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HOUSEHOLD TREE PLANTING IN KILOSA DISTRICT, TANZANIA

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ABSTRACT

The objective of this study was to assess household tree planting efforts and to investigate current constraints to afforestation in Kilosa District, Tanzania. The results of the study showed that 77 % of farmers in the district have planted trees in their farms, whether by themselves or previous farm owners. The average total number of planted trees was estimated to be 40 $\pm$ 7 (SE) trees per household. Men headed household tended to have more planted trees [44 $\pm$ 9 (SE)] than female headed households [31 $\pm$ 11 (SE)]. Middle age households had planted more trees [49 $\pm$ 14 (SE)] than younger [29 $\pm$ 13 (SE)] and elder households [33 $\pm$ 8 (SE)]. Tree planting appeared to be positively influenced by farm size and education. Fruit trees dominated in the home gardens (53 %) while non-fruits trees were more abundant far away from homestead. An investigation of constraints to tree planting and tending revealed that lack of seedlings (32 % of respondents), shortage of designated planting sites (24 %) and uncertainty over land ownership appeared to be the most important obstacles to tree planting in the district. It was surprising that land shortage became as the second leading constraint to tree planting despite the apparent low density of human population (32 people per km^2 in 2000). The study concludes by recommending that in order to promote tree planting in the country's rural areas, farmers have to be assisted in production of seedlings. Other necessary prerequisites are effective land-use planning and clear secured tenure over land.

INTRODUCTION

In Tanzania, the village afforestation programme was initiated in the early 1970s as an attempt to improve woodfuel supply in rural areas and reduce pressure on the natural forest and woodland resources. The goal was to provide enough fuelwood to the fast growing population as well as maintain a sound environmental condition for a sustainable agricultural production. It was the realisation that sources of fuelwood supply were depleting faster than expected which prompted the launch of this programme. In fact, the estimated total consumption of fuelwood (about 2 m^3 per capita) was found to be greatly in excess of the estimated wood production of the country (Kajembe 1994, Kajembe & Luoga 1996). Therefore, the need for tree growing to meet basic needs for fuelwood and poles, at the same time save some parts of the country from the threat of desertification was judged as an urgent undertaking. The emphasis was mainly put on village woodlots as a way of meeting future fuel shortages.

The main objectives of the village afforestation programme were to plant and grow as many trees as possible by individuals, schools, institutions and

villages as well as urban centres; to improve natural woodland productivity through proper management and conservation of the existing natural forests, woodlands and trees; and to ensure efficient utilisation of the available forest resources (URT 1989). The main promotional method was to supply villages with seedlings that were produced and delivered by the Forestry and Beekeeping Division and with the support of a number of Rural Development Projects. The total annual planting area needed to meet the projected fuelwood demands was calculated to be about 400,000 ha per year. Tree planting rate however never approached this figure and until early 1980s it was still well below 10,000 ha per year. This was an optimistic figure since it was based on the number of seedlings distributed and assumed a high survival rate (Kajembe 1994).

In general, very little noticeable success in the implementation of the programme has been achieved in communal woodlots. Although some success was achieved by individual planting, schools and institutions, the overall impact of village woodlots on fuelwood supply has remained marginal despite the government efforts (URT 1989).

There are several reasons for the relative lack of impact of the village afforestation programme (Kajembe 1988, 1994; Mascarenhas, 1991; Luoga, 1994). One of the main false premises is that farmers were facing a fuelwood crisis, which had to be solved by tree planting. Kajembe (1988) argued further that farmers place very low priority on producing fuelwood and seem to be generally much more interested in planting trees for construction wood, poles, fruit or other non-fuel purposes. A fuelwood shortage is only one of the several or many problems faced by farmers. Furthermore, fuelwood is seldom the only product they get from trees, often not the most important.

Generally speaking, despite the government efforts, the village afforestation campaign has had no significant impact on wood supply, while forests and woodlands continue to dwindle due to complex reasons. This paper reports on the status of household tree planting in Kilosa district, Tanzania. The specific objectives of the study were to assess household tree planting efforts and to investigate current constraints to afforestation in the district.

