COMMUNITY PARTICIPATION IN AFFORESTATION AND AGROFORESTRY PROGRAMMES IN KENYA: THE INFLUENCE OF BIOPHYSICAL ENVIRONMENTAL IN THE CASE OF TESO DISTRICT

Author: EKISA GEORGE TOM
Moi University, School of Environmental Studies
Dept. Applied Environmental social Sciences
P. o. Box 3900-30100 Eldoret- Kenya
Tel 053-43015/+254733222313
gekisa2009@yahoo.com

ABSTRACT

On global scale, community participation in various activities is the core in the quest for sustainable development and environmental protection related issues. Community involvement in tree planting in Kenya is as old as modern agroforestry that started in 1971. However, certain biophysical environmental factors have not worked against the concept of community participation in tree planting. Although deforestation and resultant problems such as woodfuel shortage and reduced other forest based products, climate change, and soil erosion, have occurred world-wide, the worst hit areas are in developing countries of the Sub-Saharan Africa. Teso District falls in this region and therefore not an exception; the district inhabitants encounter these environmental problems. The study revealed that both biophysical environmental factors were major disincentives to community participation in tree planting. Among the biophysical aspects, soil and landscape characteristics, and entomological incidences were quite significant. However, the study also discovered that water availability and pathological factors were not significant obstacles to tree planting in the district

Keywords: *Biophysical, pathological, soil, entomological and landscape*

INTRODUCTION

Seventy percent of the people in developing countries use woodfuel and depending on availability, burn an average of about 700kg per person yearly. Rural woodfuel supplies appear to be steadily collapsing in many developing countries, especially in sub-Saharan Africa. The situation has been worsening for Kenya such that woodfuel tonnage shortfalls were 5.4, 9.8 and 12.0 in 1985, 1990, and 1995 respectively. It is projected to be 30.6 by the year 2000 (NDP, 1989-93). The same Government publication further reveals that the main source of energy in Kenya is woodfuel forming 70% and 95% for the country average and in rural area respectively. In addition, this is obtained from gazetted forests (28%), agroforestry (47%) and rangelands (25%).

Teso District like other places in the tropics is faced with environmental problems such as woodfuel shortage, soil erosion, and reduced tree based products. All these problems could be solved through afforestation and agroforestry activities. Surprisingly, parties involved in these programmes namely tobacco companies (BAT and Master Mind), Government Ministries and NGOs such as Kengo and KWAP, have for years attempted to supply seedlings to their clients. However, the people on their part have negatively responded to tree planting irrespective of the support accorded by interested groups listed above.

Arnold (1991) argued that social forestry, which appeared on the scene in 1970, failed to take an adequate integrated view of the diversity of ecological, economic, legal and social factors. Adding that:

> "Whereas it was thought that peasants would undertake community forestry project purely for subsistence, it is now recognised that the financial factor provides major incentive for tree planting."

The study attempted to identify the factors behind the failure of the community to adopt agroforestry and afforestation programmes. Disclosing these factors that blocked the local people from participating in tree planting, would be a point of departure in any effective and/or appropriate package formulation/design for the district. In summary there is support by providing tree seedlings for agroforestry and afforestation programmes in Teso

District by BAT and Mastermind, but people have not fully adopted afforestation and agroforestry programmes irrespective of the assistance offered to them.

THEORITCAL SETTING OF THE RESEARCH

Specifically in this study, the literature cited here is limited to water availability, soil and landscape, entomological, and pathological aspects of the biophysical environment. Owino (1983), observed that damage to tree seedling and even trees resulted from termites attack in western and eastern parts of the country where tobacco was grown. Other destruction arose from fires, browsing and locust attack (at nursery stage). Yamashita *et al*, (1986), concurred with Owino, that damage to trees resulted from termites attack. Lack of water was also a bottleneck to tree establishment in Kitui, Machakos, Embu and Meru districts. Iida *et al.* (1989) showed that termites posed a great threat to tree planting in most ASAL areas of Kenya; hance Yatta B-2 (in Machakos) was therefore no exception to this problem. They further argued that termites were still killing trees of up to three years by ringing at the root zone. They also pointed out lack of enough water for watering seedlings due to long distances to water points.

