

Full Length Research Paper

Traditional Agroforestry practices, opportunities, threats and research needs in the highlands of Oromia, Central Ethiopia

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Informal and formal surveys were conducted at Jeldu and Guder district in two peasant associations (PA) of western Shewa zones of Oromia region in 2006/2007. The study was conducted with the objectives to describe and understand indigenous agroforestry practices and identify constraints for natural resources management and propose research agenda in the context of farming system. Informal surveys were implemented through discussion, key informant interview, and physical observation. And formal survey was conducted using structured questionnaires from one hundred households (50 per district). The common agroforestry practices recorded at both study sites were scattered trees on farmlands, trees on gullies, rivers, home gardens, live fence, grazing lands, farm boundaries and around fences. *Hagenia abyssinica*, *Dombeya torrida*, *Maytenus ugaliensis*, *Eucalyptus globulus* and *Buddleja polystacha* are abundant at Jeldu where as *Acacia abyssinica*, *Cordia africana*, *Croton macrostachys*, *Olea africana*, *Eucalyptus camaldulensis*, *Cupressus lusitanica*, *Podocarpus glaucifolius*, *Entada abyssinica*, *Ficus vasta*, *Sesbania sesban*, *Albizia scimperiana*, *Vernonia amygdalina*, *Acacia decurrens*, *Celtis africana*, *Croton macrostachys* and *Myrica salicifolia* are familiar at Guder. Free livestock movement, land shortage, poor access of tree seedlings and termite hazard are the major bottlenecks recorded outside homesteads. Soil erosion, feed shortage, wood shortage and depletion of soil fertility are the critical problems in the study areas. Investigation of feed value and soil improving characteristics are some of the potential indigenous trees and shrubs need a priority research attention. Hence this paper discussed the causes of the aforementioned problems and forwarded relevant recommendation research intervention to be conducted.

Keywords: Traditional farm forestry, farming system, and multipurpose trees.

INTRODUCTION

Agroforestry is the integration of trees/shrubs with crops and/or animals at the same time or in a rotational basis. It has been in use for at least 1300 years (Brookfield and Padock, 1994 in Sanchez, 1995). Agroforestry has both ecological and economical importance to increase productivity of land and sustainability of the environment in developing countries (Bjorn, 1991). Rochelau (1998) stated that multipurpose trees increase soil fertility, provide fuelwood, timber, animal fodder and modify microclimate of the area. Schroeder (1994) discussed the important role of agroforestry systems in keeping carbon in the terrestrial ecosystems and out of the atmosphere.

This is accomplished by preventing further deforestation and by accumulating biomass and soil carbon. Scattered trees on farmlands serve as food, fuel wood, construction wood, fodder, mulch, raw materials for making agricultural implements, household utensils, create employment and income for the farmers (Michael and Peter, 1998). Collection of information on the existing agroforestry practices and identifying its constraints is a prerequisite for agroforestry research and development work in the study areas. Hence, informal and formal survey were conducted in West Shewa zone of Oromia regional state of Guder and Jeldu districts with the objective of describing and understanding indigenous agroforestry practices, identifying and characterizing

major tree species, identifying reasons behind tree planting in the context of the farming system and also identifying and prioritizing major constraints related to tree planting.

MATERIALS AND METHODS

Study site

The study was conducted at Edensegela PA of Jeldu and Berberssa and Dogma PA (Peasant Associations) of Guder district of West Shewa zone of Oromia administrative region. The study site has located with an altitude range of 2400-3000m and 2000-2200m above sea level. In Jeldu, the dominant agricultural crops grown are barely and potato, while at Guder wheat, teff, barley, nigerseed, sorghum, chickpea, maize and lentil are major crops.

Survey procedures

Initially discussions foras were made with PA (Administrations, development agents and experts) in order to identify sites and prioritize agroforestry practices in the study areas. Then potential agroforestry practices within the Weredas were documented and study sites were selected. Checklists were also prepared and informal discussion fora were organized and made. Checklists were further enriched and developed. Moreover, transect walk and observation were employed to collect qualitative information.

Key informants interview

Key informant interview were made with elderly, knowledgeable farmers and few active youth members of the society from female and male-headed farmers. Questionnaire were prepared and pretested before conducting the actual survey. Target areas were identified using criteria's like species diversity, soil type, cropping diversity, pattern, and accessibility to the main roads. Agro- climatic zonations were also considered for target area selection to conduct the formal survey. A total of 100 farm households 50 from Jeldu and 50 from Guder Weredas were randomly selected from list of farm households available in each PA. Enumerators were recruited and trained before the actual interviews were conducted. Then, formal survey was targeted to verify and quantify the informal survey results.

Field direct observation

Field observations were made in order to strengthen the informal survey results there by to develop well-struc

ured questionnaire for formal survey. During field observation potential agro forestry practices were visited in most areas.

Household survey

Household surveys were conducted to collect information from selected individuals. Both women headed and male-headed households were considered for data collection. Besides, the interview encompasses age (young and old) and wealth (medium, poor and rich) categories for interview.

Family composition, farm holding and labor

The average family size recorded was 3 to 7 at Guder and 3 to 8 at Jeldu i.e.48 % and 28 % were from Guder and Jeldu, respectively. The respondents selected as head of the households were illiterate with educational levels of 18 %, 22 %, 4 %, 6 % at Jeldu and 2 %, 24 %, 10 % and 20 % at Guder which corresponds with reading and writing, 1-6th grade, 7-8th grade and high school graduates, respectively. Twelve % of the households at Jeldu and 34 % of the households at Guder were not participated in off farm activities. However, 88 % and 66 % of the households of Jeldu and Guder generated additional income by participating in different off-farm activities. Seventy % of the households of Jeldu and 55 % of the households of Guder had constructed the roof of their houses from iron sheet. The average land holding varies from 0.25-5 ha at Guder and 0.50-6.5 ha at Jeldu.

Crop production

The livelihoods of most farmers depend on crop production and livestock rearing. The major land use types of the study areas are cultivated land, fallow land, waterlogged, woodlot, grazing land and shrub and bush land. Farmers' at Guder grow maize (100 %) and wheat (96 %) and farmers of Jeldu grow barely, wheat, field bean, potato and linseed (82 %). The farmers in both study areas grow crops using both irrigation and rain as a source of moisture. However, farmers at Guder have better access and experiences than farmers at Jeldu. Farmers at Guder grow potato (50 %), onion and tomato (28 %), green pepper (14 %), cabbage (10 %), kale (4 %), lettuce, enset, garlic, sugarcane and various tropical fruit trees (2 %) using irrigation. Besides, farmers at Jeldu grow potato (18 %), onion (6 %) and cabbage (2 %) using irrigation.