MATERIALS AND METHODS

The study area

Kilosa district, with an area of 14 245 km^2, is one of the five districts making up the Morogoro Region. The district falls within the geographic coordinates of 5^{0}55' - 7^{0}53' South and 36^{0}30' - 37^{0}30' East (KDC 1997). According to the 1988 population census, the population of Kilosa district was 346,575 with an average household size of 5.4 during. The population growth rate between 1978 and 1988 was estimated to be 2.3 % (Bureau of Statistics 1995) but for planning purposes, the District Planning Department has adopted a rate of 2.6 % (District Planning Department Officer, Personnal communication, 2000).

The topography of the district characteristically falls into three zones:

The highlands zone which runs north-south and is part of the Eastern Arc mountains with an altitude of up to 2200 m above sea level; The plateau (medium altitude) zone, mainly located in the north of the district around Gairo stretching towards Dodoma culminates around an altitude of 1100 m above sea level; and the flood plains zone which comprises both flat and undulating plains extending the foothills in the plains with altitude around 550 m above sea level (KDC 1997).

According to Shishira *et al.* (1997), forests and woodlands cover about 57 % of the

district land area out of which eight percent are catchment forests. The Mikumi National Park extends on 19 % of the district land, while a small strip of the Selous Game Reserve fall under the territory of the district.

The district has about 17 000 ha of plantations of pines, cypress and eucalyptus species which are managed by the Central Government. As for village afforestation, development projects mainly supported by Irish Aid including the Gairo Agroforestry and Land Use Project (GALUP) and the on-going Kilosa Environment Project (KEP) have been supporting seedlings production and distribution. Some of the tree species distributed by GALUP include *Melia azedarach, Azadirachta indica, Grevillea robusta, Eucalyptus sp. Schinus molle, Jacaranda mimosifolia* and *Leucaena leucocephala*. Other agroforestry trees scattered throughout the district include *Senna spectabilis, Senna siamea, Gmelina arborea, Acacia albida, Cedrella sp. Sesbania sesban and Albizia sp*. (District Natural Resources Officer, personal communication 2000).

Kilosa district is an important catchment for the Wami river which drains eastwards and for at least three tributaries of the Ruaha river which drains the southern end of Kilosa. The mean annual rainfall ranges from 1000 to 1400 mm in the southern and central flood plains, while in the north, Gairo Division receives a mean annual rainfall of 800-1100 mm (KDC, 1997).

Like in many other districts of Tanzania, agriculture is the major economic activity and the main source of income. There is a wide variety of crops raised in the district as a result of the diversity of agro-ecological regions with respect to its topography which comprises highlands, middle lands (medium plateau) and plains. Around 93 % of farmed land is under food crops and only about 7 % of farmland is under cash crops (KDC, 1997). Most households consume their own production and almost three-quarters (74 %) of total household expenditure are spent on food (Amani, 1996). Kilosa is one of the districts with highest livestock stocking rate in Tanzania. The small-scale agropastoral system is predominant and comprises both intensive systems practised by permanently settled Kaguru and Kamba and extensive systems practised by the Masai, Barbaig and Kwavi pastoralists (Mwilawa *et al*. 1997). Despite of the low population density (about 32 people on a km^2 in year 2000), conflicts between settled farmers and pastoralists are often reported and occasionally happen to be deadly (Misana *et al*. 1997, Mjema & Andusamile 2000).

Data collection

Collection of data was conducted in two phases. The first phase involved meeting with village representatives in the form of Participatory Rural Appraisal (PRA) and informal interviews with village leaders. The second phase consisted of a household survey through a structured questionnaire, holding interviews with key informants at division and district levels and participant observation.

PRA sessions were organised in nine randomly selected villages. Participants included village government members, women representatives and the technical staff in the village. Pair-wise ranking, transect walks, resources mapping, time line and trend analysis and wealth ranking were some of techniques used during the PRA sessions.

The household surveys were carried out from July 1998 to October 1998 and from July 1999 to August 1999 in households that were selected through a stratified, multi-stage sampling process. From each administrative division, one ward was selected at random and from each ward again one village was selected randomly. The households were first stratified into

wealth groups established during PRA sessions with representatives of the villagers. In each wealth group, approximately 5% of the households were randomly chosen forming a sample of 261 surveyed households by use of a structured questionnaire.

Discussions were also held with key informants who included district and village leaders and officials in the departments of natural resources (forestry, wildlife, beekeeping and fisheries), agriculture and livestock development and planning and lands with the help of a checklist. Participant observation was ~~also~~ involved in the process of establishing eventual linkages of various data collected through other methods. Use was also made of the secondary data from the Kilosa district offices.

