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WHY PEOPLE DON'T PLANT TREES:
The Socioeconomic Impacts of Existing Woodfuel Programs:
Village Case Studies, Tanzania

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The views expressed in this paper are those of the author and should not be interpreted as representing the views of either A.I.D. or Resources for the Future.

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INTRODUCTORY NOTE

In 1968, responding to an increasing perception of wood shortage associated with deforestation, the Government of Tanzania established the Village Afforestation Program. The aim of this program, which supplied tree seedlings and forestry extension services gratis, was to encourage rural people to establish woodlots in their villages, either on a communal or individual basis. However, only 6,437 hectares of woodlots were planted between 1973 and 1978 by the 8,000 villages in Tanzania and the tree planting goals of the program (129,000 hectares per year) were far from met.

This lack of success is somewhat surprising. While village woodlot programs have been initiated in recent years in many developing countries (notably Korea, India, Upper Volta, and the Sudan), few countries appeared to have more auspicious conditions than Tanzania. For one thing, by the early 1970s all rural people had been settled in organized "ujamaa" villages, whose principle was one of communal production. The well-established government hierarchy of village councils, cells, district, regional and national officials, an inherited colonial tradition of forest preservation and agricultural extension, and villagers' awareness of deforestation and the need to plant trees all seemed to provide the necessary ingredients for large scale woodlot establishment.

In "Why People Don't Plant Trees," Margaret Skutsch explores the reasons for the low response to this program. To test her hypotheses regarding the reasons for woodlot success, she interviewed villagers in 18 villages, some with successful woodlots and some without, in wood-rich and wood-poor, wet and dry areas. Based upon these data, Ms. Skutsch concludes that forestry is being adopted in the villages of Tanzania, albeit slowly. Ms. Skutsch did not find any support for allegations that lack of technical information on tree planting or ignorance on the part of villagers of deforestation and wood fuels problems had hampered the afforestation program. While all villages were aware of the Government's position on tree planting and most households had planted trees, there seemed to be no awareness of the scale of the effort required if woodlots were to replace natural woodlands as the source of domestic fuel. Activity lagged as a consequence. There were also technical problems. For example, nurseries are centralized because of irrigation requirements; this causes losses when shortages of truck transport prevent seedling delivery at the proper time.

Based on this study, Ms. Skutsch recommends continuation of the program's current effort to decentralize nurseries. She also suggests decreased emphasis on teaching methods of tree planting (which the villagers already understand), and more attention to other parts of the program. She points out the advantages, especially in cases where village leadership is not trusted or where large plots of land are not available, of smaller, privately-owned woodlots.

Ms. Skutsch has a Master's degree in Industrial Engineering from Northwestern University. For the last eight years she has lived in Tanzania with her family, working and teaching at the ARDHI Institute for Urban Planning of the University of Dar es Salaam. This study is an outgrowth of research on biomass energy in developing countries at Resources for the Future. The work was

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Related work already completed at RFF includes a working paper, "Deforestation, Wood Energy, and Development," and three discussion papers, "Social Forestry in Developing Nations," "Reforestation and Community Development in the Sudan," and "The Impact of Forest Soils on the Prospects for Bioenergy in Developing Countries." Another study, entitled "Planning Fuelwood Plantations in Dodoma Region, Tanzania: A Linear Programming Approach," is nearing completion. Together, these six interrelated studies draw an intriguing picture of the problems and potential for wood fuels and forestry in developing countries.

These papers are issued for the dual purposes of informing the research and policy communities of results obtained from work in progress and of eliciting comments on our efforts.

Milton Russell
Director, Center for
Energy Policy Research

SUMMARY

The aim of this research was to evaluate the impact of Tanzania's policy of village afforestation. In particular, it examines the motivations that lie behind the decision of a village to adopt forestry, and the social and economic reasons for the many failures. A parallel study by Dr. A. B. Tamu is investigating the policy itself and its interpretation by those responsible for implementing it.

Eighteen villages were taken as case studies, including some which had not started social forestry, some which had but failed, and some which have been successful. Many hypothetical causes of the failure of social forestry were examined. The main findings were: (1) shortage of firewood is not merely an incentive to start a woodlot, but also to succeeding with it; (2) skills in planting and caring for young trees are widespread; (3) the style of forestry extension work tends to encourage the starting of woodlots but not their planning and expansion; (4) the transport of seedlings to the villages at the appropriate time is a greater constraint than their actual production at the nurseries; and (5) the communal aspects of organizing social forestry projects lead to more difficulties than the physical aspects of silviculture.

SWAHILI TERMS USED

Bwana Miti (Bw. Miti)	-	forestry extension officer
Shamba	-	field or farm
Ujamaa	-	working together, communal effort
Pombe	-	beer (usually brewed from maize or sorghum)
Debe	-	4 gallon oil drum (7 kg. of charcoal)
Guenia	-	sack (about 35 kg. of charcoal)
Kopo	-	small tin (about 1 kg. of charcoal)

Chapter 1

VILLAGE AFFORESTATION IN TANZANIA

Tanzania is one of the world's poorest nations and one of its most rural. Ninety percent of its population of 17 million (1978 census) lives in small settlements spread over a large geographical area, and the climate varies from humid tropical in the lowlands and coasts to semi-arid in the plateau interior, with wetter and cooler mountain zones between. As a nation, Tanzania has tried to build a political system of African socialism through a one-party system and has had a stable government since independence in 1961. However, much of the style of administration is shaped by Tanzania's history as a British colony. The capital city is Dar es Salaam, and the country is divided into twenty regions which are in turn subdivided into a total of eighty-four districts. Below this in the administrative hierarchy are divisions, wards, and villages.

Agriculture is the basis of the economy; Tanzania exports coffee, cotton, cashew nuts, tea, and tobacco, and was formerly a major supplier of sisal. The main food crops are maize, rice, and millet, but the country is no longer self-sufficient in these. Mineral resources are not so much absent as underexplored, and industrial production is limited. The rise in oil prices has vastly increased the problems of the country, in which transport is in any case a major cost; electrification is restricted to urban areas and will be for many years to come, although there is some potential for increased hydroelectricity.

Tanzania is a well-wooded country compared to many in the region. Of its 880,000 square kilometers (km²), over 310,000 are woodland or forest, and of this, 130,000 are forest reserve. A tiny fraction, 550 km², is plantation, both hardwood and softwood, for commercial exploitation. Average population density for the country is low at about 20 persons per km². Yet there is no doubt that Tanzania suffers from a shortage of fuel wood, one that will become increasingly severe as population increases and natural forests decrease. It is estimated that wood is currently being consumed at a rate which is about twice the estimated rate of regeneration of the typical woodland, miyombo.¹

The major use of wood is for fuel, either as firewood for the majority of the country's 15 million rural population, or as charcoal for most of the remaining 2 million urban dwellers. The second major use of wood is for building poles. Houses in rural areas are mostly pole and mud structures which are maintained annually and rebuilt about every seven years. While there is some possibility of local burnt brick production for house building, this does not alleviate the wood problem as large amounts of wood would be consumed in brick production.

Wood can be gathered from natural woodlands without costs, but as the woodlands are becoming further and further from the people's living places, it is becoming a marketed item in places where previously it was a free good. Wood availability varies greatly from region to region and locality to locality because of variations in climate and in population pressure. While Mnzava (1980) claims that 200 to 300 man days per household per year are spent gathering firewood in Dodoma, Kikula, and Nilsson (1982) say 1,000 hours (125 man days) per year

are needed in Arusha, and it is possible to identify other parts of the country where fuel gathering takes less than an hour a day to supply a family.

The likely impacts of the fuel wood shortage are both environmental and human; the increasing forest depletion may lead to long-term loss of soil fertility and imbalance of the water regimen, as well as loss of production due to diversion of labor to increasingly demanding wood collection, changes in diet due to choice of more easily cooked foods or fewer cooked meals, changes in other habits such as house heating, and reduction in small scale production of beer, bricks, smoked fish, etc. In Tanzania, many such changes have occurred already, but to an unknown extent, partly because in the last decade there have been major upheavals in settlement patterns from other causes so that many fundamental aspects of rural life besides fuel supply have been severely affected.

Recognising the problem of wood scarcity soon after independence in 1961, the government called for self-sufficiency of rural communities in wood (as well as in other basic commodities) in the Arusha Declaration (1967).² The government started a program of village afforestation, which might also be called community of social forestry, by which villages could receive seedlings of suitable species free from government-run district or regional nurseries, with the intention that every village should start a woodlot to supply its own wood needs and benefit the physical environment. Yet by 1980, ten years later, very little progress seemed to have been made (Mnzava, 1980). The Forest Division estimated that a total of 6,437 hectare (ha.) had been planted by villages throughout the country over the period 1973-19789, and very little was achieved before then (Kilahama, 1980). As there are over 8,000 villages in Tanzania, this is obviously a very minor achievement, compared to the target of 129,000 ha. Per year for that period, an average of just over 16 ha. per village per year (Gulliusson, Sakaya, and Sem, 1975).

The lack of success of the program is perhaps even more surprising when seen in the light of the major reforms and strong government measures taken over the same period to promote rural development generally. Compared to most other Third World countries, Tanzanian rural development policy is radical. The first very important step was nationalization of land by the Arusha Declaration. This permitted the customary law of usufructure to pertain in villages but outlawed private ownership of land for speculative purposes. In other words, land that is not actively being used for production cannot be claimed as private property. Where there is land pressure in Tanzania, land is bought and sold despite the government ruling, but this is only the case in a number of agriculturally rich areas.³

Nationalization of land meant that the wood on such unused undeveloped land became community owned, and productive communal woodlots could be started on such land without litigation over ownership or compensation. Land tenure has been cited as a major obstacle to social forestry in various Asian and African countries (Thomson, 1981; West, 1978; FAO, 1978), and very special measures have had to be taken in countries such as South Korea, where owners of unproductive land proposed for afforestation by the newly created village forestry brigades have to choose between foresting it themselves or allowing the

brigade to do so and receiving only a small percentage of the profit on this (Noronha, 1981).

A second step to promote rural development was taken by the government in 1972. It involved decentralization of the administration so that officers in all functional sectors would work together in district and regional offices to allow greater intersectoral cooperation and to give greater autonomy in many matters over local development tactics to low tiers of the government. This factor is frequently cited as a prerequisite for a successful social forestry program (FAO, 1978; Ahn, 1978), because it should allow village afforestation to develop in response to local conditions according to the urgency of other development goals such as agriculture, water supply, education, etc. In Mwanza, Shinyanga, and Singida regions, decentralization has to some extent encouraged forestry where a number of schools have started small (2 ha.) woodlots as part of the regional integrated development plans. But apart from this, the liberation of district and regional government from central control does not appear to have unleashed much enthusiasm for social forestry.

The third and crucial step taken by the government was the program of villagization in 1973-1975. More than any other government action, this program has brought about the current situation in Tanzania. Previous to villagization, people in rural areas lived scattered about in small hamlets, a few still practicing shifting cultivation. During villagization, several million people were physically moved to join other settlements, so that every village now has between 250 and 600 families where previously many had only 30 to 50. These enforced moves were intended to promote rural development by encouraging local political involvement, easier provision of welfare services, and communal production, which, it was hoped, would take off at a later stage. In the short term, villagization had the effect of clearing vast areas for agriculture around the newly enlarged villages and vastly increasing the distances people had to walk to fetch fuel wood.

Villagization and, at the same time, the creation of a village government structure were major steps in promoting activity at the village level. It is lack of just this kind of rural organization that is blamed elsewhere for failures in rural afforestation (FAO, 1978; Noronha, 1980; West, 1978). It consists of a corporate entity which must discuss and decide upon any project to be started in the village. In some villages, the village council is strongly guided by the village assembly, which is a meeting of all adult members of the village; in other villages, it is not. Although the council adheres to customary law with respect to land use and land allocation, it may take over unused land for communal production, or for a woodlot, or it may persuade individuals to give up land for such use. In most villages, uncultivated land which is normally used for grazing or gathering is available. Higher authorities may (and often do) try to persuade or 'educate' the village members to accept and pursue particular projects, such as woodlots, but unless the village government is convinced, it cannot really be forced to do so. The existence of a village government in every village means that there is a village 'ear' for the extension agents and other government workers to talk to, and that there is a means of co-opting people in the village to participate in communal projects. It also means there is some sort of grassroots control over projects.

The fourth and final factor affecting social forestry is strong central government commitment to rural development. Tanzania appears to have a central government which is really committed to the village afforestation approach. First of all, the need for local village-run woodlots was recognized as early as 1967 and a program of village afforestation subsequently was set up to encourage this. Nurseries were started at district and regional levels especially to supply villages, and posts were created in the Forest Division for forestry extension officers whose sole tasks are to care for the nurseries and encourage and train villages in the area. In practice, a shortage of funds has meant that the nurseries are small and some are limited by shortages of water. A more serious problem is the shortage of vehicles with which to deliver seedlings to the villages which would like them. The seedlings are, however, free of charge and participation in the program is voluntary and open to all villages. Now under the decentralized government system, the village afforestation program operates under general district and regional administrations and its finances therefore depend on the local budget, and the priority it is accorded depends on local government and party initiative. The government has also organized national and regional forestry festivals in which villages which achieved the most planting are awarded prizes (Mnzava, 1980). The punitive laws associated with forestry in the colonial period, which were almost entirely concerned with keeping people out of forest reserves, have been completely overhauled and a much more positive line is now taken. Finally, in 1980, the government launched a new program to advocate social forestry. With the help of the Swedish International Development Agency (SIDA), a campaign was organized through the Adult Education Institute to emphasize to villagers the importance of tree planting and to provide technical information on planting. A half million copies of a pamphlet in Swahili were printed and distributed to follow up the tree-planting message broadcast twice a week on a radio program.⁴

It is perplexing that an enlightened government which supposedly has the 'right' rural development policies and has already overcome many of the problems of land tenure and organization of villages should not have a very successful national program of village afforestation. Tanzania's experience with social forestry compares poorly to those of countries with such widely differing ideologies and approaches to rural development as South Korea, China, and India, which have had notable success in village afforestation. The slowness of adoption of tree planting by Tanzanian villages is attributed to a variety of causes. Some take the view that the people do not understand the value of trees and have to be educated about their utility (Kilahama, 1980), or that people actively dislike trees because they may harbor pests which may attack crops. It is thought that people dislike the kinds of trees which are being raised in the nurseries because the wood has poor burning characteristics (Mnzava, 1980; Hoskins, 1979). Others believe that the problems relate to pressure for land, or to lack of private tree ownership on government-owned land (Noronha, 1980). Problems of controlling cattle and preventing them from grazing on the newly planted areas, and of fire from adjacent field clearing are widely cited as discouraging factors. It is claimed that the Forest Division has failed to carry out the program properly because it has insufficient resources at its disposal to do extension work or to run the nurseries (PMO, 1980). Forestry extension officers

are sometimes criticized for addressing the men in the community rather than the women, who are the fuel gatherers. Finally, some maintain that the capacity of Tanzania villagers to carry out communal projects is low, and that it is the emphasis of the program on communal forestry which is its downfall. The aim of this study is to look systematically into all these allegations and to try to determine which carry the most weight.

A social forestry program can fail at least two points: many villages fail to start woodlots, while other villages which have started woodlots are unable to keep the trees alive. Although some of the reasons may be the same for both levels of failure, the two cases, (1) failure of a village to start a woodlot, and (2) failure of a project after it has been started are considered separately in this report because of the importance of understanding in detail the problems facing forestry extension work.

A small sample of eighteen villages was taken in a restricted geographical area, yet representing four different districts with different climatic characteristics and forestry personnel. Of these districts, one can be considered wood-rich and three essentially wood-poor in terms of endowment of natural forest; two have a dry climate of less than 600 mm while two have a wet climate of more than 1,000 mm. Within each zone four or five villages were selected to represent as far as possible a range of success in village afforestation, from villages which had not attempted a woodlot through villages which have started and that subsequently failed, to those which have successful ongoing village woodlots. These details are shown in table 1-1. The districts, for identification, are called Turiani, Uluguru, and Gairo (within Morogoro Region) and Mpwapwa (in Dodoma Region) but see footnotes 3 and 4 to the table for clarification. Each of these districts had one or more local forest officers in charge of the extension work connected with village afforestation; at the higher level of administration, one district officer was in charge of overseeing the program in both Uluguru and Turiani while Gairo has its own district officer, as did the villages in Mpwapwa.

Turiani and Uluguru both receive favorable rainfall, but Uluguru has become deforested because of population pressure while Turiani is still well endowed; Gairo represents a drier climate with only 600 mm of rain per year, and it has very little indigenous forest remaining due to clearing for agriculture. Mpwapwa is even more extreme with an unreliable rainfall and frequent drought. Research was carried out in the field in April, May, and December 1981. As the table shows, nine of the villages had not started communal woodlots; of the nine that had, five were considered to be successful in rearing trees, while four had failed. This breakdown does not represent the actual proportion of such cases in

Table 1-1. Sampling Characteristics of the Surveyed Villages

Village	District	Climate ¹	State of natural fuel-	Village woodlot starts	Village woodlot outcomes
Mhonda	Turiani ²	wet	abundant	no	-
Mkindu	Turiani	wet	abundant	no	-
Lusanga	Turiani	wet	abundant	no	-

Dihinda	Turiani	wet	abundant	no	-
Wami Ruhindo	Turiani	wet	abundant	no	-
Mlali	Uluguru ³	wet	scarce	yes	failure
Kipera	Uluguru	wet	scarce	no	-
Langali	Uluguru	wet	(scarce) ⁵	yes	failure
Nyandira	Uluguru	wet	(scarce) ⁵	no	-
Ibuti	Gairo	dry	scarce	yes	success
Msingisi	Gairo	dry	scarce	yes	success
Ihenje	Gairo	dry	scarce	yes	failure
Chakwale	Gairo	dry	scarce	no	-
Ukwamani	Gairo	dry	scarce	no	-
Chunyu	Mpwapwa	dry	scarce	yes	success
Iyoma	Mpwapwa	dry	scarce	yes	failure
Ibwaga ⁴	Mpwapwa	dry	scarce	yes	success
Ndurugumi ⁴	Mpwapwa	dry	scarce	yes	success

Source: Present study.

¹Districts with more than 1,000 mm rainfall per year are considered wet; those with less than 600 mm, dry.

²Administratively, the Turiani area is under Morogoro District, and is referred to here as a 'district' for convenience only.

³Administratively Uluguru is part of Morogoro District.

⁴Administratively, Ibwaga and Ndurugumi fall under the subdistrict Kongwa.

⁵Nyandira are unusual in that there is no shortage of firewood, although there is no natural forest in the area; this is due to private tree plantations dating from the 1950s.

the region or in the nation. Rather, the villages were deliberately selected as examples, with the help of district forestry staff. The research consisted of interviews with forestry officers at all levels, with village leaders from the village governments, and a household survey of twenty to twenty-five families in each village. A copy of the questionnaire form and schedules of the formal questions addressed to the village government are included in the appendix with other details of the research procedure.

The first item to be considered was how much fuel wood the various communities are in fact using, since varying estimates have been made in other studies. The next chapters relate villagers' motivations to woodlot successes and failures, using data from the surveys. The final chapter summarizes the major points, and tries to set the findings in the context of the political economy of Tanzania. It is hoped that these results will contribute to the design of village afforestation programs.

FOOTNOTES

1. The productive forest area, which is mainly miyombo woodland, is about 34 million ha., and its estimated potential yield is thought to be in the range of 17 million m³ per year. If the rural population of 16 million people consumed firewood at a rate of 2.2 m³ per person per year, the natural sources will soon dwindle. What these figures fail to show, however, is the local crisis, since much of the woodland cannot be harvested of fuelwood as it is too far from the population concentrated in villages (Gilliusson, Sakaya, and Sem, 1975).
2. The Arusha Declaration was a major policy statement defining socialism and self-reliance for Tanzania's development (Nyerere, 1967).
3. In Kilimanjaro, Unakysa, Bukoba, and other areas particularly the law is circumvented to some extent. The "improvements" on land, which can legally be sold, assume essentially the market value (real or market?, not both) of the land.
4. This program seems to have had limited impact. It was prepared under great pressure and implemented very hurriedly. There were a number of problems: the Regional and District Forestry staff were not consulted in its preparation; the booklet refers mainly to pine trees, which are not suitable to most areas, and a national shortage of radio batteries at the time meant that few people were able to listen. It was promulgated in only eight regions, of which Morogoro was not one; but even in Dodoma where it was supposedly carried out, none of the villages visited had seen the pamphlet or participated in the seminars.