Livestock production

The major animals reared in the area are oxen, cows,

Table 1. Endangered tree species in the study areas

Tree species	Jeldu		Guder	
		(%) Respondents	Tree species	(%) Respondents
<i>Prunus africana</i>		14	<i>Cordia africana</i>	68
<i>Juniperus procera</i>		50	<i>Olea africana</i>	36
<i>Hegenea abyssinica</i>		66	<i>Podocarpus glacialiar</i>	70
<i>Olea africana</i>		44	<i>Acacia species</i>	20
<i>Podocarpus glacialiar</i>		36	<i>Croton macrostachys</i>	6
<i>Cordia africana</i>		12	<i>Ficus vasta</i>	16
<i>Maytenus senegalensis</i>		2	<i>Ficus sycomorus</i>	8
<i>Ficus vasta</i>		2	<i>Hegenea abyssinica</i>	12
<i>Dombeya torrida</i>		2	<i>Acacia albida</i>	16
<i>Acacia abyssinica</i>		2	<i>Junipers procera</i>	32
		2	<i>Ficus sycomorus</i>	8

calf, bull, heifer, horse, donkey, sheep, goat and mule. Of the respondents in the study areas that use oxen for ploughing (100 % at Guder) and (80 % at Jeldu) have oxen. Goats are abundant at Guder (58 %) whereas horses are abundant at Jeldu (72 %).

Household income

The majority of the farmers derive their household income by selling agricultural products, animals and animal products. Farmers at Guder generate their income by selling teff, maize, linseed, wheat, nigerseed, sorghum, potato, onion, field bean and tomato. The animals, which are sold at the market are oxen, cow, heifer, bull, donkey, chicken, sheep and goat, and animal products are butter, cheese and milk. Besides, farmers also generate income by selling trees and tree products such as *Eucalyptus camaldulensis*, and *Rhamnus prenoides*, and fruits such as *Citrus sinensis*, *Psidium guajava*, *Persea americana*, *Citrus aurantifolia* and *Citrus medica* sources of income by far. Farmers at Jeldu grow barely, wheat, maize, malt barely, linseed, field pea, onion, potato, field bean, teff, gomenzer, animals and animal products, *Eucalyptus globulus*, *Rhamnus prenoides* and apple.

RESULTS AND DISCUSSION

Status of forest resources

The status of forest resources is decreasing from time to time in the country in general and the study areas in particular. It is believed that forest cover was 40 % of the country before 100 years, and around 2.5 % at present (EFAP, 1994). This is also true in the two study areas. Farmers of the study sites told that historical trends of forest cover were declining from Hailesellasiie to Derg and to EPRDF (Ethiopian Peoples Democratic Republic

Front) regimes. This was inline with the results of (Berhane *et al.*, 2005). Forest depletion resulted in runoff, shortage of construction wood, decline in wildlife, climate change, watershortage, famine, starvation, and decline in crop productivity. Besides, some tree species such as *Podocarpus glacialiar* (70 %), *Cordia africana* (68 %), *Olea africana* (36 %), *Juniperus procera* (32 %), *Acacia abyssinica* (20 %), *Ficus sycomorus* (16 %) and *Hagenea abyssinica* (12 %) at Guder and *Hagenea abyssinica* (60 %), *Juniperus procera* (50 %), *Olea africana* (44 %), *Podocarpus glacialiar* (30 %), *Prunus africana* (14 %) and *Cordia africana* (12 %) at Jeldu are becoming endangered in their locality due to deforestation. This resulted in changing the behavior of farmers towards forest and forest products utilization pattern such as fuel wood, construction wood, walking stick and beehives aspect. These findings are in agreement with the study in central highlands of Ethiopia (Berhane *et al.*, 2003) Table 1.

Seed source and seedling raising

At Jeldu 70, 60, 26 % of the respondents obtain tree seeds by collecting from local mother trees, purchasing from local market and freely provided from WOA (Wereda office of Agriculture) respectively. At Guder 100 % of the respondents obtain locally, 90 % purchasing from local market, 16 % freely provided from WOA and 2 % from other sources (Table 3). Ninety six % of the respondents at Jeldu and 86 % at Guder are voluntary to buy tree seedlings of *Podocarpus glacialiar* (76 %), *Olea africana* (68 %), *Acacia abyssinica* (46 %), *Eucalyptus globulus* (32 %), *Cordia africana* (22 %) and *Haginea abyssinica* (2 %) while farmers at Guder are interested to buy *Eucalyptus camaldulensis* (100 %), *Podocarpus glacialiar* (80 %), *Cordia africana* (72 %), *Olea africana* and *Acacia abyssinica* (44 %) and *Cupressus lusitanica* (6 %) (Table 2). Seventy six % and (92 %) of the respondents at Jeldu and at Guder preferred to plant container seedlings, and

Table 2. Farmers' preference of tree species in the area

Tree species planted	Respondents %	
	Jeldu	Guder
<i>Eucalyptus species</i>	30	100
<i>Podocarpus glacialiar</i>	66	60
<i>Acacia abyssinica</i>	40	52
<i>Cordia africana</i>	10	70
<i>Dovyalis abyssinica</i>	26	78
<i>Cupressus lusitanica</i>	40	88
<i>Chamaecytisus palmensis</i>	74	nill
<i>Sesbania sesban</i>	nill	74
<i>Schinus molle</i>	nill	2

Table 3. Seedling sources of the farmers

Seed sources of the study area	Respondents %	
	Jeldu	Guder
Nearby natural forest	54	24
Model (government) nurseries	30	58
Private nurseries	38	42
Buying from market	66	94
Buying from individuals in the area	46	84

24 % respondents at Jeldu and (8 %) at Guder preferred to plant bare rooted seedlings, because bare rooted seedlings are easy to transport, and cheap in the market.

