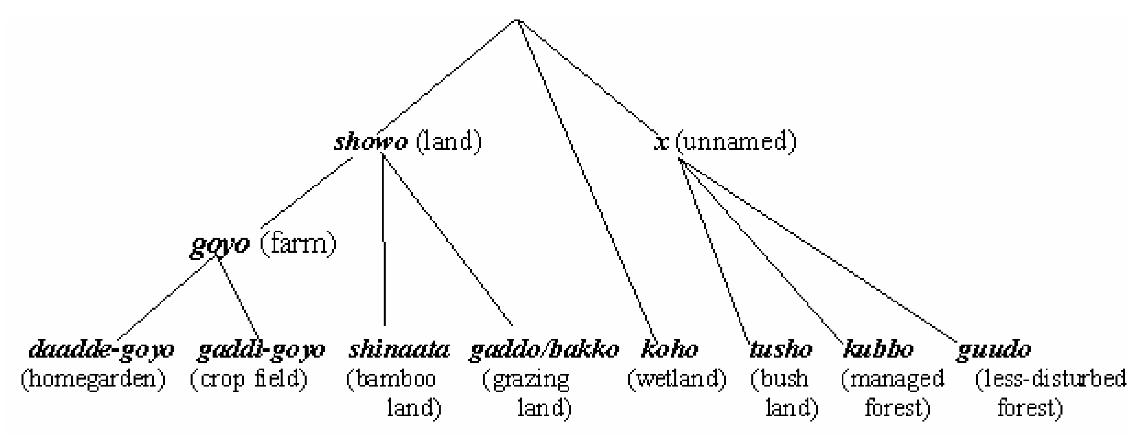


Fig. 28 Schematic representation of emic landscape categorization by the Kafecho people

In both Basketo and Kafa, all categories at the basic level (bottommost categories) and the remaining two categories of the most-divided branch are named. On the other hand, the category in the less-divided branch takes the form of a covert category, i.e. it is recognized but not named. In the Basketo system, the two middle level categories are identically labeled as '***gad***' and this shows the application of polysemous terms, i.e. terms that have two or more senses. The recognition of covert categories and existence of polysemous terms shows compliance of the local classification system with the principles of ethnobiological classification (Berlin 1992)

Analysis of the landscape classification of the two systems (Figs. 19 and 20) reveals that the purpose for which land is used, ownership of land, habitat and vegetation types are criteria used to define a category. Accordingly, in Basketo, the cultivated land units constitute the categories ***gad*** (farm); and with the inclusion of the category ***maata*** (grazing land) the higher level category, ***gad*** (land), is formed. Though an identical term (***gad***) is used to label this higher level category, the way it is used this time indirectly indicates ownership (since it is to mean personal land). Similarly, the Kafecho category ***goyo*** (farm) consists of cultivated land units; and in combination with the categories ***gaddo/bakko*** (grazing land) and ***shinaata*** (bamboo land), it forms the higher level category ***showo*** (land). Here again, ownership is implied through the use of the term ***showo***.

In both systems of categorization, the unnamed categories are formed by either lands covered by forest vegetation (***kubbo*** and ***guudo*** in Kafa) or forest-looking habitats of spontaneously growing plants (***ts'oose*** and ***duufa*** in Basketo). The gathering site (***dubashe***) of Basketo and wetland categories of both areas are affiliated to none of the lower categories. An interesting feature displayed by names of constituent categories that form the categories ***gad*** (in Basketo) and ***goyo*** (in Kafa) is that they are labeled by secondary names which are semantically binary expressions and which allow the prediction of the immediate higher category.

The use-based categorization of plants by Basket and Kafecho peoples corresponds to what is labeled as special purpose classification that involves delimiting taxa by such criteria as plant use or humoral property, i.e. properties other than use (Martin 1995, Cotton 1996). The identified nine categories in the classification of each society (Tables 5 and 10) show a high degree of correspondence (Table 49). This resemblance may be attributed to socio-cultural similarity of the two peoples and also proximity of the two areas.

Table 49 Correspondence between use-based categories of Basketo and Kafa

	Basket categories	Kafecho categories	English equivalent
1	***Fiishi***	***Maayo***	Food
2	***Sawubaz***	***Shawujoch***	Spice
3	***Gaalla***	***Atto***	Medicine
4	***K'oysisandabo***	***Gawuchoch***	Ornamental/Beautifying agent
5	***Sawk'sandabo***	***C'inno***	Perfume
6	***Kaashabo-shiishire***	***K'oolle-deejjo (Baare-k'oco)***	Thanksgiving offering
7	***Inni-mahazinddo***	***Nuusho-kichoch***	Thirst-quenching/Stimulant/Beverage
8	***Keets'andabo-wogintsine***	***Kechi-haggoch***	Construction material
9	***Mella***	***Barooch***	Others

An additional similarity relates to the comparable proportion of plants distributed in one category of one system to that of the other (Tables 6 and 11). The categories 'food', 'spice', 'medicine' and 'construction' are groups with the highest number of local plant *generics* with the ratio of items assigned to each category of Basketo to Kafa being 48:46, 24:24. 32:44, and 29:47 respectively. The number of local *generics* falling under the Kafa categories 'medicine' and 'construction' is relatively higher than those of Basketo and this is explainable in terms of the nature of Kafa homegardens. Since they largely mimic the surrounding forest vegetation, homegardens of Kafa present the household with resources that can be used for more diverse purposes including medicine and construction.

An additional point worth noting in connection to use-based categorization of the Basket and Kafecho peoples is the obviousness of the categories and their naming. The reason why some categories (food, medicine and spice) are easily recognized and named by almost every member of the community outright is associated with the importance given to the component plants of the group. The fact that the category name ***gaalla*/*atto*** (medicine) is attached to names of some of the plants used for the purpose (such as ***K'aac'gaalla Tamagaalla*** in Basketo and ***Addeche-atto, Amichi-attoo*** in Kafa) is a clear indication of the emphasis.

Hierarchical plant classification and naming of local taxa, in both sites is found to comply with the general principles of ethnobiological classification (Berlin 1992). Five hierarchical levels (Tables 7 and 12), out of the six (*kingdom, lifeform, intermediate, generic, specific, and varietal*) proposed by Berlin, are identified in this study. Moreover, the identification of categories of different levels supports the claim that universal features exist among ethnobiological classification systems (Atran 1985, Berlin 1992, Cotton 1996, Hiepko 2006). Again, the observed depth of the classification systems is in agreement with the idea that small-scale agricultural societies have a well-developed ethnotaxonomic system (Brown 1985, Berlin 1992). This is evidenced by the observed high number of local *specific* and *varietal* taxa in the two systems (Appendix 2a and 2b). Food crops (yam, ***enset***, sorghum, taro and beans in case of Basketo) and (***enset***, sorghum**,** beans, yam and cabbages in Kafa) are generics that contain local *specifics* that range in number from 5 to 70. This shows the role of subsistence mode (agriculture in the present case) in the development of elaborated local taxonomic system.

The congruence observed between the principles on naming proposed by Berlin (1992) and the way local taxa are labeled by the Basket and Kafecho peoples is another dimension of interest. While most local *generics* are labeled by simple primary names (semantically unitary expression), some bear complex primary names (semantically binary expression). In addition, some local *specifics* are labeled by primary names while others get secondary names. All recorded local *varietal* taxa are labeled with secondary names. Some complex primary names of generics are formed on the basis of analogy with another generic name that labels a conceptually related taxon. Basketo names ***bollibuy*** (***bolli*** = aerial/above ground, ***buy*** = yam) that labels *Dioscorea bulbifera* and ***bunibolla*** (***buna*** = coffee, ***bolla*** = in-law) that refers to *Galiniera saxifraga* (syn: *G. coffeoides*); and Kafa names ***michi-ooc'ino*** (***michi*** = of tree, ***ooc'ino*** = yam) that applies to *Manihot esculenta* are examples. Similarly, there exist primary names that are associated with plant quality and these include those that indicate medicinal property, ***gaalla*** in Basket and ***atto*** in Kafinoono languages. Examples of such Basketo plant names are ***k'aac'gaalla*** (***k'aac*** = ant) and ***tamagaalla*** (***tama*** = fire) that refer to *Chenopodium procerum* and *Aloe macrocarpa* which are used as ant repellant and for treating skin burn, respectively. The name ***dinger-atto*** (***dinger*** = snake) which is used to label the plant (*Senna septemtrionalis*) thought to be a cure against snake bite, and the name ***addeche-atto*** of *Verbena officinalis* which is used for treating stomach ailment are examples that can be cited from Kafa.

The labeling of *specifics* by primary names appears to be associated with the cultural importance of the below *generic* level taxa concerned, but not because of prototypicity (i.e. regarding a particular *specific* as a prototype of the *generic* to which it belongs). The ground for this judgment is that almost all of the *specifics* with primary names belong to *generics* of high cultural significance (***enset,*** yam, sorghum, taro) in both Basketo and Kafa. Prototypicity is considered not to be the cause for labeling specifics with primary names since polysemous names (identical names shared by generic and specifics) are not encountered. All recorded local *varietal* taxa are named with secondary (two part) names as one may expect, and one of the components of the names is frequently found to be descriptive. In the Basketo *varietal* of ***enset***, ***kaati-buukuma***, for instance, the term ***kaati*** (king) is attached to indicate the high quality of the tuber. In case of Kafa, colors (***c'eelle*** = red, ***nac'e*** = white, **aaƛ** = black) are used as modifiers referring to the color of parts of the plant. In some cases, source areas (i.e. the putative area from where the plant was introduced first) are used. More synonyms (i.e. more than one name applying to *generics*) are encountered in Kafa than Basketo, and this must be related to the larger area inhabited by the community group. Application of a name to more than one local *generic* is extremely rare and this can be taken as an indicator of the high quality of the classification systems.

Analysis of the correspondence between the recorded local *generics* and scientific species revealed that there exists a considerable matching between the two categories (Tables 9 and 14). Accordingly, 95.27% of Basketo *generics* showed one-to-one correspondence to scientific species, 2.7% were over differentiated, and 2.03% underdifferentiated. Similarly, 92.43% of Kafa *generics* exhibited one-to-one correspondence, 3.78% were overdifferentiated while the rest 3.78% were under differentiated. Underdifferentiation took two forms, i.e. lumping of species and lumping of genera into a single generic. When compared to a similar analysis made on Tzeltal (Mexico) *generics* by Berlin (1973), the proportion of one-to-one correspondence observed in this study is found to be significantly higher, whereas the proportion of underdifferentiation is lower and that of overdifferentiated is comparable.

Although the local systems of classification of the two peoples resembled each other in many respects such as correspondence of special purpose categories, hierarchical organization of taxa, compliance to the general principle of ethnobiological nomenclature, and high rate of local sub-*generic* taxa, differences are also noticed in connection to the taxonomic skills of the two people, i.e. with respect to identifying plants. While the Kafecho of different age groups correctly name plants without difficulty, the Basket sometimes confuse names as encountered in the case of *Vernonia hymenolepis* and *V. auriculifera*. This is most likely attributed to loosening interaction with the plant world in Basketo as the natural vegetation cover has extremely been diminished.

7.2 Nature and role of homegardens as landscape component

In both Basketo and Kafa, the homegarden system forms a central element of the landscape around which the remaining components are organized. Homegardens are the most numerous operational unit, always owned by individual households, and the least prone to conversion into other systems. This last feature of homegardens is evident from the continuing establishment of homegardens on crop fields (in both areas) and forested lands (in Kafa) but not vice versa. In addition, the homegarden area is shared with sons when the father is alive, or handed down to the eldest son when both parents pass away. The inheritor has a responsibility of maintaining the homegarden since this symbolizes the continuity of the family. Therefore, homegardens have a status of heritage in both communities, and this makes their conversion into other land use systems less likely.

Acquiring a homegarden is the most basic requirement that must be met during the transition from boyhood into a full-fledged community membership. This implies that other land use systems are of secondary importance, and therefore their very existence (in most cases) is linked to the homegarden. It is through this interlink that homegardens play a pivotal role in shaping the traditional landscape of Kafa and Basketo.

The organization of homegardens in Basketo and Kafa is largely influenced by topographic features, particularly slope. This is evident from the way gardens are divided into recognized sections and the way in which they are named. The nature of land surface determines which section a part of a plot would become when a garden is established. Land feature-garden section relation is a well-recognized matter by both communities, and the naming of the sections confirms this fact. In both Basketo and Kafa, garden section names are formulated in the manner that indicates elevation and position or direction relative to the house. The Basket word ***aldira*** that refers to the elevated garden section, for example, is a combination of two terms ***aal*** (house) and ***dira*** (higher portion of a sloppy land). Similarly, in the Kafinoono name ***dambbak'ach*** that consists of two combined words, ***dambbo*** refers to higher elevation while ***k'ach*** (-wards/towards) indicates direction**.** Therefore, as implied by names of garden parts, land feature is the prime factor considered when designing the homegarden.

Basketo and Kafa gardens, despite their resemblance in general plan and many other aspects, exhibit some differences. For instance, while garden sections are clearly and consistently recognized by Basketo farmers, two of the garden sections (elevated side and lower side) are confused by some respondents in Kafa. The fact that this is observed in households with relatively flat land again suggests the importance of land feature in recognizing garden sections.

The other aspect of homegardens of the two areas worth comparing is their plant composition. In terms of habit of homegarden plants, the pattern of proportional contribution is: Herbs > Tree > Shrubs > Climbers in both areas (Table 17, Appendices 4a and 4b). A closely similar result is reported from a study in homegardens of Bangladesh (Ali 2005) and forests of Bonga, Ethiopia (Feyera Senbeta 2006) except that a higher number of climbers than shrubs is reported in both cases. The dominance of the herbaceous component is the result of the farmers' deliberate strategy of concentrating food producing plants. When the difference between numbers of species in each category of habit is considered, Kafa homegardens contained 18 tree, 6 shrub, 12 herbaceous and 7 climber species in excess to that of Basketo. The excess, when put in percentage, is 40.91%, 15.79%, 19.35% and 140.00% in the given order of habit. The difference is significantly large (40.91%) in the case of trees and very high (140.00%) for climbers.

The observed difference can primarily be explained by the cultivation status (i.e. cultivated versus spontaneous) of homegarden plants (Table 18). In Kafa, about half (46.88%) of the species which spontaneously grow in the gardens are tolerated. This is significantly higher when compared to the 22.15% spontaneous growth in Basketo. Considering plants unique to Kafa (i.e. not shared with Basketo) homegardens, 22 tree, 16 herb, 10 shrub and 6 climber species grow by their own right. Such high amount of spontaneous growth is tied to the forest that has left behind seeds in the seed bank and also serves as source of new seeds (through dispersal) because of its close location. Maintenance of these spontaneously growing but not ardently needed components in the gardens is associated with: knowledge of the potential use of the plant species which, in turn, has originated from intimate association with the forest; absence of compelling shortage of space (unlike in Basketo); and favorable growth conditions (high soil fertility and precipitation) for the ruderals that sometimes makes their regular eradication difficult. The observed difference in plant composition between Basketo and Kafa gardens can, therefore, be attributed primarily to variation in environmental setting. Better transportation conditions, proximity to a major regional market center (Jimma) and also the national capital, presence of various organizations that are engaged in conservation and development activities also have a contribution since these create the opportunity for inflow of new crop species into homegardens of Kafa.

The architecture of Basketo and Kafa gardens conforms to the vertical and horizontal organization of tropical homegardens as described by several authors (Sommers 1982, Fernandes and Nair 1990, Caballero 1992, Gillespie *et al*. 1993, Jensen 1993). A closer look at the horizontal arrangement of plants in the gardens reveals that the positioning of plants is based on a good understanding of ecological requirements of individual plant species. For example, while plants with relatively low water requirement and those that favor rocky grounds are planted at the elevated part of the garden; those with high nutrient requirement are placed around the house; those that thrive in the open are raised at the middle of the extended lower section where shade effect is less; moisture loving herbaceous types that form a dense ground cover are grown at wet margins; and shade-loving shrubby forms are integrated with trees. Such ecological knowledge-based ordering appears to be common since it is also practiced by other local societies (Abdoellah 1990, Christanty 1990 and Okigbo 1990). However, as the reality in Basketo and Kafa suggests, factors that define distribution of plants in gardens transcend the plant-environment interaction dimension entering into the local worldview realm. The planting of only selected plant types in the corner of Basketo garden where ***kaasha*** ritual is conducted, and also the planting of some sight 'hating' plants at the backyard of Kafa gardens with the intention of avoiding a possible rotting are examples in this regard.

The multitude of management practices performed in Basketo and Kafa gardens are basically the same except for minor differences observed with regards to intensity of management. The extra care given to Basketo gardens as expressed by constant weeding, pruning and cleaning and also less tolerance to spontaneously growing species is linked to shortage of land and the consequent heavy dependence on the gardens. This is in agreement with what was expressed by Ali (2005) as inverse relationship between intensity of cultivation and landholding size.

Though the situation in Basketo and Kafa is in line, to some extent, with the general truth that women are highly involved in the management and are more knowledgeable of gardens (Brownrigg 1985, Ninez 1990, Soemarwoto and Conway 1992, Zemede Asfaw 1997, Flnerman and Sackett 2003, Mohan 2004, Vogl-Lukasser and Vogl 2004, Ali 2005), Kafa and Basketo gardens can not be judged as the main responsibility of women. Both men and women are in charge of management. As the present trend suggests, there is even an increasing involvement of men which is associated with increased commercialization of garden produce. However, such new developments, when guided by economic rationale and given the dominant decision-making role of men, can lead to drastic changes in the structure of homegardens and erosion of local knowledge.

Homegardens of Basketo and Kafa belong to the Ethiopian gardens category which, as noted by Tesfaye Abebe (2005), is characterized by diverse mixture of crop plants with ***enset*** forming the basic framework. These gardens provide services to the household that range from provision of food through keeping family health and generating income to strengthening social ties and fulfilling spiritual requirements. Irrespective of their size, they are the major suppliers of food to the household. The fact that the population in these areas has never experienced serious shortage of food is a good indicator for the reliability and stability of these agro-ecosystems. Their role of generating income is also improving due to changing trading situations; and this is of significant implication in terms of local livelihoods, particularly in Basketo where the garden is the major source of income.

Homegardens in Basketo and Kafa are in a process of change with respect to plant composition, management practices and organization. This is in compliance with the recognition that homegardens are dynamic systems exhibiting changes through time (Zemede Asfaw 2001a, Vogl-Lukasser and Vogl 2004, Peyre *et al.* 2006, Bizuayehu Tesfaye 2008). The changes that take place in Basketo and Kafa gardens can be classified into four types: succession-based, expansion-based, introduction-based, and land constraint-related. The first type of change is somewhat similar to secondary succession that involves a progressive alteration in structure and species composition of the vegetation (Grime 1979). However, succession in homegardens is of a contracted type since colonization stage by ruderals (annuals or short-lived perennials that take advantage of disturbance) is avoided or minimized; and also succession is arrested at a certain level through regular disturbance. The raising of ***enset*** followed by coffee and then tree species is analogous to the 'perennial herbs → shrubs → trees' sequence in secondary succession of other vegetation systems (Grime 1979). In the course of the process, as pointed out by Jose and Shanmugaratnam (1993), the farmers' role is directing succession rather than fighting it. This is of course based on a deep understanding of ecological processes.

Expansion- and introduction-based changes that are becoming increasingly conspicuous are justifiable not by ecological factors but by economic ones. In both Basketo and Kafa homegardens, the size of coffee is expanding at the expense of ***enset*** which represents the major staple in both areas. The closeness of the cover-abundance value of coffee to that of ***enset*** (Table 48) shows how coffee is rivaling ***enset*** in these gardens. The emphasis given to coffee emanates from the tendency of regarding the plant as more rewarding which in turn is associated with recent improvements in market availability. If the present situation continues, development of a monoculture stand is more likely posing threat to homegarden biodiversity. Development of similar situations in the homegardens of Sidama Zone of the same region, as reported by Tesfaye Abebe *et al.* (2010), reminds us how serious the situation is.

The introduction of new species is also associated with economic factors. Agricultural development-related interventions coupled with farmer interest in new crops paved the way for incorporation of close to 20% homegarden species in Basketo and Kafa (Appendix 5). Fruit trees are among the new introductions, and their success together with the expansion of shade-loving coffee could lead to a significant modification in structure and composition of homegardens. The fact that more than half (52.38%) of the newly-introduced plant species, of which the majority are promoted as part of agricultural extension packages, are common to gardens of both areas (Appendix 5) is an evidence for the influence modern agriculture is having on structure and composition of homegardens.