Goor *et al.* (1976) pointed out that in Africa, termites perhaps offered the greatest threat to tree growing. They added that termite attacked weak trees, but some trees are preferred to others. For example, Eucalyptus species. They also outlined other significant tree pests such as;

Oemida ghani attacked cypress

Snout beetle attacked eucalyptus

Gall fly (*Plytolyma lata*) attacked *Melicia exelsa* (Iroko or Mvule).

Shoot borer (*Hypsipyla robusta*) attacked Mahogany.

Buck (1980), observed that ants attack are constraints to tree planting. Kamweti (1982), outlined loss of moisture by evaporation can leave the plant without enough water. Another factor is overgrazing and trampling by both domestic and wildlife in most parts of Africa. Kamweti points out that, goats and other animals that browse rather than graze are particularly harmful. Kimwe *et al*. (1994), observed that scale insects attacked pure stands of *Calliandra* and *Sesbania* especially when closely space, termites on *Leaucean* and

Calliandra, black ants through debarking and *Leaucean spyllid* is too harmful. Termites' attack was a major problem in trees planted and seedlings in the nursery in Teso District. Domestic livestock was also a problem to tree establishment in the area (Menr Teso District, 1996).

Diseases are not usually a threat to tree planting, however, damping-off is a common and serious disease caused by more than fifty different fungi species (Goor *et al.* 1976). ICRAF (1991), following research carried out in Tabora, Tanzania, found out that both tobacco and Sesbania are susceptible to root-knot nematodes (*Meloidogyne spp*) and the infestation can become serious if these two species follow each other frequently on the same piece of land. Other species observed on MPTs at the fields in Kenya, Burundi and Cameroon included *Odontotermes spp*, attacking *Cassia siamea* and *Sesbania sesban*.

RESULTS AND DISCUSSION

The study focused on water availability, edaphic and landscape characteristics, entomological and pathological aspects of the environment. In the whole research a sample of 170 people was interviewed.

1. Water availability

The study considered water availability from the shortage point of view, areas assessed to ascertain this were rainfall amounts, location of water, quality and other competing user of the same. Responding to the question on whether the amount of rainfall received in the area was enough or not for tree establishment/ growth, 25 (14.7 %) of the respondents said that rainfall amount was more than enough, 136 (80%) said enough and only 9 (5.3%) answered not enough for tree establishment / growth.

Regarding location of water sources, majority of the people 91 (53.5%) and 68 (40%), fetched water from a distance of <0.5 to 1 kilometre respectively. The average distance was found to be 0.815 km with standard deviation of 0.467km. Therefore it is evident that most the people in the district have access to water. In other places where Kenya Finland Company had established water projects, the distance to water points was even far less than the average above.

Water quality aspects regarding tree establishment, only 3.5% of the respondents experienced water contamination situations, while the rest said that, the quality of water was good 134 (78.8%) and 30 (17.6%) said very good. Domestic uses posed a threat to tree as 113 (66.5%) of the respondents pointed out this, while 56 (32.9%) cited other uses as being livestock (drinking). Generally an overwhelming 164 (96.5%), respondents generally said that water availability was not a constraint to community participation in afforestation and agroforestry. However, only 6 (3.5%), cited water negatively affecting tree establishment in the area.

Deducing from the analysis, only domestic water use tended to deprive water for use on tree/ seedlings. Water once brought home was not used for watering trees seedlings. This was the case for some B.A.T farmers who had sited their 500 tree seedlings nurseries in the homestead (compound). Most people preferred using water for domestic activities such as cooking and washing. However, in the final analysis the majority of the people did not experience a problem with water availability in Teso District.

Observations showed that the problem of water shortage was evident when the farmers poorly time the onset of heavy rains. The majority of the farmers, especially tobacco growers, started transplanting tree seedling after harvesting season around November. So, as a result most of these transplanted seedlings usually dried up in the long drought spell commencing from late December through January and possibly ending late February. This was critical in areas with sandy soils and places with shallow soils, since such soils loose moisture a few days after the onset of long-day periods of sunshine. This was a common obstacle to tree planting around Asinge in Chakol division and most hilly areas in the northern parts of the district.