Chapter 2

FUEL CONSUMPTION IN THE VILLAGES

The official estimate of the firewood situation in Tanzania is that it is being used up at about twice the rate at which natural wood-land can supply it. This estimate rests on a rural consumption rate calculated to be 2.20 m³ per head per year in 1970, dropping to 1.85 m³ in 1985 and 1.5 m³ by the year 2000 (see table 2-1). This wood is not all for domestic use but includes an allowance of about 10 percent for rural industries and crafts and is based on an FAO study carried out in 1971 (Openshaw, 1978). Preliminary results for the current FAO fuel wood survey in Tanzania give an estimate in the range of 2 m³ per person per year (Kikula and Nilsson, personal communication). Other studies in Tanzania give both lower and higher results. The Rural Integrated Development Plan for Mwanza/Shinyanga found consumption to range from 0.41 m³ in a wood-poor zone to 1.5 m³ in areas where forest was more abundant; the average was found to be 0.71 m³ per head per year (Gulluisson and Persson, n.d.). Meanwhile, a study in the mountainous Lushoto area measured an average consumption of more than four cubic meters per year (Fleuret and Fleuret, 1978).

Table 2-1. Rural Wood Consumption Rates Presented in Various Studies
(m³/person/year)

Study	Rural wood consumption rate
Openshaw (1978)	2.2
Kikula and Nilsson (personal communication)	2.0
Gilluisson and Persson (n.d.)	0.71
Fleuret and Fleuret (1978)	4.0
Skutsch (this paper)	0.97

Tanzanian consumption figures are high relative to those for other Third World countries shown in table 2-2. Comparable studies from the Machakos District in Kenya, for example, estimate consumption at 1.53 m³ per person per year, including 0.25 m³ for crafts (Openshaw, n.d.), while in West Africa the amounts vary from about 0.7 to 1.5 kilograms (kg) per person per day, which is the equivalent of about 0.4 to 0.3 m³ per person per year.

Table 2-2. Estimated Fuel Wood Use for Various Third World Countries
(m³/person/year)

Country	Wood use
Malawi	0.77
Nepal	0.57
India	0.19
Sri Lanka	0.31
Guinea	0.50
Nigeria	1.00
Madagascar	0.52
Uganda	1.07
Kenya	0.69
Zimbabwe	0.63
Ivory Coast	1.01
Zambia	0.90

Source: Derek Earl, Forest Energy and Economic Development (Oxford, Clarendon), 1975, computed from United Nations, International Bank for Reconstruction and Development, and the U.N. Food and Agricultural Organization sources.

Data on fuel consumption was collected in the present study by asking respondents to estimate how many bundles they use per week in each of the main seasons. A typical bundle was then weighed. The reliability of this method is discussed briefly in the appendix; it is obviously not as reliable as a longitudinal recordkeeping approach but time was limited. Besides fuel consumption, though interesting in itself, was not the main concern of the research. Data was also collected on charcoal, but its use was very limited in the villages; generally only one or two families, those drawing regular salaries as teachers or other government workers, ever use it, and then not regularly. The third fuel used was maize stalks, which can be used for kindling but which are used only by a few families in a few villages. No households interviewed had any other power source. Table 2-3 shows the household survey data by village. It includes domestic uses of wood for cooking, water heating and house heating, small industrial uses, as well as distance and time to wood source, number of bundles and their weight, and charcoal consumed by the household.

Other household uses besides heating include cooking meals, heating water for tea and for bathing, and for scaring off animals, especially insects. (Ironing, and heating water for washing clothes or dishes were eliminated from the questionnaire after the pilot study showed that they had a negligible incidence.) The scaring of wildlife itself represented a very small fraction of the total fires (0.7 percent) and this was mainly for deterring termites, using wet grass rather than firewood once the blaze starts, so this too can be put aside as an insignificant use of fuel wood.

Domestic Use of Fuel

Table 2-4 shows the fuel wood consumption in the villages surveyed. The estimated domestic (that is, excluding craft use) consumption of firewood was 4.71 m³/household/year, or 0.97 m³/head/year. Three sets of hypotheses were tested using correlations in these data. The first set of hypotheses, lines 1-4 of table 2-5, tested the relationship between fuel-using domestic activities (heating, cooking, water heating) and total fuel use. Fuel consumption varied very greatly between the different areas surveyed, depending upon whether fuel was used only for cooking or for cooking and personal heating. Surprisingly, heating accounts for more wood use than all other uses, including cooking and water heating combined. Villages which are warm at night (under 1,000 m, which includes all those in Turiani plus Kipera and Mlali from the lower slopes of the Ulugurus) use only 2.92 m³/household (0.63 m³/person/year), while those that are cool at night (the rest) use only 5.86m³ household/year (1.2 m³/person/year). The need for heating in the cooler villages explains the difference, even though the number of fires said to be lit specifically for this purpose is not very high even in the 'cool' villages (92.6/household/year, as compared to 26.6 in the 'warm' villages), and formed only 5 percent of the total fires said to be lit. The correlations between the total amount of fuel used and the number of times the household lights a fire for heating is significant, at $r = 0.36$ (line 3 of table 2-3); but almost certainly the amount of fire used for heating alone is underestimated since it is common practice to keep the evening cooking fire going with constant restoking, and especially in the cooler areas the fire is a center of a social behavior (Brokenshaw and Riley, 1978).

Table 2-3 Use of Fuel

	Meals cooked /year/ household	Water heated/ year/ household	House heated/ year/ household	Animal scaring fires year/ household	Total domestic uses/ year/ household	Bundles for domestic use/ year/ household	Charcoal (kilns) for domestic use/ household/ year	Av. times pombe brewed /household/ year	Bundles for pombe/ household/ year	Bundles for other crafts/ household/ year	Total bundles /household/ year	Distance to firewood source (av.) in km	Time reported to fetch firewood (av.) in hours (per trip)	Av. dry weight of bundles (kg)	m ³ / household, domestic use	m ³ / household, all uses	m ³ / head, domestic use	m ³ / head, all uses
GAIRO																		
Chakwale	849	604	92	0.0	1545	157	38	9.4	28.9	20.0	185.9	3.1	5.9	27.1	5.91	7.01	1.18	1.40
Ihenje	806	480	72	4.3	1362	121	15	4.9	21.5	15.8	158.3	3.3	1.8	27.1	4.56	5.96	1.04	1.35
Ibuti	864	67	22	0.0	915	100	24	0.0	0.0	1.0	101.0	2.9	2.0	35.4	4.93	4.99	0.88	0.89
Ukwamani	953	603	167	3.4	1726	100	0	1.1	3.0	0.1	103.9	6.4	6.9	29.4	4.09	4.24	0.64	0.66
Msingisi	840	269	149	0.0	1257	151	0	1.2	3.1	1.7	155.8	3.7	4.5	23.9	5.02	5.17	0.90	0.92
TURIANI																		
Mhonda	974	415	35	5.2	1426	191	71	4.5	19.2	14.5	224.7	1.8	2.1	18.4	4.88	5.24	1.36	1.59
Mkindu	817	391	9	0.5	1217	103	0	1.7	6.1	15.0	124.1	1.7	3.1	18.2	2.60	3.14	0.54	0.65
Dhinda	920	233	13	0.0	1166	109	25	12.9	67.4	5.8	182.2	3.3	1.9	20.1	3.04	5.09	0.54	0.65
Wami-Ruhindo	871	264	91	4.1	1230	89	244	1.1	5.6	68.3	162.9	2.6	2.6	17.1	2.11	3.88	0.56	1.02
Lusanga	913	630	7	5.4	1555	112	0	0.0	0.0	15.0	127.0	2.0	1.0	14.8	2.31	2.61	0.44	0.49
ULUGURU																		
Kipera	942	82	8	0.0	1033	108	98	7.8	54.6	7.0	169.6	4.0	2.0	23.7	3.56	5.59	0.66	1.04
Mlali	841	481	23	0.0	1302	79	0	10.2	66.6	0.0	145.6	2.6	1.3	17.8	1.96	3.59	0.46	0.83
Langali	961	433	0	0.0	1394	120	195	4.4	7.6	0.0	127.6	0.4	0.5	22.2	3.70	3.93	0.97	1.03
Nyandira	532	537	153	0.0	1223	208	6	5.0	32.8	0.0	240.8	1.1	1.1	17.7	5.12	5.92	1.14	1.32
MPWA-PWA																		
Ibwaga	719	160	64	29.0	972	187	0	6.2	44.0	4.0	235.0	7.5	4.7	39.1	10.16	12.77	2.42	3.04
Nduruguni	713	205	100	37.0	1055	144	0	1.2	7.6	0.0	151.6	3.2	4.1	34.7	6.94	7.31	1.26	1.33
Iyoma	695	138	143	36.0	1012	158	0	7.9	50.5	0.0	208.5	2.4	3.4	31.8	6.98	9.22	1.55	2.05
Chunyu	731	76	57	26.0	890	172	0	2.2	20.0	39.0	231.0	4.2	2.6	29.3	7.01	9.41	1.63	2.19
AVERAGE	828	337	67	8.4	1240	134	40	6.7	24.4	10.4	168.6	3.1	2.9	24.9	4.72	5.87	1.01	1.26

Table 2-4. Firewood Consumption in the Villages Surveyed
(cubic meters per year)

Area	Domestic consumption		Total consumption (includes pombe & crafts)
	per household	per head	per head
Average	4.71	0.97	1.26
Turiani (5 villages)	2.99	0.65	0.93
Gairo (5 villages)	4.90	0.93	1.23
Uluguru (4 villages)	3.58	0.80	1.06
Mpwapwa (4 villages)	7.77	1.68	2.15
11 villages below 1,000 m (no heating)	2.94	0.63	0.93
7 villages above 1,000 m (heating required)	5.86	1.20	1.47

The average number of meals cooked per household per year was 828 (2.25 per day), with a range of 532 to 961, and accounted for 67 percent of all reported uses of fire. The overall correlation between the total amount of fuel used and the number of meals cooked is, however, negative (line 1 of table 2-3). It seems that in some of the 'cooler' villages in some seasons a single meal is cooked early in the evening and the fire is kept going until late. If the 'warm' villages are taken alone, there is a positive correlation of 0.65 between number of meals declared and fuel wood used.

Water heating seems to be the third most important use of firewood. It accounts for 27 percent of all uses of fire, but is not significantly related to total firewood used. The average number of times water was heated was 423/household/year in the 'cool' villages and 356 in the 'warm' ones, which is not a statistically significant difference.

The second set of hypotheses (line 5-11 of table 2-5) tested the relationship between the total amount of fuel gathered (number of bundles, bundle size, or amount used, number of fires lit and the difficulty of its collection distance). The average number of bundles brought over the whole year is 134 per household and their average weight is 24.8 kg (air dry). In the 'cool' villages, the number of bundles is 147 and their average weight 28.8 kg; in the 'warm' villages, 113 at 16 kg. Although there are no significant correlations for the villages as a whole between number of fires lit and distance, number of domestic

fires decreases as wood sources get further away from the warm villages ($r = -.78$ in line 8 of table 2-5). The size (weight) of the bundles of firewood reflects the distance people have to go to gather them; there is a positive correlation of 0.62 between these two variables (line 9 of table 2-5). This characteristic of bringing bigger bundles when the distance is greater would, one might suppose, be matched by correspondingly fewer trips to fetch them. However, the number of bundles brought down does not seem to be less for villages which have further to go ($r = 0.06$, line 10 of table 2-5), although the relationship does seem to be more as expected, in the 'warm' villages only ($r = -0.34$).

The 'cool' villages in practice represent a number of different types of lifestyles, which may explain some of the unexpected and inconclusive statistics when warm and cool villages are taken together. The most heavy uses of firewood are the Mpwapwa villages which, because of their unfavorable climate, can cultivate in only a limited part of the year. In these villages, almost six months of dry season are more or less devoted to fuel gathering by women who often collect wood six days a week, and make a big store which then keeps the family going over the busy season. This is not the case in Gairo, where fuel is collected more evenly over the year, or in the upper Uluguru villages which, because of private plantation of trees since the 1950s, do not have great distances to go to gather fuel.

Table 2-5. Correlations Between Uses, Amounts, and Distances to Fetch Fuel (product moment correlation coefficient, r)

	Overall correlation	'Warm' villages only	'Cool' villages only
FUEL USES:			
1. Number of meals vs. total fuel	-0.55	+0.65	-0.44
2. Number of water heating vs. total fuel	-0.40	-0.26	-0.54
3. Number of fires lit for house heating vs. total fuel	+0.36	-0.13	-0.02
4. All domestic uses vs. total fuel	-0.48	-0.02	-0.61
DISTANCE			
5. Number of meals vs. distance	+0.01	+0.46	+0.12
6. Number of water heating vs. distance	-0.3	-.047	-0.14
7. Number of house heating* vs. distance	0.27	-0.19	-0.13
8. All domestic uses vs.			

distance	-0.17	-0.78	+0.05
COLLECTION			
9. Bundle size vs. distance	+0.62	+0.61	+0.62
10. Number of bundles vs. distance	+0.06	-0.34	-0.00
11. Number of bundles vs. bundle size	-0.24	-0.02	-0.18

Source: Present study.

Non-domestic Use of Fuel

The main non-domestic use of firewood was for preparation of pombe (local beer). This is prepared in the home, but for sale, and the pattern varies; in some villages a few women specialize and brew large amounts regularly, while elsewhere more women brew but only on occasion. Table 2-3 gives the average number of pombe brews per household, irrespective of the mode of production; the average is 4.5 times per year, with an estimated total annual use of twenty-four bundles per household per year for this purpose. Although the figures are not to be considered entirely accurate, since people are less willing to give information on this subject (licenses are required for brewing), it is immediately evident that brewing uses a considerable quantity of firewood on top of usual domestic consumption. However, there is no significant correlation between amount used for pombe and the difficulty of obtaining wood as measured by distance to source, nor between the number of times pombe is brewed and distance, so in these villages at least the firewood shortage has not yet become intolerable!

Other uses include preparation of food for sale, which was uniformly declared by women who did this as one bundle per day, and pottery and charcoal production. Relatively few respondents were involved in these activities, usually not more than three or four in any village, and in only one village did the sample include a blacksmith. Only one village, Wami-Ruhindo, had any significant charcoal production, and even there only four families out of twenty-four were doing this. Together the per household use of firewood for these industries averaged ten bundles per year. Since the sample was small, the figures have been amalgamated, and a larger survey would have to be made for any certainty to be guaranteed regarding their incidence in the population and their average use of fuel. Thus the total rural consumption of fuel in the areas surveyed is estimated at 169 bundles/household/year, which is equivalent to 1.26 m³ per person, and of this about 14 percent is for pombe production and 6 percent for other crafts using fuel. This is considerably below the accepted figure for Tanzania, but the variation in consumption between different areas is demonstrably large.

Uses of Charcoal

Very little charcoal was used in the villages in the survey. The average was 40 kg per household (about 9 kg per head) but in most villages it was much lower than this. The few villages with significantly large numbers of people receiving a wage or salary are the exceptions. Mhonda and Langali are both ward centers, while many residential of Wami-Ruhindo are laborers on state farms. Charcoal was not used for pombe production or in any other cottage industry.

Use of Poles

The survey did not attempt to measure the use of wood for non-fuel purposes, the most important of these being house construction with poles, since this was not within the terms of reference, but it is a very important use and shortages were often mentioned. In some areas in fact it appeared that shortage of poles had been a motivating factor in the villages' decisions to start woodlots, rather than of firewood.

Chapter 3

THE VILLAGE WOODLOT

Tanzanians interviewed in this study are not lacking in appreciation of forest depletion. Only 19 percent of the sample thought that the supply of firewood and poles was sufficient from existing natural sources, and 62 percent overall felt that forests had decreased over the last ten years. When asked to name the most important reasons for planting trees, 81 percent mentioned firewood, and an equal proportion, poles for house building; but 33 percent also mentioned some form of environmental protection. Thirty percent of the respondents also mentioned commercial gain from timber or charcoal production, as well as fuel and poles, but it seems that the majority consider tree planting to be a subsistence activity of the household or village, and do not expect cash benefits from it.

In general, awareness of trees, their values, and the means of growing them seemed remarkably high in the sample and immediately brings into doubt the theory that woodlots fail because people neither know the importance of planting trees nor how to do it. All of the villages in the study said they had been in contact with local Bw. Miti (forest extension officer) and could obtain seedlings from district nurseries, though all suffered transport problems. However, most of the woodlots are small and involve very little investment of land or labor; and although the village governments and individuals said they would like to plant more trees, there was very little sign in most villages that this was likely to happen on a systematic basis, even in small annual increments.

In three of the four areas some villages were found which had started village woodlots, and some of these had been successful in rearing trees while others failed; in the fourth area, Turiani, there was no village woodlots as such but some had school or private plantations. In all areas there were examples of villages which had not tried to start woodlots. Based on the 18 village cases, we have tried to examine systematically the evidence for why one village starts a woodlot while another does not, and why one succeeds where another fails; and more speculatively, since no positive examples were found, why villages do not continue to expand their woodlots after they have been successfully started. The literature in recent years has acknowledged that the reasons may be socioeconomic as well as physical and that the reasons are usually complex (Arnold, 1978; Burley, 1980; FAO, 1977, 1978, for example). Drawing on this growing body of material, we have tried to specify a number of problem areas or hypotheses. In what follows, each hypothetical cause of woodlot failure is briefly discussed and tested against the field research results. A number of well-known and generally accepted notions about village woodlots are thus refuted while others emerge.

The nine village woodlots investigated were all on the small side - the largest was only 30 acres, the smallest less than 1, and most between 2 and 5 acres. Most were started in the late 1970s, and only one, dating from 1964, has so far been harvested for fuelwood and poles. Because of this, it has not been possible to assess the impacts the woodlots have made on fuel supply. Most

villages expressed a general wish to plant more trees. "Lack of seedlings" was the most commonly stated reason why such expansion had not yet gone ahead (mentioned by 41 percent of respondents in the villages which had started woodlots); "drought risks" was the second most common complaint (34 percent). As this study goes on to demonstrate, the reasons for failure to start woodlots are probably much more complex than this, involving a number of important social and economic factors.

Table 3-1 shows the present (1981) condition of village woodlots, their size, the species planted, their date of planting, and maintenance and upkeep. The most commonly planted species of tree was Cassia siamea, followed by Schinus molle. In some places, fruit trees were also planted while in the dried part of Mpwapwa, Azadirachta indica (neem, melia) were found. These were all planted as seedlings which had been delivered from the local Forest Division nursery. Some of the woodlots are considered to be successful, on the basis that more than 50 percent of the seedlings were still growing and healthy at the time of the study. In fact, with one exception, at Chunya, where the trees were five years old but still seemed to be struggling, successes were obviously very successful while failed projects had no trees left at all.

Generally, village governments did seem to have good control over the woodlots in terms of protecting them from individual wrongdoers. In several cases people were said to have been fined for allowing their cattle to graze on the seedlings or for having stolen poles or firewood. The wood was generally considered to be owned by the village government and in every village when a distribution plan had been worked out it was up to the village government to organize the cutting and to sell the poles and firewood back to villagers. Revenues from this activity have to contribute to the village general fund. In addition to the nine village (that is, communal) woodlots in the so-called 'starter' villages, there were twelve other small woodlots in the study villages (see table 3-2). These belonged to individuals, or to a group such as the church or the school where a small number of members was responsible, and were more or less evenly distributed between the villages classified as starters and those classified as non-starters. These private woodlots were not directly examined in the study, with the exception that some conclusions regarding suitability of the species of trees and impact of drought in the failure villages have been drawn in villages with failed communal woodlots but obviously successful non-communal woodlots. The role of the church in promoting village afforestation should not be overlooked, as it has much to do with influencing people and in providing seedlings for private planting, especially in the Gairo district. Although almost every school in the survey villages had done some planting, this was mainly for ornamental purposes, such as lining the approach road, although one or two also had small woodlots.