Land constraint exerts its impact on the nature of homegardens in different ways in Basketo and Kafa. In Basketo, homegarden land used to be shared with sons by dividing it along its length (that is from the elevated part down to the wetland margin). Due to growing shortage of land, however, parents retain the wet margin of their garden where they grow ***kororima*** which is a better income generating crop and also requires less labor to manage. This, in turn, led to creation of homegardens which lack a wet margin where plants like ***kororima***, taro and bamboo are raised, and also stimulated the growing of ***kororima*** under tree shade in drier parts of the garden. In Kafa, land shortage made some households own no managed forest. This resulted in integrating such crops as coffee, ***kororima*** and *Piper capense* (that usually are forest components) into the homegarden system.

In general, the dominance of coffee, expansion of some income generating crops, and increased introduction of crops with potential economic benefits suggest that market factors are currently imposing greater impacts in dictating the evolution of the homegardens of Basketo and Kafa.

7.3 Spices of the Basket and Kafecho peoples

7.3.1 Concept of spice and use

The perceptions of 'spice' of Basket and Kafecho peoples closely resemble each other. This is evidenced by the indiscriminate application of the terms ***sawubaz*** (in Basket) and ***shawujoch*** (in Kafinoono) whether a product originates from root, stem, leaf, fruit or seed; whether its source plant is herbaceous or woody; and whether it is used in small or large quantities. Their concept of 'spice' is, therefore, a broad one when seen in light of those that tend to define the items in terms of such criteria as quantity consumed, source region or origin, and resource plant's habit (Morrow 1951, Jansen 1981, Borget 1993, Ensminger *et al.* 1995, Billing and Sherman 1998, Farrington 1999, Weiss 2002, Snider 2007). The broad concept of 'spice' in Basketo and Kafa communities is also noticeable from the fact the category names '***sawubaz/shawujoch***' are applied not only to items used during cooking but also to those used in food processing. An example of such spices is ***hup'icho*** **(***Laggera crispata*) which is used in Kafa during the fermentation of ***k'oc'o*** (fermented product of ***enset***) for it aids in achieving the characteristic flavor and color of the product. In addition, medicinal uses are also given consideration while using spices. Therefore, the ‘spice’ concept of the Basket and Kafecho peoples is built on consideration of four aspects: taste, aroma, color, and medicinal use.

However, as can be judged from the resemblance between the kinds of spices used in Basketo and Kafa and those reported in the related literature (Hayes 1961, Jansen 1981, Borget 1993, Nigist Asfaw and Sebsebe Demissew 2009), the local concept of ‘spice’ largely coincides with that held beyond the local level. However, buckthorn (*Rhamnus prinoides*) which is treated by Jansen (1981) as spice is never considered so by these communities. Instead, this shrub, which is used for making local drinks, is put under the stimulant/beverage category. Local spices that are not common beyond the local territories are *Vepris dainellii*, *Fagaropsis angolensis* and *Laggera crispata*. However, the first two can be of a wider use, at least in the SNPPRS, since fruits of *F. angolensis* are encountered in the market of Arba Minch (a zonal town within the region); and also because their use is heavily associated to their medicinal importance.

Out of the total 31 spices recorded from both localities (Table 22), 17 are recorded from both Basketo and Kafa and used by both communities. Disparity is observed with the remaining 14 spices. The observed difference originates from three conditions. First, spices cultivated and used in one of the communities are not known by the other and hence not used. This is true for spices that commonly grow or are cultivated in Kafa but not in Basketo (e.g. *Piper capense, Lippia adoensis* var. *koseret*) and those that were recently introduced to Kafa (e.g. *Rosmarinus officinalis*, *Elettaria cardamomum*). The second condition is that plants that are cultivated and used by one group are also cultivated by the other but not used as spices. This is exemplified by *Artemisia* species that are grown in the two areas but used as spice only by Basketo people. Since these spices are used in Basketo (and also some other areas in the region) for making the hot drink made from coffee leaves (***bunaytsi***), absence of such tradition appears to be responsible for not using them in Kafa. The third condition is that people are knowledgeable about the spice, use it but not cultivate it because of lack of such tradition and also perhaps because of environmental reasons (e.g. *Trigonella foenum-graecum*, *Trachyspermum ammi* in Kafa).

Use of spices by Basket and Kafecho peoples is comparable even though higher number of specific uses (25) is reported from Kafa as compared to the 18 from Basketo (Appendix 7). However, the intensity of use of spices in Basketo households appears to be greater than that of Kafa. This is because the more spice-demanding drink ***bunaytsi*** (coffee from coffee leaves) is consumed twice a day in Basketo households on a regular basis. The observed higher number of spices that are described to be ‘frequently used’ in Basketo (Table 24) and also the greater average spice species richness of Basketo homegardens (Fig. 11) are supportive of this argument. However, since a lot of activities that pertain to commerce and development are taking place in Kafa (i.e. more interaction with outsiders), it is possible to envisage increased spice use in the future. The recent practice of using *Piper capense* for household consumption also suggests this.

7.3.2 Diversity of spice-yielding plants

A reasonable diversity of spices, as measured by species richness, is recorded from homegardens of Basketo (maximum = 14, mean = 7.32) and Kafa (maximum = 15, mean = 7.1). This is higher when compared to the maximum 3 and average 1 spice reported from Cuban gardens (Wezel and Bender 2003). At total richness per locality level, Basketo and Kafa have 24 spices each; and this is also higher when compared to the reported 10 spices in case of both Sidama gardens (Tesfaye Abebe *et al.* 2010) and Kerala gardens (Peyre *et al.* 2006), and also to the 9 spices from Cuban gardens (Wezel and Bender 2003).

Spices of Basketo and Kafa showed diversity in their distribution among higher taxa. Such greater distribution of species amongst higher taxa has been described by Magurran (2004) as taxonomic or hierarchical diversity and is an indication of greater variedness. While the high genus to species ratio (0.83 for Basketo and 0.92 for Kafa) would indicate an almost one-to-one correspondence, the family to genus ratio 0.55 for both Basketo and Kafa shows that, on average, less than two genera are included in a family. Therefore, spices, which contribute 16.11% and 12.44% to total species composition of Basketo and Kafa gardens respectively, are important functional groups with regard to the diversity witnessed at specific and levels above. Given the present emphasis put on this category of plants (EEPA, 2003), the number of spices in homegardens is likely to rise thereby enhancing garden diversity further. The fact on the ground, as demonstrated by recent introductions and also nursery sites and demonstration plots in Kafa, also suggests this trend. However, since most of the spices are herbs and a few are shrubs that are adapted to grow in association with other crop plants, monoculture may not be a threat as such. In other words, their impact in eroding garden diversity may not be as drastic as crops in the expanding category such as coffee and *Xanthosoma saggitifolium*.

Analysis of frequency of occurrence of spices in association with the preference ranking scores has confirmed existence of detectable relationship between the two. In Basketo, for example, *Capsicum frutescens*, *Ruta chalepensis*, *Zingiber officinale*, *Coriandrum sativum*, *Capsicum annuum*, *Aframomum corrorima*, *Allium sativum*, *Curcuma domestica*, *Allium cepa*, and *Ocimum basilicum* var. *basilicum* are the top ten most frequently occurring spices (Table 20). As the preference ranking test indicates, nine of these spices are among the top ten most-preferred for both household and market use (Table 26). Similarly, *Capsicum annuum*, *Ocimum basilicum* var. *basilicum*, *Ruta chalepensis*, *Zingiber officinale*, *Aframomum corrorima*, *Cymbopogon citratus*, *Curcuma domestica*, *Coriandrum sativum*, *Laggera crispata*, and *Allium sativum* are the top ten most frequently occurring spices in Kafa (Table 21). While nine of these are among the top ten most-preferred for household use, only seven spices from the list correspond to the top ten most-preferred spices for their market use (Table 27).

As this result suggests, a positive relationship exists between frequency of occurrence of spices in gardens and preference given to them by households. Pearson's correlation analysis results (Table 32) also showed existence of a significantly strong positive correlation ($p = 0$) between frequency of spice occurrence and preference score in four of the cases (i.e. household use and market use in both study areas). However, in both Basketo and Kafa, correlation coefficient values of frequency of occurrence versus household use score (0.918 and 0.895 respectively) are found to be greater than those of frequency of occurrence versus market use score (0.858 and 0.668). Linear regression analysis results (Figs. 14 and 15) similarly indicate existence of correlation between frequency of occurrence and preference. As R^2 (coefficient of determination) value indicates, in Basketo, 84.2 % of variation in frequency of occurrence of spices is explained by the score of household use rank while a lesser proportion (73.3 %) of variation is explained by market use rank score. In case of Kafa, on the other hand, household use rank score explains 80% of variation in frequency of occurrence of spices while that of market use rank is responsible for only 44.7% of variation.

What can be deduced from the results of the preference ranking, correlation and linear regression analyses is that, in both Basketo and Kafa, under the present conditions, it is the farmers' desire to use spices for household consumption which is more accountable for maintaining spice-yielding plants in gardens as compared to the intention to make money from the resources. Nevertheless, it should also be noted that a few spices (e.g. ***kororima***, *Piper capense*) are cultivated primarily for income generation, and the emphasis on economic benefits is likely to increase in the future.

Comparison of correlation coefficient (r) values of frequency-market use score pairings obtained from Basketo and Kafa helps to see the differences in the extent of commercialization of spices of the two areas. The Basketo value obtained for this pairing (0.858) is greater than the 0.668 of Kafa. This higher Basketo value of r by 0.19 margin can be taken as indicative of greater commercialization of the products in the area. This, in turn, could be associated with the selling of spices that are used for making ***bunaytsi*** (coffee from coffee leaves). Availability of herbs in a noticeably higher abundance in Basketo markets is supportive evidence to this argument.

Results of the paired comparison and preference ranking exercise (Tables 26, 27, 28, 29, 30, and 31) implicated spices of relatively higher value to Basket and Kafecho peoples. The results of the Paired comparison test showed a reasonable degree of congruence to that of preference ranking, i.e. the order of ranking of spices of the Paired comparison test is found to correspond largely to that of the preference ranking. However, some difference is observed in the extent of correspondence when the results of each area are analyzed. That is, when the rank of spices attained by the two tests remained more or less the same in Basketo, some reshuffling of rank is observed in Kafa.

On the other hand, out of the top six most preferred spices of Basketo and Kafa identified based on averaged preference ranking scores within two use types (household and market), five (ginger, long chili pepper, garlic, rue, and ***kororima***) are shared by both communities. These spices are also among the six top ranking spices of the two areas that are identified on the bases of pooled paired comparison scores. It is, therefore, possible to conclude that preference for spices and tradition of spice use of the two communities are closely related.

7.3.3 ***Kororima*** (*Aframomum corrorima*)

Kororima is the most attention-deserving spice because of its socio-economic importance and ecological benefits it renders. It is therefore crucial to understand the various aspects of this plant. Accordingly, ***kororima*** fruit yield is estimated on the basis of the observation results on flowering and fruiting pattern (Table 50).

Table 50 Estimated yield of ***kororima*** per farmers plot

	Minimum	Maximum	Average
No. of fruits recorded per quadrat at the 1st visit (Quadrat size = 4 m x 4 m =16 m^2)	18	59	36
No. of inflorescence recorded per quadrat during the whole observation period	12	28	20
Calculated no. of fruits (no. of inflorescence x 4*)	48	112	80
Total no. of fruits per quadrat (Counted + Calculated)	66	171	116
Total no. of fruits per 200 m^2 (an estimated average size of a farmer's ***kororima*** plot)	825	2138	1450
Yield in kg**/200 m^2	5.1	13.2	9

* Maximum number of fruits per inflorescence
** 1 kg = 162 Basketo ***kororima*** dry fruits

The ***kororima*** yield estimated on the basis of the observed flowering and fruiting pattern (Table 50) appears to be lower than actual. The ground for this argument is the observed disparity between the maximum number of inflorescence recorded (40) and the average aerial shoot number (512) in the studied quadrats. This, in turn, is assumed to be a result of data collection for a shorter period (data was collected only for about one third of the production period). The obtained value, therefore needs to be corrected by a factor of three (i.e. multiplied by 3) by taking the length of production period into account. Accordingly, an estimated annual production of ***kororima*** per household is found to range between 18 to 40 kg with the average amount being 27 kg. This is in agreement with what farmers mention as their annual harvest in terms of a container, i.e. one ***madaberia*** (a medium-sized sack which weighs about 35 kg). When the estimated yield is converted into money at a price of 30 Birr per kg, a household can earn a sum that ranges from 540 to 1200 Birr per year with an average of 810 Birr per year. This is a significant amount of income from one crop by rural household standards.

The other aspect analyzed was seed germination potential. In light of the present shortage of planting material and also the observed lower variability which appears to be associated with vegetative propagation method employed, understanding this aspect is crucial. No significant result in germination potential was observed among the five tested provenances. Moreover, germination obtained was low and not exceeding 30%. This value is much lower than the 88.3% maximum germination reported from a study in which seven pre-sowing treatments were used (Solomon Eyob 2009). Surface untreated seeds exhibited even a much lower (8%) germination rate. This indicates that germination problem observed in ***kororima*** is either related to hard seed coat dormancy as suggested by Solomon Eyob (2009), or is associated with fungal infection since different levels of treatments yield different germination percentages. On the other hand, complete germination failure of seeds planted in sand can be associated with moisture stress.

The chemical composition analysis of ***kororima*** seeds is almost identical to what was reported by an earlier study (Berhanu Abegaz *et al.* 1994). However, the Basketo product showed higher essential oil content and also high percentage proportion for six of the major chemical constituents (i.e. for 1,8-cineole, sabinene, β-pinene, limonene, geraniol, and neryl acetate). This difference may be attributed to soil factors since the ***kororima*** growing soils of the two areas significantly differed in five of the twelve measured variables. Difference in cultivation condition and management of the plant in the two areas may also be responsible for the disparity. More over, the drying method in Kafa that involves piercing the fruit wall and hanging the fruits above the fire place might have resulted in loss of essential oils leading to the observed lower proportion of the chemical constituents.

7.4 Commercialization of spices and associated impacts

As the study result on spices of Basketo and Kafa indicated, a large proportion of them (above 88%) are marketed even though they differ in the amount of income they generate for the household. However, using such high proportion of spices for income generation is not a long standing tradition but a recent phenomenon. This implies that spices are more and more commercialized in the two areas. Besides the marketing of spices at a high proportion, there is also additional evidence that suggests increasing commercialization of these commodities. These include: new introduction of spices into the market (e.g. ***turfo***/***timiz*** /*Piper capense/* in Kafa), marketing of value-added products as in the case of processed red pepper and turmeric, and changes in units of sale (i.e. the transition to use modern units such as kg). This last condition appears to be associated with increasing commercialization and the consequent increase in supplied volume of spices.

Obviously, it is the market incentive that lies behind increased commercialization of specie products of Basketo and Kafa. Nevertheless, factors that have a bearing on the local market must have been of greater importance than external ones since only a few of the spices are traded beyond the local level. Three factors can be taken as determinants in this connection: population rise, urbanization and the associated diffusion of tradition, and improved household income. It is obvious that the populations of Basketo and Kafa are expanding as part of the national population that grows at an annual rate of 2.6% (CSA 2008). Besides normal population growth, many more people are brought to the two areas as part of a resettlement program which is being implemented in the country. Additional people arrive in Kafa to work as laborers in the new investment projects. The cumulative increase in population affects the market in two ways: first by increasing demand for the limited available resource, and second through shrinking land holding size thereby reducing the number of spices cultivated in gardens. Those who do not cultivate are obliged to buy.

The trend of urbanization is apparently strong as can be judged from the settlement patterns in both Baskto and Kafa. This new development, together with increased movement of people and improved transport systems and communication facilities, led to adopting new food types (dishes common in urban areas) that call for more spices. Spices that are not cultivated at home are bought to satisfy this new need. The last factor, financial status of the household, is basic and associated with the first two. Because of better market conditions for cash crops, farmers are known to get better returns. This obviously puts them in a better position to buy spices; and this new trend, in turn, stimulated others to produce and sell.

Economic valorization of spices through the market means and also other methods resulted in changes in the value placed on these products and also on the long existed attitude of the local communities toward selling the items. At present, asking for spices free of charge or willingness to donate is becoming less frequent; and when this occurs it is limited to seedlings or spices that are required for medicinal purposes. All spices, except ***kororima***, were regarded to be women's plants; and men hardly had contact with them. Such attitude is observable even today in association with some of the spices. In some households, for example, when the question "Do you sell this?" is put to the male household head, the answer is immediate dismissal mixed with a tone of surprise. However, in most households, the situation is quite different. Men are increasingly becoming involved in the management and selling of spices (Appendices 8a and 8b).

As results of market chain assessment, preference ranking and paired comparison test showed, ***kororima*** is the most important income generating spice to the Basketo and

Kafecho households, the most-commercialized spice of the areas, and also that with the longest market chain. This is perhaps related to the fact that it is the only local spice that has served as an item of commerce for a long time (about a century according to an elderly informant from Basketo and one from Kafa). Information is lacking on how use and trade in ***kororima*** all began; but the greater emphasis given to the product as commercial crop as compared to its household use suggests that its market use preceded household consumption. No hint is obtained concerning its ancient use as money which was mentioned in Jansen (1981).

Kororima differs from the other local spices in two additional features, besides its commercial status. The first one relates to its role in the garden as a conspicuous element covering a good proportion of total garden area. The second feature pertains to existence of two specific product types (fruits of Basketo and Kafa) that can be readily recognized. Product processing appears to be the primary factor behind the distinctiveness of products from the two areas although environmental and genetic factors are also believed to have their own role (Roussel and Feleke Woldeyes 2009).

In the two localities, different systems of production and processing evolved due to complete isolation between the societies. This, coupled with a probable genetic difference, resulted in production of ***kororima*** unique to each area. Restricted transportation system, in its part, resulted in two separate market chains (Fig. 22) that prevented mixing of products from the two areas until they reached the national capital. The overall outcome of this is formulation of distinctive features that are used as quality criteria by all role players in the market chain (Table 43). Measurements on quantitative fruit features and also the statistical test results are in support of distinctive characteristics as recognized by the market; and this is particularly true for fruit weight and shape. The other quality mark, which is emphasized by consumers, is aroma. The Basketo product is recognized to be of stronger fragrance.

Dilution in the distinctive characteristics of products of the two main categories is likely to occur when considering diffusion of the methods of cultivation (e.g. increased incorporation into the garden) and product processing (e.g. sun-drying, post harvest fruit cleaning) from Basketo to Kafa. These practices can result in a product which resembles that of Basketo as already witnessed in T'ello of Kafa. There will also be mixing of products before they reach the national market because of an increasing transportation network. The net effect of this would be product homogeneity, eliminating specific identity of the products of both areas. Nevertheless, in light of the well-organized market system and also the reputation dedicated to each product type, the impact may not be drastic as such.

As mentioned above, commercialization of ***kororima*** and other spices is on the rise. Consequences of this new phenomenon may be assessed in light of both its actual and potential impacts on local livelihoods, social interactions, conservation of biodiversity and environmental sustainability. With regard to local livelihood, it is generally assumed that the spice component will contribute to improvement in household income. Preliminary indicators are already witnessed, and the expansion of some crops such as ***kororima,*** long chilli pepper, ginger, garlic and onion/shallot that would bring farmers more income suggests the potential contribution spices will play in this regard. As it can be judged from the list of imported spices encountered in Basketo and Kafa markets, even local demand for spices is not satisfied by local production. This, again, shows the possibility to produce more and generate income. The opportunity to promote spices as unique local products so as to bring premium prices to farmers is also high. The fact that 8 (66.67 %) of the total 12 products selected as potential candidates for protection and promotion through Geographical Indication system are spices (EHGP 2009) indicates how the products are convenient for implementing such an approach.

The impact of commercialization of spices on garden diversity is obviously positive since it facilities addition of species into garden. Dominance of one or a few species is not a threat garden diversity. Even ***kororima*** that occupies a relatively larger surface area is dotted by different species of shade providing trees. In Basketo gardens, for example, while *Cordia africana* and *Ficus vasta* are encountered in 33.33 % of quadrats in which ***kororima*** is recorded, *Croton macrostachyus* is recorded from 23.81%, *Macaranga* *capensis* and *Ficus sur* from 14.29 %, and *Polyscias fulva* from 9.52% quadrats. ***Kororima*** has conservation benefit that goes beyond the garden. In Basketo, where it is cultivated on wetland, it forms a dense cover on the ground thereby avoiding excess evaporation and consequent drying of streams. Wetlands are generally associated with this plant (and also taro), and this prevents the planting of other crops (such as eucalyptus) which might drastically modify the wetland habitat. In Kafa also ***kororima*** has a role in conservation of landscape elements. This is particularly true for managed forest since farmers avoid cutting trees under which it thrives together with coffee.