Generally the study found out that water availability was not a significant constraint to community participation in agroforestry and afforestation programmes under proper

tree seedling transplanting time and nursery siting near a water source or preferably near a permanent river or stream.

2. Edaphic (soil) and landscape characteristics

Agricultural activities rely on soil and landscape characteristics, tree as crops are no exception. Teso District as discussed in section 1.9 has diverse soil types and landscape characteristic. The study focused on selected soil and landscape based factors that were thought to be constraints to tree growth/establishment. Selected characteristics examined included water logging, soil fertility, topography and rocky grounds.

Analysis for the combined effects of the various edaphic and landscape based factors studied revealed that 155 (91.2%) of the respondents experienced more than one factor in the fields. On cumulative basis of each factor, 86 (50.6%) of the respondents experienced waterlogging conditions affecting tree planting. Concerning soil fertility, 107 (62.9%) of the respondents argued that this was a constraint to tree establishment. On the other hand, 129 (75.9%) and 136 (80.0%) of the people interviewed experienced problems of steep topography and rocky grounds respectively in their farms affecting tree planting.

Water logging cases were common in swampy areas such as Kamolo, Amooni, Kwangamor and Okwata. These were low land areas with clay soils whose common characteristic is poor water infiltration. In these places, tree species that were not tolerant to the condition did not survive. Consequently, this discouraged most farmers from planting such tree species, which unfortunately were the most abundant in all tree nurseries in Teso District and supplied by tobacco companies their farmers in the area. These species were; *Eucalyptus spp*, (*E.saligna*), *Cassia siamae, C.spectabilis*, *Leuceana leucocephala* etc. Most of which were exotic and preferred by farmers could not thrive in these waterlogged conditions. The other unfortunate part was that these companies did not encourage or provide seedlings/seeds of some indigenous tree species that could do well in waterlogged conditions such as *Grewia spp*, certain *Acacia spp*, *Conophoryngia spp*, among others. These tree species, unlike *E. saligna* have no known significant negative effects on the water table. *E. Saligna* in case it thrives, in the long run alters the water

table in the area and hence leading to a negative effect on the general ecology. Therefore, waterlogging was a major problem to tree planting and general growth among farmers whose farms had swampy parts in the area. However, under appropriate choice of suitable tree species and good draining of these areas, it is a problem that can be solved with ease.

Most farmers also cited low soil fertility as being a constraint to tree planting and growing in the area, over 62% of the respondents cited it as being a problem. It is important to note here that under normal circumstances where land is a problem, trees are planted where the soil fertility is low in order to reduce competition from cash or food crops which are quite sensitive to soil fertility. Normally healthy seedlings will show poor growth after transplanting and then stabilise after the roots have well developed. In some cases, soil nutrients may have been washed to deeper layers by leaching after rains. So when tree seedlings stretch roots into these deep layers, there is a possibility of extracting nutrients and hence continues growing. On the other hand, the choice of appropriate tree species comes into play here, because if the selected tree specie(s) does/ do not have deeper penetrating rooting systems, then poor results will be obtained. The situation in the district where agents merely tell farmers to plant trees does not take into consideration the position of the farmer's technical knowledge. As pointed out by ICRAF (1992), that most extension agents neglect the needs and constraints faced by farmers. What came out from this study was that most extension agents, especially tobacco ones, aimed at meeting the company's objectives to get as much tobacco tonnage as possible without considering farmer's circumstances with respect to appropriate tree planting for future woodfuel supply.

Topography was one of the landscape characteristics examined in this study. Majority of the people encountering this were those in hilly places of Amukura and vast parts in the northern and central regions of Teso District. The effects of topography were observable only with a combined effect of rain water run off, because run off water washed away most of the transplanted seedlings and reduce soil fertility through soil erosion on steep sites in the areas mentioned above. Topography has also frustrated afforestation

programmes by soil and water conservation team in the district, since most of the seedlings planted on the catchment areas of the district without firm embankment to protect these seedlings from surface run off ended up being washed into streams and rivers. However, contrasting the findings, under proper management of planted tree seedlings in these areas, such as diverting surface run off water from where trees have been planted is one method to overcome this problem. The other approach to deal with this is having heavy rocks (boulders) round the tree seedling, until the root system stabilizes atleast after 2 years but this would vary depending on the tree species. In addition, some places in the district, were actually too steep for the farmers to gain accessibility, so this actually made some parts of farmers' land lie fallow throughout the years.

