Agroforestry Systems 2: 177–186.

Plant species in the Kilimanjaro agroforestry system

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Key words: Agroforestry, multipurpose plants, multiple cropping, kilimanjaro, Chagga home gardens.

Abstract. An inventory of plant species was conducted on farms, farm boundaries and homesteads in the Kilimanjaro agroforestry system. The survey covered 30 farms in 6 villages in Hai District on the slopes of Mount Kilimanjaro, Tanzania. Over 100 plant species spread over 40 families were identified and their uses obtained through interviews with farmers. The species identified include 53 tree species, 29 food crop species, 21 non-woody plants of economic value and 8 weed species. The food crops, trees and other economically useful plants are carefully chosen by the local farmers and intimately intercropped on the same unit of land. In most cases, the plants had two or more uses of which food, fuelwood, medicine, poles, timber and fodder were the most important.

1. Introduction

In most of the tropics, selected tree species always form a component of the multiple cropping systems in farms and in rangelands. These multi-cropping systems (agroforestry systems) have been the subject of recent discussion among agronomists, foresters and animal husbandry specialists [3, 5, 9, 11], and a few such agroforestry systems have been described in detail [8, 16].

A recent study on the Chagga homegardens in northern Tanzania brought out the salient operational aspects and functional characteristics of that traditional agroforestry system [4]. As a follow-up, an inventory of plant species was undertaken in 30 farms and their surrrounding in the Chagga area on the slopes of Mount Kilimanjaro, and this paper summarizes its results.

2. The study area

Mount Kilimanjaro is in Tanzania at 2.9–3.3° S latitude and 37–37.5° E longitude. Its peaks is the highest mountain in Africa, rising to 5895 m.a.s.l. The study was conducted on the southern slope of the mountain in Hai Mashariki Division. The area surveyed rises from 800 to 2500 m.a.s.l.

Contribution No. 3 of the series on Agroforestry System Descriptions under ICRAF's AF Systems Inventory Project, funded partially by the United States Agency for International Development (USAID) (see Agroforestry Systems 1(3), 269–272, 1983 for project details). Series editor: P.K.R. Nair, ICRAF

The slopes of Mount Kilimanjaro have a mild climate with mean annual temperatures of 22 °C at 800 to 1000 m.a.s.l. and 18 °C at 2000 m.a.s.l. The annual total rainfall ranges from 800 mm at lower altitudes to over 2000 mm at 2500 m.a.s.l. The rainfall is bi-modal falling between October and June with a dry spell in January and February. Soil types in the area have already been listed [4]. The population density on the slopes of Mount Kilimanjaro is 190 people/km^2 with an annual growth rate of 3.7% [15]. Land is highly fragmented giving an average family farm size of 0.6 ha. This has led to a highly intensive mixed farming system with multiple cropping as its mainstay [10].

3. Method of study

An inventory of plant species was conducted on farms, farm boundaries and around homesteads in 30 subjectively selected farms. Five farms were selected from each of the following villages, Mwasi Kusini, Mwasi Kaskazini, Kushimundu, Mruwia, Kyaseni and Materuni in the study area, as shown in Figure 1.

Plant species were identified by us. Herbarium samples are kept at the National Forestry Herbarium, Tanzania Forestry Research Institute, Lushoto. Data on the local names and uses of the plant species were obtained through interviews with farmers.

4. Results and discussion

Plant species identified and their economic importance are presented in Table 1. A total of 111 plants species spread over 42 families were identified. They include 53 tree species, 29 food crop species, 21 economically useful non-woody plant species and 8 weed species. Except for the weeds, the other plant species are carefully interplanted on the same unit of land to form a very dense multistorey ecosystem as described in the system description [4]. Most of the plant species are maintained in the farm for two or more uses. For the trees, the main uses were fuelwood (90% of the tree species), medicines for humans and livestock (30% of the tree species), poles (25% of the tree species), shade (24% of the tree species), timber production (23% of all the tree species), fodder production (10% of all the tree species), other uses (19% of all tree species). Nearly all the non-woody plant species and climbers are grown for fodder or medicinal purposes.

The use of nearly all the trees to provide fuelwood is a reflection of the importance of this resource for the day-to-day life of rural communities in the tropics [2].