As there are merits, a drawback can also be envisaged in association with commercialization of spices. One such impact relates to social interactions. Traditionally, exchanging spices has been a common practice; and has also been indicator of closeness as one may walk into somebody's garden and pick a spice. This situation is changing rapidly, and this can be taken as sign of loosening of the attachment among community members. Another possible negative impact relates to conservation of the forest in Kafa. Some spices that once were harvested from the forest are increasingly being grown in the garden because of market incentives. This may decrease the value that was traditionally assigned to forests with a possible consequence of degradation.

7.5 Local environmental perception and resource use norms

As indicated in the result section, two major religious practices (***kaasha*** in Basketo and ***k'oolle-deejjo*** in Kafa) that involve sacrificing food and drinks to the spirits of ancestors or lineage groups take place with the objective of maintaining an equilibrium among the components of the cosmos. These rituals are expressions of local worldviews that are supposed to be holistic since this is a shared feature of every traditional society (Howard 1989, Slikkerveer 1999, Abrams and Primack 2001). In these religious rituals, components of different spheres of the local environment take part. These include the earth, living things including plants, animals and humans, and spirits. What can be gathered from this is that features peculiar to worldviews of traditional peoples around the world are inherent to those of Basket and Kafecho peoples. The perception that humans and nature are united and inseparable (Bennet 1999, McGregor 1999), the norm of respecting the earth and its components and thereby maintaining harmony among the various elements (Howard 1989, Balick and Cox 1996, Gonzales *et al.* 1999, Posey 1999) and the belief that natural things have spirits (Klubnikin *et al.* 2000) are some of the features worth mentioning.

The coming together of humans, plants, animals and spirits during the ritual ceremonies (***kaasha/ k'oolle-deejjo***) in the ritual site (***ts'oose*** in Basketo, ***kubbo*** or ***guudo*** in Kafa) demonstrates the oneness and respect among the different components of the cosmos. The very location where the ritual is conducted (i.e. sacred grove or forest but not gardens or farmlands where people operate) symbolizes an external world which is appropriate for the summit. Offerings are presented under trees in a solid, liquid and smoke form. Prayers are chanted. The use of verbal communication indicates that the components of the local environment can listen to and understand each other. It is the earth, the trees and sprits that are served first with the offerings (the first portion of the first harvest) whereas humans come next. This, in the first place, is a manifestation of the respect dedicated to the earth that "provides all" and its other components. Secondly, it is a matter of exercising the philosophy of reciprocity. The earth and spirits that nurture humans are being nurtured in their turn. This reciprocal nurturing is believed to bring about the highly intended harmony among members of the local cosmos.

These rituals, which are somewhat similar to 'first fruits' ceremonies of the tribes of the Columbian Plateau of American Pacific Northwest (Winthrop 1999), have an additional role of strengthening the social bond among community members and also avoid sense of discrimination. Feasting together is interpreted as a commitment to share the good and the evil. It is in this way that the rituals help in gluing the attachment among the people. Since the rituals are conducted only when crops are ready for harvest in all households of a locality, community members enjoy the fruit of the earth (the new harvest) equally and at the same moment.

The significance of local worldview in shaping resource management and utilization is quite noticeable in Basketo and Kafa. As pointed out by different authors (Reichel-

Dolmatoff 1976, Degh 1994, Berkes 1999, Slikkerveer 1999, Curry 2000) worldviews shape peoples' interaction with the environment. Management and utilization of environmental resources fall within the spectrum of such interactions. Resource management and utilization norms of the Basket and Kafecho peoples are identical in many respects to those practiced by indigenous people around the world. Four of the six local resource management practices - monitoring resource abundance and change in ecosystems, protection of vulnerable life history stages, protection of specific habitats, and temporal restrictions of harvest (Berkes *et al.* 2000, Colding and Folke 2001) - are exercised by peoples of the study areas .

The constant checking of the status of a resource in the homegarden (primarily by the male head of the household) and the watching out of wetlands by almost everybody in the community exemplify the resource monitoring behavior of the Basket and Kafecho peoples. In Basketo, people refrain from cutting bamboo during the early months of the rainy season for the adult plants at this stage are considered as 'nursing mothers'. This demonstrates local people's protective behavior of reproductive stages. Habitat protection is the most noticeable conservation practice since clearing the sacred groves in Basketo and forests in Kafa, converting wetlands into other land use systems or extracting resources outside the prescribed period is strictly prohibited.

All these management practices impose restrictions on resource utilization. These restrictions are made effective through social taboo and other rules whose violation leads to punishments such as social sanctions. Since the classes of taboos identified by Colding and Folke (2001) mainly pertain to animal resource utilization (Table 1), they are less useful in explaining the situation in Basketo and Kafa which are agrarian societies.

The prohibition of Basketo women from entering into the ***aldira*** section (elevated part) of the garden, which may be labeled as boundary taboo or gender-based taboo together with other such gender-related restrictions, avoids frequent harvesting of ***enset*** (*Ensete ventricosum*). This in turn allows the plants to stay long in the garden (till flowering) thereby creating the possibility of interbreeding. This has perhaps contributed to the creation and maintenance of quite a large number of ***enset*** varieties (Appendix 2a) some of which are high quality types and described by the society as ***enset*** of ***aldira***.

Restrictions that almost totally ban using resources either in the form of harvesting or grazing of cattle in the sacred groves and forests where religious rituals are conducted, (which can be referred to as site taboos), are of a great conservation function. Sacred groves of the mosaic Basketo landscape, which supposedly are remnants of the montane evergreen forest that once covered the area, survived because of such restrictions. The ecological functions of these sacred sites are diverse. The fact that 58 plant species (28% of the total from Basketo) are recorded from these habitats is a clear indication of the conservation role of these habitats. Spontaneously growing coffee and ***kororima*** are among the species encountered, and this forms the ground for envisaging the possible role of these sites as seed banks for these crops. No doubt that these protected areas are breeding sites of birds and other small animals which may serve important ecological functions such as seed dispersal and pest control.

The restrictions on exploiting resources from the sacred sites of Kafa may not be as obvious as those of Basketo since the area is with high vegetation cover. However, the fact that rituals are conducted under big trees must have been responsible for the Kafecho behavior of refraining from felling big trees. This, in turn, must have contributed to maintaining the forest systems intact until the recent degradation it is experiencing.

Conservation of wetlands is also attributed to strict social rules. These habitat systems which serve as a source of diverse resources (e.g. water for household consumption and cattle, construction material, medicine) are highly valued and any violation of the locally accepted use norm will lead to punishment that may be as severe as social exclusion. The strong protest against the idea of converting a wetland into a horticultural field by an outsider in Hibret k'ebele of Gimbo Woreda (Kafa Zone) shows how local people value natural systems and are determined to conserve them.

The importance attached to maintaining diverse local resources by Basket and Kafecho peoples is a demonstration of their perception of biological diversity (in terms of understanding its importance). Except for an elderly man in Kafa who showed less interest in the idea of putting additional crop plants into his garden (because of labor shortage), all remaining households included in the study (139) declared that they want to integrate more plant species into the garden and enhance its plant diversity. Basket and Kafecho peoples' objectives for maintaining high specific and infraspecific diversity is similar to those of other local people around the world (Sathees-Babu *et al*. 1992). These include maintaining harvest during the different seasons of the year thereby ensuring food security and dietary diversity; ensuring continuous and fair income through the selling of diverse produce; minimizing total crop failure in case of disease infestation or drought; making efficient utilization of space through creation and exploitation of microhabitats; and to pass a resourceful garden to children.

Besides the tendency to maintain high plant diversity in the garden, there exist less noticeable but routine practices that are indicative of conservation behavior in both societies. One such practice relates to the tradition of avoiding resource consumption to the last drop. For example, it is a custom to leave behind some food in the cooking pot; some grain is left behind in the granary under whatever food scarcity condition; and a minute portion of produce brought to market for sale is taken back. Such practice has a hidden notion of keeping some resource for future use. Upon extension, this behavior is expressed in the form of refraining from early harvesting of crops that show extra performance (e.g. bigger corncobs) with the intention of using them as seeds for the next cropping season; or restraint from harvesting outside the prescribed period. In Basketo, where within lineage marriage is prohibited, highly valued planting materials (e.g. yam) were not given to in-laws. When viewed in light of the existing traces of the then rivalry among lineages, this clearly shows how significantly germplasm was valued by local people.

7.6 Status of biological diversity in the human-managed landscapes of Basketo and Kafa

Even though a number of studies (Friis *et al.* 1982, Ensermu Kelbesa *et al.* 1992, Friis and Sebsebe Demissew 2001, Feyera Senbeta 2006, Schmitt 2006, Desalegn Wana 2009) have been conducted on the natural vegetation of Ethiopia, similar works that focus on the managed landscape are generally lacking. The situation appears to be not much different for the rest of Africa (Hylander and Sileshi Nemomissa 2008). In the present study, a total of 280 plant species for which local people mentioned specific uses was recorded from the mosaic landscapes of Basketo and Kafa. This number is comparable to the number of vascular plant species recorded from forests of Bonga (285), and Harena (289) and higher than that of Maji (146) and Yayu (217) (Feyera Senbeta 2006). Schmitt (2006) also reported 309 species of all life forms from forests of Kafa which, again, is comparable to the species encountered in this study. Such high diversity is informative of how human-managed ecosystems are important in maintenance of high biological diversity.

The level of distribution of species amongst taxa of higher categories (genera and families), termed as taxonomic diversity (Magurran 2004), exhibited by the landscapes of Basketo and Kafa is also indicative of the significant diversity supported by these systems. This is evident from the species to genera ratio that ranges from 0.81 to 0.95 in case of individual and combined floras of the areas (Table 44). Analysis of the vegetation composition at family level reveals that the flora of each area is represented by a high number of families. Moreover, a discernable pattern exists with respect to dominance of families. Fabaceae is the most species-rich family in both sites whereas other eight families that contain more than five species are common to both areas except for the difference in their proportional contribution of species. One possible explanation for this resemblance is the similarity in origin of the vegetations of both areas. The additional possible factor is selective concentration of species by humans. The extradominance of Fabaceae can be attributed to the key ecological role its component species play - which might have favored them even in the natural environment. Their diverse use to humans that include provision of foods with high nutritional value, maintenance of soil fertility, and quality timber that is used for construction and making farm implements and furniture might have contributed to the Fabaceae dominance.

One of the landscape components that significantly contributed to total species recorded from the spatial level are homegardens. As Brownrigg (1985) puts it “diversity is a cardinal trait of traditional homegardens"; and many authors (Soemarwoto 1987 and Okigbo 1992, Soemarwoto and Conway 1992, Zemede Asfaw 2001a, Zemede Asfaw 2001b, Angel-Perez and Mendoza 2004) discussed about this aspect of homegardens in a manner that supports the remark. Homegardens not only host plants cultivated for their actual or potential use but also shelter less conspicuous forest species serving as alternative habitats (Hylander and Sileshi Nemomissa 2008). Different measures used to assess the level of diversity in homegardens of Basketo and Kafa showed that these systems support a reasonable degree of plant biodiversity. The average species richness exhibited at individual study area level (41.02 for Basketo and 51.43 for Kafa) and at the combined area level (46.22) is higher than that reported for Sidama (Tesfaye Abebe 2005), Kerala (Peyre *et al.* 2006) and Cuban (Wezel and Bender 2003) gardens, i.e. 35.7, 29.3 and 21.3 respectively. When species richness of Basketo and Kafa homegardens is compared, the value for Kafa is significantly higher than that of Basketo ($p < 0.05$). High species richness of Kafa gardens is mainly attributed to high spontaneous growth (46.88%) when compared to that of Basketo (22.15%). The reasons behind this high spontaneous growth are discussed in section 7.2. However, in both Basketo and Kafa, the species richness follows symmetrical distribution pattern (Fig. 11).

Difference is also observed in the other measure of diversity, Beta diversity – a measure of the extent to which the diversity of two or more spatial units differs (Whittaker 1972, Magurran 2004). Accordingly, Kafa gardens showed high beta diversity value (2.75) as compared to the 2.61 of Basketo indicating a lower number of shared species or higher turnover of species among homegardens of Kafa. This may be related to landscape heterogeneity that can result in high beta diversity (Magurran 2004) since the landscape area covered in the study is quite larger in Kafa.

The customary practice, when measuring plant diversity in homegardens, is to treat the entire garden as a single unit. The benefit of studying the garden at a subunit level appears not to have been recognized or overlooked. The approach followed to study Sidama gardens by dividing them into units or patches (Tesfaye Abebe 2005, Tesfaye Abebe *et al.* 2010) can be taken as innovative in this regard even though the subunits recognized are determined by the researchers themselves. The observed failure to study these farming units following local subdivisions can be interpreted in terms of the prevailing tendency of researchers to employ ***etic*** instead of ***emic*** approaches in such studies. In the present study, plant diversity was assessed in the different sections of the garden (elevated side, backyard, lower side 1, 2 and 3) following the local classification of the farming unit.

As alpha diversity (species richness) values indicate, the backyard part of the garden is the most species-rich corner in both Kafa and Basketo attaining values of 10.95 and 7.52 respectively. The high species richness observed in the backyard is associated with the planting of diverse spices, vegetables and care and fertilizer input requiring plants such as yam. Nevertheless, the deliberate placing of vegetables and some other plants that are thought to be susceptible to evil eye is one reason for the observed greater concentration of species in the backyard of Kafa gardens than the Basketo counterparts. In both localities, species richness tended to decrease in the lower garden part as one goes from close to the house to the marginal part (i.e. from lower side 1 through lower side 2 to lower side 3). Decline in diversity of plants in the lower side is a result of growing, mainly cereals, as a largely uniform stand interplanted usually with cabbage (*Brassica carinata*) or legumes.

Garden sections differed in additional measures of diversity, i.e. Shannon's index (H') that takes into account the degree of evenness in species abundance, and species evenness (E) which is the ratio of observed to maximum diversity (Magurran 2004). Accordingly, the first part of the lower section (lower side 1) of Basketo gardens exhibited the highest value for Shannon's index and also evenness. The reason behind this is that ***enset*** is not dominating in this part (except in young households where gardens are usually not mature yet) but occurs mixed with coffee and other crops. In addition, plants like tubers, sugarcane and legumes are planted right at the edge. In the case of Kafa, it was the backyard that showed the highest Shannon's index value despite exhibiting lower evenness. Two conditions explain for this disparity. In the first case, when the backyard is smaller in size, it is planted mainly with vegetables and spices, and some of these (e.g.

long chilli pepper, cabbages) cover most of the space in great abundance. The other situation is that when the backyard is larger in size, spice and vegetable are planted close to the house whereas the remaining part is mainly covered with ***enset***. This higher proportional contribution of enset distorts evenness. Generally, as can be seen from the significant test result on Shannon's index values (Table 46), the elevated side, backyard and lower side 1 (all close to the house) of Basketo gardens show resemblance in terms of plant diversity. In Kafa gardens, however, it is the elevated side and the back yard that exhibit similarity with respect to plant diversity.

As the floristic similarity analysis result obtained through Sorensen's similarity index indicated, homegardens of Basketo and Kafa exhibited the highest similarity value (0.63). This could be expected since they represent the more managed land use system. The second highest similarity ratio (0.51) is observed between the homegardens and other land use systems of Kafa, and this is testimony to the role the natural vegetation plays in determining both structure and composition of Kafa homegardens. An almost identical similarity is exhibited between the other land use systems of Basketo and Kafa which achieved an index value of 0.50. This may be taken as evidence in support of the speculation that the vegetations of the two areas belong to the same floristic category, i.e. wet montane evergreen forest. The similarity between Basketo gardens and other land use systems in the area is rather low. Factors that may be held responsible for this include: intensive modification of the farming unit from the natural state, extreme degradation of the natural vegetation and a consequent absence of significant impact on the homegarden system, land-related constraint that must have minimized tolerance displayed to spontaneously growing plants. The overall picture, however, is suggestive of the significant interaction among landscape components in both Basketo and Kafa.

8. CONCLUSIONS

As the findings of this study suggest, Basket and Kafecho peoples show similarity in a number of aspects. One such similarity pertains to the local belief systems. Both societies retain, at least in a remnant form, a worldview that has suffered a lot from over a century of neglect and acculturation. The core philosophy upon which this local worldview is built on appears to be connectedness. There exists a strong sense of connectedness to the earth since people (at least some of the lineages) are believed to have originated from the soils of the land. The present generation is also connected to the past and the future through spirits that are considered to be members of the larger community. The connectedness is maintained through thanks giving ritual ceremonies like ***kaasha*** (in Basketo) and ***k'oolle-deejjo*** (in Kafa), and also rituals performed during sowing season in Basketo.

Peoples of the two areas also show similarity with respect to their perception of the local resources that must have been shaped by the local worldviews and which, in turn, resulted in conservation-oriented resource management practices and use norms. The landscapes of Basketo and Kafa demonstrate diversity at different levels (i.e. at habitat, vegetation type, land use type, specific and genetic) and this is a clear indication for the existence of worldview-guided conservation behavior among these indigenous societies. There is a body of opinion that conservation is not an objective of traditional peoples but a side effect of peoples' endeavor to maintain sustainable living through diversification of resources. This is true when considering almost every consulted farmer's reason for diversifying plants in the homegarden is broadening the resource base. However, it is hard to ignore the existence of deliberate conservation practices after learning that one reason for the exchange of planting materials among farmers is the intention of ensuring the perpetuation of the resource in the cultivated landscape. Farmers' willingness in both communities to offer planting material under the present circumstances where every transaction is becoming monitory-based is an additional reality worth considering.

The other similarity showed by the two communities relates to their local environmental knowledge. Since the lives of the Basket and the Kafecho, like any other local society, are intimately associated with the surrounding environment, they exhibit a deep understanding of its components. Exploitation of resources from the non-cultivated landscape components, the ingenious designing of the homegarden in manners compatible to local topography, the placing of plants in the garden as per their ecological requirement and efficient utilization of space, and even the strategic positioning of the house in the garden are reflection of this knowledge.

An aspect of the local environmental knowledge which is assessed in this study is local resource classification. The tradition of classifying the landscape at different scales and also the practice of classifying a particular resource in different ways (as in the case of special purpose and general plant classification) is a revelation of the pluralistic approach employed by local people when doing things. Features like high correspondence of local *generic* taxa to scientific species, and minimum synonymy and binomialization of names in the plant classification systems of the two peoples clearly show the strength of their emic classification systems and hence the need for elaborated investigation of such systems. The local vegetation degradation-related weakening of plant identification by some members of the Basket people, as compared to that of the Kafecho, indicates how vital it is to maintain biological diversity so as to allow continuing interaction between people and biological resources and, of course, maintenance of biocultural diversity.

As verified by this study, homegardens are central in the organization of the landscapes of Basketo and Kafa even if their relative role differs. In Basketo, they constitute the matrix in which remnants of the natural vegetation are embedded. Their dominance is not to a similar scale in Kafa where they are integrated in the forest system which, in turn, has influenced homegarden structure. However, the difference between the garden systems that arises from the disparity in environmental settings of the two areas is getting minimized. Population expansion and the associated rapid contraction of the forest would likely speed up the process of homogenization.

Homegardens of the two areas are irreplaceable production units since they provide almost everything the household requires for subsistence. Nevertheless, their role must not to be judged only in terms of satisfying family needs. They constitute local patrimony or heritage since they are considered as a common good, have an identity value, and are maintained in order to be transmitted to future generation. As diversity measures used in this study indicated, homegardens are major contributors to plant diversity supported by managed landscapes of the two areas which, of course, is comparable to that of the Ethiopian afromontane forests. It is not difficult to envisage the role these local farming systems would play as major repositories of biodiversity - particularly when viewed in light of the habitat conversion that is currently taking place at an alarming rate. However, the kind of dynamics homegardens are currently undergoing may end up in reversal of diversification rather than its enhancement. The contribution of homegardens to climate adaptation and carbon sequestration is also worth noting.

One group of the homegarden components that significantly contributes to the observed diversity of Basketo and Kafa gardens are spice-yielding plant species. They are a vital functional group of the garden, and constitute one of the categories recognized in the special purpose classification. The broad concept of ‘spice’ held by people of Basketo and Kafa again shows the tendency of local people to look at issues holistically. Spices are principally used in the preparation of the two more or less similar condiments known as ***Dusha*** (in Basketo) and ***dok’o*** or ***naaӡo*** (in Kafa). The tradition of using these condiments appears to be associated with the predominantly tuber-based local feeding culture that might have called for a hot but delicious flavoring agent, and also to supplement the starchy diet with vitamins and other nutrients. As analysis on the spice inventory result informs, spices are perhaps the most rapidly expanding items (in terms of number) used in food preparations. The expansion in the list of spices is attributed not only to adoption of those used by other cultures (the usual case) but also to a kind of invention. The use of fruits of the recently introduced peppercorn tree (*Schinus molle*) which is known for its ornamental purpose in many areas of the country, and also fruits of the rarely encountered *Solanum pseudo-capsicum* by the Kafecho suggests this.