Seed collection, seedling raising and planting trees

Seedling raising

Raising of tree seedlings was a common practice by farmers in study Weredas. Farmers raise tree seedlings in private nurseries such as *Chamaecytisus palmensis* (74 %), *Podocarpus glacialiar* (66 %), *Acacia abyssinica* and *Cupressus lusitanica* (40 %), *Eucalyptus globulus* (30 %), *Dovyalis abyssinica* (26 %), and *Cordia africana* (10 %). Farmers at Guder preferred to plant *Eucalyptus camaldulensis* (100 %), *Cupressus lusitanica* (88 %), *Dovyalis abyssinica* (78 %), *Sesbania sesban* (74 %), *Cordia africana* (70 %), *Podocarpus glacialiar* (60 %), *Acacia abyssinica* (52 %), and *Schinus molle* (2 %) (Table 2). This is in line with the finding of (Berhane *et al.*, 2004 and 2008). This is due to the species growing faster and moreover, they generate income. Besides, there are a number of constraints recorded in the nursery such as tree seed, water supply, nursery tools and equipments, disease and pest infestation and finally training and awareness level of the farmers.

Tree planting

Tree planting is a common activity carried out in both Weredas. For example, the farmers at Jeldu plant trees from the end of June to mid of July and farmers at Guder planting is done from June to August. The major operations conducted by farmers are weeding, hoeing, manuring, fencing and watering. However, the survival rate of the planted seedlings was very low. Most farmers have positive perceptions towards tree planting and the major constraints recorded at Jeldu were lack of seedling availability (76 %), shortage of land for tree planting (70 %), lack of most preferred tree seedlings (70 %), water shortage (28 %), lack of knowledge, problem of seedling survival, lack of tree seeds (24 %), termite hazard (22 %), animal browsing and trampling 20 %. Likewise, at Guder were lack of availability of the most preferred species (96 %), lack of seedling availability (94 %), shortage of land for tree planting (54 %), termite hazard (50 %), lack of tree seeds (37 %), lack of knowledge (25 %), labour shortage and problem of seedling survival (21 %) animal browsing and trampling (15.4 %), water shortage (13.5 %), and lack of market supply (14 % at Jeldu and 11.5 % at Guder) was also noted. This is similar with the studies conducted at Gallessa and Gariearera (Berhane *et al.*, 2004). Farmers manage seedlings by weeding, cultivation, mulching and construction of temporary shade materials. Weeding is done in September and hoeing in

Table 4. Planting site preferences if seedlings will be given to them

Preferred future planting site	Respondents %	
	Jeldu	Guder
Homestead	72	42
Scattered trees inside farmlands	36	14
Farmbaunadry (border) planting	58	50
Scattered trees on grazing lands	18	14
Degraded lands (eroded) lands	48	64
As live fence	24	58
Woodlot	16	14
Gullies	nill	2

May, June and October. Farmers practiced hoeing during rainy season, mulching during dry season and construction of temporary shade.

With regards to gender, the participation of women in the raising of seedlings, planting weeding, hoeing, protection and selling activities varied from household to household and from place to place. In some households they have a determinant role in the selling and cutting of trees however in most households they have a decisive role in seedling raising, and management activities. But their role was negligible or minimal in the cutting and selling activities of their forest. Seventy two % of the respondents at Guder and 48 % at Jeldu plant trees around their home. Seventy two, 58, 48, 36, 24, 18, 16 and 1 % farmers at Jeldu are prefer to plant seedlings at, homestead, farmbaunadry (border), degraded (eroded land), inside farmland, as live fence, scattered trees on grazing lands, woodlot and gullies respectively. Sixty four, 58, 50, 42, 14 and 2 % farmers at Guder prefer to plant on degraded (eroded) land, as live fence, farmbaunadry (border), homestead, (scattered inside farmland, grazing land, woodlot) and finally at gullies corresponds with respectively of the total respondents. Fifty two % of the respondents at Jeldu and 60 % at Guder were not interested in community planting. This is due to lack of agreement between farmers, high risk of extravagances, and lack of communal land. Farmers at Guder mentioned lack of agreement and negotiations among farmers in relation to management and utilization of the plants. But, some farmers are interested in communal planting. They are interested when communal planting is conducted at riverbanks, gullies and wastelands. Farmers said that bylaws will be drafted for management and utilization of the forests table 4.

Farm forests

Farm forest is the term used to describe all land use systems and practices in which woody perennials are deliberately grown on land used for crops and pasture (EFAP, 1994). In the study areas planting of trees on

cropland are not a common practice due to free grazing problem. However, deliberate leaving of naturally grown trees and shrubs is common. Forty eight % of the farmers at Guder and Jeldu have the habit of tree planting on farmlands. However, 52 % of the farmers have no habit of tree planting on farmlands. Farmers also mentioned the major farm forestry practices in the area are trees planted on degraded land (76 %), farmbaunadry planting (66 %), scattered trees on farmlands (62 %), roadside planting (60 %), stream bank planting (56 %), live fences (46 %), homestead planting (38 %) and woodlot (28 %) at Jeldu. At Guder scattered trees on farmland (90 %), live fences (88 %), roadside and homestead planting (85 %), farmbaunadry planting (75 %) and trees on degraded lands (63 %) are major forestry practices table 5.

Scattered trees on cropland

The practice of growing and maintenances of scattered trees on cropland may be based on protection and management of selected matured trees already on the site (Rocheleau *et al.*, 1988). Trees provide fuel, oil, building poles, fodder or gum and improve soil fertility, conserve soil moisture and improve the microclimate of the area. At Guder planting of trees scattered on cropland is not common. However, deliberate leaving of naturally grown matured trees and shrubs are common. Farmers classified naturally existing trees on cropland in three categories. The first category includes those species that have beneficial effect on soil fertility at Guder; *Croton macrostachys* (90 %), *Acacia abyssinica* (87 %), *Olea africana* (87 %), *Cordia africana* and *Celtis africana* (83 %), *Gliricidia sepium* (64 %), *Psyrdrax schimperiana* (58 %), *Ficus sycomorus* (56 %), *Ensete ventricosum* and *Sesbania sesban* (50 %), *Maytenus senegalensis* (46 %), *Podocarpus glacialiar* and *Albizia scimperiana* (42 %). Similarly tress/shrubs at Jeldu are *Acacia abyssinica* (62 %), *Vernonia auriclifolia* (60%), *Ensete ventricosum* (54 %), *Olinia rochetiana* (48 %), *Buddleja polystacha* (46 %), *Maytenus senegalensis* and *Vernonia amygdalina* (30 %), *Chamaecytisus palmensis* (34 %) respectively. The