Table 3-1. The Village Woodlots

Village	Date	Acres	Species	Condition in 1981	Delay in planting after delivery	Watering of seedlings	Weeding of woodlot	Expansion plans
1. Ibuti	1979	0-75	Cassia siamea, guava, citrus	good	1 week	1 st and 2 nd days only	once in first year	two sites totaling about 20 acres
2. Msingisi	1977	4-0	Cassia siamea,	good, minor cattle damage	Immediate	planted during rains	once in first year	none apparent
3. Ibwaya	1975	5-0	Cassia siamea, Schinus molle, Grevilla robusta	destroyed by goats, rest good	1 day during rains	planted	none (approx. 10 acres)	1 mile strip
4. Ndurugumi	1964	10-0	Cassia siamea, Grevilla robusta, Eucalyptus spp.	good	no data	no data	no data	100 acres, 5 acres per year
	1974	20-0	Cassia siamea	good but ¼ burnt	1 day	no data	twice in each of first 2 yrs.	
5. Chunya	1971	3-0	Muule fype (1)	all died	no data	none	no data	none apparent
	1976	2-0	Cassia siamea	Cassia stunted	no data	none	none	
	1979	1-0	Cassia siamea	all died	no data	none	none	
6. Ibenjo	1979	0-5	Cassia siamea	all died	1 week	none	none	none apparent
7. Mlali	1978	2-0	Cassia siamea	all died	no data	none	none	none apparent
	1980	2-0	Siderela spp.	all died	no data	none	none	
8. Langali	1979	2-0	Cypress	all burnt	no data	no data	no data	replant plot w/ Eucalyptus maldenil
Iyoma	1980	5-0	Cassia siamea	all died	1 week	none	none	4 acres cleared for this year

(1) Muule is Swahili for teak. As it is unlikely to have been teak in this area, we assume it was another hardwood species intended primarily for timber.

Table 3-2. Other Woodlots in the Villages

Village	Started by	Date	Rate of planting	Species	Condition (1981)
1. Ibuti	school	1979, 1980 1981	1 acre per year	<u>Cassia siamea</u> , citrus and	thriving, 1981 plot intercropped with maize
2. Msingisi	school	1979, 1980	1 acre per year	<u>Cassia siamea</u> , and guava	thriving
3. Ibwaga	school		1/2 acre	<u>Cassia siamea</u>	thriving
4. Ndurugumi	school	1975	n/a	<u>Cassia siamea</u>	thriving
5. Ibenje	church	1978 1980	50 seedlings 50 more seedlings	<u>Cassia siamea</u>	all died when church relocated; planted at new church site; fair
6. Langali	private	1950s	Many 1-2 acre	<u>Acacia mearnsii</u> and <u>Eucalyptus</u> <u>maidenii</u>	thriving
7. Iyoma	school	1952	<u>Delonix regia</u> around school building	<u>Cassia siamea</u>	good condition
		1979, 1980, 1981	2 acres per year	<u>Cassia siamea</u>	a few remain from 1980 only
8. Chatwale	school	1979	3 acres	<u>Cassia siamea</u>	fair

	church	1979	3/4 acre	<u>Cassia siamea</u> and citrus	poor; suspect insect damage
9. Lusanga	school	1979 1981	1 acre 70 seedlings	team <u>Eucalyptus spp.</u>	all died Good
10. Wami-Ruhindo	private	1950s et seq.	12 acre plantation	Kapok, teak, coconut, citrus, <u>Cassia siamea</u>	
11. Nyandira	private	1950s onward	many 1 acre plots	<u>Acacia mearnsii</u>	thriving

Sixty-three percent of the people in the total sample had planted trees privately, not in woodlots which by definition are areas specifically set aside for silviculture, but informally around their houses. Many of the privately planted trees are fruit trees. Papaya and bananas, which are nearly universally grown in the compounds were not counted as trees for the purpose of the study, as they cannot be used for firewood because of their non-woody stems. Nevertheless, in areas where the fuel supply is desperate, as in Unyakyusa, banana litter is used as fuel. Other fruit trees often serve multiple purposes, for shade and firewood as well as food. However, others of the privately planted trees are 'exotics' such as Cassia siamea, Tectona grandis or Eucalyptus spp. from the Forest Division's nurseries. Very frequently the respondents could not name these trees in either Swahili or their own tongue, and referred to them as a group of 'Miti Ulaya' (European tree), which is hardly accurate botanically but indicates that they are considered to be foreign and brought by the colonials. Survival rates for these privately planted trees was rather high at an estimated average of 57 percent, and 21 percent of all respondents said that their parents had planted trees when they themselves were small, which further indicates that planting is not unfamiliar in the village.

Why Do Some Villages Start Woodlots While Others Do Not?

All villages in the survey¹ were aware of the government's policy that villages should plant trees in a village woodlot, all knew that seedlings were available at the Forest Division's nursery, and all knew that there was a Bw. Miti responsible although not all could name him. This level of awareness probably has been achieved partly by radio and through Party officials visiting as much as by extension work by the Forest Division. From what the Bw. Miti told us, all the villages had been contacted by forestry extension at some time in the last three years. In contrast to some other parts of the country, however, village forestry here has not received development assistance funding from abroad and although the program exists, it is by no means in the forefront of the rural development effort. Villages have certainly never been forced to start a village woodlot by the Forest Division, who rely on persuasion mainly. Why then do some villages decide to start woodlots while others decide not?

Need and Perceived Need for Wood

The most obvious reason for a village not to start a woodlot project is that there may be no need for extra wood in that area. This was certainly the case in some villages which for climatic and historical reasons have plenty of fuelwood at hand from the natural forests close to the village, particularly in the Turiani area. If the distance people have to go to collect their firewood is a measure of the abundance of firewood, then that distance should be directly related to the chances of a village starting a woodlot taking distance as a proxy for time and effort involved in fuel gathering. In fact, the mean distance for firewood collection was reported to be 3.4 kilometers (km) in starter villages and 2.8 km in non-starters (line 2 of table 3-3). From earlier discussion on firewood consumption, we have already seen that bundle size increases with distance to the source, and bundle size is indeed significantly higher in the starter villages (table 3-3; line 26). Since none of the woodlots yet significantly contribute to fuel supply, the fact that the reported instances of using fires for house heating is higher in the starter villages is almost certainly because these villages are mainly in the colder zones (eight of the nine at above 1,000 meters in altitude), although the number of bundles of wood is not very different (table 3-3, line 25).

The supply of firewood is not a single quantifiable factor in practice; what counts is the perceived supply rather than the actual. About 20 percent of the sample households were optimistic about the supply of fuel and poles from the natural woodlands, both in the starter and the non-starter villages, but a much higher proportion in the starter villages had noted a decrease in the surrounding forests in the last ten years (71 percent to 52 percent; see table 3-3, line 1).

Further, there may be social differences in the perception of need for fuelwood, particularly between men and women. If women enjoy fuel gathering more than their other tasks, they may not feel that the hours devoted to this should be shortened (by starting a woodlot); on the other hand, it could be argued that as it is men who make most of the decisions about starting village projects, they might, callously, rate women's labor low and may therefore decide against a village woodlot to which they themselves would have to contribute labor as well as the women. It was naturally difficult to gather data on these attitudes, particularly as the sample of women respondents was rather small (see appendix). Roughly seventeen percent of the whole sample in starter villages said that women were definitely more interested than men in starting woodlots; 14.7 percent said so in non-starters (table 3-3, line 17); conversely, 26.4 percent and 20.1 percent respectively said men were (table 3-3, line 18); not a significant difference, and results analyzed separately by male and female respondents did not reveal significant differences either. The majority said men and women were equally interested. In general from informal discussion with women it appeared that fuel gathering was quite enjoyable, as it is often done in groups, but this was equally true in starter villages as in non-starters. It is clear enough from the data that need for firewood is an important factor in distinguishing the starter villages from the non-starters, so that absolute need may be accepted as a motivating factor. It should also be noted, however, that the villagers are not the only ones to notice the need; government efforts to start village afforestation have tended to be concentrated in areas with greater overall need, and it is difficult to assess to what extent this may be responsible for the differences. In Turiani, for example, where the need is not acute, only one Bw. Miti was assigned for about 60 villages, while in the drier Gairo the Bw. Miti had 33 villages to attend to.

Dislike of Trees.

It has been argued by some (for example, Moris and Openshaw, 1979) that the concept of cultivating trees is not merely unfamiliar to some societies but actually an anathema. Tribes in which the hunter-gatherer history is recent may feel that trees represent resources to be exploited rather than managed and those that have been clearing land continuously for shifting cultivation of crops may even feel that trees represent the worst in nature, to be shunned and cut down where ever possible. While this may be rather an extreme view, there are some well-documented taboos surrounding trees, only some of which can be easily explained in material terms. The well-known aversion of the Sukuma people to trees relates to the devastating eating habits of the *Quelea quelea* birds which nest in trees around fields and have caused famine in quite recent times (Noronha, 1981, although this is disputed in Mnzava, 1980). In our study, the only tree taboo noted was in Ibuti where people feared owls (representing spirits) and therefore removed all trees around their houses, the material reason for which is obscure, although to some extent this superstition is now dying out. Apart from this, the study found no evidence for any innate dislike of trees. Interestingly a high proportion of respondents (33 percent) noted that a major reason for planting trees was for protection of the environment (including 'prevention of soil erosion' and 'improvement of climate'), although this was not significantly higher in starter villages than in non-starters (36 percent to 31 percent; table 3-3, line 37). The value of cultivated trees was perceived in much the same way with respect to normal uses, in starters and non-starters (table 3-3, line 38-41), although fruit production was mentioned more frequently among starters.

Table 3-3. Differences Between Woodlot Starters and Non-starters.

Variable	Starters	Non-starters	Significance of difference ^a
Total sample	9	9	
<u>General</u>			
1. % who have noticed a decrease in natural woodland in last 10 years	71.3	52.9	NS
2. Distance to source of firewood (km)	3.4	2.8	NS
3. Average family size ¹	4.7	4.9	NS
4. Adult women per household	1.5	1.4	NS
5. % population moved to village 1973 or later	55	26	99%
6. Time per firewood collection trip (hrs)	2.8	2.9	NS
7. Distance to Bw. Miti's office (km)	10.6	10.0	NS
8. Distance to nursery	12.5	15.5	NS
9. % who are optimistic that supplies from natural woodland are sufficient	18.1	19.3	NS
<u>Tree planting</u>			
10. % who participated in communal			

woodlot	59.4	0	-
11. % who had knowledge of village government's discussions about woodlot	29.6	19.0	NS
12. % who participated in other woodlot projects	27.1	4.3	95%
13. % who have planted trees privately	74.6	52.0	90%
14. % who have planted more than 25 trees	22.2	28.7	NS
15. % families in which women planted trees	39.1	18.7	85%
16. % whose parents had planted trees	18.0	23.0	NS
17. % saying <u>women</u> are more interested	16.8	14.7	NS
18. % saying <u>men</u> are more interested	26.4	20.1	NS
19. % saying <u>richer</u> people are more interested	8.8	25.4	NS
20. % saying <u>poorer</u> people are more interested	36.7	22.2	NS
<u>Use of fuel</u>			
21. Meals cooked/year	797	859	NS
22. Water heated/year	256	418	95%
23. Homes heated/year	69	64	NS

24. All domestic uses of fire/year	1131	1347	90%
25. Bundles of firewood per year for domestic use	137	131	NS
26. Weight of bundles (kg air dry)	29.0	20.7	99%
27. Number of pombe brew per household per year	4.3	4.8	NS
28. Firewood bundles for pombe	24.5	24.3	NS

Attitudes toward woodlot

a. % of household who said that starting a woodlot or its failure was due to:

29. not enough seedlings	41	60	NS
30. not enough land	2.5	22	NS
31. people too busy	3.0	13.5	NS
32. risky, other people may claim trees	0.6	1.2	NS
33. risky, pests can ruin trees/crops	9.1	3.7	NS
34. risky, drought	34	8	NS
35. risky, cattle trample	7.5	0.0	-
36. risky, government may intervene later	2.7	0.0	-

b. Benefits of woodlots

37. protection of environment	36	31	NS
38. firewood	73	88	NS
39. poles	73	86	NS
40. timber/charcoal	25	37	NS
41. fruit	39	9	99%

Note: Significance is based on the Fisher Exact Probability Test for small samples using a two-way contingency matrix around the median value of the variable concerned (Siegel, S., Non-parametric Statistics (McGraw-Hill, 1956).

Source: Present study.

^aFamily size is measured as units from a food consumption point of view since less food cooked should require less fuel. Children and old people count as halves (see appendix for methodology).

It might further be argued that it is not trees in general but the particular species offered by the nurseries that are disliked. It is thought by some researchers that people do not like softwoods which are consumed quickly in a fire; hardwoods give a longer, slower burn and are more satisfactory for cooking. Others have said that some species of eucalyptus give off an unpleasant odor which affects the food. There was little evidence that this was a negative factor in this survey. In all the areas where village woodlots had been started, starters and non-starters had access to the same species and in Turiani, where there were no 'starters,' teak (Tectona grandis) was being offered, and all villages admired its quality both for construction and burning and very many individuals planted it for themselves. In general, of course, there is a tendency for people to prefer trees which have value for both uses and even the very fast growing character of a species such as Schinus molle which can be trimmed for firewood after two or three years, does not compensate in people's estimation for its unsuitability for poles (it is a short, shrubby sort of tree). Even so, they grow it if the seedlings are delivered. The most popular species seemed to be Grevillia robusta, Eucalyptus spp., and Cassia siamea in the drier areas, and Tectona grandis and Acacia mearnsii where the conditions were favorable.

Relation of Trees to the Agricultural System.

An issue not unrelated to the points made above is that of integration of tree cultivation into the existing farming systems. Anthropologists are rather apt to note that the mountain tribes such as the Chagga and the Nuakyusa use trees regularly for protection of crops and for fodder and attribute this to intensive use of the land brought about over a long period by a general land shortage. By contrast, plains dwelling people for whom land is not a constraint are said to have no historic need for tree cultivation and indeed given the high mobility of some of these groups, tree planting may have always been wasteful. In our study, only two villages represent the intensive mountain farming system (Nyandira and Langali), and of these, the first is a non-starter and the second an unsuccessful starter. However, these villages do have the highest rates for private planting of trees, which was not practiced in historical times, but was a response to a colonial environmental protection program in the 1950s previous to which the land had been completely cleared of trees.³

Tree cultivation may conflict with the existing farming systems by competing for land and labor, particularly in the peak agricultural season at the beginning of the rains, and because of the boundary problems associated with clearing surrounding fields by burning and cattle grazing, which by customary law may be carried out on any land not occupied by growing crops. It is frequently argued (FAO, 1977; Burley,

1980; Brokensha and Riley, 1978, Hoskins, 1979) that these factors militate against villagers' willingness to participate in communal tree planting efforts. Our study, however, showed that little weight was given to most of these factors by villagers.

Land constraints seemed to be more important than labor. Twenty-two percent of respondents in the non-starter villages claimed that land shortages made tree growing difficult, compared to only 2.5 percent in the starter villages (table 3-3, line 30), a significant difference. Field notes of the absolute amounts of land apparently available per household do not support the hypothesis that land scarcity prevents woodlot starts, especially given the small areas of land which the villages typically envisage for a woodlot - two to five acres or so. What is much more to the point is that a communal woodlot may require redesignation of a parcel of land from private to common ownership, and more will be said about this problem in a later section.

The competition of the woodlot for labor resources is also noted as a problem in some studies, since tree planting time occurs simultaneously with planting time for the agricultural crops, and this is commonly the bottleneck in farm management. However, in this study only 13.5 percent of the sample in non-starter villages and 3 percent in starter villages said that they were "too busy" to plant trees (Table 3-3, line 31). Again, this may be due to the very small size of the existing woodlots, and their consequently low labor requirements. A three-acre plantation of Cassia siamea requires one day of village labor for clearing, one for planting, and one for weeding in the first year - very little, when one considers that villagers are accustomed to giving two days or more per week for communal activities. A larger woodlot, of course, would be more demanding.

Fire had occurred in only two villages, and in only one had it completely destroyed the project. It was only mentioned as a hazard in these two villages, and even there it did not seem to be a seriously discouraging factor. At Langali, where two acres of cypress woodlot had been accidentally burned, the village seemed keen to replant, although they wanted to try another species.

Cattle damage to seedlings was not mentioned as a reason for difficulties in starting in the non-starter villages. In most villages where it had occurred, there was some punishment meted out to the offending cattle owners. While it cannot be dismissed as a difficulty in successfully rearing trees, it is evidently not considered an insurmountable problem, nor does it discourage villagers from starting a woodlot (table 3-3, line 35). Both drought and pest nuisance were mentioned more frequently in starters than in non-starters (table 3-3, lines 33 and 34).

Lack of Experience or Know-how

It is hypothesized that lack of information and lack of knowledge concerning the cultivation of trees have been responsible for the lack of response so far to village tree growing. Indeed, the "lack of tradition in forestry" has been blamed as the main problem (Mnzava, 1980). This study provides evidence which strongly contradicts this hypothesis, at least for the case of the eighteen villages included. Far from not knowing how to plant trees, about 65 percent of the households sampled had planted trees around their own compounds. This percentage was higher

in the villages which had also started village woodlots (74 percent to 52 percent, table 3-3, line 15; a difference significant at the 90 percent level of confidence).

The seedlings for most of these individual plantings had either been obtained directly from the Forest Division nursery, or were handed out to individuals by the village government at the time they were delivered to village woodlot projects (which occurs commonly, although not strictly the policy of the Forest Division), or they were stolen from the village woodlot after being planted, a practice which is noted elsewhere (Brokensha and Riley, 1978). The percentage of households which had planted more than twenty-five trees was also quite high - 22 percent and 28.7 percent respectively table 3-3, line 24). Moreover, 18 percent of respondents in starter villages and 23 percent in non-starter villages claimed that their parents had planted trees when they themselves were children (table 3-3, line 16); only 10 percent of the total sample mentioned that lack of knowledge was a problem in planting trees, with no significant differences between households in starter and non-starter villages. It is quite clear that it is not information or experience related to tree growing, that is holding back the village afforestation program in the areas studied. Lack of seedlings is a problem, however, according to the responses (table 3-3, line 29).

Cash Outlay Is Too Great

A number of workers in the field have suggested that the capital outlay required to cover costs of the project - for seedlings, fencing, insecticide, labor, etc. - may be too large for the village, or that the village may be unwilling to risk even small sums of real money on such a new type of project. Money was not mentioned in any of the villages visited as a problem connected with tree growing, for the simple reasons that seedlings are delivered free, no fencing is erected or considered even for household compounds in these areas, and insecticide is so expensive that no one would dream of applying it to crops such as trees. Labor is conscripted communally by village law, and is not paid in cash wage, so labor costs are no constraint in this context.

Poor Forest or Extension Services

There are a number of aspects of forestry extension services which could affect the success of village afforestation. Notable among them are (1) the attitude and interest of the local forestry officers (Bw. Miti) and their superiors (district forestry officers) toward village afforestation, (2) distance of local forestry officers and nurseries from the target villages, (3) lack of transport for seedlings, and (4) insufficient nursery space or lack of water for nurseries. It is often noted that foresters are skeptical about village afforestation and generally do not regard extension work as the duty of a forest officer, due to their training and experience in large-scale commercial forestry. One would perhaps expect foresters to denigrate villagers' tree-planting capabilities, thus maintaining a professional distance. Of the four Bw. Miti in the study area, we found two who in our estimation were extremely well-oriented to village forestry and who were appreciated and liked by the villagers as far as we could tell. Young and recently graduated from forestry school, they seemed to encourage villagers in their efforts, and make every attempt to get seedlings to them, and many villages within a reasonable distance of them had attempted woodlots of some kind. Only one Bw. Miti seemed to have a really disparaging attitude toward villagers.⁴ Nonetheless, in his area, a number of villages had started

woodlots. Another had taken it upon himself to experiment in his nursery with seeds of indigenous trees from the nearby woodlands, since only a limited range of exotics were available from the national seed production center. This effort seemed very commendable.