The household importance of spices goes in parallel with their use in generating income. In some cases (e.g. *Aframomum corrorima*, *Piper capense*), market uses are known to precede household consumption. The present trend in Basketo and Kafa, however, suggests that these commodities are increasingly being commercialized. ***Kororima*** (*Aframomum corrorima*) is on the lead as the most-commercialized spice in the two areas. Under the present circumstances, the driving factors behind the increasing commercialization are local ones although globalization of markets might have acted indirectly. Interestingly, two undertakings with different motives are happening with the aim of taking advantage of economic values of spices. The first approach targets maximization of economic benefits obtained from the spice sector through enhanced production of both local spices and newly introduced ones. The ultimate objective of this is improving local livelihoods. The second approach aims at securing better remuneration for local products of which spices constitute an important part. This, in its part, aims at increasing the farmer's benefit and by so doing ensure the continuation of the link between local people and environmental resources that has existed for millennia so as to conserve biological diversity and traditional know-how.

Although it is too early to talk about the consequences of these new endeavors in concrete terms, it is possible to envisage possible positive impacts and speculate negative outcomes. Increase in garden biodiversity is the first benefit of the increased cultivation and commercialization of spices. Valorization of spices, by bringing economic reward to local farmers, can help maintain homegardens themselves in the face of expanding industrial agriculture. The other biodiversity-related impact goes beyond the garden into the other land use systems, and this particularly applies to Kafa. Increased commercialization of forest spices like *Aframomum corrorima* and *Piper capense* as well as other non timber forest products like coffee and honey will make local communities care for the forest and maintain their relation with this ecosystem. This, in turn, will contribute to the conservation of biodiversity and associated knowledge. Increase in household income is the other expected outcome and this, beyond its role in improving local livelihoods, will aid in the conservation of biodiversity by maintaining the value placed on the resource base and also by avoiding desperate resource extraction initiated by urgent need of money.

The first of the unwanted impacts of the new emphasis on spices is the threat related to monoculture. Being stimulated by the market, farmers may tend to expand spices in the garden eliminating other crops that contribute to garden diversity. However, this seems less likely to occur because of the growth conditions of most of the local spices that do well when integrated with other garden elements. The other contemplated negative impact relates to the increased incorporation of forest spices into gardens. As observation results of this study indicated, more and more people in Kafa are growing *Aframomum corrorima* and *Piper capense* in their gardens. This new trend, which is likely to continue in an increased pace, may lead to abandoning the forest or giving it a lower importance. In case this happens, the detachment will be of far reaching negative impact in light of conservation of biological diversity and associated knowledge.

Lastly, it is worth noting major threats that can have an important bearing on the traditional lifestyles of Basket and Kafecho peoples and conservation of biological diversity in their landscape. The very foundations of their identity, i.e. their worldviews, are disappearing. The traditional institutions and the resulting resource use norms are also increasingly being eroded. It is largely considered as a shameful act to entertain local world outlook-related issues even by many of the community members; and those who stick to traditional norms are forced to perform the traditional practices in a less and less public manner. Education, new religious teachings, urbanization and globalization are factors responsible for the observed erosion. The other threat pertains to homegardens on which local livelihood almost entirely relies. Because of agricultural development-related interventions, homegardens of both areas are experiencing new dynamics. ***Enset***, which has been emblematic and key of these farming units, is being replaced by crops that are valued for their immediate income generation roles (e.g. coffee). It can be seen that ***enset*** and coffee are no more genial partners, as it used to be, but have became rivals. Other crops such as yam are also subject to displacement by new and more favored plants such as fruit trees. It is, therefore, difficult to predict where the traditional homegardens of Basketo and Kafa, and also the entire landscapes are heading to if the present trend continues. A timely intervention is, therefore, crucial.

9. RECOMMENDATIONS

As can be gathered from what is presented in this thesis, conservation of biological diversity is influenced by a multitude of factors. Therefore, involvement of stakeholders from different spheres is mandatory if the intended conservation and sustainable development objectives are to be attained. On the basis of this understanding, the following recommendations are made.

The role of local people in conservation of biological diversity is recognized at the present time more than ever. Conservation behavior of local people emanates from their worldview and belief systems. Therefore it is vital to grant due recognition to such fundamental aspects of local societies in the country. Going further, it is important to design undertakings that would help in reclaiming the dying out traditional practices. Local associations, school clubs and societies of interested groups can contribute to that end.

The long-established tradition of giving emphasis to crop genetic resources without giving a comparable importance to agricultural landscapes appears not to have changed as it can be judged from documents produced by relevant organizations such as the Ethiopian Institute of Biodiversity Conservation and the Environmental Protection Authority. Traditional agricultural landscapes such as those of Basketo and Kafa are heritage sites and would possibly be designated as rural hotspots in the future. It is, therefore, necessary to give proper attention to these systems, from the national to the grassroots level, when a conservation strategy is designed or environmental assessments are conducted.

The current trend of incorporating more new crops into the homegarden and also unusual expansion of some elements can drastically alter the structure and composition of these gardens. This, in turn, may lead to complete loss of the sustainability feature of homegardens exposing the local people to unexpected disaster. It is the responsibility of the concerned bodies, particularly the Agriculture and Rural Development Offices at all levels, to make an assessment of the likely impacts before promoting introductions and also conduct continuous monitoring. The issue of ***enset*** is becoming critical not only because of its `displacement by coffee but also its devastation by mole attack and bacterial wilt. The first question a researcher who wants to work in a farmer's garden would face is about the hope of getting a remedy to these problems. Farmers are getting frustrated since they didn't thus far see any solution to the problems that plague their most important crop. If things continue the same way, the interaction with farmers would sour leading to complete lack of interest to cooperate in studies. The issue, therefore, must be put in the top priority list by concerned research and academic institutions particularly the Ethiopian Agricultural Research Organization.

Enhanced production and commercialization of spices has to be encouraged. However, the approach need not be only market-oriented but has to include also conservation theme. In this regard, the attempt to introduce Geographical Indications system in the country is a promising beginning and other such protection tools have to be considered.

Kororima will play a crucial role in attaining the intended economic and environmental sustainability. One of the problems associated with cultivation of this plant is obtaining planting material. Propagating the resource plant from seeds is a potential solution. The benefit of propagating the resource plant by seed is of twofold: sufficient availability of planting material and also enhancing genetic exchange that would create variability. It is, therefore, necessary to develop a method that does not only improve germination potential of ***kororima*** but that can also be used at farmer's level. Smoke-drying of Kafa ***kororima*** may cause an impact on the surrounding vegetation as the amount of production increases since much firewood is going to be required. It is important to come up with a new drying method although this may change the quality mark (fruit wall color) of the product. In both Basketo and Kafa, mechanisms that increase the benefit sharing of farmers such as encouraging them to provide value added products need to be considered.

Finally, it can not be claimed that this study is a complete one but it lays the stepping stones for future studies. Further investigation on emic taxonomic systems, socio-cultural aspects and landscape dynamic will hopefully generate additional information.

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11. APPENDICES

Appendix 1a Local plant *generics* recorded from Basketo homegardens and their distribution in use-based categories (F=***Fiishi***/Food, S=***Sawubaz***/Spice, G=***Gaalla***/Medicine, K'=***K'oysisandabo***/Ornamental, Ss=***Sawk'sandabo***/Perfume, Ks=***Kaashabo-shiishire***/Thanksgiving offering, I= ***Inni-mahazinddo***/Thirst-quenching, Kw=***Keets'andabo-wogintsine***/Construction material, M= ***Mella/*** Others

			Use-based categories								
	***Generic* name**	**Scientific name**	**F**	**S**	**G**	**K'**	**Ss**	**Ks**	**I**	**Kw**	**M**
1	***Ababa I***	*Euphorbia cotinifolia*									√
2	***Ababa II***	*Euphorbia pulcherrima*				√					
3	***Ababa III***	*Iresine herbstii*				√					
4	***Abokaada***	*Persea americana*	√								√
5	***Alga***	*Clerodendrum myricoides*								√	√
6	***Ambba***	*Terminalia schimperiana*									√
7	***Ananas***	*Ananas comosus*	√								√
8	***Appil***	*Malus sylvestris*	√								√
9	***Arfiti-dona***	*Plectranthus edulis*	√								√
10	***Asa-buurs***	*Echinops kebericho*			√						
11	***Ashk-mits***	*Ficus palmata*									√
12	***Baabints/Baabintsa***	*Tetradenia riparia*									√
13	***Bakra***	*Ocimum basilicum* var. *basilicum*		√							
14	***Balʔa***	*Macaranga capensis*								√	
15	***Barbara/C'ork'a***	*Capsicum annuum*		√							√
16	***Barzaf***	*Eucalyptus tereticornis*					√			√	√
17	***Bata***	*Croton macrostachyus*			√		√			√	√
18	***Bidir***	*Cyperus sp.*			√						
19	***Birik'a***	*Physalis peruviana*	√								
20	***Bollibuy/Bollibola***	*Dioscorea bulbifera*	√		√						
21	***Bootsgalla***	*Trachyspermum ammi*		√							√
22	***Bora/Bori***	*Erythrina abyssinica*									√
23	***Botaya/Botay***	*Cucurbita pepo*	√								√
24	***Bulbula***	*Solanum sp.*	√								
25	***Buna***	*Coffea arabica*	√						√		√
26	***Bunibolla/ Buuribukka***	*Galiniera saxifraga*								√	
27	***Bursa/Burs***	*Echinops amplexicaulis*			√						√
28	***Burtukaana***	*Citrus sinensis*	√								√
29	***Buuringa***	*Pavetta oliveriana*									√
30	***Buuy***	*Dioscorea sp.*	√								√
31	***C'awla***	*Vepris dainellii*		√	√						√
32	***C'ima/C'aata***	*Catha edulis*			√				√		√
33	***C'olk'a***	*Rumex abyssinicus*		√							
34	***C'uk'un'a***	*Artemisia abyssinica*		√	√						√
35	***C'ursha***	*Sida rhombifolia*									√
36	***Damppa***	*Nicotiana tabacum*			√				√		√
37	***D'angra***	*Combretum collinum*								√	

Appendix 1a (continued)

	Generic name	Scientific name	Use-based categories								
			F	S	G	K’	Ss	Ks	I	Kw	M
38	***Dawri-naatir/ Koddi-genne***	*Artemisia afra*		√	√	√	√				√
39	***Deebba***	*Coriandrum sativum*		√							√
40	***Dek'etsa***	*Fagaropsis angolensis*			√						√
41	***Diima***	*Trichilia dregeana*								√	√
42	***Dona***	*Ipomoea batatas*	√								
43	***Dublbbul-dona/ Dinichcha***	*Solanum tuberosum*	√								√
44	***Dunkka***	*Ocimum basilicum* var. *thyrsiflorum*					√				√
45	***Eelints / Mithi-shetera II***	*Cajanus cajan*	√								
46	***Ertsertsa***	*Vernonia theophrastifolia*									√
47	***Faara/Suufa***	*Helianthus annuus*	√								√
48	***Faranj-ingra***	*Cupressus lucitanica*				√				√	√
49	***Faranj-tumtuma/ mithi-tumtuma***	*Cyphomandra betacea*	√								
50	***Fuutta***	*Gossypium sp.*									√
51	***Gara***	*Vernonia amygdalina*			√		√				√
52	***Garabuza/Buza***	*Vernonia hymenolepis*									√
53	***Geesha/Kulum***	*Rhamnus prinoides*									√
54	***Gembel***	*Gardenia ternifolia*									√
55	***Gisht'a***	*Annona cherimola*	√							√	√
56	***Goss***	*Hordeum vulgare*	√								√
57	***Grabiila***	*Grevillea robusta*									√
58	***Halakka***	*Moringa stenopetala*	√								
59	***Ingra***	*Juniperus procera*								√	√
60	***Irdda***	*Curcuma domestica*		√							√
61	***Ishma***	*Clausena anisata*			√					√	√
62	***K'aacgaalla***	*Chenopodium procerum*			√						
63	***Kaarot***	*Daucus carota*	√								√
64	***Kabba***	*Zea mays*	√								√
65	***Kalsha***	*Polyscias fulva*								√	
66	***Karetsgalla***	*Nigella sativa*		√							√
67	***K'ark'ara***	*Schrebera alata*								√	
68	***Katkaalla/Insilaala***	*Foeniculum vulgare*		√	√						√
69	***K'aysha***	*Triumfetta brachyceras*									√
70	***K'aysira***	*Beta vulgaris*	√								
71	***Kazmir***	*Casimiroa edulis*	√								
72	***K'its'***	*Ocimum lamiifolium*			√						
73	***Kochchi/Goys***	*Lagenaria siceraria*									√
74	***K'omla***	*Vicia faba*	√								√
75	***K'onts'ira***	*Caesalpinia decapetala*									√
76	***Kooka/Fruntush***	*Passiflora edulis*	√								√
77	***Kordda***	*Kalanchoe petitiana var. petitiana*						√			
78	***K'ost'a***	*Beta vulgaris*	√								√

Appendix 1a (continued)

	Generic name	Scientific name	Use-based categories								
			F	S	G	K’	Ss	Ks	I	Kw	M
79	***Looma***	*Citrus aurantifolia*	√				√				√
80	***Loomaka/Loomacha***	*Garcinia buchananii*	√								√
81	***Maara***	*Ficus ovata*								√	√
82	***Mahmacha***	*Cymbopogon citratus*		√	√		√				
83	***Manggo***	*Mangifera indica*	√								√
84	***Mara***	*Albizia schimperiana*									√
85	***Mayts'***	*Brassica oleracea,* *Brassica carinata*	√								√
86	***Meets'a***	*Phoenix reclinata*									√
87	***Mitsi-buuy***	*Manihot esculenta*	√								√
88	***Mits'mit'sa***	*Capsicum frutescens*		√							√
89	***Moha***	*Cordia africana*								√	√
90	***Moss***	*Sorghum bicolor*	√								√
91	***Muuza***	*Musa paradisiaca*	√								√
92	***Muzga***	*Premna schimperi*			√						√
93	***Naana***	*Mentha spicata*		√	√					√	
94	***Naattira***	*Artemisia absinthium*			√	√	√				√
95	***Och/Ocha***	*Syzyygium guineense*	√							√	√
96	***Ochooloni***	*Arachis hypogea*	√								√
97	***Oha***	*Acanthus pubescens*									√
98	***Okasha/Koroorima***	*Aframomum corrorima*		√	√						√
99	***Olma***	*Pycnostachys abyssinica*			√						√
100	***Ols/Olsa***	*Ekebergia capensis*								√	
101	***Ook'intsa***	*Prunus africana*					√			√	√
102	***Paapaya***	*Carica papaya*	√								√
103	***Salits'a***	*Sesamum orientale*	√								√
104	***Sanaafic'***	*Brassica nigra*		√							
105	***Sasbaana***	*Sesbania sesban*									√
106	***Shaagiz'***	*Ficus thonningii*									√
107	***Shaash/Shaasha***	*Lippia adoensis var. adoensis*					√	√		√	
108	***Sherkka***	*Colocasia esculenta,* *Xanthosoma saggitifolium*	√								√
109	***Shetera***	*Phaseolus vulgaris, Phaseolus lunatus, Vigna unguiculata*	√								√
110	***Shita/Mashmits***	*Celtis africana Burm.*									√
111	***Shombok'a***	*Arundo donx*								√	√
112	***Shonkora***	*Saccharum officinarum*	√								√
113	***Shuk'a/Abusha***	*Trigonella foenum-graecum*		√							√
114	***Shunkurtta***	*Allium cepa*		√							√
115	***Shuwshuwe***	*Casuarina sp.*								√	√
116	***Sibikka/Feets'a***	*Lepidium sativum*		√	√						√
117	***Siisa***	*Entada abyssinica*			√						√
118	***Suuliya***	*Amaranthus caudatus*			√						
119	***Talbba***	*Linum usitatissimum*	√		√						√
120	***Tamagaalla***	*Aloe macrocarpa*			√						

Appendix 1a (continued)

	Generic name	Scientific name	Use-based categories								
			F	**S**	**G**	**K’**	**Ss**	**Ks**	**I**	**Kw**	**M**
121	***Terkka***	*Maesa lanceolata*								√	√
122	***Tilma***	*Solanecio mannii*									√
123	***Tiyacha***	*Cleome gynandra*	√								
124	***Ts'altta***	*Ruta chalepensis*		√	√						√
125	***Ts'ek'am***	*Ricinus communis*			√						√
126	***Ts'iqilgomen***	*Brassica oleracea*									√
127	***Ts'oha***	*Dracaena steudneri*									√
128	***Tumtuma***	*Lycopersicon esculentum*	√								√
129	***Turungga***	*Citrus medica*	√					√			√
130	***Tuuma***	*Allium sativum*		√	√						√
131	***Uuts/Uutsa***	*Ensete ventricosum*	√			√					√
132	***Uutsaafo***	*Canna indica*									√
133	***Waasha***	*Dracaena fragrans*									√
134	***Waatsi-etsa/Etsa***	*Ficus sur*									√
135	***Wola***	*Ficus vasta*								√	√
136	***Wooshi/Woosha***	*Arundinaria alpina*								√	√
137	***Wusisa***	*Indigofera arrecta*			√						
138	***Wuuzinga***	*Sapium ellipticum*								√	√
139	***Yiiringa***	*Pisum sativam*	√								√
140	***Zaaga***	*Milletia ferruginea*			√		√			√	√
141	***Z'alma***	*Zingiber officinale*		√							√
142	***Z'ankarsha***	*Olea welwitschii*					√			√	
143	***Zargi***	*Triticum sp.*	√								√
144	***Zaytuna***	*Psidium guajava*	√								√
145	***Ziga***	*Podocarpus falcatus*				√				√	√
146	***Zimpad'a***	*Thymus schimperi*		√			√				√
147	Unnamed I	*Artemisia annua*		√							
148	Unnamed II	*Lupinus albus*	√								

Appendix 1b Local plant *generics* recorded from Kafa homegardens and their distribution in use-based categories (M= ***Maayo****/Food, S=****Shawujoch****/Spice, A=* ***Atto****/Medicine, G=****Gawuchoch****/Ornamental, C=* ***C'inno****/Perfume, K'=* ***K'oolle-deejjo****/Thanksgiving offering, N=****Nuusho-kichoch****/Thirst-quenching, K=* ***Kechi-haggoch****/Construction material, B=****Barooch****/Others*)

	Generic name	Scientific name	Use-based categories								
			M	S	A	G	C	K'	N	K	B
1	***Aaʔafo***	*Nigella sativa*		√							√
2	***Aaʔmac'o***	*Artemisia afra*			√	√					√
3	***Aaʔmato***	*Psychotria orophila*						√			√
4	***Aato***	*Vicia fuba*	√								√
5	***Ababo***	*Canna indica, Euphorbia cotinifolia, Iresine herbstii, Datura innoxia*				√					√
6	***Acho/Gawusho***	*Solanum americanum*	√		√						
7	***Aggiyo***	*Clerodendrum myricoides*			√					√	√
8	***Ajjoo***	*Coccinia abyssinica*	√								√
9	***Ambaat'o/ Ambaad'o***	*Rumex abyssinicus*			√						
10	***Amblaacho/ Addeche-atto***	*Verbena officinalis*			√						
11	***Amichi-attoo/ Gergech-atto***	*Persicaria senegalensis*			√						
12	***Ammitiballo***	*Solanecio mannii*			√						√
13	***Anaanaso***	*Ananas comosus*	√								√
14	***Ataro***	*Pisum sativam*	√								√
15	***Avokaado***	*Persea americana*	√								√
16	***Baaroo/Amaraggo***	*Zea mays*	√								√
17	***Baggo***	*Combretum paniculatum*									√
18	***Baro***	*Capsicum annuum*		√							√
19	***Bare-ak'ayo***	*Solanum pseudo-capsicum*		√							
20	***Barzaafo***	*Eucalyptus sp.*				√				√	√
21	***Bayro***	*Paullinia pinnata*								√	√
22	***Bero***	*Erythrina abyssinica*									√
23	***Beesho/Bucho***	*Cyperus fischerianus*					√	√			√
24	***Bibbero***	*Milletia ferruginea*			√		√			√	√
25	***Bic'erguc'o***	*Turraea holstii*								√	√
26	***Book'o***	*Bersama abyssinica*								√	√
27	***Boto***	*Lagenaria siceraria*									√
28	***Bulo***	*Solanum sp.*	√								
29	***Buno***	*Coffea arabica*	√						√	√	√
30	***Buk'o***	*Cucurbita pepo*	√								√
31	***Burttukaano***	*Citrus sinensis*	√								√
32	***Buto***	*Schefflera abyssinica*								√	√
33	***C'aaro***	*Ficus Sur*								√	√
34	***C'aato***	*Catha edulis*			√				√		√
35	***C'aatto***	*Albizia schimperiana*								√	√
36	***C'addiraamo***	*Ruta chalepensis*		√	√	√	√				√
37	***C'aggo***	*Maesa lanceolata*								√	√

