SOCIAL FORESTRY NETWORK

PUTTING TREES INTO THE FARMING SYSTEM: LAND ADJUDICATION AND AGROFORESTRY ON THE LOWER SLOPES OF MOUNT KENYA

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Network Paper 8a **Summer 1989**

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This paper is based on a part of the research conducted in October 1988 for the ODA/Government of Kenya 'Embu-Meru-Isiolo Arid and Semi-Arid Lands Project'. The full report is entitled 'Assessing farmers' tree-use and tree-planting priorities'.

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INTRODUCTION AND SURVEY METHOD

The writer was asked to help the Government of Kenya/ ODA Embu-Meru-Isiolo Forestry project, located on the lower northern and eastern slopes of Mount Kenya in Kenya by conducting rapid rural survey work which would highlight farmers' tree-needs and interests and hence help to shape the planning of nursery species and extension methods. Only the initial farmer-survey is reported on here.

Since too many surveys of farmer attitudes are based on asking hypothetical questions, we decided to try to focus on what farmers were actually doing already on their farms, using a farm by farm approach. It was decided to select study locations which reflected a range of altitude zones, population densities and social groups, and which had varying access to the forestry component of the project. After a preliminary period of discussion with project staff and visits to the project area the writer decided to work in six localities, to represent Zones 3, 4 and 5 in Embu and Meru respectively.

The plan was:

- to choose six nurseries, and the areas within which each was sited; and to make a checklist of the species being grown in each particular nursery, with which to compare the species being grown on farms in the area;

- in the company of a nursery-worker familiar with the surrounding area to visit farms and interview farmers at a progressively increasing distance from the nursery until interviewers discovered that they were beyond its area of outreach. (This method is known as distance decay sampling.)

- to record the tree-species found on the farm with the farmer's and project staff's help, noting site and the species' value in the farmer's eyes; and to ask a small number of other questions spending no more than about 20 minutes with each farmer interviewed.

Sample size and composition

The aim was to interview a roughly equal number of farmers in each of Zones 3, 4 and 5, split roughly 50:50 by sex and 22:33:44 by class. The intention was that the work should be quickly, simply and replicably done, not that a daunting major sampling exercise should be set in train. We completed 100 useable interviews in the time available (about ten days).

The whole sample breakdown class-wise is close to the goal set, though it is more uneven at zonal level. It was fairly easy to make rough-and-ready household class assessments, with the guiding knowledge of accompanying nursery and project staff and in two areas the sub-location chiefs who came with us for the day. Indicators used were the state of repair of homestead buildings and the presence or absence of corrugated iron or concrete; the number of buildings in the compound (household size is quite a good wealth indicator where family labour is so important); and any available evidence of off-farm employment or cash-crop earnings.

The gender balance is more uneven, and is a product of chance in that we did not know whom we would find at home when we called at farms. Nor were the women we interviewed all household heads. We encountered, nevertheless, strong views about trees and their usefulness, regardless of the formal position within the household of women interviewed.

Background for the selection of areas

Zones

Although zone boundaries are arbitrary by comparison with the infinite gradations actually to be found on the slopes of Mount Kenya, and although there are several zoning systems in use which do not entirely tally with one another, the pattern is broadly as indicated in Table 1 overleaf.

Table 1: Agro-ecological zones

German AEZs	offic zones	Altitude M	Mean Temp NC	Average Rainfall mm	Description of zone's vegatation
L.M. 3	3	910 - 1280	20.6 - 22.9	1000 - 1400	Good for cotton. Fair for food. Less intense cultivation.
L.M. 4	4	760 - 1220	21.0 - 23.7	800 - 1200	Much uncultivated land; millet, sorghum and drought resistant crops.
L.M. 5	5	610 - 700	24.1 - 24.7	650 - 850	Very low fertility Acacia scrub.

(Source: Diocese of Meru and ITDG, 1987)

Population

Co-varying with zone are population densities, which are naturally high in the higher, better watered, and more fertile zones, and which thin out in the lower, drier, zones where the soil is poorer, as well. Villages are smaller in the lower zones and ultimately scattered homesteads almost entirely take their place.