RESULTS AND DISCUSSION

General tree planting efforts in the district

The average numbers of seedling raised and distributed for planting since 1989/90 in the district was 543,091 seedlings year^{-1} and 515,300 seedlings year^{-1} respectively, with an average survival rate of 75% (Table 1). This relatively high survival rate can be equated to an annual planting area of 348 hectares assuming a spacing of 3m x 3m. The ten years cumulative area of 3,480 ha that is covered with trees can be noted along tracks and around institutions such as schools, church buildings and other social and government centres like markets, hospitals, projects headquarters and others (own observation).

Household tree planting efforts

The study showed that about 77 % of respondents reported having trees in their farms, whether planted by themselves or previous farm owners. This figure is relatively less than the 92% of farmers who claimed to have planted trees throughout Tanzania during the last decade as reported by Aalbaek (2000). The average total number of trees per household was estimated to be 40 $\pm$ 7 (SE) trees per household. This value is slightly above that reported by Aalbaek (2000) of 25 $\pm$ 13 (95% confidence level) in the stratum named Morogoro woodland, which included both Morogoro Rural and Kilosa districts.

Table 1: Number of seedlings raised and distributed from 1989/90 to 1999/2000 in Kilosa District, Morogoro, Tanzania.

Year	Seedlings produced	Seedlings distributed	Survival rate (%)
1989/90	650,000	650,000	75
1990/91	535,000	529,000	75
1991/92	690,000	675,000	84
1992/93	563,000	315,000	79
1993/94	540,000	540,000	85
1994/95	496,000	475,000	82
1995/96	619,000	488,000	69
1996/97	600,000	600,000	58
1997/98	400,000	400,000	72
1998/99	481,000	481,000	71
1999/2000	400,000	-	-
Overall (1989/90-1999/2000)	543,091$\pm$28,525 (SE)	515,300$\pm$34,734 (SE)	75$\pm$3 (SE)

Source: District Natural Resources Office, 2000

Note: SE = Standard Error

- For year 1999/2000, the number of seedlings distributed and survival rate were not available.

Men headed households tended to have more planted trees [44 ± 9 (SE)] than female headed households [31 ± 11 (SE)] (Table 2). This may probably be linked with farm size. Female headed households had smaller farm size (1.8 ± 0.2 (SE) ha) than men headed households (2.9 ± 0.2 (SE) ha). In fact, from Table 2, it is clear that those households with large farm size had more planted trees than smaller farm size. Although, the linear regression model (number of planted trees against farm size) had a very low coefficient of determination (R^2= 0.11), it showed that farm size had a positive effect on tree planting. Kajembe and Luoga (1996), Kajembe *et al*. (2000) and Aalbaek (2000) have reported that the size of land holding has a very strong positive effect on tree planting.

Investigating the effect of age on tree planting effort, middle age households had planted more trees [49 ± 14 (SE)] than younger [29 ± 13 (SE)] and elder households [33 ± 8 (SE)] (Table 2). This is probably not only because younger households may not have had the time yet to plant as many trees as older households but also they have smaller land holdings (Aalbaek 2000). Older farmers may also have distributed their land to their heirs and thus remaining with only smaller farms. Another reason for less number of planted trees by elder households may be the fact that the group of elders also includes the majority of those with no formal education while tree planting appeared to be positively influenced by education (Table 2). However, while in this study a positive relationship between education and the number of planted trees was observed, in Njombe and Mwanza, Kajembe and Luoga (1996) and Kajembe *et al*. (2000) respectively, did not find significant correlation between education and tree planting.

Comparing the three main zones found in the district, the northern appears to excel the central and southern zones in the average number of tree planted in household home gardens and farms (Table 2). This may be explained by the presence of the GALUP project in the north of the district. The north is the most populated but also the most arid and most degraded part of the district and hence has received more attention from government interventions for environmental rehabilitation. The southern

Table 2. Average numbers of planted trees by demographic and agrarian factors and geographic location, Kilosa District, Morogoro, Tanzania

Demographic and agrarian factors and geographic location		Number of observations	Average number of planted trees	Standard error (SE)	Statistical tests	
					t	p (=0.05)
Gender	Men	192	44	9	0.85	NS
	Female	69	31	11		
Age group	Young (<30 yrs)	38	29	13	1.07	NS
	Middle age (30-50 yrs)	123	49	14	1.00	NS
	Elder (>50 yrs)	100	33	8		
Education	No formal education	165	31	6	2.05	*
	Primary and others	96	57	17		
Farm size	< 2 ha	147	16	4	2.90	*
	2-4 ha	71	55	13	1.20	NS
	>4 ha	43	101	36		
Geographic location	Central zone	85	30	8	2.08	*
	Northern zone	87	57	14	1.45	NS
	Southern zone	89	34	15		

Note: * = Significant difference between two successive means
NS = No significant difference between two successive means

Table 3: Most dominant tree species planted in home gardens and far in the farms, Kilosa District, Morogoro, Tanzania.