Table 5. Farmers ranked out trees that have role on soil fertility improvement

Jeldu			Guder		
Trees grow in the area	Points	Rank	Tree species grow in the area	Points	Rank
<i>Dombeya torrida</i>	49	1	<i>Ensete ventricosum</i>	138	1
<i>Hegenea abyssinica</i>	55	2	<i>Ficus sycomorus</i>	240	2
<i>Maytenus senegalensis</i>	95	3	<i>Sesbania sesban</i>	245	3
<i>Ensete vertricosum</i>	107	4	<i>Croton macrostachys</i>	293	4
<i>Acacia species</i>	127	5	<i>Acacia albida</i>	322	5
<i>Vernonia amygdalina</i>	159	6	<i>Cordia africana</i>	329	6
<i>Buddleja polystacha</i>	170	7	<i>Ficus vasta</i>	361	7
<i>Mayrica salicifolia</i>	168	8	<i>Acacia abyssinica</i>	392	8
<i>Allophylus abyssinica</i>	184	9	<i>Euclea schimperi</i>	405	9
<i>Erythrina brucei</i>	212	10	<i>Vernonia amygdalina</i>	422	10
<i>Leonotis ocyimifolia</i>	254	11	<i>Podocarpus glacialiar</i>	499	11
<i>Commiphora abyssinica</i>	259	12	<i>Albizia schimperiana</i>	552	12
<i>Chamaecytisus palmensis</i>	285	13	<i>Maytenus senegalensis</i>	555	13
<i>Juniperus procera</i>	286	14	<i>Olea africana</i>	577	14
<i>Bersama abyssinica</i>	287	15	<i>Celtis africana</i>	594	15
<i>Stereospermum kunthianum</i>	290	16	<i>Clausena anisata</i>	597	16
<i>Rhamnus prenoides</i>	290	16	<i>Gliricidia sepium</i>	603	17
<i>Ricinus communis</i>	294	17	<i>Olinia rochetiana</i>	608	18
<i>Juniperus procera</i>	300	18	<i>Coffee arabica</i>	636	19
<i>Olea africana</i>	302	19	<i>Rhus glutinosa</i>	638	20
	307	20	<i>Premna schimperi</i>	652	21
			<i>Adhatodea schimperiana</i>	667	22
			<i>Carissa edulis</i>	743	23
			<i>Salix subserata</i>	744	24
			<i>Galenia saxifraga</i>	763	25
			<i>Psydrax schimperiana</i>	770	26
			<i>Aningeria altissima</i>	772	27
			<i>Euphorbia abyssinica</i>	881	28

second category includes those species that have adverse effect on adjacent crops. These are *Eucalyptus camaldulensis* (67 %), *Rhus glutinosa* (31 %), *Podocarpus glacialiar* (29 %), *Ensete ventricosum*, *Coffee arabica* and *Psydrax schimperiana* (25 %), *Olinia schimperiana*, *Dodonea angustifolia* and *Gliricidia sepium* (23 %), *Cupressus lusitanica* (21 %) and *Euphorbia triculai* (21 %) at Guder. While at Jeldu *Eucalyptus globulus* and *Juniperus procera* (8 %), *Myrica salicifolia* and *Leonotis ocyimifolia* (2 %) included in the second category. In the third category those species that contribute to wood production without any clear adverse effect on adjacent crops are *Podocarpus glacialiar* (24 %), *Adhatodea schimperiana* (21 %), *Coffee arabica* (20 %), *Cupressus lusitanica* (14 %) and *Sesbania sesban* and *Clausena anisata* (12 %) at Guder, and *Vernonia amygdalina* (40 %), *Maytenus senegalensis* (38 %), *Senecio gigas* (32 %), *Myrica salicifolia* (28 %), *Dombeya torrida*, *Olinia rochetiana* and *Commiphora haberssinica* (24 %) at Jeldu (Table 6).

Farmers were ranked considering tree species grown in farmlands and their contribution on soil improvement. Accordingly among the tree species grown in farmlands and their contribution on soil improvement farmers were ranked, among the 20th ranked species the first 12 soil improving species at Jeldu in order of priority were *Dombeya torrida*, *Hagenea abyssinica*, *Maytenus senegalensis*, *Ensete ventricosum*, *Acacia abyssinica*, *Vernonia amygdalina*, *Buddleja polystacha*, *Myrica salicifolia*, *Allophylus abyssinicus*, *Leonotis anisata*, *Commiphora habessinica*, and *Chamaecytisus palmensis* and at Guder highly soil improving species from 28th ranked ones in order of priority are *Ensete ventricosum*, *Ficus sycomorus*, *Sesbania sesban*, *Croton macrostachys*, *Acacia albida*, *Cordia africana*, *Ficus vasta*, *Acacia abyssinica*, *Euclea schimperi*, *Vernonia amygdalina*. Which is a good indicator of rich on organic matter and nitrogen (Table 6). In order to come to a conclusion about the importance of the trees for soil fertility further study on the status of soil fertility under the

Table 6. Major tree species scattered on farmlands and farmers perception on their effect