Sources of income

The diversity of income opportunities decreases from higher to lower zones. Crop sales are the main income source for everybody and livestock, acting as the buffer of stored wealth against droughts, come second. Brewing (of honey and millet beers) though officially illegal, is an important third source of income in Zones 4 and 5. Businesses such as shopkeeping and wholesaling are similarly key subsidiary activities in Zones 3 and 4.

Four-fifths of wealthy farmers own cattle, while only a third of poor farmers do. Cattle are kept for milk, and as a store of wealth for food purchases and for larger expenses such as school fees. Two-thirds of poor farmers own goats, however. Goats act almost as currency in the lower zones and are valued above all for their hardiness and their ability to thrive on browse. Nearly half of

all farmers own beehives, and almost all have chickens.

Land consolidation

Land consolidation has given the individual farmer greater security of tenure, but substitutes a single larger plot for several smaller ones. The loss of access to plots in different ecological zones reduces flexibility and increases risk, and many individuals have had to give up good higher-zone land. Consolidation also reduces access to fallow and grazing land, and forces farmers to adopt more labour-intensive methods. Finally, the strengthening of individual title systematically destroys the clan and lineage as land-allocating political entities. Plots are larger among the wealthy in each zone and tend to be larger in the lower zones than the higher, except that in Tharaka (Zone 5), farm plots are relatively small because Tharakans rely heavily on livestock which are kept elsewhere. In this sample Magutuni (Zone 3) in Meru, and Rwika (Zone 3) and Thiba (Zone 5) in Embu, were areas where land adjudication was complete or all but complete. Marimanti (Zone 5) in Meru and Kathera (Zone 4) in Embu were about half way through adjudication. Mutonga (Zone 4) in Meru had not yet begun upon land adjudication.

THE RESULTS OF THE SURVEY

Tree species by interview area: the balance between indigenous and exotic species

In each of the areas studied, the species discovered on each farm were recorded if the farmer had either planted the tree, or had made a deliberate decision not to fell it when clearing land. As might be imagined, a farmer fortunate enough to have 'captured' a good number of valuable pole and timber trees on his farm at the moment when he began to farm the land, will only plant further trees for highly specific purposes.

In the course of interviewing farmers, it became clear that their classification of trees did not fit neatly with the standard botanical one. While foresters contrast indigenous with exotic species, farmers contrast 'local' (**kinyeji**) with 'new' (**kigeni)** species. To them, trees brought into the Meru-Embu area from elsewhere in Kenya could be 'new' and familiar exotics such as mango,

papaya and sisal be regarded as **kinyeji**. It would be perverse to set out non-local indigenous species as exotic here, but the distinction between 'naturalized' and new exotics is an important one, since nurseries are predominantly concerned with introducing farmers to the latter.[1]

In general where the number of species saved is high, the number of new exotics planted is low, while the number of old exotics remains almost constant. This is predominantly because the already-familiar exotics are mainly fruit trees or boundary species both of which enhance the value of the farm. In more denuded areas - such as Embu 3 and Embu 5 in this sample - there are far fewer saved species, far fewer of the indigenous species which farmers progress from saving to planting, and a high proportion of new exotics. In such situations farmers had made a lot of effort, in often extremely unrewarding circumstances, to plant and replant pole species until they had some success.

The average number of species found on each farm was seven to eight in most areas, and twelve or more in Magutuni, Meru 3, the most favourable area of the six.

In both districts planted trees become relatively less important and saved trees more important as one moves from Zone 3 to Zone 5. But it is also clear that there are fewer saved indigenous species to be found in the Embu areas, than in Meru, and consequently more enthusiasm for planting. All three Embu areas, where the rainfall is slightly less good, but particularly Embu 3 and Embu 5, plant a higher proportion of new exotics than do the Meru areas. Old exotics on the other hand are of similar importance in all areas.