Nearly 30 food crop species are used in the multicropping system on the same unit of land. In one of the surveyed farms (2 ha in size), more than 15 food crop species were planted. This phenomenon is very different from the

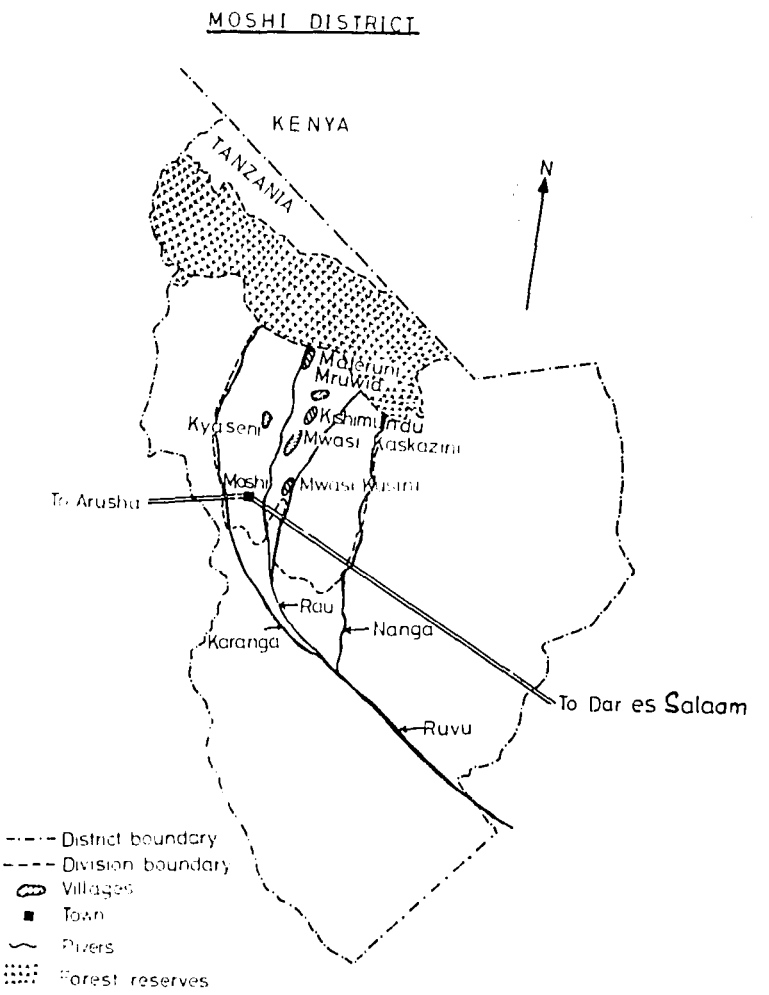

Figure 1. Location of villages sampled for this study.

conventional two-crop intercropping that is often reported in the literature (for example, 1, 7, 12, 14), and provides the farmer with the insurance for basic necessities that is so crucial under poor economics and the vagaries of climate.

This inventory brings out for the first time the totality of plant species used in the multicropping as practised at the farm level in the region. Most of these species are under-exploited and their role and importance in the rural communities little understood by outsiders. Undoubtedly, one of the opportunities in agroforestry lies in exploiting the vast potential of such species, large numbers and forms of which can be found to exist in the various localized agroforestry systems around the world [6, 13].

Table 1. Plant species in the Kilimanjaro agroforestry system, Northern Tanzania

Family name	Botanical name	Common nane	Vernacular name	Uses	Remarks
Alangiaceae	*Alangium chinense*		Mringonu	Fuelwood, fodder and shade	fast-growing tree to 25 m
Amaranthaceae	*Achyranthes aspera*		Kisoka	Fodder, medicinal	shade tolerant shrub
	Amaranthus dubius		Shaana	Vegetable	
Anacardiaceae	*Anacardium occidentale*	cashew	Mkorosho	edible fruit and seed, fuelwood	tree to 12 m
	Mangifera indica	mango	Mwembe	edible fruit, fuelwood	tree to 20 m
	Sorindeia madagascariensis		Mngwera	shade, fuelwood & edible fruits	tree 10–15 m
Annonaceae	*Annona muricata*		Mstafeli	edible fruits, fuelwood	tree 5–8 m
	Uvaria sp.		Mrisirisi	timber and fuelwood	woody climbers, shrub or small tree
Apocynaceae	*Rauwolfia caffra*		Msesewe	timber, fuelwood, catalyst for brewing, medicinal	tree 12–20 m
	Tabernaemontana usambarensis		Mracha	fuelwood, medicinal	
Araceae	*Colocasia esculenta*	taro	Maduma	edible roots	
Araliaceae	*Cussonia holstii*		Mnengere	fodder	tree to 8 m high
Balsaminaceae	*Impatiens kilimanjari*		Sunguala	weed, ornamental	
Bignoniaceae	*Jacaranda acutifolia*		not available	shade, fuelwood, ornamental	tree to 12 m
	Kigelia africana	sausage tree	Imomo	fuelwood, years and sponges from fruits	tree to 6–15 m
	Markhamia Platycalyx		Mtarawanda	timber, fuelwood, poles	tree to 22 m
Boraginaceae	*Cordia abyssinica*		Mringaringa	timber, shade, fuelwood, fodder	tree to 20 m
	Ehretia cymosa		Mnemvu	poles, medicinal	
Bromeliaceae	*Ananas comosus*	pineapple	Mnanasi	edible fruits	
Burseraceae	*Commiphora zimmermannii*		Mfifina	fodder	tree 10–20 m
Caricaceae	*Carica papaya*	pawpaw	Mpaipai	edible fruits	
Commelinaceae	*Commelina latifolia*		Torontoro	fodder	rambling herb