An important factor to be considered beyond the interaction of Bw. Miti and the village is the relationship of the Bw. Miti extension agents to their immediate superiors in the district offices. In fact, district forestry officers, despite their nominal support for the concept of village afforestation, seemed in this study to have limited interest in the program. In two separate instances, a district forest officer proposed a village for inclusion in the study as one in which the people had never planted trees and did not value them, when in fact both had masses of trees planted, privately or otherwise.⁵ This is partially because there are no proper records kept by district officers, a practice which itself indicates lack of interest. More importantly, it was found that the local Bw. Miti in these areas were well aware of the situation in these particular villages, visiting them frequently and taking an interest in their doings. Despite the extension agents' general habit of reporting back to the district office biweekly, the information about these villages had clearly not been transmitted to the district forest officers. Presumably, evaluation of the state of village afforestation is not the main point of these meetings, which perhaps are more concerned with immediate problems of supply of seeds or vehicles. Of course, the sample of officers was rather small, and district foresters have many responsibilities beyond that of the village afforestation program; but it seems at least in our small survey that the issuing of licenses and the maintenance of catchment and other large plantations takes the major part of their attention and interest.

Two Bw. Miti in the study were less successful, due to personality or lack of interest, or possibly due to their greater distance from the villages. One had to cope with a nursery at one end of a 100 km beat and sixty villages scattered on small side roads, without even a bicycle of his own to use, but the average distance from the study villages to the Bw. Miti's office was 10.6 km to starter villages and 10 km to non-starters (table 3-3, line 7). The distance from the villages to the nursery was 12.5 km and 15.5 km respectively (table 3-3, line 8). Distance could be considered a proxy for the amount of influence the forestry extension service might have on a village, based simply on the probability of repeated visits of the officer to the village, but the data do not support the hypothesis that more distant villages are less likely to comply. Whether they can obtain seedlings depends almost entirely on whether a lorry is available, rather than on how far they are located from the nursery, and in only one village did people (the school children) actually walk to the nursery to collect seedlings. This was from a village close to the nursery, naturally, but it occurred only because of the crusading spirit of the headteacher and his ability to compel the children to work for the village woodlot. The quality and quantity of extension advice was not a factor in this case, and indeed it did not appear lacking elsewhere, although there is some doubt that seedlings are not as easily obtainable as the villagers desire.

Shortage of resources is an important factor limiting the credibility and effectiveness of the Forest Division for despite the promise that seedlings will be delivered to any village that would like them, this is in practice not possible under the present situation. None of the Bw. Miti in the areas studied had any vehicle to deliver seedlings; only one had even a bicycle. In one area, a lorry from the general pool was released from the district office for seedling delivery for only one week of the year, and not necessarily in the rainy season, when seedlings should be planted. It is unlikely that much more vehicle time is available in other areas. Much depends on the Bw. Miti himself and how well he can make his case at the district office in competition with dozens of other official and unofficial requests for the vehicles.

Even without transportation constraints, it is evident that the nurseries set up by the Forest Division at the district level (or sometimes by division) for the supply of seedlings for this village program are rather small; most nurseries raise between 50,000 and 100,000 seedlings a year in total. Not allowing for any losses (which in all probability are about one-third of the total), this would forest only a rough total of 50 to 100 acres; but each nursery was supposed to serve between 35 and 65 villages. At present, this insufficient nursery capacity is rational only because transport is a greater bottleneck. The Forest Division intends that nurseries be decentralized and that more progressive villages have their own nursery (Kilahama, 1980). But there is a major block to this: the chronic lack of water in most villages. In the areas where forestry seems to be important because of the natural lack of trees, people already walk 3 to 7 km to fetch drinking water. Clearly, no one is going to walk that far to fetch water for daily watering of seedlings, and the quantity of water that would be required is in any case excessive. A nursery had been operating in the 1960s in one village where, because it had been designated a 'village settlement,'⁶ a concrete water tank with a pump had been built. In the 1970s, however, that village's population tripled due to enforced immigration of people from neighboring scattered settlements during 'villagization,' the demand for domestic water increased, and the nursery had to be discontinued. Until adequate water is brought by pipe to the villages, which is not expected in the next few years, there is no possibility of establishing village nurseries at all in the areas studied. In climatically more favorable areas, such as Turiani, where water is more abundant, there is often also less immediate need for tree planting. Although in every village we heard complaints about shortage of seedlings (table 3-3, line 29, as already mentioned) and although undoubtedly it is a problem, not too much credence should be given to this as it is also a favorite excuse for lack of interest, and one that at the same time condemns the district governments as inefficient which most villages naturally believe.

Presence of Other Agencies

It has been suggested that the activities of agencies other than the Forest Department might encourage village afforestation. The Anglican Church has taken up the cause of tree planting and was very active in one area of the survey. The mission runs a small nursery of *Cassia siamea* and fruit trees, and seedlings are distributed to churches in the area. Many individuals also came to buy seedlings for themselves. They also came at night to steal them, which did not dismay the missionary at all, for it indicated that people were extremely keen to obtain trees. The question to be asked is whether the presence of this agency active in reforestation led to more village adopting woodlots as projects. While it is evident that in some villages the personal support for tree planting by respected village church members did influence the village to start its own woodlot, this was not always the case and in several instances church plots were started by the village did not follow suit. Essentially, this is an element of the leadership factor which is discussed below.

Lack of Involvement of Women

Gathering firewood is an almost exclusively female task. It has been suggested (Hoskins, 1979) that one of the reasons for woodlot failures is that the Forestry Service directs its attention mainly to the male members of the village. In fact, in the Tanzania case, the Forest Division deals with the village government rather than with individuals, although the former is composed mainly of men. Involvement of women has no clear relation to project adoption; there does not seem to be a great deal of difference between starters and non-starters in terms of how interested women are thought to be in afforestation by the men and women in the households sampled. Unfortunately, the

sample of women respondents was rather small and a separate reckoning from them was not possible. Although there is no difference in attitude between men and women, there is a significant difference in participation: nearly 40 percent of households in starter villages said their women had planted trees, while only 18.7 percent of households in non-starter villages reported their women to have planted trees (table 3-3, line 15).

Lack of Support for Communal Activities

One of the more important factors to be investigated is whether woodlots are unpopular because they are attempted as communal projects, and that it is the communal aspect that is unpopular rather than the tree growing itself. Though popular with government officials and foreign assistance officers, communal projects have a lot of drawbacks, as well as potential advantages, and villagers are certainly well aware of this.

All villages in Tanzania have some communal activities, whether they are 'ujamaa' villages or not.⁷ Most have a communal shamba, which may vary in size from five to 300 acres or so. All villages have a school which has been recently built by communal labor. The system usually calls for all able bodied men and women to participate on one or more fixed days in the week; a record is kept of attendance and a fine is levied on those who fail to show up. The product of the communal shamba is generally sold and the takings divided between the village fund (for general purposes) and a special fund (as for a mill), and the laborers; the proportion varies. The limited success of communal agricultural production due to both lack of participation and low labor productivity has been well documented elsewhere (Putterman, 1980; McHenry, 1978). In general, one would expect willingness to participate in communal woodlots to be related to willingness to participate in other communal projects. If it is the communality of the project which is the stumbling block to woodlots, non-starter villages should have unsuccessful communal agricultural projects. Seven of the starters and four of the non-starters had active and relatively successful communal shambas as far as we could judge from field notes. While this suggests that the communal aspect of village afforestation does not present an additional obstacle to starting a woodlot, it is not conclusive evidence.

Common property, such as a village woodlot, may be subject to abuses which discourage participation of villagers. For one thing, there is the freerider problem: someone else might run off with the product of their labor. Second, the maturation period of trees is long, and this compounds the risk. It has been suggested that the fear of expropriation of the wood by other groups prevents villagers from participating in communal woodlots. This study explored this hypothesis by finding out how it was planned that the product be divided or used and by inquiring indirectly about fears of outside intervention. In every case where a woodlot has been started, the planned distribution system was identical; the village government would oversee the cutting of wood when it was ready and would sell it to any villager wishing to buy it, with the money going to the village fund. (In practice, only one village had already reached the stage of actually doing this.) The non-starter villages generally did not appear to have discussed how profits would be shared although most had discussed the possibility of starting a woodlot; certainly no alternative system was offered and surprisingly no mention of how the wood was to be shared has been made by the Party or the Forest Division at any time during the program or the more recent afforestation campaign. Although few people acknowledged in the interviews that 'other people may take the wood' (table 3-3, line 32), many indicated that the village leaders were not to be trusted and

might embezzle the money. This is easily possible since many villagers are illiterate and many more confused by figures. Most rural people in Tanzania indeed are intensely suspicious of any financial dealings undertaken on their behalf. Whether or not they are actually cheated is, of course, not the point; what counts is what people perceive as a risk. It is rather difficult to quantify this and to judge to what extent mistrust of the village leaders resulted in the village not agreeing to start a woodlot. Of the starters, it seemed to us from field notes that about seven generally expressed trust in their governments compared to only two of the non-starters which would be a significant difference, but this is only a very subjective rating based on superficial evidence visible in brief visits to the villages. In some non-starter villages, it seemed to be not the official village leaders so much as powerful conflicting social groupings that might be inhibiting communal projects and in these villages we certainly met more sullen and suspicious respondents. To the outsider it was often difficult to see immediately which group the village leaders most favored, or which group might gain unequal benefit from a community woodlot. The conflicts generally seemed to relate to land allocation or to the influx of new people during villagization. Where such feelings are strong, it is quite likely that a small communal project such as a woodlot would be swamped with factionalism. Although woodlots had apparently been discussed by the village governments in all the villages, there was some evidence that more people had been involved in the discussions in the starter villages (table 3-3, line 10), which would support a hypothesis of the need for broad-based participation in decision making for successful adoption of community woodlots.

It has also been suggested that people might mistrust the motives of the national government in pressing for village afforestation, in particular they might fear that the government would simply take over the forest areas once they had been established. Memories of severe punishments meted out during colonial times to offenders cutting wood illegally in forest reserves might bolster this fear, although the present government is more lenient. Moreover, given the recent history of enforced population relocations, the people might fear that they would simply be moved out of the area once the trees were established as a woodlot. In only two villages, however, and these were starters, was there mention of possible government trickery in the interviews (table 3-3, line 36), and in general the people seemed remarkably secure about their land tenure and rights; nor was there fear of new people moving into the village and benefitting from communally owned trees without contributing mentioned in any village.

Initially, it was hypothesized that villages which had had the largest immigration during the villagization period might be the most reluctant to take up communal efforts such as woodlots because of the insecurity which might be felt by newcomers, but interestingly, the exact reverse seems to be true. The average percentage of new population in the starter villages was 55 percent, but only 216 percent in the non-starters (table 3-3, line 5). One might deduce from this that governments may be better organized or more trusted in villages which have had to reorganize themselves completely, but more likely it related to land tenure tradition. Since village woodlots require that land be set aside from individual tenure for long-term communal use, it is possible that the non-starter villages are those in which the older village government has less actual say in the allocation of land.

In villages where land had been privatized for a long time and plots of land had been owned by households by custom, much resentment may have been aroused by reallocation of land to public use. For an annual crop such as maize, the transfer may be easier, since by traditional law land is frequently lent without rent to other people for annual crops, and thus a private plot might be considered 'lent' to the village government. But planting of permanent crops establishes ownership, by the same custom, and thus older residents of a village might

strongly resist the village government's plans to use 'their' land for tree planting. From this it would follow that villages with a larger proportion of newcomers would be much more amenable to the village government's redesignation of land, because they themselves have not established private territoriality so strongly.

One might expect resentment about land reallocation to woodlots to be strongest where there is an absolute shortage of land, which occurs in only a few of the villages in the study. But this does not seem to be the case; probably because the woodlots are for the moment so small as to be insignificant in real terms. Nevertheless, the taking of land for woodlots may be opposed as a dangerous precedent.

Summary

A sample of eighteen villages in four restricted parts of Tanzania is too small to allow conclusions to be drawn for the country as a whole. Its value, rather, is to bring to light problems perhaps hitherto overlooked which might in fact exist in other areas as well. Of the nine villages which had started woodlots most were ones with a greater need for fuelwood as measured by current use. This was particularly clear in the case of the Gairo and Mpwapwa villages, in contrast with the Turiani villages in the steamy forested foothills. But not all the Gairo villages started woodlots communally; motivation to do so seemed to depend a great deal on the villagers' trust in their leaders and where this was weak, woodlots did not materialize, despite the villagers' skills and knowledge and despite the existence of church and school woodlots, which were independently organized by a few members of the village. The study reveals two factors which are definitely related to the probability of a village starting a woodlot: (1) the need for firewood, as measured by a variety of indexes, and (2) the trust of the villagers particularly in the financial morality of their village government.

The study found that a shortage of land militated against starting woodlots, but the transfer of land from private to public use for a communal woodlot was a greater problem. Most of the variables considered did not seem to affect these villages' decision to start, or not to start a woodlot. These irrelevant factors include lack of experience or technical information (all villages in the study had plenty of both), shortage of labor, fear of cattle trampling, or of fire damage, the outlay involved, poor extension services, and dislike of trees or taboos related to trees. Although lack of seedlings was the most commonly stated reason for villages not starting a woodlot, this does not really seem to be the most important factor. Nevertheless, supply of seedlings could certainly be improved upon in this area, especially by delivering them at the right time to the villages.

Why Do Woodlots, Once Started, Fail?

Of the nine village woodlots that had been started in the sample, four were judged to have been unsuccessful, because virtually all of the trees had died. Survival rate in the other five was at least 50 percent in all cases. Why should failures occur in village woodlots, especially when so many private and school/church projects manage to prosper? This is an important question, for when the trees have been planted, the most arduous work has already been done. The reasons for lack of success may be physical, such as drought or fire, for example, but they may also be of social origin; we were told many times by Forest Division personnel that the trees were being 'neglected.' It is the task of

this section to explore what factors contribute to woodlot failure once the village commitment has been made and the trees are in the ground, and why.

Lack of Tree Planting Knowledge

One of the oft quoted problems of afforestation, and one of the premises of the national adult education campaign for afforestation of 1980, was that people do not know the correct techniques for tree planting. Incorrect tree planting could cause trees to die after planting. Indeed, the pamphlet prepared to accompany the national campaign devotes 49 of its 74 pages to information of this kind (Institute of Adult Education, 1980). This emphasis, however, seems somewhat misdirected in the light of the findings of this study.

Over 63 percent of the respondent households had already had the experience of planting trees with an average reported survival rate of 58 percent. It is, however, the case that the proportion of people who have successfully planted trees outside village woodlots is much higher in the successful villages than in unsuccessful ones (87 percent to 59 percent; see table 3-4, line 2). However, the survival rate of trees outside village woodlots is actually higher in the unsuccessful villages than in the successful ones (62 percent to 45 percent; see table 3-4, line 3); in other words, fewer people planted trees in the unsuccessful villages but those who did, did so with more success. In any case, since more than half the total villagers raised more than half their own seedlings successfully, it is unlikely that the failure of the village woodlot is due to sheer incompetence. Further, seven of the nine villages which did start woodlots also had some other kind of successful tree project belonging to a private individual or to a school or church. Four of these seven villages had successful village woodlots and three had failed village woodlots. Although the non-communal woodlots were very small and essentially ornamental, they nevertheless represent organized tree planting and care, indicating that tree planting skills are present in the villages. The proportion of people whose parents had planted trees did not differ significantly between successful and unsuccessful villages (table 3-4, line 4), although it does correlate significantly with the number of people who have ever planted trees privately. Only a very small proportion claim that lack of information is a problem with respect to tree planting. Fewer people make the claim at all in the unsuccessful villages than in the successful ones (table 3-4, line 5). It is very evident that tree rearing skills are widespread in all the villages, successful and unsuccessful, and that the people do not feel a lack of knowledge or experience in this. This is a crucial finding, and the design of future extension programs should take this finding into account.

Table 3-4. Variables Tested to Differentiate Between Successful and Unsuccessful Village Woodlot Projects

Variable	Average in successful villages	Average in unsuccessful villages	Significance of difference ^a
1. Sample size (no. of villages)	5	4	

2. % who have planted trees privately	86.8	59.3	90%
3. Survival rate of privately planted trees (%)	62	45	NS
4. % whose parents had planted trees	15.6	21.0	NS
5. % who say they don't know how to plant trees	19.0	3.3	NS
6. Distance to Bw. Miti's office (km)	12.8	8.0	NS
7. % who say drought is a major threat to woodlots	33.0	34.0	NS
8. % who say pests are a major threat to woodlots	13.6	1.8	90%
9. % who participated in communal woodlots	78.0	36.3	95%
10. Distance to source of firewood (km)	4.3	2.2	90%
11. Weight of bundles (kg air dry)	32.5	24.7	90%
12. Bundles of firewood per year for domestic use	151	120	NS
13. % who have noticed a decrease in natural woodlot in last 10 years	70.2	72.7	NS
14. % who are optimistic that supplies from natural woodlands are sufficient	10.4	31.0	NS

15. % who say they are too busy with agriculture to work on woodlots	1.8	5.0	NS
16. % who had knowledge of village government's discussions about woodlots	36.6	21.0	NS
17. % who say <u>women</u> are more interested	6.0	30.5	NS
18. % who say <u>men</u> are more interested	24.4	28.8	NS
19. % families in which women planted trees	41.8	35.7	NS

Note: Significance is based on the Fisher Exact Probability Test for small samples using a two-way contingency matrix around the median value of the variable concerned (Siegel, S., Non-parametric Statistics (McGraw-Hill, 1956)).

Distance from Extension Services

Distance from the Bw. Miti to the village did not seem to be related to woodlot failure. The distance is actually greater for the successful villages (12.8 to 8.0 km; table 3-4, line 6), although the difference is not significant statistically.

Wrong Type of Seedling

A further hypothesis is that the Forest Division has caused the failure of some projects by providing the wrong type of seedlings, that is to say, seedlings which are unsuitable or only marginally suitable to the micro-climate of a village. In general, this did not seem to be the case, since the species used were in all cases hardy and well tried, particularly Cassia siamea. In every case of failure, examples could be found of trees of the same species grown successfully in the village or in a nearby village in the same year. Where drought caused the failure of the village woodlot, villagers said that the seedlings were delivered by the Forest Division too late, so that they dried up. The truth of this is difficult to prove since the Forest Division responds by saying that the seedlings were handled badly by the villagers or left too long in their polythene containers in the sun. The species themselves, however, were undoubtedly quite suitable according to international and national recommendations (NAS, 1980; FAO, 1977, Mnzava, 1980).

Poor Site for Woodlot

It might be thought that because the woodlot is a communal woodlot, good land held by individuals might not be available, and the land 'sacrificed' to the woodlot would be the worst in the village. Although this seemed to be the case in villages in Arusha and Singida (Kikula and Nilsson, 1982), there was no evidence of this problem in the areas covered in the present study, when there was no serious land shortage.

While this judgment is not based on soils analysis, in every case the land for the woodlot was fairly central to the village and surrounded by (private) shambas of crops - mainly maize - which appeared to be in no worse than average condition. Generally the areas less good for cultivation are given over to cattle grazing, and these areas are avoided for woodlots because of the difficulty of protecting the seedlings from cattle.

Blame for the failure of woodlots was in all cases laid by the villagers on the sheer physical factors of fire, drought, or pests, as might be expected. All these play a part in the health of woodlots, but they need not necessarily be devastating nor kill the woodlot entirely. Of the four failures, one was totally burnt. The others were said to have been dried out by the sun, either because the rains had failed, or, more commonly, because the seedlings had been brought to the village too late in the season and had not been able to benefit from what rain there was. While sympathizing with the attitude of the villagers faced with a hard and unforgiving nature, one cannot accept these statements entirely at face value. Often such explanations are given to cover other reasons, for undoubtedly there is some truth in them. When asked specifically to mention the problems facing woodlots, the same proportion of respondents in successful and unsuccessful villages mentioned drought (table 3-4, line 7) and fire was not considered a serious problem in the long run even in the village in which the woodlot had burned. Pests (that is, termites) were considered more of a problem in the successful villages than in the unsuccessful ones, but still only by a very small proportion of respondents. Yet in these same villages we were told that pests and drought have been responsible for the failures by the village leaders who are those responsible for the woodlot.