Tree species and land adjudication

Once land is demarcated there is a new need for boundary markers, and gradually the pole and timber trees which were on the land when it was demarcated will be felled and replaced by planted substitutes of other species. Until land is permanently cultivated, there is no real need for

[1] The tree species classified as 'naturalized' exotics in this report are: Azadirachta indica; Banana; Citrus orange; Citrus lemon; Mango; Papaya; Sisal. Two familiar exotic non-trees also appear in the lists because they had tree-like functions for farmers - Ricinus communis (Castor Oil plant) and Lantana camara, a 'weed' used for kindling and hedging.

roads to reach each farm without passing over the land of another. But as land-use intensifies, roads are created and they in their turn generate the need for gates and stock-proof hedging.

Bernard (1972) argued that trees are removed when land is adjudicated, but this clearing in fields is only a part of the process. Riley and Brokensha (1988), who have monitored the Mbeere area for many years, have noted that in the medium term, land adjudication engenders the planting of more trees than before, as it does the building of more permanent housing.

In Embu there appears to be a visible contrast between the study areas in Embu 3 and Embu 5, where land adjudication is all but complete and higher proportions of exotics are being planted, and Embu 4, where land adjudication is still at an early stage and where there are clearly more indigenous species and fewer exotics. Yet the picture is not so simple. Meru 3, where land adjudication has long been complete, and Meru 4 where it has not yet begun, both show identical proportions of planted to saved trees, and indigenous to exotic trees. It is necessary to look at **where** on the farm the trees cluster to fully understand the way in which land adjudication changes the landscape: overall numbers do not help.

Table 2, which was compiled by aggregating data from the 67 adjudicated and 33 unadjudicated farms in the survey, suggests how the clustering of trees on land changes with adjudication. Where previously trees were predominantly planted in cropland, consolidation causes a decrease in this practice and a great increase in field boundary planting. Block planting may possibly increase as well. At the same time, the number of indigenous species saved in the field decreases sharply. It would seem from this sample that more effort is made to preserve valuable species in the compound after land adjudication but that compound planting - already important in the pre-adjudication phase - simply continues much as before. During the period of the survey, it was possible to see clearly that adjudication tends to lead to a smaller number of species on the farm, but to the presence of more individual trees from each species.

Table 2: Where tree species are planted, in adjudicated and unadjudicated land

SITE	ADJUD	UNADJUD
PLANTING compound boundary in compound	 18% 15	 17% 16
COMPOUND TOTAL	33%	33%
field boundary in cropblock in a block	16 14 2	8 17 1
FIELD TOTAL	32%	26%
PLANTING TOTAL	65%	59%
SAVING compound boundary in compound	 5 9	 1 8
COMPOUND TOTAL	14%	9%
field boundary in cropland	1 20%	0 32%
FIELD TOTAL	21%	32%
TOTAL SAVING	35%	41%
GRAND TOTAL	100%	100%

NB: these are numbers of species, not trees

Farmers' reasons for planting trees

After the trees planted on their farms had been identified and noted, farmers were asked to say for what purposes **in their own case**, they had been or would be prepared to plant trees, mentioning as few or as many as they liked. These were subsequently classified under eleven headings - fruit, fodder, fuelwood, cash, shade, windbreaks, fencing, and four categories which need a little more explanation -

poles and timber: these were not distinguished by farmers, since the ideal tree would provide both;

microclimatic improvements: informants mentioned the coolness trees provide; and their belief that trees attract rain;

soil benefits: under this heading are grouped mentions of terracing using trees, or the recognition that trees can increase soil fertility.

beauty: some farmers felt strongly that trees enhanced the landscape around their homes and mentioned this as an incentive for planting distinct from practical reasons such as the creation of shade or protection from wind.

Over the whole sample, the reasons given for tree-planting aggregated as follows:

1.	poles	86%		
2.	fruit	49%		
3.	shade	40%		
4.	fuelwood		37%	
5.	cash	21%		
6.	windbreak		17%	
6.	microclimatic benefits			17%
8.	soil benefits		11%	
9.	fodder	9%		
9.	beauty	9%		
11.	fencing, boundary marking			5%

However, it is the variations observable on the pattern, by area studied, by wealth category, and by gender, which make the results most interesting and useful.