Compositae	*Ageratum conyzoides*		Mafuna	fodder	shrubs
	Conyza sumatrensis		Inanzie	weed	
	Galinsoga parviflora		Shimakamaka	vegetable	
	Helichrysum spp.		–	weed	herbs/shrubs
	Senecio spp.		Ifuifui	medicinal	
	Vernonia subuligera		Iduhuduhu	medicinal, weed	shrub or small tree to 6 m
Convolvulaceae	*Ipomoea batatas*	sweet potato	Shisowia	edible roots, vegetable	
Cruciferae	*Brassica oleracea*	cabbage	Kabichi	vegetable	
Cucurbitaceae	*Telfairia pedata*		Makungu	fat from seed	climber with stems to 30 m long
Dioscoreaceae	*Dioscorea alata*	yam	Ngao, Shia	edible tubers	
	D. bulbifera	yam	Nduu	edible tubers	
Ebenaceae	*Diosy pros mespiliformis*		Msindesinde	timber, fuelwood	tree to 20 m
	Euclea divinorum		Mkinyanyi	fuelwood, red dye from bark	shrub or small tree
Erinaceae	*Agauria salicifolia*		Not available	fuelwood	tree 12–15 m
Euphorbiaceae	*Bridelia micrantha*		Mmarie	fuelwood, poles, withies, fodder	tree to 15 m
	Croton macrostachyus		Mfurufuru	shade, fuelwood & goat fodder	tree to 15 m
	Jatropha curcas		Mchimbakaburu	boundary and grave marking	tree to 6 m
	Manihot esculenta	cassava	Muhogo	edible root, vegetable	shrub to 4.5 m
	Maragaritaria discoidea		Mshamana	fuelwood, poles, fodder	
	Ricinus communis	castor oil tree	Mbarika	purgative oil, medicinal	short lived shrub to 6 m
	Synadenium volkensii		Mracha	for making graves and boundaries, poisonous sap	tree with fresh branches
	Tragia brevipes	stinging nettle	Kimangima Shiwawo Kilachia		

Table 1. (continued)

Family name	Botanical name	Common name	Vernacular name	Uses	Remarks
Gramineae	*Eleusine coracana*	finger millet	Mbege	grains are used in the preparation of local brew (mbege) and making porridge	
	E. indica,				
	E. africana	fowl-foot grass	Kikwale	pasture grass	
	Panicum monticola		Mlaa	pasture grass	
	Saccharum officinarum	sugar cane	Miwa, Mauwa	edible stem	
	Tripsacum laxum	Guatemala grass		fodder	
	Vetiveria zizanioides	vetiver	Khuskhus grass (manzao)	thatching, anti-erosion	
	Zea mays	maize	mahindi, meemba	staple food	
Labiatae	*Geniosporum rotundifolium*		Isuwambewa	weed	
	Hoslundia opposita		Tarambe	hedges, fodder	
	Iboza riparia		Mombo, Ombo	medicines for stomach ache & fever	
	Ocimum suave		Ikachi	medicine for stomach ache	
Lauraceae	*Persea americana*	avocado	Mparachichi	edible fruits, shade, fuelwood	
Leguminosae (Caesalpinioideae)	*Caesalpinia decapetala*	mauritius thorn	King'utuo	boundary marking, hedges	thorny shrub
	Cassia didymobotrya		Iwinu	purgative, antihelminthic leaves	shrub to 6 m
	C. floribunda		Ototo	weed	
Leguminosae (Mimosoideae)	*Albizia Schimperiana*		Mruka	fuelwood, shade	tree 20–30 m
	A. petersiana		Muula	poles, fuelwood, shade	tree to 12 m
	Newtonia buchanani		Mkufi	timber, shade, fuelwood	