Deliberate Sabotage

At one end of the scale is the possibility of deliberate sabotage by a person or group of persons who seek to make political points or avenge other wrongs by deliberate destruction of communal property such as a woodlot. Various undocumented cases of dramatic fires which destroyed woodlots have been reported throughout the country. In one of the villages surveyed, a communal sugar shamba of 200 acres had burned and it was common gossip that this had been deliberately started by an individual who claimed the land as his own. However, the two incidences of fire (one in a successful and one in a failure village) were both said by village leaders and by the people to be accidental, and in both cases the offender was taken to court and acquitted of arson, although they were fined for negligence. Other types of sabotage, however, may occur where dislike of the project is more diffuse throughout the community, so that the responsibility for the sabotage is not easily placed on any one individual; this may be called deliberate negligence.

Deliberate Negligence

This is a much more common explanation for the failure of a woodlot and is due to inept or deliberate mishandling of the seedlings during the planting or insufficient care taken of the trees once they had been planted. In retrospect, it is very difficult to ascertain when the damage to the trees occurred, although in every case it was in the first year. Negligence as a factor has the most impact in the very early stages when proper planting, weeding, and perhaps watering are required. It is plausible that the village government might “persuade” the villagers to clear a plot and dig holes and plant the seedlings, but not convince them to make any further effort. In such a situation, villagers might be coerced into the first stages by being told they “had” to plant trees with visiting party and government officials, etc., lending pressure. It is frequently the case in agricultural extension that the people go along with the rules, doing the minimum they can get away with, and when the crops (or trees) ‘unfortunately’ die, it is hard to distinguish deliberate negligence from damage done by pests or drought in the area. To test the hypothesis that deliberate negligence occurred in the ‘unsuccessful’ villages, we should first look for evidence that the villagers were pushed into the project unwillingly. Village reluctance is very hard to determine, since the village government can only be expected to be very positive, at least to outsiders, about an issue clearly supported by the central government. If the project were generally unpopular, it would be expected to have lower participation. The evidence does indicate that the project had less popular support in the unsuccessful villages. In two of these villages, hardly anyone in the sample of 25 households seemed to have participated in the woodlot. It is likely that more of the sample in fact did participate, but that in the face of heavy social contention, they did not admit to it afterwards. Overall, 78 percent of the households participated in the successful woodlots and only 36 percent in the unsuccessful ones (table 3-4, line 9).

Assuming that woodlot failure is due at least in part to deliberate negligence and project unpopularity, we wish to determine what caused the project to be unpopular.

Local Wood Availability

Zealous government officials (at the village level and above) might pressure villagers into starting a woodlot, even where there is no pressing need for one. In this case, the people might neglect the woodlot for the good reason that fuel wood or poles are already plentiful and there are no additional benefits to be gained from a woodlot. Villagers who succeeded in maintaining woodlots had to go significantly farther to collect firewood than villagers who neglected their woodlots (4.3 km compared to 2.2 km; table 3-4, line 10) and the former group collected wood in significantly larger bundles, which also indicates local wood shortages (table 3-4, line 11). It is clear that the successful villages also normally use more firewood as the number of bundles used per household is higher (table 3-4, line 12). Awareness of wood shortages was not related to woodlot success: more than 70 percent of the sample in both groups noted that forests had decreased over the last ten years (table 3-4, line 13). People in the unsuccessful villages were more optimistic about the supply of wood from natural forests, as was expected, but the difference is not significant (table 3-4, line 14). Need for wood appears to be a strong motivating factor in the success of village woodlots.

Labor Availability

Inadequate labor was mentioned as a factor in only one of the unsuccessful villages (table 3-4, line 15). The time commitments for woodlots in the successful villages were so small that this cannot really be a serious issue, given the current small scale of the woodlot projects, since after clearing (one day) and planting (one day), only one or two days of communal labor in the first year were required, and in most of these villages, two days per week are regularly given over to communal activities such as the village shamba. Lack of labor does not explain woodlot failure.

Lack of Trust of the Village Leaders

As we have already noted, there is a strong relationship between the number of people participating and the chances of the woodlot succeeding. But high participation levels may be an indicator of several underlying factors of woodlot success. In fact, the relationship of the villagers to their own government, their trust in its motives and morals, and the government's ability to organize the villagers into working on any communal project are very closely intertwined. Past failure or scandals naturally work against further communal effort. Only 21 percent of the people in the villages with failed woodlots seemed to have any idea of what discussion went on in the village government before the project was adopted; in successful villages, villager awareness of the plan was more widespread (37 per cent; table 3-4, line 16), although the difference is not significant. From field notes only one of the four unsuccessful villages had a successful communal shamba, while all five of the successful ones had ongoing communal agricultural production. While one cannot totally dismiss the possibility of the same physical constraints affecting both the communal shamba and the communal woodlot, it seems rather more likely that the common problem relates to the leadership in the villages. In the same climatic zones some villages had failed communal shambas and woodlots and others were successful at both. Where the people support their leaders, woodlot projects seem to progress without difficulty through the weeding and caring stages of the first year. In these villages, if problems such as cattle grazing of the seedlings occurs, the offenders are punished. By contrast, in the unsuccessful villages, although the trees are planted and government directives thus were complied with, lack of full support from the people seems to lead to negligence and a variety of explanations are offered for failure.

Firewood is the Women's Affair

Another possible explanation is that half the population may have withdrawn its support for a woodlot because firewood collection is traditionally women's work. There was no indication that more women than men had taken part in the clearing and planting operations, however; as in all village projects, all adults were supposed to participate. There is some but not a significant difference (30 percent to 6 percent; table 3-4, line 17) between the proportion of people (mostly male respondents) who felt that tree planting was of particular interest to women, while 29 percent of villages with successful woodlots and 24 percent of the unsuccessful ones felt that men were more interested (table 3-4, line 18). Moreover, there was no significant difference between the samples in successful and unsuccessful villages in the proportion of households in which women had been involved in tree planting (36 percent and 42 percent; table 3-4, line 19). According to this study, therefore, woodlot failure cannot be blamed on differences between men's and women's attitudes.

Summary

A case-by-case examination of the various failed woodlots in the sample suggests that in at least two villages (Ihenje and Mlali) woodlots failed as a result of deliberate neglect by the villagers, who had a definite conflict over matters unrelated to the woodlot with the village leaders promoting the woodlot. In one case, the conflict was over alleged misuse of funds by the village leaders, and in the other there was an apparent conflict over reallocation of land to newcomers brought to the village during villagization. None of the successful villages with successful woodlots appeared to have these kinds of social problems. In the other two villages that had unsuccessful woodlots, it would appear that the reasons for failure were probably physical. Drought and fire are real hazards which can destroy the best tended woodlot. In this study, cattle damage was not a major factor, nor were the failures related to a lack of technical information, choice of poor site, choice of inappropriate species, or to lack of labor to tend the seedlings at the appropriate times. Villages with less firewood available from natural woodland were more likely to succeed than villages nearer a large natural wood supply.

Why Do Villages Not Continue Planting Once They Have Started?

Most of the village woodlots visited in the study were too small to have much impact on the overall fuel situation. A five acre stand of Cassia siamea might be expected to yield 20 to 25 m³ of firewood annually after five to eight years of growth. Based on the official estimate of the rate of wood consumption, this would support only about ten people or two families; even at the lower consumption rate found in this study, such a woodlot would support only four families. To actually supply wood from woodlots would require one acre per family, or two acres per family in colder areas. To accomplish this at the village level would require incremental planting every year combined with a system of rotational cutting, such as is commonly practiced in commercial forestry. As mentioned earlier, the target for planting is 18 hectares or 40 acres per year per village in order to become self-sufficient. Yet while the villages have an average of 450 families, the largest woodlot was only 30 acres in total, having started in 1964; and most were between two and five acres.

It is quite understandable that villages plant only a small area in their first attempt at an organized woodlot. However, it is less clear why, once the experiment appears successful, villagers do not continue to expand the area, albeit slowly. There seemed to be no urgency in the villages to embark on such an on-going program nor any real understanding of the scale of such a task. Only three villages had planted trees in more than one year in succession, and this included Nduruguni, the most successful village in the survey, and Mlali, which is one of the most spectacular failures. Only Nduruguni had set a final target for area to be planted (100 acres) and a yearly rate at which they wished to proceed (5 acres per year). Three others could indicate actual sites where they intended to extend afforestation but were not able to estimate the area nor had they any program for planting. In no case were these areas more than 20 acres. In the remaining starter villages, including those which had made unsuccessful attempts, the village leaders generally said they were very interested in planting more trees but could not say where or when.

The concept of rotational forest management did not seem to be very familiar to village leaders, and it is almost certain that the area of woodlot required to supply village needs is not really understood either. The extension work that has been carried out so far has mainly been

to exhort the villages to start a communal plantation, and to provide the seedlings for it, but if village forestry is to proceed, it must involve more sophisticated planning of planting and consumption.

The tendency of villages to regard village forestry as a one-time activity is due to the style of extension work and way in which pressure is brought to bear on villages by the central government to initiate projects of this kind. As noted before, this pressure is applied not through the Forest Division so much as through the Party, whose workers are probably not any more aware of the scale and planning required for village forestry than the villagers themselves. Often by successfully planting a "token" woodlot of perhaps two acres, the village appears to have fulfilled its obligations to national policy, and can therefore rest on its laurels. The Party officials, whose support and enthusiasm for the village afforestation program is strongly motivated by the desire to promote communal activities in general, may well be satisfied with this.

The common reasons given for failure to continue planting was "lack of seedlings," and although the nurseries were relatively well supplied the year this research was undertaken, this cannot be dismissed entirely as a constraint, particularly in the case of the more successful villages such as Ndurugumi, which had been in correspondence with the district forest officer concerning the number of seedlings and could not be supplied with enough. The priority of the Forest Division seems to be to get all villages started on an afforestation project before encouraging or even allowing the enthusiastic ones to race ahead with planting, an attitude which mirrors the general egalitarian ideology of rural development in Tanzania.

FOOTNOTES

1. Profiles of the villages in the survey are given in the appendix.
2. Statistical significant will be taken to be at the 90 percent confidence level or above unless otherwise noted.
3. This was the notorious Uluguru Land Scheme, which was a program started in 1951 for environmental protection in this overpopulated area. Terracing to prevent erosion was enforced on all farmers and this was such an unpopular measure that riots broke out and one government official was killed; the program was subsequently dropped. It is often forgotten that forestry was an integral part of the scheme which at least in this western part of the Uluguru has had a lasting beneficial impact on soil conservation and on fuel supply.
4. In this case the officer concerned seemed to us to act in the most discouraging manner. At one village, where a woodlot had already been started, the village government had written to the Forest Division to ask for seedlings to plant an additional 5 acres. They had already received a reply saying that due to the inability of the nursery to supply enough for everyone, the village could only have half the number that year. The villagers had therefore prepared 2.5 acres of land ready with holes for planting the seedlings. When we arrived in the village with the Bw. Miti, who evidently had not been in the village for a long time and didn't appear to know the village's plans, he told them flatly that they couldn't have any seedlings at all, as they had been allocated elsewhere. Had it not been for our visit, it seems unlikely that the villagers would have ever been informed.
5. Records are generally kept only of the number of seedlings taken by each village from the nursery. In one case the villagers obtained seedlings themselves by digging them up from nearby forests, and so the village was thought to have made no attempts to start a woodlot; in the other, the village had received seedlings from the Forest Division only the previous year but the records did not show it.
6. The village settlement scheme was for capitalization of agriculture, and a number of villages were chosen in the early 1960s and provided with a great deal of infrastructure to support this. The agricultural results were not impressive and the scheme was later dropped.
7. 'Ujamaa' villages are supposed to have a significant amount of communal production, although almost all villages have some. For historical reasons all the Mpwapwa villages were registered as ujamaa villages, while few others were. However, there is no essential difference in organization or administration.

Chapter 4

CONCLUSIONS

In the villages of Tanzania surveyed in this study, forestry is being adopted, but rather slowly. This slowness cannot be attributed to lack of awareness of the need to plant trees, nor to lack of technical information on how to do it. All villages expressed a desire to plant trees and a knowledge of the government's position on village forestry, and pointed out the steady decrease in the firewood and pole supply from the surrounding natural woodlands. Most of the households interviewed had planted trees themselves, usually around their own houses, and most of these trees thrive. Half of the villages in the survey had planted small communal woodlots, and some of these were very successful. Most of them were in cooler zones where wood was used in greater quantities for heating. Other woodlots run by schools and churches were common. However, there seemed to be no understanding in the villages of the scale of afforestation required if woodlots are to replace the natural woodlands as the source of domestic firewood.

The key to success of village communal woodlots is leadership, not climate and physical obstacles. Where villagers have no conflicts with their village government, woodlot projects seem to start and to thrive. Men and women seem equally enthusiastic about tree planting although villages where more women were involved generally did slightly better.

Seedlings were said to be in short supply, but the constraint is not that too few seedlings are reared in government nurseries, but rather that truck transport is lacking to take them to the villages at the crucial planting time. Unreliability of rainfall means that distribution of seedlings cannot easily be scheduled, but must be in response to the rains. While decentralization of nurseries would reduce dependence on heavy vehicles, there is no possibility of this until a reliable and sufficient water supply is piped to the villages.

Extension work has concentrated on exhorting villages to start woodlots and on providing seedlings, mostly of Cassia siamea, which is popular and hardy. Much effort had been expended (for example, in the recent campaign carried out by the Adult Education Service) telling people to plant and giving technical advice on handling seedlings, despite the fact that villages have a good grasp of these facts already. No information has been disseminated on methods of sequential planting and rotational cutting which are the more difficult, new, and necessary elements in village forestry (see IAE, 1980, for example).

In keeping with Tanzania's approach to rural development, the village afforestation program is focused on communal forestry. Only one case was found of an individual acquiring large amounts of land to plant trees as a deliberate attempt to capitalize on future fuel wood shortages in the village (Wami-Ruhindo); in two other villages (Nyandira and Langali), virtually all village members had small woodlots for their own use and for sale of wood outside the village. The danger of privatization and development of fuel wood monopolies seems remote at present.

By and large, however, plantations owned privately or by a group such as a church or school did better than village communal lots, and although small, represented a larger effort per individual participant. The advantages of small-scale woodlots controlled by a limited number of people in cooperation are self evident, especially in a situation where village leadership is not always trusted and where consolidation of large plots of land may be impossible.

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Appendix 1

Research Procedure

The eighteen villages in four zones in Morogoro and Dodoma were selected in consultation with district-level forestry officers to represent cases of success, failure, and non-start with respect to village afforestation. The questionnaire was pilot tested in Mlali village in March 1981 and the revised version was used in the fourteen Morogoro villages in April and May 1981 and in the Dodoma villages in December 1981. Five undergraduate research assistants worked in the field in Morogoro and two in Dodoma. In Morogoro each lived for a period of one week in the village while the principal researcher circulated between; in Dodoma we all three worked in one village at a time, for a shorter period. The latter method was preferable from the point of view of the principal researchers' contributions and control over the way questionnaires were filled in. Interviews of forestry personnel and village leaders were the responsibility of the principal researcher alone.

In each village twenty to twenty-five households were selected for interviews. This was done by choosing seven "ten-cells" from the village register at random; then three to four households in each ten-cell were interviewed.

It had been intended to interview an equal number of men and women but this was unfortunately not possible. The surveys were done in both cases in the period immediately before the rains. This had the advantage that people were at home rather than at work in the fields, including the women. Owing to the fact that no female interviewers could be recruited, however, in most cases we were not permitted to interview women without the presence of a male member of the household, and in some cases we were not permitted to interview women at all. That the presence of the male member influenced the answers of the female respondents is without doubt. In the first place, the women were frequently said to have poor language skills in Swahili, which necessitated translation of our questions and translation of the answers, often with a fair bit of prompting on the part of the translator. In the few female-headed households a quite different attitude was apparent, the women becoming much more boisterous in their responses, without any hint of language difficulty, and offering opinions much more freely. A better strategy, in retrospect, would have been to budget for two interviewers per household, ensuring if possible that one is female in every case, and making simultaneous questionnaire interviews for male and female members of the household.

A copy of the questionnaire is attached. By and large the procedure followed guidelines set out by Openshaw (n.d.) in Woodfuel Surveys: Measurement Problems and Solutions to These Problems. The consumption has been estimated per standard adult person, that is, working adults are counted as one unit and children and old people, who are considered to eat less food and thus require less fuel, are counted as one half a unit. The questionnaire divided uses into: cooking, heating water, heating, scaring animals, and various craft uses including brewing of pombe, pottery, blacksmithing, charcoal production, and making food for sale. The incidence of other uses, measurement of which is recommended in the above-mentioned text, were so low that no accuracy could be attained.

In measuring actual consumption, a seasonal recall method was used. The respondent was asked to state how many bundles of wood were used by the household (cooking unit) in each of the main seasons. Although this is not as accurate a method as a longitudinal survey

(see, for example, Bajracharya, 1979), it was considered sufficient for the research since consumption measurement was not the main purpose of the study but provided comparative background information on which to interpret the main variables, that is, success and failure of woodlots.

Estimates of the size of bundles were done by weight, using a spring balance. In the Morogoro villages, only seven out of each twenty-five households were included in this part of the survey, the interviewer measuring bundles as they were brought in from the woodlands. In Dodoma all households were included but using simulated bundles put together by women in their compounds to demonstrate the bundle size they normally gathered. It is possible that this resulted in over-estimation in this area, although occasionally we were able to measure a real bundle as well and they fell within the general range of the simulated bundles. A sample from each bundle was taken in an airtight container; it was tagged and weighted on an accurate balance to the Botany Laboratory at the University, then air-dried and reweighed. A correction factor for wetness of each bundle was thus obtained and the values quoted are the corrected, air-dried ones.

Analysis of the data has been made primarily at the village level because the total number of households was too large to be fitted onto locally available computer systems. The main statistical test used was the t-test for differences of means, and significance was taken to be at the 90 percent level of confidence.

VILLAGE FIREWOOD AND AFFORESTATION SURVEY 1981

Household Questionnaire

Village _____
Number of sample _____

1. How many people live in this household here?

Children under 15 _____ Adult men _____
Old people _____ Adult women _____ Total _____

2. Head of household is

Male Female

3. Person answering this questionnaire is

Male Female

4. Is anyone in the family a balozi?

Yes No

5. How long has the family lived in this village?

Whole life Since early 1960s
Since villagization Later than 1974
(1969-1974 period)

6. How many acres does this household cultivate altogether?

_____ acres

NOTE: IF ANSWER IS GIVEN IN HECTARES PLEASE CONVERT TO ACRES: 2.4 acres = 1 hectare

7. How many cows, oxen, or bulls does the household own?

(Total of these) _____

How many pigs, sheep, and goats (total of these) _____

8. Does any of the family living here have a wage job?

Yes

No

9. Does any of the family living here have a trade other than agriculture?

Yes

No

10. At this season of the year (wet/dry/cold DELETE THOSE NOT APPLICABLE), how many times do you cook meals per day?

11. Is this true in all seasons?

Yes

No

IF ANSWER IS NO, THEN PLEASE COMPLETE THE FOLLOWING:

In the _____ season we cook _____ times per day

In the _____ season we cook _____ times per day

12. What fuel do you normally use for cooking?

Firewood

Charcoal

Kerosine

Maize stalks

Other _____

PLEASE MARK ONLY ONE TO THE ABOVE QUESTION

Do you sometimes use another kind of fuel?

- | | | | |
|----------|-----------------------|--------------|-----------------------|
| Firewood | <input type="radio"/> | Charcoal | <input type="radio"/> |
| Kerosine | <input type="radio"/> | Maize stalks | <input type="radio"/> |

PLEASE MARK ONLY ONE ANSWER TO THE ABOVE QUESTION

13. How many times per week do you heat water at this season of the year?

14. Is this the same in all seasons of the year?

- Yes No

IF ANSWER IS NO, THEN COMPLETE THE FOLLOWING:

In the _____ season we heat water about _____ times per week
In the _____ season we heat water about _____ times per week

15. What fuel do you normally use for heating water?

- | | | | |
|-------------|-----------------------|--------------|-----------------------|
| Firewood | <input type="radio"/> | Charcoal | <input type="radio"/> |
| Kerosine | <input type="radio"/> | Maize stalks | <input type="radio"/> |
| Other _____ | <input type="radio"/> | | |

PLEASE MARK ONLY ONE ANSWER TO THE ABOVE QUESTION

Do you ever use any other fuel for heating water?