Rocky grounds were also experienced mostly in hilly places and a few areas with shallow soils due to bedrock closer to the topsoil or even exposed. Other places had bedrock near the ground surface or small stones scattered all over the surface. The effect of this factor was experienced when farmers planted tree seedlings, which resulted in the following;

i) Some trees species such as *Eucalyptus* simply dried only after few months
ii) Certain tree species like *Cassia siamea* had a stunted growth.

These are characteristics of root failure to penetrate into deeper layers to get moisture and nutrients especially when drought sets in. The final result of this was that most farmers were discouraged from planting trees in such sites. Unfortunately these were the probable sites for tree planting as most of the other section of household farm was under cash or food crops cultivation for most farmers.

3. Entomological (pests) incidences

Trees like agricultural crops suffer from pest damage. The problem is more critical when no chemicals or other methods are available to control their spread and damage. Termites were the most prevalent tree pests in the district. The responses for each parameter were as follows:-102 (60.0%) of the people argued that the incidences of

pest(s) attack were very frequent, while 56(32.9%) frequent, 4 (2.4%) rarely and finally 8 (4.7%) had not experienced pest attacks in their farms.

Like other parts of the tropics, Teso district experienced entomological problems relating to tree planting emanating from termites attack. Several species existed and posed danger to tree growth. Unlike Goor *et al. (*1976) argument that termites attacked weak trees, findings in Teso District did not affirm this because irrespective of the health status of the tree or seedling termites still attacked and killed it or reduced the tree to stunted growth form. Preferred tree species were *Eucalyptus* and *Cuppressus spp*, but for most indigenous tree species the attack was only mild. Termites killed young trees by ring debarking or girdling the lower parts of the stems, this usually interfered with the phloem functioning and consequently nutrients transfer to other parts of the plant. Alternatively termites attacked roots destroying the whole tree. The various termites species found in the area as listed in table 1 attacked most tree species. Another common pest especially attacking cypress was the cypress Aphid (*Cinara cupressi*), this attacked cypress causing severe die-bark and consequently death of the whole plant. Others that were not very significant in effects were Leuceana flies, snout beetle and cutworms mostly in tree nurseries.

Table 1: Summary of termites effects on trees

Species Scientific Name	Local (Teso) Name	Characteristics	Trees species attacked
Macrotermes natalensis	Ingerepo	-Swarm at dawn; build conical shaped mounds with several open projections on the sides.	Most tree species but prefer *Eucalyptus spp* and *Cupressus spp*
-	Ikibuluno	-Swarm at about 1.00 p.m., build conical shaped mounds without open projections	Same
-	Amakauri	-Swarm late in the evening, one day after rain showers -Attack young plants and do not make mounds	Same
-	Imakatei	-Swarm at about 2.00 p.m., one day after rain showers -Attack young trees and do not make mounds	Same
Odontotermes badius	Emome/ Epegere	-Have subterranean nests that appear after rains and you can see a lot of work in the openings by the workers -Swarm at dusk after rains	Same

Source: Teso District Survey, 1997 by the author.

4. Pathological (diseases)

The study revealed that there were very few if any disease incidences on trees. The most common in tree nurseries was damping-off. However, crop diseases were very common as illustrated by the destruction of cassava plant resulting from a viral attack.

Responding to the question on frequency of disease attack /or incidences in their farms, 1 (0.6%) said very frequent, 22 (12.9%) frequent, 32 (18.8%) rarely and majority 115 (67.6%) of the respondents did not experience any disease attack or incidences on the trees in their farms.

Majority of the farmers did not encounter any damage from disease attack on their trees except for certain diseases outlined below;

i) Damping off: This was a common fungal disease, in most tree nurseries in the district.

ii) Greening disease: This is a disease that affects citrus plants, the symptoms include; the stems turning green and some parts yellowish. It is a viral disease transmitted by hopping insect (*Citrus psyllid*). In the over all assessment under proper chemical control and appropriate nursery management that excludes damp conditions, these are not serious pathological problems that can be major disincentives to community participation in afforestation and agroforestry activities the district.

