Culture, History and Identity: Landscapes of Inhabitation in the Mount Kilimanjaro Area, Tanzania

Essays in honour of Paramount Chief Thomas Lenana Mlanga Marealle II (1915-2007)

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CHAPTER FOURTEEN

ENVIRONMENT AND WORLDVIEW: THE CHAGA HOMEGARDENS

PART I: ETHNOBOTANY AND ETHNOZOOLOGY

Andreas HEMP and Claudia HEMP

A. THE CHAGGA 'HOMEFOREST'

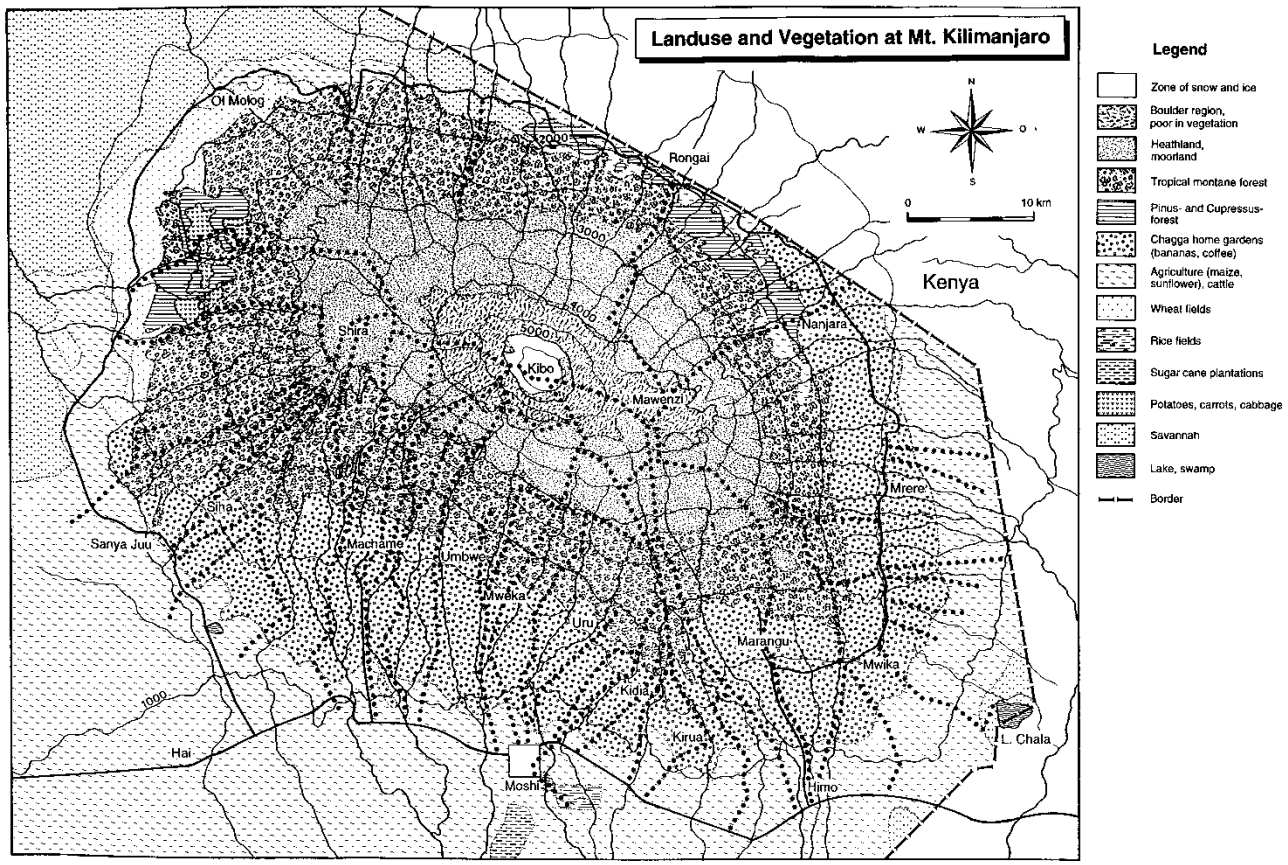
INTRODUCTION

Over the last 2,000 years people have continuously inhabitated the slopes of Mount Kilimanjaro (Odner 1971a, 1971b). However, during the last few decades the human population has increased dramatically. In 1913 the first reliable census was conducted on Kilimanjaro (Raum 1914), which showed a total population of about 100,000 people (the estimation of Widenmann (1899) with 50,000-60,000 Chagga people living on Kilimanjaro in 1895 seems to be much too low; see part II below). In 2002 the census counted 1,053,204 people (National Bureau of Statistics 2003). As such, the population has multiplied 10 times in 90 years. Most of the population is concentrated at an altitude between 1000 and 1800 metres, with densities varying from 500 to 1000 people per km^2 in some areas (Timberlake 1986; FAO 1986). Here a very remarkable kind of land use prevails: dense 'banana forests' with a scattered upper tree layer, the so-called Chagga homegardens, in English 'banana grove', in German *Bananenhain*, in KiChagga *mndà*` (the term 'homegarden' itself refering to the small size and subsistence-level of the farms, cf Nair 1993). Due to this sustainable and well developed agroforestry system (see Fernandes *et al* 1984) degradation in this vegetation belt is rare, despite the enormous population. In their homegardens the Chagga use four vegetation layers. Under a tree layer, which provides shadow, fodder, medicines, firewood and formerly also construction wood bananas are grown, and under the bananas coffee trees, and beneath these vegetables. This multi-layer system maximises the use of limited land. The area is irrigated by a network of canals fed by main furrows originating from the montane forest. Rough estimates indicate over one thousand of these furrows of varying lengths and capacities (Ramsay 1965). Some of these certainly date back to about 1600 BCE, others very likely to about 1200 BCE, while yet others have been dug rather recently or are still under construction (Winter, part II of this article).

This farming system evolved over several centuries and, unlike the land use in the lower zones, did not change much over the last decades. Evidence that the first irrigated banana gardens existed in the 12th century indicates a lengthy level of agricultural continuity. This ancient land use system has, in part, formed the identity of the Chagga, who are of multiethnic origin, despite belonging to the Bantu people. Until the 19th century they spoke about themselves only as *wandu wa mndeny* ('people living in the banana groves'), having similar culture but different (24) dialects and (6-9) languages (Raum 1909; Winter 1994). The Swahili name 'Chagga' refers to both, the traditionally settled area on the Eastern and Southern slopes of Kilimanjaro, and (later) the people who have historically lived in this area. The agroforestry system of the Chagga homegardens is a unique feature of Kilimanjaro, stretching over the climatically most favourable zone of the southern and south-eastern slopes over an area of 1000 km^2 (**figure 1**). If one was to pass from north-east to the south-western end of this belt and assuming there was a continuous road, one could drive for 120 km through a closed 'banana forest' composed of about 225 million banana 'trees'. The same type of land use, although with a much smaller extension, showing virtually the same floristic and structural composition, occurs on the Pare Mountains and Mount Meru, (Hemp, A. unpub. data).

The Chagga live within their homegardens in single dwellings; villages as such do not exist. Nonetheless, along the main roads centres with church, village council, schools and some shops are situated. Livestock – cattle, goats, sheep and pigs and sometimes even poultry – are kept in stalls. Bee-keeping also plays an important role. Women and children spend a great part of the day collecting grass along paths, fields and forest edges and on steep meadow slopes. Pasture farming is rare in this zone as most of the land is dedicated to intensive agroforestry, as well as due to historical reasons, in particular to prevent theft by Maasai groups. Therefore (based on the nature of their components) the Chagga homegardens can be classified as an agrisilvicultural system (Nair 1993). The Chagga homegardens has been the subject of different studies dealing mainly with socio-economic (Clemm 1963; Brewin 1965; Fernandes *et al* 1984; O'Kting´ati and Kessy 1991; Mdoe and Wiggins 1997) or ethnobotanical and ethnozoological aspects (O'Kting´ati *et al* 1984; Hemp, A. 1999; Hemp, C. 2001). The array of cultivated species was also described in detail by the first scientists on Kilimanjaro, e.g. Volkens (1897) and Widenmann (1899). In more recent studies Hemp, A. (2006a) described the natural flora, vegetation and structure of the homegardens and Hemp, C. (2005) investigated the function of the homegardens as the

Figure 1. Land use and vegetation cover of Mount Kilimanjaro



habitat of an endangered and endemic grasshopper species. To highlight their function for biodiversity and as a refuge area for natural plants and animals the species composition of this man-made habitat has to be compared with all vegetation formations of Mount Kilimanjaro, which are briefly described in the following section.

KILIMANJARO: TOPOGRAPHY, CLIMATE AND VEGETATION

Topography

Mount Kilimanjaro is located 300 km south of the equator in Tanzania, on the international border with Kenya. It is the highest mountain in Africa, a huge stratovolcano (approximately 90 by 60 km), composed of three single peaks, Kibo (**figure 2**), Mawenzi and Shira that reach an altitude of 5,895 m, 5,149 m and 3,962 m respectively (**figure 3**). Kilimanjaro is also the world's highest solitary mountain, looming 5,000 m above an open undulating plain that averages around 1,000 m. The mountain's topography features very deep valleys, particularly on the western and southern slopes, as well as east of Mawenzi. These valleys together with some secondary vents create important refuge areas for wild flora and fauna on the lower slopes where cultivation is predominant (Hemp, A. 2001). The morphology of the upper areas of Mount Kilimanjaro was formed by glaciers that, at points, during the last ice age reached down to an altitude of 3000 m (Downie and Wilkinson 1972, Hastenrath 1984).

Climate

Mount Kilimanjaro's climate is characterised by two distinct rainy seasons: the long rains from March to May, and the short rains around November. According to the climate classification systems of Köppen and Troll/Pfaffen (in Müller 1983) Mount Kilimanjaro has a 'seasonal dry tropical climate'. However, rainfall and temperature vary with altitude and exposure to the dominant wind blowing from the Indian Ocean. The foothills of the southern slopes receive an annual rainfall of 800-900 mm and at 1500 m the lower southern slopes receive 1500-2000 mm. At 2100 m in the middle part of the forest belt, annual rainfall reaches a maximum of around 3000 mm, which is greater than that recorded on other high East African mountains (Hemp, A. 2001, 2006d). Higher up at 2400, 2700 and 3,000, some 80, 70 and 50 percent respectively of this maximum were observed (**figure 4**). The northern slopes, on the lee side of the mountain, receive much less annual rainfall.

The mean annual temperature in Moshi (813 m) is 23.4°C (Walter *et al* 1975). It decreases to 18.2°C at 1400 m

Figure 2. Altitudinal vegetation zones on the southern slope of Mount Kilimanjaro. A: colline savannah zone; B: submontane cultivation zone; C: montance forest zone; D: (sub)alpine zone

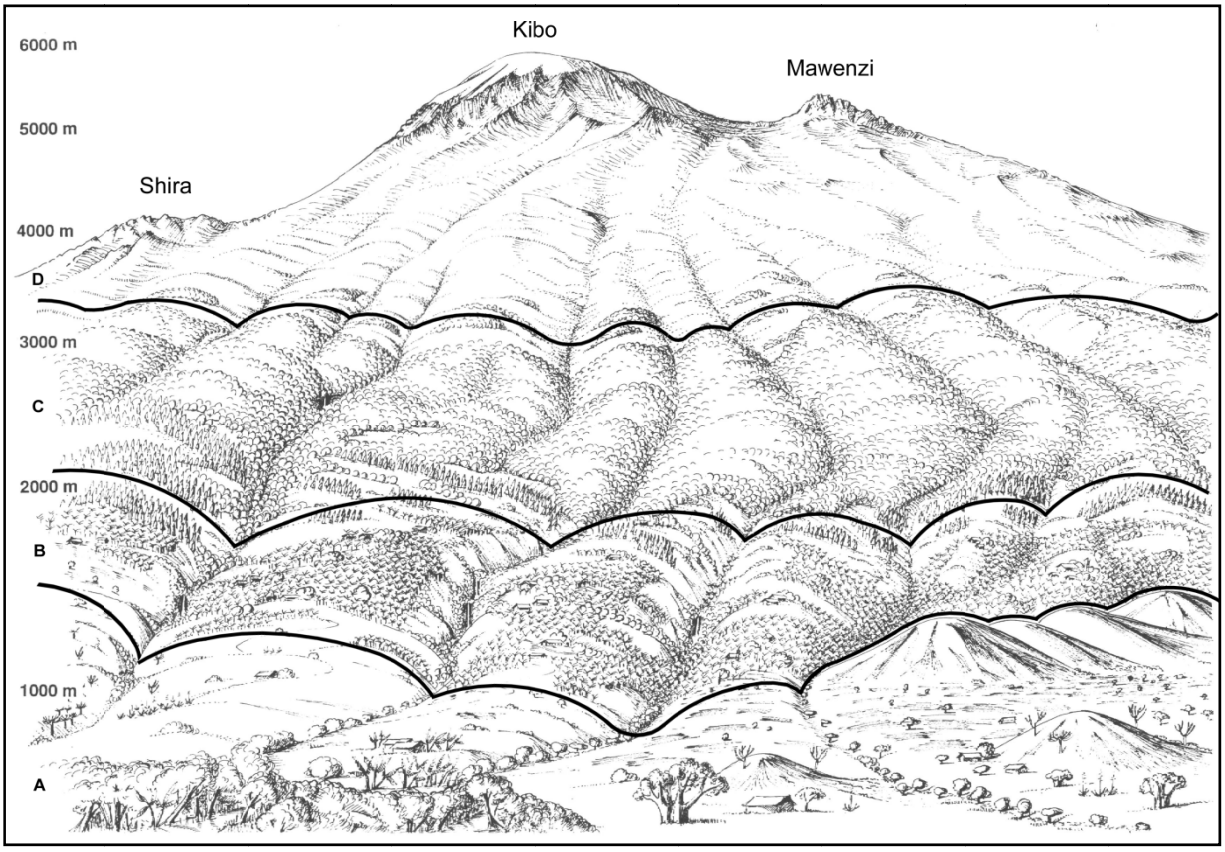


Figure 3. Kibo: The snow-covered main peak of Kilimanjaro

Figure 4. Mean annual precipitation and temperature combined from three transects on the southern slope of Mount Kilimanjaro. Mean annual temperature was obtained from punctual measurements at 30 cm depth in the soil except the lowest and uppermost temperature values, which are from Walter *et al* (1975) and Thompson *et al* (2002) respectively; mean annual minimum temperature was calculated from absolute minimum temperatures from the years 2001-2003 on the tree transects; precipitation data from above 1800 m from the year 1999-2004, from below 1800 m since 1997 in addition to station measurements from the Tanzania Meteorological Agency for various time periods

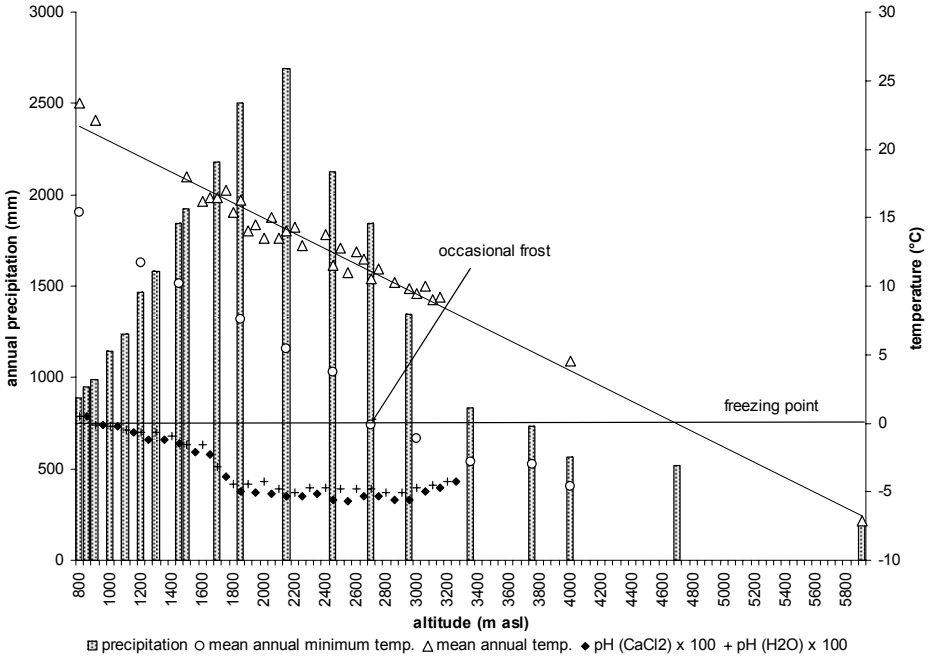
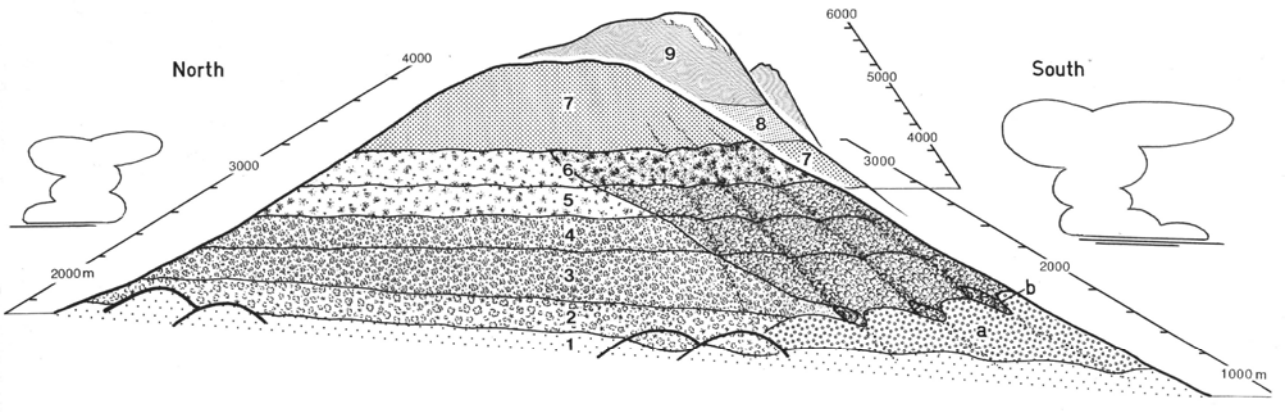


Figure 5. Schematic north-south profile showing the western slope of Mount Kilimanjaro (Shira, Kibo, Mawenzi) with main altitudinal zones and vegetation types. 1: colline (savannah) zone; 2: submontane zone with *Croton-Calodendrum* forest [a: coffee-banana plantations in the submontane zone on the southern slope; b: submontane gorge forests on the southern slope]; 3: lower montane zone with *Cassipourea* forests on the northern slope and *Agauria-Syzygium-Ocotea* forests on the southern slope; 4: middle montane zone with *Cassipourea* forests on the northern slope and *Ocotea* forests on the southern slope; 5: upper montane zone with *Juniperus* forests on the northern slope and *Podocarpus-Ocotea* forests on the southern slope; 6: subalpine zone with *Juniperus* forests on the northern slope and *Podocarpus* forests on the southern slope; 7: subalpine zone with heathlands (*Erica* bush); 8: lower alpine zone with *Helichrysum* cushion vegetation; 9: upper alpine and nival zone, mainly bare of vegetation



inside the coffee-banana belt (own data) and –7.1°C on the top of Kibo at about 5800 m (Thompson *et al* 2002) with a change rate of about 0.6°C per 100 metres (**figure 4**). The climate in the alpine belt above 3500 m is characterised with nightly frosts all the year round and intensive sunshine during daytime (Hedberg 1964).

Vegetation

Mount Kilimanjaro has a rich diversity of ecosystems, particularly of vegetation types resulting mainly from a large range in altitude and rainfall. Several vegetation zones can be differentiated (see **figures 3 and 5**).

***Colline zone*:** Between 700 and 1000 m, a dry and hot colline savannah zone surrounds the mountain. This zone is mainly under crop production or used for pasture. Small relicts of indigenous savannah vegetation are found on secondary vents (savannah grasslands, woodlands and cliffs; see **figure 6**) and along rivers (riverine forests). Larger remnants of indigenous savannah vegetation still exist around Lake Chala on the eastern, as well as on western and northern foothills of Mount Kilimanjaro. The main cultivation area with its coffee-banana fields, the Chagga homegardens, is located between 1000 and 1800 m in the submontane and lower montane zone (**figure 7**). Remnants of old forests are only found in the deepest valleys and gorges with different stages of disturbed forest, bush, riverine and grass vegetation.

***Montane zone*:** Closed-canopy mixed forests cover the montane zone (**figure 8**). The lower forest line borders the cultivated areas at around 1600-1800 metres on the southern and eastern slopes and at 1300 m on the western slopes. The upper closed forest line reaches approximately 3100 m in many areas around the mountain. An overview of the main forest types is detailed below.

***(Sub)alpine zone*:** Between 3100 and 3500 m, forests of *Erica excelsa* are gradually replaced with *Erica*-bush. The dominant species are *Erica arborea* and *Erica trimera*, *Protea caffra* and *Euryops dacrydioides*. On the south-eastern slopes, moorland vegetation, characterised by tussock grass and giant lobelias, fringes the forest. At an altitude of about 3900 m, the *Erica* heathlands grade into a *Helichrysum* vegetation cushion that extends up to 4500 m (**figure 9**). The higher altitudes are almost devoid of vegetation (for details of the (sub-)alpine vegetation of Mount Kilimanjaro see Hedberg 1951; Klötzli 1958; Beck *et al* 1983; Hemp, A. 2008).

Figure 6. Savannah grassland at the south-eastern foothills of Kilimanjaro with the Ugueno (North Pare) Mountains in the background

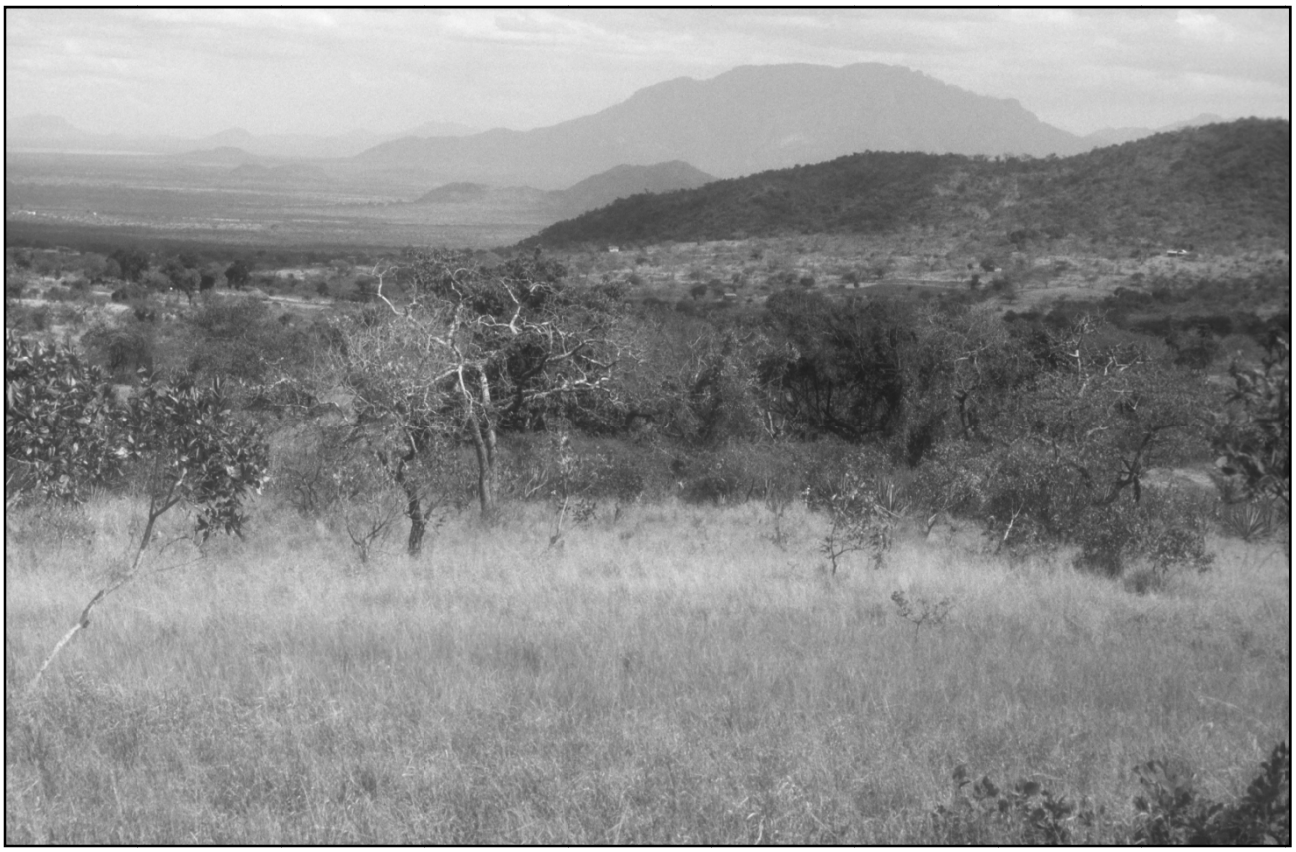


Figure 7. Chagga homegardens in the area of Kibosho with an open tree canopy and dense banana undergrowth

Figure 8. Montane rainforest at 1900m above Nrwa on the southern slope of Kilimanjaro

Figure 9. Alpine Helichrysum dwarf shrub at 4,000 m below Mawenzi

Vegetation Structure of the Homegardens

Figure 10 shows a vegetation profile of a Chagga homegarden in the area of Kidia (Old Moshi) (all data from Hemp, A. 2006a). Typical of the agrisilvicultural system of the Chagga homegardens is their multilayered vegetation structure similar to a tropical montane forest. Therefore the growth form spectrum (**figure 11**) displays beside herbs also trees, shrubs, lianas and epiphytes. Apart from some cultivated fruit trees, e.g. *Persea americana* (avocado), *Mangifera indica* (mango) and *Syzygium cumini* (a Myrtaceae) or introduced timber trees such as *Grewillea robusta* and *Cupressus lusitanica*, most of the 82 encountered tree species are remnants of the former forest cover. Most widespread are *Albizia schimperiana*, *Rauvolfia caffra, Cordia africana, Commiphora eminii* and *Margaritaria discoidea*. Nearly all banana fields are covered by at least some trees. Fifty-two liana species were found in the survey. Eleven species were cultivated plants with important agricultural crop plants such as three *Dioscorea* and *Passiflora* species and the Cucurbitaceae *Telphairia pedata* belonging to this growth form.

Similar to the trees, epiphytes and lianas most of the shrubs in the Chagga homegardens were forest species. However, in the shrub layer the most important cultivated plants occurred: different varieties of *Musa x sapientium* (dessert bananas) and *Musa x paradisiaca* (cooking bananas) and *Coffea arabica*. Bananas form a dense (mean cover value 50 percent) upper shrub layer of about 4-6 m height and coffee trees a lower layer of 1.5-2 m. Volkens (1897) and Widenmann (1899) rightly reported that the bananas on Kilimanjaro are most luxuriant with heights of 6-8 m in the area of Kibosho and Kilema. This may be due to the fact that the bedrocks in these areas of the wet central southern slope consist of rhomb porphyry instead of porous tuff and ashes as in the adjacent regions of the southern slope (Downie and Wilkinson 1972) and that the eastern slope receives less precipitation.

Biodiversity of the Homegardens

Flora

The Chagga homegardens maintain a high biodiversity with over 500 species including 400 non-cultivated plants (all data from Hemp, A. 2006a). This is about three quarters of the species occurring in the ruderal vegetation formation (i.e. vegetation on road sides, waste places and fallow arable land) on Kilimanjaro (**figure 12**). With over 700 species this formation holds rank three in respect of species richness after the forests and grasslands. Most areas of the submontane coffee-banana belt resemble woodland with a dense undergrowth of bananas (**figures 7 and 10**). Thus, 193 forest species were found in the studied plots, species that need a forest-like habitat structure for surviving (**figure 13**). This is about 17 percent of the 1,223 forest plants of Kilimanjaro (45 percent of the forest trees and 17 percent of the forest

epiphytes; see Hemp, A. 2006b). Compared with large scale commercial coffee plantations this conserving function becomes evident: four surveyed commercial plantations harboured only six forest species, and three quarters of the species were widespread ruderal or cultivated species. This holds not only for plants but also for insects such as Saltatoria (see below). On the other hand there are some forest species, which were directly or indirectly favoured by the Chagga people. An example of an intentionally dispersed forest plant is *Dracaena fragrans* (**figure 14**). This shrub or small tree has lost almost all natural habitats on Kilimanjaro, except a handful of submontane river gorges. However it is one of the most characteristic species in the banana plantations, where it is used as a hedge plant since it is easily propagated by cuttings. *Dracaena fragrans* is an important ceremonial plant and *Dracaena* hedges are protected as they serve also as burial markers.

Figure 10. Profile (27x2.5 m) and ground plan (27x5 m; bold lines indicate the area used for the profile) of a typical Chagga homegarden in Kidia (Old Moshi) at 1400 m asl. Exposition south west, inclination 25°, mean annual precipitation 2000 mm, mean annual temperature °C. An open light upper canopy is formed by *Albizia schimperiana* var. *amaniensis*, on which epiphytes such as the fern *Drynaria volkensii* and *Telphairia pedata*, a liana with oil-containing seeds, find habitats. Bananas form a dense upper shrub layer of 4-6 m height, coffee trees a lower shrub layer of 1.5-2 m, intermingled with 1-1.5 m high Coco Yam (*Colocasia esculenta*). The lower side of the banana field borders a path; where *Dracaena fragrans* is planted as a hedge

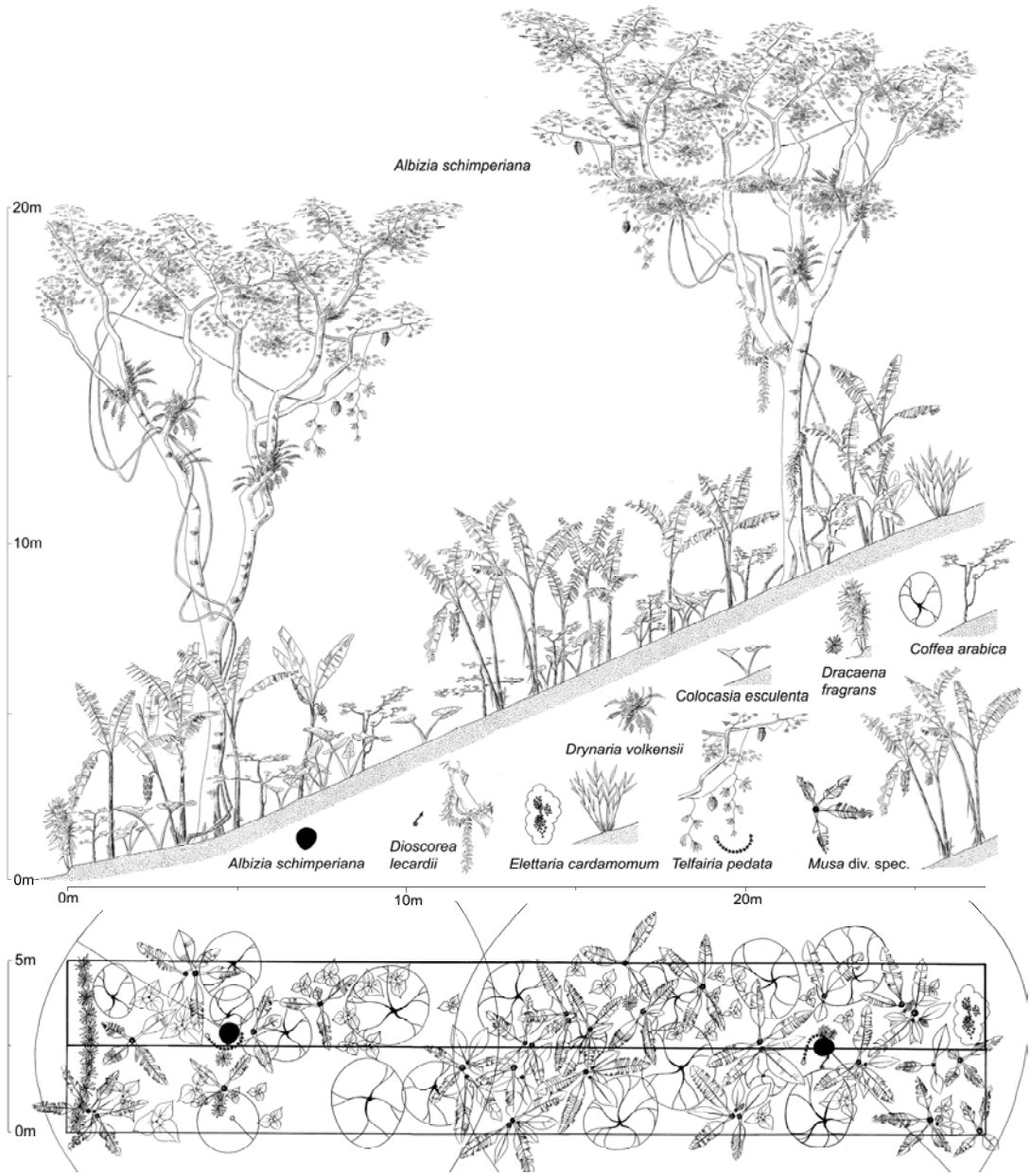


Figure 11. Growth form spectrum of the Chagga homegardens showing species number of the respective stratum in the vegetation plots

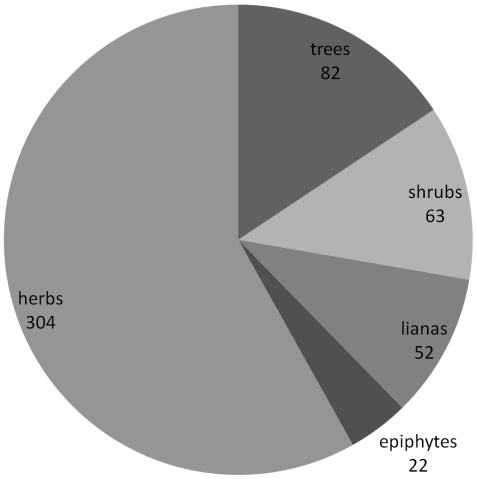


Figure 12. Vascular plant species richness in the main vegetation formations and the banana plantations of Kilimanjaro

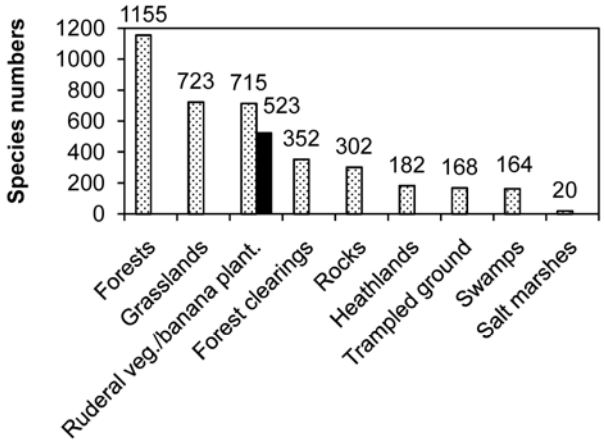


Figure 13. Floristic composition of the banana fields in respect of the different vegetation formations on Kilimanjaro

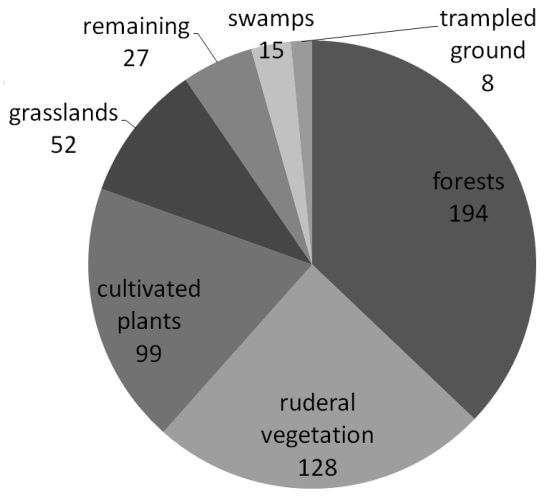


Figure 14. *Dracaena fragrans* is an important ceremonial plant and *Dracaena* hedges are protected as they also serve as burial ground

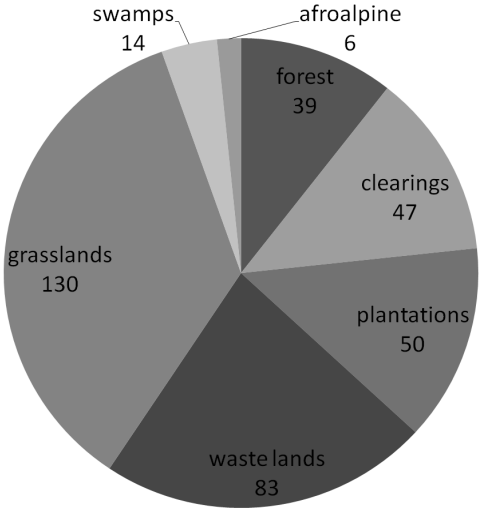
Anthropogenic influence does not only destroy natural habitats but sometimes it enlarges the distribution of indigenous species by increasing habitat diversity. An example of such apophytes sensu Rikli (1903) (i.e. indigenous species, which could extend their natural distribution area due to human influence) is the fern *Christella dentata*, a species indigenous to the riverine forests of the colline and submontane zone of Kilimanjaro. Its main habitat and main distribution area are nowadays the coffee-banana plantations with their ramified irrigation system and forest-like structure on the southern and eastern slopes. The same holds for *Impatiens walleriana* and the fern *Adiantum poiretii*. Another apophyte is *Pellaea viridis*, which naturally thrives on Kilimanjaro in submontane *Croton-Calodendrum* forests (Hemp, A. 2008). Some forest plants (e.g. *Pilea tetraphylla*) are only encountered in the banana plantations but in none of the about 600 forest plots established on the mountain, highlighting the important conserving function of the Chagga homegardens, which might therefore be better described as 'homeforests' than homegardens. These findings are in line with the fact that biodiversity in general on Kilimanjaro culminates at 1000-1300 m with over 900

vascular plant species inside the coffee-banana belt (Hemp, A. 2005a), the most densely populated region of the mountain. This is due to the high variety of (moderately) cultivated areas (the Chagga homegardens), forest patches, river gorges and grasslands at this altitude. This (mostly human-made) variety of habitats, the high beta-diversity and promotion of alpha-diversity, allows species from lower altitudes to 'climb' up the mountain. A similar phenomenon was observed in the Saltatoria fauna of Kilimanjaro (Hemp and Hemp 2003).