Species scattered on farmlands	Guder			Species scattered on farmlands	Jeldu		
	Supportive	Competitive	No impact		Supportive	Competitive	No impact
<i>Eucalyptus camaldulensis</i>	6	67	nill	<i>Eucalyptus globulus</i>	nill	8	nill
<i>Acacia abyssinica</i>	87	17	nill	<i>Cupressus lusitanica</i>	4	nill	nill
<i>Croton macrostachys</i>	90	6	6	<i>Hagenea abyssinica</i>	4	nill	2
<i>Olea africana</i>	87	6	8	<i>Dombeya torrida</i>	18	nill	24
<i>Cordia africana</i>	83	6	8	<i>Olinia rochetiana</i>	48	nill	24
<i>Adhatodea schimperiana</i>	29	8	21	<i>Maytenus senegalensis</i>	30	nill	38
<i>Ensete ventricosum</i>	50	25	nill	<i>Acacia abyssinica</i>	62	nill	42
<i>Euclea schimperi</i>	39	17	4	<i>Ensete ventricosum</i>	54	nill	4
<i>Clausena anisata</i>	31	10	12	<i>Myrica salicifolia</i>	18	2	28
<i>Acacia albida</i>	40	13.5	8	<i>Buddleja polystacha</i>	46	nill	26
<i>Carissa edulis</i>	29	21	2	<i>Vernonia amygdalina</i>	30	nill	40
<i>Cupressus lusitanica</i>	29	29	14	<i>Rhamnus prenoides</i>	28	nill	14
<i>Podocarpus glacialiar</i>	42	23	24	<i>Senecio gigas</i>	24	nill	32
<i>Glericidia sepium</i>	64	17	8	<i>Chamaecytisus palmensis</i>	34	nill	2
<i>Ficus vasta</i>	39	17	6	<i>Leonotis anisata</i>	4	2	6
<i>Sesbania sesban</i>	50	12	12	<i>Commiphora habessinica</i>	16	nill	4
<i>Celtis africana</i>	83	6	2	<i>Juniperus procera</i>	6	8	2
<i>Maytenus senegalensis</i>	46	25	nill	<i>Bersama abyssinica</i>	20	nill	nill
<i>Coffee arabica</i>	31	15	20	<i>Olea africana</i>	nill	nill	nill
<i>Albizia schimperiana</i>	42	4	6	<i>Pilliosigma thonningii</i>	14	nill	6
<i>Ficus sycomorous</i>	56	21	4	<i>Ricinus communis</i>	nill	nill	2
<i>Euphorbia abyssinica</i>	27	31	10	<i>Vernonia amygdalina</i>	10	nill	8
<i>Rhus glutinosa</i>	35	19	2	<i>Podocarpus glacialiar</i>	6	nill	nill
<i>Premna schimperi</i>	35	23	nill	<i>Vernonia auriculifolia</i>	60	nill	4
<i>Olinia rochetiana</i>	31	23	nill	<i>Ficus sycomorous</i>	nill	nill	24
<i>Dodonea angustifolia</i>	40	25	6	<i>Rhus glutinosa</i>	nill	nill	4
<i>Psydrax schimperiana</i>	58	19	2				2
<i>Vernonia amygdalina</i>	27	19	nill				
<i>Galenia saxifraga</i>	37	17.3	4				
<i>Ficus vasta</i>	29	13.5	2				
<i>Aningeria altissima</i>	27		2				
<i>Mayrica salicifolia</i>	37		6				
<i>Acacia decurrense</i>	31		6				

tree and its effect on productivity of barley is necessary. This agrees with the finding of the study conducted at Galledda and Gariearera (Berhane *et al.*, 2004).

Trees on home garden

Homestead planting is an old practice that involves the use of land on tree planting. Major purposes of the trees around houses include fruit, fodder, wood production and ornamental. Trees occur in home gardens in almost every ecological zone and farming systems. This is based on farmers' preferences and the experience they inherited from their parents. Farmers of the study site

plant tree/shrub species in home gardens i.e. 85 % of the respondents at Jeldu and 80 % at Guder have trees on their homesteads. The survival and performance of seedlings in the open field was lower at Jeldu than at Guder due to frost hazard. The result is similar with the findings of the study conducted at similar agroecological zone of Galledda (Birhane *et al.*, 2004, 2008). The most commonly grown trees near homesteads both planted artificially and grown naturally at Jeldu are *Myrica salicifolia* (60 %), *Buddleja polystacha* (56 %), *Allophyllus abyssinicus* (48 %), *Dombeya torrida* and *Commiphora habessinica* (44 %), *Acacia abyssinica* (28 %), *Eucalyptus globulus* (26 %), *Hagenea abyssinica* (14 %), *Vernonia amygdalina* (8 %), *Commiphora habessinica* (6

Table 7. Response of farmers in the managements and protection of naturally grown trees on homesteads

	Yes	No
Jeldu	85	15
Guder	80	20

Table 8. Farmers preferences criteria's of species selection for live fence

Criteria's for selection	Respondents %	
	Jeldu	Guder
Coppicing ability	66	100
Broadleaved nature	44	74
Thick and dense growth form	28	50
Thorny	44	50

%), and *Olea africana*, *Rhus glutinosa*, *Juniperus procera* (2 %). And species grown near homestead at Guder are *Acacia abyssinica* (8 %), *Eucalyptus camaldulensis* (8 %), *Podocarpus glaucilior* (6 %), *Juniperus procera*, *Euclea schimperi*, *Olea africana* and *Sesbania sesban* (4 %), *Vernonia amygdalina*, *Dovyalis abyssinica*, *Adhatodea schimperiana*, *Rhamnus prenooides*, *Acacia decurrens* and *Cupressus lusitanica* (2 %) (Table 6). Besides, farmers in the study area have experiences of intercropping of crops with multipurpose trees such as, maize, sorghum, teff, linseed and wheat with *Podocarpus glaucilior*, *Eucalyptus camaldulensis*, *Cupressus lusitanica*, *Acacia abyssinica*, *Acacia albida*, *Ricinus communis*, *Olea africana* and *Cordia africana* at Guder. Similarly, farmers at Jeldu intercrop wheat, field pea, potato, field bean and barley with *Acacia abyssinica*, *Maytenus senegalensis*, *Buddleja polystacha*, *Dombeya torrida*, *Rhus glutinosa*, *Eucalyptus globulus*, *Pygeum africana* and *Arundo donax* which agrees with the findings of (Berhane et al., 2004) table 7.

Living fence

Living fences are most common practices in rural landscapes of Ethiopian. Among the respondents 84 % at Jeldu and 79 % at Guder have an experience of planting trees and shrubs as live fences. The most widely grown tree/shrub species as living fence at Jeldu are *Dombeya torrida*, *Buddleja polystacha*, *Commiphora habessinica*, *Allophylus abyssinicus*, *Vernonia amygdalina*, *Eucalyptus globulus*, *Myrica salicifolia*, *Cupressus lusitanica*, *Chamaecytisus palmensis*, *Olea africana*, *Adhatodea schimperiana*, *Millittia ferruginea*, *Vernonia amygdalina*, *Euphorbia tricuali* and *Ricinus communis*. Similarly, at Guder *Cupressus lusitanica*, *Eucalyptus camaldulensis*, *Dovyalis abyssinica*, *Celtis africana*, *Sesbania sesban*,

Vernonia amygdalina, *Acacia species*, *Cordia africana*, *Podocarpus glaucilior*, *Psydrax schimperiana*, *Adhatodea schimperiana*, *Olea africana*, *Croton macrostachys*, *Albizia schimperiana*, and *Entada abyssinica* are common living fences. Farmers have certain criteria in selecting tree /shrub species as living fence; 73.3 % of the sample farmers at Jeldu prefer those species that coppice easily, where as 58.5 %, 56.5 % and 54 % of the sample farmers prefer to plant those species that are thorny, more leafy and dense crown, respectively. Among the species farmers at Jeldu preferred to plant species of *Eucalyptus globulus* (64 %), *Myrica salicifolia* (58 %), *Dombeya torrida*, *Buddleja polystacha*, and *Commiphora habessinica* (54 %), *Allophylus abyssinicus* (52 %), *Cupressus lusitanica* (10 %), *Adhatodea schimperiana* (6 %), *Chamaecytisus palmensis* and *Olea africana* (2 %) for live fences. In contrast, farmers at Guder preferred species of *Eucalyptus camaldulensis* (70 %), *Cupressus lusitanica* (44 %), *Dovyalis abyssinica* (28 %), *Celtis africana* (16 %), *Entada abyssinica* (12 %), *Sesbania sesban* (10 %), *Adhatodea schimperiana* (8 %), *Croton macrostachys* (4 %), and *Vernonia amygdalina*, *Acacia species*, *Mimusops kummel*, *Psydrax schimperiana* and *Albizia schimperiana* (2 %) table 8.