Leguminosae					
(Papilionoideae)	*Calpurnia aurea*		Mletangawo	poles, fuelwood, antihelminthic, insecticide	
	Erythrina abyssinica		Mriri	shade, fuelwood	
	Phaseolus vulgaris	beans	Maharagwe	food	
	Pisum sativum	peas	Njegere	vegetable	
	Tephrosia aequilata		Urutupa	fuelwood, poisonus seed	
	Vigna unguiculata	cowpea	Kunde, Soko	food	
Liliaceae					
(Alloideae)	*Allium cepa*	onion	Vitunguu	spice	
Liliaceae					
(Asphodeloideae)	*Aloe volkensii*		Sale la njofu, Iratune	grave marking, sap medicine for wounds	
Liliaceae					
(Dracaenoideae)	*Dracaena afromontana*		Masale	fence, boundary marking and grave marks	
Malvaceae	*Sida acuta*		Mlenda	fodder	
Melliaceae	*Trichilia emetica*		Mbomu	timber, fuelwood, poles, shade	
	Turraea robusta		Mokyanyama	fuelwood	
Melianthaceae	*Bersama abyssinica*		Mchakuru	timber, shade and fuelwood	
Menispermaceae	*Stephania abyssinica*		not available	weed, climber	
Moraceae	*Artocarpus heterophyllus*	Jack fruit	Mfenesi	edible fruits, fuelwood	tree 10 -20 m
	Chlorophora excelsa			timber	tree to 35 m+
	Ficus exasperata	fig	Msasa	shade, fuelwood	tree to 20 m
	F. natalensis		Mfumu	shade, ritual tree	tree 18–20 m
	F. vallis-choudae		Mkuu	shade, fuelwood	tree 18–20 m
	Morus alba	mulberry	Ipala, Wero, Iwero	boundary marking, hedges, edible fruits	tree to 15 m
Musaceae	*Musa nana*	banana/	Kiguruwe	edible fruits, fodder	
	M. paradisiaca	Plantain	Mshare	fodder	

Table 1. (continued)

Family name	Botanical name	Common name	Vernacular name	Uses	Remarks
Myrtaceae	*Eucalyptus camaldulensis*		Mkaratusi	fuelwood, poles, crushed leaves relieve colds	
	E. citriodora		Mkaratusi	fuelwood, poles, crushed leaves relieve colds	
	E. grandis		Mkaratusi	fuelwood, poles, crushed leaves relieve colds	
	E. robusta		Mkaratusi	fuelwood, poles, crushed leaves relieve colds	
	E. saligna		Mkaratusi	fuelwood, poles, crushed leaves relieve colds	
	Myrica salicifolia		Mkaratusi	fuelwood, medicinal	
	Psidium guajava	guava	Mpera	edible fuits, fuelwood	tree to 8 m
			Mwisi, Mmasi	fuelwood, edible fruits	tree to 25
Oleaceae	*Olea capensis*		Loliondo, Mchio	timber, fuelwood, poles, withies	tree 20–30 m
Passifloraceae	*Passiflora edulis*	Jack fruit	Isapiku	edible fruits	climber
Proteaceae	*Grevillea robusta*	Australian silky oak	Mkawilia	timber, shade, fuelwood	tree to 30 m
Rosaceae	*Eriobotrya japonica*	loquat	Sambia?	edible	
			Mstafeli	edible fruits, fuelwood	tree to 7.5 m
	Rubus steudneri		Mawero	hedge, edible fruits	shrubs
Rubiaceae	*Coffea arabica*	coffee	Mkahawa	coffee, fuelwood	
	Pentas lanceolata		not available	weed, ornamental	
	Vangueria madagascariensis		Ndawiro, Ndoro	fuelwood, edible fruits	tree to 10 m
Rutaceae	*Citrus limon*	lemon	Mlimau, Ndimu	edible fruits, fuelwood	
	C. sinensis	sweet orange	Mchungwa, Ichungwa	edible fruits, fuelwood	

Solanaceae	*Capsicum annum*	red pepper	Mpilipili	spices	
	C. frutescens	bird chillies	Ngogwe	edible fruits	
	Datura arborea		not available	boundary marking	tree to 7 m
	Lycopersicon esculentum	tomato	Mnyanya	edible fruits	
	Nicotiana tabacum	tobacco	Mbatu	snuff and tobacco	
	Solanum incanum		Ndu	medicine for stomach ache and anti-snake bites	shrub 1–2 m
	S. nigrum		Nafu	vegetable	
Ulmaceae	*Trema orientalis*		Mrisio	fodder, fuelwood	fast-growing tree to 15 m
Verbenaceae	*Lantana camara*		Singarere	hedge, grave marking, weed	shrub 1–2.5 m

Acknowledgements

Financial support to collect the data was provided partly by ICRAF's Agroforestry Systems Inventory Project [6]. Staff of the University of Dar es Salaam participated by permission of Professor M.L. Kyomo, Dean, Faculty of Agriculture, Forestry and Veterinary Science, Morogoro.

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