- | | | | |
|-------------|-----------------------|--------------|-----------------------|
| Firewood | <input type="radio"/> | Charcoal | <input type="radio"/> |
| Kerosine | <input type="radio"/> | Maize stalks | <input type="radio"/> |
| Other _____ | <input type="radio"/> | | |

PLEASE MARK ONLY ONE ANSWER TO THE ABOVE QUESTION: OMIT IF IRRELEVANT

16. Do you ever use a fire to warm the house up (e.g., in the evenings), or to warm yourselves?

Yes No

17. During which seasons?

Dry Wet Cold

18. About how often per week would you do this? _____

19. What kind of fuel would you use?

Firewood Charcoal
Kerosine Maize stalks
Other _____

20. Do you ever use fire to scare off wild animals or insects from the house?

Yes No

21. In what seasons?

Dry Wet Cold

22. About how often per week would you do this? _____

23. If we consider all these uses together, that is cooking, heating water, heating the house, scaring animals, how many bundles of firewood per week does the household use in each season? (NOTE: POINT OUT TO THE RESPONDENT THAT THIS DOES NOT INCLUDE SPECIAL USES SUCH AS POMBE BREWING OR CRAFTS, ABOUT WHICH QUESTIONS FOLLOW.)

_____ bundles in the dry season per week
_____ bundles in the wet season per week
_____ bundles in the cold season per week

24. How much charcoal do you use per month for these purposes?

_____ debes/gunia/kopo in the dry season per month
_____ debes/gunia/kopo in the wet season per month
_____ debes/gunia/kopo in the cold season per month

NOTE: PLEASE DELETE THE IRRELEVANT MEASURES OF VOLUME. IF ANSWERS ARE GIVEN BY WEEK OR BY WHOLE SEASON, PLEASE CALCULATE MONTHLY EQUIVALENT

25. Do you ever do any of the following activities?

Pombe brewing	<input type="radio"/>	Cooking food for sale	<input type="radio"/>
Smoking fish	<input type="radio"/>	Making charcoal	<input type="radio"/>
Pottery making	<input type="radio"/>	Making red bricks	<input type="radio"/>
Any other craft which uses fuel	<input type="radio"/>		

FOR EACH OF THE ACTIVITIES TO WHICH THE RESPONDENT REPLIED, PLEASE FILL IN THE FOLLOWING DATA:

26. Name of activity _____

How many times per year do you perform this? _____ times per year
What kind of fuel do you use?

Firewood Charcoal Kerosine
Other _____

How much fuel do you use each time you carry out the activity? _____

PLEASE NOTE WHETHER ANSWER IS IN: bundles/debes/gunia/ kopo/liters

27. Name of activity (if there is a second one) _____

How many times per year do you perform this? _____ times per year
What kind of fuel do you use?

Firewood Charcoal Kerosine
Other _____

How much fuel do you use each time you carry out the activity? _____

PLEASE NOTE WHETHER ANSWER IS IN: bundles/debes/guia/ kopo/
liters

28. Name of activity (if there is a third one) _____

How many times per year do you perform this? _____ times per year
What kind of fuel do you use?

Firewood Charcoal Kerosine
Other _____

How much fuel do you use each time you carry out the activity? _____

PLEASE NOTE WHETHER ANSWER IS IN: bundles/debes/guia/kopo/
liters

NOW WE COME TO QUESTIONS OF FEELINGS AND ATTITUDES ABOUT TREE AND TREE GROWING

29. Would you say there is enough natural woodland around your village to
meet the present village needs for fuelwood?

Yes No Don't know

30. Would you say there is sufficient wood for future generations?

Yes No Don't know

31. Is there sufficient supply of poles for buildings from the natural woodlands,
for the present time?

Yes No Don't know

32. Will the supply be enough for future generations?

Yes No Don't know

33. Has anyone in the household ever planted trees?

Yes No

IF YES, PLEASE COMPLETE THE FOLLOWING:

Tree planting was done by

Men Women Men & Women Children

Year first tree planted _____

Place of planting tree:

Around house Village communal treeplot

As a field boundary around own shamba

Church tree project In own shamba

School tree project On a special private tree plot

Forest Division project

Other _____

(NOTE: MULTIPLE ANSWERS ARE PERMISSIBLE)

Types of trees planted (UP TO FOUR TYPES MAY BE GIVEN)

How many of these trees did you plant?

(NOTE: USE SAME ORDER AS IN SECTION ABOVE)

Usually quite a few trees die, only some survive. About what percentage of those you planted survived?

_____ % _____ %
_____ % _____ %

(NOTE: USE SAME ORDER AS IN SECTION ABOVE; YOU MAY HAVE TO CALCULATE PERCENTAGES, IF RESPONDENT MERELY SAYS HOW MANY DIED)

From where did you get the seedlings?

- Grew them ourselves From the Forest Division
- From the school From the church
- Other source _____

34. Did your parents, or any close relatives in that generation, plant trees when you were a child?

- Yes No Don't know

IF ANSWER IS YES, PLEASE COMPLETE THE FOLLOWING:

Where did they plant the trees?

- Around their house In a communal project
- As field boundary In a church project
- In their own shamba In a school project
- On a special private tree plot
- Other _____

What kind of trees did they plant? (UP TO FOUR TYPES MAY BE GIVEN)

35. What kind of wood do you like best as firewood?

(UP TO THREE TYPES MAY BE GIVEN)

36. What kind of wood do you like best for building poles?

(UP TO THREE TYPES MAY BE GIVEN)

37. Thinking back over the last ten years, would you say that the natural woodland around this village has increased or decreased?

- Increased Decreased Stayed about the same
Don't know

38. Do you think there have been any major changes in the quality of the environment apart from this?

- Decreased fertility of farmland Drying up of stream
Less good pasture for animals Fewer tsetse
Fewer wild vegetables available Less rainfall
Gullying and erosion
Other _____
Can't think of any

MULTIPLE ANSWERS PERMISSIBLE

39. What do you yourself think are the main benefits of planting trees?

- Firewood Environmental protection
- Poles Provision of shade
- Commercial sales of timber Provision of fruit
- Minor products (ropes, honey, etc.)
- Other _____

40. What do you yourself think are the main difficulties that arise in planting trees, based on experience in this village or in villages you know about?

- Lack of seedlings Don't know how to grow trees
- Not enough land Drought is a big risk
- Too busy with other work cattle may graze on the seedlings
- Other people may cut down trees
- Government may issue regulations on use of trees later
- Pests may be harboured in the trees
- Other problems _____

SECTION A: FOR VILLAGES WHICH HAVE SUCCESSFUL TREE PLANTATIONS (COMMUNAL)

SECTION B: FOR VILLAGES WHICH HAVE TRIED COMMUNAL TREE PLANTING BUT FAILED

SECTION C: FOR VILLAGES WHICH HAVE NOT YET TRIED COMMUNAL TREE PLANTING

SECTION D: FOR VILLAGES WHICH HAVE A SCHOOL OR CHURCH TREE PROJECT ONLY

PLEASE USE ONLY ONE SECTION, AS APPLICABLE

SECTION A: FOR VILLAGES WHICH HAVE SUCCESSFUL COMMUNAL TREE PLANTING PROJECTS; ALSO FOR

SECTION B: VILLAGES WHICH HAVE TRIED COMMUNAL TREE PLANTING BUT FAILED

41. When the village government/council was discussing plans for the tree

planting project, what kinds of problems were discussed?

- | | | | |
|---|-----------------------|------------------------|-----------------------|
| Size of shamba | <input type="radio"/> | Who was to do the work | <input type="radio"/> |
| Who was to bring seedlings | <input type="radio"/> | What kind of trees | <input type="radio"/> |
| How the wood was to be shared out after the trees had grown | <input type="radio"/> | | <input type="radio"/> |
| Don't know | <input type="radio"/> | Other _____ | <input type="radio"/> |

42. In what activities did you yourself, or members of your family, participate?

- | | | | |
|---------------------|-----------------------|-------------------|-----------------------|
| Initial discussions | <input type="radio"/> | Choosing the site | <input type="radio"/> |
| Gave land for plot | <input type="radio"/> | Clearing the plot | <input type="radio"/> |
| Planting trees | <input type="radio"/> | Weeding | <input type="radio"/> |
| Watering | <input type="radio"/> | Other _____ | <input type="radio"/> |

SECTION B: FOR FAILED COMMUNAL TREE PLANTING ONLY

43. What do you think were the main reasons for failure of the tree planting project?

- | | | | |
|------------------------|-----------------------|-----------------------|-----------------------|
| Drought | <input type="radio"/> | Not watered enough | <input type="radio"/> |
| Wrong kind of trees | <input type="radio"/> | Planted at wrong time | <input type="radio"/> |
| People too busy | <input type="radio"/> | People too lazy | <input type="radio"/> |
| Not organized properly | <input type="radio"/> | | |

44. Do you think the trees would have survived if they had been planted individually by people on their own land?

- Yes No Maybe Don't know

SECTION C: FOR VILLAGES WHICH HAVE NEVER TRIED COMMUNAL TREE PROJECT

45. Has your village government/council ever discussed starting a tree planting project as a communal venture?

- Yes No Don't know

IF ANSWER IS YES:

For what reasons then has the village decided not to start a tree planting project?

- Don't know We are planning to start one later
- Not enough land There is no need for it
- People are unwilling to do the necessary work
- Too risky, chances of failure are high
- Can't get seedlings Other _____

Do you know any villages which have attempted to start a communal tree planting project? Please name them and say if they were successful or not.

- | | | | |
|-------|-------------------------------|-------------------------------|----------------------------------|
| _____ | Success <input type="radio"/> | Failure <input type="radio"/> | Don't know <input type="radio"/> |
| _____ | Success <input type="radio"/> | Failure <input type="radio"/> | Don't know <input type="radio"/> |
| _____ | Success <input type="radio"/> | Failure <input type="radio"/> | Don't know <input type="radio"/> |

SECTION D: FOR VILLAGES WITH SCHOOL OR CHURCH TREE TREE PROJECTS ONLY

46. Would you say the school/church tree project has been generally successful or unsuccessful?

- Successful Unsuccessful Don't know

Did any member of your household participate in the project?

- Yes No

In what activities did you participate?

- Initial discussions Choosing the site
- Gave land for plot Clearing the plot

Planting trees Weeding
Watering Other _____

Has the village government ever discussed a communal tree planting project apart from this school/church one?

Yes No

IF ANSWER IS YES:

For what reasons has the village then decided not to start one?

Don't know Plan to start one later
Not enough land There is no need for it
People are unwilling to do the necessary work
Too risky, chances of failure are high
Can't get enough seedlings Other _____

FOR ALL RESPONDENTS IN ALL VILLAGES, PLEASE ASK THE FOLLOWING QUESTIONS

47. Would you say in general that women are more interested in plant trees, or men?

Women Men Both the same

48. Would you say that richer people or poorer people had more interest in tree planting?

Richer Poorer Both the same

49. Are there any other comments you would like to make about village tree planting, for our report?

QUESTIONNAIRE FOR THE CHIEF FIREWOOD GATHERER IN EACH HOUSEHOLD

NOTE: IS THIS THE SAME PERSON WHO ANSWERED THE MAIN QUESTIONNAIRE?

Yes No

1. At this season of the year, how often per week do you go to collect firewood?

_____ times per week.

2. How many people from the household go to collect it together?

___ women ___ children ___ men

Total _____

3. How many bundles do you bring back each time? _____

4. Please can you show us how big a typical bundle is?
INTERVIEWER THEN WEIGHS THE TYPICAL BUNDLE

weight = _____

5. About how far do you go to get the firewood? _____ miles/km
(DELETE AS APPROPRIATE)

6. How long does it take you each time? _____ hours

7. In the other seasons of the year, do you collect more often or less often?

Same as this season Not same as this season

Appendix Table 2-1. Data by village

	Size of communal woodlot	Date of woodlot	Other woodlots (1)	Village population (families)	Average family size (units) (2)	Adult women / household	% of population immigrated post 1973	Success of communal shamba	Land shortage	Average distance to source	Distance to Bw. Mill's	Distance to surgery
STARTERS												
<i>Successes</i>												
Ibuti	0.7	1979	S	250	5.6	1.1	20	Yes	No	2.9	2.0	5.0
Msingisi	4	1976	S	260	5.6	1.8	72	Yes	No	3.7	3.0	0.0
Ibwaga	5	1975	S	370	4.2	1.5	60	Yes	No	7.5	4.0	4.0
Nduruguni	30	1964	S	400	5.5	1.7	75	Yes	No	3.3	32.0	32.0
		1974										
Chunyu	2	1976		250	4.3	1.4	100	Yes	No	4.2	23.0	23.0
		1979										
Average, successes				306	5.0	1.5	65			4.3	12.8	12.8
<i>Failures</i>												
Ihenje	0.5	1979	C	270	4.4	1.3	75	No	No	3.3	6.0	9.0
Mlali	2.0	1978		540	4.3	1.9	37	No	Yes	2.6	8.0	15.0
		1980										
Langali	2.0	1979	P	520	3.8	1.1	5	None	Yes	0.5	0.0	7.0
Iyoma	5.0	1980	S	250	4.5	1.3	60	Yes	No	2.4	18.0	18.0
Average, Failures				395	4.3	1.4	44			2.2	8.0	12.3
Average, All starters				345	4.7	1.5	55			3.4	10.6	12.5
NON-STARTERS												
Chakwale			S + C	750	5.0	1.8	17	Yes	Yes	3.1	8.0	11.0
Ukwamani			C	350	6.4	1.5	8	No	No	6.4	2.0	3.0
Mhonda				340	3.6	1.6	37	Yes	Yes	1.8	4.0	16.0
Mkindu				760	4.8	1.3	33	Yes	No	1.7	10.0	20.0
Lusanga			S	700	5.6	1.0	18	No	No	2.0	6.0	4.0
Dhinda				350	5.6	1.0	18	No	No	3.3	3.0	3.0
Wami-Ruhindo			P	220	3.8	1.0	66	None	No	2.6	38.0	50.0
Nyandira			P	450	4.5	1.6	0	None	Yes	1.1	8.0	15.0
Kipera				280	5.4	1.0	40	No	Yes	4.0	11.0	18.0
Average, non-starters				466	4.9	1.4	26			2.8	10.0	15.5

(1) S = School, C = Church, P = Private.

(2) Children and old people counted as half units.

Table 2-2. Data by Village

	Meals/ year/ hh	Water heating/ year/ hh	House heating/ year/ hh	Animal soaring/ year/ hh	Total domestic fires/ year/ hh	Bundles firewood for these uses/ hh	Average no. of pombe/ hh	Bundles firewood for pombe/ hh	Bundles firewood for crafts	Charcoal/ hh (kilos)	Average dry wt. of bundles (kilos)	Total use of firewood/ hh (m3)	Total use firewood/ oap (m3)
STARTERS													
<i>Successes</i>													
Ibuti	864	67	22	0	935	100	0	0	1.0	24	35.6	4.9	0.9
Msingisi	840	269	149	0	1257	151	1.2	3.1	1.7	0	239	5.1	0.9
Ibwaga	719	160	64	29.0	972	187	6.2	440	4.0	0	39.2	12.7	3.0
Nduruguni	713	205	100	370	1055	144	1.2	7.6	0.0	0	34.7	7.3	1.3
Chunyu	731	76	57	26.0	890	172	2.2	20.0	39.0	0	29.3	9.4	2.2
Average	773	155	78	18.0	1022	151	2.2	14.9	9.1	4.8	32.5	7.9	0.9
<i>Failures</i>													
Ihenje	806	480	72	4.3	1362	121	4.9	21.5	15.8	15	27.1	5.9	1.4
Mlali	841	481	23	0.0	1302	79	10.2	66.6	0.0	0	17.8	3.6	0.8
Langali	961	433	0	0.0	1394	120	4.4	7.6	0.0	195	22.2	3.9	1.0
Iyoma	695	138	143	36	1012	158	7.9	50.5	-	0	31.8	9.2	2.0
Average	826	383	59	10.0	1268	120	6.9	365	5.2	52.5	24.7	5.7	1.05
Average, all starters	797	256	69	14.0	1131	137	4.3	245	76	26.0	29.0	6.9	0.97
NON-STARTERS													
Chakwale	849	609	92	0.0	1545	157	7.4	28.9	0.0	38	27.1	7.0	1.4
Ukwamani	953	603	167	3.6	1725	100	1.1	3.8	0.1	0	29.4	4.2	0.6
Mhonda	934	415	35	5.2	1426	191	4.5	19.2	14.5	71	18.4	5.7	1.6
Mkindu	817	391	9	0.5	1217	103	1.7	6.1	15.0	0	18.2	3.1	0.7
Lusanga	913	630	7	5.4	1555	112	0.0	0.0	15.0	0	14.8	2.6	0.5
Dhinda	920	233	13	0.0	1166	109	12.9	67.4	5.8	25	20.1	5.1	0.9
Wami-Ruhindo	871	264	91	4.1	1230	89	1.1	5.6	68.3	244	17.1	5.9	1.3
Nyandira	532	537	153	0.0	1223	208	5.0	32.8	0.0	6	17.7	5.9	1.3
Kipera	942	822	8	0.0	1033	108	7.8	54.6	7.0	98	23.7	5.6	1.0
Average, non- starters	859	418	64	2.0	1347	131	48	24.3	14.0	53.5	20.7	4.7	1.0

1 Calculated at 1,000 kilograms = 1.39 m3 (see Openshaw, 1981).

Table 2-3

	Percent house- holds over planted trees	Percent house- holds planted >25 trees	Percent house- holds in which women planted trees	Percent house- holds participat- ing in village woodlot	Percent households participating in school/ church woodlot	Average survival rate of trees (%) (privately planted)	Percent whose parents planted trees	Median year of the planting	Percent believe sufficient fuelwood available	Percent have noted decrease of forests	Percent with knowledge of village gov't. discussion of woodlots	Percent saying women more interested	Percent saying men more interested	Percent saying richer people interested	Percent saying poorer people interested
STARTERS															
<i>Successes</i>															
Ibuti	76	15	29	58	28	65	5	1979	0	83	66	5	21	37	0
Msingisi	100	47	28	63	5	40	5	1979	14	57	43	0	32	0	32
Ibwaga	100	29	75	86	57	46	38	-	7	86	24	5	19	0	67
Nduruguni	95	15	51	90	50	54	10	1974	16	95	25	0	30	0	50
Chunyu	100	0	26	93	0	18	20	1979	15	30	25	0	20	7	20
Average	94.2	21.2	41.8	78.0	28.0	44.6	15.6		10.4	70.2	36.6	6.0	24.4	8.8	33.8
<i>Failures</i>															
Ihenje	50	0	0	4	29	75	0	1980	16	62	25	8	45	0	45
Mlali	55	0	11	0	0	88	26	1973	1	85	2	15	70	15	70
Langali	89	89	84	84	5	70	58	1952	-	84	21	89	0	5	16
Iyoma	85	5	48	57	70	17	0	-	76	60	36	10	0	15	30
Average	70.0	23.5	35.7	36.3	26.0	62.5	21.5		31	72.7	21.0	30.5	26.4	8.8	40.3
Average, all starters	83.4	22.2	39.1	59.4	27.1	52.6	18.0		18.1	71.3	29.6	16.8	26.4	8.8	36.7
NON-STARTERS															
Chakwale	20	17	0	-	0	-	0	1980	5	70	21	63	13	33	25
Ukwamani	60	33	27	-	24	50	16	1978	8	0	12	8	16	0	25
Mhonda	0	0	0	-	0	-	0	-	2	64	12	4	25	25	25
Mkindu	100	50	50	-	0	68	91	1974	52	62	25	13	71	29	71
Lusanga	88	20	5	-	5	90	29	-	15	58	8	4	0	4	0
Dhinda	80	20	52	-	12	77	0	1979	7	96	68	0	33	33	38
Wami-Ruhindo	37	29	14	-	0	84	0	1963	65	42	0	0	11	0	0
Nyandira	84	80	16	-	0	90	53	1964	-	0	0	0	11	0	0
Kipera	40	10	15	-	0	57	0	1978	0	80	25	5	0	85	0
Average, non- starters	56.5	28.7	18.7	-	4.3	64.5	23.0		19.3	52.4	19.0	14.7	20.1	25.4	22.2