Trees and shrubs along waterways

Growing trees and shrubs along waterways such as ponds and lakes is mainly for protection and the practice is done by individual farmers or by community. Trees mainly reduced washing of silting, soil erosion and deposition into the water bodies. Trees that are found along waterways are not important only as a source of fuelwood, timber; livestock feed etc. but also protect fragile land and make it more productive. In the study areas there exist many waterways due to the topography

of the area. Moreover, clearance of vegetation aggravated the problem and more gullies are formed that require temporary or permanent conservation structures. Currently, farmers deliberately plant trees and shrubs along waterways and rivers. Besides, farmers sometimes deliberately plant *Eucalyptus globulus* around water bodies. The most widely grown tree/shrub species at Jeldu along water bodies and river banks are *Juniperus procera* (40 %), *Maytenus senegalensis* (36 %), *Podocarpus glacialiar* (30 %), *Acacia abyssinica* (28 %), *Dombeya torrida* (22 %), *Buddleja polystacha* (16 %), *Combretum molle* (12 %), *Eucalyptus globulus*, *Olea africana* and *Olinia rochetiana* (10 %), *Prunus africana* and *Mayrica salicifolia* (8 %), *Commiphora habessinica*, *Rosa abyssinica* and *Carissa edulis* (6 %), *Morus alba* and *Ficus vasta* (4 %), and *Leonotis ocymifolia*, *Juniperus procera*, *Ficus vasta* and *Croton macrostachys* (2 %). Likewise at Guder *Salix subserata* and *Euclea schimperi* (56 %), *Croton macrostachys* (54 %), *Carissa edulis* (36 %), *Acacia abyssinica* (28 %), *Olinia rochetiana* (14 %), *Rhus vulgaris* (10 %), *Clausena anisata* and *Calpuria aurea* (8 %), *Aningeria altissima*, *Albizia schimperiana*, *Celtis africana* and *Rhus glutinosa* (6 %), *Ficus vasta*, *Euclea schimperi* and *Acacia decurrense* (4 %), *Olea africana*, *Podocarpus glacialiar* and *Adhatodea schimperiana* (2 %) are commonly found species.

Trees and shrubs on borders and boundaries

A kind of strip planting (non competitive) trees are grown on idle land along farm boundaries. The objective of border and boundary planting is to provide protection and shelter against wind and sun. Eighty % of the respondents at Jeldu and 100 % at Guder showed interest towards farm boundary planting. These include tree species such as *Hagenea abyssinica* (50 %), *Olea africana* (36 %), *Chamaecytisus palmensis* (30 %), *Podocarpus glacialiar* and *Dombeya torrida* (28 %), *Cupressus lusitanica* (20 %), *Juniperus procera* and *Prunus africana* (16 %), *Acacia abyssinica* (6 %), *Eucalyptus globulus*, *Croton macrostachys* and *Ficus sycomorus* (4 %), *Prunus africana*, *Allophylus abyssinicus* and apple (2 %) at Jeldu and *Eucalyptus camaldulensis* (98 %), *Cupressus lusitanica* (68 %), *Dovyalis abyssinica* (40 %), *Cordia africana* (38 %), *Podocarpus glacialiar* (24 %), *Sesbania sesban* (16 %), *Euclea schimperi* (12 %), *Olea africana* (10 %), *Croton macrostachys* (8 %), *Vernonia amygdalina*, *Acacia albida* and *Acacia abyssinica* (6 %), *Hagenea abyssinica* (4 %), *Ensete ventricosum*, *Rhamnus prenoides*, *Catha edulis*, *Schinus molle*, *Mandifera indica*, *Persea americana* and *Coffee arabica* (2 %) at Guder (Table 9). Farmers plant boundary or border trees in the study areas for the purpose of fuel wood, cash income, lumber, medicinal value, construction wood, live fence and fodder for

animals. However farmers informed that using some species such *Eucalyptus globulus* and *Cupressus lusitanica* care should be taken due to their adverse effect on agricultural crops.

Farm woodlots

A woodlot is a small plantation established or kept to produce firewood, poles, posts or other small round wood. Farmers allocate a certain area of land for planting of *Eucalyptus globulus* at Jeldu and *Eucalyptus camaldulensis* at Guder. Eighty eight % of the respondents at Jeldu and 92 % at Guder plant *Eucalyptus globulus* and *Eucalyptus camaldulensis* to generate cash income (Table 10). However, due to the perception that the species has a negative effect on neighboring crops the woodlots are not located at the boundaries of two neighboring farmers' fields where field crops are to be planted.

Scattered trees planted on grazing lands

The production of woody plants combined with pasture or rangeland is often referred to as sylvopastoral system. Tree planting on grazing lands is not a common practice in both study areas. However, deliberate protection and management of the naturally grown trees on grazing land is a common practice, because naturally grown trees on grazing lands have several benefits such as lumber, construction wood, medicinal value, good odor and firewood. The major tree species naturally grown on grazing lands at Jeldu are *Comberetum molle*, *Buddleja polystacha*, *Myrica salicifolia*, *Allophylus abyssinicus*, *Cupressus lusitanica*, *Podocarpus glacialiar*, *Olea africana*, *Pygeum africana*, *Maytenus senegalensis*, *Rhus glutinosa*, *Myrica salicifolia*, *Dombeya torrida*, *Olinia rochetiana*, *Leonotis ocymifolia*, *Acacia abyssinica*, *Eucalyptus globulus*. While at Guder *Olea africana*, *Podocarpus glacialiar*, *Croton macrostachys*, *Acacia abyssinica*, *Euclea schimperi*, *Psydrax schimperiana*, *Carissa edulis* and *Cordia africana* are the common species on grazing lands. Besides, farmers were interviewed about future tree planting on grazing lands and they replied that *Maytenus senegalensis* (54 %), *Juniperus procera* (46 %), *Acacia abyssinica* (30%), *Dombeya torrida* (28 %), *Podocarpus glacialiar* (18%), *Olinia rochetiana* (14%), *Comberutum molle* and *Myrica salicifolia* (12 %), *Olea africana*, *Eucalyptus camaldulensis*, *Buddleja polystacha* and *Leonotis ocymifolia* (8 %), *Allophylus abyssinicus*, *Mayrica salicifolia*, *Rhus glutinosa* and *Hagenea abyssinica* (4 %), and *Pygeum africana* and *Vepris dainellii* (25) are preferred species for planting. Farmers at Guder preferred to plant on grazing lands *Acacia abyssinica* (50 %), *Croton macrostachys* (30 %), *Ficus vasta* (26 %),