Saltatoria

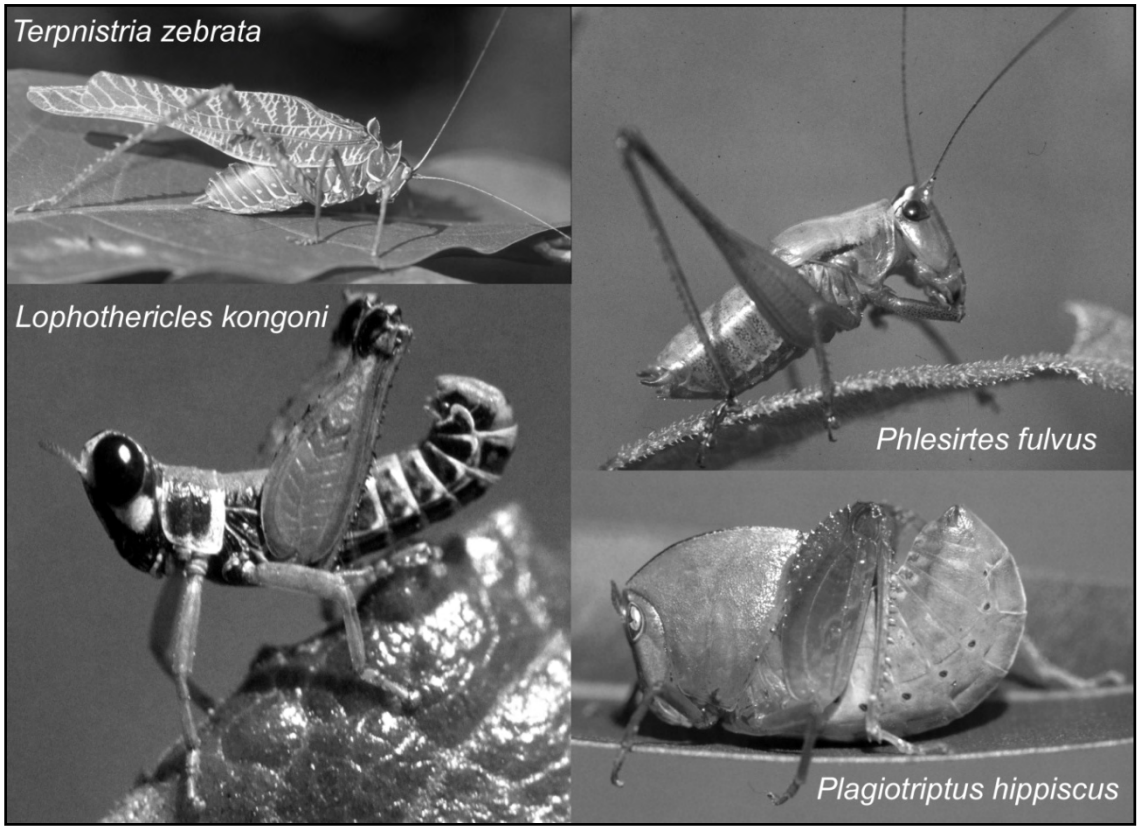
One hundred and ninety-two Saltatoria species (grasshoppers and bush crickets) were recorded for the whole of Mount Kilimanjaro, the majority in grassland (130 species), followed by waste land including fallow arable land, roadsides and open disturbed places (83 species), forests (38 species), and clearings (47 species) (see **figure 15**). The Chagga home gardens form an important habitat in respect to biodiversity, with 52 species, about a quarter of the whole Saltatoria fauna. Comparatively few species were found in swamps (fourteen species) and only six Saltatoria species occur in the afro-alpine zone. Over 70 percent of the Saltatoria species found in the Chagga homegardens originate from forest communities, the remainder are open land forms. The forest species come from the colline zone (twelve species), the sub-montane zone (twelve species) and montane zone (four species). Ten forest species, mainly from colline savannah forest communities, were not found in the homegardens. One hundred and fifty-four

Figure 15. Saltatoria species of different habitats on Mount Kilimanjaro. Many species occur in more than one habitat and the numbers provided are based on 192 species



open land species are known; only 24 species (16 percent) were found in plantations; eight are open land forms from the colline zone and fifteen were found in the sub-montane zone. Only one species is an inhabitant of the montane zone. Thirty-two percent of the species in the Chagga home gardens are endemic. Endemism rate for the whole of Mount Kilimanjaro/ Meru area is 16

Figure 16. Mixture of partly endemic Saltatoria species found within Chagga homegardens



percent. The Chagga homegardens provide habitat to more than half of the endemics occurring from the colline to the afro-alpine zone of Mount Kilimanjaro. Two endemic species found in plantations originate from habitats of the colline zone, nine from sub-montane and five from montane habitats. Twenty-five percent of all colline endemics also occur in plantations, as well as 75 percent of all sub-montane and 63 percent of all montane endemics of Mount Kilimanjaro. Although highly influenced by human habitation, the Chagga homegardens serve as important regional refuge for Saltatoria species, especially for forest species and endemics. The mixture of retained tree canopies and open patches appears to favour a mix of species typically not found together elsewhere (**figure 16**).

CULTIVATION HISTORY AND SOCIO-ECONOMY

Introduced and Cultivated Species in the Chagga Homegardens

This section gives a short overview concerning the history of the development of the Chagga homegardens, which is partly derived from the more detailed descrption given by Winter in Part II. The Chagga homegardens – or 'banana groves' as they have commonly been cast in the ethnography – in their modern arrangement are the result of a long history of immigration of humans and introduction of food plants. A characteristic feature of the homegardens with their more than 500 plant species is the high number of introduced plants with about 100 cultivated species and 41 neophytes (i.e. introduced species, which became naturalised). Nearly all cultivated species come from other (sub-)tropical parts of the world: from America (e.g. avocado, papaya, sweet potato, tree potato, maize, tomato, potato) or India (e.g. mango, lady fingers (*Abelmoschus esulentus*)) and South-East Asia (e.g. banana, taro (*Colocasia esculenta*)). Coffee is of African origin; however it also is not natural on Kilimanjaro but introduced from Ethiopia. Most of these species were introduced very recently, principally during the colonial period.

According to the archaeological evidence (see Odner 1971a, 1971b) the first food-producing inhabitants of Kilimanjaro arrived there during the first and second century BCE, establishing a continuity lasting up to today. They came from Cameroon, spoke a language of Bantu extraction and possessed the technology of producing and forging iron (Soper 1971). They also brought along the custom of using *Dracaena fragrans* for fencing their gardens (Winter, Part II of this contribution). Besides continuing their older habits of hunting and collecting, they pursued their food-producing activities as planters of indigenous root crops and by keeping goats. Bulbs and tubers, e.g. of *Dioscorea* species (*D. lecardii, D. minutiflora, D. bulbifera*), were either brought from West Africa or found in the forests of Kilimanjaro and are still used today (other important *Dioscorea* species are of Asian origin: *D. alata* was introduced to Zanzibar from Asia several hundred years later (Milne-Redhead 1975; Mansfeld 1986a). However, these first Bantu-speakers and planters do not appear to have been the first food-producers in East Africa. Almost two millennia earlier there had begun a trickling into East Africa of keepers of cattle and sheep and growers of millets (*Eleusine coracana*, *Sorghum* ssp.), and speakers of a Southern Cushitic language who had originated in Ethiopia. These Cushites preferred open savannah and did not settle the forested slopes of Kilimanjaro. The later in-moving Bantu-speakers were the first humans to do so.

Until very recently the most important food source on Kilimanjaro were bananas, which were introduced by the earliest immigrants of Madagascar from their Indonesian homelands, who later settled on the African mainland coast and migrated inland. It is still a matter of debate as to when these immigrants first arrived on Madagascar. Linguistic studies point to a period from 1-400 BCE for this immigration; archaeological research, however, so far lacks evidence of human presence on Madagascar before the 10th century and evidence from written history is equivocal. A clear documentation of bananas on the East African coast, however, by the Arab geographer Mas'udi dates into the 10th century. These Indonesian immigrants must be held responsible for the introduction not only of bananas but also of taro (*Colocasia esculenta*) and chicken (Winter, Part II of this contribution). According to Simmonds (1966) most of the recent banana varieties on Kilimanjaro originate from the East African coast, and it can be assumed that bananas as well as taro and chicken were introduced by people from the coast in the 12th century together with the irrigation system, which probably has its roots in Yemen. Already at this time about 30,000 people lived on the mountain, who had an increasing caravan trade with the coastal Swahili population. Artificial irrigation not only enabled the year-round supply of important food plants such as bananas and finger millet (*Eleusine coracana*), which became cultivated at the same time on the mountain, but also was the base for a more intensive land use with manure. The growing population seems to have militated against leaving worked plots fallow for many years. Permanent use of a plot, however, required manuring, something unknown to local Bantu cultivators, but well known to the descendants of Middle Eastern peasants. Local Bantu cultivators had been losing their cattle's manure by pasturing them in the wild. Middle Eastern peasants preserved their cattle's manure by keeping them in stables. Keeping them in a stable, however, necessitated feeding them with fodder collected outside by human beings. It seems to free their womenfolk from going to collect green fodder or instead carrying water long distances the Chagga men decided to dig water furrows to their homesteads (Winter, Part II of this contribution).

The developments up to this point in time had provided all the ingredients of the Chagga homegarden, short of its food-plants of American origin and those of European introduction. There were the plants of Indonesian origin: banana varieties, taro, there were legumes of various

origins, there were indigenous shade-trees, and there was irrigation. And there were also cattle and small-stock. The next important additions to the homegardens food supply were sweet potatoes (*Ipomoea batatas*) and maize, both introduced from America to the East African coast by the Portuguese during the 16th century (Mansfeld 1986b). The Chagga word for maize, *iimbá´*, derived from the name of the island of Pemba where maize was first grown by Portuguese (Winter pers. comm.). Regarding sweet potatoes, however, there is linguistic evidence, that this American food-plant reached Kilimanjaro much earlier from West Pacific region via Madagascar (Winter pers. com.). Other American food-plants, apart from maize, such as potatoes and tomatoes, entered the Chagga home-gardens only after the beginning of the colonial period, i.e. during or after the 1890s. Potatoes are, for example, called by an expression which in translation means 'European sweet-potatoes'. Coffee trees were introduced by Roman Catholic missionaries at Kilema in 1898 and spread quickly to European farmers in Kilimanjaro who grew them in monocultures under shade trees, and where Chagga farm-hands learned how to treat them. Prior to the First World War some Chagga chiefs began to follow the example of European farmers, but it was not until the second half of the 1920s that ordinary Chagga in large numbers took to growing coffee trees in their banana groves, thereby completing the modern arrangement of a Chagga homegarden after a history of 2000 years. Today, Kilimanjaro is one of the main agricultural regions in Tanzania (O'Kting´ati and Kessy 1991) producing a variety of cash crops including coffee, sugar cane, sisal, pyrethrum and cotton as well as subsistence crops, such as bananas, beans, rice and millet.

Cash crops

Coffee is the major cash crop of Kilimanjaro and since the first coffee tree was introduced by missionaries in Kilema in 1898 a period of sustained development began which brought the Chagga people to a state of prosperity. During the 1950s and early 1960s coffee, sugarcane and sisal plantations of the Kilimanjaro area contributed much to the economy of the country. In the following decades the plantation economy collapsed, however, due to low prices in the world marked of coffee and sisal and outbreaks of coffee berry disease. During this period several large scale wheat farms and coffee plantations were nationalised. However, due to poor management some of those farms were abandoned and reverted to bushes and the plantations depreciated very rapidly (Mbonile 1999b). Due to the low coffee prices on the world market many farmers envisage to replace their coffee trees by other crops such as passion fruits. As a result of these influences coffee production in the region dropped from 35,000 tonnes a year in the mid-1970s to 15,000 tonnes today.

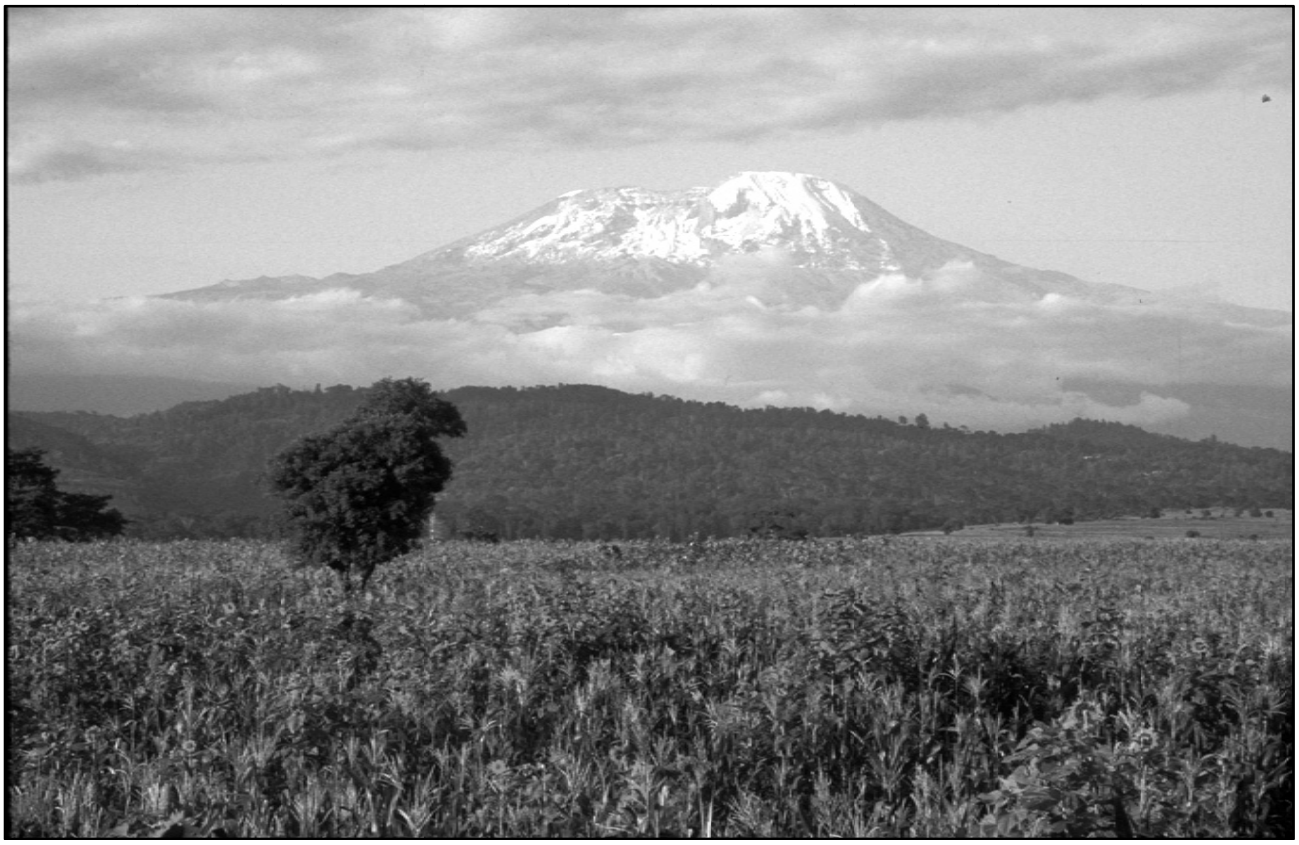
The associative movement – the case of Kilimanjaro Native Planters Association

Before the First World War under German administration, African farmers were allowed to grow and sell coffee. Dr. Theodor Förster, chairman of the Kilimanjaro Planter's Association, pioneered the organised production and marketing of Kilimanjaro coffee in the former German East Africa towards African peasant enterprises able to compete with settlers' plantations. This in mind, he took his servant, Josefu Merinyo to Germany to study book-keeping and to be introduced to the principles of Western agriculture, peasant economics and the German peasants' co-operative movements. Back in Africa Josefu Merinyo started to grow coffee. After the war and the change of rulers from German to British, Merinyo organised with the assistance of the District Commissioner of Moshi, Major Charles Dundas, the Kilimanjaro Native Planters Association (KNPA). Between 1924 and 1931 the association became very powerful with over 10,000 members. But through its skilled defence of the interests of the Chagga farmers against European settlers the Chagga movement was observed with increasing suspicion by the British administration. In the early 1930s Merinyo was accused for embezzlement and sent into exile. The powerful KNPA was converted into a co-operative, the Kilimanjaro Native Cooperative Union (KNCU) led by a British president. In the 1950s KNCU was at its peak and became a model for African co-operatives. After independence regional economic associations (especially those of the Chagga) were observed suspiciously by the newly established socialist regime. All important leading positions in KNCU were given to officials of the ruling party leading to mismanagement and finally bankruptcy of KNCU in 1980. In 1984 KNCU was established again but never gained the same importance as before due to the difficult contexts of the world market. Furthermore during the liberation of the Tanzanian economy during the early 1990s KNCU lost its monopoly in the coffee trade (Winter 1979).

Subsistence Crops

In contrast with cash crops, there has been a general increase in the per capita production of maize and beans between 1964 and 1988 (O'Kting´ati and Kessy 1991). This is due to the increasing conversion of savannah land into fields in the foothills and changes in farming practices from shifting cultivation to intensive or shortened fallow periods (Mbonile 1999a). Nonetheless there has been a deficit between demand and supply of cereals and starches on Mount Kilimanjaro in recent years (O'Kting´ati and Kessy 1991). The available land per household in the Chagga homegarden area has been declining over time because of the increasing population and associated division of land through the patrilinear

Figure 17. Most areas of the former savannah are planted with maize and sunflowers



inheritance system. A typical plot in the banana zone (*kihamba* or 'inherited land' and land cultivated as banana grove or *mndà*`) consists of about 1.7 hectares, the smallest often being less than one hectar (Mdoe and Wiggins 1997). Such a plot size is too small to support an average size family. Most farmers, therefore, acquire or rent a field in the savannah areas on the foothills (*shamba* land) to grow maize or get fodder for the cattle. As a consequence, banana has been replaced by maize as the staple food. *Kihamba* and *shamba* are usually over 10 km distant. Nearly all arable land in the banana zone is under cultivation and it is impossible to open virgin land; in the savannah area the conversion of natural landscape into cultivated land is an ongoing process. The highland farms are worked by hand tools and fertilised by cattle manure and mulching, whilst the lowland *shamba* are mostly prepared by hired tractors, by hand hoes and rarely by ox-plough teams and improved with mineral fertiliser (see Mdoe and Wiggins 1997).

The dominant subsistence crops in the homegardens are bananas. The fruits of about 25 varieteies of banana are grown (Simmonds 1966), varying widely in shape, colour, size and taste: from small (10 cm in length) sweet yellow bananas to long red bananas (40 cm in length). For all important varieties Chagga names exist and the people are able to distinguish them simply by vegetative characters. Most important are the several different varieties of cooking bananas (e.g. *bukoba*, *mjokosi*, *mshare*) that provide the main food source on Kilimanjaro, followed by bananas for brewing the local beer (e.g. *mlali*, *mnanambo*). Sweet bananas (*ndizi sukari*) are mainly for the children. The dry and hot savannah zone between 700 and 1000 m was historically avoided by the Chagga in fear of the Masai warriors, tsetse fly and malaria and also due to water scarcity (Brewin 1965). Before the mid-1960s, pastoralism and the cultivation of finger millet (*Eleusine coracana*), an important ingredient of local beer, were the primary agricultural activities in this zone (O'Kting´ati and Kessy 1991) conducted primarily by people who lived at higher elevations. Since the 1960s, an increasing number of people began to settle in that zone and more land was put under cultivation using modern mechanised farming systems. Today most areas on the southern foothills are planted with maize and beans (**figure 17**) with maize, finger millet, pigeon peas (*Cajanus cajan*), groundnuts and sunflowers on the eastern foothills. To the west wheat is produced by large farms owned by private and government companies. East of Moshi rice is cultivated. In the plains south of Moshi sugar plantations replace a formerly forested area. Due to the increasing cultivation of maize, the growing of *eleusine* there or in the home-gardens has been almost completely phased out. The considerable Chagga demand for this beer-corn is met by importation from distant parts of Tanzania.

Invasive Species

Not all introduced species are (still) cultivated ones. Some ornamentals escaped from horticulture, while others were introduced by chance as weeds. Beside horticulture and agriculture, tourism is another source of neophytes at Kilimanjaro. Some of these neophytes are very widespread within the cultivated areas. A typical example is *Adiantum raddianum* C. Presl*.,* a neophytic fern from America inhabiting shady embankments of roads and water canals in the coffee-banana belt (Hemp, A. 2006a). From the distribution of this fern (**figure 18**) it becomes obvious that it spread over the whole coffee-banana belt and that tourism – as in case of the introduced grass *Poa annua* (Hemp, A. 2008) - was surely not the cause for its propagation. Similar to *Poa annua*, this neophyte invaded mainly anthropogenic vegetation (Chagga homegardens, roadsides, waste places), but is rare in natural (forest) vegetation. In general alien plant species mainly invade only anthropogenic vegetation types on Kilimanjaro.

THE EXTINCT NATURAL FORESTS OF KILIMANJARO'S LOWER SLOPES

The 'banana forest' of the Chagga homegardens replaced a natural forest, which covered the lower slopes of Mount Kilimanjaro before human settlement. From the forest species found in the banana gardens it can be assumed that this former forest resembled in some aspects the lower montane *Cassipourea* forests of the western and northern slopes. However, due to the much higher precipitation on the southern slope, major differences to these forests can be expected; and above 1500 m it seems elements of the camphor forests constituted to their floristic composition, similar to the lower montane *Ocotea-Casspipourea* forests of the South Pare Mountains. As nearly all of these former submontane forests have disappeared, it is difficult to reconstruct their full floristic composition. However, in the cultivated submontane and lower montane zone of the southern slopes of Mount Kilimanjaro the deepest valleys harbour forest relics that are of great biogeographical and palaeobotanical importance. Many of the species in these forests were previously not known from Kilimanjaro and some of them are believed to be endemic to the Eastern Arc Mountains. (Hemp, A. 2006b). The occurrence of such species suggests that in former times the southern slopes of Mount Kilimanjaro were inhabited by a rich diversity of forest flora. Since humans have continuously inhabited the lower slopes of Kilimanjaro for at least 2000 years, it can be assumed that many forest species were extirpated together with the forest cover. Thus, the lower degree of endemism of Kilimanjaro can be explained by wide destruction of the lower montane forest rather than the younger age of the mountain as previously suggested (e.g. Rodgers and Homewood 1982; Lovett 1988; Iversen 1991; Fjeldså *et al* 1997). Occurrence of several fern relics in these forests leads to the same conclusion. This is corroborated by the fact that forest species such as members of the grasshopper group *Saltatoria,* who are affected less by forest devastation, have similar numbers of endemic forest species in the submontane and montane zone on Mount Kilimanjaro, Mount Meru and the East Usambara Mountains. Endemic grasshopper species have coped with the habitat change from forest to plantations (Hemp and Hemp 2003; Hemp, C. 2005).

In summary, the Chagga homegardens maintain not only a high biodiversity, they are an old and very sustainable way of land use that meets several different demands. Beside crop production, the sparse tree layer provides people with firewood, fodder and timber. But the high demand of wood, low coffee prices on the world market and the introduction of coffee varieties that are sun-tolerant endanger this effective system (Hemp, A. *et al* in press). In some areas of the mountain (e.g. on the eastern slopes) the trees in the banana fields are very scattered or already missing. At Mweka on the central southern slope a large foreign coffee company felled hundreds of old trees in November 2003 to grow coffee. In order to reduce the pressure on the forest, it is necessary, to support tree planting in the Chagga homegardens with their unique agroforestry system. Similar to environmental programs for farmers in the European Union (e.g. for the protection of wetlands or dry meadows), there should be a program that rewards farmers who have a certain share of their land covered by trees. It can be estimated that homegardens supply between 25 to 35 percent of families' fuelwood requirements (Fernandes *et al* 1984). As the banana belt is nearly as extensive as the forest reserve, this will of course have major effects in terms of forest protection and the water balance. In concert with new marketing and farming strategies for growing organic coffee through traditional methods, an advertising campaign should be started especially in European countries where the awareness of environmental problems is high.

B. THE CHAGGA WILD FOREST

The montane forest of Kilimanjaro is an important resource in the daily life of the Chagga. Every day thousands of people, in particular children and women enter the lower area of the forest reserve to collect fodder, fire wood, honey and medicinal plants. However, fodder collecting, (illegal) grazing and timber cutting are serious threats to forest regeneration. Therefore over the last century the growing human population has not only converted virtually all the lower forest zone into cultivated land, but the higher situated forests of Kilimanjaro have also experienced major changes in their extent and species composition.

FOREST TYPES

Natural forests cover an area of about 1,020 km^2 (see **table 1**). Most of these are protected as forest reserve. Due to a huge altitudinal range of over 3,000 m and the

Table 1. Area of the forest types inside the Forest Reserve and National Park

Vegetation type	Community	Area in the year 2000 (km^2)
Remnants of subalpine *Erica trimera* forest	21	<1
Upper montane *Erica excelsa* forest	19	32
Upper montane *Hagenia* forest	20	107
Upper montane Podocarpus forest	17	60
Lower - upper montane *Ocotea* forest	11, 12, 14, 15	220
Middle and upper montane *Ocotea* forest	14, 15	120
Lower montane *Ocotea*-forest	11, 12	100
Potential *Ocotea* forest (*Ocotea* stands over-exploited)		110
Upper montane *Juniperus* forest	18	40
Lower-middle montane *Cassipourea* forest	6, 7, 9	282
Lower montane *Cassipourea* forest	7	45
Middle montane *Cassipourea* forest	6	162
Lower montane *Cassipourea-Ocotea* forest	9	75
Submontane *Croton-Calodendrum* forest (west and north)	4, 5	45
Submontane *Croton-Calodendrum* forest (west)	4	27
Submontane *Croton-Calodendrum* forest (north)	5	18
Olea regeneration stages in *Croton* and *Cassipourea* forests		41
Lower-upper Montane riverine forest	13, 16	67
Lower montane gorge and riverine forests	8	15
Natural forest		1020
Clearing, meadow		36
Forest plantation		160
planted with trees		70
not planted with trees		90
Potential forest area		1216
Forest reserve		1078
Forest inside the National Park		138

Figure 18. Records of *Adiantum raddianum* on Mount Kilimanjaro, at the base of the UTM grid. The scale of the squares is 4 km^2. This introduced fern spread over the whole submontane and lower montane banana plantation belt. Gaps within the distribution area inside the banana plantations (especially in its eastern part) are mostly due to lack of data (for legend see Figure 1)

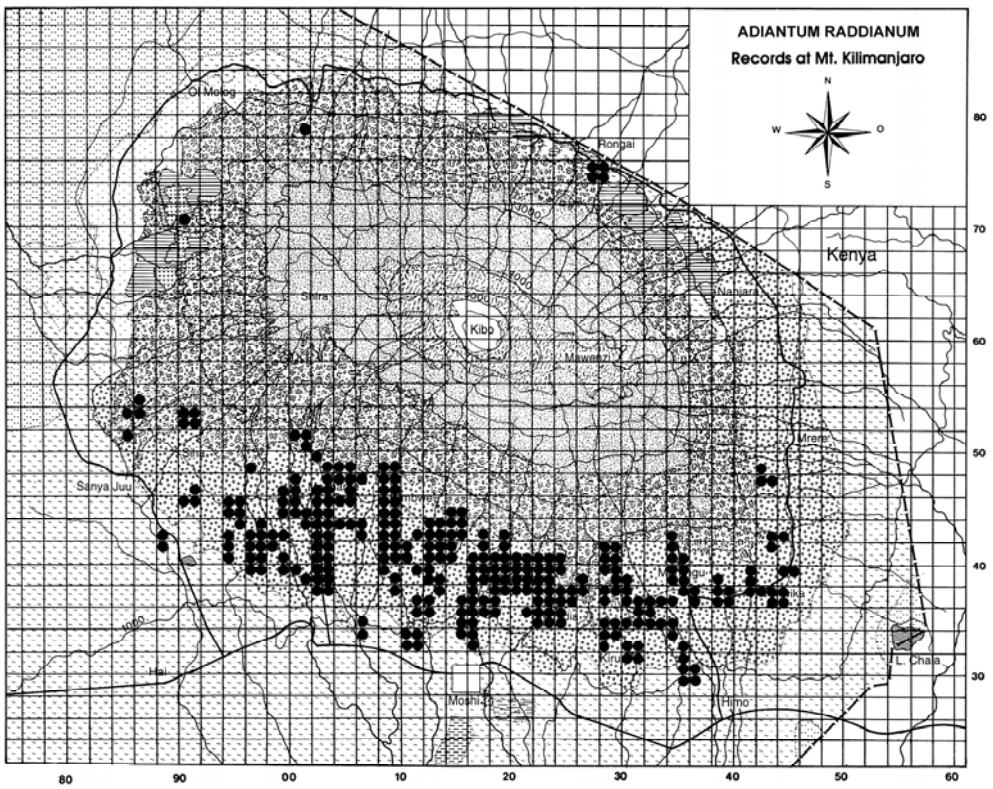
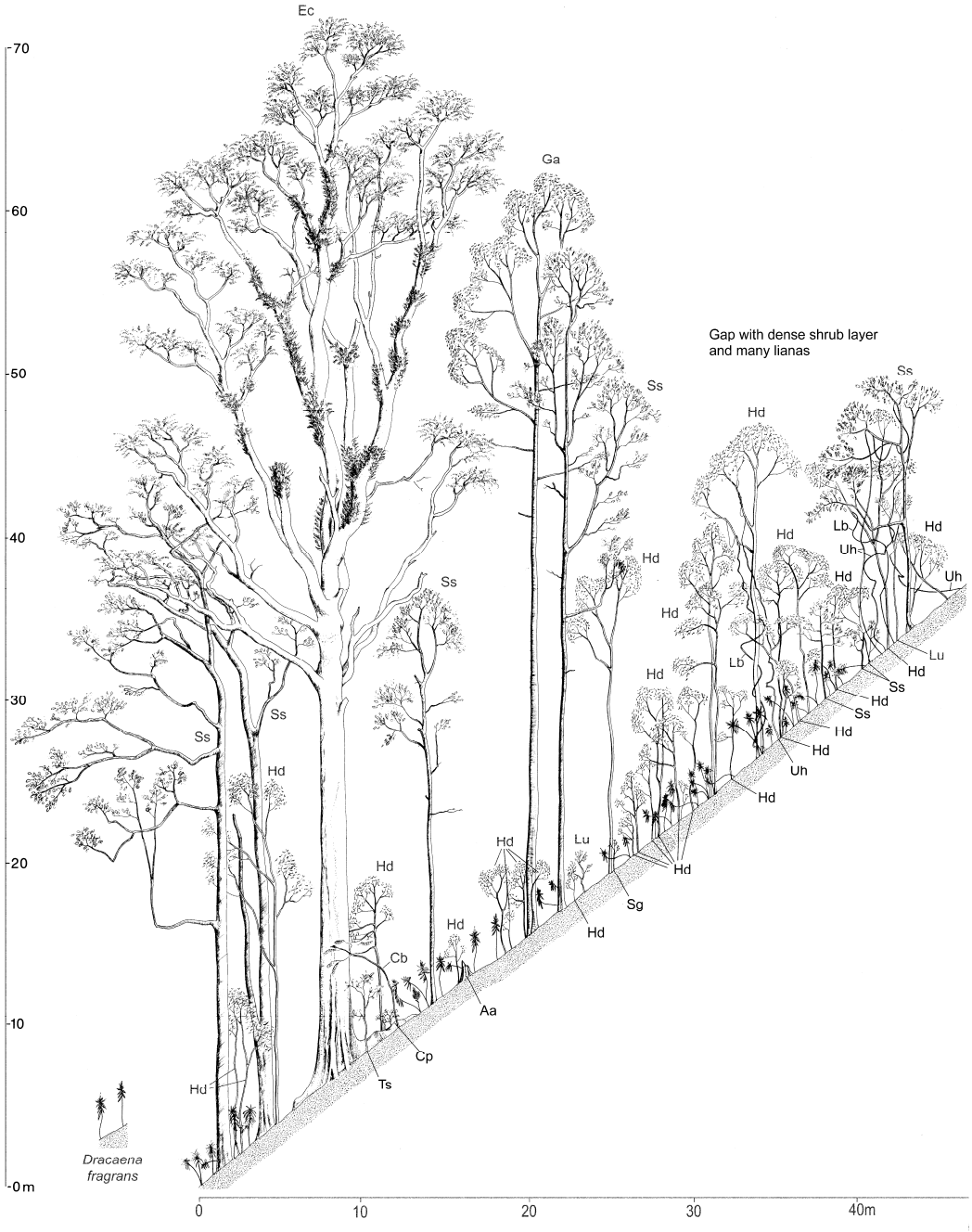


Figure 19. Profile (45x5 m) of a submontane gorge forest at 1,500 m asl. on the southern slope. Mean canopy height 40 m with some emergent trees (*Ekebergia capensis*) reaching heights of over 60 m. In the upper part of the profile lianas and shrubs form dense thickets under a gap in the tree canopy. [Aa: *Aningeria altissima* (death), Cb: *Casearia battiscombei*, Cp: *Chassalia parvifolia*, Ec: *Ekebergia capensis*, Ga: *Garcinia* sp. nov., Hd: *Heinsenia diervilleoides*, Lb: *Landolphia buchananii*, Lu: *Leptonychia usambarensis*, Sg: *Syzygium guineense*, Ss: *Strombosia scheffleri*, Uh: *Urera hypselodendron*.]



strong climatic contrast of the slopes there is a large variety of forest types (for a more detailed description see Hemp, A. 2006b). In the cultivated submontane and lower montane zone of the southern slopes of Mount Kilimanjaro forest is restricted to deep valleys and gorges with small relics of *Leptonychia usambarensis* gorge forests and *Mitragyna rubrostipulata* riverine forests (**figure 19**). These forests, although of very small extent (15 km^2), are of great biogeographical and palaeobotanical importance (see below). In the montane forests on the wet southern slopes, the dominant tree species is Camphor (*Ocotea usambarensis*). Camphor forests cover an area of about 220 km^2. In the lower areas (1800-2200 metres) Camphor is associated with *Agarista* (*Agauria) salicifolia, Macaranga capensis* var. *kilimanjarica* and (especially between Mweka and Umbwe) *Polyscias fulva*. This forest zone is heavily influenced by human activities, as indicated by the presence of these species: *Agarista*, an Ericaceae, is favoured by (human-lit) fires, whilst *Macaranga* and

Polyscias, two pioneer species, populate forests that have been opened up, for instance, by the logging of Camphor.

The middle montane zone (2,200-2,500 m) is the main habitat of Camphor where pure stands exist (**figure 20**). Moisture reaches its maximum level in this zone, as indicated by the wealth of epiphytes and ferns, in particular filmy ferns and tree ferns (Hemp, A. 2001, 2002, 2006c). In the gorges and along the streams *Cornus volkensii* is an important constituent of the tree layer. In the upper montane zone (2,500-2,800 m) Podo (*Podocarpus latifolius)* starts to prevail. Higher up (between 2800-3100 m) forests dominated by Podo, East African Rosewood (*Hagenia abyssinica)* and *Prunus africana* form the tree canopy. Monodominant stands of *Erica excelsa* (Ericaceae) play also an important role in this zone, replacing *Podocarpus* and *Hagenia* forests after fire (Hemp and Beck 2001; Hemp 2005b), forming the actual upper closed forest line at 3200 m (**figure 21**). However, small remnants and burnt forests indicate that the upper closed forest line recently reached to 3,850 m; and remnants of subalpine *Erica trimera* forests with tree heights of 10 m mark the former and potential upper closed forest line at above 4,000 m (Hemp 2005b), today representing the highest elevation forests in Africa.

Due to lower precipitation the forests of the northern and western slopes are completely different in terms of species composition and structure. On the western slopes below 1,600 m and on the northern slopes below 2,000 m the relatively dry submontane forest is dominated by wild olive (*Olea europaea* ssp. *africana*), *Croton megalocarpus*, *Calodendrum capense* and *Diospyros abyssinica.* Extending over 282 km^2 the lower and middle montane forest types (1,600-2,500 m) on the eastern, northern and western slopes are characterised by the trees Pillar Wood (*Cassipourea malosana*)*, Vepris simplicifolia*, *Fagaropsis angolensis* and *Olea capensis*. Between 2,500 and 3,100 m East African Cedar (*Juniperus procera*), East African Rosewood and *Podocarpus latifolius* are dominant tree species. Today some 160 km^2 of natural forest have been replaced by industrial forest plantations in various stages of establishment.