Tree species	Number of trees			
	Home gardens	Farms / Woodlots	Total	Average per Household
Citrus sp. (Mchungwa)	343	0	343	1
Cocus nucifera (Mnazi)	365	1918	2283	9
Mangifera indica (Mwembe)	444	151	595	2
Eucalyptus sp.	11	1297	1308	5
Acacia mearnsii (Mkwende)	0	751	751	3
Melia azedarach (Mmelea)	129	223	352	1
Pinus sp. (Mti ulaya)	0	579	579	2
Tectona grandis (Msaji)	15	130	145	1
Senna sp. (Mjohoro, Mzonobali)	201	1916	2117	8
Others (fruits sp.)	738	20	758	3
Others (non-fruits sp.)	167	447	614	2
Others (fencing sp.)	644	0	644	2
Total	3057	7432	10489	40

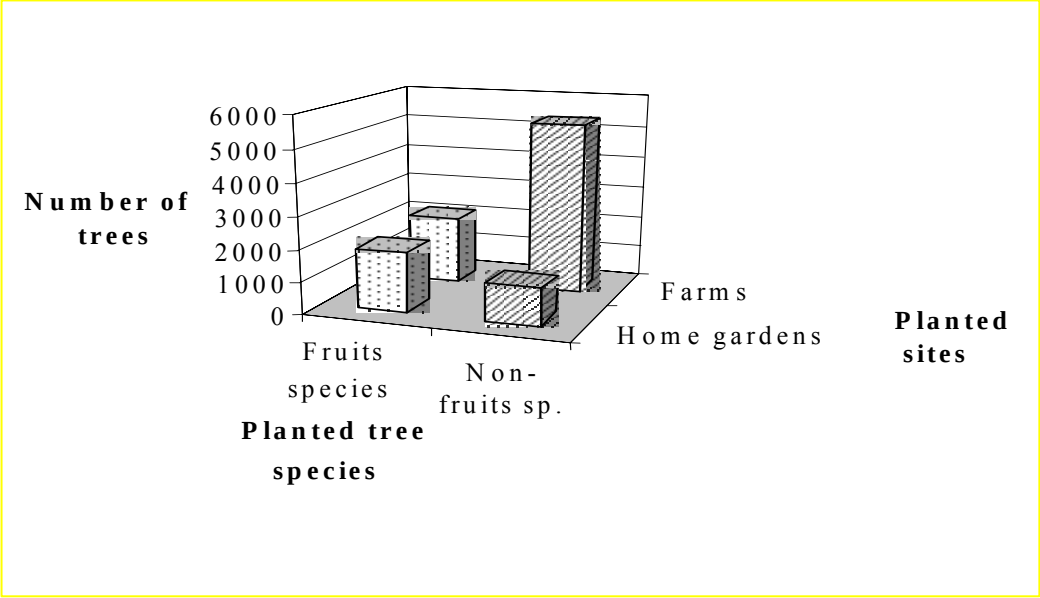

Figure1: Number of planted trees and their plantation site, Kilosa District, Morogoro, Tanzania

part of the district has relatively higher population than other parts of the district (apart from the north) and is now becoming progressively sensitised to afforestation to meet their needs for forest products.

Planted tree species

The most important tree species planted in home gardens, on farms and in woodlots are presented in Table 3. Fruit trees represented 38% of all trees planted in home gardens and far away the homesteads in farms. However, fruit trees were dominant in home gardens (53%) than non-fruit trees (Figure 1).

In Kilosa district, household planted trees are found in home gardens, on farms (some kind of agroforestry) and along avenues. Woodlots are also found in some places particularly facing fuelwood problems like Gairo, Nongwe and Kidodi Wards. Kajembe *et al.* (2000) found that in Mwanza District (Tanzania) tree planting is a widespread coping strategy against deforestation. The types of tree management systems practised in Mwanza include home gardens, scattered trees in farms, woodlots and fallow woodlands (called locally "*ngitiri*").