Table 2-4

	<i>Reasons for not starting or not extending the woodlot</i>						<i>Reasons for not starting not extending the woodlot</i>			<i>Benefits of tree planting</i>				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(i)	(ii)	(iii)	(iv)	(v)
	Not enough seedlings	Not enough land	Too busy	Other people may take the wood	Pests harbored in trees	Don't know how to plant trees	Risky drought	Risky-cattle trampling	Government may intervene	Environmental protection (I)	Firewood	Timber/charcoal	Fruit	Poles
STARTERS														
<i>Successes</i>														
Ibuti	5	96	0	0	0	17	25	0	13	8	100	41	29	100
Msingisi	0	5	9	5	36	18	59	14	9	45	86	50	0	95
Ibwagu	38	0	0	0	10	0	52	29	0	67	71	38	52	62
Nduruguni	60	0	0	0	5	0	30	15	0	35	75	25	45	85
Chunyu	13	0	0	0	0	53	0	0	0	33	47	7	53	47
Average	41.4	1.3	1.8	13.6	19.2	33.2	33.2	11.6	4.4	37	76	32	35	78
<i>Failures</i>														
Ihenje	59	0	0	0	0	29	29	0	0	42	75	21	4	70
Mlali	50	20	15	0	0	10	25	0	0	25	95	15	50	85
Langali	-	-	-	-	-	-	-	-	-(2)	-	-	-	-	-
Iyoma	15	0	0	0	5	0	50	0	0	30	35	10	60	45
Average	41	6.6	5.0	0	1.7	3.3	34.0	0	0	32	68	15	38	66
Average, all starters	41	2.5	0.4	9.1	13.3	33.7	33.7	7.5	2.7	35.6	73	25	37	73
NON- STARTERS														
Chakwale	79	13	0	0	0	0	0	0	0	17	75	33	0	87
Ukwamani	25	-	-	-	-	8	8	0	0	68	100	8	0	96
Mhonda	48	64	12	0	0	0	0	0	0	33	88	48	0	96
Mkindu	-	-	-	-	-	-	-	-	-(2)	38	95	50	8	83
Lusanga	75	21	17	0	0	13	8	0	0	54	50	17	33	66
Dhinda	96	0	4	4	12	8	16	0	0	8	100	96	0	96
Wami-Ruhindc	54	41	0	0	13	20	0	0	0	25	83	33	4	58
Nyandira	11	33	33	0	0	0	21	0	0	11	100	11	2	100
Kipera	95	5	42	5	0	0	0	0	0	26	100	37	16	100

Average, nonstarters	60.4	22.1	13.5	1.0	3.1	6.1	7.5	0	0	31	88	37	9.2	86
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- (1) Includes soil conservation, improved weather, shade, etc.
- (2) Missing data due to error of interviewer.

Appendix 3

Description of the Villages in the Survey

GAIRO AREA

This area is a plain at about 1,300 meters (m) above sea level, with rocky outcropping hills; it is in the lee of the Nguru mountains and receives only about 600 millimeters (mm) of rainfall per year. It much more closely resembles Dodoma and the drier inland regions than Morogoro. Gairo, the main settlement, lies on the Morogoro-Dodoma road, and the villages are concentrated along this road and on one or two side roads from it. The people are largely Kagulu, but most only moved to the area in the 1960s during the maize boom when this area became a prime production area. The original miyombo woodland cover which was being progressively but slowly removed over the last century was at that point more or less totally cleared for agriculture, leaving forest only on the areas too steep for cultivation. The old trial laws which governed the use of trees and particularly the protection of valuable slow-growing trees, though still remembered by the older people, are ignored today.

The CMS (Anglican) mission has been active in this area since the 1960s and in the last ten years has been very much concerned with reforestation. In the mid-1970s the missionaries at Gairo on the bidding of the Bishop of Morogoro set up a nursery and demonstration areas where fruit trees (guava, orange, and other citrus) and some firewood trees, notably Cassia siamea, are grown and sold to individuals. They did not have much difficulty in persuading people of the value of these trees. A good number of seedlings are even stolen at night.

The Forest Division is also active in Gairo. There are a number of catchment forests which are entirely a government responsibility, but in addition there is a forest officer in charge of education and extension to villages around Gairo, who has been working there since 1978. His territory includes thirty-three villages of which he classified eight as being successful in village forestry projects (including Msingisi and Ukwamani), and ten as failures (including Ihenje and Chakwale), this estimate being based, as it universally seems to be in the Forest Division, on the number of seedlings required and taken up by the villages. He supervises a nursery at Msingisi where there are about eight laborers, and is supposed to distribute the seedlings to villages, but is equipped only with a (borrowed) bicycle and a lorry which he can request from Kilosa, the District Centre, for one week a year, and this often at the wrong season only. As some of the villages are as much as 30 kilometers (km) from his base in Gairo and as he has no assistance in the extension work, communication and distribution are not easy. The main species being promoted is Cassia siamea although there are also fruit trees. Some indigenous and local species were being tried out in the nursery, the seeds having been gathered from the natural woodlands.

Chakwale

Chakwale is a large settlement of 750 families started in 1949 by some Somalis; it increased in size and importance in 1974 when it became a ward center. It is in

the center of a large and rather fertile plain and is obviously both wealthier and has better services than most villages. A number of families, some of them Arab, own tractors and cultivate large farms of upwards of fifty acres. Some of these large farms are noticeably hedged with minyaa as a windbreak. The majority, however, farm five to eight acres, sometimes hiring tractors from the wealthy farmers, especially for bringing in the harvest, although the charge for this seems exorbitant; the tractor owner concerned is said to have bought a Landrover on the proceeds of hiring one of his tractors for one year for this purpose. There are about 3,000 cattle in the village, mainly belonging to people of the Kamba tribe, and there is a communal shamba of 350 acres. This is organized by the village government and is cultivated by hiring a tractor from one of the private tractor owners. The share of profits from the shamba is one quarter to the village fund and three quarters to the families who worked it, but after paying for the tractor hire there can be only a small profit left. It is evident that the village leaders cooperate with the wealthy farmers, who also own the rather well-stocked shops, although both the chairman and secretary have been brought in from outside (this is unusual in the case of chairman) to replace previous officeholders who had been fired by the village (reasons were not forthcoming). There is a communal shop, but this, like most communal village shops, is not very well run and suffers competition with the experienced Arab shop owners. However, the village seems relatively stable, with piped water supply and a supply of consumer goods; although there is a definite social ordering and exploitation, most of the ordinary people seemed content in being better off than villagers elsewhere in these respects.

Firewood is in short supply as the whole plain is covered with prospering maize; the nearest source is about 5 km but the wealthy farmers buy firewood from other villages or use charcoal imported from outside the area. From October to December the majority use corn stalks, except cattle owners who believe this will cause death of the cattle (which presumably feed on stubble). One part of the village is entirely Muslim; in this area the women were not allowed to answer our questions. The estimate of fuelwood used given by the male respondents here was thought by the research assistant to be a gross exaggeration, and this might explain the extremely high total use calculated for this village.

The school started a small tree plantation of under three acres in 1979 (Cassia siamea) and the CMS church planted just under one acre of fruit trees and Cassia siamea in 1978. Christian families are able to obtain seedlings from the church. Other efforts at afforestation include a few minyaa shelterbelts as previously mentioned, but there seems to be very little interest in a communal woodlot, although the chairman did say that ten acres had been set aside to this (Cassia siamea and eucalyptus). We did not see this site and suspect it did not exist. It is clear that fuelwood is not the rich man's problem and that the village government is closely allied to the richer farmers, thus it is quite natural here that a woodlot is not considered a high priority. Land in this situation is at a premium.

Ibuti

Ibuti is named after a local type of tree but by tradition the villagers shunned trees and cut down all trees around their houses to rid themselves of owls, which were considered ill omens. This belief is really not quite dead although people were not individually willing to admit they personally supported this superstition. The village, which is amalgamated with another smaller one called Ngiloli, is strung out along a valley at 2 km from Gairo town. It grew rapidly during villagization from its origins in the 1960s (it was earlier a witch doctor's famous abode) to a population of 260 families in 1981. Of these about forty are cattle herders who live in the more remote part of the village, who are not Christian, and who do not participate much in village affairs. The majority, however, are cultivators without cattle and the influence of the church is very strong, mainly through the great personal respect in which its leaders are held, particularly the school's headmaster who is a driving force in the village; it is this core of people who run the village government. The village is relatively poor, and without much sign of differential wealth, but seems to have a strong sense of identity. There is a block farm of 250 acres which indicates a level of communal organization and trust.

The level area and the lower slopes were cleared twenty years ago for maize cultivation, and today even the highest of the nearby hills have been stripped of trees. Several people pointed out that streams from these hills, once perennial, now dry up soon after the rains finish, and that the village consequently now has a domestic water problem (there are some wells). Firewood is generally cut from sites about 3 km to the south and east, and in addition to that taken for domestic use, a considerable amount is taken from sale to Gairo town. It is estimated that two thirds of the women carry headloads of about forty or fifty kilos once a week on Saturdays to the market there, for which they get about 15 shillings. The village leaders and most of the people recognize that the fuel situation is about to become critical but there is no way of limiting this trading practice since the forests are common land.

A small village tree plantation project was started in 1978, using Cassia siamea seedlings from the nursery at Msingisi and with the advice of the Bwana Miti, and the backing of the church. Three quarter acres have been successful reared; the seedlings were brought by children who walked to the nursery (about 4 km) and they also brought buckets of water to irrigate the seedlings in the critical first season. Undoubtedly the cooperation between church and village government, and the influence of the head teacher over the children, were the key factors in the success of this, but there have been no extensions of the woodlot so far. If it were to be extended at its present site land would have to be taken from individuals and they would have to be compensated with other land elsewhere, but we were not able to establish if this was the reason. The village would like to have a nursery of its own, but there is no place with permanent water close by.

The school started planting at the same time and expanded its woodlot every year so that it now has three acres. The trees are mixed fruit and Cassia siamea and in this last year the young seedlings have been intercropped with maize. The woodlots look well tended and the failure rate has been quite low for this area. The headmaster again has been personally responsible for this

woodlot project and takes immense pride in his achievements. Gradually most people in the village have been persuaded by him to plant at least fruit trees around their houses despite the visitation of owls.

Ihenje

Ihenje is the name of a prominent hill behind this village, which is an old (that is, pre-1960s) settlement, though greatly expanded in that decade and again during villagization. Its population is now 270 families and most now live on the flat land where a definable village center could be formed; previously they had been widely scattered on the hill slopes. The flat land is all cleared but there is still a good deal of forest on the hill and on others around. Most people are primarily cultivators but keep a few cattle (three or four per family), so there is no separate group of cattle keepers at Chakwale or at Ibuti. However, there is some land use conflict as browsing cattle are brought back through the fields to the houses at night. Village leaders appear to be well respected but there is great hostility between villagers and the teachers at the school which possibly results from disagreement over use of the school book fund or some similar issue. Parents have forbidden their children to work on any project initiated by the teachers including the intended woodlot.

Forests still exist about 2 km away, as well as immediately behind on Ihenje hill, despite the trade in woodfuel, which is the usual Saturday activity of the women here as at Ibuti. Compared to most villages in this area Ihenje is well supplied as there are no villages to its east or south.

The village leaders planned a communal woodlot project in 1980 of Cassia siamea and orange trees and requested the Bwana Miti to bring the seedlings. The plantation was done by the villagers but close to the school and with teachers supervising. Water had to be brought in buckets but this activity was quickly abandoned apparently due to a dispute between villagers and the teachers, and all the trees then failed. The church started a plantation of Cassia siamea in 1978, but it moved the following year to a new site at the other end of the village and most of the trees therefore died untended. New trees, about fifty, were planted around the new building, having been brought by church members from the CMS nursery at Gairo. These are doing well.

Ukwamani

Ukwamani lies on the Dodoma road about 1 km west of Gairo town and had 350 families. This area has been settled for at least a century, the elders recalling how the first people had come here because of the many elephants in the dense forest (in the pre-German period). Wholesale clearing began with the growing of cash crops (British period), particularly maize. The village, however, only took on its current compact form in 1971, and increased in size in 1975 with villagization. It is a village primarily of cultivators, with few cattle, and is not wealthy. The old tribal leaders still have influence over the people but are not represented on the village government which is run mainly by church leaders who seem to be well respected. The CMS mission has been an important force for organization in the village.

The area around the village as far as the eye can see is completely cleared, but dense forests, some of which are reserves, exist 6 km to the north and 10 km to the west and these are the primary sources of fuelwood. Corn stalks are the secondary fuel.

In 1976 the Bishop of Morogoro instigated a tree planting scheme at Ukwamani mission and a series of phases have successfully been carried out with more than six acres planted mainly with Cassia siamea and eucalyptus, but also a few guava and oranges and Schinus mole. The seedlings come from the nursery at Msingisi, about 3 km away. The church distributes seedlings to individuals, most of whom are Christians in this village, who have very little contact with the Bwana Miti and know little of his role; many have planted fruit trees around their houses. The school has planted Cassia siamea first for ornamental purposes and later on a small plot (one-half acre). There is no communal plantation although the church plantation is regarded as such by the Bw. Miti. However, it seems that only a limited number of villagers were actually concerned with the organization and the work on this.

Msingisi

Msingisi is the name of a local tree, and this village of 260 families lies on the drier part of the plain south of Gairo town and at some distance from the mountainous and forested areas. The cultivation areas stretch 5 to 6 km south of the village and grazing land is even further; cattle are brought to the homestead in the center of the village nightly, and most families own cattle, some having herds of more than 100 head. The village is new, being formed by overflow of people from the Katangi area to the southeast in 1972. As the people are predominantly cattle herders, each family cultivates only about 2 acres of food crops. Many of the women do not speak Swahili, or pretend or have to pretend not to, and in most cases we had to rely on men to translate; in any case we were not permitted here to interview women unless a man in the family was present. Like many cattle people the wealth is held in the form of cattle and is not realized as cash or converted into material comforts, apart from wives; and the society generally appears "reactionary" or traditional in this. Control of the village government is in the hands of the wealthiest and oldest cattle owners; a number of younger, non-cattle owning 'progressives' have had little success in bringing in projects for change. There is a small communal shamba of maize.

Wood is collected from areas to the south, which takes about six hours per trip. No one seems to feel that this is a hardship, possibly because there is a surplus of young female labor in the typical family as cultivation areas are small.

The Forest Division's nursery is located in this village, which is only 3 km from Gairo and several villagers are employed as laborers to tend it; the village is designated by the Bw. Miti as a success in starting its woodlot project. An area of about 4 acres around the village office is beautifully laid out with Cassia siamea trees ranging from three to five years old, and prospering. Relations between the village and the Bw. Miti seem to be very good and recently the village agreed to plant a few more trees around the communal shamba. In addition many

individuals have obtained fruit tree seedlings and planted them around their houses.

Mgeta/Mlali

This area on the western slopes of the Ulugurus, which rise over 300 m, has been overpopulated for two generations and soil erosion and deforestation have been of great concern to the government since the 1930s. The power parts in the rain shadow receive 1,000 mm of rain per year, while the higher villages, with a much more temperate climate, get about 1,400 mm. These areas on the upper slopes are well known for fruit and vegetable production and serve markets in Morogoro and Dar es Salaam. A good gravelled road was constructed up the extremely steep mountain side in the colonial times to service settled farms and is relatively well maintained.

Concern over environmental deterioration led to the notorious Uluguru Land Scheme (ULS) in the 1950s when terracing of agricultural land was first strongly encouraged and later enforced. This led in places to rioting and the anti-terracing issue was taken up in the independence struggle. On the eastern side of the Ulugurus where most of the violence occurred there is now no terracing, but on this upper western side, where a form of terracing had in any case been practiced since time immemorial, and where administration of the land scheme seems to have been tactful, every inch of land is terraced today. What is often overlooked is the forestry work done in connection with the ULS. Numerous catchment forests were created on hill crests and in other vulnerable places, and reportedly (possibly exaggerated) there were 100 Bwana Shambas based in Mgeta alone, and much of their work was to encourage farmers to plant trees on their land. At any rate the chief Bwana Shamba is still somewhat affectionately remember as Mr. 'Kidunyo' (Mr. Short). According to the older people, before the arrival of this team there were no trees to be seen at all in the whole area. It is not clear to what extent compulsion was used here, however, to introduce this quite amazing tree planting effort.

The Forest Division continues today to encourage planting trees with a nursery at Bunduki which distributes seedlings to those who want them, free. Bringing them to the villages high in the mountains can, however, be a problem. Another nursery is being started at Peko half way down the mountain. The Bwana Miti is stationed in Mgeta, and is from the area himself; he has worked as Bw. Miti for eight years, which is unusual for Tanzania, where the policy seems to be to move experts around extremely fast. The Division of Forestry at the University of Morogoro has also been active in the area and has assisted in the setting up and maintaining of a seventy acre cypress plantation at Peko where timber is exploited commercially. Although several churches grow trees on their own plots, there has been no active church program to encourage afforestation.

Nyandira

Nyandira, with a population of 440 families, is the highest village in the sample at almost 1,800 m, in an extremely attractive location almost in the clouds. It is about 8 km above Mgeta along a difficult and stony road. It appears

extremely lively and prosperous as income is earned all year round from the vegetable and fruit trade. These are grown in great quantity and variety (many temperate crops are included - apples, pears, plums, parsley, beetroots, leeks, lettuces, etc.). Houses are solidly constructed of local sun dried bricks and most have corrugated iron rooves, some even having timber ceilings inside. The people perhaps should not be considered typical African peasants; they appear to be more like 'yeoman farmers.' Many have pigs in small enclosures near their houses which feed on household wastes, and almost all have a domestic orchard. The chairman is well informed and has a primary education, is evidently liked and of like mind with most of the inhabitants. Although some must have been better off than others, we did not meet any very poor families, and there does not appear to be any system of labor hiring; land seems relatively fairly divided. This is perhaps partly because villagization did not affect the village which means that few new people were moved in, and few people within the village shifted to new sites. It appears that the housing has always been somewhat scattered and it would not be possible to cluster it (as has been done elsewhere) for lack of suitable flat sites. However, most people have several plots of agricultural land, one around the house and another at a distance of 3 to 4 km.

Almost every family has a private tree plantation of Acacia meurns (black wattle) and/or Eucalyptus maidaini; between one fifth and one fourth of the land appeared to be permanently under trees. Every remaining inch was terraced and under maize or vegetables with fruit trees usually planted along the terrace walls or along furrows for irrigation. Fuelwood is thus immediately available close to the house; most individuals claim to have planted between 100 and 1,000 trees personally. The young seedlings are dug from the existing planted areas and transferred; in this climate particularly black wattle grows well and is very easily propagated. It is interesting that this village was classified by the district Bw. Miti (who had never visited it) as a 'failure' in afforestation terms, since it had not requested or received seedlings from the Forest Division nursery! However, the village has neither a communal shamba nor a communal tree plantation. All land was long ago (there is a matrilineal system in this area, which is to say land passes through the women, not the men; which is not to say that the women have control of the land, rather their families do). To obtain land for a communal project such as a woodlot, where land is obviously very productive and in short supply, would probably be extremely difficult; the interesting factor is that despite this short supply people maintain their private woodlots jealously. The families who have no woodlots are forced to buy fuelwood from the others, but these are very few indeed (less than 10 percent of the sample).

Langali

Langali is a village amalgamated spatially to Mgeta town, the local center, and has immediate access to the services this provides (shops, post office, and large market). It is an old settlement with a population of 520 families, where the main crops are maize, beans, onions, and tomatoes; it is too warm to grow the variety of crops found at Nyandira, but coffee is rapidly being adopted. The people are in many ways similar to those of Nyandira, indeed among the Luguru people from this whole area are considered to be rather unusual and famous for

education and leadership; land is all occupied and owned by individuals and much of it is terraced. There is an active village government and the chairman is a woman.