Figure 20. Profile (60x5 m) of a middle montane *Ocotea* forest at 2200 m asl. on the southern slope (community 14, Tab 2), rich in vascular epiphytes and tree ferns. Mean tree height about 30 m with an upper canopy of 40 m built up by *Ocotea usambarensis*. The tree fern *Cyathea manniana* is a typical companion, playing an important role in the forest regeneration as is apparent from the pure *Cyathea* stand in the right part of the profile, where a large branch of the *Ocotea* on the right had fallen several years before causing a gap in the tree canopy. [At: *Aphloia theiformis*, Co: *Canthium oligocarpum*, Cp: *Chassalia parvifolia*, Da: *Dracaena afromontana*, Es: *Embelia schimperi*, Gs: *Galiniera saxifraga*, Im: *Ilex mitis*, Lk: *Lasianthus kilimandscharicus*, Ou: *Ocotea usambarensis*, Pa: *Pavetta abyssinica*, Pc: *Psychotria cyathicalyx*, Pf: *Psychotria fractinervata*, Rm: *Rapanea melanophloeos*, Sm: *Schefflera myriantha*, Xm: *Xymalos monospora*]

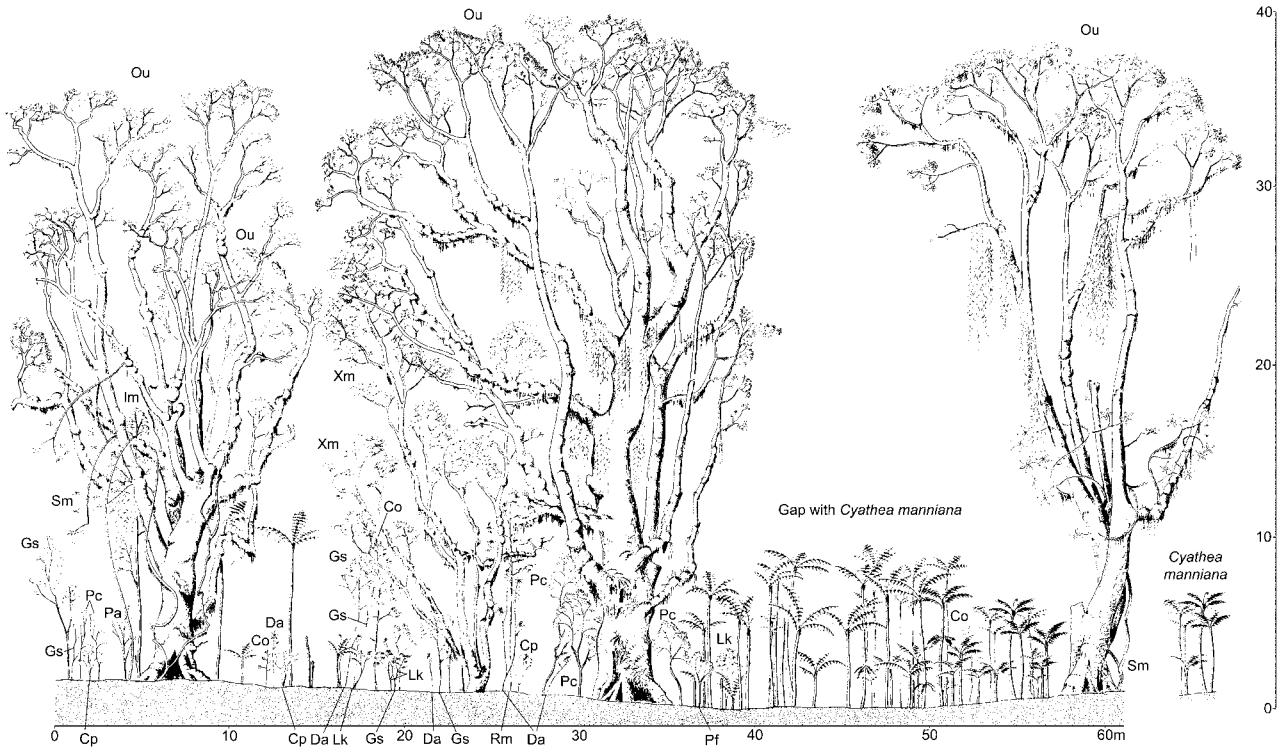
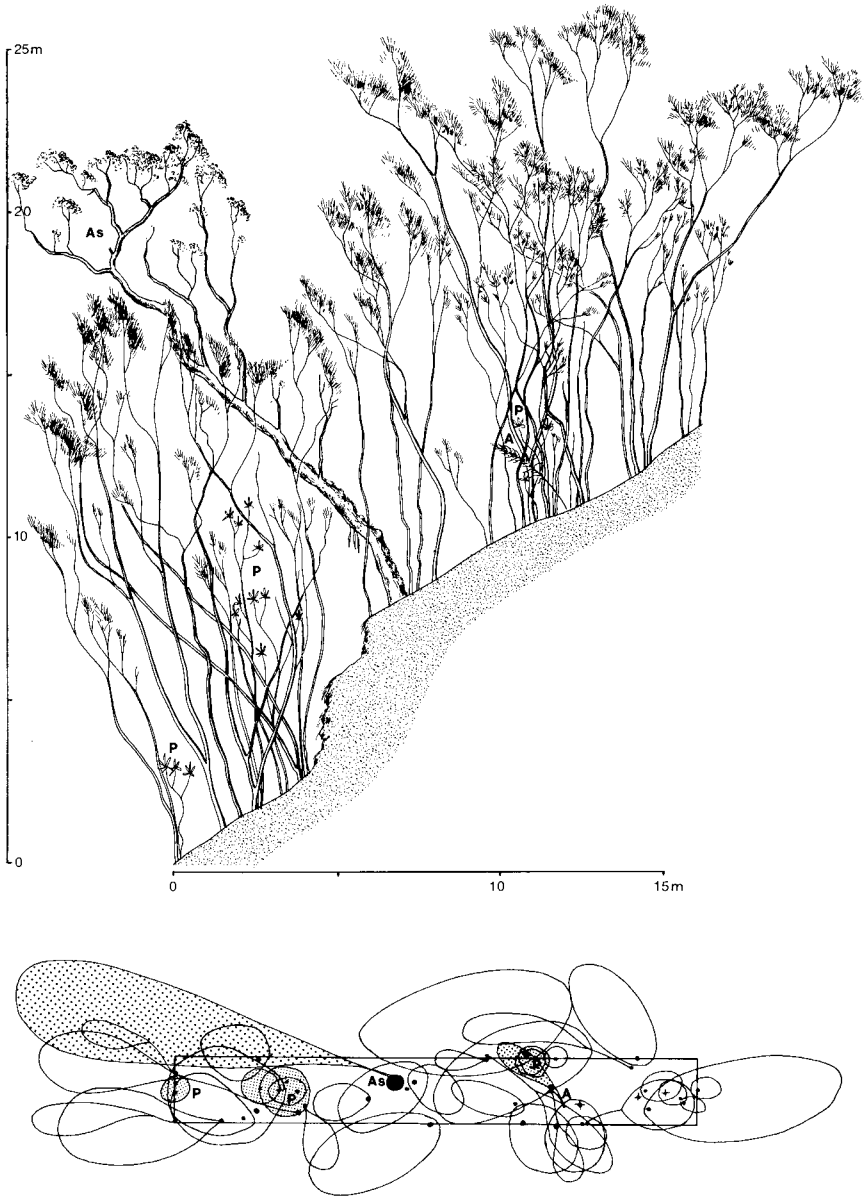


Figure 21. Profile (16x2 m) of an upper montane *Erica excelsa* forest at 3000 m asl. The multi-stemmed growth form of *Erica* indicates resprouting from stumps after fire. [A: *Anthospermum usambarense*, As: *Agrista salicifolia*, P: *Pittosporum* sp.; trees and shrubs not labelled are *Erica excelsa*, crosses mark dead trunks]



ANTHROPOGENIC IMPACTS

Fire

Fire is an important ecological factor on Kilimanjaro (Hemp, A. 2005a). Fire distribution on Kilimanjaro follows the precipitation regime. Regular fires occur every year in the colline savannah zone and in the upper montane and subalpine zone and to a lesser degree in the submontane and lower montane forest zone. Due to an increasingly drier climate, precipitation has decreased on Kilimanjaro by 30 percent in recent years, and higher anthropogenic impact, fires have played an increasingly destructive role in the forests of Kilimanjaro during the last 100 years and in particular over the last three decades. During this time Kilimanjaro has lost about 150 km² of high altitude forests due to fire and the upper closed forest line was lowered by 900 m. As these forests have an important function for fog water collection, this has an impact on the water balance of the whole mountain (Hemp, A. 2005b). Most of these fires are anthropogenic, but natural fires do occur as well and old charcoal horizons in the soil suggest that fires have occurred for a very long time, probably back to the last ice age (Hemp and Beck 2001), although they would have been less frequent than today.

Fire causes sharp discontinuities in composition and structure of the tall (20-30 m canopy) upper montane *Hagenia-Podocarpus* forests at 2,800-3,000 m. The giant heather *Erica excelsa* becomes dominant at this altitude forming dense monospecific stands of about 10 m height

Figure 22. Illegal sawpit (camphor is the most targeted tree species on Kilimanjaro)

(**figure 21**), consisting of multi- and single-stemmed trees of apparently similar age, suggesting simultaneous sprouting after a fire (Hemp and Beck 2001). During long periods of dry climate with recurrent fires, the *Erica* forest boundary moves downslope whilst it advances upslope during wet periods. The presence of *Erica* enhances fire risk, since even fresh *Erica* wood burns well, which in turn prevents the *Podocarpus* forest from re-establishing. At high fire frequency, the closed *Erica excelsa* forest degrades into open bushland of approximately 1.5 m height dominated by *E. trimera* and *E. arborea* at elevations of between 3,200 and 4,000 m (the potential treeline). A high frequency of fires even destroys this bush, resulting in *Helichrysum* cushion vegetation, which is the climatic climax vegetation at altitudes above 4,000 m. Due to the open canopy of the *Erica* forest the microclimate changes as is obvious from the composition of the herb layer: montane forest species disappear and light demanding species of the alpine flora such as representatives of the genera *Helichrysum* or *Senecio* become dominant, which can not successfully compete in shady forests. Burning in low altitude forests changes the composition as well as structure of species. About 10 percent of the tree species in the drier submontane *Croton-Calodendrum* forests of the western and northern slopes are deciduous. This habitat is thus an adaptation to longer dry seasons, and also possibly to recurring fires. In the same forest type distinct fire-induced *Olea europaea* ssp. *africana* dominance stages are quite common, covering 41 km^2 (**table 1**). Similar to *Olea*, the fire-resistant trees *Agarista salicifolia* and *Morella salicifolia* (both with a thick, corky bark) are distributed in the fire-influenced forests of the lower and upper montane zone.

Logging

In addition to fires devastating the forest there are other threats to this ecologically important vegetation zone. The results of an aerial survey (Lambrechts *et al* 2002) in combination with a ground survey revealed that the forests of Mount Kilimanjaro are heavily impacted by logging of indigenous trees in most areas below 2500 m elevation. In particular the moist *Ocotea* forests that cover most of the southern slopes are undergoing serious destruction caused by the intensive illegal logging of camphor trees (**figure 22**). On the eastern slopes this overexploitation has resulted in forests free of mature *Ocotea* but still with the same structure and otherwise the same species composition. These 'potential montane *Ocotea* forests' cover an area of 110 km^2. This means one third of the actual camphor zone is already depleted and the remaining part is being heavily modified. Similar is the situation for the second most targeted tree species, *Juniperus procera*. Only 40 km^2 of cedar forest of a potential area of about 120 km^2 on the whole northern slope, today covered by *Hagenia* and *Podocarpus* forest,

are left. However, most of the cedar forests were felled by legal sawmills up to the 1980s. Therefore only a few recent illegal felling activities were observed on the northern slope during the aerial survey, during which altogether nearly 8000 cut trees were counted. These numbers approach those of the heavy legal felling activities during World War II and the early 1980s (Hemp, A. *et al* in press).

Overall Impact of Forest Loss

In addition to the losses of about 150 km^2 of upper montane and subalpine forests from fire since 1976, losses due to clear cutting of lower elevation forests amount to 450 km^2 since 1929, bringing the total loss to approximately 600 km^2. Thus Kilimanjaro has lost about 30 percent of its former forest cover (Hemp, A. *et al* in press). Deforestation on mountain foothills raises the mean cloud condensation level which results in a gradual shrinking of the cloud zone. A similar effect is caused by global warming and drying of the air (Bruijnzeel 2001). In addition to changes in the water balance of the mountain loss of cloud cover may have added to the observed general decreasing trend in precipitation during the last century.

Forest Plantations

About 15 percent of the indigenous forests have been converted into forest plantation areas on the north-western and northern slopes since 1950 (**figure 1**), mainly using fast growing exotic tree species, such as pine (*Pinus patula*) and cypress (*Cupressus lusitanica*) (Wood 1965b). These forest plantations were usually established when local farmers were allowed to inter-crop annual agricultural crops (on Kilimanjaro mainly potatoes, carrots and cabbage) with tree seedlings for the first years, an agro-forestry practice which is commonly called 'Shamba system' or 'Taungya system'. The system, however, has not worked well as evidenced by the findings of the aerial survey undertaken in 2001 (Lambrechts *et al* 2002). Over 50 percent of the Shamba system areas were not planted with tree seedlings. Moreover some sixteen villages were found in these forest plantation areas. In addition to high rainfall and a large number of habitats, the high biodiversity of Kilimanjaro's forests is at least partly due to the lack of a bamboo zone. In the place of monospecific bamboo with low species numbers stands highly diverse upper montane *Ocotea* and *Podocarpus* forests covering large areas, which support high numbers of epiphytes and pteridophytes (Hemp, A. 2002). In particular, epiphytes suffer from the lack of a complex stratification, the sparse ramification and from the smooth bark of bamboo.

Lack of Bamboo Forest

The lack of a bamboo forest on Kilimanjaro relates to the interplay of biotic (anthropogenic) and abiotic factors. For 100 years scientists have discussed potential reasons for the absence of a bamboo belt on Kilimanjaro which is one of the great biogeographical mysteries of East Africa. Bamboo (*Sinarundiaria alpina*) occurs over extensive areas of nearly all East African mountains. However, on Kilimanjaro *Sinarundinaria alpina* is inconspicuous and rare, but not completely missing (Volkens 1897; Moreau 1944; Greenway 1965), while it forms a bamboo zone on the nearby volcano Mount Meru only 40 km away. The lack of a bamboo zone on Kilimanjaro was recognised by the first visiting scientists at the end of the 18th century (e.g. Volkens 1897; Uhlig 1904) but reasons considered were obscure (Greenway 1965; White 1983) or referred to a supposed drier climate (e.g. Hedberg 1951; Hastenrath 1973; Lind and Morrison 1974; Shugart *et al* 2001). More recently it has become clear that rainfall in the central southern forest zone is high (Hemp, A. 2001) so this explanation seems unlikely.

Observations on other East African mountains showed that the occurrence of bamboo is linked to a special type of disturbance: the activity of large herbivores. Buffalo and elephants are living in high numbers in the bamboo zones of Mount Kenya, Mount Meru and the Aberdares. In all investigated plots obvious signs (paths and droppings) of the activity of buffalo and elephants were found, which bend and pull up old bamboo shoots and dig the soil. This propagates bamboo from fallen culms and fragmentised parts of the rhizomes enhancing vegetative propagation (Agnew 1985). This suggestion is corroborated by Banana and Tweheyo (2001), who observed that bamboo is being replaced by hardwood trees in Echuya forest in Uganda after elephants and buffalos became extinct after overhunting prior to 1960. There is considerable evidence that *Arundinaria alpina* is a light-demanding pioneer species that benefits generally from disturbance, not only the influence by megaherbivores, but also especially from fires (Lebrun 1960; Glover and Trump 1970; Masiga *et al* 2001) or human activities (Hamilton and Perrott 1981; Marchant and Taylor 1998). On Mount Kilimanjaro large herbivores occur only on the western and northern slopes, whereas they are missing on the southern slope. This may be due to several factors. The Kitendeni corridor which connects the elephant and buffalo population in the forests with the game population of the Amboseli National Park in Kenya is on the drier northern slopes (Grimshaw and Foley 1991; Blanc *et al* 2003). On the wetter southern and eastern slopes an upward migration of large herbivores is now no longer possible through the densely populated submontane coffee-banana belt, which covers an area of about 1,000 km^2. Even the surrounding former savannah areas are now cultivated and covered by human settlements and have not been populated by large herbivores since the 1960s.

From studies on Mount Kenya (Vanleeuwe and Lambrechts 1999) it is known that elephants climb slopes only up to a steepness of about 30 degrees. On the south western and north eastern slopes of Kilimanjaro very deep (up to several 100 m) and very steep (>30°) valleys exist, which reach high up into the alpine zone. These

deep gorges prevent large herbivores migrating from the northern side of the mountain to the southern. Combined with human occupation of the wetter slopes, this means the southern and south eastern montane forests of Mount Kilimanjaro are no longer accessible to buffalos and elephants. From early descriptions (e.g. Widenmann 1890; Volkens 1897; Jaeger 1909), when the savannah on the southern foothills was still intact and not yet settled by humans it is known that elephants lived in the forests there. However, Volkens, who intensively explored Kilimanjaro's landscape between 1893 and 1895, did not see a single elephant and similarly Widenmann stated that there were few in the forests of Kilimanjaro compared with the adjacent Mount Meru (where a bamboo zone exists). Both authors reported that the Chagga people hunted elephants and, even at this time, the human population impeded elephants from migrating inside the large forest block between the deep inaccessible gorges of Kikafu and Weru-Weru rivers on the southern slope. As the southern slopes of Kilimanjaro have been continuously populated by humans for at least 2,000 years, population density of large herbivores in this area was therefore probably comparatively low for a very long time. Winter (see Part II) estimates that at 1000 CE about 17,500, at 1200 CE 30,000 and at 1800 CE 80,000 people lived on the mountain. At this time the demand of ivory on the world market began to rise more and more steeply.

In 2001 the actual influence of elephants and buffalos on forest structure and composition was observed during ground studies and aerial survey of the threats to Kilimanjaro's forests (Lambrechts *et al* 2002). Large herbivores can dramatically change huge forest areas creating mosaics of clearings, open forest stands and closed forest patches, thus creating ideal conditions for the light demanding bamboo. The ecological reason for the lack of a bamboo zone on the northern side of the mountain is clearly the low precipitation, rather than the lack of herbivores, as the rainfall is less than about 1,100 mm per year and hence below the critical amount of 1,250 mm. This is similar to the situation on Mount Kenya, where the bamboo zone is restricted to the wet south eastern slope but is absent from the drier northern slope. Similar coincidences between the occurrence of megaherbivores, bamboo zones and climate are obvious on many other mountains in East Africa as well. The montane forests of Kilimanjaro's southern slope appear to be climatically and edaphically suitable for *Arundinaria alpina*. However, the biotic habitat factors, especially site preparation by large herbivores, are today found only on the northern slopes, which are too dry. This interplay of biotic and abiotic factors not only probably explains the lack of a bamboo zone on Kilimanjaro but also on the adjacent Pare and Usambara mountains which have a similar settlement history and steep slopes; and perhaps the general distribution of bamboo zones in East Africa. Furthermore, land use history also offers possible explanations for levels of diversity and endemism.

C. KILIMANJARO'S ENVIRONMENT FROM THE VIEW OF THE CHAGGA PEOPLE

The Chagga make use of their rich natural environment in a great variety of ways, and consequently there is a large vocabulary of plant and animal names (Hemp, A. 1999, Hemp and Winter 1999). The plants serve as forage, for household and agricultural purposes, in medicinal applications, as drugs and for magic purposes, and plants and animals are important food sources. The knowledge is largely found only among the older people, while younger people tend to disdain such 'traditional' resources, preferring 'modern' industrial products. Therefore it must be feared that this traditional knowledge will fall into oblivion in the near future. The discussion of plants, arthropods and the vertebrate groups discussed below were investigated for their local names and use on the southern slopes of Mount Kilimanjaro in the area of Old Moshi. Speakers were interviewed independently and names noted (for more methodical details see Hemp, A. 1999).

PLANTS: SCIENTIFIC VERSUS NOMENCLATURE

Two main criteria are applied by the Chagga for naming plants: a conspicuous character (mostly vegetative) and the usage of the plant itself. Thus abstract groups of plants are formed with common characteristics that may however differ in other apparent characters, mostly in the flower. Some examples are given below for some frequent Chagga terms and important plant species. A list of about 600 plants with their Chagga names (Old Moshi dialect) is provided in **appendix 1** (modified and reproduced from Hemp, A. 1999). For information on writing and intonation of the Chagga language see Hemp and Winter (1999). Further lists of different Chagga dialects are published by Bayard Hora and Greenway (1940), Watt and Breyer-Brandwijk (1962), Steele (1966) and Beentje (1994).

An example of a Chagga name for a heterogeneous plant group with a common vegetative character is nduwá-mádu´. This expression (nduwá` = water store, mádu´ = ear) denotes plants with roundish, ear-like leaves which occur in moist places: *Centella asiatica* (Apiaceae), *Hydrocotyle mannii* (Apiaceae), *Alchemilla volkensii* (Rosaceae) and *Geranium arabicum* (Geraniaceae). The first part of the name refers to the habitat of the plants growing on humid soils, while the second refers to the shape of the leaves.

Kuṛùshí` (which means slippery) is a collective expression for completely different botanical plant species (flowering plants, ferns, mosses) that often form a slippery cover on stones (*Trichomanes melanotrichum*, various moss species); or it refers to small epiphytes on trees in humid montane rain forest like *Streptocarpus montanus* (Gesneriaceae), *Cynorkis* and *Polystachia* spp. (Orchidaceae) and filmy ferns (*Hymenophyllum* and *Trichomanes* spp.); or epiphytic ferns, that are not 'real'

Figure 23. Fern nomenclature in Kichagga, part 1. A-C Kurùshí` (which means slippery) is a collective expression for fern species that often form a slippery cover on stones and branches such as *Hymenophyllum splendidum* (C) or other epiphytic ferns that are not 'real' ichamérî´-ferns (see below) because of their lingulate, entire leaves (e.g. *Loxogramme abyssinica* (A) or *Vittaria volkensii* (B). Ichamérî´ (E-H) are all soft-leafed species, which are eaten by cattle. The expression kichamérî´ designates maiden-hair ferns of the genus *Adiantum* (*A. poiretii*, *A. raddianum* and *A. capillus-veneris*) whereas *A. incisum* (H) with differently shaped leaves is called ichamérî´. *Actiniopteris radiata* (D) belongs to a fern section of poikilohydrous savanna species with small tough and xeromorphic leaves that become dormant in every dry spell, curling up and unfolding again after being moistened; for such ferns no name could be gathered in Chagga language

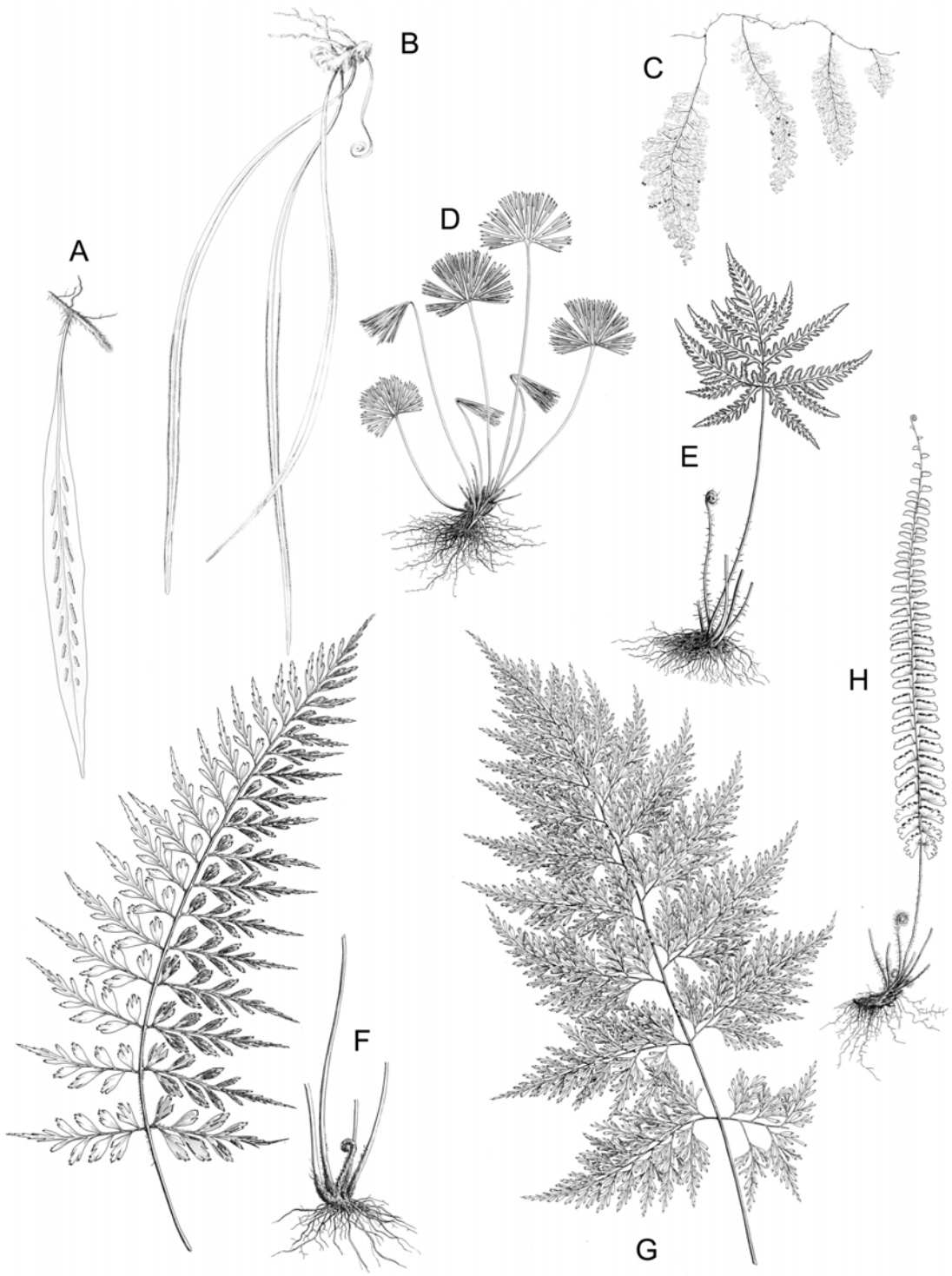


Figure 24. Epiphytes and epiphytic parasites in Kichagga. Ndamàngó` is an expression for epiphytic parasites of the plant family Loranthaceae, relatives of the mistletoes (A: *Englerina woodfordioides*). D: a branch, densely covered by kuŗùshí`, filmy ferns (C: *Hymenophyllum capillare)* or epiphytes with tongue-like leaves such as *Elaphoglossum* species or orchids such as *Cynorkis pleistadenia* (B)

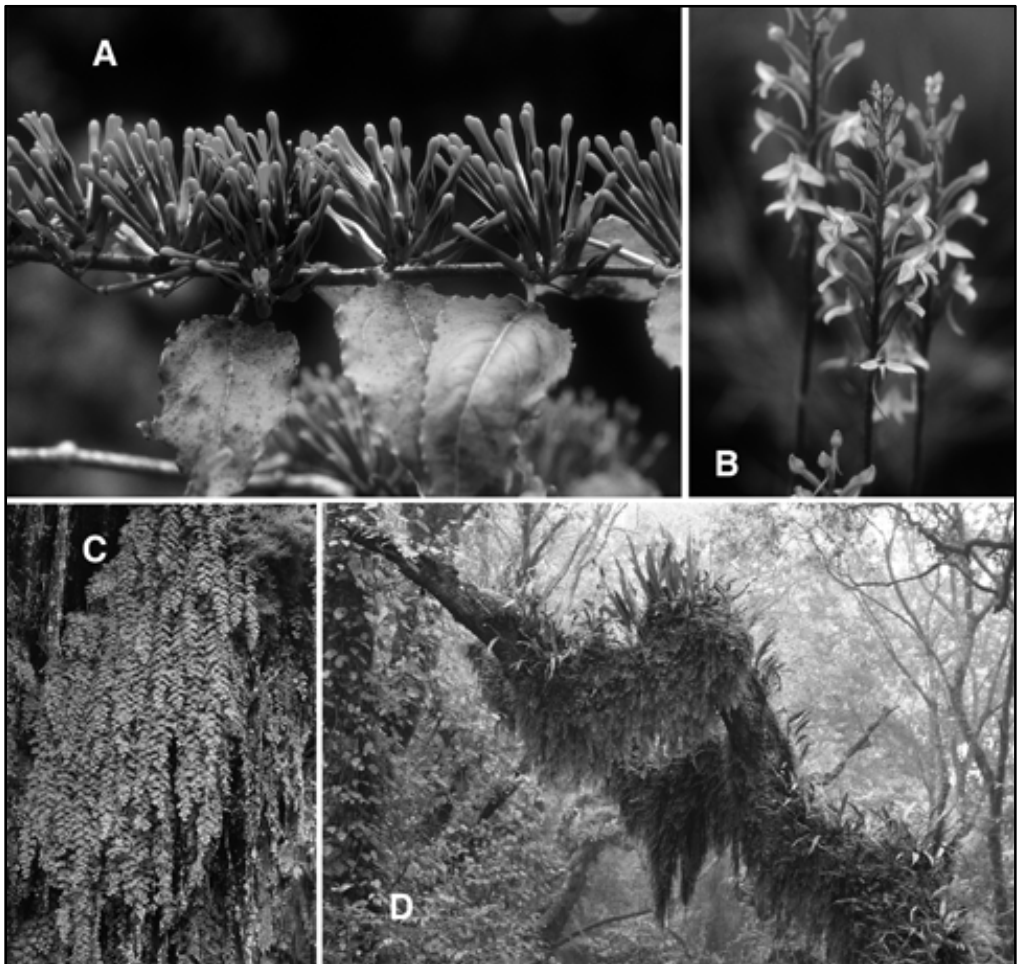


Figure 25. Oruchú´ stands for papilionaceous plants with thorny branches e.g. *Caesalpinia decapetala*

ichamérî´-ferns (see below) because of their lingulate, entire leaves (e.g. *Elaphoglossum*, *Loxogramme*, *Vittaria*, *Lepisorus* and *Pleopeltis* spp.) (**figures 23 and 24**). Plants called isilè` possess aciculate leaves, e.g. trees and shrubs of *Erica* species or *Stoebe kilimandscharica* (Asteraceae).

Sometimes plants covered by one Chagga name are also classed together in the botanical system. Thus *Eriosema montanum*, *Desmodium repandum*, *Tephrosia villosa* and *Crotalaria lachnocarpoides*, belonging to the family Papilionaceae, are all known by the name mbalàshò´. Also the name oruchú´, which is the Chagga name for *Caesalpinia decapetala* (**figure 25**), *Mimosa invisa* and *Pterolobium stellatum*, stands for papilionaceous plants with thorny branches which are, however, different in the colour of their flowers (yellow, red, white) and their growth form.

A systematic group is formed also by the term itoló´, standing for the labiatiflorous shrubs *Englerastrum scandens*, *Plecthrantus alboviolaceus*, *P. comosus*, *P. igniarius*, *Solenostemon sylvaticus* and *Tetradenia riparia*.

The life form of a plant is important for the description as well. Thus, kiseránìndà´ ('banana tree climber'), is a term used for twining plants like *Thunbergia alata* or *Lactuca glandulifera*. Neither plants show similarities in other respects.

A common name for grasses is mkarí´ ('the tough one'). However, for some grass species there are special terms, like msukí` for barb grasses with long beards *Hyparrhenia hirta* and *rufa* (tribe Andropogoneae), *Heteropogon contortus* and *Hyperthelia dissoluta*. *Isachne mauritiana* and *Panicum trichocladum* with delicate, tufted inflorescences are called kokòwò`, while digitiform grasses like *Chloris pycnothrix*, *Cynodon dactylon* and *Cynodon nlemfuensis* are known as otsuó`. Grasses used as roof covering for the traditional Chagga hut (see below) are named natsì´ (*Cymbopogon caesius*, *Themeda triandra*).

General expressions for sedges are ilachù´ and lahò´. Ilachù´ is used for bigger species, while lahò´ characterises smaller sedges, which are also identified as lilùwù´. A more specialised term for *Bulbostylis* and *Fimbrystilis* species with juncaceous leaves is otsungà´.

The differentiation of shrubby Rubiaceae, which resemble each other vegetatively and are even hard to identify with scientific keys is very precise in the Old Moshi Chagga dialect. The two major groups are mkarìkárà` (*Keetia gueinzii*, *Pauridiantha paucinervis*, *Rutidea fuscescens*) and mwengèchá` (*Chassalia*- and *Psychotria* species). In addition to the above mentioned Rubiaceae there are at least six further shrub species with their own Chagga names in the area of Old Moshi.

Even more names exist for trees, which are designated to species level in many cases. Chagga expressions for 104 tree species have been studied. Very important trees are e.g. msedí´ (*Ocotea usambarensis*, valuable timber) or mshihíò` (*Olea capensis* ssp. *welwitschii*, an old cultural tree).

Plants with clover-like leaves are onyonyò´ (there are similar terms in the German language: 'genuine' clover species (Klee) in the family Papilionaceae and the systematically unrelated wood sorrels (*Oxalis*, 'Sauer'klee) or fern species of the genus *Marsilea* ('Klee'farn) with clover-shaped leaves). In Chagga, onyonyò´ defines *Parochetus communis* (Papilionaceae), *Oxalis corniculata* and *latifolia* (Oxalidaceae), *Marsilea minuta* (Marsileaceae) and *Alchemilla volkensii* (Rosaceae), which, however, differ slightly in leaf shape.

A frequent name is ipuchì´ ('cloud'). This term is applied often to Acanthaceae species (*Asystasia gangetica*, *Barleria micrantha*, *Justicia striata*, *J. flava*, *Phaulopsis imbricata*) and the Lamiaceae *Platostoma africana*. These plants have in common small zygomorphic flowers, whitish in colour.

Asteraceae species with small, longlasting flowers which cannot be used as cattle food because of their strong aromatic smell (*Conyza sumatrensis*, *Helichrysum foetidum*, *H. forskahlii*, *H. odoratissimum*, *Pseudognaphalium luteo-album*) are called ilya-nzíhè` ('eat it, locust'). Similar expressions can also be found in German and English e.g. for weeds: *Melampyrum pratense* (Cow-wheat, Wachtelweizen) or *Pedicularis* spp. (Lousewort, Läusekraut).

An example of a term referring to a purely vegetative character is isungùwalá´. Plants with sappy, translucent and soft stems, like most *Impatiens*, *Dorstenia*, *Elatostema*, *Pilea* and *Begonia*, also some *Streptocarpus* species are known under this Chagga expression.

Mdehá-fùkò` ('mole rat trapper') does what the name suggests being the winding *Stephania abyssinica* (Menispermaceae) plant. To prevent caries, *Acmella calirhiza* (= *Spilanthes mauritiana*) is used. Its name kisingà-mùaná-hèhò´ ('apply it to the first tooth of the child') highlights the medicinal application.

Usage is the main aspect of fern names. Ichamérî´ are all soft-leafed species which are eaten by cattle, while isulú` are taken for stall litter only because of their hard and perhaps poisonous (*Pteridium aquilinum*) fronds. The expression kichamérî´ (deminutive of ichamérî´) designates maiden-hair ferns of the genus *Adiantum* (*A. poiretii*, *A. raddianum* and *A. capillus-veneris*). The flowering plant *Thalictrum rhynchocarpum*, which has very similar leaves, is also called kichamérî´. This again is an example of how flowers are of minor interest in plant naming. There is the expression ihofú´ for all tree ferns and the huge shrub-like *Marattia fraxinea*. All humble moss ferns and club mosses creeping on the ground carry the Chagga name ikurèrà´, while kurùshí` are epiphytic ferns with tongue-like leaves.

USAGE

The majority of the 600 plant species investigated in the area of Old Moshi were used for cattle forage (56.6 percent, see **table 2**). A similar situation was found by Esser (1986) and Brenzinger *et al* (1994) with other East African people as well. The easily satiated goats are given mostly thorny plants, while pigs are fed with the sappy *Impatiens*, *Begonia* and *Commelina* species (isungùwalá´, ikengérâ´). The most tender herbs are reserved for rabbits. Cattle eat the greatest varieties of plant species.

Medicinal Plants

The second most important group (29.3 percent or 176 species in the study) were medicinal plants (see **figure 26**). The pharmacologically most important plant families in Old Moshi are the Compositae (Asteraceae) with 27 potent species, followed by Labiatae (Lamiaceae) with thirteen, Papilionaceae (Fabaceae) with nine and Caesalpiniaceae with seven species. Apocynaceae, Cucurbitaceae, Euphorbiaceae, Umbelliferae (Apiaceae) each contributed six pharmacological species. The area richest in medicinal plants proved to be the savannah. The central focus of medicinal care is the gastro-intestinal tract, followed by veterinary, anti-cough (during the long rains the climate become significantly colder) and dermatological medicine. Of some importance are also haemostatic ointments, little wonder perhaps considering the daily handling of sharp bush knives. Dental problems also seem to be common on Mount Kilimanjaro. **Table 3** includes examples of pharmacologically useful plants, which were checked with the prelude medicinal plants database (http://www.metafro.be/preludeset_language =en&cl=en). This database includes a huge ethobotanical set of African plants.

Many of the 115 applications are well-known uses of widespread medicinal plants; however more than half of the species mentioned in the table were used as treatments for other symptoms and over 30 not included at all in the prelude data base. This indicates that there is probably more pharmacological potential which is up to now only locally known. Information about mechanisms and components of some of these medicinal plants are given, (e.g. in Bally 1938; Watt and Breyer-Brandwijk 1962; Sengbusch and Dippold 1980; Neuwinger 1996). Eight percent of the 600 plant species were used for construction material, and 9.5 percent for food. The four plant species with magic properties - mostly against the evil eye – seem to be only a small part of the applied magical plant species, but especially in the presence of white people such secrets are not easily revealed. The section 'others' contains various usages in the household and agriculture, e.g. agents against cockroaches and mole rats, the manufacturing of fibers, the adding of flavours to brew the local banana beer, the obtaining of glues and polishing materials, and the technique of lighting fires with the aid of special pieces of wood.

Table 2. Usage of plants at Mount Kilimanjaro

Usage	**Species numbers**	**Species numbers in %**
Cattle forage	334	56.6
cattle	237	39.5
goats	47	7.8
pigs	12	2.0
sheep	5	0.8
Stall litter	9	1.5
Medicinal plants (incl. magic)	176	29.3
Construction material	48	8.0
Food	57	9.5
Ornamental plants	11	1.8
Others	60	10.0

Table 3. Medicinal plants on Kilimanjaro

Scientific species name	**Plant family**	**Included for this symptom in the prelude database**	**Included for another symptom in the prelude database**
Stomach problems (mainly diarrhoea, dysentery, stomach pains, gastritis)			
Albizia petersiana	Mimosaceae	yes	
Alchemilla volkensii	Rosaceae	no	no
Argemone mexicana	Papaveraceae	yes	
Artmesia afra	Asteraceae	yes	
Basella alba	Basellaceae	yes	
Begonia johnstonii	Begoniaceae	no	no
Boehrhavia diffusa	Nyctaginaceae	no	yes
Centella asiatica	Apiaceae	yes	
Clerodendron johnstonii	Vitaceae	yes	
Clutia robusta	Euphorbiaceae	another species of the same genus	no
Conyza persicifolia	Asteraceae	another species of the same genus	no
Conyza sumatrensis	Asteraceae	yes	
Crassocephalum bojeri	Asteraceae	no	yes

Desmodium repandum	Fabaceae	no	yes
Dissotis senegambiensis	Melastomataceae		
Euclea divinorum	Ebenaceae	yes	
Euclea natalensis	Ebenaceae	another species of the same genus	no
Euphorbia hirta (for babies)	Euphorbiaceae	yes	
Indigfera arrecta	Fabaceae	yes	
Indigofera swaziensis	Fabaceae	other species of the same genus	
Launea cornuta	Asteraceae	no	yes
Leucas mollis	Lamiaceae	no	no
Markhamia lutea	Bignoniaceae		
Ocimum suave	Lamiaceae	yes	
Oreosyce africana	Cucurbitaceae	no	no
Oxalis corniculata	Oxalidaceae	yes	
Oxalis latifolia	Oxalidaceae	another species of the same genus	no
Paullinia pinnata	Sapindaceae	yes	
Pilea rivularis	Urticaceae	no	no
Plantago palmata	Plantaginaceae	yes	
Plectranthus barbatus	Lamiaceae	yes	
Pterolobium stellatum	Caesalpiniaceae	no	no
Rumex bequaertii	Polygonaceae	no	yes
Sanicula elata	Apiaceae	no	no
Sida cuneifolia	Malvaceae	yes	
Solanum incanum	Solanaceae	yes	
Acmella calirhiza	Asteraceae	yes	
Tetradenia riparia	Lamiaceae	yes	
Tridax procumbens	Asteraceae	yes	
Vernonia galamensis ssp. afrom.	Asteraceae	no	no
Waltheria indica	Sterculiaceae	no	yes
Stomach ulcer			
Harrisonia abyssinica	Simaroubaceae	yes	
Homalocheilos ramosissimum	Lamiaceae	no	no
Lepidotrichilia volkensii	Meliaceae	no	no
Phyllanthus boehmii	Euphorbiaceae	other species of the same genus	no
Laxative, purgative, vomitive			
Abrus precatorius	Fabaceae	yes	
Bersama abyssinica	Melianthaceae	no	yes
Cassia bicapsularis xx	Caesalpiniaceae	another species of the same genus	no
Cassia didymobotrya	Caesalpiniaceae	yes	
Momordica foetida	Cucurbitaceae	yes	
Zehneria scabra	Cucurbitaceae	yes	
Anthelmintic			
Rapanea melanophloeos	Myrsinaceae	yes	
Launea cornuta	Asteraceae	yes	
Wahlenbergia abyssinica	Campanulaceae	no	no
Anti-cough, asthma			
Asparagus africanus	Asparagaceae	no	yes
Conyza sumatrensis	Asteraceae	yes	
Crassocephalum bojeri	Asteraceae	no	yes
Dissotis senegambiensis	Melastomataceae	no	yes
Leucas mollis	Lamiaceae	no	no
Oreosyce africana	Cucurbitaceae	no	no
Osyris compressa	Santalaceae	no	yes
Polygala sphenoptera	Polygonaceae	no	yes
Rumex abyssinicus	Polygonaceae	yes	
Tamarindus indica	Caesalpiniaceae	yes	
Tetradenia riparia	Lamiaceae	yes	
Toddalia asiatica	Rutaceae	yes	
Haemostatic			
Albizia petersiana	Mimosaceae	no	yes
Conyza sumatrensis	Asteraceae	another species of the same genus	yes
Crassocephalum bojeri	Asteraceae	no	yes
Crassocephalum montuosum	Asteraceae	yes	
Ehretia cymosa	Boraginaceae	yes	
Homalocheilos ramosissmum	Lamiaceae	no	no
Indigofera arrecta	Fabaceae	yes	

Kniphofia thomsonii	Asphodelaceae	no	no
Trichodesma zeylanicum	Sterculiaceae	yes	
Tridax procumbens	Asteraceae	no	yes
Viola eminii	Violaceae	no	no
Caries			
Acmella calirhiza	Asteraceae	yes	
Celosia schweinfurthiana	Amaranthaceae	other species of the same genus	no
Euclea natalensis	Ebenaceae	no	no
Rumex abyssinicus	Polygonaceae	no	yes
Senecio discifolius	Asteraceae	no	no
Solanum incanum	Solanaceae	yes	
Heart problems, high blood pressure			
Apium leptophyllum	Apiaceae	no	no
Malaria			
Rapanea melanophloeos	Myrsinaceae	no	yes
Aloe ballyi (figure 26)	Aloaceae	another species of the same genus	no
Aloea volkensii	Aloaceae	yes	
Snake-bite			
Terminalia brownii	Combretaceae	no	yes
Eczema			
Euclea divinorum	Ebenaceae	yes	
Phytolacca dodecandra	Phytolaccaceae	yes	
Tagetes minuta	Asteraceae	yes	
Headache			
Drymaria cordata	Caryophyllaceae	yes	
Indigofera arrecta	Fabaceae	yes	
Cold			
Drymaria cordata	Caryophyllaceae	yes	
Rheumatism			
Bryophyllum pinnatum	Crassulaceae	yes	
Kalanchoe crenata	Crassulaceae	yes	
Dislocation, strain			
Psiadia puntulata	Asteraceae	no	no
Abortifacient			
Phytolacca dodecandra	Phytolaccaceae	yes	
Abortion prevention			
Indigofera arrecta	Fabaceae	yes	
Aphrodisiac for seduction of women			
Podocarpus latifolius	Podocarpaceae	no	no
Appetite stimulant			
Hypericum peplidifoium	Hypericaceae	no	no
Induce Birth			
Conyza sumatrensis	Asteraceae	no	no
Kidney problems			
Wahlenbergia abyssinica	Campanulaceae	no	no
Tonsilitis			
Erythrina abyssinica	Fabaceae	no	no
Veterinary			
Stomach (digestion) problems (cattle)			
Ricinus communis	Euphorbiaceae	yes	
Alangium chinense	Alangiaceae	no	yes
Scutia myrtina		no	no
Englearstrum scandens		no	no
Rumex abyssinicus		yes	
Rhoicissus tridentata		no	yes
Cassia spectabilis		yes	
Increase of amount/quality of lactation			
Cyphostemma maranguense		no	no
Cissus olivieri		no	no
Alangium chinense		no	no
Pilea rivularis		no	no

Figure 27. The traditional Chagga bee-hive hut has now nearly disappeared

Dwellings

To erect the traditional Chagga hut, the so-called bee-hive (**figure 27**) hut which has now nearly disappeared, various natural materials were primarily taken. For the vertical arms of the hut basket (ndingó`), branches of *Pauridiantha paucinervis*, *Lasianthus kilimandscharicus*, *Trichocladus ellipticus*, *Oxyanthus speciosus*, *Rutidea fuscescens* or *Olea capensis* ssp. *welwitschii* were cut. These arms were elongated with offshoots (masorá`) of *Dombeya torrida*, *Macaranga kilimandscharica*, *Dracaena fragrans* or *Rapanea melanophloeos* which create the curved top of the basket. The horizontal bent branches (mavendó`) connecting the vertical structures were particularly flexible boughs of *Rhamnus prinoides*. For the lower wall measuring about 1 m in height (sambàrá`) *Rytigynia uhligii* was utilised. Appropriate tree species for the four inner supporting posts of the hut (mvediá`), the two door poles (shiekó`), as well as the posts of the cattle stall (mbangó`) were *Xymalos monospora* and the termite resistant tree-fern *Cyathea manniana*. Limbs of *Schefflera volkensii* were used as connecting bars (muriíchó`) between the posts of the cattle stall (mbangó`). Carpenters used *Macaranga kilimandscharica* and *Syzygium guineense* for supporting bars of the storage loft (muhambà´). Ropes were cut from the barks of *Dalbergia lactea*, *Ocinotis tenuiloba*, *Rutidea fuscescens*, *Peddiea fischeri*, *Urera hypselodendron* and *Stephania abyssinica* to connect the loft bars. *Cyperus laxus* and dried banana leaves (ndawá`) served as roofing material, but mostly the grasses *Cymbopogon caesius* and *Themeda triandra* (natsì´) were used.