Area summary

To summarize, poles are in demand in all areas, followed by fruit where feasible. Those in completely adjudicated areas are keener to grow fuelwood than those who are not; and on the whole it is only those whose land is adjudicated who begin to think of making money out of selling fruits or poles. Those in **unadjudicated** land are the keenest on planting trees as boundary markers and hedges: the rest presumably have already planted all the trees they want for this purpose. Of the more minor benefits of trees, shade is the most important, followed by trees for

wind protection and microclimate improvement.

Wealth summary

All wealth categories place a similar high priority on poles, fruit and shade. The poor are more interested in growing fuelwood than are the well off and have more interest in cash from trees and in windbreaks. Interest in microclimatic and soil benefits from trees is greater, the higher the wealth category. (Have the wealthy heard more about these benefits on the radio than the poor?) The poor are more interested in tree-fodder than are the wealthy - a finding which tallies with the fact that the poor are more likely to be goat-owners than cattle owners, and that leaf-fodder for cattle is a new idea in the area. The desire for trees for fencing and for beauty seems not to be class related.

Gender summary

Poles are of similar importance to men and women. Both sexes also place a similar value on growing firewood, which was almost universally used among our interviewees rather than charcoal. Some men also mentioned growing it to sell to tobacco growers. Women value fruit somewhat less highly than men and are far less interested in the cash that may be made from growing trees. (Fruits are currently the main money earners from farm-grown trees.) Men are also more interested in tree-fodder than are women, which makes sense since animals are still predominantly owned by men.

Among the more intangible benefits of trees, women not only value shade a great deal more than do men, but also mention trees for windbreaks and trees for hedges and boundaries far more. They would also seem to be more interested than men in the value of trees to the micro-climate. It is as if women are mainly interested in making the farm a more comfortable and secure place to live and work. On the other hand men mentioned the beneficial effect on the soil of trees, and their beauty, more often than women.

We asked several couples informally whether there were conflicts over tree-planting priorities.

On the whole they claimed that there were not, and other research (e.g. Shepherd, 1984) has pointed to the unforeseen improvement in husband-wife relations with the weakening of the clan and the strengthening of the individual household after land adjudication. As one husband said, 'If you grow poles and try to sell them privately and use the money privately, she will be furious. You have to agree. Women and men have come together these days.'

Pole preferences

The project especially wished to know whether pole crops were valued more for speed of growth or for durability. While the preference was clearly for fast-growing if soft poles, over a quarter of the sample said that they needed both. Preferences by sex were insignificant, but preferences by class are worth noting. The least certain about what they want are the poorest. All categories express a preference for fast-growing (but therefore soft) poles, and the rich realise most clearly that they also need hard poles and that they therefore need to plant both. No discernable patterns emerged by zone or by adjudicated or unadjudicated farms.

Income from trees

We asked farmers to tell us about on-farm and off-farm income from trees. Income data is notoriously hard to collect from strangers, and we usually approached the question crab-wise by asking firstly what prices could be got in the area for various items, and then which of those the farmer him or herself sold at times, and how often.

It is perfectly clear that, for the time being, many people can make more out of bushland products such as charcoal and honey than they can out of any tree product grown on the farm. Farmers explained that charcoal-making was hard work but the most reliable cash-earner and women and men may turn to charcoal burning if need arises. Honey produces a good return for modest investment but only in unadjudicated areas. As the best honey trees are felled or privatised, incomes from this source will dwindle. Only in Tharaka (Meru 5) are honey and charcoal incomes likely to continue far into the future. Here, beekeeping is still the best source of income after crop and livestock production (ICRA and EMI, 1984).

However, quite large numbers of farmers are involved in modest sales of tree products which they have grown themselves. A higher percentage were involved in Meru (with better rainfall) than in Embu and in high zones, where fruit can be grown, than low zones. Thus in Meru Zone 3, 62% of the sample grew fruit for sale, and even in arid Embu Zone 5, 10% did so.