Appendix 1b (continued)

	Generic name	Scientific name	Use-based categories								
			M	S	A	G	C	K'	N	K	B
38	***C'ap'ero/Ooppo***	*Ficus ovata*									√
39	***C'iko/Wundifo***	*Apodytes dimidiata*					√			√	
40	***Daammo***	*Ocimum lamiifolium*			√						
41	***Daggicho***	*Celosia trigyna*									√
42	***Dangiretto***	*Vernonia auriculifera*									√
43	***Deebboo***	*Coriandrum sativum*		√	√						√
44	***Dicho***	*Aeollanthus densiflorus*					√				√
45	***Digic'o***	*Calpurina aurea*			√						√
46	***Diibo***	*Rothmannia urcelliformis*									√
47	***Diido***	*Galiniera saxifraga*								√	√
48	***Diik'o***	*Sorghum bicolor*	√								√
49	***Diiro***	*Ocimum basilicum* var. *thyrsiflorum*				√	√				
50	***Diʔo***	*Cordia africana*								√	√
51	***Dinger-atto/ Dinger-giraaro***	*Senna septemtrionalis*			√						
52	***Dok'o***	*Ipomoea batatas, Solanum tuberosum*	√								√
53	***Duuk'isho***	*Allium cepa, Allium sativum*		√	√						√
54	***Emo***	*Dracaena fragrans*									√
55	***Faranjji-c'iido***	*Cupressus lucitanica*				√					√
56	***Faranjji-kooko***	*Passiflora edulis*	√			√					
57	***Gaahijjo/ Sharshecho***	*Pavonia urens*									√
58	***Gaashigaano***	*Tristemma mauritianum*	√								
59	***Gaasho***	*Eragrostis tef*	√								√
60	***Gabo***	*Trilepisium madagascariense*								√	
61	***Gachchoo***	*Euphorbia ampliphylla*								√	√
62	***Garoo I***	*Caesalpina decapetala*									√
63	***Geello***	*Entada abyssinica*									√
64	***Geeshoo/Get'o***	*Rhamnus prinoides*									√
65	***Girawo***	*Vernonia amygdalina*			√					√	√
66	***Girabiilo***	*Grevillea robusta*								√	
67	***Gisht'o***	*Annona cherimola*	√								√
68	***Gizayo***	*Withania somnifera*			√						
69	***Gobbo***	*Phaseolus vulgaris, Phaseolus lunatus, Cajanus cajan, Vigna unguiculata*	√								√
70	***Goddo***	*Artemisia absinthium*				√	√	√			√
71	***Gorecho***	*Rumex nepalensis*			√						
72	***Guc'ino***	*Carduus leptacanthus*			√						
73	***Heelo***	*Elettaria cardamomum*		√							√
74	***Humo***	*Flacourtia indica*									√
75	***Hup'icho I***	*Laggera crispata*		√							
76	***Hup'icho II***	*Physalis peruviana*	√								
77	***Imbric'o***	*Clausena anisata*			√		√			√	√

Appendix 1b (continued)

	Generic name	Scientific name	Use-based categories								
			M	S	A	G	C	K'	N	K	B
78	***Irddo***	*Curcuma domestica*		√							√
79	***Kaaffaaro/Ataaro***	*Buddleja polystachya*								√	√
80	***K'ac'emmitobbo***	*Kalanchoe petitiana var. petitiana*			√						
81	***Kac'ino***	*Albizia gummifera*									√
82	***K'ammo***	*Rhus ruspolii*								√	√
83	***Kareshoo***	*Polyscias fulva*								√	√
84	***K'ap'ero/ K'ap'erecho***	*Echinops kebericho*			√						√
85	***K'arero***	*Pouteria adolfi-friederici*								√	√
86	***Karooto***	*Daucus carota*	√								√
87	***K'aysiro***	*Beta vulgaris*	√								√
88	***Kefo***	*Ocimum basilicum* var. *basilicum*		√							√
89	***K'eto***	*Ilex mitis*									√
90	***K'iiddo***	*Colocasia esculenta, Xanthosoma saggitifolium*	√								√
91	***Kollaacho***	*Erythrina brucei*								√	√
92	***Kooko***	*Cyphomandra betacea*	√								
93	***Kooso***	*Hagenia abyssinica*			√						√
94	***Koshereto***	*Lippia adoensis var. koseret*		√			√	√			
95	***K'ost'o***	*Beta vulgaris*	√								√
96	***Kooyo***	*Albizia grandibracteata*								√	
97	***K'umbaafo***	*Solanum dasyphyllum*									√
98	***K'undobarbaro***	*Schinus molle*		√							
99	***Kuro***	*Diospyros abyssinica*									√
100	***Loomo***	*Citrus aurantifolia*			√		√				√
101	***Maango***	*Mangifera indica*	√								√
102	***Mac'ollaaggo***	*Foeniculum vulgare*		√	√						√
103	***Meello***	*Ficus vasta*				√		√			√
104	***Mengret'o***	*Vepris dainellii*									√
105	***Michi-ooc'ino/ Kechi***	*Manihot esculenta*	√								√
106	***Mit'mit'e/Mit'o***	*Capsicum frutescens*		√							√
107	***Muutto***	*Linum usitatissimum*	√								√
108	***Muuzo***	*Musa paradisiaca*	√								√
109	***Naanayo***	*Mentha spicata*		√							√
110	***Najjo***	*Ocotea kenyensis*								√	√
111	***Nat'aacho***	*Rytigyina negelecta*								√	√
112	***Niim***	*Azadirachta indica*									√
113	***Nuuk'ishoo***	*Brucea antidysenterica*			√						√
114	***Ooc'ino***	*Dioscorea sp.*	√								√
115	***Oofiyo/Oogiyo***	*Aframomum corrorima*		√							√
116	***Oomo***	*Prunus africana*								√	√
117	***Orooro***	*Ekebergia capensis*								√	√
118	***Paappayo***	*Carica papaya*	√								√
119	***P'iiƻo***	*Hippocratea africana*								√	

Appendix 1b (continued)

	Generic name	Scientific name	Use-based categories								
			M	S	A	G	C	K’	N	K	B
120	***Poomo***	*Malus sylvestris*	√								
121	***Rozmaro***	*Rosmarinus officinalis*		√							
122	***Shaano***	*Brassica carinata, Brassica oleracea, Raphanus sativus*	√								√
123	***Shakkero***	*Macaranga capensis*								√	√
124	***Sharsharo/ Sharsha'o***	*Justicia schimperiana*			√					√	
125	***Sheddo***	*Sapium ellipticum*								√	√
126	***Sheeƀ***	*Allophylus abyssinicus*								√	√
127	***Sheeshino***	*Cyathea manniana*								√	√
128	***Sheetto***	*Indigofera arrecta, Sida rhombifolia*									√
129	***Shenaafo***	*Brassica nigra*		√							√
130	***Shek'o***	*Hordeum vulgare*	√								√
131	***Shiishimmo***	*Acmella caulirhiza*			√						
132	***Shiit'o***	*Amorphophallus gallaensis*									√
133	***Shikko***	*Maytenus gracilipes*									√
134	***Shinaato***	*Arundinaria alpina*								√	√
135	***Shiip'o***	*Sorghum bicolor*	√								√
136	***Shombok'o***	*Arundo donx*								√	√
137	***Shonkooro***	*Sacccharum officinarum*	√								√
138	***Shoollo***	*Pittosporum viridiflorum*								√	√
139	***Shooto***	*Acacia pilispina*									√
140	***Shooteppo***	*Ficus palmata*			√						√
141	***Shuukindo***	*Artemisia abyssinica*			√						
142	***Shuuri-atto I***	*Geranium arabicum*			√						
143	***Shuuri-atto II***	*Pilea rivularis*			√						
144	***Shuwshuwe***	*Casuarina sp.*									√
145	***Spatooda***	*Spathodea campanulata*									√
146	***Sufo***	*Amaranthus hybridus*	√								
147	***Suufoo***	*Helianthus annuus*	√								√
148	***Tasbaano***	*Sesbania sesban*									√
149	***Teep'o***	*Triticum sp.*	√								√
150	***T'eho/T'esso/ T'echo***	*Ricinus communis*								√	√
151	***T'igaago***	*Ficus thonningii*									√
152	***Timaatimo***	*Lycopersicon esculentum*	√								√
153	***Togo***	*Dicliptera laxata*			√						
154	***Tojjo***	*Peponium vogelii*	√								
155	***Toocho***	*Cymbopogon citratus*		√	√	√					√
156	***Tumbaaƀ***	*Nicotiana tabacum*			√				√		√
157	***T'umo***	*Premna schimperi*								√	
158	***Turfo***	*Piper capense*		√							√

Appendix 1b (continued)

	***Generic* name**	**Scientific name**	**Use-based categories**								
			M	**S**	**A**	**G**	**C**	**K’**	**N**	**K**	**B**
159	***Turijjo/ Nacce-oollo***	*Vernonia hymenolepis*	√								
160	***Turunggo***	*Citrus medica*	√		√						√
161	***Tushumo***	*Pavetta abyssinica*									√
162	***Ufo I***	*Celtis africana*								√	√
163	***Ufo II***	*Asparagus racemosus*			√						√
164	***Uuch-atto***	*Scadoxus multiflorus*			√						
165	***Uullulloo/ Burbbusho***	*Lucas martinicensis*					√				
166	***Uut'o***	*Ensete ventricosum*	√			√					√
167	***Waago***	*Croton macrostachyus*			√					√	√
168	***Waasho***	*Elaeodendron buchananii*									√
169	***Woc'o***	*Thymus schimperi*		√							√
170	***Wogaammo***	*Ehretia cymosa*								√	√
171	***Wokko***	*Dioscorea bulbifera*	√								√
172	***Yaayo***	*Fagaropsis angolensis*		√	√					√	
173	***Yaho***	*Olea welwitschii*								√	√
174	***Yango***	*Sorghum bicolor*	√								√
175	***Yanjiballo***	*Zingiber officinale*		√	√						√
176	***Yak'aallo***	*Ocimum gratissimum*			√						
177	***Yeemo***	*Landolphia buchananii*									√
178	***Yebbo***	*Phoenix reclinata*								√	√
179	***Yeʔero***	*Pycnostachys abyssinica*			√						√
180	***Yingaamo***	*Phytolacca dodecandra*									√
181	***Yino***	*Syzygium guineense*						√		√	√
182	***Yoocho***	*Chenopodium procerum*			√						
183	***Yumbroaʔo***	*Momordica foetida*									√
184	***Yuddo***	*Dracaena steudneri*									√
185	***Zaytuuno***	*Psidium guajava*	√								√

Appendix 2a Polytypic local *generics* of Basketo homegardens

Local *generic* name	**Scientific name**	**Local *specific* name**	**Local *varietal* name**
Botaya/Botay	*Cucurbita pepo*	***D'eedda***	
		Zoldda / Goldda	
		Gara	
		Shoojja	
Buna	*Coffea arabica*	***Goraz***	
		Ordda	
		Zangga	
Buuy	*Dioscorea sp.*	***Aats'ia***	
		Afri	
		Ayna	
		Baassa	
		Beez	
		Busup'	
		Dorts'a	
		Duurundufa	
		Gaara-gandifa	
		Gandifa	
		Gebsha	
		Gossa	
		Kaatayna	
		Kani-ts'ussa	
		Mac'ibuy	
		K'eqila	
		Sasa	
		Waathayna	
		Wolgidi	
		Yesha	
Dona	*Ipomoea batatas*	***Faaʔa***	
		Gad/Gadi	
Mayts'	*Brassica oleracea, Brassica carinata*	***Dood'a***	
		Godi	
		Lemats	
		Seella	

Appendix 2a (continued)

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Moss	*Sorghum bicolor*	***Delkka***	
		Bazira	
		Gembba (Bolosa)	
		Gersha	
		Baskit	
		Delgga	
		Domʔa	
		Dulk'a	
		Ordda	
		P'eqila	
		Silddimaldda	
		Zangga	
Muuza	*Musa paradisiaca*	***Asmara***	
		Gad/Gadi	
		Kenya	
Sherkka	*Colocasia esculenta, Xanthosoma saggitifolium*	***Bunchira***	
		C'ula	
		Dabbidoolla	
		Duuddana	
		Dooriya	
		Gabidda	
		Gara	
		Gooba	
		Fila	
		Siik'a	
		Umshich	
		Zaydi-gobitsa	
Shetera	*Phaseolus vulgaris, Phaseolus lunatus, Vigna unguiculata*	***Awu-laalintsa***	
		Mitsi-shetera	
		Saad	
		Zawdita	
		Zabarssi	
Shonkkora	*Saccharum officinarum*	***Gad/Gadi***	
		Wonjja	

Appendix 2a (continued)

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Uuts/Uutsa	*Ensete ventricosum*	***Aflaara***	
		Alkka	
		Ankima	
		Baabsul	
		Borgada	
		Brik'a	
		Buukuma/Buuhuma	***Aach-buukuma***
			Kaati-buukuma
			Zinkki-bukuma
		Dimutsa/Gadima	
		Gaarats'a	
		Gaayaka	
		Geenna	
		Gubaaka	
		Gurk'um	
		Juura/Daathi-k'andda	
		Kaak'a	
		Maak'a	
		Mashmeitsa	
		Oppa	
		Oysa	
		Osad'a	
		K'arqara	
		K'artta	
		K'iippila	
		Ts'obaaka	
		Worjjamacha	
		Zinkka	***Zinkka***
			Kaati-zinkka

Appendix 2b Polytypic local *generics* of Kafa homegardens

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Ababo	*Canna indica, Euphorbia cotinifolia, Iresine herbstii, Datura innoxia*	***C'eelle-ababoo I***	
		C'eelle-ababoo II	
		C'eelle-ababoo III	
		Moon'e-ababo	
Baro	*Capsicum annuum*	***Guc'o***	
		Koloso	
Buk'o	*Cucurbita pepo*	***Gewe-buk'o***	
		Kote-buk'o	
		Yuure-buk'o	
Dichoo	*Aeollanthus densiflorus*	***Nac'e-dicho***	
Dok'o	*Ipomoea batatas, Solanum tuberosum*	***Ceelle/Gibrinne-dok'o***	
		Nooc''e dok'o	
		Goojjam-dok'o	
Duuk'isho	*Allium cepa, Allium sativum*	***Ceelle-duuk'isho***	
		Nac'e-duuk'isho	
Gobbo	*Phaseolus vulgaris, Phaseolus lunatus, Cajanus cajan, Vigna unguiculata*	***Gobello/ Gombelli-gobbo***	
		Kotegobboo	
		Michi-gobboo/Michi-mihato	
		Akuri-gobbo	
		Woho	
Muuzo	*Musa paradisiac*	***Kafi/Habasho***	
		Keeniyo	
		Mizan/Dinko	
Ooc'ino	*Dioscorea sp.*	***Booye***	
		Daano	
		Shallo	
		Wooyeto	
		Zelo	
K'iiddo	*Colocasia esculenta, Xanthosoma saggitifolium*	***Gibrinne-k'iiddo***	
		Kafi-k'iiddo	***Nacco***
			Shimero
			Yiitiro
		Sudaan-k'iiddo/ Miizan-k'iiddo	

Appendix 2b (continued)

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Uut'o	*Ensete ventricosum*	***Aakkibaro***	
		Arekko	***C'eelle-arekko***
			C'iiki-arekko
			C'oba-arekko
			Nacce-arekko
		Adellibocho	
		Ageno	
		Atere	
		Badaado/Bado	
		Bajjo	***Aaƛ-bajjo***
			Ceelle-bajjo
			Nacce-bajjo
			Yaahe-bajjo
		Bocho	***Aaƛ-bocho***
			Addellibocho
			Bok'elle-bocho
			C'eelle-bocho
			Ganjji-bocho
			Kec'e-bocho
			Manjji-bocho/Manjjwo
			Nac'e-bocho
		Bongo	
		Bot'echo/Bod'ibocho	
		Bumbbo	
		Bushiro	
		Butecho	
		C'aggecho	
		C'ammero	
		C'onggo	
		C'oomijjo	
		Coora-k'ayo/C'ooro	
		Dabiyo	
		Diik'i	
		Eppecho	
		Eppo	
		Gajjo	
		Gayo	
		Geno	
		Genjjo	
		Gigibbo	
		Gink'aayo	
		Gooshinddo	
		Gosheno	
		Gushiro	

Appendix 2b (continued)

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Uut'o (contd.)	*Ensete ventricosum*	***Guu'iro***	
		Hic'ewo	
		Kallo	
		Koremmo	
		Maac'a-damo	
		Maattechcho	
		Mac'koto	
		Maddi	
		Mashengo	
		Mecho	
		Mishiko	
		Mishk'o	
		Moocho	
		Niik'o	
		Noobo	***C'eelle-noobo***
			Dawri-noobo
			Manjji-noobo
			Nac'e-noobo
		Oomo	
		K'eek'ero	
		K'oc'e-taato	
		K'up'o	
		Shallaakko	
		Sharkosho	
		Shimmo	
		Shit'eno	
		Shoto	
		Shuboo	
		Shuuri-uut'o	
		Taayo	
		Tambbo	
		Taraallo/Bumbbi	
		Topacho	
		Tuutto	
		Tuusho	
		Uka	
		Uutiro/Uutino	
		Wanggo	
		Wuʔiro	
		Yak'o	
		Yeebbeno/Aachecho	
		Yudaafo	

Appendix 2b (continued)

Local *generic* name	Scientific name	Local *specific* name	Local *varietal* name
Shaano	*Brassica carinata, Brassica oleracea, Raphanus sativus*	***Dawrechche/ Dawri-shaanoo***	
		Koyoo	
		Nac'e-shaanoo	
		Shokko	
		K'odhe-shaano / T'iqilgomano	
Sheetto	*Indigofera arrecta, Sida rhombifolia*	***C'eelle-sheetto***	
		Nac'e-sheetto	
Shonkooro	*Sacccharum officinarum*	***C'eello***	
		Nac'o	
		Shinaati	
Yango	*Sorghum bicolor*	***Budeello***	
		Daap'o	
		Daliilo	
		Derkamo	
		Hanc'ero	
		K'uliche	
		Shosha	

Appendix 3 List of plant species recorded from Basketo and Kafa (HG=recorded from homegardens, OLUS=recorded from other land use systems)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
1	*Acacia pilispina* Pic.-Serm.	Fabaceae			√		FW185
2	*Acanthus pubescens* (Oliv.) Engl.	Acanthaceae	√	√			FW406
3	*Acmella caulirhiza* Del.	Asteraceae			√		FW457
4	*Aeollanthus densiflorus* Ryding	Lamiaceae			√		FW195
5	*Aframomum corrorima* (Braun) Jansen	Zingiberaceae	√	√	√	√	FW254,302
6	*Alangium chinense* (Lour.) Harms	Alangiaceae				√	FW392
7	*Albizia grandibracteata* Taub.	Fabaceae			√	√	FW391,466
8	*Albizia gummifera* (J. F. Gmel.) C. A. Sm.	Fabaceae			√		FW343
9	*Albizia schimperiana* Oliv.	Fabaceae	√	√	√	√	FW149,418
10	*Allium cepa* L.	Alliaceae	√		√		
11	*Allium sativum* L.	Alliaceae	√		√		
12	*Allophylus abyssinicus* (Hochst.) Radlk.	Sapindaceae			√	√	FW354
13	*Aloe macrocarpa* Tod.	Aloaceae	√				FW314
14	*Amaranthus caudatus* L.	Amaranthaceae	√				FW178
15	*Amaranthus hybridus* L.	Amaranthaceae			√		FW370
16	*Amorphophallus gallaensis* (Engl.) N. E. Br.	Araceae			√	√	FW340
17	*Ananas comosus* (L) Merr.	Bromeliaceae	√		√		
18	*Annona cherimola* Mill.	Annonaceae	√		√		FW323
19	*Annona senegalensis* Pers.	Annonaceae		√			FW278
20	*Apodytes dimidiata* E. Mey. ex Arn.	Icacinaceae		√	√	√	FW386,421
21	*Arachis hypogea L.*	Fabaceae	√				
22	*Artemisia absinthium* L.	Asteraceae	√		√		FW196
23	*Artemisia abyssinica* Sch. Bip ex A.Rich.	Asteraceae	√		√		FW192,203
24	*Artemisia afra* Jack. Ex Wild.	Asteraceae	√		√		FW191
25	*Artemisia annua* L.	Asteraceae	√				FW172
26	*Arundinaria alpina* K. Schum.	Poaceae	√	√	√	√	
27	*Arundo donax* L.	Poaceae	√		√		
28	*Asparagus africanus* Lam.	Asparagaceae				√	FW387
29	*Asparagus racemosus Willd.*	Asparagaceae			√		FW318
30	*Aspilia mossambicensis* (Oliv.) Wild.	Asteraceae		√		√	FW266,385
31	*Azadirachta indica* A. Juss.	Meliaceae			√		FW346
32	*Berkheya spekeana* Oliv.	Asteraceae		√			FW289,416
33	*Bersama abyssinica* Fresen.	Melianthaceae		√	√	√	FW375,
34	*Beta vulgaris* L.	Chenopodiaceae	√		√		
35	*Brassica carinata* A.Br.	Brassicaceae	√		√		FW209,328
36	*Brassica nigra* (L.) Koch.	Brassicaceae	√		√		
37	*Brassica oleracea* L.	Brassicaceae	√		√		
38	*Bridelia scleroneura* Muell. Arg.	Euphorbiaceae		√			FW269,452
39	*Brucea antidysenterica* J.F.Mill.	Simarubaceae			√	√	FW374
40	*Buddleja polystachya* Fresen.	Loganiaceae			√		FW181,456
41	*Caesalpina decapetala* (Roth.) Alston	Fabaceae	√		√		FW431,463
42	*Cajanus cajan* (L.) Millsp.	Fabaceae	√		√		