Fire

To traditionally light a fire, a piece of wood of the tree *Xymalos monospora* is carved to a square cross-section, along one edge of which shallow grooves are incised. On one side these holes continue as projections. The holes function as supports for rotating dry *Xymalos monospora* sticks, while the projections lead the resulting heat to the tinder material (dried bark or lichens). The fire wood (kipongòrò`) and stick (ovito) can be used several times, depending on the number of holes. Höhnel (1892) also described a similar fire-making technique used by people in East Africa.

Banana Beer

For brewing the traditional banana beer (wu.arì`) several ingredients are necessary: Finger millet (*Eleusine coracana*) (mbege) comparable to the malt in European-style beer for the sugar input and the typical taste, certain banana varieties (e.g. mlali, mnanambo) as sugar source

for the fermentation and the bark of *Albizia schimperiana* (mfuṟúhánjè`), the most common tree species in the homegardens (see **figure 10**), and the roots of *Rhamnus prinoides* for the bitter taste and as a alcohol fortifier (partly comparable to the role of hops in European-style beer). These ingredients are cooked with water. The necessary germs to start the fermentation are available everywhere, i.e. sticking on the brewing instruments or flying in the air. There is the rumour that the sophisticated irrigation system was established on Kilimanjaro not only for the cultivation of the bananas (which receive in most areas enough rainfall) but also, at least in part, was promoted by the wish for the year-round supply of *Eleusine* for brewing.

Bee-Keeping

Bee-keeping plays an important role on Mount Kilimanjaro. Two bee species are kept: the bigger, stinging honey-bee *Apis mellifera* ssp. *monticola* (njukí`= 'the elder brother') that resembles the European honey-bee and a small stingless bee of the genus *Meliponula* (nyorì´= 'the younger brother') (Hemp, C. and Winter 1999). Due to the contrasting defence mechanisms of these two bee species, the modes of harvesting the honey by the Chagga are completely different. Forty to 50-cm thick hollowed-out trunks of *Xymalos monospora*, *Ocotea usambarensis* or *Cordia abyssinica* serve as bee-hives (mu.odú`) (**figure 28**) and are fixed on easy accessible trees with horizontal branches in the montane forest belt, in the case of the njukí`-bees (*Apis mellifera* ssp. *monticola*). This type of bee-hive can be found in the area of Old Moshi up to the upper forest border at altitudes of about 2,700 m. At this altitude, forests with *Erica excelsa* dominate (Hemp and Beck 2001), which is a good source of honey. The more thermophilic nyorì´-bee (*Meliponula (Axestotrigona) ferruginea* (Lepeletier)) is kept at lower altitudes, mostly in the plantation belt where the hives are often placed directly under house roofs or in trees of the savannah gallery forests.

To harvest the honey of the aggressive njukí`-bees, a bundle of plants is prepared to smoke out these stinging bees. The honey collector first cuts logs of *Aphloia theiformis* into pieces giving a particularly hot fire, ties them with lianas like *Urera hypselodendron,* and holds the bunch into a fire of dry *Erica* twigs, which are lit very easily. Then he gathers leafy branches of the Rubiaceae shrub *Pauridiantha paucinervis*, as well as fronds of the bigger *Asplenium* species, and covers the glowing *Aphloia* logs. The whole, now heavily smoking bundle is again tied with liana ropes except for a space in the upper part of the bundle for blowing in air. With this smoking weapon, the honey collector can dare to approach the bee-hive to take out the combs. Combs filled with larvae are regarded as exceptionally delicious. Of course with this method the bee-hives are heavily damaged. Even more radical is the harvesting of wild bee colonies, since during the smoking process the whole adjacent forest is sometimes also set on fire. Less dramatic is the harvesting of the honey of the stingless bees. After opening the hive, the unusual comb-structures are revealed. The nyorì´-bees do not build horizontally orientated hexagonal combs like the njukí`-bees, but fill the hive with roundish, spindle-shaped 'honey-pots' which measure about 5 cm in diameter. Thus the harvesting is not performed by taking out whole combs but by smashing the honey-pots to release a fluid, watery honey. This curious, sour-tasting nyorì´-honey (losì´) is regarded as highly medicinal, while the njukí`-honey (wuukí`) is similar in taste to European honey.

Figure 28. Hollowed-out trunks of *Ocotea usambarensis* serve as bee-hives (mu.odú`)

Figure 29. Chameleons – although harmless reptiles –are mistrusted by most Chagga. Many strange tales are told about these animals and therfore even children are afraid of handling them. All chameleons are called kiafúò´ in the Chagga language

THE ANIMAL EVIRONMENT OF THE CHAGGA

In the area of Old Moshi mostly old men and women had some knowledge about animals whereas young people hardly knew about most arthropods, even vertebrates. Generally more conspicuous species had names which were known over a larger group of people, even adjacent areas on Kilimanjaro. Less conspicuous species mostly had names common only to certain clans, sometimes varying considerably between adjacent clans. In the home gardens a great variety of crops are cultivated in a multi-layer system. The plantation belt reveals a very rich inventory of birds, small mammals and arthropods, which often become obvious only when they damage crops. Livestock of the Chagga people are cattle, swine, goats and chickens. These are ideal hosts for a variety of parasites, which sometimes also attack humans. Many Chagga terms identify precisely those molesting insects, while bigger and more colourful insects like butterflies are only grouped roughly, being considered mostly unimportant to the average life.

Steeper areas on the southern slopes of Mount Kilimanjaro are used as meadows, which are extraordinarily diverse in invertebrates. Children and women spend part of the day cutting grass and herbs for their livestock. Thus old women especially possess an excellent knowledge of the fauna occurring there. Parts of the plantation belt are irrigated by one or more irrigation canals. These canals first appear high in the montane forest and are taken there from small rivers. Although there are quite a number of typical freshwater arthropods there are hardly any Chagga terms for them (Hemp, C. 2001). The plantation belt ends in the area of Old Moshi at an altitude of about 1,700 m and is bordered by the so-called half-mile forest strip which serves for timber. Thus *Eucalyptus*, cypress and pine trees are planted in some places, but due to irregular forestry practices and uncontrolled cutting huge patches of high-altitude meadows with a rich invertebrate life mingle with the heavily disturbed forest. The Saltatoria (grasshoppers, locusts and katydids) fauna especially have been intensively investigated in this area (Hemp and Hemp 2003).

With increasing altitude the park-like area changes into closed forest communities until at about 1,800-1,900 m indigenous montane forest where apparently few insects prevail. The upper forest border lies above Old Moshi at 2700 m, fringing the moorlands, and is characterised by tussock grasses and giant lobelias. The arthropod and bird life in this zone is again more apparent, e.g. large tenebrionid beetles and colourful grasshoppers of the genus *Parasphena*. Above 3,100 m the vegetation consists of *Erica* bush and above 4,000 in the alpine zone the vegetation is limited to scattered *Helichrysum* tussocks, where the faunistic diversity is restricted to some few specialists (Hemp, C. 2001). Vernacular names of the Chagga for mammals, birds, reptiles and amphibians are plentiful. Nearly every mammal and bird species has at least one name, sometimes even more terms are used to designate one species. Some reptiles, especially snake species are easily recognised by the locals and possess their own names (e.g. the python and the puff adder). However, most of the reptiles are grouped by their outer appearance, as chameleons (**figure 29**), geckos, lizards and tortoises. Many snakes are named after their colour. A difference is made mainly between green, blackish, and brownish species. All in all 21 vernacular names were found for 43 reptile species. Only two terms are applied for amphibians. The Chagga distinguish between terrestrial living species and those restricted to water. For the nomenclature of the Chagga terms and the full species lists of collected animals see Hemp, C. and Winter 1999; Hemp, C. *et al* 1999; Hemp, C. 2001.

VERTEBRATA

Mammals

Although the major tourist attraction of Tanzania today, large mammals are comparatively unfamiliar to the majority of the Chagga people. Most large mammals are extinct now for several generations in Chaggaland. Only those few people who roam around in the montane forest belt and above (e.g. honey collectors, poachers) have some knowledge about the animals in these zones, e.g. the shy eland antelopes (*siṛòó´* or *kiṛoó´*) in the afroalpine zone, wart hogs (*iwutirì*`) and duikers in the forest. Far better is the knowledge about small mammals, especially those living in close neighborship of the Chagga – in the plantation belt. Most small mammals are regarded as a vermin and are therefore intensively hunted. Harmful to all sorts of fruit are the vivid sun squirrels (*njindí´*) which are therefore often killed by slingshots or caught in traps. Also bushbabies (*ngiahà*`) are not popular with the Chagga since they are held responsible for damaging fruit, especially bananas and coffee berries although a great share of their diet is covered by insects. At the same time the giant Gambain rat (*kipopórù´*) is hunted with

traps together with various other rodents such as mice and rats. Very destructive in the homegardens are root rats (*fukò´*), often dragging whole plants into the underground or killing plants and trees by eating off their roots.

In the densely populated plantation belt larger mammals have become very rare, especially small antelopes such as the suni (*sinì´*). Especially in the forest snares are put out to catch antelopes whose meat is a welcome enrichment of the diet. To entrap warthogs, bush pigs and duiker species in the forest deep pits are dug along their passes which are covered with grass. Old Chagga reported that formerly klipspringer (*mburú yà njà´*) and colobus monkeys (*ndoró´*) were frequent. Today these species are found more frequently only on the northern slopes of Kilimanjaro where the human population pressure is not as high as on the southern slopes. Also different ethnic groups live on the northern slopes (mostly Maasai) while the Chagga concentrate on the western, southern and eastern slopes of Kilimanjaro. Both animal species were strongly hunted since their furs were used for the traditional clothing of the Chagga. Klipspringer furs served as cuffs covering the shinbones and those of the colobus monkeys were processed into headdresses. This demand of hides probably reduced these two species considerably on the southern slopes of Kilimanjaro while on the western and northern slopes especially colobus monkeys are still quite frequent forest inhabitants.

Feared are hyaenas of which two species occur on Kilimanjaro: the striped hyaena (*ifulù mùtihílîé´*) and the spotted hyaena (*ifulù ngúgwé´* or *mbondà´*). Only very rarely today do single hyaenas get lost in the plantation belt while in the savannah. Along river gorges and on the western and northern slopes these carnivores are more frequent. Very dreaded are genets (*mtahà´*or *tahà´*) because they are cunning thieves often intruding into chicken or rabbit houses through the smallest cavities and killing all inhabitants in a murderous frenzy. Because of its concealed life the African civet (*kirerèmbà`*) still survives in the plantation belt while the leopard (*rumù´* or *ngo`*) – at least in the area of Old Moshi – has completely disappeared during the last 10 years. Relative neutral is the attitude of most Chagga against some other small mammals occurring – partly in high numbers – in the plantation belt. These are hedgehogs (*kisafúrû´*), populating favourably the few mud roads of the area during night hours in their search for food. Also bats and fruit bats (both groups are known as *ikungù`*) live a comparatively undisturbed life in the plantation belt (**appendix 2**).

Birds

Birds are plentiful on the slopes of Kilimanjaro and of varying importance for the Chagga people mainly because various species are edible but also because they often have a role in superstition. Birds are conspicuous mainly because of their specific songs. Therefore the knowledge about bird species is quite common among many Chagga and even children have a considerable understanding of many species, especially those which are edible. Very popular since tasty, for example, are species of dove. Five dove species were recorded in the area of Old Moshi and four names encountered. Since these dove species are regularly searched for and the species occupy different habitats, the Chagga differentiate precisely between the species and perhaps accounts for the high number of different names found (see **appendix 3**). On the other hand the tiny sunbird species, also occurring plentifully in the Chagga homegardens are not distinguished from each other because they are of no special interest. They are all simply called *kilya-máchuchù´*.

A number of birds play an important role in superstition. There are roughly two groups: birds which are regarded as bringing luck and those which are a portent of something evil to happen. A wagtail or *malàìkà´* is regarded as bringing luck. *Malàìkà´* (‘angel’) is not derived from Kiswahili so this name must have originated in Christian times since angels are not known in the Chagga culture. Similar to myths in parts of Europe the call of the woodowl (*ikudùkùdú´*) indicates that bad things are going to happen and someone in the neighbourhood is going to die. To fight off this doom it is helpful to throw salt into the fire. A similar bad omen is connected with hornbills. Very powerful charms are also connected with crows (*ikuú´*). Somebody finding a dead crow inside a box in front of his door has to fear for the worst. In the area of Old Moshi this seems to be one of the most powerful charms to threaten a member of the community. Some stories are told among the Chagga which derive from the typical songs of some bird species. The song of the common bulbul or *ikongóvìr̲ò´* is regarded as being very polite as its call sounds similar to ‘Good morning neighbour!’ in the Chagga language. The Abyssinian nightjars call in the night hours and sound similar in the Chagga language to the saying ‘Oh, what hardship!’ and is therefore called *ifa-dó´* meaning ‘the distress’. Another story is told about the red crested cuckoo. Its song sounds as if somebody repeatedly shouts: ‘I was almost killed’. The Chagga tell the following story in connection with this bird: a dying grandmother asked her granddaughter to fetch quickly water for her from the spring. But she should hurry up because if she delayed she would be cursed not to be able to drink ever again. But the girl was late, brought the water too late and therefore was transformed into this bird.

Amphibians

Amphibians are rather hidden animals living a very inconspicuous life. In the aforementioned study a toad and some frog species were collected. The Chagga only distinguish between terrestrial and aquatic living amphibians: species living in water are *ngelé´* including tadpoles while terrestrial species such as the toads are known as *kiiló´* (**appendix 4**).

Reptiles

A variety of Chagga names exist for reptiles (**appendix 5**). The much-feared snakes are particularly distinguished. But instead of discerning between dangerous and harmless species the colour is of more importance. Most speakers were unaware that not all snakes are harmful or that some can be useful. Therefore the most applied tactic of dealing with snakes in Chaggaland is killing them. The python or *sadú´* is a highly-feared animal and many mystical legends are told about this species. These stories mostly deal with missing people being devoured by enormously-sized pythons. The viper family consists of mainly poisonous species and their habitus is more or less uniform. Thus species such as the puff adder (*Bitis arietans*) and the night adder (*Causus rhombeatus*) are called *ihuhú`*. However, in the plantation belt of Old Moshi only the night adder was occasionally seen. The gaboon adder (*Bitis gabonica*) is not recorded for Kilimanjaro. The name *kopòkó`* was applied for gaboon adders seen in the Arusha Snake Park where individuals of this species are exhibited. Cobras are differentiated in the Chagga language as well. Speakers claimed that snakes which raise their heads and flatten their necks belong to the dangerous *sawákà´*. Thus the special defence behaviour of these snakes gave them their name. One of the more frequent occurring snakes in the plantation belt is the harmless brown house snake (*Lamprophis fuliginosus*). Especially old Chagga people recognised this snake species with the name *mboléà´*. It often intrudes into houses and chicken coops in search of the rats on which they prey. Although harmless and very useful these snakes are also often found killed on streets and pathways. For all other snakes investigated mainly three names are applied: green or greenish snakes are called *osalé´* regardless of whether it is a very poisonous boomslang or merely a harmless bushsnake. All brownish snakes are known as *overéshì`* while more blackish species are united as *singò´*.

Most other reptiles are grouped by their habits: all chameleons (**figure 29**) are called *kiafúò´*, tortoises and turtles *ngurú`*, geckos *kilya-múhondí´* and lizards *isehèsà`*. A special name, *ndoshì´*, identifies the blue agama (*Agama agama*), the rough-scaled plated lizard (*Gerrhosaurus major*), *isororo*, and monitors (*Varanus*), *mbukándà´*. All of these species occur mostly in the savannah zone. Only the blue agama is a frequent species while monitors and the rough-scaled plated lizard are rather rare. The names of the two latter species were obtained only from a few Chagga elders, as most of those consulted did not know the names of these reptiles, probably because they are typical savannah forms and are rarely seen. Very interesting is the name *ndasá-kùví´* ('aims with two sides') for the blind snake (*Typhlops*) which is also applied for some invertebrats, the earwigs (Dermaptera) and rove beetles (Coleoptera: Staphylinidae). Thus this name united animals which have two 'similar' ends and may be harmful at either.

INVERTEBRATA

Roughly 2,300 invertebrate species were collected during previous study (**appendix 6**) and 124 Chagga names registered in the Old Mochi dialect for them. The majority of collected invertebrate were insects (1,120 species) contributing 110 names. A more detailed overview about different families or single species is provided in **appendix 7**. Generally the Chagga people of Old Moshi name invertebrates with the following criteria: (1) whether they are parasites, dangerous / poisonous; (2) after conspicuous characters (eg. smell or noise); (3) their status as pests; (4) their palatability; (5) their body shape; and (6) conspicuous habits. Species groups which are similar in their outer appearance are often grouped together, regardless of their size or whether they are harmful or pests.

Scoletida (Nemathelminthes and Plathelminthes)

Known as *kiodòyé´* (pl. *shiwoodòyé´*), parasites are an important group. Therefore various local names exist for single parasite species. Roundworms (*Ascaris* sp.) are frequently found with domestic animals but also with humans, especially children. Tapeworms (*Taenia* sp.) are known as *njolà`*.

Mollusca /Gastropoda

Only two names exist for snails and slugs, irrespective of size or colour. All snails are called *ngochó*, all slugs *ikorù´*.

Annelida

All earth-living worm-like creatures are known as *mbilìlì´* comprising real earthworms (Lumbricidae) as well as similar creatures, e.g. hair worms (Nematodae). Leeches are generally only known to people working on agricultural fields in the savannah (especially rice fields) and are called *mnurà´*.

Chelicerata / Arachnidae

All spiders, regardless of whether they are large or small, ground-living or inhabiting nets, are called *mbuwù`*. Other related groups such as camel spiders (Solifugae) or daddy longlegs (Opiliones) are also described only through this expression, although the Chagga people know very well that e.g. the bite of a camel spider is painful and that daddy longlegs are harmless arthropods. Scorpions are well known although these arthropods are not very frequent on the southern slopes of Mount Kilimanjaro. Nevertheless most Chagga people know these arthropods probably because of their very painful stings. Scorpions are called *kisuwà`*. Parasites mostly from the mite group (Acari) were collected during ethno-

zoological field work. Ticks and mites are known as *icherí´*.

Mandibulata: Crustacea

From the crawfish order only sweet water crabs and woodlice are apparent. While nearly every informant knew about sweet water crabs (*ngalá´*), hardly anybody could give a name for woodlice. Nonetheless a few old people named woodlice as *nyangà`*.

Antennata: Chilopoda (chilopods) and Progoneata (Diplopoda, centipeds)

All chilopods, also species of the genus *Scolopendra* whose bite is feared, are put together in the Chagga language as *ndalá`* while all centipeds are known as *ichongòlòlò`*.

INSECTA

During the study most of the collected arthropods belonged to the insect order. Very apparent and rich in species were beetles (Coleoptera). Most of the listed species were seen together with native speakers in the entomological collection of the TAFORI (Tanzania Forest Research Institute) in Moshi. This collection originates from the early 1940s while the Institute was under British management. Mostly insects harmful to timber were collected but also a good number of butterflies and moths. Today this collection has been transferred to Dar es Salaam (probably National Museums). Therefore focus of this collection were the longicorn beetles (Cerambycidae, 178 species), weevils (Curculionidae, 68 species), auger beetles (Bostrychidae, 33 species), jewel beetles (Buprestidae, 28 species), bark beetles (Scolytidae, 28 species), and Platypodidae (22 species) while other - species rich - beetle families on Kilimanjaro such as the rove beetles (Staphylinidae), the leaf beetles (Chrysomelidae) or the scarab beetles (Scarabaeidae) were poorly collected.

Coleoptera (beetles)

As in most European language where a uniform expression exists for the beetle group, the term *irimbòchò´* is used in the Chagga language to designate most species of Coleoptera. Often members of the bug order (Heteroptera) are also named *irimbòchò´*. Main criterion for using this name is the roundish-oval shape of insects of a size of 1-2 cm (see under Heteroptera). Thus *irimbòchò´* are most species belonging to the families fungus weevils (Anthribidae), leaf beetles (Chrysomelidae), weevils (Curculionidae), soft-winged flower beetles (Malachiidae), blister beetles (Meloidae), scarab beetles (Scarabaeidae), jewel beetles (Buprestidae), ground beetles (Carabidae), longicorn beetles (Cerambycidae), checkered beetles (Cleridae), ladybirds (Coccinellidae), clown beetles (Histeridae), Lagriidae, stag beetles (Lucanidae), Platypodidae, and darkling beetles (Tenebrionidae). If the beetles are smaller than about 0.5 cm they fall under the diminutive form *kirimbòchò´*.

Exceptions are all those beetle species which are conspicuous, either because of their size or colour or because they are pests. As in Europe fire flies have a different name: *mnang´ò`*. Also whirligig beetles (Gyrinidae), which are frequent on irrigation canals and all bodies of freshwater, do have a special name: they are called *kichoóndì`* (which means 'lamb'). Sometimes various other water-living insects such as water striders (Gyrinidae) were named *kichoóndì* although it is possible that this is a confusion and only whirligig beetles originally carry this name. Longish-oval beetles which may also show other conspicuous characters such as enlarged mandibles are often named *otu´*, *iotu´*or *olotù´*. Stag beetles and click beetles (Elateridae) belong to this group as well. Jewel beetle were called *ilangametu lya shídiní´*. Species of Flatidae and Fulgoridae had the name *ilangametu*. Jewel beetles and some of the species of Flatidae and Fulgoriae are colourful and of longish shape. Maybe this unites these insects groups in the eyes of the Chagga people of Old Moshi.

The name *kivirò`* is applied to a variety of insects from different groups: beetles (Coleoptera), bugs (Heteroptera), neuropterans (Neuroptera). A common character that may explain why all these insects are put into one collective is that they are small, often pests and 'are living in the dirt'. Also all Bostrychids are called *kivirò`* and the nymphs of antlions (Myrmelionidae). Adult antlions are not regarded as *kivirò`* and most people did not even know that there is a connection between these stages. Adult antlions were mostly confused with dragonflies (Odonata). Completely different is the heteropteran species *Neuroctenes caffer* of the family Aradidae. Nymphs of this bug species camouflage themselves with dirt particles and are hardly recognisable as insects unless they move. The trait 'living in the dirt' is obviously the reason that this species belongs to the *kivirò`* group.

Species of the genus *Callosobruchus* are severe pests on beans. Therefore they have their own name in the Chagga language: *ngungù´*. Staphylinids, especially members of the genus *Paederus*, which contain over 600 species worldwide, are well known to the Chagga. When squashed on human skin they exude an irritating secretion from their abdominal glands containing the potent toxin Paederin causing painful dermatitis. The secretion causes burning wounds which take a long time to heal. Furthermore some of the larger staphylinids are conspicuously coloured and thus easy to recognise. The so-called Nairobi Fly (*Paederus sabaeus*) is a well known species of this family since the population of this species may increase dramatically during some years especially during *el niño* events. Due to confusion with rove beetles or because of their body shape earwigs (Dermaptera) are also called *kisànà´* although people mostly knew that

these insects are harmless. Some grubs of beetles also have special names. Grubs living in the soil are called *itambàchà´*. During the study the name *itambàchà´* was applied especially to the grubs of scarab beetles (Scarabaeidae). However, when the beetle larvae found in timber they were called *ndokò´*. All larvae of this type presented to native speakers belong to longicorn beetles (Cerambycidae). The white coffee borer *Anthores leuconotus* is a severe pest to coffee, especially to *Coffea arabica*. Larvae of this species attack fresh wood boring themselves even down to the roots damaging coffee trees considerably (Aulmann and LaBaume 1991). Originally *Anthores leuconotus* was attacking various Rubiaceae species but after the installation of large coffee plantations in East Africa this longicorn beetle became a severe pest (Bohlen 1978). Some respondents explained that *ndokò* are a popular food among children.

Dermaptera (earwigs)

Two expressions exist for earwigs (Dermaptera): *kiasáná`* (also used for *Paederus* sp., see above) means 'something which is joined together' and *ndasá-kùví´* which means 'aims with both sides'. The last term probably refers to the large pincers of earwigs.

Diptera (flies)

As in various European languages many members of the Diptera are united under the term 'fly'. This also holds for the Chagga language where all fly-like insects are called *nzí´*. Thus most members of the families Muscidae (house flies) or Syrphidae (hover flies) belong to this group. As in most groups of parasites, molesting insects also have their own names in the order Diptera: horse flies (Tabanidae) and tsetse flies (Glossinidae) are known as *ichong´à´*, while the ever present yellow fever mosquito (*Aedes aegypti,* Culicidae), being active only during daytime hours is known as *kipanù´*. The malaria transmitting *Anopheles* mosquito (there are about 40 species of *Anopheles* known world-wide which may transmit malaria) also belongs to the family Culicidae. However, these mosquitos are called *mbuwù`*. Curiously this name is also applied to completely different arthropods – the spiders (see above). Fruit flies (*Drosophila* sp.) are present as soon as ripe fruits are around. Therefore these flies are well known to most Chagga people and are called *surú`*. Moth flies of the genus *Psychoda* (Psychodidae) are frequent in toilets and bathrooms. Although they do not molest people they are regarded as being special and thus carry their own name: *surú yà chòròní´* ('fruit fly of the toilet').

Hemiptera: Heteroptera. In the Chagga language bugs (Heteroptera) are a heterogenous group in respect to names. The two names *kirimbò`* and *mbuhúdû´* could be regarded as characterising bugs more genrerally, while *kimatírà`* are more colourful species, e.g. *Sphaerocoris annulus* (a pest to various crops). Although belonging to the order Coleoptera, ladybirds of the genus *Epilachna* (Coccinellidae) are also known as *kimatírà`*. Bugs emitting bad odours when being irritated are called *imamdashù´* or *mafutá-mbòchò´* e.g. many species of stink bugs (Pentatomidae). *Mafutá-mbòchò´* derives from *mafudá`* ('fat') and *irimbòchò´* ('beetle'). Huge assassin bugs (Reduviidae) are feared among the Chagga and therefore have their own names: *irimbòchà`*, *iringòchì`* and *irumùnù* depending mostly on the speaker and their clan. Thus, for example, the white eye assassin bug *Platymeris biguttatus* is a typical insect which has the name *irimbòchà`*.

Homoptera

Only for few groups of the Homoptera do names exist in the Chagga language, and here mostly for pest species or larger, more conspicuous species such as cicadas. Thus all plant juice sucking insects are called *mvià´* comprising species of the families Cicadidae (cicadas), Flatidae (plant hoppers), Fulgoridae (latern flies) and Cercopidae (spittle bugs). Aphids (Aphididae) are known as *kimambà´* and Membracidae (horned tree hoppers) which often aggregate on certain plants are called *ikrupu*. For large fulgorids (latern flies) *ilangameto* was used by some speakers as well.

Hymenoptera

With the exception of ants (Formicidae) there are only a few expressions for hymenopterans in the Chagga language. Species defined as 'wasps' (Vespidae, Sphecidae, Pompilidae) are generally called *kifi´*. Larger species, for example those in the group Pompilidae, sometimes also emitting noises when they fly, are known as *mdahà`*. Generally *mdahà`* are larger flying insects emitting 'dangerous' noises. Hence this name applies for insects of different families and even orders (see **appendix 7**). Carpenter bees (Anthophoridae) are regarded as *irimbòcho* ('beetle') or *irimbòcho lyà wŭkí`* ('honey beetle') since these insects are known to produce honey. Bees (Apidae) are important in Chaggaland, their honey very popular. On Mount Kilimanjaro two subspecies of the honey bee are present: the African honey bee *Apis mellifera scutellata* and *Apis mellifera monticola*. The latter subspecies is only found on few high mountains in East African and is restricted to higher elevations. *Apis mellifera* subspecies are known as *njukí`* ('bee') and produce honey which is called *wuukí`*. Very important is another bee genus, the stingless bee of the genus *Meliponula* (*losì´*) that is kept in small hives attached or near the Chagga houses. *Meliponula* bees produce a fluid sour honey known as *nyorì`* which has medicinal properties.

Formicidae

Ants have a variety of names in the Chagga language. The Chagga people distinguish at least a dozen ant

species. Very striking in the plantation belt, especially during the rainy seasons, are the safari ants (*Dorylus* sp.). In large ant trails *Dorylus* species cross pathways and roads, even intruding into houses. The aggressive soldiers guarding these trails are feared since their bites are very painful. A careless step into one of these trails is an experience which will be remembered a long time. Thus '*mbomé´*' is a term that people learn from early childhood. Although very similar in appearance, *Dorylus* species living in the montane forest are called *mrakò´*. The harmless and tender ants of the genus *Camponotus* are conspicuous since they solitary or in small groups lap around on the floor of houses or verandahs in the evening hours. In the poor light of oil lamps and candles they cast long spooky shadows on the floor in their search for food. Maybe because of this trait these delicate insects have their own name: *ikarà-kàrá´*. Species of the family Myrmicidae build ant-hills similar to the European representatives of this group. As European species they exude irritating secretions from abdominal glands. Species of the genus *Crematogaster* raise their abdomen when provoked, a habit which gave them their English name 'cocktail ant'. In Kichagga these ants are called *mambò*` or *sangù´*. Tiny ant species of the genus *Tetramorium* are bothersome since they immediately appear plentiful when sugary food is spilled or not hermetically sealed. All tiny ant species gathering around food are called *susá*`. In small groups of three to five individuals ants of the subfamily Ponerinae are sometimes seen on pathways or in grasslands from the colline to the submontane zone on Kilimanjaro. Species of the genera *Plectroctena* and *Pachycondyla* have a large body size, are mostly deep black and are feared because of their painful stings. Characteristic of this group of ants is their perceived ability to converse with each other. Sometimes these insects can be recognised by their whispering noises in grasslands often before they are seen. When irritated individuals lift their heads, threateningly open their mandibles and emit sizzling chirps. These insects are known as *ilondò´*.

Isoptera

Termites are an omnipresent group in almost all zones on Mount Kilimanjaro, with the principal exception of the alpine zones. While in the savannah zone termites are obvious because of their huge termite mounds (*sohú´*), in the plantation belt termites or *msorá´* are obvious only when damaging buildings. After strong rains alate kings and queens of the various *Odontotermes* species spread in their thousands. These forms called *ngumbí´* are popular food when fried and are collected especially by children.

Lepidoptera

Only a few names exist for the adult stages of butterflies and moths. A name comprising all variations of Lepidoptera is *itandáwùrî*`. For some conspicuous moths (e.g. from the families Brahmeidae, Geometridae, Eupteridae and Saturniidae) the name *ikongólìmá*` was given. This name means 'toothless bat' (*ikungù*` = bat) referring to their often considerable body size and swift flight. Species being attracted to light at night fall under the group *kiwuwúna*. Besides moths *kiwuwúna* comprises insects from different groups. However, the most typical representative of *kiwuwúna* are the drones of *Dorylus helvolus* (Formicidae). During certain times of the year these insects are during the night attracted to light in high numbers, banging repeatedly and noisily into lamps and crushing to the floor. Different names have the caterpillars. *Ohonjò*` are injurious species e.g. of *Spodoptera* and *Epilema* moths attacking food. Caterpillars with hairs, often feared because of the irritating properties of these hairs on human skin are generally called *ikurara* or *ikongòmìdo´*. *Ishinù´* are those caterpillars without hairs.

Neuroptera and Odonata

Only a few names seem to exist for the orders of the neuropterans and dragonflies. Although dragonflies and the adults of ant lions are frequent during certain times of the year, most interviewees could not give names for these insects. Since both groups have similar traits they are mixed up with each other. Thus dragonflies as well as the adults of ant lions are called *idangáshi*` or *isidí-mèmbá´*.

Phthiraptera, Mallophaga and Siphonaptera

These insect orders are mostly apparent only because they contain some of the most frequent animal and human parasites. Interviewed Chagga reported that lice (*nda´*) are sometimes found on old men and women but are otherwise not very common. Fleas on the other hand are omnipresent although most people rejected having ever been molested by these parasites. Cat fleas (*Ctenocephalides felis*) were the most common flea species on animals as well as on humans. The larger human flea (*Pulex irritans*) was collected only occasionally. All fleas are called *sawà*`. Biting lice (*titìrí*) are sometimes a nuisance with poultry, affecting humans only if the contact between humans and domestic animals gets too close.

Blattodea, Mantodea, and Phasmida

The Chagga have relatively few names for these orders of insects. Cockroaches are divided roughly into two groups: small species and juveniles are called *injé*` while larger species (>3 cm) are *itarìwó*`. While almost everybody could give the name *kimanjùo-kùdu´* for all kinds of praying mantis, only a few people knew that stick insects are called *kinatsù´*. Since stick insects look like dried grasses it is no wonder that the name *kinatsù´* derives from certain grasses. *Natsì´* are the two grasses *Themedra triandra* and *Cymbopogon caesius* which were traditionally are used for roofing.

Orthoptera

Saltatoria species are an important group because they are: (1) eye catching; (2) palatable / poisonous; and (3) pests. Therefore a number of Chagga names exist differentiating most groups and even species. In the Old Mochi dialect the embodiment of a grasshopper is *ndatàrì*`. This includes all those species which are longish or more compact, ground or tree-living, of brownish or brown-greenish colour and 1-4 cm bodysize. Most acridids belong to this group as well as all eumastacids (small tree-living species) and some of the smaller locusts (Oedipodinae) such as the very common ground-living berseem grasshopper (*Morphacris fasciata*). As already mentioned above many names for the less important groups often depend on clan affiliation. While *ndatàrì*` was the most common name in the area of Old Moshi, *ngalíà´* was the equivalent name in the adjacent Kibosho area of Kilimanjaro. Other terms used in the Old Moshi area were also *kisesè*` and *indì´*. A common name for Saltatoria being of larger bodysize is *nzihè*`. All grasshoppers and locusts of a bodysize bigger than about 4 cm fell under this group. *Nzihè*` seems to be a generally more accepted name for grasshoppers and locusts in the Chagga language since it is understood almost everywhere on Mount Kilimanjaro.

Acrida species (Acridinae) are noticeable because of their body shape and their curious longish head and the fact that they are most apparent in grasslands, especially in the savannah. Two names were found for *Acrida* species within two clans of the Old Moshi area: *ihuwà´* and *ochingó´*. If longish grasshoppers are of vivid green very often two other names were applied: *senènè*` or *olindó*` (**figure 30**). However, both these names are mainly applied for tettigoniid species, mostly *Horatosphaga*, *Ruspolia* and *Conocephalus* species. *Senènè*` are also edible species. Locusts of the genus *Gastrimargus* are eye-catching species in grasslands from the savannah to the lower border of the montane forest. When startled these insects fly up showing their colourful hind wings and emit crackling sounds. Maybe therefore these species have the particular name *ifaámàyè*`. Also a proper name was found for species with a crested pronotum. Thus few cyrtacanthacridine and acridid species were called *orimòngó´* or *orikòngò*`, depending on the speaker. For some larger species with dark parallel fasciae on the pronotum occurring in montane grasslands another name was found as well: *msesèà´*. Most speakers identified the calliptamine *Acorypha laticosta* as *msesèà´* but sometimes also other species with a similar pronotal pattern were taken as *msesèà´*, e.g. the widespread species *Metaxymecus gracilipes* and the large *Cyrtacanthacris tatrica*.