Cash is a constant need and there is no doubt that farmers wish to sell whatever they can. Farmers hoped that they would be able to sell firewood to tobacco growers, home-grown charcoal to town, and poles to market, in future. Currently only a tiny number of farmers in the study areas have sold farm-grown poles and so far always to neighbours.

Farmers' preferred farmsites for tree-planting

Within the constraints imposed by what will grow in particular zones, farmers were remarkably consistent in the choices they made about where to put particular categories of tree and particular species, in fact.

Table 3 gives us a picture of the way in which tree location on the farm changes through time - as suggested by the adjudication stage of the six study areas. As land-use becomes more intensive and permanent, and planted trees begin to take over from saved trees, so trees shift ground.

True agroforestry mixes are positively unpicked in the process. Firstly, the shift is from the field to the compound, a shift seen everywhere, but most in the driest areas. Here, once saved indigenous field species begin to be used up, farmers cluster many of the trees they decide to plant around the compound, presumably to keep an eye on them and water them. But the more striking pattern is the exodus of trees over time from cropland mixtures into field boundaries or blocks. This is seen not just in the changeover from saved to planted trees, but even in the fact that there are more planted trees in crops in unadjudicated areas than in adjudicated areas. Indeed, whenever farmers answered 'yes' to our question: 'Did you make any mistakes about where you put the trees?' they would explain that

Table 3: Location of species on the farm, for each of six areas

	EMBU3 adjud	EMBU4 in proc	EMBU5 adjud	MERU3 adjud	MERU4 unadjud	MERU5 in proc
PLANTING compound boundary in compound	18% 17%	15% 12%	24% 15%	16% 15%	14% 14%	17% 18%
COMPOUND TOTAL	35%	27%	39%	31%	28%	35%
field boundary in a cropland in a block	22% 16% 4%	20% 17% 3%	12% 12% 0%	16% 10% 1%	7% 21% 2%	1% 19% 1%
FIELD TOTAL	42%	40%	24%	27%	30%	21%
PLANTED SPECIES	77%	67%	63%	58%	58%	56%
SAVING compound boundary in compound	4% 8%	0% 6%	5% 13%	8% 10%	1% 8%	1% 9%
COMPOUND TOTAL	12%	6%	18%	18%	9%	10%
field boundary in cropland	1% 10%	1% 26%	2% 17%	1% 23%	0% 33%	1% 33%
FIELD TOTAL	11%	27%	19%	24%	33%	34%
SAVED SPECIES	23%	33%	37%	42%	42%	44%
	100%	100%	100%	100%	100%	100%

NB: Percentages are of species identified not of numbers of trees

adjud: adjudicated

in proc: undergoing adjudication

unadjud: not yet adjudicated.

tree-planting in crops had been a mistake (usually because of the introduction of ploughing) and that they wished they had grouped their trees at the boundaries.

A breakdown of trees on the farm by apparent wealth of the household shows a modest tendency for the poor to plant more species in the compound and less in the field than their wealthier counterparts, and for the wealthy to have a higher proportion of planted species to saved species than the middling or poor. However, these categories have saved more species in the compound than the wealthy. The fact that the wealthy do more block planting than anyone else is probably an indication of their having both more land and more labour at their disposal.

Preferred species for each farm site

Nearly 100 tree species were identified on the farms investigated: 'old' and 'new' exotics; indigenous species saved but never planted; saved **and** planted species; and a small number of indigenous species found planted and not saved. In order to focus only on the most important, however, a shorter list has been drawn up which includes only species identified at least four times in at least one type of planting site. This gives us 37 species: 16 indigenous species which farmers both plant and save; 7 indigenous species which they save but do not attempt to raise; 7 'new' exotics; 6 'old' exotics; and 1 indigenous planted-only specie. These are as follows, in descending order of importance in each category.