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
43	*Calpurina aurea* (Ait.) Benth.	Fabaceae			√		FW351
44	*Canna indica* L.	Cannaceae	√		√		
45	*Canthium oligocarpum* Hiern.	Rubiaceae				√	FW167,369
46	*Capsicum annuum* L.	Solanaceae	√		√		
47	*Capsicum frutescens* L.	Solanaceae	√		√		FW237
48	*Carduus leptacanthus Fresen.*	Asteraceae			√		FW357
49	*Carica papaya* L.	Caricaceae	√		√		
50	*Casimiroa edulis* La llave	Rutaceae	√				
51	*Cassipourea malosana* (Baker) Alston	Rhizophoraceae				√	FW472
52	*Casuarina sp.*	Casuarinaceae	√		√		FW213
53	*Catha edulis* (Vehl.) Forssk. ex Endl.	Celastraceae	√	√	√	√	
54	*Celosia trigyna* L.	Amaranthaceae			√		FW329
55	*Celtis africana* Burm. F.	Ulmaceae	√	√	√	√	FW223,422
56	*Chenopodium procerum* Moq.	Chenopodiaceae	√		√		FW184,326
57	*Chionanthus milddbraedii* (Gilg & Schellenb.) Stern	Oleaceae				√	FW368,486
58	*Citrus aurantifolia* (Christm.) Swingle	Rutaceae	√		√		
59	*Citrus medica* L.	Rutaceae	√		√		
60	*Citrus sinensis* (L.) Osbeck	Rutaceae	√		√		
61	*Clausena anisata* (Willd.) Hook.f. ex Benth.	Rutaceae	√	√	√	√	
62	*Cleome gynandra* L.	Capparidaceae	√				FW236
63	C*lerodendrum myricoides* (Hochst.) R.Br ex Vatke	Lamiaceae	√	√	√	√	FW317,427
64	*Coccinia abyssinica* (Lam) Cogn.	Cucurbitaceae			√		
65	*Coffea arabica* L.	Rubiaceae	√	√	√	√	
66	*Colocasia esculenta* (L.) Schott	Araceae	√		√		
67	*Combretum adenogonium* Steud. ex A. Rich.	Combretaceae		√			FW277
68	*Combretum collinum* Fresen.	Combretaceae	√	√			FW273
69	*Combretum molle* R. Br. ex G. Don	Combretaceae		√			FW274,404
70	*Combretum paniculatum* Vent.	Combretaceae			√	√	FW360
71	*Cordia africana* Lam.	Boraginaceae	√		√	√	
72	*Coriandrum sativum* L.	Apiaceae	√		√		FW211
73	*Crassocephalum macropappum* (Sch. Bip. ex A. Rich.) S. Moore	Asteraceae				√	FW358
74	*Croton macrostachyus* Del.	Euphorbiaceae	√	√	√	√	
75	*Cucurbita pepo* L.	Cucurbitaceae	√		√		
76	*Cupressus lucitanica* Mill.	Cupressaceae	√	√	√		
77	*Curcuma domestica* Val.	Zingiberaceae	√		√		
78	*Cyathea manniana* Hook.	Cyatheaceae			√	√	FW478
79	*Cymbopogon citratus* (DC.) Stapf.	Poaceae	√		√		FW433
80	*Cyperus fischerianus* A. Rich.	Cyperaceae			√		FW444
81	Cyperus sp.	Cyperaceae	√				FW468
82	*Cyphomandra betacea* (Cav.)Se.	Cyperaceae	√		√		

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
83	*Dalbergia lactea* Vatke	Fabaceae		√		√	FW243,372
84	*Datura innoxia* Mill.	Solanaceae			√		FW474
85	*Daucus carota* L.	Apiaceae	√		√		
86	*Dicliptera laxata* C.B.Clarke	Acanthaceae			√		FW393
87	*Dioscorea abyssinica* Hochst. ex Kunth	Dioscoreaceae		√			FW280
88	*Dioscorea bulbifera* L.	Dioscoreaceae	√		√		FW224
89	*Dioscorea* sp.	Dioscoreaceae	√		√		FW436,450
90	*Diospyros abyssinica* (Hiern) F. White	Ebenaceae			√		FW471
91	*Dombeya torrida* (J. F. Gmel.) P. Bamps	Sterculiaceae		√			FW268
92	*Dracaena afromontana* Mildbr.	Dracaenaceae				√	FW359
93	*Dracaena fragrans* (L.) Kor-Grawal	Dracaenaceae	√	√	√	√	FW434
94	*Dracaena steudneri* Engl.	Dracaenaceae	√		√		
95	*Echinops amplexicaulis* Oliv.	Asteraceae	√				FW171,208
96	*Echinops kebericho* Mesfin	Asteraceae	√		√		FW445,485
97	*Ehretia cymosa* Thonn.	Boraginaceae			√	√	FW364
98	*Ekebergia capensis* Sparm.	Meliaceae	√	√	√	√	FW241,417
99	*Elaeodendron buchananii* (Loes.) Loes.	Celastraceae		√	√	√	FW347,464
100	*Elettaria cardamomum* (L.) Maton	Celastraceae			√		
101	*Embelia schimperi* Vatke	Myrsinaceae		√		√	FW257,377
102	*Ensete ventricosum* (Welw.) Cheeseman	Musaceae	√		√		
103	*Entada abyssinica* Steud. ex A. Rich.	Fabaceae	√		√		FW324,482
104	*Eragrostis tef* (Zucc.) Trotter	Poaceae			√		
105	*Erythrina abyssinica* Lam. ex D.C.	Fabaceae	√		√		FW407
106	*Erythrina bruce*i Schweinf.	Fabaceae			√		
107	*Eucalyptus sp.*	Myrtaceae		√	√		FW341
108	*Eucalyptus tereticornis* Smith	Myrtaceae	√				FW415
109	*Euclea racemosa* Murr.	Ebenaceae		√			FW398
110	*Euphorbia ampliphylla* Pax.	Euphorbiaceae		√	√	√	FW454
111	*Euphorbia cotinifolia* L.	Euphorbiaceae	√		√		
112	*Euphorbia pulcherrima* Klotzsch.	Euphorbiaceae	√				
113	*Euphorbia schimperiana* Scheele	Euphorbiaceae				√	FW388
114	*Fagaropsis angolensis* (Engl.) Dale	Rutaceae	√	√	√		FW187,222
115	*Faurea speciosa* Welw.	Proteaceae		√			FW278
116	*Ficus ovata* Vahl	Moraceae	√		√		FW426,455
117	*Ficus palmata* Forssk.	Moraceae	√		√		FW163,190
118	*Ficus Sur* Forsk.	Moraceae	√	√	√	√	FW240, 462
119	*Ficus thonningii* Bhume	Moraceae	√	√		√	FW311
120	*Ficus vasta* Forsk	Moraceae	√	√	√		FW238
121	*Flacourtia indica* (Burm. f) Merr.	Flacourtiaceae		√	√		FW261,479
122	*Foeniculum vulgare* Mill.	Apiaceae	√		√		FW256
123	*Galiniera saxifraga* (Hochst.) Bridson	Rubiaceae	√	√	√	√	FW167,353
124	*Garcinia buchananii* Baker	Guttiferae	√				FW161,162
125	*Gardenia ternifolia* Schumach. & Thonn.	Rubiaceae	√	√			FW435

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
126	*Geranium arabicum* Forssk.	Geraniaceae			√		FW180
127	*Gossypium sp.*	Malvaceae	√				FW437
128	*Grevillea robusta* R. Br.	Proteaceae	√		√		
129	*Grewia ferruginea* Hochst. ex A. Rich.	Tiliaceae		√		√	FW423,476
130	*Grewia mollis* Juss.	Tiliaceae		√			FW401
131	*Guizotia scabra* (Vis.) Chiov.	Asteraceae		√			FW286,408
132	*Guizotia schimperi* Sch. Bip. ex Walp.	Asteraceae				√	FW394
133	*Hagenia abyssinica* (Bruce) J.F.Gmel.	Rosaceae			√		
134	*Helianthus annuus* L.	Asteraceae	√		√		
135	*Hibiscus berberidifolius* A. Rich.	Malvaceae				√	FW381,477
136	*Hippocratea africana* (Willd.) Loes.	Celastraceae		√	√	√	FW345,473
137	*Hordeum vulgare* L	Poaceae	√		√		
138	*Hoslundia opposita* Vahl	Lamiaceae		√			FW259
139	*Ilex mitis* (L.) Radlk.	Aquifoliaceae			√	√	FW367
140	*Indigofera arrecta* A. Rich.	Fabaceae	√	√	√		FW194,294
141	*Ipomoea batatas* (L.) Lam.	Convolvulaceae	√		√		
142	*Iresine herbstii Lindl.*	Amaranthaceae	√		√		FW235
143	*Juniperus procera* Hochst. ex Endl.	Cupressaceae	√				
144	*Justicia schimperiana* (Hochst. ex Nees) T. Anders	Acanthaceae			√	√	FW197,366
145	*Kalanchoe petitiana* A. Rich. var. *petitiana*	Crassulaceae	√		√	√	FW307,331
146	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	√		√	√	
147	*Laggera crispata* (Vahl) Hepper & wood	Asteraceae			√		FW356
148	*Landolphia buchananii* (Hall. f.) Stapf	Apocynaceae			√	√	FW344,376
149	*Lannea welwitschii* (Hiern) Engl.	Anacardiaceae		√			FW287
150	*Lantana ukambensis* (Vatke) Verdc.	Verbenaceae		√			FW281
151	*Lepidium sativum* L.	Brassicaceae	√				
152	*Lepidotrichilia volkensii* (Gurke) Leroy	Meliaceae				√	FW363
153	*Lepisanthes senegalensis* (Juss. ex Poir.) Leenh.	Sapindaceae		√			FW249.428
154	*Linum usitatissimum* L	Linaceae	√		√		FW255
155	*Lippia adoensis* Hochst. var. *adoensis*	Verbenaceae	√		√		FW216,335
—	*Lippia adoensis* Hochst. var. *koseret Sebsebe*	Verbenaceae			√		FW339
156	*Leucas martinicensis* (Jacq.) R.Br.	Lamiaceae			√	√	
157	*Lupinus albus* L.	Fabaceae	√				FW227
158	*Lycopersicon esculentum* Mill.	Solanaceae	√		√		
159	*Macaranga capensis* (Baill.) Sim	Euphorbiaceae	√	√	√	√	FW207
160	*Maesa lanceolata* Forssk.	Myrcinaceae	√	√	√	√	
161	*Malus sylvestris* Miller	Rosaceae	√		√		FW242,355
162	*Mangifera indica* L.	Anacardiaceae	√		√		
163	*Manihot esculenta* Granz	Euphorbiaceae	√		√		
164	*Maytenus arbutifolia* (A. Rich.) Wilczek	Celastraceae		√			FW453
165	*Maytenus gracilipes* (Welw.ex Oliv.) Exell	Celastraceae			√	√	FW200,253

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
166	*Maytenus senegalensis* (Lam.) Exell	Celastraceae		√			FW275,399
167	*Maytenus undata* (Thunb.) Blakelock	Celastraceae		√			FW304,425
168	*Mentha spicata* L.	Lamiaceae	√		√		FW424
169	*Milletia ferruginea* (Hochst.) Bak	Fabaceae	√	√	√	√	
170	*Momordica foetida* Schumach.	Cucurbitaceae			√	√	FW321
171	*Moringa stenopetala* (Bak. f.) Cuf.	Moringaceae	√				
172	*Mucuna stans* Welw. ex Bak.	Fabaceae		√			FW271,400
173	*Musa paradisiaca* L.	Musaceae	√		√		
174	*Mussaenda arcuata* Poir.	Rubiaceae		√			FW293
175	*Nicotiana tabacum* L.	Solanaceae	√		√		
176	*Nigella sativa* L.	Ranunculaceae	√		√		FW218,309
177	*Nuxia congesta* R. Br. ex Fresen.	Loganiaceae		√			FW301
178	*Ocimum basilicum* L. var. *basilicum*	Lamiaceae	√		√		FW449
—	*Ocimum basilicum* L. var. *thyrsiflorum* (L) Benth.	Lamiaceae	√		√		FW448
179	*Ocimum gratissimum* L.	Lamiaceae		√	√	√	FW291,336
180	*Ocimum lamiifolium* Hochst. ex Benth	Lamiaceae	√		√		FW337,405
181	*Ocotea kenyensis* (Chiov) Robyns &Wilczek	Lauraceae			√	√	FW378
182	*Olea welwitschii* (Knobl.) Gilg & Schell.	Oleaceae	√	√	√	√	FW233
183	*Otostegia tomentosa* A. Rich.	Lamiaceae		√			FW284
184	*Oxyanthus speciosus* DC.	Rubiaceae		√		√	FW244,379
185	*Passiflora edulis* Sims.	Passifloraceae	√	√	√	√	
186	*Paullinia pinnata* L.	Sapindaceae			√	√	FW382
187	*Pavetta abyssinica* Fresen.	Rubiaceae		√	√	√	FW332,440
188	*Pavetta oliveriana* Hiern	Rubiaceae	√	√			FW248,346
189	*Pavonia urens* Cav.	Malvaceae			√		FW483
190	*Pentas lanceolata* (Forssk) Defl.	Rubiaceae		√			FW265
191	*Peponium vogelii* (Hook.f.) Engl.	Cucurbitaceae			√	√	FW480
192	*Persea americana* Mill.	Lauraceae	√		√		
193	*Persicaria senegalensis* (Meisn.) Sojak	Polygonaceae			√		FW342
194	*Phaseolus lunatus* L.	Fabaceae	√		√		FW183,212
195	*Phaseolus vulgaris* L.	Fabaceae	√		√		FW210,219
196	*Phoenix reclinata* Jacq.	Arecaceae	√	√	√	√	FW412
197	*Physalis peruviana* L.	Solanaceae	√		√	√	FW389
198	*Phytolacca dodecandra* L'Heirt.	Phytolaccaceae			√	√	
199	*Pilea rivularis* Wedd.	Urticaceae			√		FW334
200	*Piper capense* L.f.	Piperaceae		√	√	√	
201	*Pisum sativam* L.	Fabaceae	√		√		
202	*Pittosporum viridiflorum* Sims	Pittosporaceae			√	√	FW348
203	*Plectranthus edulis* (Vatke) Agnew	Lamiaceae	√				FW295
204	*Podocarpus falcatus* (Thunb.) R.Br.ex Mirb.	Podocarpaceae	√	√		√	
205	*Polyscias fulva* (Hiern) Harms	Araliaceae	√	√	√	√	

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
206	*Pouteria adolfi-friederici* (Engl.) Baehni	Sapotaceae			√	√	FW487
207	*Premna schimperi* Engl.	Lamiaceae	√	√	√	√	FW188,319
208	*Protea madiensis* Oliv.	Proteaceae		√			FW263,
209	*Prunus africana* (Hook. f.) Kalkm.	Rosaceae	√	√	√	√	FW165,327
210	*Pseudarthria hookeri* Wight & Am.	Fabaceae		√			FW282
211	*Psidium guajava* L.	Myrtacea	√		√		
212	*Psorospermum febrifugum* Spach.	Hypericaceae		√			FW283,411
213	*Psychotria orophila* Petit	Rubiaceae			√	√	FW350,380
214	P*ycnostachys abyssinica* Fresen.	Lamiaceae	√		√		FW229
215	*Raphanus sativus* L.	Brassicaceae			√	√	FW182
216	*Raphiostylis beninensis* (Planch.) Benth.	Icacinaceeae					FW362475
217	*Rhamnus prinoides* L'Herit.	Rhamnaceae	√	√	√	√	FW213
218	*Rhus ruspolii* Engl.	Anacardiaceae		√	√		FW276,458
219	*Ricinus communis* L.	Euphorbiaceae	√		√		
220	*Rosmarinus officinalis* L.	Lamiaceae			√		
221	*Rothmannia urcelliformis* (Hiern) Robyns	Rubiaceae			√	√	FW349
222	*Rubus apetalus* Poir.	Rosaceae		√		√	FW414,460
223	*Rumex abyssinicus* Jacq.	Polygonaceae	√		√		FW157,186
224	*Rumex nepalensis* Spreng	Polygonaceae			√		FW488
225	*Ruta chalepensis* L.	Rutaceae	√		√		FW441
226	*Rytigyina negelect*a (Hiern) Robyns	Rubiaceae		√	√	√	FW305
227	*Sacccharum officinarum* L.	Poaceae	√		√		
228	*Sapium ellipticum* (Hochst ex Krauss)	Euphorbiaceae	√	√	√	√	
229	*Scadoxus multiflorus* (Martyn) Raf.	Amaryllidaceae			√		FW189
230	*Schefflera abyssinica* (Hochst. ex A. Rich.) Harms.	Araliaceae			√	√	
231	*Schefflera myriantha* (Bak.) Drake	Araliaceae				√	FW371
232	*Schinus molle L.*	Anacardiaceae			√		
233	*Schrebera alata* (Hochst.) Welw.	Oleaceae	√	√			FW155,312
234	*Senna septemtrionalis* (Viv.) Irwin & Barneby	Fabaceae		√	√	√	FW390
235	*Sesamum orientale* Gillett	Pedaliacea	√				
236	*Sesbania sesban* (L.) Merr.	Fabaceae	√		√		FW330
237	*Sida rhombifolia* L.	Malvaceae	√	√	√	√	FW193,292
238	*Solanecio mannii* (Hook. f.) C. Jeffrey	Asteraceae	√	√	√		FW447,489
239	*Solanum americanum* Miller	Solanaceae			√	√	FW467
240	*Solanum dasyphyllum Schumach.*	Solanaceae			√		FW490
241	*Solanum incanum* L.	Solanaceae		√			FW288
242	*Solanum pseudo-capsicum* L.	Solanaceae			√		FW199
243	*Solanum* sp.	Solanaceae	√		√		FW234,470
244	*Solanum tuberosum* L.	Solanaceae	√				
245	*Sorghum bicolo*r (L.) Moench	Poaceae	√		√		
246	*Spathodea campanulata* P. Beauvv.	Bignoniaceae			√		

Appendix 3 (continued)