The Pyrgomorphidae comprise species which are often large and very colourful and sometimes protected by powerful chemicals. Since a variety of grasshoppers, locusts and katydids are palatable it is important to distinguish between the poisonous and non-poisonous species. Typical pyrgomorphids, frequent in the plantation belt are the foam grasshopper *Dictyophorus*

Figure 30. *H. heteromorpha* is a frequent inhabitant on Mount Kilimanjaro occurring from savannah grasslands to montane meadows. Therefore and because it is edible the Chagga people know this species very well. Adults – as other katydids as well- are known as senènè` while the nymphs of this species are called olindó`

Figure 31. Pyrgomorphid grasshoppers are usually very poisonous and very colourful. On being disturbed they secrete bad smelling foam. Flightless forms of these grasshoppers, such as this *Dictyophorus griseus* occurring frequently in the plantation belt, are called imtangà` or itangà`. Itangàwàsí` are species with fully developed wings

griseus (**figure 31**) and the elegant grasshopper *Zonocerus elegans*. These two species are also serious pests often badly damaging crops. Although flightless they have few enemies. Most pyrgomorphids are protected by cardiac glycosides – heart poisons - showing this through their colourful patterns and/or hind wings. In the area of Old Moshi these insects are called *itangà*`, *mtangà*` or *imtangà*`, depending on the speaker. Alate pyrgomorphids such as *Taphronota calliparea* or *Phymateus viridipennis* are distinguished as *mtangàwàsí*` or *mkawàsí*`. Although the species *Atractomorpha acutipennis* belongs to the family Pyrgomorphidae also being poisonous, it is no typical representative. It is rather small for a pyrgomorphid and of uniform green colour. Its affiliation can only be guessed when looked at more closely. Maybe therefore the Chagga differentiate in this

case very accurately. Only for *Atractomorpha acutipennis* the name *irengo* is applied. A uniform group, known to almost everybody, with the Chagga name *njechéri´* are the crickets. Crickets are frequent in all kinds of habitats, occurring even in houses, and noticeable also because of their continuous songs during night hours. Although quite similar in character to a cricket, mole crickets are nevertheless distinguished in the Chagga language, known as *kirukà´*. Armoured ground katydids (Hetrodinae) are more frequent only in the savannah zone. Although considered harmless they have the name *kiihútsù´*, perhaps because of their large size and unusual spiny body shape (**figure 32**).

Figure 32. Especially on crop fields of the savannah species of armoured ground katydids (Hetrodinae) occur. Although harmless most Chagga recognised these katydids as kiihútsù´

CONCLUSION: HOMEGARDEN, HOMEFOREST, HOMEMOUNTAIN

The Chagga homegardens maintain not only a rich biodiversity, they are an old and very sustainable way of land use that meets several different demands. Beside crop production, the sparse tree layer provides people with firewood, fodder and timber. Furthermore the Chagga make use of their natural environment in a great variety of ways and consequently the whole natural vegetation of Kilimanjaro is (and has been) influenced and shaped by humans. The interplay of biotic and abiotic factors possibly not only explains the lack of a bamboo zone but also explains land use history and offers possible explanations for levels of diversity and endemism. Mount Kilimanjaro therefore serves as a striking example of the large and long lasting anthropogenic influence on African landscape.

PART II: THE SOCIAL HISTORY OF THE CHAGGA IN OUTLINE WITH SPECIAL REFERENCE TO THE EVOLUTION OF THE HOMEGARDENS[1]

J. Christoph WINTER

INTRODUCTION

The study of an agro-biological feature so central to a society as the Chagga home-garden, along with its history, has to acknowledge that it is part of the society's socio-economic set-up, and has to take account of the fact that as such it developed as part of its social and economic history. A short outline of this social history should therefore be welcome as a background to the specific discussion of the home-garden. It should be noted that the term 'Chagga' used here may refer to both, the traditionally settled area on the Eastern and Southern slopes of Kilimanjaro (as it no longer does in living speech, having been replaced by *Uchagani* in Swahili and 'Chaggaland' in English), and – most vibrantly – the people who have traditionally been living in this area. These people did not evolve as one 'tribe' – until after 1900 when the gradually entrenching German colonial administration taught them to consider themselves 'one tribe' – and this new concept soon eliminated the idea that 'Chagga' originally just meant the area. Thereafter, however, the mixed local populations, loyal then to some 30-odd sovereign rulers, whose reigns were distributed over an equal number of different geographical locales along the said southern and eastern slopes of Kilimanjaro, aligned as beads on a string, went on refusing to admit an unified 'tribal' Paramount Chief until 1948. This office was reformed in 1956 to be filled by a democratically elected 'tribal' President who, in 1962, to everybody's surprise, declared to have for several years been a secret member of Nyerere's T.A.N.U., the colony's independence party despised by most Chagga, and that therefore Chaggaland was T.A.N.U.-land.

The Chagga were diverse in their speech forms, which mostly represented dialects, or often rather languages, of a type which after 2,000 years of linguistic divergence remained common only to Kilimanjaro and its immediate neighbourhood, including Mount Meru, the river oases of Kahe and Okuma (=Arusha Chini), and Ugweno of the North Pare Hills and also the language of the Northern Taita Hills, Wundanyi, in Kenya. But the local community of Ngaseny at the northern end of the eastern slope until eighty years ago spoke a totally different language which was distantly related to Maasai, yet was not excluded from Chagga identity. European observers found at the end of the 19th century, before colonial rule interfered which soon led the Chagga to begin thinking of themselves as 'a tribe', that the peoples of Chagga and their aforementioned close linguistic relatives from Mount Meru to Ugweno (with no reports available regarding Wundanyi) used to identify their unity by reference to a cultural or rather economical-agricultural feature. They called themselves *wa.ndu wà mú.nde.ènyí*` ('People of the Home-Gardens').

Until the 1960s it was commonly held that the history of the Swahili began with Greek authors writing about the East African coast during the first few centuries CE, and that Chagga history began about 1500, the farthest time their oral historical traditions would reach back, telling of the immigration of their oldest-established clans. And the prehistory of both these peoples' Bantu-speaking ancestors in their areas was estimated to go back an unfathomable number of millennia. The Swahili were accounted as a basically Middle Eastern people with a civilization who, however, had adopted Bantu speech; the Chagga were widely considered one of those Negro peoples at the stage, not quite of savagery for this was reserved for peoples at the hunter-and-gatherer stage, but still at that of raw barbarism. In many high-school geography text-books there is a chapter on Kilimanjaro. There, the Chagga home-gardens are always singled out for special praise on account of their characteristic storey-wise cultivation of banana-plants below high shading trees, coffee-bushes below the banana-plants, pulses below the coffee-bushes, and vegetables and root-crops below the pulses. It is usually pointed out that the Chagga apparently copied what they observed in the rain forest next to their plots, and often there is hardly a word, or none at all, regarding their use of artificial irrigation in their home-gardens.

Yet the last 50 years of research have considerably changed this picture. The gist of the following demonstrations is to convey a conception that while they were rather late in acquiring a civilization based on intensified agriculture as compared with most Arabian, Indian or European peoples, they had nevertheless been operating, adapting and improving this advanced agriculture already for almost 700 years by the time they were taken into the fold of European colonialism shortly before 1900. Were they still barbarians then? In their own view they definitely were not, but who would then listen to 'black natives'? (In fact, some did, including prominently a few of their missionaries and colonial administrators!). Chagga home-gardens – or 'banana-groves' (in German *Bananenhaine*) as they have commonly been called in the ethnography – obviously were the gradual creation of a food-producing population.

[1] Part II of this contribution is an extended abstract of a book by this author soon to be published on traditional irrigation and ancient religion in Kilimanjaro. It has therefore been decided to dispense with footnotes and bibliographic referencing in order to save space and in view of full bibliographic documentation to be published in that forthcoming book.

They evolved about 1900 years from the time the first cultivating peoples settled in Chagga until the latest crop plants and pesticides were added to their repertoire during the 20th century, along with the amazing changes in the demographic structure of cultivators and beneficiaries of these same home-gardens which occurred during the same century, and adverse ecological changes due to global warming which began to be registered during the last few decades.

THE FIRST CHAGGA

In fact, the vanguard of the first food-producing inhabitants of Kilimanjaro, or so archaeology tells us, arrived there in the 1st and 2nd centuries CE, and they set up a continuity lasting up to today. They were producers of a type of pottery known as Kwale Ware, descended from (after a re-naming) Urewe Ware which had developed in the Interlacustrine area since about 500 CE; they introduced to the area of Kilimanjaro the technology of producing and forging iron which their forefathers had acquired about 1000 BCE near their original homes south of Lake Chad; and they belonged to the descendants of the first cultural tradition entering the area of the present Uganda, Rwanda, Burundi, Tanzania and Kenya which spoke a Bantu language (which had originated south of Lake Chad in south-eastern Nigeria and southern Cameroon out of local representatives of the Niger-Kordofanian language-family. This earliest branch of Bantu speech reaching eastern and southern Africa – Rain Forest Stratum IIA –, represented a cultural type known as 'old Erythraic' or 'West African'. In the most recent terminology, however, they are called, only in respect of East Africa, 'Upland' peoples, descended from 'Mashariki' (Swahili for 'Eastern') peoples settled in the Interlacustrine region, afterwards the Bantu *vagina gentium*.

Their iron-working in eastern (and later also southern) Africa made up the so-called Early Iron Age. They also brought along the custom of using *Dracaena* (the 'dragon-blood tree') as a plant for fencing-in their gardens – in fact a plant capable of creating veritable living stockades around a homestead – and eventually with over one hundred other ritual uses for the people of Chagga. There are some other examples of their cultural heritage. Very likely they already pursued their ancestor-cult and had their peculiar fear of, and hostility toward, what they considered reproductive abominations, namely not only monster births but also twin and other multiple births, births feet or hands first, and infants cutting their upper incisors before the lower ones. Such infants and their mothers had to be killed or in other ways be made away with, in order to save the mystically threatened life of their mothers' brother (respectively brother in the original matrilineal social order), or their father (respectively husband after the social order had been transformed to patrilineal).

The origin of this group, about a millennium earlier, had been in the border region of modern southern Nigeria and the southern Cameroon. It is held that they had picked up their iron technology in that area of their origin. This technology had been pioneered about 1400 BCE in Asia Minor by the Hittites, was high-jacked there by peoples of the 'Great Migrations' about 1200 BCE who had started out from Central Europe (including Bayreuth), after they had crushed the Hittite Empire, and by 1100 BCE had been taken across the Mediterranean to North Africa and Egypt by the so-called Sea-Peoples, the ancestors *i.a.* of the Biblical Philistines. After the Western wing of these Sea-Peoples who had descended through Italy and Sicily to modern Tunesia, had been repulsed from Egypt, upon their retreat they appear to have opened up the so-called 'Chariot Trail' across the Sahara to the Bend of the Niger and to Lake Chad, introducing there their iron technology about 1000 BCE and at the same time beginning the raiding for slaves and trading them back to the Mediterranean, an operation which seems to have both, invited the founding of Carthage about 800 BCE by Phoenicians, and triggered South of Lake Chad, by their slave raiding, the emigration of those earliest Bantu-speakers from Nigeria and the Cameroons after some run-away slaves had supplied the emigrants with the secrets of the production and working of iron.

These forebears of East Africa's Bantu therefore migrated eastward along the northern fringe of the Congo rainforest into the Interlacustrine region where they arrived about 500 BCE and stayed for some centuries, consolidating their numbers and cultural make-up while meeting up with communities of different origins and traditions. Eventually small communities of their descendants emerged from this *vagina gentium*, fanning out and – as far as the interests here go – skirting Lake Victoria southwards and northeastwards. Besides continuing their older habits of hunting and collecting, they pursued their traditional food-producing activities as planters of indigenous root-crops and by keeping goats. But contacts with groups of very different origins may also have introduced them to some seed-crop agriculture (millets) and the keeping of sheep and even cattle. The present languages and dialects of the Chagga still show traces evidencing the type of Bantu (Rain Forest Stratum IIA) these early immigrants spoke, while archaeological evidence does not support the idea that besides root-crops, goats and bees they already used seed-crops and sheep or cattle, too. This much for the new inhabitants of Kilimanjaro itself.

THE CHAGGA'S ORIGINAL NEIGHBOURS

Around Kilimanjaro (and its rainforests) there had been living on the savannahs hunters and gatherers of the physical and linguistic type known as Khoisan for many millennia; archaeological evidence thereof exists in the form of bored weighting stones for digging sticks and killing spears inserted into elephant traps. Their cultural type was called 'Mahalbi' or 'Eurafrican Steppe Hunters'. Their presence is estimated to have amounted to only about 100,000 for the whole of present Tanzania

up to about 1 CE. Modern descendants of theirs are e.g. linguistically the Sandawe (now cultivators) of Kondoa District and culturally the Hadza hunter-gatherers (speakers of an as yet unclassifiable language having click phonemes as are otherwise characteristic of Khoisan languages) of Mbulu District. Unlike the Hadza, most other hunter-gatherer groups in East Africa shared their territories with pastoral groups and eventually adopted the latters' languages. Thus the Dahalo around the lower Tana river speak a Southern Cushitic language but retain a few click-words from their former Khoisan language; the Aasáx of the Lelatema Range south of Kilimanjaro and the Ng'omvia of Gogoland also speak southern Cushitic languages (Winter 1979); and the Akie of Tanzanian Maasailand and the Okiek of the Kenyan Mau Range and other parts of Kenya all speak dialects of Southern-Nilotic Kalenjin. Besides these savannah-hunters there were also rainforest hunters, pigmoids who had spread from the Congo forests along the almost uninterrupted stretch of forest which at that time still extended at least to Mount Meru – the evidence is ornithological. Modern descendents of these pigmoids are the Boni, hunters and gatherers of the forests of southern Somalia and north-eastern Kenia who now speak a Somaloid language, and whose original Bantu language of the type known as 'Rain Forest Pre-Bantu' has left traces in a number of Swahili and Comoro dialects. Legendary reminiscences of such pigmoid predecessors appear in the tales of the Chagga and all their mountain-dwelling neighbours from the Pare to the Gikuyu.

Leaving those hunters and gatherers, the first Bantu-speaking planters and iron-producers do not, however, appear to have been the first food-producers in East Africa. Archaeology in fact shows that about 1,500 years before the first appearance of those earliest Bantu planters, there had begun a trickling into East Africa of herders of cattle and sheep and growers of millets. In other words, these people grew grain-crops reproduced by seed-sowing, not tuber-crops reproduced by the planting of cuttings. They were speakers of a Southern Cushitic – i.e. Afro-Asiatic – language which had spread from what is now Ethiopia. The cultural type they represented was called 'Hamitic' or 'East-Hamitic'. Modern descendants of theirs are e.g. the Iraqw in Mbulu District, and linguistically also the Southern-Cushitic speaking hunter-gatherers mentioned before. Representatives of neither those Cushites nor those Khoisan people who both preferred open savannah country, seem, though, to have settled the forested slopes of Kilimanjaro. The in-migrating Bantu-speakers, however, met there up with the pigmoid hunters, expelled them, and established their own root-crop gardens fenced in with *dracena,* thus beginning the evolution of Chagga home-gardens. Loan-words in the Chagga idioms betray, however, that intercourse with those savannah roamers, and some absorption of their people, did happen before, during and almost two millennia after, those first Chagga arrived in Kilimanjaro.

NEW ARRIVALS IN THE NEIGHBOURHOOD

Also in the early part of the first millennium CE another type of people arrived on the plains around Kilimanjaro which have more recently become the home of the Eastern Nilotic speaking Maasai. In those early times these intruders had to conquer the aforementioned Cushitic herders. They were speakers of Southern Nilotic. Their modern descendants are e.g. the Barabaig Datoga mostly of Hanang District. Culturally they represented a mixture of, at bottom, so-called 'Ethiopic' or 'Old Nigritic' culture, with at the surface pervasively 'Hamitic' or 'East-Hamitic' features. Their interactions with the people of Chagga also left traces in the latter's idioms, culture and economy. The Chagga word for *Eleusine coracana*, '*mbege*' which became an important ingredient of their local beer as well as their baby food, is derived from the Southern Nilotic root *'pec'*. *Eleusine* millet was originally domesticated either in northern India or Ethiopia. In Kilimanjaro it was at first not grown in homegardens but on irrigated plots in the savannah below, but its cultivation was moved into the homegardens, to grow beneath the banana-plants, when the savannah plots were needed for growing maize from about 1800 CE. This maize became needful then in the first place for feeding the porters of the increasing number of caravans from the coast visiting the local rulers, and in the second place as a food reserve, under the local rulers' control, for drought years.

The Proto-Kalenjin (within Southern Nilotic) root reconstructed as **mori:n(k)* or **mɛrɛ:ŋ* which refers to the typical East African cylindrical bee-hive manufactured by hollowing out a section of a tree-trunk, was adopted into most Bantu languages of East Africa, cf for example into Swahili as *m.zinga* (*r*<*z*; root-*m*<Bantu-prefix). Bee-keeping with this technology became an economic main-stay of the hunter-gatherer groups with Southern Nilotic and Southern Cushitic speech who thus equipped began also to colonise forested mountain-sides, e.g. the Aasáx settling the Nyandarua Range before the Kikuyu moved in, and the (Kalenjin-speaking) Okiek settling the Mau Range, and the Akie (of the same linguistic descent) coming early to settle in Chagga. The Chagga word for the cylindrical bee-hive '*mu.odú*' is, however, not related to that original Southern Nilotic root, but is the word which means 'dug-out canoe' in East African Bantu languages. It thus is a survival of an earlier technology and time when bees were housed in wooden troughs and the Chagga lost experience of canoes and the need to reserve a word for denoting them. Bee-hives hung in the shade-trees are a very common though not an absolutely necessary inventory of Chagga home-gardens. They are also common in the montane forest as well as the savannah below Kilimanjaro.

SOME ADAPTATIONS TO CHAGGA ENVIRONMENT

Although their ancestors arrived below the mountain with a knowledge of iron smelting and working, when they

moved into Chagga this activity ceased for want of iron ore and was continued only in Ugweno where some river-beds contained iron sands. In Ugweno, the Paramount rulers were a clan of smiths, and they carefully controlled the distribution of their forgings in Chagga, the greater part of which was subject to their overrule. Until late into the 18th century, iron weapons and tools were exceedingly rare in Chagga, and smithies apparently were absent. Maasai smiths *(il-kunono)* were invited to settle in Chagga when the rise of demand for ivory on the world market made available, by caravans from the coast and thus breaking Ugweno's monopoly, a new supply of iron wire imported from abroad. Pot-making, too, was discontinued in most parts of Chagga allegedly for lack of suitable clays. At the end of the 19th century, pot-making and exporting to other parts was recorded only for Ugweno, Useri, Kahe and Narumu. But since it is known that the Kahe people, before going to settle their river oasis known as Kahe in about 1750 CE, had lived for a century in Mbokomu, all the while making and selling pots, it is open to debate whther lack of good clay was the real reason. Likely it was a belief that the exposure of pot-making women to the suspicion of sorcery eradicated this activity in most places. A similar belief may have cleared out earlier iron forging activities in Chagga, seeing that elsewhere forging by men most often accompanied potting by their wives, all to the temporary economic and political advantage of Ugweno.

The Indonesian Contributions to Coastal Culture

A still unsolved problem is the question of when the earliest immigrants of Madagascar arrived on the island from their Indonesian homelands. About their immigration there is no doubt, and that some of their company, too, settled on the African mainland coast and migrated inland, is vouchsafed by such relics of Indonesian culture as outrigger-canoes and ships with sewn planks (Swahili: *mi.tepe)* on the coast and on Lake Victoria. They also must be held responsible for the introduction to Africa of many very important Indonesian food plants, especially banana, taro, yam and sweet potatoe (the latter obtained in Melanesia in pre-Columbian times), and also chicken. Linguistic studies of several different parameters point to the period from about 1 to 400 CE for this immigration, viz. prior to massive Hindu immigrations to Indonesia; archaeological research, however, so far lacks evidence of human presence on the island before the 10th century, and evidence from written history is considered equivocal, as clear documentation of an Indonesian food plant on the East African coast (*scil*. banana) is not obtained until the 10th century (with the Arab geographer Masᶜūdī), while the mentions of 'Waq-waq' people in the Western Indian Ocean during the first half of the first millennium CE are claimed by supporters of the linguistic theory as identifying those early Indonesians, but are denied as such by supporters of the archaeological theory who hold them to be mythical chimaeras. It has to be understood that archaeological research on Madagascar in search of its earliest human inhabitants has not been able, for various political reasons, to progress since soon after the island's political independence in 1960. However, on the island of Zanzibar there have recently been found chicken bones in a cave-dwelling context dated to about 1 CE, which appears to clinch the linguists' theory. Chicken do not, however, seem to have reached Chagga and its homegardens, at a distance of less than 300 km, until nearly 1900 years later, i.e. during early colonial times. There are still many adult Chagga who refuse to eat eggs or chicken, claiming that like pigs they are not clean food suitable for human consumption.

Bananas having always been the most characteristic plant of the Chagga homegarden, clearly call for a consideration of when it first appeared in Kilimanjaro. Among the Chagga there is a tradition widely current that the Mari clan's ancestor brought the first banana-plant along when he arrived from Gikuyu-Land, north of the present city of Nairobi. They recall that this ancestor's wife bore the name *Ɗinda* which means 'banana plant'. It is indeed likely that the Mari clan originated from Gikuyu-Land. The clan's oldest and still most populous settlement is in Siha, and the Siha dialect of Chagga does show some unusual features which remind of the Gikuyu language. But that ancestor's arrival from Gikuyu-Land cannot have happened before about 1600, because only from then did patrilineal clans develop in Chagga. Had Mari arrived earlier, the clan would have been matrilineal, named *Ɗinda* after his wife, and would have dissolved upon the people turning patrilineal, taking all their *Ɗinda* clan lore to the grave. However, 1600 CE is much too late a time for the first introduction of banana to Kilimanjaro. Mari and his wife may very well have come with yet another variety of banana, but not with the first. Many botantical banana specialist considered that the vast majority of the more than two dozens banana varieties currently being grown in Kilimanjaro reached the mountain from the Indian Ocean coast via Usambara and the Pare or Taita Hills, some from Gikuyu-Land, and some, rather late, from Uganda. Linguistics can offer these clues: The Chagga word *i.kundu* ('ripe, sweet banana') belongs to a Proto-Bantu root **kòndò/*kòndè* with widely distributed reflexes, which is to be compared with the Malagasy word *akondro*, ('banana'). The Chagga and Dabida word *i.ruɣu* ('green banana for cooking') descends from a proto-form **-bi=dugu,* because only the sequence **dṳ* would result in the retroflex */r/,* the sequence **dị* resulting in an ordinary */r/*. The Gikuyu word *i.rịgu* is derived from another, younger proto-form **-bi=dịgu* which developed from the former by way of vowel differentiation. This latter proto-form is also the origin of the Mijikenda word *ma.izu*, the Swahili and Comoro word *ma.zu*, and probably the Arabic word *mauz*, as well as, by another way of derivation, of the Swahili word *n.dizi*. Hence, it appears that the Chagga-Dabida form represents the oldest shape of the word whose reflexes in the other languages mentioned were supplanted by reflexes of the younger proto-form.

South Arabian Contributions to Coastal Civilisation

Ancient Greek authors give witness that about 1 CE there had been in existence already for a century or so intercontinental maritime trade between Egypt, Arabia, Persia and India, making use of the Monsoon winds. The rising hegemonic Yemenite kingdom, Ḥimyar, claimed some kind of suzerainty, too, over the trade posts established on the East African coast. One Dionysos, a Greek trader from Alexandria, is reported to have gone in c. 50 CE – obviously with a trading caravan – from the coast up-country as far as three weeks travel to a great mountain (perhaps Kilimanjaro) where he traded successfully before returning to the coast and thence back to Alexandria. The trade posts on the coast were said to be run by Arabs who had married local women, spoke the local language and acted as interpreters and brokers for the foreign traders. Did these coastal Arabs also run their own trading caravans into the interior? We do not know.

Undetermined is also the kind of Arabs active on the Indian Ocean and the East African coast. Members of three linguistic and cultural groups have to considered: (a) speakers of Sabā'ic or Ṣayhadic languages (all now extinct) which included Ḥimyaric, the language of the ruling section of the hegemonic empire in Southern Arabia at the time; (b) South-Arabian, still today represented by Mahrī (in Eastern Ḥadramūt) and Soqoṭrī (on the Island of Sokotra); and (c) North-Arabic from which all modern Arabic dialects derive, and nomadic groups affiliated to which had begun by the 1st century BCE to infiltrate Southern Arabia. In addition to these Arabs, we also have to consider Coptic-speakers from Egypt, a country which was not to be Arabised for almost another millennium. But it is clear that among these groups, followers of the pre-Islamic polytheistic religion of Southern Arabia were prominent.

In Southern Arabia, artificial irrigation was practised since at least the mid-3rd millennium BCE, and the people's polytheistic religion effectively was the religion of this irrigation. By the 10th century BCE when the legendary Queen of Sheba (Sabā') from Southern Arabia is supposed to have visited King Solomon in Jerusalem, some South Arabians had begun to use an alphabet and a few centuries later, under the leadership of their theocratic priest-kings known (in the singular) as *mukarrib*, embarked on gradually developing their most important irrigation system with a catchment area of over 10,000 km^2, the one in the Wādī Dhana, on a truly monumental scale. After its huge dam at Mā'rib was completed in about 500 BCE, it was counted among the Seven World-Wonders. And archaeology has ascertained that storey-wise cultivation was in use, not probably by copying any rain forests, but because of the scarcity of irrigated arable. Yet, beside this project of 'oriental despotism', there were also numbers of smaller irrigation systems operated on a village level.

During the next several centuries after AD 1, Southern Arabia which had thrived enormously for nearly a millennium on controlling the production and exportation of incense as well as undertaking a large part of the overland caravan trade between Egypt and the Levant on the one side and India on the other, slumped economically and politically after Mediterranean traders had learned to by-pass Southern Arabia by way of Monsoon sailing, in parallel with the rise of the Roman Empire. Between the mid-3rd century CE and its conquest by Islam, Southern Arabia experienced some Jewish and Greek Christian immigration, then the adoption of the Mosaic faith by the ruling elite, the country's conquest by Christian Ethiopians, and finally its inclusion into the Persian Empire. In the course of these developments it appears that monotheistic creeds of various kinds, including a reformed version of the local religion, gained much ground among the people. Similarly on the East African coast the ranks of the established traders and brokers during these centuries were no doubt added to by Jews, Zarathustrians, Hellenistic Greeks, Gnostics and Christians.

The local African language would seem to have at first been some dialect of Southern Cushitic, but after the 2nd century CE the Bantu, having also spread along the coast, apparently starting from the Wami River area, seem to have acquired numerical dominance to the point of also forcing a shift toward their Bantu speech. During the following 1,000 years a dialect continuum developed along the coast from modern Southern Somalia to Northern Mozambique and throughout the Comoro Islands; and out of one of whose northernmost dialects all the modern Swahili dialects were to develop after about 1200 CE. By that time, that particular dialect had absorbed the influence of an accent which came from a Bantu language of the Shire-Zambezi River area, likely through the importation of slave nurse-maids from there who influenced life-long the pronunciation of their masters' children. About 1200 CE speakers of this original dialect of Swahili swept south along the coast, imposing strict Islamic observance and their dialect upon the coastal peoples who so far had been speaking sister dialects of this Proto-Swahili dialect; only the Comoro islands in the South, and the Benadir dialect in the North, were not drawn into this new Swahili realm.

The forcible Islamisation after 622 CE, first of Arabia, then of Mesopotamia and Persia caused many unyielding adherents of the old polytheistic religions to flee their homelands. The Parsees of Mumbai, for example, are the descendants of Zarathustrian Persians who in this context fled to India. Southern Arabians and Persians (the latter known in Swahili as *Wa.Shirazi* after the then important harbour town of Shiraz; the descendants of other probably earlier refugees are known as *Wa.Daibuli*, apparently originating from Daybul, a port town about the border of modern Iran and Pakistan) followed established trading routes to the East African coast so as to protect their religious freedom. Southern Arabians in particular possessed a tradition of three millennia of constructing and working small-scale as well as huge irrigation systems. And their traditional polytheistic religion was tightly integrated with their irrigation concerns. It is assumed that the monotheistic trend apparent in Southern

Arabia during c. 350-630 CE had not yet much affected many rural, irrigating peasant communities who decided to flee from Islamisation. But already some 50 years before this process started, a natural disaster definitively destroyed the great dam of Ma'rib in 575, at the same time when the whole country was conquered by Sassanid Persia, and these two catastrophes seem to have triggered their own waves of refugees who were in the know of irrigation, its religion, and storey cultivation. They did not introduce building in stone on the East African coast, but this had virtually ceased, too, for some time already in Southern Arabia.

During the next 500 years, Islam itself reached the East African coast as the religion of temporary trading visitors or individual immigrants from the Middle East. It did not yet acquire the status of the dominant religion but remained one among several others among which polytheistic versions from old Arabia and old Persia, maybe also from Hellenistic Greece and Babylonia, and from *præter*-Mosaic Judaism, may still have continued for several centuries. The Lemba or Waremba of present Zimbabwe appear to be descended from such a Judaic community once established on nearby the coast of Sofala, the East African 'Gold Coast'.

The People of Maore Pottery and North-Eastern III Bantu Speech in Kilimanjaro

Still during the period of the Early Iron Age (which lasted roughly until about AD 1000) – say in the 9th century when the total population of Chagga may have numbered but some 17,500 – another group of Bantu-speakers arrived in Kilimanjaro and influenced the local idioms very considerably. In most other parts of East Africa their language was even able completely to wipe out all evidence of the earlier Rain Forest Stratum IIA variety of Bantu language. This considerable effect implies that these immigrants were able pretty soon to acquire for themselves socially, religiously and politically leading roles even among or over the aboriginal populations. They were makers of a type of pottery known as Maore Ware, and in point of language they represented an amalgam of the Savannah Strata I and IIIA. Savannah Stratum I had arisen from a community of Eastern-Sudanic speakers – distant relatives of one part of the ancestors of the afore-mentioned Southern Nilotic speakers – adopting Bantu speech while retaining and transmitting in their speech community the accent of their earlier Eastern-Sudanic language, which may have been preserved for us in the Kuliak languages of Northern Uganda. Their cultural heritage was 'Ethiopic' or 'Old Nigritic'.

The people of Savannah Stratum IIIA had been speaking an Eastern Sudanic (probably Nilotic) language but adopted Bantu speech while preserving the accent of their earlier language. Culturally this stratum was itself a mixture of 'Ethiopic'/'Old Nigritic' with 'Middle Erythraic A' or 'New Sudanic' culture. The former implies an economy of keeping cattle and small stock with seed-agriculture, the latter implies having sacred priest-kings who must be immolated after a set period of years of rule or at the first sign of illness. This tradition of 'Divine Kingship' originated in prehistoric times in the Fertile Crescent. Modern representatives in Eastern Africa are, for example, the Shilluk of the Southern Sudan and their close relatives in Uganda, Kenya and Tanzania known by the collective name of Luo. What allowed this stratum to acquire its superiority over the aboriginals in Kilimanjaro was no doubt the ideology it was able to broadcast there as it had been or was still also able to do in huge areas elsewhere in Africa, Europe, India, Indo-China, Indonesia, Polynesia, Mexico and Peru.

Archaeologists, such as Knut Odner, have considered another three different pottery types (C, D, E) intrusive to Kilimanjaro home pottery traditions before about 1600 CE. His last type E shall be discussed in more detail below; for his earlier types C and D, we lack sufficiently detailed information for a non-archaeologist to be able to assign them to some known linguistic or cultural entity. Of the latter, there are also two:

- As influence from the Savannah Stratum IVB-1 has been declared the fact that all the related Bantu idioms from Mount Meru through Chagga and Gweno to Dabida in the Taita Hills have reduced their original seven-vowel system to a five-vowel system by merging the tense high vowels /i̲/ and /u̲/ with the non-tense vowels /i/ and /u/. The geographical origin of this influence has been located about the Tete Region of Mozambique where much later on, between 1580 and 1630 CE, the cannibalistic Zimba and the Umbo also rose to invade East Africa up to Malindi and Kilimanjaro.
- (b) Immigrations of Central Kenya Bantu (i.e. Gikuyu, Kamba) introduced not only the habit of shifting the realisation of every toneme one syllable later than its home-syllable into every dialect of Chagga, but also the habit introduced by them of pronouncing the nasal in each of the combinations /mb, nd, ŋg/ as /^{m}b, ^{n}d, ^{ŋ}g/, i.e. as if spoken with one's nose pinched close, is still found in the dialects of Siha and Ng'uni, and of Western Kibosho, viz. on either side of Machame which wedged itself in between only after about 1600. The dialects of Central Kilimanjaro (Uru to Mwika) acquired from these immigrants the habit of pronouncing the prefix of class four (in Swahili /vi./) as /chi./ or /shi./, and Gweno adopted from them the pronounciation of /s/ as /θ/, i.e. in lisped fashion. And in this context belongs the tradition of the Mari clan's ancestors having brought the first – or the first of one variety of – banana plant to Kilimanjaro.

THE IMMIGRATION OF AN IRRIGATING, POLYTHEISTIC COMMUNITY FROM THE COAST

In about 1200 CE, the population of Kilimanjaro may have reached a total of about 30,000. About this time, is found a community of people from the Indian Ocean coast, from the areas of Mombasa to Pangani, arrived in Kilimanjaro, settled there (possibly in Mbokomu) and constructed the first irrigation works in Kilimanjaro. The introduction of irrigation by this community implies the investment of communal labour to dig a water furrow of maybe 2-6 km length which would have engaged the labour capacity of all respective male youths and men for perhaps two to three years. This based on the assumption that there lived approximately 1,000 souls in any one place (except Mbokomu which was much less populous) where now there are living some 33,000 people. No local community would have been ready to invest this amount of labour for such an unwarranted or un-safeguarded return, unless another community went ahead and physically demonstrated the viability and profitability of such an investment. Moreover, the rituals which the Chagga practised in connection with their irrigation works, included the occasional sacrificing (i.e. immolating), by the owner of an irrigation furrow, of his own virgin daughter. Such a practice is completely outside of Bantu or other African cultural traditions, but used to be part of Middle Eastern pre-Islamic religion and is cited in the Qur^{c}an as an abomination of this older Arabian religion. It thus cannot realistically be imagined as something which perhaps an individual itinerant preaching development during those times might have converted the Chagga, let alone an inspired local. Again, this practice could only have spread to the local Chagga from the example of a community that had come to live in their midst and who for many generations had deeply believed in the inevitability and efficacy of this practice. Moreover, Chagga folk-lore preserves the memory of former pilgrimages to sanctuaries sited in Kilimanjaro torrents' river-beds which in the details of their rites also clearly represent reminiscences of the pre-Islamic form of the Arabian autumn-festival of the Hajj which before Muhammad had neither been monopolised by ^{c}Arafat near Mecca, nor amalgamated with the Meccan spring-celebration of the ^{c}Umra or disconnected from the solar calendar in favour of integration with the Muslim lunar calendar which moves through the solar year.

Talking of calendars, before the European calendar – propagated since 1889 by the Christian missions, the colonial government and the European traders who had early supplanted the Muslim caravan men – replaced its indigenous predecessors, there had been current two types of calendars in Kilimanjaro: (a) in the Southeast about Marangu a lunar calendar based throughout on six lunar double-months of 59 days each, such as is preserved as a survival in three names of double-months in the Arabic Muslim calendar; and (b) a composite calendar of ten lunar months rotating through the solar year, and two to four (sometimes more) months which were fixed to the on-set of the great rains (i.e. the equinox of mid-March). The former calendar (a) is at the present time difficult to interpret. The other calendar (b) may in Kilimanjaro be older or younger, but it represents a model which – in contrast to the former, has been registered by unequivocal evidence from many places between Malindi and Pangani on the coast, Kilimanjaro and Mount Kenya in between, and the coast of Lake Victoria as the usual extreme goal of a caravan journey. Another version of it has also been reported from Mogadishu, and there, there is evidence that it was in use already by 1269 CE. The Muslim calendar of the Swahili is another, secondarily fully lunarised version of this calendar. The origin of this luni-solar calendar is to be traced back the pre-Islamic Arab luni-solar calendar which survives in use among Yemenite peasants and Arab and Sudanese sailors.

Besides this Arabic influence on calendrical matters there are also Persian influence to be seen. For example, in the celebration of the pre-Islamic New Year festival of *Nauruz* in various places on the Swahili coast, and also until about 1900 in Kilimanjaro itself. From one area in Kilimanjaro we also have memories of a kind of fire-worship and from another of still continuing water-worship, both reminding of ancient Persian religious practices. And the decarnating practice of traditional burial in Kilimanjaro, as well as the custom of relinquishing certain kinds of corpses in sacred forests, seems to resemble the Zoroastrian institution of the Towers of Death. Also from several areas of Chagga, too, there have been reported apparently megalithic burial customs recalling such megalithic remains in certain parts of Southern Arabia. So how did such a community of irrigators come to move to Kilimanjaro in about 1200 CE? The answer seems to begin with the crusades. The first dated mosque in East Africa, the mosque of Kizimkazi on Zanzibar, all built in stone, was erected just about a dozen years after the First Crusade (1096-1099). But it was the Third Crusade (1189-1192), the one involving *i.a*. Richard Lion-Heart and Salah-ad-Din, which changed everything. Some of the crusaders, and especially in Syria, wrought unspeakable cruelties among civilian populations, massacring men, women and children for the mere crime of calling themselves Muslims. This set off on the one hand a fundamentalist awakening, and on the other hand a wave of refugees among the locals. Fundamentalism answered the question: if we have to face death because of our Islamic religion should we at least have studied its precepts – which we had not been doing very much for some time past – and be ready to fight for them. As refugees, such fundamentalists traversed Mesopotamia and some of them found their way southward to the East African coast.

Somewhere about the Lamu Archipelago in modern Kenya they quickly gained the political leadership of a local community, enforced Islam as its sole religion, and fired their citizens into a *jihad* or 'holy war' against one after the other of the other coastal trading posts, from Southern Somalia to Northern Mosambique, and including the islands of Pemba, Zanzibar, Kilwa and

Mafia, leaving only the Comoro Islands untouched. Thereby they not only extended for some time their political overrule and economic exploitation, but they also founded in permanence Swahili society and culture which have been grounded from their inception in the Islamic faith and the Swahili language, both of which were together disseminated by them at that time. The Kilwa Chronicle composed, or copied from earlier manuscripts, in about 1500 CE, indicates 1204 as the beginning of this process. Wolfram von Eschenbach's epic *Parzival*, written between 1200-1210, depicts Parzival's father coming to the aid of a beleaguered black queen – indubitably pre-Islamic – in the Lamu-Pate Archipelago, and having valiantly fought off her assailants – presumably Islamic – sired on her Parzival's half-brother Feirefiz whose skin as a half-blood, so Wolfram writes, was checkered black and white like a chess-board.

Nonetheless this forcible spread of Islam on the East African coast again produced a wave of refugees who preferred to stick to their old religion. Again they fled along long-established trade routes, this time up-country, and some of them, *viz*. the aforementioned community, reached Kilimanjaro. A Swahili chronicle copied in 1912 from earlier manuscripts reflects these developments. Both, the Bantu autochthones and the immigrants from the coast appear to have been organised in matrilineal, matrilocal clans. It appears that while these immigrants introduced irrigation and their religion to Chagga, they did not at the same time introduce a technology of building in stone, as did their persecutors introduce now to the East African coast. The developments up to this point in time had provided all the ingredients of the Chagga home-garden, short of its food-plants of American origin and those of European introduction. Already available were the plants of Indonesian origin: banana varieties, taro, yam, sweet potato, there were legumes of various origins, there were indigenous shade-trees, and there was irrigation. And there were also cattle and small-stock, and the ritual fencing plant, the *Dracaena*.

VARIOUS ADVANTAGES OF IRRIGATION

At this point it is sensible to ask what was the advantage of introducing irrigation? This question has often been asked and answered quite differently by Europeans and indigenes. My own research has shown that irrigation fulfils different primary needs in different parts of Chagga, and that irrigation, therefore, spread to different parts of Chagga at very different times. However, this matter is much too complex to explain in detail here, but in summary it can be presented this way: the Eastern slopes of Kilimanjaro are too poorly provided with natural sources of irrigation water to have motivated the digging of numerous irrigation furrows and the dependent extensive development of homegardens. Rather, these Eastern Chagga concentrated on cattle and small-stock raising. And do not let us forget that already the earliest Bantu-speaking immigrants brought with them the tradition of holding women's food markets every few days where vegetable foodstuffs mostly grown on the Southern slopes were made available to the women from the Eastern dryer slopes, too.