Planted and saved species

1	Commiphora spp	9	Ficus natalensis/thonningii
2	Melia volkensii	10	Lonchocarpus eriocalyx
3	Tamarindus indica	11	Markhamia spp
4	Balanites aegyptiaca	12	Vitex doniana/keniensis
5	Cordia abyssinica	13	Bridelia micrantha
6	Croton megalocarpus	14	Azanza garckeana

7	Terminalia prunioides	15	Acacia mellifera
8	Erythrina abyssinica	16	Kigelia aethiopum/africanum

Indigenous species saved only

1	Acacia tortilis	5	Sterculia africana
2	Terminalia brownii	6	Berchemia discolor
3	Combretum zeyheri/spp	7	Fagara spp
4	Combretum collinum		

'New' exotics

1	Grevillea robusta	5	Cassia spectabilis
2	Cassia siamea	6	Melia azederach (actually indigenous to other parts of Kenya)
3	Eucalyptus spp		
4	Leucaena leucocephala	7	Avocado

'Old' exotics

1	Mango	4	Lemon
2	Papaya	5	Banana
3	Citrus orange	6	Sisal

Indigenous specie planted only

- Euphorbia tirucalli

If we aggregate the data from the 100 farms in the sample, the careful planning of tree-location

becomes apparent.

Farmsite 1: The Compound Boundary

In this site, top preference has gone to two good indigenous hedging species grown vegetatively - Commiphora spp. and Euphorbia tirucalli; Sisal also makes some contribution where it will grow. Six 'new exotics' grown for poles, are used to help demarcate the compound as well, while other indigenous saved or saved-and planted species (the latter starred) provide shade, and store quality timber against the time it may be needed. The only fruits are Papaya and Tamarindus indica.

Table 4 : Compound boundary preferences

TREE SPECIES PLANTED		COMPOUND boundary
22 Commiphora spp	*	29p
31 Euphorbia tirucalli		27p
76 Cassia siamea	E	24p
82 Grevillea robusta	E	21p
80 Eucalyptus spp.	E	11p
84 Leucena leucoceph.	E	9p
85 Melia azederach	E	8p
77 Cassia spectabilis	E	6p
97 Papaya	OE	5p
57 Tamarindus indica	*	5p
26 Croton megalocarpus	*	4p
52 Sisal	OE	4p
SAVED		
59 Terminalia prunioides	*	5s
19 Combretum collinum		4s

22 Commiphora spp	*	4s

15 species

Table 5: Preferences in the compound

TREE SPECIES PLANTED		COMPOUND within yard
97 Papaya	OE	27p
96 Mango	OE	26p
93 Citrus orange	OE	14p
14 Balanites aegyptiaca	*	7p
76 Cassia siamea	E	6p
95 Lemon	OE	6p
99 Banana	OE	5p
57 Tamarindus indica	*	4p
23 Cordia abyssinica	*	4p
80 Eucalyptus spp.	E	4p
SAVED		
7 Acacia tortilis		15s
20 Combretum zeyheri/spp		8s
22 Commiphora spp	*	8s
58 Terminalia brownii		8s
14 Balanites aegyptiaca	*	5s
19 Combretum collinum		5s
59 Terminalia prunioides	*	4s
30 Erythrina abyssinica	*	4s
60 Vitex doniana/keniens*		4s

19 species

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Farmsite 2: Inside the Compound

It would seem from this sample, set out in Table 5, that the yard is an important site for fruit trees. There are eight listed here - both old exotics and indigenous species. Trees valuable for light poles, or which provide wood suitable for domestic carving also appear (Nos 23, 30, 60). Trees which provide shade and which store timber for future needs constitute much of the 'saved' list here, and Commiphora spp seem to be saved wherever they are found because their ability to generate live fencing from stakes is so useful. New exotic species are far less important in the yard than on the yard boundary.