There is no indigenous forest left in this area. During the ULS, tree planting was taken up on a massive scale, the favorites being Eucalyptus maidini, cypress, black wattle, and Grevillia robusta. Most families have a tree plantation which supplies their needs for firewood, poles, and rope (obtained from black wattle bark).

A communal tree plantation of cypress of about 2 acres was started in this village in 1978. In 1980 this burned. This seems to have been the result of negligence rather than deliberate sabotage; it appears to have occurred when the adjacent fields were cleared by fire, as they are annually. No action was taken against the offender. The village intends to replant the site, but this time with Eucalyptus maidini which is much faster growing. The school has planted eucalyptus and cypress along its approach road and a mission has also planted some of these species. However, the impetus for general tree planting here came from the (colonial) forestry department in the first instance and seedlings and advice are still very in demand. The village has proposed to the forestry department that a nursery should be set up in Langali itself; people are particularly interested in oranges which would be a good cash earner. A coffee nursery was started in Mgeta recently by the Coffee Authority and is very well maintained.

Mlali

Mlali lies lower down the mountain on the foothills of the Ulugurus, about 12 miles from Morogoro to which it has stronger links than with Mgeta. Like many villages it was an old settlement which was greatly expanded during villagization and land was redistributed at that point. Newcomers frequently find that the land they have been allocated is in practice 'lent' to them by the former 'owner'; although they do not generally have to pay any rent or tribute, there are restrictions on what can be grown, notably perennial crops are not permitted because then the land by natural law would become their own. This obviously has serious impacts on tree planting activities. Apart from this factor, the fact of land conflicts might explain the evident distrust and lack of internal coherence in village affairs, although such a conclusion can only be surmised since no one would speak of such problems directly. The village also appears somewhat wary of outside agents of government and other bodies. Being closer to Morogoro, it has had a great deal more exposure to these than the higher villages, particularly Nyandira. The Tobacco Authority has agents in the village who have been trying in vain to get people to grow tobacco. In fact, a simple calculation made it clear that tobacco cultivation is a poor option in terms of returns to labor compared to vegetable crops and bananas that are normally grown, but the tobacco agents claimed that villagers were 'lazy' and 'uncooperative' and frequently harangued them. (The fact of the already quite severe fuel shortage did not appear to trouble the tobacco agents.)

There has been an 80 acre communal farm for three years (maize) but the product of the first two seasons was negligible. The firewood situation is becoming serious as much as the area of lower slope has already been cleared and there was little afforestation at this altitude during the ULS. The Forest Division was asked to bring seedlings for a communal tree plantation which they did in 1978 and 1980. The villagers claim these were brought during the dry season; they were evidently not watered, and all perished in the 2 acre plot, which looked untended. However, the streets are nicely lined with Cassia siamea trees dating from about 1975. Individuals claim to plant fruit trees but the question 'who prefers to plant trees: men or women, richer or poorer people?' caused ructions and it is evident that there has been some open conflict over the issue although we were unable to get people to talk about it and the chairman claimed there had been none. This was just one of many issues about which people were not forthcoming.

Kipera

Kipera, with 280 families, is at the foot of the Ulugurus and to some extent acts as a suburb of Morogoro. It has a zealous secretary who has evidently been sent there to get things moving in this generally apathetic village. Several families in the sample were seriously considering moving away from the village because conditions were not good. The chairman was not a strong leader and the villagers were clearly not behind the administration. A communal shamba of tobacco (7 acres) had been planted but not weeded at all. Only two families in the whole village had been successfully persuaded to take up tobacco cultivation privately.

The firewood situation was rather serious although a well-wooded hill was within easy reach; this, however, had been made taboo by the elders of the village who evidently still had more influence in village affairs than the official government. It is possible that there is a rift between these authorities, but we were unable to ascertain whether this was the case. There has been no communal planting of trees and very few individuals plant them for their own use. Possibly the newcomers since villagization do not feel secure in long-term occupancy here.

TURIANI AREA

Turiani lies on the southeast-facing slopes of the Nguru mountain block (it rises to 3,000 m) where annual rainfall is up to 1,800 mm and where dense forest appears to envelop much of the upper mountain slope and part of the lower. This area was chosen as a 'control area,' that is, where it might be assumed that firewood was not a problem. The vegetation is very lush and most of the villages are surrounded by trees. The population is concentrated on the lower slopes where there are permanent streams while the plain has been cleared for sugar and rice cultivation. There is also a teak plantation of 6,000 acres; many of the trees are reaching maturity now at 60 years. The area is on a route that was strategic during the colonial period but has become peripheral in the post-independence period as the conditions of the road and the state of Turiani town testify. Although there has been some immigration, it has not been on the scale

of that of Gairo, but there has been some growth of migrants from Kilimanjaro in the last three years in the northeast extreme of this area. The people are mainly Nguru (the indigenous) with some Zigua and a few Luguru who arrived in this area during the last fifty years when land began to run out in the Uluguru area.

One forestry officer is based in Turiani; he is in charge of forest affairs in two divisions, Turiani and Mvomero, that is, a total of about sixty villages which extend along and on both sides of a road about 80 km long. He has no transport of any sort although he is able to utilize a district lorry for about one week every year. The nursery is at one extreme end of this territory, on the east of the teak plantation. There are six assistant Bwama Miti whose duties are to issue licenses to individuals to cut protected timber species from the natural forest (mpingo ebony, kiangazie mahogany, etc.). There are also a number of laborers to run the nursery. However, he himself is also in charge of education and extension and of encouraging villages to plant trees. The plan is for thirty village schools to receive 1,000 seedlings each next year to be distributed from the nursery by this Bw. Miti; however, communication is clearly hampered. A seminar on tree planting which was supposed to be attended by the chairmen of all villages in the area was held shortly before our arrival but in fact attracted very little participation; the villages in the study, apart from Mhonda, appeared never to have heard of it.

The only large plantation, apart from the teak estate, which is a semi-government concern, belongs to Turiani Hospital where 700 eucalyptus were planted to supply hospital cooking needs in the future. Seedlings for this were obtained from the Forest Division's nursery. There is little Christian mission work in this mainly Muslim area and certainly none connected with tree planting.

Mkindo

Mkindo is an old village core which grew to 750 families during villagization when scattered hamlets all around were moved to join this central village on the road. It appears relatively prosperous, without a shortage of land since it is adjacent to a large otherwise unoccupied piece of the flood plain; most families cultivate several acres of rice there in addition to a variety of vegetables and fruit for home consumption. The rainfall is reliable and agriculture is in some ways much easier than in Gairo, where there is constant risk of drought and low yields, or the upper Ulugurus, where a great deal of effort is needed to retain fertility through terracing, etc. Relations between the village government and the ordinary people as far as we could judge were unexceptional, and the chairman appeared to be well liked. There is a small communal shamba which is apparently doing well.

The problems of obtaining firewood are obviously not severe as the village itself is under a canopy of assorted species of trees, although many of these are coconuts and papaya which do not make good fuel (mango wood, however is regularly used for domestic cooking). However, the villagers did mention a decrease in its availability and a sugar (jagari) mill in an adjacent village had made visible inroads in the natural woodland in a strip up the mountain to the east. The chairman explained the village tree conservation rules; cutting of trees

along the stream banks is prohibited, and this rule seems to be well followed; great ire was aroused by the Department of Works bridge repairing team recently who hacked down all trees around the culverts. By tradition, the more valuable hardwoods of the forest are cuttable only on individual permission from the village elders; today a license is required instead from the Forest Division, and people agree that the former was effective in controlling their use.

The village has no communal tree plantation nor has it ever discussed the possibility. The school has planted teak trees, about 200, over its own compound. Individuals regularly plant coconut, papaya, mango, citrus trees and occasionally others for shade, but not for fuel deliberately. One local tree is especially planted amid coconut trees because its roots are said to exude an insecticidal substance which deters termites.

Mhonda

Mhonda is a village on a side road about 4 km above Turiani up the mountain slope. It is dominated by an imposing Roman Catholic mission (1977) which among other activities runs an excellent carpentry school using indigenous hardwoods from the forest in which it appears to be engulfed. There is also a national teacher training college here, and the presence of these gives the village the air of a small town although in reality it has only 350 families. A proportion of the houses are constructed on red bricks which are produced in small quantities in a village kiln. The village has an exceptionally well ordered office and an energetic village manager who works well with the village chairman and secretary and a number of progressive leaders, all of whom expressed disapproval of the lazy habits of their fellow villagers, who cultivate without bothering to weed, cut prohibited timber without license, fail to build brick houses, and believe in witchcraft. There is a small communal shamba (60 acres) which is apparently functioning adequately and a variety of other productive projects including the brick kiln and a cooperative bakery, which indicate that the leaders are able to organize the villagers.

There is no firewood problem in the village although to travel even half a mile uphill is arduous climbing. A number of villagers mentioned that some areas which had been cleared for agriculture had had landslides. Protected species such as teak and mahogany are much liked for building and for fires and are cut because there is really very little possibility of controlling this. The village plans a 10 acre woodlot (the site was indicated to us, but had not yet been prepared; it was on a steeply sloping hill, presently lightly wooded); but it is not an immediate priority. There is no level site that could be used since flat land is extremely valuable in this highly dissected landscape. The school has asked the Forest Division for 3,000 mahogany seedlings to plant, some of which may in fact be intended for this village woodlot since the chairman was unsure what species were to be planted there. Individuals are not in the habit of planting trees even for fruit; they are well supplied with the mangoes and coconuts planted by the mission at the end of the last century, all over the village.

Lusanga

Lusanga is a village of 700 families on the edge of the teak estate, sandwiched between this and the semi-government sugar plantation at Mtibwa; it is about 8 km east of Turiani. The gathering of many people formerly scattered around this area, in 1975, resulted in clearing of all the remaining low lying land for agriculture, and land shortage is a major conflict between old and new settlers. Much land is "lent," with the proviso that no perennial crops are planted on it. Several villagers, including the chairman, own large areas (20 acres or more) and hire others to work on it at peak seasons. The chairman himself is an old man feared rather than respected by many, and there is a village manager who is a highly qualified forester by training (with higher qualifications than any of the official Bwana Miti in the field; village managers, who were appointed in 1978, were taken from all walks of life, usually without much choice on their part).

There is a 250 acre communal of sugar, which was burnt down last year by someone who claimed that this land was his own, and who has since been drummed out of the village. The proceeds of this shamba all go to the village fund toward the cost of a flour mill.

There has been virtually no discussion regarding a communal woodlot since land is in short supply and fuelwood and poles can in any case be obtained near at hand from the teak plantation. Although officially not allowed, the management of the teak plantation has come to an understanding with these villagers that they are allowed to use the ample fallen branches. Probably it is worth their while keeping a good relationship with the surrounding villages as there is always danger of forest fire when fields are burnt, should a farmer be negligent. The school, it seems under persuasion of the village manager, has recently planted 70 eucalyptus seedlings around its compound, although the headmaster did not know either the Swahili or the English name of these trees. Teak trees planted in the school the previous season all died. The approach path, however, is lined with Cassia siamea which date from 1975.

Many of the older original houses have orange, papaya, and coconut in their compounds and a few have added teak seedlings from the plantation, for shade and, eventually, for building.

Dihinda

Dihinda is an isolated settlement some 20 km east of Turiani on a poor road. It is an old village site that was greatly expanded in the 1970s and is in the margins of the Chagga resettlement zone. There is evidently still plenty of land for cultivation. Shambas are in any case rather small (1 1/2 - 2 acres per family); the village seems very poor compared to others and has few services at all. The few Chagga families who have moved in with large banana shambas have, however, made a great deal of money in a short time, and the villagers, who are actually exploited badly by them by performing wage labor in return for food in the hungry season, do not resent their presence and possibly hope that more will arrive soon so that they would organize shops and mills as they have done in villages over the east. The indigenous people are unable to do this due to fear of witchcraft to which one appearing to be wealthier than the others, is immediately prone.

The fuelwood problem is not acute, although large areas of natural forest were cleared in previous years to produce charcoal which was commissioned by a private agent with a lorry. Since the condition of the road has deteriorated in the past few years, the lorry has visited less and the trade is diminishing. The village government has discussed the possibility of a small teak woodlot; since the nursery is only a few kilometers away it would be easy to arrange, but no steps have been taken yet to implement this, nor has the school made any significant move to plant. Individuals, however, have obtained seedlings of teak and planted these around their own houses, they also regularly plant coconuts, oranges and mangoes from seed.

Wami-Ruhindo

Wami-Ruhindo is a small village in the flood plain of the Wami River, just to the south of the main channel, and at some distance from the other villages in this sample. It was selected primarily because of the very well organized tree plantation which can be seen from the road (the district forest officer believed this to be a village project, wrongly). The village is relatively new, although one or two families including the owner of the tree plantation have lived there for 40 years. The whole area is sparsely populated but two state farms set up in the early 1970s attracted a good many people who are now casually employed as laborers while maintaining a small farm in this adjacent village. There are many tribes represented and the chairman was formerly an army medical assistant and has travelled widely abroad during the war. In all there are just over 200 families cultivating 1 to 2 acres each of rice and maize; a communal shamba of cotton is planned (22 acres). The leaders do not have much hope that people will turn up for work on this shamba, however.

The fuelwood situation is not bad at present since there are about 50 acres of forest on one of the state farms; about 1 mile from the village is a forested section of fuel, and for charcoal making (about 20 families are involved in this). Although the leaders say they have tried to persuade the villagers to plant trees there have been no plans for a communal woodlot of any kind. In fact the leaders will think themselves very successful if any harvest is taken from the cotton shamba, which is much more in the eye of the district government than a small woodlot would be. The private woodlot was started by one individual (not a member of the village government), who was employed by some Greek sisal farmers 35 years ago. They gave him kapok tree seedlings which he planted on the margins of a 3 acre plot. Within this area he gradually planted oranges, cashews, coconuts, teaks and other trees. Later he extended his area and now has about 12 acres of plantation, getting seedlings mainly commercially from Morogoro, but also from the Forest Division nursery there. He makes no profit at present (apart from his own firewood and fruit needs) from this plantation, his intention being that it will serve as an "old age pension" from firewood and timber, which his son will cut and sell for him when he is too old to continue regular cultivation and to run the village tea house.

The school has planted a few cassia trees around their pathways. Few individuals have planted even privately, and many prefer to buy firewood or

charcoal, and even food, rather than gathering or growing it themselves. There does not seem to be any animosity between the ordinary people and the plantation owner, despite the fact that he must garner a large proportion of their income by selling tea and buns to them; the children are allowed to gather fruit and kapok freely in his woodlot. There is a sense of temporary occupancy about this village, since people are here really only for the wage labor, without secure jobs.

MPWAPWA

This area in the Dodoma region was included in the study after the research was completed in Morogoro because so few examples of successful village woodlots were found in the original zones. We were in fact informed by the headquarters of the Forest Division in Dar es Salaam that many villages in the Mpwapwa area had been planted trees for more than ten years, but although we found many villages with woodlots, only one predated villagization.

The area is directly to the west of the Gairo area and has an even more extreme climate with low and unreliable rainfall; however villages on the foothills and to the north of a central ridge are better off in this respect. Mpwapwa town, the district center, serves the area south of the ridge, while Kongwa, a subdistrict center serves the north, which was at one time one of the major areas of the illfated Groundnut Scheme (1952).

Because of the problem of erosion all over Dodoma region a special unit known as HADO was set up to effect countermeasures and particularly to encourage forestry. HADO plantations have been started in many places where there is particular danger of erosion, some dating from ten years ago. The administrations of HADO and the Forest Division are quite separate and they maintain separate nurseries. HADO maintains its own plantations; it also distributes seedlings to villages and does some extension work, although this is mainly the work of the Forest Division.

Chunyu

Chunyu is a village of 650 families of the Gogo tribe in the Mpwapwa area about 25 km from Mpwapwa town. An ujamaa village, it has a large communal shamba; the staple crop here is sorghum since rainfall is too unreliable for maize; the only cash crop is groundnuts. The poverty of the village was immediately evident; drought in the last few years has reduced harvests and children under two years look badly malnourished. The village regularly receives government famine relief.

The only trees visible, apart from occasional baobab trees, are Cassia siamea planted in a 20 acre plot by HADO in 1976, and a small village woodlot of Cassia siamea and Azdrachriacta indica which look rather stunted. About one third of the trees in this woodlot have failed; they were planted in 1976. The village reports that a 3 acre plot was planted with "a type of muule," that is, an unidentified tree, but grown from timber rather than poles or firewood, and failed, and that 1 acre planted with Cassia siamea and Schinus mole also failed in 1981.

According to villagers the climate had become steadily more adverse over the last ten years and firewood sources are from 4 to 7 km away and retreating. Despite this, or perhaps because of it, each household had a large store of fuel, about 3 to 6 cubic meters. Women are said to spend about 6 hours a day, 6 days a week, gathering fuel in the dry season before the agricultural crop season begins, when they rely on the store for supply.

Iyoma

Iyoma was classified by the district forestry officials as a non-starter but in fact had planted 5 acres of Cassia siamea in a village woodlot in 1980; these dried out and all perished. It is a much smaller village than Chunya, with 250 families, and is less accessible being far from the main road, but appeared to have a better rainfall. Nevertheless, they reported drought for the last two years and malnutrition was very much in evidence in the small children. Four acres had been cleared ready for tree planting in 1982.

The village has a large communal shamba and many communal development activities. The school has planted a few trees in most years since 1975 and some of these survive, particularly those closest to the school buildings (the planting cannot really be said to constitute a woodlot, however).

Ibwaga

Ibwaga is a village on the north facing foothills only 3 km from Kongwa town. It clearly has a much more reliable rainfall than the villages on the Mpwapwa side. With a population of 370 families it appears relatively prosperous. The village has had a communal shamba since 1973 which has grown from 59 acres to 150. They have a communal tree plantations of 5 acres of blocks of Cassia siamea, Grevillea robusta and Schinus mole, dating from 1975, of this the Cassia and Schinus are growing well. There is no evidence at all of the Grevillea which were browsed on by cattle. The whole area is unfenced, and shows the marked preference of cows for some species over others.

The village leaders would like to plant "a mile" of trees all along the village. As the existing woodlot is about 100 meters deep, we estimate that this would be equivalent to a total of about 30 acres although the leaders thought it would be an addition of 10 acres to the existing 5.

Firewood is at least 7 km from the village and very large bundles were gathered - the largest we measured was 65 kilos. Many women earned a living by gathering firewood in the hills far beyond Kongwa and selling it there in the market place.

Ndurugumi

Ndurugumi is a village with obvious infrastructural advantages - brick office buildings, a storage barn, a water tower, and a relatively well graded road. It had started in 1961 as a village settlement to grow groundnuts and, in common with

other such villages, was granted all these facilities as a sort of demonstration on the value of capitalized agriculture. During villagization, however, the population has tripled to 465 families; it has a successful 200 acre communal shamba of maize and the climate is more favorable than that of the other village in this zone. In its period as a village settlement the village had planted 10 acres of mixed trees - Cassia siamea, Grevillea robusta, Jacaranda, and Eucalyptus. At this time the village had its own nursery too, and many individuals planted trees in their homesteads. After villagization in 1974 a further 20 acres of Cassia siamea were planted, but the nursery had to be discontinued because the water supply was not sufficient for the additional families who had been moved in. Some of these trees had been damaged in an accidental fire but both woodlots looked very well cared for.

This was the only village in which poles and some firewood were already being cut; these were sold to villages at 3/= a pole and 2/= a bundle of firewood, considerably under the market price in Mpwapwa. The village had fairly concrete plans for extension of the project, and were planning to add 5 acres per year up to 100 acres, on a slightly hilly area not in the center of the village where the present woodlot stands. Moreover, their plans for the coming year were already crushed by the inability of the Forest Division to meet their seedling requirement. They had requested 5,000 (for 5 acres) and were informed that they could have only 2,500. They had already prepared the 2 1/2 acres when we arrived with Bw. Miti to do the research. He told them flatly that they could not have any at all, because they were all allocated to other villages. Had we not come it is unlikely that they would have had any news of this.

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