Constraints to tree planting and tending

A number of constraints to tree planting and tending were reported and the most serious constraint was lack of seedlings which accounted for 32% of the respondents (Figure 2). s are illustrated in Figure 2 in terms of percentage of interviewed villagers. The lack of seedlings (32 % of respondents) and. The lack of specified planting sites (24 %) and uncertainty over land ownership (16 %) appear also to be important obstacles to tree planting in Kilosa. It is surprising that land shortage came as the second leading constraint to tree planting despite the apparent low density of human population (32 people per km^2 in 2000). However, Misana *et al.* (1997) reported that over two thirds (72 %) of villagers in Kilosa district claimed that land was not enough for agricultural purposes. Aalbaek (2000) also found that about 28 % of surveyed farmers throughout Tanzania reported land scarcity as one of the top constraints to tree planting.

The issue of tenure insecurity deserves also serious attention since it affects decisions on long-term investments. Most farmers particularly recent migrants and those practising shifting cultivation appear to be uncertain over long term tenure. To them, only short-term investment on land is profitable. This seems to be a serious constraint to investing and managing forests and woodlands under the current land tenure regime in Tanzania where land is a state property. In Uganda, Banana (2000) reports that people are only willing to plant trees on their privately owned land and not on communal land. However in the case of Tanzania, land and tree tenure may generate two contradicting behaviours. On one hand, people may not plant trees because of lack of secure tenure over land, while on the other hand people may plant trees as a means to gain control over land (Luoga 1994, Aalbaek 2000).

Other constraints to tree planting and management mentioned by about 13% of respondents cumulatively, include annual

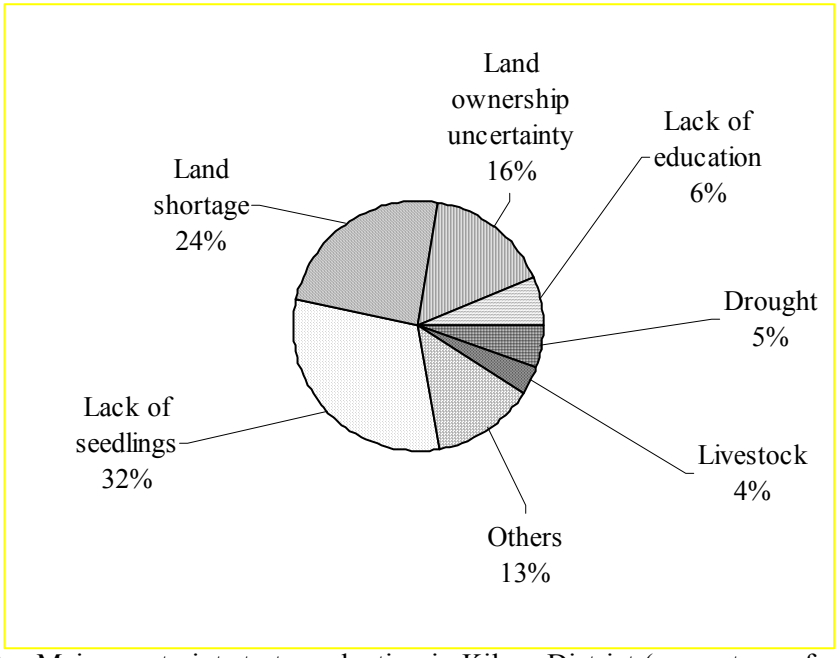

Figure 2: Main constraints to tree planting in Kilosa District (percentage of respondents), Morogoro, Tanzania

fires, lack of capital, fruit diseases (e.g. orange and mango diseases), termites, lack of labour force, lack of reliable market, theft and recurrent floods.

CONCLUSION

The majority of farmers have planted trees in their farms. In general, men headed households have more planted trees than female headed households. The number of planted trees also varied with age of the household heads and geographic location. Farm size and education were observed to influence positively tree planting. Fruits trees are dominant in the home gardens while non-fruits are more abundant far away from homesteads. Lack of seedlings and shortage of designated planting sites are considered to be the major constraints to tree planting in Kilosa district. However uncertainty over land ownership is also an important aspect hindering investment in tree planting. Hence, increased assistance of household in the production and distribution of seedlings, participatory and effective land use planning and a land law which provides clear, long term and secure tenure over the land are important pre-requisites to persuading people to invest in tree planting and management.

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