Table 6: Preferences in field boundary

TREE SPECIES PLANTED		IN THE FIELD Boundary
82 Grevillea robusta	E	35P
76 Cassia siamea	E	12P
47 Melia volkensii	*	12P
31 Euphorbia tirucalli		9P
80 Eucalyptus spp.	E	8P
77 Cassia spectabilis	E	7P
84 Leucaena leucoceph	E	6P
96 Mango	OE	4P
26 Croton megalocarpus	*	4p
SAVED		
3 Acacia mellifera	*	5S

Farmsite 3: The Field Boundary

In the field boundary, as shown in Table 6, new exotic pole species reign almost supreme: new trees for a new function. The exception is Melia volkensii, the one indigenous timber species

whose growth rate can match the exotics. Euphorbia tirucalli plays a far more minor role than it does in the compound fence, and Commiphora is hardly used at all. Acacia mellifera is planted and saved to some extent in the hedgerow because it is thorny as well as providing good poles; Croton megalocarpus is a highly valued timber tree, and mangos are valued in the hedge for shade, fruit and ultimately timber. The field boundary is clearly not regarded as a suitable place to put many fruit trees: seemingly because they are too valuable to be planted where others could gather the fruit. Since they constitute such a reliable source of income, the fact that they shade other crops is regarded as an acceptable trade-off: indeed, once they have begun to bear, they **are** an annual crop in their own right.

Farmsite 4: Field Blocks

Few farmers in the sample had planted field blocks. Those who had, naturally had speedy cash returns in mind, and only new exotics were seen.

Because most farmers must live from their small farm-plots, they want trees to complement crops, not replace them. On our limited evidence, block-planters seem to be those with off-farm incomes, such as shop-keepers and drivers: a pattern more frequently seen in the highest rainfall zones.

Table 7: Preferences for field blocks

TREE SPECIES PLANTED		IN THE FIELD Block
82 Grevillea robusta	E	7P
76 Cassia siamena	E	4P

Farmsite 5: In the field

Considering the range of saved trees in fields (see Table 8b) the switchover made by farmers when they choose trees to plant there, is spectacular. Of the 11 most popular planted trees found

in the field, 6 are fruit-trees (four old exotics, one indigenous and one new exotic) and 5 are fast-growing pole and timber species: Melia volkensii and the four most popular new exotics. Cassia siamea is the best liked of these because of its light shade, and relative compatibility with crops.

Table 8a: Planted species in the field

TREE SPECIES PLANTED		IN THE FIELD within crop
96 Mango	OE	20P
76 Cassia siamena	E	19P
82 Grevillea robusta	E	11P
97 Papaya	OE	11P
95 Lemon	OE	10P
93 Citrus orange	OE	9P
47 Melia volkensii	*	9P
57 Tamarindus indica	*	8P
84 Leucaena leucoceph.	E	6P
80 Eucalpytus spp.	E	5P
92 Avocado	E	5P

There are twenty-two saved indigenous species noted in four or more instances in the fields in this sample (see Table 8b), of which fifteen are also planted by farmers. Yet farmers have chosen to continue to locate only two of these - Tamarindus indica and Melia volkensii - in the field when

Table 8b: Saved species in the field

TREE SPECIES SAVED		IN THE FIELD within crop
7 Acacia tortilis		26S
58 Terminalia brownii		17S
57 Tamarindus indica	*	15S
20 Combretum zeyheri/spp.		14S
47 Melia volkensii	*	14S
59 Terminalia prunioides	*	11S
23 Cordia abyssinica	*	9S
30 Erythrina abyssinica	*	8S
45 Lonchocarpus eriocaly	*	7S
17 Bridelia micrantha	*	7S
14 Balanites aegyptiaca	*	6S
55 Sterculia africana		6S
19 Combretum collinum		5S
22 Commiphora spp	*	5S
26 Croton megalocarpus	*	5S
36 Ficus natalensis/thon	*	5S
13 Azanza garckeana	*	4S
15 Berchemia discolor		4S
33 Fagara spp.		4S
40 Kigelia aethiopum/af.	*	4S
46 Markhamia spp.	*	4S
60 Vitex doniana/keniens	*	4S

planting them. The rest, kept seemingly partly to provide a source of seed or cuttings for future planting, are relocated, once they are planted rather than saved, to the field boundary, compound boundary and into the compound.

Of the seven remaining planted-only species, six are highly valued for timber but are too slow-growing to be perceived as worth planting: Acacia tortilis, Terminalia brownii, Combretum zeyheri, Combretum collinum, Berchemia discolor, and Fagara spp. One, Sterculia africana, however, has excellent wood for the carving of utensils, and ought to be planted in the compound. Lack of interest so far in 'domesticating' is curious.