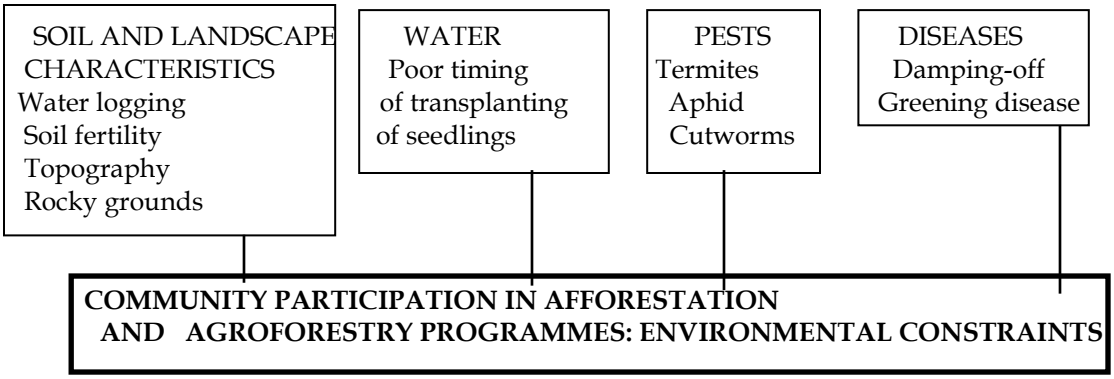
5. Other environmental factors

The most commonly cited environmental factor in the study was the damage as a result of browsing on trees by goats. However, other livestock, cattle and sheep, also posed a danger to transplanted seedlings in the area. This study affirmed findings by the Teso District forest Officers in 1996, where it was noted that goats damaged a lot of seedlings in Amukura division tree nursery.

SUMMARY/ CONCLUSION

From analysis and discussions, two of the examined biophysical environmental factors were obstacle to farmers' involvement in tree planting activities. There were several species of termites, which destroyed young trees in farms. On the other hand, soil and landscape characteristics such as waterlogging, rocky grounds in the farms were equally detrimental to tree planting in the district.

Figure 1. Summary of biophysical factors



Although, some of the examined environmental factors, such as water and disease aspects were not significant bottleneck to community participation in tree planting, entomological and edaphic factors were critical factors that acted as major disincentives to community involvement in tree planting.

REFERENCES

Arnold, J. E. M. (1991). *Community Forestry: 10 years in review*. FAO Community forestry note 7, 1991. Rome.

Buck, L. E (1988). Planning for agroforestry development: In Buck (ED). *A Socio-economic aspect*. Proceedings of the Kenya National Seminar on agroforestry.

Goor, A .M. and Barney, C. W. (1976). *Forest tree planting in Arid zones*: The Renold Press company- New York.

ICRAF (1991). *International Centre for Research in Agroforestry*: Annual Report 1991. Published by ICRAF, Nairobi.

Iida, S., Cheboiwo, J. K. and Edazawa, O. (1989). *Socio-economic baseline survey of the pilot forest area*: Project working paper No. 3: JICA/ EFRI. Nairobi.

Kamweti, D. (1982). *Tree planting in Africa south of the Sahara*. The Environmental Laison Centre, Nairobi.

Kimwe, S. et al. (1994). *Planting sites and Configuration*: Agroforestry field manual: KWAP and ETC. Nairobi.

_____Ministry of Environment and Natural Resources; Annual Report, Teso District, 1996.

Owino, F. (1983). *B.A.T Kenya woodlot A appraisal project summary Report*: Department of Forestry University of Nairobi. Nairobi.

_____ The Kenya National Development Plan 1989-1993. Government printer, Nairobi.

Yamashita , H. and Noda , N. (1986). *Report of the survey on training needs in semi-arid areas of Kitui, Machakos, Meru and Embu districts*: Project working paper No.5 : JICA/ KEFRI. Nairobi.