	Scientific name	Family	Basketo		Kafa		Col. No.
			HG	OLUS	HG	OLUS	
247	*Steganotaenia araliacea* Hochst. ex A. Rich.	Apiaceae		√			FW260
248	*Strychnos innocua* Del.	Loganiaceae		√			FW306
249	*Syzygium guineense* (Willd.) DC.	Myrtaceae	√	√	√	√	FW285
250	*Teclea nobilis* Del.	Rutaceae		√		√	FW303
251	*Tephrosia vogeli*i Hook. f.	Fabaceae		√			FW267
252	*Terminalia brownii* Fresen.	Combretaceae	√	√			FW290
253	*Terminalia schimperiana* Hochst.	Combretaceae		√			FW169,402
254	*Tetradenia riparia* (Hochst. Ex Benth.) Codd	Lamiaceae	√	√			FW176,300
255	*Thymus schimperi* Ronniger	Lamiaceae	√		√		FW206,232
256	*Trachyspermum ammi* (L.) Sprague ex Turrill	Apiaceae	√				FW217,308
257	*Trema orientalis* (L.) Bl.	Ulmaceae		√			FW258,429
258	*Trichilia dregeana* Sond.	Meliaceae	√	√			FW246,420
259	*Trigonella foenum-graecum* L.	Fabaceae	√				
260	*Trilepisium madagascariense* Dc.	Moraceae			√	√	FW395
261	*Tristemma mauritianum* J. F. Gmel	Melastomataceae			√	√	FW352
262	*Triticum sp.*	Poaceae	√		√		
263	*Triumfetta brachyceras* K. Schum.	Tiliaceae	√	√		√	FW151,383
264	*Turraea holstii* Gurke	Meliaceae		√	√	√	FW250,316
265	*Urena lobata* L.	Malvaceae		√			FW264
266	*Vangueria apiculata* K. Schum	Rubiaceae		√			FW251,439
267	*Vepris dainellii* (Pichi-Serm.) Kokwaro	Rutaceae	√	√	√	√	FW179,373
268	*Verbena officinalis* L.	Verbenaceae			√		FW325
269	*Vernonia amygdalina* Del.	Asteraceae	√		√	√	
270	*Vernonia auriculifera* Hiern	Asteraceae		√	√	√	FW214
271	*Vernonia hymenolepis* A. Rich.	Asteraceae	√	√	√		FW159,320
272	*Vernonia ischnophylla* Muschl.	Asteraceae		√			FW272
273	*Vernonia theophrastifolia* Schweinf. ex Oliv. & Hiern	Asteraceae	√	√			FW397
274	*Vicia faba* L.	Fabaceae	√		√		
275	*Vigna unguiculata* (L.) Walp.	Fabaceae	√		√		FW177
276	*Vitex doniana* Sweet	Lamiaceae		√			FW262
277	*Withania somnifera* (L.) Dunal in DC.	Solanaceae			√		FW198
278	*Xanthosoma saggitifolium* (l.) Schott	Araceae	√		√		
279	*Zea mays* L.	Poaceae	√		√		
280	*Zingiber officinal*e Rescoe	Zingiberaceae	√		√		FW220

Appendix 4a Habit and cultivation status of plant species recorded from Basketo homegardens (T=Tree, S=Shrub, H=Herb, C=Climber, C.S=Cultivation Status, Cu=cultivated, S=Spontaneous)

N0.	Scientific name	Habit				C.S		N0.	Scientific name	Habit				C.S	
		T	S	H	C	Cu	S			T	S	H	C	Cu	S
1	*Acanthus pubescens*			√			√	39	*Cordia africana*	√				√	
2	*Aframomum corrorima*			√		√		40	*Coriandrum sativum*			√		√	
3	*Albizia schimperiana*	√					√	41	*Croton macrostachyus*	√				√	
4	*Allium cepa*			√		√		42	*Cucurbita pepo*			√		√	
5	*Allium sativum*			√		√		43	*Cupressus lucitanica*	√				√	
6	*Aloe macrocarpa*			√		√		44	*Curcuma domestica*			√		√	
7	*Amaranthus caudatus*			√		√		45	*Cymbopogon citratus*			√		√	
8	*Ananas comosus*			√		√		46	*Cyperus sp.*			√		√	
9	*Annona cherimola*	√				√		47	*Cyphomandra betacea*	√				√	
10	*Arachis hypogea*			√		√		48	*Daucus carota*			√		√	
11	*Artemisia absinthium*			√		√		49	*Dioscorea bulbifera*				√	√	
12	*Artemisia abyssinica*			√		√		50	*Dioscorea sp.*				√	√	
13	*Artemisia afra*			√		√		51	*Dracaena fragrans*		√			√	
14	*Arundinaria alpina*	√				√		52	*Dracaena steudneri*	√					√
15	*Beta vulgaris*			√		√		53	*Echinops amplexicaulis*		√			√	
16	*Brassica carinata*			√		√		54	*Echinops kebericho*		√			√	
17	*Brassica nigra*			√		√		55	*Ekebergia capensis*	√					√
18	*Brassica oleracea*			√		√		56	*Ensete ventricosum*			√		√	
19	*Caesalpinia decapetala*		√			√		57	*Entada abyssinica*	√					√
20	*Cajanus cajan*		√			√		58	*Erythrina abyssinica*	√					√
21	*Canna indica*			√		√		59	*Eucalyptus tereticornis*	√				√	
22	*Capsicum annuum*			√		√		60	*Euphorbia cotinifolia*		√			√	
23	*Capsicum frutescens*			√		√		61	*Euphorbia pulcherrima*		√			√	
24	*Carica papaya*	√				√		62	*Fagaropsis angolensis*	√				√	
25	*Casimiroa edulis*	√				√		63	*Ficus ovata*	√				√	
26	*Casuarina* sp.	√				√		64	*Ficus palmata*	√					√
27	*Catha edulis*		√			√		65	*Ficus sur*	√					√
28	*Celtis africana*	√					√	66	*Ficus thonningii*	√					√
29	*Chenopodium procerum*			√		√		67	*Ficus vasta*	√					√
30	*Citrus aurantifolia*		√			√		68	*Foeniculum vulgare*			√		√	
31	*Citrus medica*		√			√		69	*Galiniera saxifraga*		√				√
32	*Citrus sinensis*		√			√		70	*Garcinia buchananii*	√				√	
33	*Clausena anisata*		√				√	71	*Gardenia ternifolia*	√				√	
34	*Cleome gynandra*			√			√	72	*Gossypium sp.*		√			√	
35	*Clerodendrum myricoides*		√				√	73	*Grevillea robusta*	√				√	
36	*Coffea arabica*		√			√		74	*Helianthus annuus*		√			√	
37	*Colocasia esculenta*			√		√		75	*Hordeum vulgare*			√		√	
38	*Combretum collinum*	√					√	76	*Indigofera arrecta*		√				√

Appendix 4a (continued)

N0.	Scientific name	Habit				C.S		N0.	Scientific name	Habit				C.S	
		T	S	H	C	Cu	S			T	S	H	C	Cu	S
77	*Ipomoea batatas*			√		√		114	*Premna schimperi*		√				√
78	*Iresine herbstii*			√		√		115	*Prunus Africana*	√				√	
79	*Juniperus procera*	√				√		116	*Psidium guajava*	√				√	
80	*Kalanchoe petitiana* var. *petitiana*			√		√		117	*Pycnostachys abyssinica*				√	√	
81	*Lagenaria siceraria*			√		√		118	*Rhamnus prinoides*		√			√	
82	*Lepidium sativum*			√		√		119	*Ricinus communis*		√				√
83	*Linum usitatissimum*			√		√		120	*Rumex abyssinicus*			√			√
84	*Lippia adoensis* var. *adoensis*		√			√		121	*Ruta chalepensis*			√		√	
85	*Artemisia annua*			√		√		122	*Saccharum officinarum*		√			√	
86	*Lupinus albus*			√		√		123	*Sapium ellipticum*	√				√	
87	*Lycopersicon esculentum*			√		√		124	*Schrebera alata*	√				√	
88	*Macaranga capensis*	√					√	125	*Sesamum orientale*			√		√	
89	*Maesa lanceolata*		√				√	126	*Sesbania sesban*		√			√	
90	*Malus sylvestris*		√			√		127	*Sida rhombifolia*		√				√
91	*Mangifera indica*	√				√		128	*Solanecio mannii*			√			√
92	*Manihot esculenta*		√			√		129	*Solanum sp.*			√		√	
93	*Mentha spicata*			√		√		130	*Solanum tuberosum*			√		√	
94	*Milletia ferruginea*	√				√		131	*Sorghum bicolor*		√			√	
95	*Moringa stenopetala*	√				√		132	*Syzyygium guineense*	√				√	
96	*Musa paradisiaca*			√		√		133	*Terminalia schimperiana*	√					√
97	*Nicotiana tabacum*			√		√		134	*Tetradenia riparia*		√			√	
98	*Nigella sativa*			√		√		135	*Thymus schimperi*			√		√	
99	*Ocimum basilicum*			√		√		136	*Trachyspermum ammi*			√		√	
100	*Ocimum lamiifolium*		√				√	137	*Trichilia dregeana*	√					√
101	*Olea welwitschii*	√				√		138	*Trigonella foenum-graecum*			√		√	
102	*Arundo donx*		√			√		139	*Triticum sp.*			√		√	
103	*Passiflora edulis*				√	√		140	*Triumfetta brachyceras*		√				√
104	*Pavetta oliveriana*		√			√		141	*Vepris dainellii*	√				√	
105	*Persea americana*	√				√		142	*Vernonia amygdalina*		√			√	
106	*Phaseolus lunatus*			√		√		143	*Vernonia hymenolepis*		√				√
107	*Phaseolus vulgaris*				√	√		144	*Vernonia theophrastifolia*		√				√
108	*Phoenix reclinata*	√					√	145	*Vicia faba*			√		√	
109	*Physalis peruviana*			√			√	146	*Vigna unguiculata*			√		√	
110	*Pisum sativam*			√		√		147	*Xanthosoma saggitifolium*			√		√	
111	*Plectranthus edulis*			√		√		148	*Zea mays*		√			√	
112	*Podocarpus falcatus*	√				√		149	*Zingiber officinale*			√		√	
113	*Polyscias fulva*	√					√								

Appendix 4b Habit and cultivation status of plant species recorded from Kafa homegardens (T=Tree, S=Shrub, H=Herb, C=Climber, C.S=Cultivation Status, Cu=cultivated, S=Spontaneous)

N0.	Scientific name	Habit				C.S		N0.	Scientific name	Habit				C.S	
		T	S	H	C	Cu	S			T	S	H	C	Cu	S
1	*Acacia pilispina*	√					√	36	*Carica papaya*	√				√	
2	*Acmella caulirhiza*			√			√	37	*Casuarina sp.*	√				√	
3	*Aeollanthus densiflorus*			√		√		38	*Catha edulis*		√			√	
4	*Aframomum corrorima*			√		√		39	*Celosia trigyna*			√			√
5	*Albiza schimperiana*	√					√	40	*Celtis africana*	√					√
6	*Albizia grandibracteata*	√					√	41	*Chenopodium procerum*			√		√	
7	*Albizia gummifera*	√					√	42	*Citrus aurantifolia*		√			√	
8	*Allium cepa*			√		√		43	*Citrus medica*		√			√	
9	*Allium sativum*			√		√		44	*Citrus sinensis*		√			√	
10	*Allophylus abyssinicus*	√					√	45	*Clausena anisata*		√				√
11	*Amaranthus hybridus*			√		√		46	*Clerodendrum myricoides*		√				√
12	*Amorphophallus gallaensis*			√			√	47	*Coccinia abyssinica*				√	√	
13	*Ananas comosus*			√		√		48	*Coffea arabica*		√			√	
14	*Annona cherimola*	√				√		49	*Colocasia esculenta*			√		√	
15	*Apodytes dimidiata*	√					√	50	*Combretum paniculatum*				√		√
16	*Artemisia absinthium*			√		√		51	*Cordia africana*	√				√	
17	*Artemisia abyssinica*			√		√		52	*Coriandrum sativum*			√		√	
18	*Artemisia afra*			√		√		53	*Croton macrotachyus*	√				√	
19	*Arundinaria alpina*	√				√		54	*Cucurbita pepo*			√		√	
20	*Asparagus racemosus*				√		√	55	*Cupressus lucitanica*	√				√	
21	*Azadirachta indica*	√				√		56	*Curcuma domestica*			√		√	
22	*Bersama abyssinica*	√					√	57	*Cyathea manniana*	√					√
23	*Beta vulgaris*			√		√		58	*Cymbopogon citratus*			√		√	
24	*Brassica carinata*			√		√		59	*Cyperus fischerianus*			√		√	
25	*Brassica nigra*			√		√		60	*Cyphomandra betacea*	√				√	
26	*Brassica oleracea*			√		√		61	*Datura innoxia*		√			√	
27	*Brucea antidysenterica*	√					√	62	*Daucus carota*			√		√	
28	*Buddleja polystachya*		√			√		63	*Dicliptera laxata*			√			√
29	*Caesalpina decapetala*		√				√	64	*Dioscorea bulbifera*				√	√	
30	*Cajanus cajan*		√			√		65	*Dioscorea sp.*				√	√	
31	*Calpurina aurea*	√					√	66	*Diospyros abyssinica*	√				√	
32	*Canna indica*			√		√		67	*Dracaena fragrans*		√			√	
33	*Capsicum annuum*			√		√		68	*Dracaena steudneri*	√					√
34	*Capsicum frutescens*			√		√		69	*Echinops kebericho*		√			√	
35	*Carduus leptacanthus*			√			√	70	*Ehretia cymosa*	√					√

Appendix 4b (continued)

N0.	Scientific name	Habit				C.S		N0.	Scientific name	Habit				C.S	
		T	S	H	C	Cu	S			T	S	H	C	Cu	S
71	*Ekebergia capensis*	√					√	106	*Linum usitatissimum*			√		√	
72	*Elaeodendron buchananii*	√					√	107	*Lippia adoensis* var. *koseret*		√			√	
73	*Elettaria cardamomum*			√		√		108	*Leucas martinicensis*			√			√
74	*Ensete ventricosum*			√		√		109	*Lycopersicon esculentum*			√		√	
75	*Entada abyssinica*	√					√	110	*Macaranga capensis*	√					√
76	*Eragrostis tef*			√		√		111	*Maesa lanceolata*		√				√
77	*Erythrina abyssinica*	√				√		112	*Malus sylvestris*		√			√	
78	*Erythrina brucei*	√				√		113	*Mangifera indica*	√				√	
79	*Eucalyptus sp.*	√				√		114	*Manihot esculenta*		√			√	
80	*Euphorbia ampliphylla*	√				√		115	*Maytenus gracilipes*		√				√
81	*Euphorbia cotinifolia*		√			√		116	*Mentha spicata*			√		√	
82	*Fagaropsis angolensis*	√					√	117	*Milletia ferruginea*	√					√
83	*Ficus ovata*	√					√	118	*Momordica foetida*				√		√
84	*Ficus palmata*	√					√	119	*Musa paradisiaca*			√		√	
85	*Ficus Sur*	√					√	120	*Nicotiana tabacum*			√		√	
86	*Ficus thonningii*	√					√	121	*Nigella sativa*			√		√	
87	*Ficus vasta*	√					√	122	*Ocimum basilicum*			√		√	
88	*Flacourtia indica*		√				√	123	*Ocimum gratissimum*		√				√
89	*Foeniculum vulgare*			√		√		124	*Ocimum lamiifolium*		√				√
90	*Galiniera saxifraga*		√				√	125	*Ocotea kenyensis*	√					√
91	*Geranium arabicum*			√			√	126	*Olea welwitschii*	√					√
92	*Grevillea robusta*	√				√		127	*Arundo donx*		√			√	
93	*Hagenia abyssinica*	√					√	128	*Passiflora edulis*				√	√	
94	*Helianthus annuus*		√			√		129	*Paullinia pinnata*				√		√
95	*Hippocratea africana*				√		√	130	*Pavetta abyssinica*		√				√
96	*Hordeum vulgare*			√		√		131	*Pavonia urens*		√				√
97	*Ilex mitis*	√					√	132	*Peponium vogelii*			√			√
98	*Indigofera arrecta*		√				√	133	*Persea americana*	√				√	
99	*Ipomoea batatas*			√		√		134	*Persicaria senegalensis*			√			√
100	*Iresine herbstii*			√		√		135	*Phaseolus lunatus*			√		√	
101	*Justicia schimperiana*			√			√	136	*Phaseolus vulgaris*				√	√	
102	*Kalanchoe petitiana* var. *petitiana*			√			√	137	*Phoenix reclinata*	√					√
103	*Lagenaria siceraria*			√			√	138	*Physalis peruviana*			√			√
104	*Laggera crispata*			√			√	139	*Phytolacca dodecandra*				√		√
105	*Landolphia buchananii*	√					√	140	*Pilea rivularis*			√			√

Appendix 4b (continued)

N0.	Scientific name	Habit				C.S		N0.	Scientific name	Habit				C.S	
		T	S	H	C	Cu	S			T	S	H	C	Cu	S
141	*Piper capense*		√				√	167	*Sesbania sesban*		√			√	
142	*Pisum sativam*			√		√		168	*Sida rhombifolia*		√				√
143	*Pittosporum viridiflorum*	√					√	169	*Solanecio mannii*		√				√
144	*Polyscias fulva*	√					√	170	*Solanum americanum*			√			√
145	*Pouteria adolfi-friederici*	√					√	171	*Solanum dasyphyllum*			√		√	
146	*Premna schimperi*		√				√	172	*Solanum pseudo-capsicum*			√		√	
147	*Prunus africana*	√					√	173	*Solanum sp.*			√			√
148	*Psidium guajava*	√				√		174	*Sorghum bicolor*		√			√	
149	*Psychotria orophila*		√				√	175	*Spathodea campanulata*	√				√	
150	*Pycnostachys abyssinica*				√		√	176	*Syzygium guineense*	√					√
151	*Raphanus sativus*			√		√		177	*Thymus schimperi*			√		√	
152	*Rhamnus prinoides*		√			√		178	*Trilepisium madagascariense*	√					√
153	*Rhus ruspolii*	√					√	179	*Tristemma mauritianum*			√			√
154	*Ricinus communis*		√			√		180	*Triticum sp.*			√		√	
155	*Rosmarinus officinalis*			√		√		181	*Turraea holstii Gurke*		√				√
156	*Rothmannia urcelliformis*	√					√	182	*Vepris dainellii*	√					√
157	*Rumex abyssinicus*			√			√	183	*Verbena officinalis*			√		√	
158	*Rumex nepalensis*			√			√	184	*Vernonia amygdalina*		√			√	
159	*Ruta chalepensis*			√		√		185	*Vernonia auriculifera*		√				√
160	*Rytigyina negelecta*	√					√	186	*Vernonia hymenolepis*		√				√
161	*Sacccharum officinarum*		√			√		187	*Vicia fuba*			√		√	
162	*Sapium ellipticum*	√					√	188	*Vigna unguiculata*			√		√	
163	*Scadoxus multiflorus*			√		√		189	*Withania somnifera*			√		√	
164	*Schefflera abyssinica*	√					√	190	*Xanthosoma saggitifolium*			√		√	
165	*Schinus molle*	√				√		191	*Zea mays*		√			√	
166	*Senna septemtrionalis*		√				√	192	*Zingiber officinale*			√		√	

Appendix 5 Plant species integrated into the homegardens of Basketo and Kafa in the last two decades

No.	Scientific name	Recent introductions to Basketo gardens	Recent introductions to Kafa gardens	No.	Scientific name	Recent introductions to Basketo gardens	Recent introductions to Kafa gardens
1	*Aframomum corrorima*+		√	22	*Elettaria cardamomum*		√
2	*Aloe macrocarpa*	√		23	*Euphorbia cotinifolia*	√	√
3	*Ananas comosus**	√	√	24	*Euphorbia pulcherrima*	√	
4	*Annona cherimola* *		√	25	*Fagaropsis angolensis*+	√	
5	*Arachis hypogea*	√		26	*Grevillea robusta*	√	√
6	*Azadirachta indica*		√	27	*Iresine herbstii*		√
7	*Artemisia annua*+	√		28	*Lupinus albus*	√	
8	*Beta vulgaris*	√	√	29	*Malus sylvestris**	√	√
9	*Brassica oleracea*	√	√	30	*Mangifera indica**	√	√
10	*Cajanus cajan*		√	31	*Manihot esculenta*	√	√
11	*Canna indica*		√	32	*Mentha spicata*+	√	√
12	*Carica papaya**	√	√	33	*Musa paradisiacal* (2 new varieties) *	√	√
13	*Casimiroa edulis**	√		34	*Persea americana**	√	√
14	*Casuarina sp.*	√	√	35	*Piper capense*+		√
15	*Catha edulis*	√	√	36	*Psidium guajava**	√	√
16	*Citrus sinensis**	√	√	37	*Rosmarinus officinalis*+		√
17	*Citrus medica**		√	38	*Scadoxus multiflorus*		√
18	*Cupressus lucitanica*	√	√	39	*Sesbania sesban*	√	√
19	*Curcuma domestica*+	√	√	40	*Solanum pseudo-capsicum*+		√
20	*Cyphomandra betacea**	√	√	41	*Vepris dainellii*+	√	
21	*Daucus carota*	√	√	42	*Xanthosoma saggitifolium*	√	√
						30	34

* Fruit crops

\+ Spice yielding plants

Appendix 6 Local spices used in Basketo and Kafa condiments

	Scientific name	Basketo		Kafa
		Bunaytsi-gaalla (coffee medicine)	***Dusha*** (crushed mixture of spices)	***Dok'o/ naaፖ*** (crushed mixture of spices)
1	*Ocimum basilicum* var. *basilicum*	√	√	√
2	*Capsicum annuum*	√	√	√
3	*Trachyspermum ammi*	√	√	
4	*Vepris dainellii*	√		
5	*Artemisia abyssinica*	√		
6	*Artemisia afra*	√		
7	*Coriandrum sativum*	√	√	√
8	*Fagaropsis angolensis*	√		
9	*Curcuma domestica*	√	√	
10	*Nigella sativa*	√	√	
11	*Foeniculum vulgare*	√	√	
12	*Cymbopogon citratus*	√	√	
13	*Capsicum frutescens*	√	√	√
14	*Mentha spicata*	√		
15	*Aframomum corrorima*	√	√	√
16	*Allium cepa*		√	
17	*Trigonella foenum-graecum*		√	
18	*Lepidium sativum*	√	√	
19	*Ruta chalepensis*	√	√	√
20	*Allium sativum*	√	√	√
21	*Zingiber officinale*	√	√	√
22	*Thymus schimperi*	√		√
23	*Artemisia annua*	√		