CONCLUSION

Looking at the way in which trees are incorporated into the farm, it is clear that what has gone on is a process of improvement upon what nature gave in the first place. A tract of bush is turned into a farm with trees on it, through careful processes of selection and enrichment. While the diversity of good hardwood species is gradually lost, the gain in fruit-trees, in appropriately placed trees of all kinds and in species which are really wanted, is enormous.

From the evidence presented in this paper one sees the hand of both men and women in the trees planted on an adjudicated farm. Women have helped to make the farm cool, sheltered and secure with compound shade, windbreaks, and boundary hedging; men have planted tree cash-crops, especially fruit, and have planted and preserved timber for the future. The detailed interest in the trees of the bushland almost always found among rural peoples, continues in the carefully planned incorporation of privately owned trees into the new tenurial situation.

Findings from the 'distance decay' approach

Somewhat to our surprise, no very clear pattern emerged to distinguish farms near to nurseries and those further away in this particular survey. Numbers of 'new' exotics planted are a little higher in nearby farms, but many factors complicate this perception.

Firstly,farmers had acquired nursery-raised seedlings from a variety of sources, not all of them necessarily attributable to the project. Farmers mentioned special occasions on which they had been able to take a few seedlings from a temporary distribution point, such as a Harambee (communal self-help) gathering; several had planted seedlings brought home by their children from school, and it was impossible in the time available to find out where these schools had obtained their seedlings; in Thiba, as we got further and further from the nursery, we gradually realised that we were drifting into the distribution area of the Tana River Development Board nursery, which was more used because it was located near to the place people were going to for water anyway. Sometimes individuals had simply bought seedlings in a town such as Meru or Embu when they happened to be there.

Secondly,farmers had taken seeds from one another to some extent, particularly of easy-to-collect new exotics such as Cassia siamea and Leucaena leucocephala.

Thirdly, a few farmers had made amazingly strenuous efforts to travel for seedlings. One farmer had walked 5 km each way several times, in order bring home the several hundred seedlings he wanted to plant in his farm. He was lucky enough to live in the company of a large extended family, so that he could make this effort in the rains without detriment to the farming activities which others were able to continue with.

Only in one locale (Marimanti) did we get to the point where some farmers had no contact with any source of nursery-raised seedlings, and indeed had never heard of the project nursery. Nevertheless, all of them had planted some indigenous species.

In all the hundred farmers we visited and interviewed, only two had planted no trees at all, and both had only recently been through the land consolidation process, and were newly settled on their land. Both had planted trees at their previous farm, they said. On the contrary, farmers readily plant species which grow by cuttings, truncheons, and root-suckers, collect seed from the field for species which germinate easily, and look for transplantable wildings. Mini nurseries were occasionally found, occupying a few thorn-protected tins by the back door, or an old sufuria (aluminium cooking pot) lodged in the branches of a compound tree, out of the reach of chickens

and goats.

What the distance decay survey revealed perhaps most strongly, was that those far away from nurseries simply lack extension advice and hence access to or knowledge of new species whose properties might better meet needs than the species already known and used. But farmers were already deeply committed to trees and tree-planting. and need advice, rather than motivation sessions.

References

Bernard, Frank Edward, 1972

East of Mount Kenya: Meru agriculture in transition
Ifo-Institut für Wirtschaftsforschung München, Afrika-Studienstelle, Weltforum Verlag, München,1972.

ICRA and EMI, 1984

The Farming system in Tharaka: strategies for subsistence in a marginal area of Kenya. A report prepared for the EMI programme and ICRA. (The International Course for Development-Oriented Research in Agriculture, Wageningen, Netherlands.) ICRA Bulletin No 15. December 1984.

Riley, Bernard and Brokensha, David, 1988

The Mbeere in Kenya (2 vols) Institute for Development Anthropology, University Press of America, 1988.

Shepherd, Gill, 1984

Responding to the contraceptive needs of rural people. A report to OXFAM on Kenya. OXFAM: Oxford, 1984.