Table 9. Response of species preferences for farmbaunadry planting

Species preferred by farmers	Respondents %	
	Jeldu	Guder
<i>Eucalyptus species</i>	4	98
<i>Cupressus lusitanica</i>	20	68
<i>Dovyalis abyssinica</i>	nill	40
<i>Podocarpus glacialiar</i>	28	24
<i>Euclea schimperi</i>	nill	12
<i>Cordia africana</i>	nill	38
<i>Olea africana</i>	36	10
<i>Croton macrostachys</i>	4	8
<i>Sesbania sesban</i>	nill	16
<i>Vernonia amygdalina</i>	4	6
<i>Juniperus procera</i>	16	4
<i>Acacia albida</i>	nill	6
<i>Hagenea abyssinica</i>	50	4
<i>Acacia abyssinica</i>	6	6
<i>Ensete ventricosum</i>	nill	2
<i>Rhamnus prenoides</i>	nill	2
<i>Chata edulis</i>	nill	2
<i>Sugarcane</i>	nill	2
<i>Schinus molle</i>	nill	2
<i>Mandifera indica</i>	nill	2
<i>Persea americana</i>	nill	2
<i>Coffee arabica</i>	nill	2
<i>Myrica salicifolia</i>	nill	nill
<i>Chamaecytisus palmensis</i>	30	nill
<i>Croton macrostachys</i>	4	nill
<i>Dombeya torrida</i>	28	nill
<i>Ficus sycomorus</i>	4	nill
<i>Prunus africana</i>	2	nill
<i>Maytenus senegalensis</i>	16	nill
<i>Allophyllus abyssinicus</i>	2	nill
<i>Apple</i>	2	nill

Olea africana (14 %), *Dovyalis abyssinica* (12 %), *Ficus vasta* (10 %), *Podocarpus glacialiar*, and *Comberetum molle* (6 %), *Maytenus senegalensis*, *Euclea schimperi*, *Sesbania sesban* and *Croton macrostachys* (4 %), *Psydrax schimperiana*, *Carissa edulis*, *Clausena anisata*, *Albizia schimperiana* and *Buddleja polystacha* (2 %) (Table 11).

Forage and pasture

As elsewhere in the highlands of Ethiopia, feed shortage is the major factor that impeded livestock productivity at Jeldu and Guder. At Guder, the source of livestock feeding is mainly fragmented grazing lands in and around the vicinity of farmers own holdings. These areas include seasonally waterlogged and fragments at the margin of

ones own holding, land not suitable for arable farming. According to the respondents the major sources of animal fodder at Jeldu are natural grazing (82 %), crop residue (76 %), improved fodder crops (22 %), allocation of grazing lands (28 %), hay harvesting and collection (38 %), grazing in cropland after harvest (24 %), local beverage residues (local beer and local alcohol residues)(56 %). At Guder, natural grazing (90 %), crop residue (86 %), improved fodder crops (54 %), allocation of permanent grazing lands (86 %), hay harvest (78 %), grazing in seasonally crop land (74 %) and local beverage residues (48 %) are sources of livestock feeds. Farmers at Guder classify months of the year in terms of relative feed availability. For instance, feed availability is scarce, June as intermediate, and March, April, May, July and August as months when feed shortage is critical. Besides, major constraints for animal grazing at Jeldu

Table 10. Reasons of tree planting

List of reasons	Respondents %	
	Jeldu	Guder
Fuel wood	90	98
Construction	88	79
Fodder for animals	84	73
Soil fertility maintenance	82	58
Fencing	78	17
Shade	76	73
Cash	88	92
Improve local climate	64	65

Table 11. Farmers preference of planting trees scattered on grazing lands

Preferred species	Respondents %	
	Jeldu	Guder
<i>Olea africana</i>	8	14
<i>Podocarpus glacialar</i>	18	6
<i>Croton macrostachys</i>	nill	30
<i>Acacia abyssinica</i>	30	50
<i>Euclea schimperi</i>	nill	4
<i>Psydrax schimperiana</i>	nill	2
<i>Carissa edulis</i>	nill	2
<i>Cordia africana</i>	nill	26
<i>Ficus vasta</i>	nill	10
<i>Clausena anisata</i>	nill	2
<i>Albizia scimperiana</i>	nill	2
<i>Celtis africana</i>	nill	12
<i>Dovyalis abyssinica</i>	nill	2
<i>Maytenus senegalensis</i>	54	4
<i>Sesbania sesban</i>	nill	4
<i>Croton macrostachys</i>	nill	2
<i>Comberutum molle</i>	12	2
<i>Buddleja polystacha</i>	8	nill
<i>Myrica salicifolia</i>	4	nill
<i>Allophyllus abyssinicus</i>	4	nill
<i>Juniperus procera</i>	46	nill
<i>Pygeum africana</i>	2	nill
<i>Rhus glutinosa</i>	4	nill
<i>Myrica salicifolia</i>	12	nill
<i>Dombeya torrida</i>	28	nill
<i>Leonotis ocymifolia</i>	8	nill
<i>Acacia abyssinica</i>	30	nill
<i>Eucalyptus species</i>	8	nill
<i>Hagenea abyssinica</i>	4	nill
<i>Olinia rochetiana</i>	14	nill
<i>Vepris dainellii</i>	2	nill

were lack of grazing land and diseases (80 %), lack of animal feed (72 %), drought (36 %), water shortage (18 %), lack of on time vaccination (14 %) and high livestock

population (10 %). While respondents at Guder mentioned that lack of grazing land (96 %), lack of animal feed (80 %), disease infestation (72 %), high livestock

population (40 %), lack of on time vaccination (32 %), drought (24 %) and water shortage (14 %) are the major constraints for livestock production. Crop-residue from teff, barely and wheat are the other feed sources in the area. Oxen among the livestock groups deserve priority in feeding the crop residues. Farmers responded that there is practically no land meant for communal grazing and they usually feed their animals with tree leaves available in their holdings and in nearby forest. The farmers are interested in planting of fodder trees such as *Chamaecytisus palmensis* at Jeldu and *Sesbania sesban* at Guder.