Turning now to the Southern slopes: these can be divided into six parts from East to West. The crucial defining feature is a rather low mountain spur projecting southward roughly between the point where higher up is found the saddle between the two peaks of Mawenzi and Kibo. Whereas the underground on the Eastern and Southern slopes outside this spur is mostly composed of basalt, this spur is mostly composed of gravels and tuffs apart from occasional basalt bombs. The Southern slopes start in the East with Mwika which is still rather dry like the Eastern slopes. Then there follow Mamba, Marangu, and Kilema, the last one already on the Eastern flank of the spur. These three counties, and their higher mountainside, catch a large part of the Monsoon rains in March-May and in October-November. The counties following westwards of Kilema, viz. Kiruwa, Old Moshi, Mbokomu and Eastern Uru are still on the spur but turn round to the lee side of the Monsoon rains. Further westward there follow Western Uru, Kibosho, Machame and Siha, all of which lie on the slopes below Kibo or Shira peaks. The first three of them, and especially Machame, receive plenty precipitation while the fourth, Siha, borders on the uncultivable Western slopes and accordingly receives only marginal rainfall. Oral historical traditions seem to suggest that the first irrigation works were constructed in Mbokomu, and my physical inspection of the place has confirmed that it belongs among the areas most in need of it while, too, offering the greatest physical problems to its realisation. Situated on the gravelly spur, it required the digging of furrows many kilometres long which lost much water on the way through leakage. At Machame and Kibosho in the West, irrigation seems to have been a late introduction. At Kilema, Marangu and Mamba, on the other hand, its introduction may not have been late but motivated by other reasons.

At Mbokomu on the lee side of the spur, the limited precipitation seems to have made irrigation necessary in order to secure prolonged moisture for the crop to mature to harvest-able fruition. At Kilema, Marangu and Mamba which were clearly much more favourably placed for agriculture, because crops used to grow by natural precipitation up to harvesting time, growing overpopulation seems to have militated against leaving worked plots fallow for many years. Permanent use of a plot, however, required manuring, something unknown to local Bantu cultivators, but well known to the descendants of Middle Eastern smallholders. Local Bantu cultivators had been losing their cattle's manure by pasturing them in the wild. Middle Eastern peasants were wont to preserve their cattle's manure by keeping the animals in stables. Keeping them in a stable, however, necessitated feeding them with fodder collected outside by human beings. Who would then go to collect green fodder for the cattle? The men required their women to do it, but they replied that they had already enough to do

with carrying household water to their homes. Hence the men in Kilema, Marangu and Mamba decided to dig water furrows to their homesteads – which in their areas often ran to just a few hundred metres – so as to free their womenfolk for going to collect green fodder which would make away with long fallowing periods of their homegardens. A British district officer once asked Chagga men in a meeting why they did not pasture their cattle in the open. They replied by asking: 'Who should then run after those cattle and collect their dung in order to carry it home into the banana-grove?' The daily task of moving the dung from the stable to the homegarden and distributing it to the banana plants and coffee bushes became women's work. In the West, the people of Kibosho and Machame seem to have been able to subsist mostly without irrigation into rather late times, while the people of Siha, like those of the dry Eastern slopes of Kilimanjaro, appear to have sided very much with the pastoral peoples in their locale.

The ideal type of the Chagga homegarden appears to be represented in three varieties: (1) of Kilema, Marangu and Mamba where the primary need was to relieve the womenfolk of their water-carrying for home-use; (2) of Mbokomu, Old Moshi etc where the primary, and probably also original, need was to extend watering up to the final maturing of crops, the freeing of the womenfolk from water-carrying being a welcome side-effect; and (3) of Kibosho, Machame etc to which irrigation was probably rather late in spreading because (a) natural precipitation was rather plentiful, and (b) the need to avoid fallow periods arose rather late because of considerably more ample room being available there than elsewhere. The irrigation system instituted about 1200 by that immigrant community with its polytheistic pre-Islamic Arabian religion developed and thrived until about 1800. This was possible only because the on-going caravan trade with the coastal Swahili population was carried on by intermediaries, i.e. people of inland ethnic groups such as Mijikenda and Kamba who in those times were not Muslim. The point also worth making is that the undisturbed existence for some 600 years in Kilimanjaro of the pre-Islamic Arabian religion was made possible only by the near total abstinence of Arab or Swahili Muslim traders personally visiting Kilimanjaro during this period. One major disturbance did, however, happen after nearly 400 years.

THE IMMIGRATION OF THE FOUNDERS OF THE PRESENT PATRILINEAL CLANS

Between about 1580 and 1590 there occurred in Eastern Africa a devastating drought. It affected the flow-off from Lake Victoria and was registered on Kairo's Nilometer. It caused wide-spread hunger, epidemics and uprooting of people who left their homes in search of food in all the area from present Southern Somalia and Uganda to the Zambezi. It brought the cannibalistic hordes of the Zimba from Tete in Mozambique to slaughter the inhabitants of Kilwa, to threaten Mombasa and Malindi, and it brought the Segeju from Shungwaya on the Juba River to meet up with the Zimba in front of Malindi where they annihilated the cannibals under the eyes of a Portuguese fleet at anchor in Malindi's road-stead. The origins of some people who eventually happened to end up in Chagga is preserved in oral historical traditions: there were people from Pokomoni on the lower Tana River, from Mumoni on the upper Tana River, from Kambaland, from the Taita Hills, from Maasailand, from the Pare Hills, Usambara, Mijikenda, and from Pangani came a family who are described as white people, probably Christians, likely Portuguese. Some of those homeless wanderers, and among them the ones just mentioned, coalesced into marauding bands circling around the coast, Tana River, Mount Kenya, Kilimanjaro and Usambara.

When the drought finally subsided, they fragmented into smaller units which settled among the ethnic groups established along their former migratory route. It is they who must be identified with the makers of the aforementioned type E pottery. When caravan trade resumed, these interethnic connections made them the ideal local partners of the traders. In this function they acquired wealth which they could use to build up their social and political stature. The people in Chagga had so far been matrilinear apart from a few bee-keeping clans which had recently immigrated from patrilinear hunter-gatherer groups. The new immigrants from those marauding bands set up their own patrilinear clans and by their economic and political success were gradually able to absorb the people of the matrilinear clans into their patrilinear clans. With the former's demise their oral historical traditions were lost, all extant historical traditions (apart from some connected with irrigation furrows) beginning only with the founding of those patrilinear clans and a statement about which outside ethnic group was the original home of the particular clan founder. The detailed data on the political history of eleven areas which later grew into small kingdoms, also has allowed the reconstruction of a reliable chronology of the history of Chagga and Ugweno since about 1580. The patrilinear immigrants organised their men in one comprehensive age-set scheme which included all areas of Chagga and Ugweno but excluded the men joining their clans from the earlier local matrilinear clans. This created two social classes on an hereditary basis: on the one hand there were the circumcised and initiated warriors and politically active elders, all descended from those immigrants, and on the other hand there were the uncircumcised, disenfranchised agricultural serfs, descendants of the indigenous people. Each patrilinear clan comprised both classes.

Each exogamous, politically autonomous clan with 10-30 warriors lived localised on its own slope, ridge or plateau, surrounded on all sides by insulating dense rain forest and often ravines. Other patches of forest served various ritual purposes, such as the seclusion for many months of groups of initiates, or the disposal of certain kinds of corpses. Before the slow process of political consolidation gradually reduced the need for so many protecting forests, these forests limited the areas available for home-gardens and hence the population size. In about

1630 Chagga was ravaged by another roving army of famine-driven masses, the Umba, who had originated about Tete on the Zambezi like the Zimba some fifty years before. Eventually they were successfully turned away. Chagga male circumcision is reported to have played a crucial role in this success. During the early 1740s a huge outbreak of the volcano near Kilaguni Lodge in Kenya's Tsavo National Park, *Mlima wa Shetani* filled the air all over Chagga with dense black ash for about one week. Reports of this event are connected with the names of specific rulers and specific age-sets in Chagga and hence provide a welcome check on the reconstruction of the political chronology of Chagga, since this event has also been dated by radiological methods. This event is also remembered in connection with the ritual sacrifice of virgins at irrigation furrows.

THE ABOLITION OF SERF LABOUR IN THE HOMEGARDENS

The East African coast was segmented in the same way as the West African coast where this segmentation was reflected in the naming of coastal stretches. The following names survived at least into colonial times, and one until today: (a) Ivory Coast; (b) Slave Coast (now Benin); and (c) Gold Coast (now Ghana). We do not know that the Arabs named sections of the East Africa coast in this way, but if they did, they would have called (a) the East African 'Ivory Coast' the area about Mombasa with Kilimanjaro in its hinterland; (b) the 'Slave Coast', Kilwa and Zanzibar with their hinterland from the northern end of Lake Malawi to Lake Tanganyika; and (c) the 'Gold Coast', the area about Sofala in Mozambique, i.e. the out-let for the gold production of Zimbabwe. The natural reason for this sectioning is that you can get gold only where it can be found in the ground; likewise ivory of superior quality can be produced only where the local elephants will grow it in their jaws. Slaves, however, can be caught wherever there are humans; but their chasing causes wide-spread upset, disturbing the trade in gold or ivory as the case may be, so that slave-hunting was best restricted to areas where neither the trade in gold nor that in ivory would suffer from it. In this sectioning, as just learned, Kilimanjaro fell for very valid reasons into the hinterland of the East African 'Ivory Coast'. The export of slaves from was always minimal.

Some years before 1800 the world market price for ivory began to rise more and more steeply. Traditionally, most ivory leaving Mombasa was exported to India, because there, every bride had to be presented with an ivory bracelet. But with Indian elephants, different from African ones, tusks are only found in the males, and they are decidedly smaller. And the Indian human population was anyway already then vastly outgrowing India's elephant population. However, the recent steep rise was occasioned by another two factors and these both had to do with pianos. On the one hand, in Europe, the successes of the piano works of Mozart, Hayden, Beethoven, Schubert, Mendelssohn and Chopin caused the instruments ever-increasing demand. And all their white keys had to be covered by white ivory plates. On the other hand in the U.S.A., the conquest of the Wild West was ongoing, and every new saloon needed its own piano; but it also needed its own billiard tables together with their billiard balls. The latter had to be made of ivory, and the best ivory for them came from Kilimanjaro. The ability of one ball to repel another ball which is contacted, is measured in units of brisance, and the material from Kilimanjaro was found to be superior to any other.

This rising demand on the world market was, however, unable to be met by a corresponding supply on the part of the caravan-trade intermediaries who for centuries had been the middlemen between the ivory producers (e.g. in Kilimanjaro) and the ivory sellers (e.g. in Mombasa) who sold to the world market. The traditional middlemen, Kamba and Mijikenda, seem to have challenged the Swahili to try themselves and increase the supply at the sources. One of the results was indubitably that Muslims, whether Arabs or Swahili, after a gap of some 600 years of no direct communication, arrived in Kilimanjaro and discovered that there was a community which still followed exactly the same polytheistic rites, harbouring the same polytheistic beliefs, which Allah and his prophet Muhammad had decreed in the Qur^{c}an to be abominations and anathema to every right-believing person. Their initial shock must have been overwhelming. The total population of Chagga by this time probably exceeded 80,000. It was the kingdom of Mamba which for more than two generations had been able to monopolise caravan contacts, had grown immensely wealthy and like a metropolis had attracted many people from other parts of Chagga. A warrior census conducted there in 1801 suggests that about one half of the total population of Kilimanjaro was at that time concentrated at Mamba. Mamba in fact had again some 40,000 inhabitants in the census of 1967 when, however, the total for the whole of Chagga was about 800,000, and Mamba's part but 5 percent instead of 50 percent. In the face of such numbers, no Muslim caravan could hope to change the Chagga people's faith by the sheer force of arms as the Qur^{c}an directed them to do with polytheists. But no doubt the Muslim leaders remonstrated severely and consistently with the local leaders, propagating Islam and threatening to discontinue their trade.

Between 1810 and 1820 the Chagga complied to the point of transforming their polytheism into a new form of indigenous monotheism. To accept Islam outright appeared impossible to them seeing the Islamic prohibition of alcoholic drink. Abandoning their old polytheism at this time was not too much of a problem, however, because their traditional social order of chiefly clans, warrior freemen and agricultural serfs which this religion had helped to support, had also suddenly begun to crumble. The eager competition among the new Arab and Swahili traders, combined with the increasing exhaustion of Mamba's elephant resources, had weakened Mamba's monopoly of caravan contacts.

Neighbouring chiefs were drawn into this trade but had to suffer military retribution from Mamba. At this point the chief of tiny Keny, Horombo, decided to liberate the serfs of his chiefdom by having them circumcised and initiated, whereby he increased his fighting force substantially. He then subjected all the other small chiefdoms on the Eastern slope to his rule, freed their serf populations and built up a powerful army. At the same time he acquired ample new elephant hunting grounds below the Eastern slopes. Mamba lost importance and with its still huge population suffered very badly during an epidemic of cholera in 1808. Keny and Kilema inherited the leadership in caravan contacts after Kilema, too, had liberated its serfs. The situation of military threat also forced the serfs' liberation in most other chiefdoms; only Uru is known to have for very special reasons continued the old socio-political structure into at least the 1860s and is for this reason (which is no longer remembered among the people) still today derided as backward. The liberation of the serfs and their turning into warriors necessarily increased the agricultural work-load of the womenfolk in the home-gardens.

THE INTRODUCTION OF AMERICAN FOOD-PLANTS AND OF COFFEE

The 19th century is characterised by continual wrangling and warring, subjecting and federating among the thirty-odd smaller and bigger chiefdoms of Chagga. Manioc may have reached Kilimanjaro early as a safeguard against famines. About 1800, when the visits of caravans from the coast increased, some kings began programmes of growing maize by soccage work in the plains below the settled slopes in order to be able to provide food to those caravans. On those plains fields the people had already grown their beer-corn, *Eleusine coracana* which now was pushed up into their homegardens. The Chagga word for maize, derived from the name of the island of Pemba where it was first grown by Portuguese, seems however to have entered the language much earlier than 1800. During the 1870s and 1880s, the chief of Mbokomu, Mlatie, was several times exiled from his country for lengthy periods. As he was also an expert constructor of irrigation furrows, he is reported to have assisted in many places where he lived in exile, in designing and building new furrows. Other American food-plants, apart from maize, such as Irish potatoes and tomatoes, entered the Chagga homegardens only after the beginning of the colonial period, i.e. during or after the 1890s. Potatoes are, for example, called by an expression which in translation means 'European sweet-potatoes'. Coffee trees were introduced by the Roman Catholic missionaries at Kilema in 1898 and spread quickly to European farmers in Kilimanjaro who grew them in monocultures under shade trees, and where Chagga farm-hands learned how to treat them. Some Chagga chiefs began to follow the example of European farmers before the First World War, but it was not until the second half of the 1920s that ordinary Chagga in large numbers took to growing coffee trees in their banana-groves, thereby completing the modern arrangement of a Chagga homegarden. Areas below the height above sea-level suitable for coffee-trees became settled and turned into homegardens only after about 1950. In these homegardens there may now be found many mango-trees and some coconut palms as well as avocado trees among the shade trees. Some papaya plants have here and there joined the banana-plant storey.

PRESSURE OF POPULATION GROWH ON THE HOMEGARDENS

In 1913 the first reliable census was conducted in Kilimanjaro which showed a total population of nearly 100,000. The census of 1988 returned a total of over one million. Thus, in 75 years the population of Chagga multiplied more than tenfold. This is due mainly to a cultural habituation from earlier centuries to produce enough children to counteract an infant mortality of above 85 percent and further losses caused by wars, famines, epidemics, ordinary illnesses and accidents. Dr Carl Ittameier, the doctor of the Leipzig Lutheran Mission's hopital at Machame, made a study in 1912/13 were he showed that an infant mortality of almost 85 percent plus a miscarriage frequency of almost 11 percent was then normal in Chagga families with little or no contact with the mission and its hospital, but that this mortality could be lowered to about 12 percent in those families that regularly profited from the hospital's service and from the female missionaries' instructions to girls and wives about domestic and bodily hygiene. This meant a rise from the approximately even survival rate of 4.5 percent to 88 percent, and an overshooting of the balance by a whacking 83.5 percent!

The Chagga customary inheritance laws require, that the youngest son inherit his father's homestead and banana-grove, and that the father during his lifetime should have acquired or developed another banana-grove to settle his eldest son. Middle sons have no claims to estate from their father. With the vast population increase during the 20th century, there have for generations been few chances for fathers for providing their eldest sons with an extra banana-grove or home-garden, so that mostly the one extant grove had to be divided between the two brothers. This has lead to ever shrinkingly sized homegardens. As a consequence, banana has been replaced by maize, grown on the plains or purchased, as the staple food, because on the plain below the slopes there remains more space. But the growing of *Eleusine* there or in the homegardens has had to be faded out almost completely. The still considerable and increasing Chagga demand for this beer-corn has to be met by importation from distant parts of Tanzania. The cash income of the Chagga from their coffee sales, too, has dwindled to the proportion of pocket-money because on the one hand world market prices, or the growers' share in them, have gone down, and on the other hand growers have fewer trees on their diminished home-gardens. Not a few Chagga have up-rooted their coffee trees in spite of the threat of stiff penalties from the government, and turned to growing various kinds of vegetables mostly known to the

European or Indian cuisine in their homegardens, not for their own consumption but for sale on the market or the streets of the municipality of Moshi. The Chagga in general are clamouring for a new cash-crop that in *lieu* of coffee would enable them to reap much higher prices for harvests produced on much smaller plots than before.

The increasing pressure of the population on the soil has during the last generation led people in some places to try and establish new homegardens on steep valley slopes, and for this purpose pioneering in Chagga the technique of field-terracing. There are no traces known so far in Chagga of this technique having been used at any earlier time. And the generally gentle inclination of the mountain's main slopes, in between the steep river valleys, in combination with the loamy soil and the root structure of shade trees and banana plants, has allowed to such investment to be dispensed with.

Diminishing incomes from their homegardens, and comparatively good opportunities for locally acquiring modern education and professional training, have led to very many able-bodied men and women leaving Kilimanjaro in order to spend their working lives in the towns and cities of East Africa and the wider world. Upon retirement they intend to return home and settle down in a mansion they have built on however small a plot. Usually an eldest or youngest son leaves his father's homestead for town during his adolescence and after two, three or four decades returns upon his father's death to succeed to the estate of his father's homegarden, turning into a small-holder after having been a government official, a doctor, a trader or craftsman, a teacher or a clerk, while his own children are now earning their living in town or city. His grandchildren, however, tend to have been, and to continue, growing up not in town or city but on the family estate, the homegarden. This means that as a tendency, each generation of young adults that moves off to run the nation's economy in an urban setting, has been raised, fed, educated and professionally trained largely at the family's rural home and by the working-power of their grandparents. The rural population consists largely of lots of children and youths at school and training institution, and elders past the usual retirement age. The absence of most of the able-bodied young men causes serious problems for the up-keep of the irrigation system. Irrigation furrows silt up thoroughly during every rainy season and require to be dug out toward the end of the rains when another irrigation period is to begin. But the school-youths have no time, and their grandfathers often lack the physical strength for this work. There are still enough unemployed young men around who would be happy to do the work, but since they are not family, they would have to be paid for it. This money, however, is not available. A programme by the coffee cooperative or the government to subsidise such work would assist enormously to put such unemployed young men into work, to keep the irrigation system fully in operation, and to allow the Chagga homegardens to remain as productive as they have been for so many generations.

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Appendix 1. List of vascular plants and their Chagga names in the Old Mochi dialect
(underlined names are the most widespread and reliable names; whereas ? denotes that the names are questionable)

Spermatophyta: Gymnospermae	
Cupressaceae	
Cupressus lusitanica MILL.:	irambàhù´, mwerèsì`
Podocarpaceae	
Podocarpus latifolius (THUNB.) MIRB.:	mtong'òsò´
Spermatophyta: Angiospermae: Dicotyledonae	
Acanthaceae	
Adhatoda engleriana C. B. CL.:	idungu
Asystasia gangetica (L.) T. ANDERS.:	ipuchì´, ilindí´, ivindì´
Barleria micrantha C. B. Cl.:	ifunà`?, kimamúò´, mkundú-kûndú´, ipuchì´
Isoglossa lactea LINDAU:	mlovìná`
Justicia flava VAHL:	ipuchì´
Justicia striata (KL.) BULLOCK:	ipuchì´
Macrorungia pubinervia (T. ANDERS.) C.B. CL.:	mlovìná`
Mimulopsis kilimandscharica LINDAU	mlovìná`
Phaulopsis imbricata (FORSK.) SWEET:	ipuchì´
Thunbergia alata SIMS:	kiserá-nìndà`
Aizoaceae	
Glinus lotoides L.:	mchimbìrì´
Alangiaceae	
Alangium chinense (LOUR.) REHDER:	iringònú´
Amaranthaceae	
Achyranthes aspera L.:	iambádà`, ikamà-mùmbè`
Aerva javanica (BURM. F.) SCHULTES (*Aerva persica* (BURM. F.) MERRILL):	msufì`
Amaranthus hybridus L. ssp. *hybridus*:	kianá`
Celosia schweinfurthiana SCHINZ.:	itoyá`, mroè´
Cyathula polycephala BAK.:	ifumbò`, ikamà-mùmbè`, ikamisùrá lyà mútsudú`
Anacardiaceae	
Sorindeia madagascariensis DC:	ndaràhò´, ngoèdá`, ngoèdá`
Annonaceae	
Uvaria leptocladon OLIV.:	kikomú´
Apocynaceae	
Carissa edulis (FORSK.) VAHL:	(i)otopò`, mchuhùná`, imang'ò´ (Strychninfrucht)
Landolphia buchananii (HALL. F.) STAPF:	mnyaríhì´
Oncinotis tenuiloba STAPF:	mtuwà`
Rauvolfia caffra SOND.:	mseséve´
Rauvolfia mannii STAPF:	kirahá-sùsù` kyá mûtsudú`
Saba comorensis (BOJER) PICHON:	mtuwà`
Tabernaemontana pachysiphon STAPF (*T. holstii* K. SCHUM.):	irachà´, mbaràshà`
Thevetia peruviana (PERS.) K. SCHUM.:	irasùwà`
Aquifoliaceae	
Ilex mitis (L.) RADLK.:	msahìdà`
Araliaceae	
*Cussonia s*picata* THUNB.:	iengérè´, iporòrì`
Polyscias fulva (HIERN) HARMS:	mcharoro*
Schefflera myriantha (BAK.) DRAKE (*S. polysciadia* HARMS):	mfurùmá`
Schefflera volkensii (ENGL.) HARMS:	ikodè-kòdè`, mfurùmá`
Asclepiadaceae	
Gomphocarpus semilunatus A. RICH.:	imuwalàlè lyá Nûkà`
	la porini, ifurù-fúrù´
Mondia whytei (HOOK. F.) SKEELS:	mtuwà`
Secamone punctulata DECNE.:	mnyaríhì´
Balsaminaceae	
Impatiens digitata WARB. ssp. *digitata*:	isungùwalá´
Impatiens kilimanjari OLIV. :	isungùwalá´
Impatiens pseudoviola GILG:	isungùwalá´
Impatiens nana ENGL. (*I. trichochila* WARB.):	isungùwalá´
Impatiens volkensii WARB.:	mworerèmù´
Impatiens walleriana HOOK.F.:	isungùwalá´
Balanitaceae	
Balanites aegytiaca (L.) DEL.:	iungù´
Basellaceae	
Basella alba L.:	ilelèmà`
Begoniaceae	
Begonia johnstonii OLIV.:	iolò´
Begonia meyeri-johannis ENGL.:	iringò-rìngó´, ikangà` sumbùra`?
Begonia sutherlandi HOOK. F:	iolò´, isungùwalá´
Bignoniaceae	
Kigelia africana (LAM.) BENTH. (*K. aethiopicum* (FENZL) DANDY):	imomò´
Markhamia lutea (BENTH.) K. SCHUM. (*M. platycalyx* SPRAGUE):	mturù-wàndá´
Stereospermum kunthianum CHAM.:	iungá´
Tecoma stans (L.) H. B. & K.:	mbihìnù´
Bombacaceae	
Adansonia digitata L.:	imangi, mbuyú`
Ceiba pentandra (L.) GAERTN.:	msufì`
Boraginaceae	
Cordia africana LAM. (*C. abyssinica* R. BR.):	mringà-ríngà´
Cynoglossum lanceolatum FORSK.:	ichambàdá`
Ehretia cymosa THONN.:	mnemvù´
Trichodesma zeylanicum (L.) R. BR.:	iwashá`
Cactaceae	
Rhipsalis baccifera (J. MILL.) STEARN:	itumbulu, mnyarà´
Caesalpiniaceae	
Bauhinia tomentosa L.:	mchahémbè´
Parkinsonia aculeata L.:	msambòchì´
Caesalpinia decapetala (ROTH) ALSTON:	oruchú´, msha´
Caesalpinia pulcherrima (L.) SWARTZ:	irehèrà`
Cassia siamea LAM.:	mnjohòró` (kisw.)
Cassia spectabilis DC.:	mnjohòró` (kisw.)
Chamaecrista mimosoides (L.) GREENE (*Cassia mimosoides* L.):	iwandàlà`, kirundú´, kimunahá-nàhá` , kimaà-mùtsikó`, ikamà-mùmbè`
Delonix elata (L.) GAMBLE:	imerà´
Oxystigma msoo HARMS:	msohú´, msohòhó´, msohó´
Piliostigma thonningii (SCHUMACH.) MILNE-REDH.:	idongó-njòfù, mkandà-kándà´
Pterolobium stellatum (FORSK.) BRENAN:	oruchú´
Senna bicapsularis (L.) ROXB. (*Cassia bicapsularis* L.):	hechí`, otupá`
Senna didymobotrya (FRESEN.) IRWIN & BARNEBY(*Cassia didymobotrya* FRESEN.):	ivinù´
Senna septentrionalis (VIVIANI) IRWIN & BARNEBY (*Cassia floribunda* CAV.):	otupá`, hechí`, ivinù´
Tamarindus indica L.:	mwoyà´
Campanulaceae	
Wahlenbergia abyssinica (A. RICH.) THULIN:	lima?*, mtakúnyà´, kima-márùwá`, mbihìnù´
Capparaceae	
Cleome monophylla L.:	mroè´, imaà-kùnárè´, fundó-fùndó`
Maerua angolensis DC.:	ilemà-njòfù
Caricaceae	
Carica papaya L.:	ipapàì`
Caryophyllaceae	
Drymaria cordata (L.) ROEM. & SCHULTES:	iwadá-ngùmbì´,

	orumbàhì´
Stellaria media (L.) VILL.:	orumbàhì´, mbarà-hàangà´
Celastraceae	
Hippocratea goetzei LOES.:	mlaá`
Maytenus acuminata (L. F.) LOES.:	msewùsâ`
Maytenus mossambicensis (KLOTZSCH) BLAKELOCK var. *mossambicensis*:	msambòchì´
Maytenus senegalensis (LAM.) EXELL:	msambòchì´ músorò´
Chenopodiaceae	
Chenopodium ambrosioides L.:	imbiò-mbíò´
Combretaceae	
Combretum zeyheri SOND.:	ikalà-ngòyò´
Terminalia brownii FRESEN:	msahìdà`
Terminalia kilimandscharica ENGL.:	mpukó´
Compositae (Asteraceae)	
Acmella calirhiza DEL. (*Spilanthes mauritiana* (PERS.) DC.):	kisingà-mùaná-hèhò`
Adenostemma mauritianum DC.:	mbechè yá mùringéni´
Ageratum conyzoides L.:	ifunà`
Anisopappus oliverianus WILD:	iwará-kùìlà `
Artemisia afra WILLD.:	itasì`
Aspilia pluriseta SCHWEINF.:	singàrèrè
Bidens pilosa L.:	mbechè´
Conyza attenuata DC. (*C. persicifolia* (BENTH.) OLIV. & HIERN.):	isina?, ifunà`, ipasà´?
Conyza hypoleuca A. RICH.:	mchowà´
Conyza newii OLIV. & HIERN:	ikamà-nìndà`, ikachì´, iparà-njùwà` ?, ira-ndáwà´, isinà lyá mûtsusú`
Conyza subscaposa O. HOFFM.:	irié`
Conyza sumatrensis (RETZ.) E. H. WALKER (*C. floribunda* H. B. K.):	ichombèrí`, ialà-njàá`, panjàví`?
Conyza vernonioides (A. RICH.) WILD:	kiwalé´
Crassocephalum crepidioides (BENTH.) S. MOORE:	irombò´, sufì`
Crassocephalum montuosum (S. MOORE) MILNE-REDH.:	irambòhò´, iparà-ngòmí`, iparà-njùwà`, irombò´
Crassocephalum picridifolium (DC.) S. MOORE:	ipachà-sòká´
Dichrocephala integrifolia O. KUNTZE:	ifunà`, ifunà` lyà kísorò´
Emilia discifolia (OLIV.) C. JEFFREY (*Senecio discifolius* OLIV.):	kipungùrù`, kisungùrù`, kimamúò´, imbudé`
Galinsoga parviflora CAV.:	ipanjàví`, kimakà-mákà´, ihenù`, kima-mákà´/ kimua-muaka ?, ingerèsà´
Helichrysum foetidum (L.) CASS.:	ipachà-sòká´?, ilya-nzíhè
Helichrysum forskahlii (J. F. GMEL.) HILLIARD & BURTT *(H. cymosum* (L.) LESS.):	kima-mbórà`, ilya-nzíhè
Helichrysum odoratissimum (L.) LESS.:	iparà-njùwà`, ialà-njàá`
Helichrysum schimperi (SCH. BIP.) MOESER:	ikummádâ´, ifu-ífu´
Helichrysum setosum HARV.:	iwará-kùìlà`
Helichrysum splendidum (THUNB.) LESS.:	ifudà-fùdá´
Lactuca glandulifera HOOK.F.:	kiserá-nìndà`
Lactuca inermis FORSK. (*L. capensis* THUNB.):	kima-márùwâ`, ima-márùwá`
Launaea cornuta (OLIV. & HIERN.) C. JEFFREY:	kimamamrua, mchungá`(kilemanda màngó`)
Melanthera scandens (SCHUMACH. & THONN.) ROBERTY:	ipachà-sòká´, kifahà-fáhà
Microglossa pyrrhopappa (A. RICH.) AGNEW (*Conyza pyrrhopappa* C. H. SCHULTZ EX A. RICH.):	ifunà`, ifu-ífu´, ichowà´
Piloselloides hirsuta (FORSK.) C. JEFFREY:	imbatù-mbátù´
Pseudognaphalium luteo-album (L.) HILLIARD & BURTT:	ifu-ífu´i, ilya-nzíhè`
Psiadia punctulata (DC.) VATKE:	mchowà´, isinà´, itorò´
Senecio maranguensis O. HOFFM.:	(k)ikunda mburu, shiwale ya poriri, mbirì`
Senecio syringifolius O. HOFFM.:	ilelèmà`
Solanecio angulatus (VAHL) C. JEFFREY (*Crassocephalum bojeri* (DC.) ROBYNS):	potsò-pótsò´, iparanjua, iparà-njùwà`
Solanecio mannii (HOOK. F.) C. JEFFREY (*Crassocephalum mannii* (HOOK. F.) MILNE-REDH.):	iringìrí´, itumu-ringiri*
Sonchus oleraceus L.:	kima-márùwá`
Sphaeranthus gomphrenoides O. HOFFM.:	ifaámià`
Stoebe kilimandscharica O. HOFFM. var. *densiflora* O. HOFFM.:	isilè`
Tagetes minuta L.:	imbangì`, iwarumú`, iwaró`
Tithonia diversifolia (HEMSL.) GRAY:	imtahó`, iwaró`
Tolpis capensis (L.) SCH. BIP.:	kima-márùwá`
Tridax procumbens L.:	mbichìrí`
Vernonia brachycalyx O. HOFFM.:	ifu-ífu´
Vernonia galamensis (CASS.) LESS. ssp. *afromontana* (R. E. FRIES) M. GILBERT:	iwonú`
Vernonia glabra (STEETZ) VATKE (*V. hindei* S. MOORE):	kima-márùwá`
Vernonia myriantha HOOK. F. (*V. subuligera* O. HOFFM.):	iduhùdù´
Vernonia purpurea WALP. (*V. duemmeri* S. MOORE):	ifu-ífùí`
Connaraceae	
Rourea thomsonii (BAK.) JONGKIND (*Jaundea pinnata* (BEAUV.) SCHELLENB.):	mchohòrò`, msinèfu fó mûtsudú`
Convolvulaceae	
Convolvulus kilimandschari ENGL.:	ikuwù´, ikuwù lyá mûtsudú`
Dichondra repens J.R. & G. FORST.:	nduwà-màdú
Ipomoea batatas POIR.:	kisohíà´
Afrocrania volkensii (HARMS) HUTCH.:	irundú´
Crassulaceae	
Bryophyllum pinnatum (LAM.) OKEN:	iokò´
Crassula alsinoides (HOOK. F.) ENGL.:	ikidembè´, iwandàlà`
Kalanchoe crenata (ANDREWS) HAW.:	imboókò-mbóôkò´, iokò´
Kalanchoe densiflora ROLFE var. *densiflora* CUF.:	iokò´, iolo
Cruciferae (Brassicaceae)	
Lepidium bonariense L.:	ichombèrí`, ialà-njàá`
Raphanus sativus L.:	imurá`
Cucurbitaceae	
Ctenolepis cerasiformis C. B. CLARKE IN HOOK. F.:	itundà lyà njókâ`
Diplocyclos palmatus (L.) C. JEFFREY:	kimaà-ngànú´
Diplocyclos schliebenii (HARMS) C. JEFFREY:	kisamà-sàmá´
Luffa cylindrica (L.) ROEM.:	idodòkí´(kisw.)
Momordica foetida SCHUMACH.:	irengò`, iseranda, iwurú`
Momordica friesiorum (HARMS) C. JEFFREY:	kokorò´
Oreosyce africana HOOK. F.:	kifahà-fáhà, ikuwu
Telfairia pedata (SIMS) HOOK.:	ikomè´
Zehneria scabra (L.F.) SOUL:	mbawá´?, iparù´, mserùwá`, mwosarànge´, kirorò´
Dipsacaceae	
Dipsacus pinnatifidus A. RICH.:	ipachà-sòká´
Ebenaceae	
Diospyros mespiliformis A. DC.:	ichengò`
Euclea divinorum HIERN.:	mwurúkà´, iwurúkà´, iwurúkà´

Euclea natalensis A. DC.:	iwurúkà´
Ericaceae	
Agauria salicifolia (COMM. EX LAM.) HOOK. F. EX OLIV.:	ihahánà´, mwadài`
Erica arborea L.:	isilè`
Erica excelsa (ALM & FRIES) BEENTJE (*Philippia excelsa* ALM & FRIES):	isilè`
Erica trimera (ENGL.) BEENTJE (*Philippia trimera* ENGL.)	isilè`
Euphorbiaceae	
Acalypha fruticosa FORSSK. var. *eglandulosa* A.R.-SM.:	ikundá-mbùrú`
Acalypha ornata A. RICH.:	isongoléà´
Acalypha psilostachya HOCHST. var. *psilostachya*:	kikundá-mbùrú`
Acalypha racemosa BAILL.:	ikundá-mbùrú`
Acalypha volkensii PAX:	ikundá-mbùrú`, kirundú´
Bridelia micrantha (HOCHST.) BAILL.:	mwarìé`
Clutia abyssinica JAUB. & SPACH var. *usambarica* PAX & K. HOFFM.:	iparàchìchí´ (kisw.)
Clutia robusta PAX:	mwolótàwà´, mndundú`
Croton macrostachyus DEL.:	mfurù-fúrù´
Croton megalocarpus HUTCH.:	mfurù-fúrù´
Drypetes gerrardii HUTCH.:	mmadai?
Euphorbia hirta L.:	kima-mútsirí´, mbichìrí`
Euphorbia systyloides PAX:	kima-márùwá`
Macaranga capensis (BAILL.) SIM.:	ihahá´
Macaranga kilimandscharica PAX:	ihahá´, mnahá-nàhá`
Margaritaria discoidea (BAILL.) WEBSTER var. *nitida* (PAX) A.R. SM.:	mshamànà´
Manihot esculenta CRANTZ:	idumá´
Micrococca volkensii (PAX) PRAIN:	kikarìkárà`, mdowó´
Phyllanthus suffrutescens PAX:	kima-múrukà´, kifurúhánjè`, orumbàhì´, kiohì´, mkunárè´
Ricinus communis L.:	iwonú`
Synadenium glaucescens PAX.:	irasò´
Tragia brevipes PAX:	kima-mángI´má`
Flacourtiaceae	
Aphloia theiformis (VAHL) BENN.:	mhinjà`, iwurúkà lyá mûtsudú`, iturùhúngà`
Casearia battiscombei R. E. FRIES:	mrikà-wàndu`
Dovyalis abyssinica (A. RICH.) WARB.:	mmangò´
Flacourtia indica (BURM.F.) MERR.:	mdochì´ (fruit), msambòchì´ (íka´) (plant)
Oncoba spinosa FORSK.:	msambòchì´
Geraniaceae	
Geranium arabicum FORSK.:	sangàrí`?, nduwà-màdú
Gesneriaceae	
Streptocarpus caulescens VATKE:	isungùwalá´, lekùrà´, ipachà-sòká´
Streptocarpus montanus OLIV.:	kurushí`
Hamamelidaceae	
Trichocladus ellipticus ECKL. & ZEYH.:	isinà´
Guttiferae (Hypericaceae)	
Garcinia volkensii ENGL.:	mtovìrí`
Hypericum peplidifolium A. RICH.:	ndoró`, sunguru
Hypericum revolutum VAHL SSP. *KENIENSE* (SCHWEINF.) N. ROBSON:	MAKILALA
Hypericum revolutum VAHL SSP. *REVOLUTUM*:	KILYA-MÚCHARÈ´, KIDAMBÙÒ`, IHENGÈ-MÚRA´, ITORÒ´
Labiatae (Lamiaceae)	
Englerastrum scandens (GÜRKE) ALSTON:	ilelèmà`, kitoló´?
Isodon ramosissimum (J. D. HOOKER) CODD (*Homalocheilos ramosissmum* (HOOK. F.) J. K. MORTON):	iwurí-wùrí`, iwurí-wùrí`, mwoserèká
Leucas grandis VATKE (*L. mollis* BAKER):	isamùrì´, ifumbò`?, ima-mukangá`
Ocimum gratissimum L. (*O. suave* WILLD.):	ikachì´
Platostoma africanum P. BEAUV.:	ipuchì´, irengò`, itombòlò`, kima-mbórà`, ifunà`
Plectranthus alboviolaceus GÜRKE:	itoló´
Plectranthus coeruleus (GÜRKE) AGNEW:	kiombo (Rombo-Dialekt)
Plectranthus comosus SIMS (*P. barbatus* GÜRKE):	mwoserèká, itoló´
Plectranthus edulis (VATKE) AGNEW:	ipachà-sòká´
Plectranthus igniarius (SCHWEINF.) AGNEW:	itoló´, ihombò´?
Pycnostachys meyeri GÜRKE:	idawàwá´
Salvia coccinea L.:	kimamúò´
Salvia nilotica JACQ.:	ima-mukangá`
Satureia abyssinica (BENTH.) BRIQ.:	iraá-njùkí`
Satureia biflora (D. DON) BENTH.:	kimamúò´?, kirindi*, kimamírî´
Solenostemon sylvaticus (GÜRKE) AGNEW:	itoló´
Tetradenia riparia (HOCHST.) CODD:	itoló´, ihombò´
Lauraceae	
Cinnamomum camphora (L.) J. PRESL:	msedí´?
Ocotea usambarensis ENGL.:	msedí´
Persea americana MILL.:	iparàchìchí´ (kisw.)
Lobeliaceae	
Lobelia deckenii (ASCHERS.) HEMSL.:	isambò´
Lobelia giberroa HEMSL.:	isambò´, kurushí`?
Lobelia holstii ENGL.:	kimamdoko?, mtakúnyà´
Monopsis stellarioides (PRESL.) URB.:	orumbàhì´, oyovindi*
Loganiaceae	
Nuxia floribunda BENTH.:	mwengúrà´
Strychnos scheffleri BAK. F.:	mlaá`
Loranthaceae	
Agelanthus elegantulus (ENGL.) POLH. & WIENS (*Loranthus keudelii* ENGL.):	mwadài`, ndamàngó`
Englerina holstii ENGL.:	ndamàngó`
Englerina woodfordioides (SCHWEINF.) BALLE:	ndamàngó`
Loranthus ulugurense ENGL.:	ndamàngó`
Phragmanthera usuiensis (OLIV.) M. GILBERT (*Loranthus rufescens* DC.):	ndamàngó`
Plicosepalus curviflorus (OLIV.) VAN TIEGH.:	ndamàngó`
Tapinanthus brunneus (ENGL.) DANSER:	ndamàngó`, ndamàngó`
Malvaceae	
Hibiscus vitifolius L.:	iwashá`, iruwàwà´
Kosteletzkya adoensis (A. RICH.) MAST.:	ishoshókò´
Pavonia urens CAV.:	ilembèhú´
Sida acuta BURM. F.:	mnahá-nàhá`
Sida tenuicarpa VOLLESEN (*S. cuneifolia* agg. ROXB.):	kirundú´
Melastomataceae	
Dissotis senegambiensis (GUILL. & PERR.) TRIANA:	mnafù`, kiungùyà`, iolò´, kifahà-fâhà, mbalàshò yá mùsarí`
Meliaceae	
Lepidotrichilia volkensii (GÜRKE) LEROY:	mchengò`, mwowonì`, kimuovírò´, mkondè-kóndè´ , mlya-ndéhè´ fo mûtsudú`?
Toona ciliata M. ROEM.:	itirá-ngèlá`
Trichilia emetica VAHL:	ngoèdá`, mtsutsù´
Turraea robusta GÜRKE:	mlya-ndéhè´
Melianthaceae	
Bersama abyssinica FRESEN.:	ira-ndáwà´, irandà-ngùvè`, kichengò`, mlaí-làí`
Menispermaceae	
Stephania abyssinica (DILLON & A. RICH.)	mdehá-fùkò`