Appendix 7 Specific uses of spices in Basketo and Kafa

	Basketo		Kafa
1	for preparing the condiment ***dusha***	1	for preparing th condiment ***dok'o/naaʔo***
2	for spicing ***bunaytsi*** (hot drink made from coffee leaves)	2	to spice coffee
3	to spice coffee	3	to spice butter
4	to spice butter	4	To spice ***k'oc'o***
5	to spice cabbage	5	to spice cabbage
6	to flavor cheese	6	to flavor cheese
7	to flavor milk	7	to flavor roasted maize grains
8	to flavor water	8	to flavor milk
9	to flavor ***harek'e*** (locally made sprit)	9	to flavor water
10	to spice tea	10	for spicing ***c'eemo*** (hot drink made from coffee leaves)
11	to spice ***wot'*** (a kind of sauce)	11	to flavor ***harek'e*** (a locally made sprit)
12	for preparing ***berbere*** (powdered long chilli pepper)	12	to spice tea
13	for coloring bread	13	to spice ***wot'*** (a kind of sauce)
14	for washing/smoking utencils	14	to spice ***shiro*** (mush made of peas)
15	as a perfume	15	for preparing ***berbere*** (powdered long chilli pepper)
16	as a medicine	16	to sice rosted beef
17	as a source of income	17	for coloring bread
18	as ornamental	18	for coloring ***berbere*** (powdered long chilli pepper)
		19	for washing/smoking utencils
		20	as a perfume
		21	as a medicine
		22	for rituals
		23	as a source of income
		24	as ornamental
		25	for washing body of the deceased

Appendix 8a Gender role in managing spices, and propagation materials in Basketo (W=Women, M=Men)

N0.	Scientific name	Person in charge of				Propagation method
		Planting	Harve-sting	Selling	Donat-ing	
1	*Ocimum basilicum* var. *basilicum*	W	W	W	W	Seed, seedling
2	*Capsicum annuum*	W&M	W	W	W	Seed, seedling
3	*Trachyspermum ammi*	M	M	M	W&M	Seed
4	V*epris dainellii*		W	W	W	Seedling
5	*Artemisia abyssinica*	W	W	W	W	Seedling
6	*Artemisia afra*	W&M	W	W	W	Cutting
7	*Coriandrum sativum*	W	W	W	W	Seed
8	*Fagaropsis angolensis*		M	W	W	Seedling
9	*Curcuma domestica*	W&M	W&M	W	W	Rhizome, Seedling
10	*Nigella sativa*	M	M	W	W	Seed
11	*Foeniculum vulgare*	W&M	W	W	W	Seed
12	*Cymbopogon citratus*	W	W		W	Rhizome
13	*Capsicum frutescens*	W&M	W	W	W	Seed, Seedling
14	*Mentha spicata*	W	W	W	W	Cutting
15	*Aframomum corrorima*	M	M	M	M	Rhizome
16	*Brassica nigra*	M	M			Seed
17	*Allium cepa*	W&M	W&M	W&M	W	Bulb
18	*Trigonella foenum-graecum*	M	W&M	W	W	Seed
18	*Lepidium sativum*	W&M	W&M	W	W&M	Seed
20	*Ruta chalepensis*	W&M	W&M	W	W&M	Seed, cutting
21	*Allium sativum*	W&M	W&M	W&M	W&M	Bulb
22	*Zingiber officinal*e	W&M	W&M	W	W&M	Rhizome
23	*Thymus schimperi*	W&M	W	W	W	Cutting
24	*Artemisia annua*	M	W		W	Cutting

Appendix 8b Gender role in managing spices, and propagation materials in Kafa
(W=Women, M=Men)

N0.	Scientific name	Person in charge of				Propagation method
		Planting	Harve-sting	Selling	Donat-ing	
1	*Nigella sativa*	W	W	W	W	Seed
2	*Solanum pseudo-capsicum*	W	W		W	Seed, Seedling
3	*Capsicum annuum*	W&M	W&M	W	W	Seed, Seedling
4	*Ruta chalepensis*	W	W&M	W	W	Seed, Cutting
5	*Allium cepa*	W&M	W&M	W	W	Bulb
6	*Coriandrum sativum*	W	W	W	W	Seed
7	*Elettaria cardamomum*	M				Seedling
8	*Laggera crispata*		W			
9	*Curcuma domestica*	W&M	W&M	W	W	Rhizome
10	*Ocimum basilicum* var. *basilicum*	W	W	W	W	Seed, Seedling
11	*Lippia adoensis* var. *koseret*	W	W	W	W	Cutting
12	*Schinus molle*	W	W			Seedling
13	*Foeniculum vulgare*	W	W	W	W	Seed, Seedling
14	*Capsicum frutescens*	W&M	W	W	W	Seed, Seedling
15	*Mentha spicata*	W	W	W	W	Cutting
16	*Allium sativum*	W&M	W&M	W	W	Bulb
17	*Aframomum corrorima*	W	W&M	W&M	W&M	Rhizome
18	*Rosmarinus oficinalis*	W	W	W	W	Cutting
18	*Brassica nigra*	M	W		W	Seed
20	*Cymbopogon citratus*	W	W	W	W	Rhizome
21	*Piper capense*	M	M	M		Seedling
22	*Thymus schimperi*	W	W	W	W	
23	*Fagaropsis angolensis*		M		W	
24	*Zingiber officinal*e	W&M	W&M	W	W	Rhizome, Seedling

Appendix 9a List of community members who participated in the study (Basketo)

A. Local research assistants

1. Ato Ato Adem Girma
2. Ato Amare Fulas
3. Ato Feredegn Zerfu

B. Informants who participated in group discussions and guided field walks

Name	K'ebele
Kaati Mazgo Gardda	Wad'a
Ato Dinku Dippo	»
Ato Abraham Furtibabo	
Ato Esatu Saho	Saatsa-Makeesa
Ato Woriyo Booc'o	»
Ato Gasso Ibjo	»
Ato Ticho Ambesso	»
Ato Alemu Admasu	»
Ato Godaano skaro	»
Ato Munido Work'ado	-
Ato Getachew Teshome	-
Ato Feleke Arintto	-
Ato Asso Buto	Sheela-Kanaboola
Ato Beyene Dippo	Geze Ayma
Ato Gizachew Iddo	»
Ato Zik'aso Bezu	»
Ato Tamirat Derwato	»
Ato Ayele Eshetu	»
Ato Angaamo Bayou	Dooko-C'are
Zaanit Gezahegn	»
Ato Addisu Zegicho	»
W/o Seherefe Endale	»
Ato Zemene Is'into	»
Ato Dumaye C'abuk'0	Ob'ca
Ato Bilaato Diggo	Mottikeesa
Ato Fekaadu Defersha	Dooko-Ayma
Ato Getachew Teshome	»
Ato Getito Gawse	D'oc'a
Ato Terefe Ashenafi	»

C. Households whose gardens were used as study unit in Basketo

Name	K'ebele		Name	K'ebele
Ato Awoke Birega	Dooko Ayma		Ato Tsedeke Tirfe	Awura-Sosta
W/o Gamane Mero	»		Ato Girma Mengesh	»
Ato Kitatu Haile	»		Ato Baddo Malabato	»
Ato Zewde Mengistu	»		Ato Lakew Shibeshi	»
Ato Abraham Lalife	»		Ato Amenu Alemu	»
Ato Muko Dayso	Wada		Ato Abera Asitso	Obc'a
Ato Zewde Mulugeta	»		Ato Tesfaye Berhanu	»
W/o Sherefe Setegn	»		Ato Mitacew Sheyicho	»
Ato Geremew Balo	»		Ato Agazo Awsato	»
Ato Tujare Tadese	»		W/o Almaz Metekia	»
W/o Tubane Shero	Satsa-Makesa		Ato Fikadu Birega	Zabba
W/o Kelemuwa Satife	»		ATo Kasahum Muchuko	»
Ato Maddo Ukko	»		Ato Admaso Miljo	»
Ato Wondimu Wordiso	»		Ato Feredegn Zerhun	»
Ato Cheneke Dadi	»		Ato Immito Azato	»
Ato Syoum Berhanu	Dooko Care		Ato Dundile Girma	Mandita
Ato Amenu Ketso	»		Ato Taye Garso	»
W/o Senayit Zuto	»		Ato Wolde Mengistu	»
Ato Kebede Awusato	»		Ato Ganana H/Mariam	»
Ato Berhanu Algo	»		Ato Ayira Dizita	»
W/o Bogalech Gasgodo	Geze-Ayma		Ato Yisehak Kebede	Gaara-
Ato Gizachew Ido	»		Ato Kebede Gidiso	»
Ato Beyene Dipo	»		Ato Hasho Halitso	»
Ato Endeshaw Sebseb	»		Ato Dentha Garbela	»
Ato Geresu Sugo	»		Ato Ajuja Abebe	»
W/o Zenebech Bezabeh	Dabtsa-		W/o Felekech G/Hiwot	Sheela- Kan.
Ato Fekadu Berahanu	»		Ato Adisu Aymakasho	»
Ato Adugna Baykeda	»		Ato Gobena Goto	»
Ato Sheddo Essito	»		Ato Gizaw Aytiso	»
W/o Shit'oto Amusa	»		Ato Gizachew Belayneh	»

Appendix 9b List of community members who participated in the study (Kafa)

A. Local research assistants

1. Ato Adale Haile
2. Ato Gebre Asfaw
3. Ato Adelo Haile
4. Ato Adugna Gebre

B. Informants who participated in group discussions and guided field walks

Name	K'ebele
Ato Kedir Abamilki	Kayakeella
Ato W/Michael Keto	»
Ato Tamene Tesema	»
W/o Meselech Gezahegn	»
Ato Getachew Nigatu	»
Ato Tesfaye Teshome	»
Ato Firew Fikadu	»
Ato Alemu Gebre	Hibret
Ato Demeke Mengistu	»
Ato Tesema Gebre	»
W/o Manelebish Shiferaw	»
Ato Takele G/Maria	»
Ato Adeto Gawo	»
Ato Gebre Yebbo	»
Ogarasha Haile Keto	Beemo
Ato Engido Haile	»
Ato Zerihum Mohmed	»
W/o Aregash Haile	»
Ato Haile Shawo	Kic'o
Ato Mekonnen Mengistu	»
W/o Zenebech Alemayehu	»
Ato Barud G/Yesus	»
Ato Aefa Woldesenbet	Ufa
Ato Adello Siro	»
Ato Wondimu W/yes	»
Ato Mengistu Mamo	»
Ato Samuel Shawo	»
Ato Azage G/Medihin	Kuti
Ato Wodajo GEbre	»
Ato K'oc'ito W/Michael	»

Name	K'ebele
Ato Wondimu Gebre	»
Ato Meshesha Wolde	»

C. Households whose gardens were used as study unit in Kafa

Name	K'ebele		Name	K'ebele
Ato Demeke Mengistu	Hibret		Ato Berhanu Alemu	»
Ato Ashebir Gebre	Ufa		Ato Alemayehu Yebbo	»
Ato Wondimu Woldeyes	»		Ato Tesema Mero	»
Ato Legese Tafese	»		Ato Tadesse W/Michael	»
Ato Ademe Haile	»		Ato Kapisho Kelo	»
W/o Manalebish Shiferaw	»		Ato Kifle Misho	»
Ato Tesema Gebre	»		Ato Keto Wolde	»
Ato Teka Busho	»		At Wondimu W/Senbet	»
Ato Abamecha Abafogi	»		Ato Mitiku W/Mariam	»
Ato Mengesha Ambo	»		Ato Abebe Gebre	»
Ato Abate Tadesse	Kic'o		M/re Gebre Tewolde	Kuti
Ato G/Michael G/Senber	»		Ato G/Mariam Ambo	»
Ato Haile Wolde	»		Ato Kifle Kidane	»
Ato Teka G/Michael	»		Ato G/Yesus Gebre	»
Ato Mamo G/Michael	»		Ato W/Yohanes Gawo	»
Ato Kebede G/Michael	»		Ato Admasu Haile	»
Ato Meshesha W/Tsadik	»		W/o Belaynesh Kifle	»
Ato Semato W/Mariam	»		Ato Kinfe Engida	»
Ato Alemayehu Mola	»		Ato Kochito W/Michael	»
Ato Wondafrash Kidane	»		Ato Mamo Yebbo	»
Ato W/Michael Addo	Beemo		Ato Haile W.Giorgis	Ermo
Ogarash Haile Kello	»		W/o Worke Ato	»
W/Zenebech W/Michael	»		Ato Haile W/ giorgis	»
Ato Kebede Shaho	»		Ato W/Senbet Mero	»
Ato Berhanu Atumo	»		Ato W/Michael Nibo	»
Ato Gaweto W/Sillasie	»		Ato Alemu Ago	»
W/o W/Michael Keto	»		Ato Admasu Demise	»
Ato Kebede H/Mariam	»		Ato Tadesse W/Sillasie	»
Ato Ayele Gibo	»		Ato Addelo Haile	»
Ato Wondim W/Semayat	»		Ato Haile Gebre	»
Ato Gezahegn W/ Mariam	Kayakeella		Ato W/Giorgis W/Mich.	Beha
Ato Bekele Zewde	»		W/o Gawge Geleso	»
W/o Mulunesh Gebre	»		Ato W/Mariam Gebre	»
W/o Woinitu Ayele	»		W/o Lomitu Abebe	»
W/o Azalech Gebre	»		Ato Aklilu Gadisa	»
Ato Gababo G/Michael	»		W/o Meseret Tadesse	»
Ato Gawo Gebre	»		Ato Haile Gebo	»
Ato Desta Shalmo	»		Ato Admasu Keto	»
Ato Asefa Haile	»		Ato Takele W/Semayat	»
Ato K/ochito G/Mariam	»		Ato G/Tsadik Gebre	»

Appendix 10a Checklist of questions used during household interviews

■ Basic demographic questions (Name, age, gender, family size, religion, level of education, social status)

A. On homegardens

1. How do you call the house and the cultivated land surrounding it (the garden)?
2. How old is the garden?
3. Was the garden established by you or is it an inherited one?
4. What functions does the garden serve?
5. Do you grow a crop plant type in any part of the garden?
6. Is there a name for different parts of the garden?
7. What are the purposes each garden section is used for?
8. Do all household members work in the different sections of the garden?
9. What are the crop plants you grow in your garden?
10. Who, among household members, is involved in planting, harvesting, processing and marketing activities?
11. Are there plants which grow in the garden spontaneously?
12. If there are spontaneous plants, why do you maintain them in the garden?
13. Which plants of the garden are included in the garden in the last 10-20 years?
14. Where do you get new plants? And why did you plant them?
15. Are there crops which are diminishing or expanding in the garden?
16. If there are changes in the abundance of some crops of the garden, what are the reasons for the observed changes?
17. Are there plants which are raised in new locations in the garden other than the corners they used to be grown?
18. Do you have additional land where you grow crops?
19. Will the garden be converted into other production units in the future?
20. What is the value of the homegarden to you?

B. On Spices

1. What are plants that you use for flavoring food?
2. For what purposes do you use spices?
3. What are the major foods or preparations that call for many spices?
4. Do spices differ in their use to the household? How?
5. Questions on individual spices
   - ♦ What kind of purpose is the spice used for?
   - ♦ What are its harvested parts?
   - ♦ What are product transformation processes?
   - ♦ What is the frequency of use of the spice by the household?
   - ♦ How is it propagated?
   - ♦ Where is it cultivated in the garden?
   - ♦ Is it available in the garden throughout the year or is it seasonal?
   - ♦ Who, in the household, is in charge of cultivation, harvesting, selling and donating?
   - ♦ What are production related problems?

6. Are there changes in consumption, processing production of spices?
7. Are there spices obtained form other land-use systems?
8. What are new spices that are being incorporated into the homegarden system?
9. In what form of product are spices sold?
10. Where do you sell spice?
11. Who are the customers that buy spices?
12. What are the units of sell?
13. Are there supports or incentives that encourage spice production?
14. What are the changes in the number and amount of spices being sold and in the amount of income obtained?

C. On resource perceptions, classification and use norm

1. What is the name of this plant?
2. Are there different types of this plant? What are they?
3. What purposes is the plant used for?
4. Are there harvesting related restrictions?
5. What is the benefit of growing diverse crops in the garden?
6. What is your idea of increasing crop types in the garden?
7. How do you maintain the different types of crops in your garden?
8. Do you share garden produce or planting materials with other people?
9. Are there plants which are maintained in connection to religious practices?

Appendix 10b Checklist of questions used during focus group discussions

■ Basic demographic questions (Name, age, gender, religion, social status)

1. What is the use of the named plant?
2. Does the name of the plant have any meaning?
3. How do the named plants differ? In what respects?
4. How do you call the house and the cultivated land surrounding it (the garden)?
5. How are other land units adjacent to the garden named?
6. How do the different land units differ from each other?
7. To whom do the homegarden and other land-use systems belong?
8. What benefits do commonly held lands give to the community?
9. Who has the right to use resources from commonly held lands?
10. How is resource use from commonly held lands regulated?
11. Are there resources whose use is prohibited either totally or temporarily?
12. What are the landscape components that are getting diminished?
13. What religious rituals do you conduct?
14. Why are rituals held?
15. Where are rituals performed?
16. Which plants are associated to or used in rituals?
17. How are household of closely situated gardens related?
18. Are there kinship based divisions of the society?
19. How is the traditional administration organized?

Appendix 10c Checklist of questions used during interviews with local traders

1. How long have you been in business?
2. What are you trading in?
3. Whom do you buy spices from?
4. What are the spices that are supplied to other places in the country?
5. Question on ***kororima***
   - What are the months during which the new harvest is brought to market?
   - What quality criteria are used when buying or selling the product?
   - What are the destination markets?
   - Under what provenance name is the product sold in distant markets?
   - Are there other places in the country that produce the spice?
   - What is the acceptance of your product in national and other markets?
   - What is the current price per kilogram of the product? How has price changed over years?
   - What are factors that cause quality deterioration of the product?
   - Since what time has the spice been traded?
6. On ***t'imiz*** (*Piper capense*)
   - Since what time has the spice been traded?
   - When and how did the trading of the spice begin?
   - What are the destination markets?
   - What quality criteria are used when buying or selling?
7. Are there incentives that encourage trading of spices?
8. What are the changes in relation to supply, demand and quality of spices?

Appendix 10d Checklist of questions used during interviews with traders beyond the local level

1. What are the source areas of the country that supply ***kororima***?
2. How are ***kororima*** products from different supplying areas identified?
3. Is there variation in the price of ***kororima*** of different provenances?
4. Do consumers show preference for different provenances of ***kororima***?
5. What quality criteria are used when buying or selling ***kororima***?
6. What is the likelihood of mixing ***kororima*** of different provenances?
7. What is the current price of a kilogram of ***kororima***? How is it changing?
8. Are there seasonal variations in the price of ***kororima***?
9. What are the different product types of ***kororima*** that are marketed?
10. Whom do you sell ***kororima*** products?
11. Are ***kororima*** products sold outside the country?
12. What are the changes in relation to supply, demand and quality of spices?

Appendices 10e Checklist of questions used during interviews with institutions, organizations, and associations associated to spice valorization

A. National and regional institutions

1. Does your institution undertake activities that relate to spices?
2. If there are some activities, what is the objective of engaging in these activities?
3. How are these activities organized and implemented?
4. What activities are being undertaken in relation to production, promotion and commercialization of spices?
5. Which spices are identified as items of potential benefit?
6. How is product quality controlled?
7. Who are the stakeholders in the spice sector? And how are they involved in your activities?
8. What are the changes observed in recent years in connection to spices?

B. Local (study area level) institutions/organizations/associations

1. Does your institutions/organizations/associations undertake activities that relate to spices?
2. If there are some activities, what is the objective of engaging in these activities?
3. What are the spices of the area?
4. How are spices related to local livelihood and biological resources?
5. What are the major commercial spices of the area?
6. What is the trend of spices production?
7. How are producer farmers supported in relation to spice production?
8. What are the mechanisms of maintaining and controlling quality?
9. What incentives are used to encourage spice production and commercialization?
10. What are the major constraints in relation to spice production and processing?
11. What are commercialization related changes observed in recent years in connection to spices?