Similarly, livestock obtain most of their feed from the seasonally fallow land, following barely crops, and residues of barely and wheat at Jeldu. Feed availability is relatively better from September to January and livestock suffer critical feed shortage thereafter until August. Farmers escape feed shortage through feeding of animals stored feed (60 %), immigration to surplus feed available sites and storage of crop residues (58 %), feeding of animals cutting and grazing materials in natural forest and tree leaves and purchasing and feeding balanced animal feed (nigerseed fursheka) (36 %) and harvesting, storing and purchasing of hay (28 %). Farmers at Jeldu also escape critical feed shortage seasons by the storage of crop residues and feeding (88 %), animal feed storage for critical season (84 %), grazing in natural forest and feeding tree leaves in the forest (66 %), storage of hay and purchasing (56 %), purchasing of balanced animal feed (34 %), immigration to surplus feed available areas. Farmers at Jeldu explained that they are usually forced to cut some naturally available tree species locally known as 'Kombolcha' (*Maytenus senegalensis*) and 'Danissa' (*Dombeya torrida*) to feed their animals during critical feed shortage periods. Some farmers have also reported that they move their cattle in search of feed during the wet season. Farmers also mentioned the most preferred trees by animals in order of priority at Jeldu are *Dombeya torrida*, *Hegenea abyssinica*, *Maytenus senegalensis*, *Ensete ventricosum*, *Acacia abyssinica*, *Vernonia amygdalina*, *Chamaecytisus palmensis*, *Mayrica salicifolia*, and *Olinia rochetiana* and farmers at Guder responded that *Ensete ventricosum*, *Sesbania sesban*, *Vernonia amygdalina*, *Euclea schimperi*, *Olea africana*, *Myrica salicifolia*, *Acacia abyssinica*, *Dodonea angustifolia*, *Acacia decurrens* are most preferred trees by animals in order of priority. Farmers also forward their feeling to forage trees to plant around the homesteads and they technical support from researchers. According to farmers' experience that should be further promoted at Jeldu include *Maytenus ugalsensis* (40 %), *Hegenea abyssinica* (34 %), *Vernonia amygdalina* (24 %), *Myrica salicifolia* (20 %), *Chamaecytisus palmensis* (14 %), *Rhus glutinosa* (8 %), *Acacia abyssinica* (10 %), *Vepris dainellii* (4 %), *Ensete ventricosum* (2 %), and *Pygeum africana* (2 %). While farmers at Guder has given empha-

sis to *Sesbania sesban* (80 %), *Vernonia amygdalina* (54 %), *Albizia schimperiana* (38 %), *Euclea schimperi* (24 %), *Ensete ventricosum* (16 %), *Hypericum revoletum* (12 %), *Olea africana* (10 %), *Dodonea angustifolia* (8 %), and *Cordia africana* (6 %).

Fuel sources of the area

Farmers use products of different trees, crop residues and cowdung as fuel sources. Farmers living in Jeldu used cow dung, firewood, crop residues and kerosene for cooking, lightening and heating purpose. Similarly farmers at Guder use the leave of eucalyptus as fuel sources in addition to the above mentioned ones. All the respondents at Guder used cow dung and firewood as fuel sources. However, 82 and 72 % of the respondents at Jeldu used firewood and cow dung respectively as a fuel sources. Besides, 92 % of the respondents at Guder and 20 % at Jeldu used crop residue as fuel sources.

Traditional beliefs and cultural taboos

Ethiopia is full of different beliefs, religions and cultural taboos. Tree grown around some cultural areas such as Orthodox Church and Mosques are prohibited from cutting. Farmers living in Jeldu told that some peoples believe in trees they praise underneath of the trees such as 'Yekalcha' emnet and the 'Abdirkalch emente' prohibited cutting of *Pygeum africana*, *Juniperus procera* and *Podocarpus glacialiar*. Besides the government policy is prohibited cutting of endangered trees

Opportunities and threats of the study areas

Both Jeldu and Guder Wereda have favorable climate for growing of trees the farmers have a habit of protecting and using trees such as *Acacia albida*, *Acacia abyssinica*, *Cordia africana* and *Croton macrosthyas* at Guder and *Juniperus procera*, *Maytenus senegalensis*, *Acacia abyssinica* and *Hegenea abyssinica* at Jeldu grow naturally on farms. The effect of the trees on the yields of different crops not yet known and farmers showed willingness to plant trees on farms and this opportunity shouldn't be missed. Therefore; farmers need to be provided with appropriate seedlings and encouraged to plant on farms. Appropriate planting and management techniques need to be developed and extended to farmers. Besides, screening should be carried out to select suitable varieties or provenances for distribution to farmers. At Guder there is a better potential and experience for improving agroforestry than Jeldu because of strong tradition of growing trees and intercropping of trees with fruit trees and vegetables. The possession of private woodlots by farmers is indeed very

unique to Ethiopia. There are, therefore, excellent opportunities for introducing improved agroforestry practices so that there is a need to provide improved provenances of *Eucalyptus globulus*, *Eucalyptus camaldulensis* and cypress. The farmers' plant/protect trees on farmland and appreciate their role in improving soil fertility. Hence it is necessary to carry out agroforestry trials in relation to intercropping designs, spacing, planting techniques, and management of shaded trees.

CONCLUSION AND RECOMMENDATION

Endangered and threaten indigenous tree species in the area and also their effect on crops yields are not properly documented. Therefore, it is important to study the dominant and co dominant species in the area and their effect on crop productivity. Future study is suggested on the nutrient concentration and their decomposability of the most preferred and dominant indigenous tree species growing in the area. Research should also focus on fast growing, system compatible and marketable tree/shrub species for future adoption by farmers. It is important to consider those potential indigenous tree and shrub species for soil fertility improvement, animal feed and biological soil conservation integrated with soil conservation structure. Research programmes should be encouraged in promotion of the most preferred species around homesteads, gullies and riverbanks as well as niche compatible afforestation

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