WALP. var. *formentella* (OLIV.) DIELS:	
Tiliacora funifera (MIERS) OLIV.:	kirundú´
Mimosaceae	
Acacia albida DEL.:	mmerà´
Acacia brevispica HARMS:	kikalè´
Acacia hockii DE WILD.:	mmerà´
Acacia mearnsii DE WILD.:	iwotóni´
Acacia melanoxylon R. BR.:	iwotóni´
Acacia nubica BENTH.:	mgunga mavi (kisw.)
Albizia gummifera (GMEHL) SMITH:	mlamvía`
Albizia petersiana (BOLLE) OLIV.:	milú´
Albizia schimperiana OLIV. var. *amaniensis* (BAK.F.) BRENAN:	mfurúhánjè`, mrukà`
Dichrostachys cinerea ssp. *cinerea* (L.) WIGHT & ARN.:	kimaàkùnárè´, mwerà´
Mimosa invisa MART. EX COLLA:	oruchú´
Newtonia buchananii (BAKER) GILB. & BOUT.:	mkufí´
Monimiaceae	
Xymalos monospora (HARV.) BAILL.:	mtovìrí`, mdirí´, kiolà-fùó`, ndidì`
Moraceae	
Dorstenia zanzibarica OLIV.:	isungùwalá´, iokò´
Ficus exasperata VAHL:	itsatsá´
Ficus lutea VAHL:	mtembó´
Ficus sur FORSSK. (*Ficus capensis* THUNB.):	kmuyù´, mkuyù´
Ficus thoningii BL.:	mfumù´
Ficus vallis-choudae DEL.:	kmuyù´
Milicia excelsa (WEIN.) C. C. BERG (*Chlorophora excelsa* WELW.):	mvulè` (kisw.), mriè`
Trilepisium madagascariense DC. (*Bosqueia phoberos* BAILL.):	isangà`?
Myricaceae	
Myrica salicifolia A. RICH.:	iwachè´
Myrsinaceae	
Embelia schimperi VATKE:	ngetsì`
Maesa lanceolata FORSSK.:	imkuyù lyá mûtsudú`, irido*
Rapanea melanophloeos (L.) MEZ.:	mrasò´, msahìdà`, ifumù´?, msahìdà`?
Myrtaceae	
Eucalyptus saligna SM.:	opanì`
Psidium guajava L.:	mperá`
Syzygium guineense (WILLD.) DC.:	mmasâê´
Nyctaginaceae	
Boerhavia diffusa L.:	mtindì fó ngûvè`, ifunà`
Ochnaceae	
Ochna insculpta SLEUMER:	kirihá-mènyá`, kirahá-sùsù` (fruchtende Pflanze)
Olacaceae	
Strombosia scheffleri ENGL.:	mkondè-kóndè´
Oleaceae	
Jasminum schimperi VATKE (*J. eminii* GILG):	kimuovírò´
Olea europea L. ssp. *africana* (MILL.) P. S. GREEN (*O. africana* MILL., *O. chrysophylla* LAM.):	msènèfù´
Olea capensis L. ssp. *welwitschii* (KNOBL.) FRIIS & P. S. GREEN:	mshihìò`
Oliniaceae	
Olinia rochetiana A. JUSS.:	msadá`, iwachè´?
Onagraceae	
Fuchsia magellanica LAM. var. *discolour* (LINDL.) BAILEY:	kima-mámbô´
Ludwigia abyssinica A. RICH.:	ihengè-múra´
Orobanchaceae	
Orobanche minor SMITH:	ososì
Oxalidaceae	
Oxalis corniculata L.:	onyonyò´, inyonyò´
Oxalis latifolia H. B. & K.:	inyonyò´, onyonyò´, isunjùkù´
Papaveraceae	
Argemone mexicana L.:	kima-márùwá`
Papilionaceae (Fabaceae)	
Abrus precatorius L.:	mdelá´
Aeschynomene mimosifolia VATKE:	iwaró`
Arachis hypogaea L.:	karàngà` (kisw.)
Clitoria ternatea L.:	ikilewò´
Crotalaria lachnocarpoides ENGL.:	mbalàshò´
Crotalaria natalitia MEISSN.:	mnahá-nàhá`
Dalbergia lactea VATKE:	mpalálùó`
Desmodium repandum (VAHL) DC.:	mbalàshò´
Eriosema montanum BAK. F. var. *montanum*:	mbalàshò´, mbalàshò´
Erythrina abyssinica DC. ssp. *abyssinica*:	mdidì`
Glycine wightii (WIGHT & ARNE.) VERDC.:	fundó-fùndó`
Indigofera arrecta A. RICH.:	inahá-nàhá`
Indigofera swaziensis BOLUS var. *perplexa*:	ipasà´, iwurí-wùrí`, irehèrà`
Parochetus communis D. DON:	onyonyò´
Tephrosia villosa (L.) PERS.:	imbalàshò´
Tephrosia vogelii HOOK. F.:	otupá`, utupá`
Vigna membranacea A. RICH. ssp. *membranacea*:	okohò´
Vigna parkeri BAK.:	okohò´, sokò-ndèhè´, fundó-fùndó`, opuchà`
Vigna vexillata (L.) BENTH. var. *angustifolia*:	okohò´
Zornia setosa BAK. F.:	lekùrà´, opuchà`
Passifloraceae	
Passiflora edulis SIMS:	ikungù´
Adenia gummifera (HARV.) HARMS:	msangàrí`
Basananthe hanningtoniana (MAST.) DE WILDE:	mhawò`
Phytolaccaceae	
Phytolacca dodecandra L`HÉRIT.:	iveésâ´
Piperaceae	
Peperomia abyssinica MIQ.:	kimamírî´, ikengérâ´
Peperomia tetraphylla (FORST.) HOOK. & ARN.:	kiwovè´, kurerambiri
Piper capense L. F.:	iringò-rìngó´
Piper umbellatum L.:	iringò-rìngó´
Plantaginaceae	
Plantago fischeri ENGL.:	isa-mbàtù´
Plantago palmata HOOK. F.:	itengèrà´?, mlimú-lìmú`, liliwù´
Polygalaceae	
Polygala sphenoptera FRESEN.:	kima-ndókò´
Polygonaceae	
Oxygonum sinuatum (MEISN.) DAMMER:	mbihìnù´
Polygonum pulchrum BLUME:	mlimí-lìmí`
Polygonum salicifolium WILLD.:	ipachà-sòká´
Polygonum senegalense MEISN.:	mlimí-lìmí`
Rumex abyssinicus JACQ.:	iolò´
Rumex steudelii A. RICH. (*R. bequaertii* DE WILD):	mlimú-lìmú`, mlimí-lìmí`
Rumex usambarensis (DAMMER) DAMMER:	iolò´, iwolò´
Proteaceae	
Grevillea robusta A. CUNN. EX R. BR.:	kapìliá` (kisw.), kapìliá`(kisw.)
Punicaceae	
Punica granatum L.:	ikurù-mángá` (kisw.), mkungumanga
Ranunculaceae	
Ranunculus multifidus FORSK.:	mbechè´
Thalictrum rhynchocarpum DILLON & A. RICH.:	kichaméri´
Rhamnaceae	
Rhamnus prinoides L'HERIT:	mschimbà-mùmbà´
Scutia myrtina (BURM. F.) KURZ.:	oche´, otopò`
Rosaceae	
Alchemilla volkensii ENGL.:	nduwà-màdú, onyonyò´
Hagenia abyssinica (BRUCE) J. F. GMEL.:	mwangá`, mlangá´

Mespilus japonica (THUNB.) LINDLEY:	helìmú`
Prunus africana (HOOK. F.) KALKM.:	mwudí´
Rubus rosifolius SM.:	ipalà´ (Pflanze), ihurò´ (Frucht)
Rubus steudneri SCHWEINF.:	ipalà´ (Pflanze), ihurò´ (Frucht) , iverò´?
Rubiaceae	
Canthium oligocarpum HIERN ssp. *captum* (BULLOCK) BRIDSON:	mdowó´, kidowó´
Chassalia parvifolia K. SCHUM.:	mw.engèchá`, mwadài`
Cremaspora triflora (THONN.) K. SCHUM. ssp. *triflora* VERDC.:	msewùsá`
Galiniera saxifraga (HOCHST.) BRIDSON:	iliwà´
Galium aparinoides FORSK.:	ipuchì´, kiwashá`
Keetia gueinzii (SOND.) BRIDSON:	kikarìkárà`
Lasianthus kilimandscharicus K. SCHUM. ssp. *kilimandscharicus*:	mdashù´
Mitragyna rubrostipulata (K. SCH.) HAVIL.:	mkundú-kûndú´, kuìnìnì` (engl.)
Mussaenda frondosa L.:	kuìnìnì` (engl.), ikuyù´ lyá mûtsudú`
Oxyanthus speciosus DC. ssp. *globosus* BRIDSON:	kitotòrò´, loliondo, mtovìrí`
Pauridiantha paucinervis ssp. *holstii* (K. SCHUM.) BREM.:	kikarìkárà`, mkarí´kara
Pavetta abyssinica FRESEN. var. *abyssinica*:	mdowó´
Pentas lanceolata (FORSK.) DEFLERS:	mwoserèká
Psychotria capensis (ECKL.) VATKE ssp. *riparia* (K. SCHUM. & K. KRAUSE) VERDC. var. *riparia*:	kitorò´
Psychotria cyathicalyx PETIT:	mw.engèchá`, ikondè-kóndè´ lya mtsudu, iporò lyà mútsudú`
Psychotria fractinervata PETIT:	mtovìrí`, imowiro lya mtsudu, mw.engèchá`
Psychotria lauracea (K. SCHUM.) PETIT:	mrahàchà´, irachà´, (k)iparadima, (k)ishimbíra-dìmá`, ishimbá-dìmá`
Richardia scabra L.:	mbichìrí`
Rutidea fuscescens HIERN. ssp. *fuscescens* (*R. odorata* K. KRAUSE):	mkarìkárà`, kikundá-mbùrú`
Rytigynia uhligii (K. SCHUM. & K. KRAUSE) VERDC. (*R. schumannii* ROBYNS):	kiorakio, kiwurá-kìo´, ivirò´?
Vangueria infausta BURCH. ssp. *rotundata* (ROBYNS) VERDC. (*V. rotundata* ROBYNS):	ndovìrò´ (Früchte), kidowó´ (Pflanze)
Rutaceae	
Clausena anisata (WILLD.) BENTH.:	ndawàwá´
Teclea simplicifolia (ENGL.) VERDOORN:	mwadài`
Toddalia asiatica (L.) LAM.:	mkaà-Nàngá`
Santalaceae	
Osyridocarpos scandens ENGL.:	kidambùò`
Osyris lanceolata HOCHST. & STEUDEL (*O. compressa* (BERG) A. DC.):	mdambùò
Sapindaceae	
Allophylus abyssinicus RADLK.:	mpekà´
Allophylus ferrugineus TAUB.:	kiolà-fùó`
Dodonaea viscosa (L.) JACQ.:	irukà`, iturùwá´
Filicium decipiens (WIGHT & ARN.) THWAITES:	mtovìrí`, ikondè-kóndè´ , mkufí´ mûsorò´
Paullinia pinnata L.:	mngorúsù´
Sapotaceae	
Bequaertiodendron natalense (SOND.) HEINE & J. H. HEMSL.:	isangà`
Scrophulariaceae	
Alectra sessiliflora (VAHL) KUNTZE:	kimamúò´, mnahá-nàhá`, kikachù´
Striga asiatica (L.) KTZE.:	unanua (Rombo-Dialekt)
Verbascum brevipedicellatum (ENGL.) HUBER-MORATH (*Celsia floccosa* BENTH.):	ikachì´
Simaroubaceae	
Brucea antidysenterica MILL.:	kirasì´, ichengo
Harrisonia abyssinica OLIV.:	kingotùò`, otopò`
Solanaceae	
Capsicum frutescens L.:	kiwasì´
Cestrum nocturnum L.:	cha-ùsikú`(kisw.)
Cyphomandra betacea (CAV.) SENDTN.:	ipirìngànî` (kisw.)
Datura stramonium L.:	kimaà-ngànú´
Datura suaveolens HUMB. ET BONPL. EX WILLD.:	iduhùdù´, kimaà-ngànú´
Nicandra physalodes SCOP.:	itungùchà`, iverò´, idungu
Physalis peruviana L.:	itungùchà`
Solanum aculeatissimum JACQ.:	iduó`
Solanum anguivi LAM. (*S. indicum* AUCT. NON. L.):	iduó`
Solanum incanum L.:	iduó`, nduó`, iduó`
Solanum nakurense C. H. WRIGHT:	mnasaga (sic?)
Solanum nigrum L.:	nafù`
Solanum terminale FORSK. ssp. *terminale*:	irondòwólò´, ikunda mburu
Sterculiaceae	
Dombeya torrida (J. F. GMEL.) P. BAMPS (*D. goetzenii* K. SCHUM.):	mkiwú´
Waltheria indica L.:	ichadà´
Thymelaeaceae	
Gnidia latifolia (OLIV.) GILG:	kimuoviná`
Peddiea fischeri ENGL.:	msahìdà`?; irisí-rîsí´
Tiliaceae	
Grewia bicolour JUSS.:	iparà-ngòyò´, salemi (Rombo-Dialekt)
Triumfetta flavescens A. RICH.:	ichadà´, ishoshókò´
Triumfetta rhomboidea JACQ.:	ishoshókò´
Triumfetta tomentosa BOJ.:	ishoshókò´
Ulmaceae	
Trema orientalis (L.) BL. (*T. guineensis* (SCHUM. & THONN.) FICALHO):	iisí`, isasà´?, ikuyù´?
Umbelliferae (Apiaceae)	
Agrocharis incognita (NORMAN) HEYW. & JURY (*Caucalis incognita* NORMAN):	ipachà-sòká´?, shimambora, mwambádà`, ikaà-nà-ìra´
Apium leptophyllum (PERS.) BENTH.:	kimuwerèsì`, orumbàhì´, mbirì njìsisé`
Centella asiatica (L.) URB.:	nduwà-màdú
Cryptotaenia africana (HOOK. F.) DRUDE:	ima-múhasà`
Hydrocotyle mannii HOOK. F. var. *mannii*:	nduwà-màdú
Peucedanum kerstenii ENGL.:	kiwalé´
Peucedanum linderi NORMAN:	kiwalé´
Sanicula elata DON.:	iporórì`?, mbechè´?, mbirì`, ima-mukangá`
Urticaceae	
Elatostema paivaeanum WEDD.:	nzungà´, isungùwalá´ lyá mûringénì´
Girardinia diversifolia (LINK) FRIIS:	mbawá´
Laportea aestuans GAUD.:	mbawá´
Pilea johnstonii OLIV. subsp. *johnstonii*:	isungùwalá´, ipachà-sòká´
Pilea rivularis WEDD.:	kisungùwalá´, imamthiko, iolò´, ipachà-sòká´
Urera hypselodendron (A. RICH.) WEDD.:	mchirì`
Verbenaceae	
Clerodendrum johnstonii OLIV.:	ifumbò`
Lantana camara L.:	kiwirá-kìo´
Lantana trifolia L.:	iwaró`
Lantana viburnoides VAHL:	ifaámià`
Lippia kituiensis VATKE (*L. ukambensis*	kifafa*

VATKE):	
Stachytarpheta jamaicensis (L.) VAHL:	mwambádà`, kiwaró`
Violaceae	
Viola eminii (ENGL.) R.E. FRIES:	onyonyò´
Vitaceae	
Cissus oliveri (ENGL.) GILG:	itumbùlù´
Cissus rotundifolia (FORSK.) VAHL:	ishimbá-dìmá`
Cyphostemma cyphopetalum (FRESEN.) WILD & DRUM. (*C. nierense* (TH. FR. JR.) DESC.):	kisamà-sàmá´, itumbùlù´
Cyphostemma maranguense (GILG) DESC.:	kima-múhasà`, itumbùlù´
Cyphostemma masukuense (BAK.) WILD & DRUM. ssp. *masukuense*:	itumbùlù´, mhongò`
Rhoicissus tridentata (L. F.) WILD & DRUM.:	mrumbù-rùmbù`, ingarù´
Spermatophyta: Angiospermae: Monocotyledonae	
Agavaceae	
Furcraea cubensis VENT.:	katànì` (kisw.)
Aloaceae	
Aloe ballyi REYNOLDS:	mwalàlè´, inaboru (Rombo-Dialekt)
Aloe macrocarpa TOD. ssp. *lateritia* (ENGLER) GILBERT & SEBSEBE (*A. graminicola* REYNOLDS):	mngapòlí`
Aloe volkensii ENGL.:	mratùné´
Amaryllidaceae	
Scadoxus multiflorus (MARTYN) RAF.:	mbongò`
Scilla hyacinthina (ROTH.) ALSTON (*S. indica* BAK.):	mbongò`, iduha (Rombo-Dialekt)
Zephyranthes grandiflora HERB.:	mbongò`
Anthericaceae	
Chlorophytum comosum (THUNB.) JACQ. (*C. elgonense* BULLOCK):	isalé´, isalé´ lyá mûtsudú`
Chlorophytum viridescens ENGL.:	isalé´
Araceae	
Colocasia esculenta (L.) SCHOTT:	idumá´, jimbi (kisw.), sohò´
Asparagaceae	
Asparagus africanus LAM.:	kiserá-nìndà`, kumaà-mùtsirí´
Asphodelaceae	
Kniphofia thomsonii BAK.:	mbalálé´?, iratùné´
Cannaceae	
Canna bidentata BERTOL.:	mlimí-lìmí`?
Commelinaceae	
Aneilema aequinoctiale (P. BEAUV.) KUNTH:	ikengérâ´
Aneilema minutiflorum FADEN:	ikengérâ´
Commelina benghalensis L.:	ikengérâ´
Commelina foliacea CHIOV.:	ikengérâ´
Bulbostylis coleotricha (A. RICH.) C. B. CL. (*Abbildgaardia coleotricha* (A. RICH.) K. LYE)	otsungá`
Carex chlorosaccus C. B. CL.	ilachù´, lahò`
Cyperus articulatus L.	irié`?
Cyperus atroviridis C. B. CL.	ilachù´
Cyperus brevifolius (ROTTB.) HASSKN. ssp. *intricatus* (CHERM.) K. LYE	lilùwù´?, liliwù´?
Cyperus cyperoides (L.) KUNTZE ssp. *cyperoides* var. *cyperoides*	lahò`, kimirì-mìrí´?
Cyperus dichroöstachyus A. RICH.	
Cyperus distans L. F. ssp. *distans*	ilachù´, lahò`
Cyperus distans L. F. ssp. *longibracteatus* (CHERM.) K. LYE var. *niger* C. B. CL.	kiviri´
Cyperus laxus LAM. ssp. *sylvestris* (RIDLEY) K. LYE (*C. diffusus* VAHL ssp. *sylvestris*)	ilachù´, herù´
Cyperus maranguensis K. SCHUM.	ilachù´
Cyperus mundtii (NEES) KUNTH	lilùwù ´, liliwù´,lahò`
Cyperus niger RUIZ & PAV. ssp. *elegantulus* (STEUDEL) K. LYE	lahò`, lilùwù´, liliwù´, kiviri´
Cyperus niveus RETZ. var. *leucocephalus* (KUNTH) FOSBERG	lilùwù´, liliwù´
Cyperus pseudoleptocladus KÜK. var. *polycarpus* KÜK.	ilachù´
Cyperus rigidifolius STEUDEL	lahò`
Cyperus sesquiflorus (TORR.) MATTF. & KÜK. ssp. *apendiculatus* (K. SCHUM.) K. LYE	lahò`
Cyperus sesquiflorus (TORR.) MATTF. & KÜK. ssp. *sesquiflorus*	lahò`
Cyperus tomaiophyllus K. SCHUM.	ilachù´
Fimbristylis dichotoma (L.) VAHL	otsungá`
Dioscoreaceae	
Dioscorea bulbifera L.:	okohò´
Dracaenaceae	
Dracaena afromontana MILDBR.:	isalé´
Dracaena steudneri ENGL.:	isalé´
Gramineae (Poaceae)	
Aristida adoensis HOCHST.:	msukí`, ikarí´?
Arundinaria alpina K. SCHUM.:	mwiwalé´
Chloris pycnothrix TRIN.:	otsuó`
Chloris roxburghiana SCHULT.:	mwoshoko (Pare-, Rombo-Dialekt)
Cymbopogon caesius (HOOK & ARN.) STAPF:	natsì´
Cynodon dactylon (L.) PERS.:	otsuó`
Cynodon nlemfuensis VANDERYST:	otsuó`
Digitaria macroblephara (HACK.) STAPF:	sangàrí`
Digitaria pearsonii STAPF:	kokòwò`
Eleusine indica (L.) GAERTN.:	ialà-njàá`
Elionurus muticus (SPRENG.) KUNTZE:	kifuwà`
Enneapogon cenchroides (ROEM & SCHULT.) C. E. HUBBARD:	nguru-nguru (Pare-, Rombo-Dialekt)
Eragrostis schweinfurthii CHIOV.:	ikarí´
Eragrostis tenuifolia (A. RICH.) STEUD.:	ikarí´
Festuca abyssinica A. RICH.:	mkarí´
Harpachne schimperi A. RICH.:	mkarí´, mbarà-hàangà´, njoòyà´
Heteropogon contortus (L.) ROEM. & SCHULT.:	njoòyà´, kitsatsò´, msukí`
Hyparrhenia hirta (L.) STAPF:	msukí`, kitsatsò´
Hyparrhenia rufa (NEES) STAPF:	msukí`, kitsatsò´
Hyperthelia dissoluta (STEUD.) W. D. CLAYTON:	msukí`
Isachne mauritiana KUNTH:	kokòwò`
Melinis minutiflora P. BEAUV.:	sangàrí`, (i)ifudà-fùdá´
Panicum maximum JACQ.:	mhuhù´
Panicum trichocladum K. SCHUM.:	kokòwò`
Paspalum conjugatum BERG.:	ikarí´
Pennisetum polystachion (L.) SCHULT. ssp. *polystachion*.:	nguru-nguru (Pare-, Rombo-Dialekt)
Pennisetum purpureum SCHUMACH.:	cha-pùng'á`
Pennisetum setaceum (FORSSK.) CHIOV.:	nguru-nguru (Pare-, Rombo-Dialekt)
Rhynchelytrum repens (WILLD.) C. E. HUBBARD:	mkarí´, ilalé`, mbarà-hàangà´
Rottboellia cochinchinensis (LOUR.) W. D. CLAYTON (*R. exaltata* L. F.):	chapunga
Setaria homonyma (STEUD.) CHOIV.:	mlaá`
Setaria megaphylla (STEUD.) TH. DUR. & SCHINZ:	ilalé`
Setaria plicatilis (HOCHST.) ENGL.:	ilalé`, ikarí´, ifahià`, mlaá`
Sorghum arundinaceum (DESV.) STAPF:	iverà`
Sorghum vulgare L.:	mtamá`
Sporobolus africanus (POIR) ROBYNS & TOURNAY:	ikarí´
Sporobolus festivus A. RICH.:	ikarí´
Sporobolus fimbriatus (TRIN.) NEES:	ikarí´
Themeda triandra FORSSK.:	natsì´
Zea mays L.:	iimbá´
Iridaceae	
Aristea alata BAK.:	ilalé`
Dierama cupuliflorum KLATT (*D. pendulum* (L. F.) BAK.):	ilachù´
Musaceae	
Ensete edule (J. F. GMEL.) HORAN (*E.*	(i)isangàrúhù´

ventricosum (WELW.) G. E. CHEESM.):	
Orchidaceae	
Aerangis coriacea SUMMERH.:	mbalálé´, kurèrà´
Cynorkis pleistadenia (REICHB. F.) SCHLTR.:	kurushí`
Polystachia simplex RENDLE:	kurushí`
Palmaceae	
Phoenix reclinata JACQ.:	ikangáchì`
Smilacaceae	
Smilax anceps WILLD. (*S. kraussiana* MEISN.):	mkoróròmù´
Typhaceae	
Typha domingensis PERS.:	ilalé`
Velloziaceae	
Xerophyta spekei BAK.:	kitsewú´
Zingiberaceae	
Aframomum angustifolium (SONNERAT) K. SCHUM.:	ilikì`?
Elettaria cardamomum MATEN:	ilikì`
Pteridophyta	
Actiniopteridaceae	
Actiniopteris dimorpha PIC. SERM.	ichaméríî´
Actiniopteris radiata (SWARTZ) LINK	ichaméríî´
Actiniopteris semiflabellata PIC. SERM.	ichaméríî´
Adiantaceae	
Adiantum capillus-veneris L.:	ichaméríî´
Adiantum hispidulum SWARTZ:	ichaméríî´
Adiantum incisum FORSSK.:	ichaméríî´
Adiantum poiretii WIKSTR. *(A. thalictroides* SCHLECHTEND.):	ichaméríî´
Adiantum raddianum PRESL:	(k)ichaméríî´
Cheilanthes farinosa (FORSK.) KAULF.:	ichaméríî´
Cheilanthes multifida (SWARTZ) SWARTZ:	ichaméríî´
Doryopteris kirkii (HOOK.) ALSTON (*Doryopteris concolour* (LANGSD. & FISCH.) KUHN var. *kirkii* HOOK.):	ichaméríî´
Pellaea quadripinnata (FORSSK.) PRANTL:	ichaméríî´
Pellaea schweinfurthii (HIERON.) DIELS:	ichaméríî´
Pellaea viridis (FORSSK.) PRANTL:	ichaméríî´
Aspleniaceae	
Asplenium abyssinicum FEE:	ichaméríî´
Asplenium adiantum-nigrum L. :	ichaméríî´
Asplenium aethiopicum (BURM. F.) BECHERER:	ichaméríî´
Asplenium bugoiense HIERON.:	ichaméríî´
Asplenium elliottii C. H. WRIGHT:	ichaméríî´
Asplenium erectum WILLD. var. *usambarense* HIERON.:	ichaméríî´
Asplenium friesiorum C. CHR.:	ichaméríî´
Asplenium gemmiferum SCHRAD.:	ichaméríî´
Asplenium hypomelas KUHN:	ichaméríî´
Asplenium linckii KUHN:	ichaméríî´
Asplenium loxoscaphoides BAK.:	ichaméríî´
Asplenium monanthes L.:	ichaméríî´
Asplenium normale D. DON:	ichaméríî´
Asplenium praegracile ROSENST.:	ichaméríî´
Asplenium protensum SCHRAD.:	ichaméríî´
Asplenium sandersonii HOOK.:	ichaméríî´
Asplenium smedsii PIC. SERM.:	ichaméríî´
Asplenium strangeanum PIC. SERM. *(A. rutifolium* (BERG.) KUNZE):	ichaméríî´
Asplenium theciferum (KUNTH) METT.:	ichaméríî´, ikurèrà´
Asplenium unilaterale LAM.:	ichaméríî´
Asplenium volkensii HIERON:	ichaméríî´
Blechnaceae	
Blechnum attenuatum (SWARTZ) METT.:	ichaméríî´
Blechnum australe L.:	ichaméríî´, irengò`?
Cyatheaceae	
Cyathea humilis HIERON	ichaméríî´, ihofú
Cyathea manniana HOOK.:	ichaméríî´, ihofú ´
Dennstaedtiaceae	
Blotiella glabra (BORY) TRYON:	ichaméríî´
Blotiella stipitata (ALSTON) FADEN:	ichaméríî´

Hypolepis sparsisora (SCHRAD.) KUHN:	ichaméríî´
Pteridium aquilinum ssp. *aquilinum* (L.) KUHN:	isulú`
Dryopteridaceae	
Arachniodes foliosa (C. CHR.) SCHELPE:	ichaméríî´
Didymochlaena truncatula (SWARTZ) J. SM.:	ichaméríî´
Dryopteris antarctica (BAK.) C. CHR. (*Dryopteris callolepis* C. CHR.):	ichaméríî´
Dryopteris atamanthica (KUNZE) KUNTZE:	ichaméríî´
Dryopteris fadenii PIC. SERM. (*Dryopteris pentheri* (KRASSER) C. CHR. of 1. ed. of UKWF):	ichaméríî´
Dryopteris kilemensis (KUHN) O. KUNTZE:	ichaméríî´
Dryopteris pentheri (KRASSER) C. CHR. (*Dryopteris inaequalis* (SCHLECHTEND.) O. KUNTZE of 1. ed. of UKWF) :	ichaméríî´
Megalastrum lanuginosum (KAULF.) HOLTTUM (*Ctenitis lanuginosa* (KAULF.) COPEL):	ichaméríî´
Nothoperanema squamiseta (HOOK.) CHING (*Dryoptris squamiseta* (HOOK.) O. KUNTZE):	ichaméríî´
Polystichum fuscopaleaceum ALSTON:	ichaméríî´
Tectaria gemmifera (FEE) ALSTON:	ichaméríî´
Gleicheniaceae	
Dicranopteris linearis (BURM. F.) UNDERW.:	isulú`
Hymenophyllaceae	
Hymenophyllum kuhnii C. CHR.:	kurushí`
Hymenophyllum tunbrigense (L.) SM.:	kifuwà`
Trichomanes melanotrichum SCHLECHTEND.:	kurushí`, ikurèrà´
Lomariopsidaceae	
Elaphoglossum aubertii (DESV.) MOORE:	kurushí`
Elaphoglossum deckenii (KUHN) C. CHR.	
Elaphoglossum hybridum (BORY) BRACK.:	mlimú-lìmú`, ichaméríî´
Lycopodiella cernua (L.) PIC. SERM.:	ikurèrà´, italáhòmbò`, ihombò´, kila-hómbò´
Lycopodium clavatum L.:	ikurèrà´, irerà`
Marattiaceae	
Marattia fraxinea SM.:	ichaméríî´, ihofú´
Marsileaceae	
Marsilea minuta L.:	kimaà-mùonyó`, ionyò´
Oleandraceae	
Arthropteris orientalis (GMEL.) POSTH.:	ichaméríî´
Oleandra distenta KUNZE:	loliondo, mnyahà-sàkà fó mûtsudú`
Polypodiaceae	
Drynaria volkensii HIERON.:	ichaméríî´
Lepisorus excavatus (WILLD.) MOORE (*Pleopeltis excavata* (WILLD.) SLEDGE):	ichaméríî´, ikurèrà´, kurushí`
Loxogramme abyssinica (BAK.) M. G. PRICE (*L. lanceolata* (SWARTZ) C. PRESL):	ikurèrà´, kurushí`
Pleopeltis macrocarpa (WILLD.) KAULF.:	ichaméríî´, ikurèrà´ , kurushí`
Pteridaceae	
Pteris catoptera KUNZE:	ichaméríî´
Pteris dentata FORSSK.:	ichaméríî´
Pteris vittata L.:	ichaméríî´
Schizaeaceae	
Mohria vestita BAK. (*M. caffrorum* (L.) DESV.):	ichaméríî´
Selaginellaceae	
Selaginella abyssinica SPRING:	ikurèrà´
Selaginella kraussiana (KUNZE) A. BR.:	ikurèrà´ , irengò`?, kisilè kyà múringénì´
Thelypteridaceae	
Amauropelta bergiana (SCHLTDL.) HOLTTUM (*Thelypteris bergiana* (SCHLECHTEND.) CHING):	ichaméríî´

Christella dentata (FORSK.) BROWNSLEY & JERMEY *(Cyclosorus dentatus* (FORSSK.) CHING):	ichaméri´
Pneumatopteris unita (KUNZE) HOLTTUM (*Cyclosorus madagascariensis* (FEE) CHING):	ichaméri´
Vittariaceae	
Vittaria volkensii HIERON.:	kurushí`, lilùwù´
Woodsiaceae	

Athyrium scandicinum (WILLD.) PRESL var. *scandicinum*:	ichaméri´
Cystopteris fragilis (L.) BERNH.:	ichaméri´
Cystopteris nivalis (PIROTTA) PICH. SERM.:	ichaméri´
Deparia boryana (WILLD.) M. KATO (*Dryoathyrium boryanum* (WILLD.) CHING):	ichaméri´
Diplazium zanzibaricum (BAK.) C. CHR.:	ichaméri´

Appendix 2. List of mammals and their Chagga names in the Old Mochi dialect

Taxon/ species	Chagga name	Swahili name	English name
Artiodactyla			**Even-toed Ungulates**
Suidae			Pigs
Potamochoerus porcus daemonis	nguvè yà njà´	nguruwe-msitu	Kilimanjaro bush pig
Phacocoerus aethiopicus	iwutirì`	ngiri	warthog
Hippopotamidae			Hippopotamuses
Hippopotamus amphibius	ngeré`	kiboko	hippo
Giraffidae			Giraffes
Giraffa camelopardalis	ohorì´, nyorì´	twiga	giraffe
Bovidae			Hollow-Horned Ruminants
Cephalophus callipygus	sumbùdà`	funo	Harvey's duiker
Cephalophus spadix	mendè´	mindi	Abbott's duiker
Neotragus moschatus	sinì´	paa	suni
Madoqua kirkii	mendè´	dikidiki	kirkdikdik
Oreotragus oreotragus	mburú yà njà´	mbuzi-mawe	klipspringer
Tragelaphus scriptus	sarìhà´	pongo, mbawala	bushbuck
Tragelaphus imberbis	ngatàtà`	tandala-mdogo	lesser kudu
Tragelaphus strepsiceros	ngatàtà`	tandala-mkubwa	greater kudu
Tragelaphus oryx	siròó´, kiroó´	pofu	eland
Oryx gazella	morìní´	choroa	oryx
Redunca ssp.	ilì`	tohe	reedbuck
Connochaetes taurinus	ngondì´	nyumbu	wildebeest
Aepyceros melampus	taràchì`	swalapala-kaskazi	northern impala
Gazella sp.	taràchì`	swala	gazelle
Syncerus caffer	mbohò´	nyati, mbogo	buffalo
Perissodactyla			**Odd-toed Ungulates**
Equidae			Asses and Zebras
Hippotigris quagga	itikò`	punda-milia	Burchell's zebra
Rhinoderotidae			Rhinoceroses
Diceros bicornis	murà´	kifaru	black rhino
Hyracoidea			Hyraxes
Dendrohyrax ssp.	mbelèlè`	perere	tree hyrax
Proboscidea			Elephants
Elephantidae			Elephants
Loxodonta africana	njofù`	tembo, ndovu	African elephant
Tubulidentata			**Pipe-Toothed Animals**
Orycteropidae			Aardvarks
Orycteropus afer	ilomà`	muhanga	aardvark, antbear
Pholidota			**Scaly Anteaters**
Manidae			Scaly Anteaters or Pangolins
Manis temminckii	kinguàlà`	kakakuona	Temminck's ground pangolin
Rodentia			**Rodents**
Sciuridae			Squirrels
Xerus rutilus	kiroròmà`	kidiri, kichakuro	East African ground squirrel
Heliosciurus rufobrachium undulatus	njindí´	kindi	red-legged sun squirrel
Paraxerus ochraceus aruscensis	njindí´	kindi	Tanganyika mountain squirrel
Hystericidae			Porcupines
Hystrix galeata	isasà`, ipiá-msasà`	nunguri-misitu	forest porcupine
Hystrix africaeaustralis	isasà`, ipiá-msasà`	nunguri-nyika	lowland porcupine
Cricetidae			Cricetine Rodents
Cricetomys gambianus	kipopórù´, kirondò´?	buku-milima	giant Gambian rat
Thryonomyidae			Cane rats
Thryonomys ssp.	irehènyà`	ndezi, nkungusi	cane rat
Muridae			Rats and Mice
Rattus rattus	ikoì-kòì`	panya	common rat
Mus hildebrandti	mbewà`	kipanya	mouse
Tachyoryctes splendens	fukò`	fuko > chag.	root rat
Lagomorpha			**Hares and Rabbits**
Leporidae			Hares and Rabbits
Lepus capensis	kilyoódang'á`	sungura-mwitu	Cape hare

Carnivora			**Carnivores**
Canidae			Dog Family
Caninae			Dogs and Foxes
Canis adustus	iparà´, ngarȧràrȇ`?	bweha-miraba	striped jackal
Canis mesomelas	iparà´, ngarȧràrȇ`?	bweha-shaba	silver-backed jackal
Canis aureus	iparà´, ngarȧràrȇ`?	bweha-dhahabu	golden jackal
Lycaoninae			Hunting Dogs
Lycaon pictus	isiî`,kiité kyà ngérêní´	mbwa-mwitu	hunting dog
Mustelidae			Martens and Weasels
Ictonyx striatus	kiahà´	kicheche	striped pole-cat, zorilla
Mellivorinae			
Mellivora capensis	kiaráng'ù´,kiparà-mùodù´	nyegere	ratel, honey badger
Viverridae			Civet-Cats
Viverrinae			Civets and Mongooses
Genetta ssp.	mtahà´, tahà´	kanu	genet cat
Viverra civetta	kirerèmbà`	fungo	African civet
Herpestinae			Mongooses
Herpestes ichneumon	muha`	nguchiro-mkubwa	Egyptian mongoose
Atilax paludinosus	mchurù`, muha`	nguchiro-maji	marsh mongoose
Mungos mungo	mchurù`, muha`	nguchiro-miraba	banded mongoose
Bdeogale crassicauda	muha`	nguchiro-kijivu	bushy-tailed mongoose
Ichneumia albicauda	muha`	nguchiro-mkia-mweupe white-tailed mongoose	white-tailed mongoose
Helogale parvula	mchurù`, muha`	nguchiro-mfupi	dwarf mongoose
Rhynchogale melleri	muha`	nguchiro-vidole-4	Meller's mongoose
Protelidae			Aardwolf
Proteles cristatus	iritì`, isihèè`	fisi-ya-nkole	aard-wolf
Hyaenidae			Hyaenas
Hyaena hyaena	ifulù mútihílîé´, mbondà´	fisi-mirabe,shundwa	striped hyaena
Crocuta crocuta	ifulù ngúgwè`, mbondà´	fisi-madoa,kingugwa	spotted hyaena
Felidae			Cats
Pantherinae			Large Cats
Panthera leo	simbá´, muisò´, ngatúnî´	simba	lion
Panthera pardus	rumù´, ngo`, rung'ù´	chui	leopard
Acinonychinae			Cheetahs
Acinonyx jubatus	ngarȇ`	duma	cheetah
Felinae			Small Cats
Leptailurus serval	nzanà´	mondo	serval
Primates			**Primates**
Lorisidae			Lorises
Galaginae			Galagos or Bushbabies
Otolemur garnettii panganiensis	ngiahà`, ikongólìmá`	komba	Garnett´s Galago
Anthropoidea			Apes and Monkeys
Cercopithecidea			Monkeys and Baboons
Papiinae			Baboons
Papio cynocephalus	ifuvé`	nyani-njano	yellow baboon
Cercopithecinae			Long-Tailed Monkeys or Guenons
Erythrocebus patas	ngimá`	kima-mwekundu	Patas monkey
Cercopithecus mitis	ngimá`	kima	blue guenon
Cercopithecus albogularis	ngimá`	kima	white-throated guenon
Cercopithecus aethiops	kinangòyò´	tumbili	black-faced vervet
Colobinae			Thumbless Monkeys
Colobus guereza caudatus	ndoró´	mbega	Kilimanjaro colobus
Insectivora			**Insectivores**
Erinaceidae			Hedgehogs
Erinaceus albiventris	kisafúrû´	kalunguyeye	four-toed hedgehog
Macroscelididae			Elephant Shrews
Petrodromus tetradactylus	itatàrì`,kinyungù-nyùngú´sange-masikio	four-toed elephant shrew	Rüsselratte
Chiroptera			**Chiropteres**
Megachiroptera			**Fruit Bats**
Epomorphorus anurus	ikungù`	popo	epauletted fruit bat
Microchiroptera			**Bats**
Pipistrellus nanus	ikungù`	popo	banana bat, African pipistrelle

Appendix 3. List of birds and their Chagga names in the Old Mochi dialect

Taxon / species	Chagga name	Swahili name	English name
Struthionidae			
Struthio camelus	nyahá`	mbuni	ostrich
Scopidae			
Scopus umbretta	iparà-ngàlá´, sambà-mùedà`	mshingi, nyundo	hammerkop
Ciconiidae			
Ciconia abdimii	ngoyóyò`	korongo-samawati	white-bellied stork, Abdim's stork
Leptoptilos crumenifer	kingìsìtòkì´ engl.	korongo mfukoshingo	marabou stork
Threskiornithidae			
Hagedashia hagedash	imuodùó´	kwarara kijani	hadada ibis
Anatidae			
Anas ssp.	ipandàshà`	bata ...	wild duck
Accipitridae			
Gyps bengalensis	ingarà-mtonì`, mtonì`	tumbusi mweupe	white-backed vulture
Neophron percnopterus	ingarà-mtonì`, mtonì`	tumbusi njano	Egyptian vulture
Necrosyrtes monachus	ingarà-mtonì`, mtonì`	tumbusi ...	hooded vulture
Milvus migrans aegyptius	nyonyóngà´, mtonì`	kipanga ...	Egyptian kite
Elanus caerulus	kioré`	kipupwi	black-shouldered kite
Aquila rapax?	okuró´	msasi	tawny eagle
Lophaetus occipitalis	imuosurá`	matepe	long-crested hawk-eagle
Kaupifalco monogrammaticus	kioré`	shakivale ...	lizard buzzard
Gypaetus barbatus	ndoò`	tumbusi, tai-mzoga	lammergeyer, bearded vulture
Buteo oreophilus	mberó`	shakivale ...	mountain buzzard
Buteo buteo vulpinus	ovishí´	shakivale ...	steppe buzzard
Buteo rufofuscens	ovishí´	shakivale ...	augur buzzard
Accipiter tachiro	ovishí ló mânduhúnî´	hajivale ...	African goshawk
Accipiter rufiventris	ovishí ló mânduhúnî´		rufous-breasted sparrow hawk
Melierax polyopterus???	Kioré`	hajivale ...	pale chanting goshawk
Falconidae			
Falco peregrinus	mbarà-hàangá´	kozi	peregrine hobby
Falco cuvieri	kimbarà-hàangá´, kioré`	mwimbizi, mleke	African hobby
Phasianidae			
Francolinus hildebrandtii?	ikurà´	kwale mwekundu	Hildebrandt's francolin
Numida meleagris	ngangá`	kanga, chepeo	helmeted guinea-fowl
Columbidae			
Treron australis	oreké´	ninga	(Moshi) green pigeon
Columba arquatrix	mbukù`	njiwa	olive pigeon
Streptopelia semitorquata	mbetà´	mwigo	red-eyed dove
Tympanistria tympanistria, =Turtur t.	mbunà´	wanda njano	tambourine dove
Turtur chalcospilos	mbunà´	wanda ...	emerald-spotted wood dove
Cuculidae			
Cuculus solitarius	ndekiréèfa´	semukoko mwekundu	red-crested cuckoo
Chrysococcyx cupreus?	Inchoòchè`	tipitipi kijani	emerald cuckoo
Centropus superciliosus	kiduhùdù`	dudumizi	white-browed coucal
Musophagidae			
Tauraco hartlaubii	irié`	shorobu bluu	Hartlaub's turaco
Psittacidae			
Poicephalus ssp.	Kasukú` swah.	Kasuku	parrot
Alcedinidae			
Ispidina picta	ngerè-ngérè´	kisharifu	pygmy kingfisher
Halycon albiventris	ilaá-mfirì`, ilya-ndéhè´	kurea ...	brown-hooded kingfisher
Meropidae			
Merops ssp.	Ilya-njúkî`	mtilili	bee-eater
Bucerotidae			
Bycanistes brevis	ikuráng'à´	hondohondo ...	silvery-cheeked hornbill
Tockus nasatus	kilya-ndûû`	fimbi mweusi	grey hornbill
Tockus alboterminatus	ikeíkèî`, ndehè´	fimbi-kichungi	crowned hornbill
Bucorvus cafer, =B. ledbeateri	itutù´	mumbi	ground hornbill
Upupidae			
Upupa epops	kidundu?	jogoo-mwitu, hudhud	hoopoe
Strigidae			
Ciccaba woodfordii, =Strix w.	ikudùkùdú´	bundi	African wood owl
Bubo africanus/lacteus	nguhùmá`	babewana	spotted/Verreaux's eagle owl
Caprimulgidae			
Caprimulgus poliocephalus	ifa-dó´, ilaá-mfirì`		Abyssinian nightjar
Coliidae			
Colius striatus, C. *macrourus*	ichilílì`	pwaju	speckled mousebird
Trogonidae			

Capitonidae			
Gymnobucco leucotis, =*Stactolaemal*	ira-mbàkó´	kisigajiru	white-eared barbet
Pogonorhynchus (Lybius) malanopterus	ika`, ikoròrò`	kisigajiru	brown-breasted barbet
Pogoniulus leucomystax?	kindamàngó´	kitororo njano	moustached green tinker-bird
Indicatoridae			
Indicator minor?	kingonòndà`	kongozi-asali mdogo	lesser honey-guide
Picidae			
Camethera sp.?	ngonòndà`	kigogota	woodpecker
Dendropicos fuscescens?	kikitò´	kigogota, king'oto	cardinal woodpecker
Apodidae	mbaí-mbàí`	mbayuwayu	swifts
Motacilidae			
Motacilla aguimp	kimalàikà` swah.	kitwitwi mraba	African pied wagtail
Motacilla alba?	Sesèrì`	kitwitwi	white wagtail
Timalidae (=Turdoididae)			
Turdoides jardineï?	irehéchè´	mpayupayu milia	arrow-marked babbler
Pseudalcippe abyssinica	mkongóvìrò´		hill babler
Pycnonotidae			
Pycnonotus barbatus	ikongóvirò´	kizelele	common bulbul
Andropadus nigriceps, =A. tephrolaema	mkongóvìrò´		mountain bulbul
Platysteiridae			
Batis molitor	irichò´	kapura-panda ...	chin-spot flycatcher
Monarchidae			
Tchitrea viridis, =*Terpsiphone v.*	mnyoróvì´	shore kishungi	paradise flycatcher
Turdidae			
Turdus olivaceus	itahá-mforì´, iramtotò`	mkesha ...	olive thrush
Saxicola torquata	njarì-njárì´	chati	stone chat
Cossypha heuglinii	mnyoróvì´	kurumbiza, papura	white-browed robin
Cossypha caffra	mnyoróvì´	kurumbiza, papura	robin chat, Cape robin
Pogonocichla stellata	ilya-mbómê´		white-starred bush-robin
Sylviidae			
Camaroptera brevicaudata	kilaá-mkarò´	macho-kioo	grey-backed camaroptera
Camaroptera brachyura	mvikò´, kitsaná-mbàngò`,	macho-kioo	green-backed camaroptera
Cisticola eminii?	kiwuyù´	kibubutu ...	rock-living cisticola
Hirundinidae	mbaí-mbàí`	kijumba-mshale	swallows and martins
Dicruridae			
Dicrurus adsimilis	ihendà-nà-mmbè`	mlamba-ncha	fork-tailed drongo
Laniidae			
Lanius collaris	mlisí`	barabara	fiscal shrike
Malaconotidae			
Laniarius aethiopicus, =L. ferrugineus	idondòchò`, ikoníngò´	tiva mweupe	boubou shrike, tropical boubou
Corvidae			
Carvus albus	ikurú´	kunguru ...	pied crow
Corvus albicollis	kikorìsó`	kunguru mweusi	white-naped raven
Sturnidae			
Cinnyricinclus leucogaster	owarì´	kwezi zambarau	violet-backed starling
Onychognathus morio	ingikíò`	kizole mweusi	redwing starling
Zosteropidae			
Zosterops senegalensis eurycricota	mbirò´, kimuombirò´	kisigi, manja	Kilimanjaro yellow white-eye
Nectariniidae			
Nectarinia venusta	kilya-máchuchù´	neli ...	variable sunbird
Estrildidae			
Spermestes nigriceps, = Lonchura n.	kilya-ríwù´, kinarèngè`	tongo-kanga	rufous-backed mannikin
Lagonosticta rubricata	kinapùrù´	biliwili	African firefinch
Estrilda melanotis?	kinderí´	mshigi njano	yelow-bellied waxbill
Ploceidae			
Ploceus baglafecht reichenowii	iraí`		Reichenwo's weaver
Quelea quelea	ichichí-ràí`	kivo	red-billed quelea
Fringillidae			
Serinus sp.	kikundá-mmbè`	chiriku, msili	canary, seedeater

Appendix 4. List of amphibians and their Chagga names in the Old Mochi dialect

Species	Chagga name
Bufo regularis	kiilǿ´**
Phrynobatrachus natalensis	kiilǿ´*****
Ptychadena mascareniensis	kiilǿ´*
Ptychadena oxyrhyncha	kiilǿ´**
Rana angolensis	kiilǿ´*****
Rana angolensis (Juv.)	ngelé´****
Strongylopus fuelleborni	kiilǿ´**
Strongylopus kilimanjaro	kiilǿ´**

Appendix 5. List of reptiles and their Chagga names in the Old Mochi dialect

Familien/ Gattungen/ Arten	Chagga-Namen (Mochi)	Swahili-Namen	Englische Namen
Agamidae			
Agama hispida aculeata	isehélè´		Ground Agama
Agama agama	ndoshì´		Blue Agama
Boidae			
Python sebae	sadú´	chatu	African Rock Python
Chamaeleonidae			
Bradypodion tauetanum	kiafúò´	kinyonga	Tanganyika Two-horned Chamaeleon
Chamaeleo bitaeniatus	kiafúò´	kinyonga	Two-lined Chamaeleon
Chamaeleo dilepis	kiafúò´	kinyonga	Common or Flap Eared Chamaeleon
Chamaeleo gracilis	kiafúò´	kinyonga	
Chamaeleo melleri	kiafúò´, mdilo	kinyonga	Giant Chamaeleon
Chamaeleo rudis	kiafúò´	kinyonga	Mountain Striped Chamaeleon
Colubridae			
Boaedintinae			
Crotaphopeltis hotamboeia	mboléà´		Herald Snake
Dasypeltis medici	overéshì`	mla-mayai-kahawia	Brown Egg Eater
Dasypeltis scabra	overéshì`	mla-mayai-maua	Common Egg Eater
Dispholidus typus	osalé´	sukutu	Boomslang
Dispholidus typus (Juv.)	singò´	sukutu	Boomslang
Lamprophis fuliginosus	mboléà´***	chata-kijivu	Brown House Snake
Philothamnus hoplogaster	osalé´	namalanga	Green Bush Snake
Philothamnus semivariegatus	osalé´	nihanga	Spotted Bush Snake
Thelotornis capensis	overéshì`	kamutimuti	Bird or Twig Snake
Psammophinae			
Psammophis phillipsii	overéshì`		Olive Grass Snake
Psammophis punctulatus	overéshì`		Red Headed Sand Snake
Psammophis subtaeniatus	singò´	miraba-kahawia	Stripe-bellied Sand Snake
Cordylidae / Gerrhosaurinae			
Gerrhosaurus major	isororo		Rough-scaled Plated Lizard
Elapidae			
Dendroaspis polylepis	singò´	songwe	Black Mamba
Dendrosaspis angusticeps	osalé´	hongo	Green Mamba
Naja haje	sawaka	koboko-mkubwa	Egyptian Kobra
Naja nigricollis	singò´	koboko-mate	Black-necked cobra
Emydidae			
Pelomedusa subrufa	nguru`, ikasa	kasa	Marsh Terrapin
Gekkonidae			
Chemaspis africana	kilya-múhondí´	mjusi	
Hemidactylus squamulatus squamulatus	kilya-múhondí´	mjusi	Leaf-toed Gecko
Lygodactylus conradti	kilya-múhondí´	mjusi	Dwarf Gecko
Lacertidae			
Holaspis guentheri	kelasa	mjusi	Blue-tailed Tree Lizard
Leptophlopidae			
Leptotyphlops scutifrons merkeri	isehele ?	nyakatu	Peter´s Thread Snake
Scincidae/ Lygosomatiinae			
Mabuya quinquetaeniata	isehèsà`	mjusi	Blue-tailed Skink
Mabuya striata	isehèsà`****	mjusi	Striped Skink

Testudinidae			
Testudo pardalis	nguṟú`	kobe	Leopard Tortoise
Kinixys belliana	nguṟú`	kobe	Bell´s Hinged Tortoise
Malacochersus tornieri	nguṟú`	kobe	Pancake Tortoise
Typhlopidae			
Typhlops punctatus	ndasá-kùví´	birisi ...	Blind Snake
Varanidae			
Varanus exanthematicus	mbukándâ´	kenge	Rock Monitor
Varanus niloticus	mbukándâ´	kenge	Water Monitor
Viperidae			
Causinae			
Atheris ceratophorus	kimala	kipiri ...	Swamp Viper
Causus rhombeatus	ihuhú`	kipiri-usiku	Night Adder
Viperinae			
Bitis arietans	ihuhú`	bafe	Puff Adder
Bitis gabonica	ihuhú`, kopòkó`	moma-misitu	Gaboon Adder

Appendix 6. List of investigated arthropod taxa and number of Chagga names in this study

		Investigated species	**Kichagga names**
Nemathelminthes		3	1
Plathelminthes		2	1
Mollusca/Gastropoda		10	2
Annelida		4	2
Chelicerata		> 10	4
Crustacea		3	2
Chilopoda und Diplopoda		>10	2
Insecta		1120	110
	Coleoptera	650	24
	Dermaptera	2	2
	Diptera	38	13
	Ephemeroptera	1	1
	Heteroptera	47	19
	Homoptera	24	5
	Hymenoptera	62	19
	Lepidoptera	169	5
	Neuroptera	1	5
	Odonata	2	3
	Blattodea	6	4
	Mantodea	7	1
	Phasmida	3	2
	Saltatoria	102	31
	Anoplura	2	1
	Mallophaga	1	1
	Siphonaptera	2	1

Appendix 7. List of arthropod species collected with their respective names in the Chagga language

Many of the listed species originate from the entomological collection of the TAFORI (Tanzania Forest Research Institute) in Moshi. Since for e.g. beetles or moths only few expressions exist only the number of investigated species is listed in brackets behind the respective family if only one or few expressions were found for the whole group. For more detailed information about species and literature used see Hemp and Winter (1999). Juv.: nymphal stage, Swah.: term derived from Kiswahili, Engl.: term deriving from the English language; ?: name of questionable origin.

Taxon/ species	**Chagga name**
Scolecida	
Nemathelminthes, Ascaroidea	
Ascaris lumbricoides Linné	kiodòyé´
Neoascaris vitulorum Goeze	kiodòyé´
Toxascaris sp.	kiodòyé´
Plathelminthes, Cestodes	
Taenia solium Linné	njolà`
Taenia saginata Goeze	njolà`
Mollusca /Gastropoda	
Achatina kilimae Dautzenberg	ngochó´
Achatina pilsbryi D´Ailly	ngochó´
Martensia albopicta v. Martens	ngochó´
Streptaxis enneoides v. Martens	ngochó´
Thapsia kibonotoensis D´Ailly	ngochó´
Thapsia radiata D´Ailly	ngochó´
Trochonanina membranacea D´Ailly	ngochó´
Vitrina ericinellae D´Ailly	ngochó´
Atoxon lineatum Simroth	ikorù`
Atoxon taeniatum Simroth	ikorù`
Articulata	
Annelida	
Lumbricidae	
Platydrilus sp.	mbilìlì´
Pygmaeodrilus sp.	mbilìlì´
Polytoreutus sp.	mbilìlì´
Glossiphoniidae (Hirundinea)	

Batracobdella nilotica Johansson	mnurà´
Arthropoda	
Chelicerata / Arachnida	
Scorpiones	
Parabuthus liosoma H. & E.	kisuwà`
Araneae	mbuwù`
Opiliones	mbuwù`
Solifugae	
Ceroma ornatum Karsch	mbuwù`
Acari	
Ixodes (Ixodidae)	icherí´
Eutrombidium sp. (Trombidiidae)	icherí´lyá mbûrú`
Mandibulata / Crustacea	
Decapoda	
Potamon johnstoni Miers	ngalá´
Telphusa pilosa Hilg.	ngalá´
Isopoda	
Diploexochus bituberculatus Budde-Lund	nyangà`
Antennata (Tracheata)	
Chilopoda / Scolopendridae	
Scolopendra sp.	ndalá`
Progoneata (Diplopoda)	ichongòlòlò`
Insecta (Hexapoda)	
Apterygota	
Zygentoma	
Machiloides malagassus Silv.	mnorà´
Pterygota	
Coleoptera	
Alleculidae	
Allecula sp.	irimbòchò´
Anobiidae	
Clada castipennis Kolbe	irimbòchò´
Anthicidae (6)	kivirò`
Anthribidae (12)	irimbòchò´ (iteéchù´)
Bostrychidae (33)	irimbòchò´, olotù´, kivirò`, mkokè´
Brenthidae (10)	irimbòchò´
Bruchidae (4)	irimbòchò´ ; ngungù´
Buprestidae (27)	olotù´, ilangametu? lya shídiní´, otu´
Cantharidae (1)	irimbòchò´
Carabidae (21)	irimbòchò´
Cerambycidae (178)	irimbòchò´, otu´, irimbòchò lya mêmbé´
Chrysomelidae (39)	irimbòchò´
Cleridae (12)	irimbòchò´
Coccinellidae (22)	irimbòchò´
Colydiidae (7)	irimbòchò´
Corylophidae (1)	irimbòchò´
Cucujidae (2)	irimbòchò´
Curculionidae (69)	irimbòchò´, sikànìà` engl., kivirò`, mbuhúdû´
Dasytidae (3)	irimbòchò´
Elateridae (7)	olotù´, otu´
Endomychidae (2)	irimbòchò´
Erotylidae (1)	irimbòchò´
Gyrinidae (2)	kichoóndì`
Histeridae (8)	irimbòchò´
Lagriidae (3)	irimbòchò´
Lampyridae (2)	mnyang'ò`
Lucanidae (6)	irimbòchò´, otu´
Lycidae	
Cautires profanus Klein	irimbòchò´, irombocha
Lycus constrictus Fahraeus	kipandà-nìndà`, irimbòchò´, irombocha
Lycus rotundicollis Klug	kifurì`
Lyctidae (5)	irimbòchò´
Lymexilonidae (3)	irimbòchò´, kiasánà´
Meloidae (14)	irimbòchò´, otu´, mbuhúdû´
Mordellidae (1)	irimbòchò´
Nitidulidae (2)	irimbòchò´
Passalidae (6)	irimbòchò´, olotù´, otu´
Passandridae (1)	irimbòchò´
Phalacridae (3)	irimbòchò´
Platypodidae (23)	irimbòchò´, kivirò`
Sagridae (2)	irimbòchò´, njechérî´ (Männchen)
Scarabaeidae (55)	irimbòchò´
Scolytidae (28)	irimbòchò´, kivirò`
Staphylinidae (2)	kiasánà´, ndasá-kùví´, kilondó kyà wáfurù`
Tenebrionidae (19)	irimbòchò´, otu´
Trogostidae (4)	olotù´, otu´, irimbòchò´
Dermaptera	
Forficulidae	
Bormansia africana Verh.	kiasánà´, ndasá-kùví´
Anisolabis felix Burr.	kiasánà´, ndasá-kùví´
Diptera	
Anthomyidae	
Glossina sp.	mbung'ò´
Asilidae	
Progonistes athletes Speiser	kifi´
Chloropidae	
Epimadiza hirta Mallach	nzi´
Melanochaeta vulgaris Adams	nzi´
Culicidae	
Aedes sp.	kipanù´
Anopheles demeilloni Evans	mbuwù`
Pyretophorus costalis Lw.	mbuwù`
Diopsidae	
Diopsis longicornis Macquart	mbuwù`, nzi´
Diopsis thoracica	ikarà-kàrá´
Drosophilidae	
Leucophenga apicifera Adam	surú`
Glossinidae	
Glossina morsitans Westwood	ichong'à`
Muscidae (7)	nzi´
Otitidae	
Physiophora clausa Macquart	nzi´
Phoridae	
Megaselia sp.	nzi´
Psychodidae	
Psychoda sp.	surú yà chòròní´
Syrphidae (4)	nzi´
Tabanidae (7)	ichong'à`
Tachynidae (3)	irimbòchò´
Tephritidae (2)	nzi´
Tipulidae (1)	kiwuwúnà`, mbuwù`. kimdahà`, idangàshà lyà njá´
Ephemeroptera	
Caenis sjöstedti Ulmer (Juv.)	kimnorà´
Heteroptera	
Aradidae	
Neuroctenus caffer Stål	kivirò`, (shi)kidutsa
Belostomatidae	
Hydrocyrius colombiae Spinola	mdahà`, irukà´
Coreidae	
Acanthomia tomentosicollis Stål	mdahà`, kirimbò`
Anoplocnemis curvipes Fabricius	mdahà`, kirimbò`
Anoplocnemis dallasiana Let. & Sev.	mdahà`, kirimbò`
Anoplocnemis montadorii Distant	irimbòchò´, mbuhúdû´
Cletus caffer Stål	irimbòchò´, mdahà`, mvià``, kirimbò`
Leptocorisa sordida Bl.	kimdahà`
Liorhyssus sp.	mdahà`, kirimbò`
Plectropoda bicolour Haglund	mdahà`, irumùnù`, kirimbò`
Rhyticoris terminalis Burmeister	isolònyà´, mdahà`
Gerridae	

Metrocoris distanti Kirkaldy	kisoróvì`
Lygaeidae	
Graptostethus servus Fabricius	isolònyà´, irombòchà`
Lygaeus mentis-lunae Berg	kirimbò`
Nysius binotatus Germar	irimbòchò´
Oncopeltus famelicus Fabricius	mdahà`, kirimbò`
Nepidae	
Laccotrephes vicinus Signoret	mdahà`, irukà´
Pentatomidae	
Acrosternum pallido-conspersum St.	imamdashù´
Antestia lineaticollis	kimatírà`
Antestiopsis orbitalis bechuana	kimatírà`, kirehérèhé`
Antestiopsis variegata	kimatírà`
Aspavia pallidispina Stål	kirimbò`
Aspavia sp.	irimbòchò´, mvià``, ifumbò`, kirimbò`
Atelocera captoria Germar	irimbòchò´, kirimbò`
Boerias sp.	irimbòchò´, kirimbò`
Calidea bohemani Stål	irimbòchò´
Calidea dregii Germar	irimbòchò´
Carbula carbula Distant	kirimbòchò´, kirimbò`
Cryptacrus comes Fabricius *princeps* Horv.	imamdashù´
Cryptacrus comes Fabricius *rufopictus* Walker	imamdashù´, irimbòchò´
Dismegistus sanguineus De Geer	irimbòchò´
Dryadocoris apicalis Herrich-Schaeffer	mvià``
Halyomorpha viridescens Walker	imamdashù´
Macrorhaphis dallasi Schouteden	irimbòchò´, kirimbò`
Macrorhaphis spurcata Walker	imamdashù´
Nezara viridula Linné	irimbòchò´, kirimbò`, imamdashù´
Piezosternum calidum Fabricius	irimbòchò´, kirimbò`
Piezosternum fallax Breddin	irimbòchò´, kirimbò`
Sphaerocoris annulus Fabricius *ocellatus* Klug	irimbòchò´, kirimbò` kimatírà`, imamdashù´
Sphaerocoris testudo-grisea De Geer	irimbòchò´, kirimbò`
Plataspidae	
Brachyplatys palliceps Fabricius	irimbòchò´, mvià``
Coptosoma puncticeps compunctum Mont.	irimbòchò´, kirimbò`
Libyaspis punctata Leach	mvià``, irimbòchò´, imamdashù´
Pyrrhocoridae	
Dysdercus cardinalis Gerstaecker	imamdashù´, kimaà-sùrú`
Dysdercus orientalis Schouteden	mdahà`, kirimbò`
Reduviidae	
Cerilocus sp.	kimaà-sùrú`, kimatírà`
Platymeris biguttata Linné	irimbòchà`, iringòchì`
Homoptera	
Aphidae (4)	kimambà`
Cercopidae	
Hemitriecphora sp.	irombòchà lyà núkà`
Locris vulcani Jacoby	mvià`, irombòchà lyà núkà`
Ptyelus flavescens Fabricius	mvià`
Ptyelus grossus var. *eburneus* Walker	mvià`
Triechoras sp.	mvià`, irombòchà lyà núkà`
Cicadidae (5)	mvià`
Flatidae (1)	mvià`, ilangameto
Fulgoridae (4)	mvià`, ilangameto
Membracidae (5)	ikrupu
Hymenoptera	
Anthophoridae	
Xylocopa inconstans Sm.	irimbòchò´
Xylocopa caffra Linné	irimbòchò´
Xylocopa inconstans Sm.	irimbòchò´
Xylocopa nigrita Feb.	irimbòchò´
Xylocopa olivacea Fahraeus	irimbòchò´
Xylocopa rufoflava De Geer	irimbòchò´
Apidae	

Allodape sp.	irimbòchò´, kifi´
Apis mellifera monticola Latreille	njukî`
Megachile antinorii Grip.	irimbòchò´, kifi´
Meliponula (Axestotrigona) ferruginea (Lepeletier)	losì´, nyorì`
Chalcididae (3)	inunù`, kifi´
Eurytomidae (1)	kifi´
Formicidae	
Aenictinae	
Aenictus sp.	mrakò´
Dorylinae	
Dorylus cf. *nigricans* Illiger ssp. *burmeisteri* Shuckard (Arbeiter, Soldaten)	mbomé´
Dorylus cf. *affinis* Shuckard (worker. soldier)	mrakò´
Dorylus helvolus Linné (male)	kiwuwúnà`
Formicinae	
Camponotus sp. A	ikarà-kàrá´, iring´o, inunù`, sangù´, irumna?
Camponotus sp. B	inunù`, irumùnù`, susá`
Camponotus sp. C	ikarà-kàrá´, inunù`, iruí-rùí`, irumùnù`
Camponotus sp. C ?	ilondò´, ikarà-kàrá´
Camponotus sp. D	inunù`, ikarà-kàrá´, sangù´
Camponotus sp. E	inunù`, ikarà-kàrá´, iruí-rùí`
Camponotus sp. ?	inunù`, iruí-rùí`
Myrmicinae	
Crematogaster cf. *ferruginea* Forel	mambò`, sangù´
Myrmica cf. *natalensis* Santschi	irong'o?, susá`
Myrmica cf. *rugulosoides* var *striata* Finzi	sangù´
Myrmica cf. *striatula* Nylander	inunù`, sis`mèsì` (swah.)
Oecophylla smaragdina Fabricius	ikarà-kàrá´
Pheidole cf. *megacephala* Fabricius	susá`
Polyrhachis militaris Fabricius	inunù`
Polyrhachis revoili André	sis`mèsì` (swah.)
Tetramorium sp.	susá`
Ponerinae	
Pachycondyla analis Latreille	ilondò´
Plectroctena mandibularis Smith	ilondò´, ilondò-lóndò´
Ichneumonidae (13)	kifi´, mdahà`
Mutilidae (2)	inunù`, kifi´
Nomadidae (1)	inunù`, kifi´
Pompilidae (1)	mdahà`, kifi´
Scoliidae (1)	kifi´, mdahà`, nyorì`
Sphecidae	
Ammophila punctaticeps Arn.	mdahà`, kifi´, kimdahà`
Cerceris iniqua Kohl ssp. *cratocephala* Cam.	mdahà`
Chalybion spinolae Lep.	kifi´
Padolonia canescens Dahl	kiwuwúnà`, kifi´, kifi´, mdahà`
Sphex bohemani Dahl	mdahà`, kifi´
Vespidae	
Belonogaster dubius Kohl	kifi´ kya mboho
Belonogaster griseus Fabricius	kifi´, kifi kyá mbôhó`
Belonogaster sp., Larven	ianá`
Ropalidia sp.	kifi´
Synagris neguis Buyss.	mdahà`, kifi´
Lepidoptera	
Arctiidae (7)	itandáwùrí `, kiwuwúnà`
Bombycidae (1)	itandáwùrí `, kiwuwúnà`
Brahmeidae (1)	itandáwùrí `, ikongálìmá`
Cossidae (3)	itandáwùrí `, kiwuwúnà`
Danaidae (2)	itandáwùrí `

Eupterotidae (5)	itandáwùrí `, ikongálìmá`
Geometridae (6)	itandáwùrî`, ikongálìmá`
Hesperidae (1)	itandáwùrî`
Lasiocampidae (17)	itandáwùrî`, itandáwùrí` kiihútsù´
Limacodidae (2)	itandáwùrî`, kiwuwúnà`
Lycaenidae (6)	itandáwùrî`
Lymantriidae (6)	itandáwùrî`, kiwuwúnà`
Metarbelidae (1)	itandáwùrî`, imchadò`
Noctuidae (10)	itandáwùrî`
Spodoptera exempta Walker	ohonjó´
Spodoptera exigua Hübner	ohonjó´
Notodontidae (5)	itandáwùrî`, kiwuwúnà`
Nymphalidae (18)	itandáwùrî`
Melanitis leda leda Linné	itandáwùrí `, ikungù`
Papilionidae (6)	itandáwùrî`
Pieridae (8)	itandáwùrî`
Pyralidae (1)	itandáwùrî`, itandáwùrí` kiihútsù´
Saturniidae (25)	itandáwùrî`, ikongálìmá`
Sesiidae (2)	itandáwùrî`, irimbòchà`, iringòchì`
Sphingidae (26)	itandáwùrî`, itandáwùrí` kiihútsù´
Syntomidae (4)	itandáwùrî`, kiwuwúnà`
Zygaenidae (3)	itandáwùrî`, kiwuwúnà`
Neuroptera	
Myrmeleonidae	
Macroleon validus Mcl.	idangàshà`, isidi-memba, mdahà`
Macroleon validus Mcl., juv.	kidutsá`, kivirò`
Odonata	
Lestidae	
Lestes sp.	mdahà`, kerengende?
Libellulidae	
Orthetrum sp.	kerengende?, dudumisi (kisw.)
Blattodea	
Blaberidae	
Cyrtotria sp.	itarìwò´
Leucophaea maderae Fabricius	itarìwò´
Nauphoeta cinerea Olivier	injè`, itarìwò´
Blatellidae	
Blatella germanica Linné	injè`
Blattidae	
Deropeltis barbeyana Saussure	itimbolo?, irimbòchò´
Deropeltis austraniana Saussure	injè`, itarìwò´
Mantodea	
Mantidae (7)	kimanjùo-kùdu´
Phasmida (3)	kinatsù´, kimanjùo-kùdu´
Saltatoria	
Caelifera	
Acrididae	
Acridinae	
Acrida sulphuripennis Gerstaecker (juv.)	ndatàrì`, olindó`
Acrida sulphuripennis Gerstaecker	olindó`, ihuwa?, senènè`, ochingó´
Coryphosima stenoptera Walker	ndatàrì`, kikombá-mùwalá´
Duronia chloronota Stål	ndatàrì`
Gymnobothroides levipes Karsch	ndatàrì`
Gymnobothrus lineaalba Bolivar	ndatàrì`
Odontomelus brachypterus Gerst.	ndatàrì`
Uganda kilimandjaricus Sjöstedt	nzihè`
Oedipodinae	
Acrotylus patruelis Herrich-Schaeffer	ndatàrì`
Aiolopus thalassinus Fabricius	ndatàrì`
Gastrimargus africanus Saussure	inyerì´, kimamtsaná´
Gastrimargus verticalis Saussure	nzihè`, ifaámàyé´, inyerì´, ndatàrì`
Heteropternis couloniana Saussure	ndatàrì`, nzihè`
Humbe tenuicornis Schaum	orimòngò´, orikòngò`
Jasomenia sansibara (Karsch)	ndatàrì`
Morphacris fasciata Thunberg	ndatàrì`
Paracinema tricolour Thunberg	ndatàrì`, indí´, senènè`
Trilophidia conturbata Walker	ndatàrì`
Calliptaminae	
Acorypha laticosta Karsch	msesèà´, nzihè`, iring'ò`
Catantopinae	
Abisares viridipennis Burmeister	kisesè`, ndatàrì`
Diabolocatantops axillaris saucius (Burmeister)	ndatàrì`
Eupropacris vana Karsch	kikombá-mùwalá´
Hadrolecocatantops kilimandjaricus Ramme	ndatàrì`, nzihè`
Ixalidium sjöstedti Kevan	ndatàrì`
Phaeocatantops decoratus Gerstaecker	ndatàrì`
Coptacridinae	
Parepistaurus deses Karsch	ndatàrì`
Cyrtacantharidinae	
Acanthacris ruficornis Stoll	ifaámàyé´, itaràhò´, nzihè`
Cyrtacantharis tartarica Linné	ndatàrì`, nzihè`, msesèà´, itaràhò´, itaráfùò`, kilalátsò´
Kraussaria deckenii Kevan	orimòngò´, orikòngò`
Ornithacris cyanea Stoll	imamkuyu`, orikòngò`
Eyprepocnemidinae	
Eyprepocnemis plorans Charp.	ndatàrì`, kimamtsaná´
Oxyaeida brachyptera Miller	inyerì´
Taramassus cunctator Karsch	ndatàrì`, inyerì´, ngalìà´ (Kibosho)
Metaxymecus gracilipes Brancsik	ndatàrì`, msesèà´
Oxyinae	
Oyxa hyla hyla Serville	ndatàrì`
Gomphocerinae	
Truxalis burtti Dirsh	senènè`
Eumastacidae (Thericleinae)	
Chromothericles kanga Sjöstedt	ndatàrì`
Lophothericles carinifrons Karsch	ndatàrì`, kitangà`
Lophothericles kongoni Sjöstedt	ndatàrì`
Plagiotriptus hippiscus Gerstaecker	orikòngò`
Lentulidae	
Altiusambilla modicicrus Karsch	ndatàrì`
Usambilla olivacea Sjöstedt	ndatàrì`, itangà`
Pyrgomorphidae	
Atractomorpha acutipennis Guérin-Melneville	irengo, senènè`
Chrotogonus hemipterus Schaum	ndatàrì`, njechérî´
Dictyophorus griseus Reiche & Fairmaire	imtangà`, itangà`, itangàwàsí`
Dictyophorus griseus Reiche & Fairmaire, juv.	itangà`, imamtangà`
Parasphena meruensis Sjöstedt	itangà`, mtangà`
Parasphena pulchripes Gerstaecker	itangà`
Phymateus aegrotus Gerstaecker	mtangà`, itangà`, mtangàwàsí`
Phymateus viridipes Stål	mkawàsí`, mtangàwàsí`, itangà`, mtangà`
Phyteumas purpurascens (Karsch)	mkawàsí`, mtangàwàsí`, itangà`, mtangà`
Pyrgomorpha conica (Olivier)	ndatàrì`
Zonocerus elegans Thunberg	imtangà`, itangà`
Zonocerus elegans Thunberg, juv.	mtangà`, itangà`
Tetrigidae	

Dasyleurotettix infaustus (Walker)	ndatàrì`
Unterordnung Ensifera	
Gryllacridae	
Gryllacris sp.	njechérî´
Gryllidae (9)	njechérî´
Oecanthus sp.	njechérî´
Gryllotalpidae	
Gryllotalpa africana Beauvois	kirukà´
Heterodidae (4)	kiihútsù´
Tettigoniidae	
Conocephalinae	
Anthracites montium Sjöstedt	njechérî´
Conocephalus conocephalus Linné	senènè`, olindó`
Conocephalus iris Serville	senènè`, olindó`
Conocephalus maculatus Le Guillon	njechérî´, ndatàrì`
Megalotheca longiceps Perringuey	senènè`
Phlesirtes kibonotensis Sjöstedt	njechérî´, ndatàrì`
Phlesirtes kilimandjaricus Sjöstedt	njechérî´, ndatàrì`
Ruspolia differens Serville	senènè`, olindó`
Phaneropterinae	
Arantia fasciata (Walker)	senènè`
Eurycorpha varia Brunner	senènè`, olindó`
Horatosphaga heteromorpha Karsch	senènè`, olindó`
Horatosphaga heteromorpha Karsch, juv.	senènè`, njonò`
Melidia kenyensis Chopard	senènè`
Monticolaria kilimandjarica Sjöstedt	ndatàrì`, imlaì´, njechérî´
Peronura clavigera Karsch	ndatàrì`
Phaneroptera sparsa Stål	olindó`
Pseudophyllinae	
Acauloplax exigua Karsch	olindó`
Phthiraptera	
Anoplura	
Pediculidae	
Pediculus captitis De Geer	nda´
Pediculus humanus Linné	nda´
Mallophaga	
Menoponidae	
Meopon gallinae Linné	titìrí`
Siphonaptera	
Pulicidae	
Pulex irritans Linné	sawà`
Ctenocephalides felis Bouché	sawà`