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The Fuelwood Problem and the Sustainable Reproduction of Rural in Mai-ai-ihü Village, Kenya

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The Fuelwood Problem And The Sustainable Reproduction of Rural Life In Mai-ai-ihii Village, Kenya.

A Dissertation Submitted in Partial Satisfaction of The Requirements of the Degree of Doctor of Philosophy in Urban Planning.

by

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To our children Njambi, Konyu, Njuguna and all other Kenyan children in the hope that they will grow into a future that they will be able to control with creative human labour and consciousness.

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ABSTRACT OF THE DISSERTATION

The Fuelwood Problem And The Sustainable Reproduction Of Rural Life In Mai-ai-ihii Village, Kenya.

by

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Doctor of Philosophy in Urban Planning
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The woodfuel energy crisis in Africa and other parts of the Third World can no longer be ignored. Woodfuel and related energy problems are important and pressing issues in Africa today. The vast majority rely on fuelwood to meet their basic energy needs. Supplies are diminishing while consumption is growing.The quality of life is deteriorating further and the environment is getting more and more degraded.

This dissertation uses data from Mai-ai-ihii village in Kenya, to demonstrate the causes of fuelwood shortage and how this

affects the quality of rural life. First, it investigates the extent of the fuelwood problem in the village. Next, it examines the socio-economic characteristics of the community and how they relate to the fuelwood problem.

The study emphasises the fact that rural people understand their environment because of their practical experiences. It is, therefore, necessary that any policies or programmes of action proposed to alleviate the energy problem in rural areas should be based on unlocking and building on past and present experiences learned and practised by rural communities.

CHAPTER ONE

INTRODUCTION

1.1 Statement of the Problem

This study examines the inter-relationship between forest environment (i.e., deforestation), and fuelwood* use and the impact this inter-relationship has on the rural life of a village community called Mai-ai-ihii in Kenya. The object is to relate fuelwood energy needs to the exploitation of forest resources in Mai-ai-ihii and show the complex problems associated with meeting rural energy needs and the effects on the village community life. At the end, the study proposes an alternative strategy for energy supply to the village and rural Kenya based on sustainable methods learned and practised by the community.

Providing for household energy needs in rural Kenya takes up a substantial part of the resources of poor households - both in cash purchases and in the time required to gather wood or crop and animal waste (Hosier, 1984). The current trend of rising prices of alternative energy services (oil, gas, etc.) and diminishing fuelwood supplies will make this problem even more acute in the future.

In the rural areas of Kenya, energy has a vital role in food preparation and in satisfying other basic needs such as lighting, heating, etc. The dominant energy source is firewood that comes from local forests and tree stands. The collection and usage of firewood often leads to depletion of existing forest vegetation and accelerates soil erosion with adverse consequences on agricultural productivity (Edward, 1979). Shortage of firewood energy is known to lead to significant decline in nutrition levels in rural communities by constraining food preparation (Wisner and Mbithi, 1974).

The problems associated with increased fuelwood consumption in Kenya have become more severe in recent years with the increasing privatization of areas under forest, the commercialization of fuelwood, rapid population growth and expanding commercial agriculture (O'Keefe, 1984). Traditional community methods of nurturing common fuel resources are being rapidly abandoned. Rural village communities such as Mai-ai-ihii face three challenges of ensuring: (a) preservation of a healthy forest environment; (b) increasing supply of fuelwood and (c) improvement in the quality of community life. Mai-ai-ihii community village is a representative settlement unit for other rural units found especially in the medium and high potential areas in Kenya. This study focuses on the dimension of the fuelwood scarcity problem in relation to the reproduction of rural life in this village and explains the strategies being evolved for coping with the problem within the community.

There is a dire lack of information on the extent of fuelwood and energy crisis in rural areas. The general perception is still that rural areas have abundant forests to sustain their population growth, but this is mostly incorrect. In Kenya, 85% of the total population reside in the rural areas and is recorded as growing very fast (National Development Plan, 1989). The forested land is 3% of the total land area of Kenya, which supports a large proportion of smallholder farmers (75%). The depletion rate is 27% or 19,000 hectares of land per annum (Muhoho, 1990).

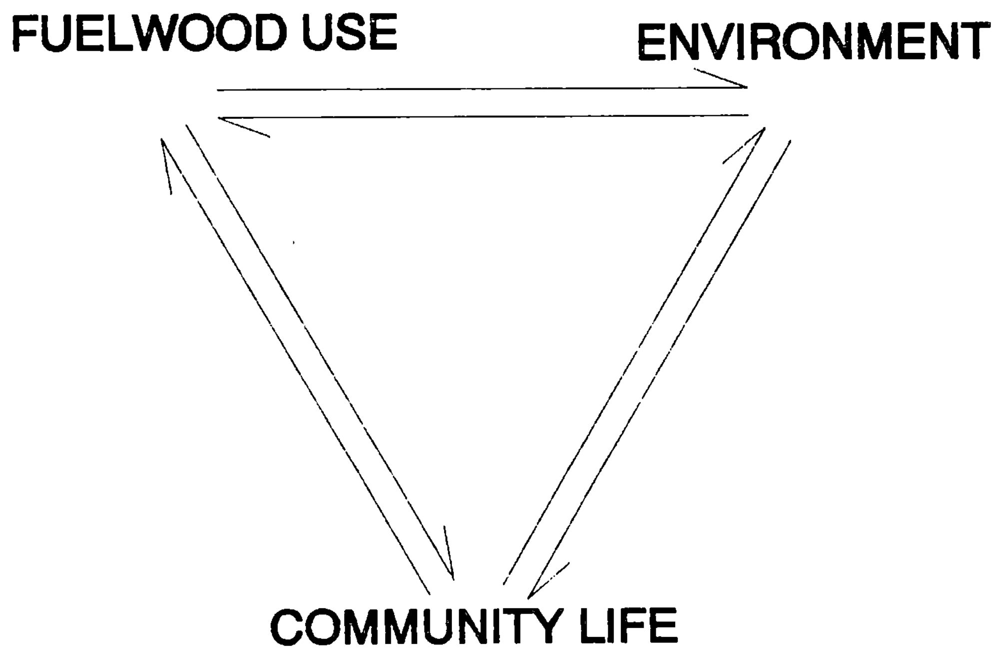
Kenya has a well stated fuelwood national policy. Approaches by the state to the fuelwood problem began with support for improved and efficient fuel technologies. Currently, they extend to active campaigns for reafforestation. But, such interventions still remain at isolated areas and have not been integrated within community lifestyles. Furthermore, methods learned by the rural communities of coping with the fuelwood problem have not been incorporated or given attention although such methods are known to be environmentally sound and sustainable (Richards, 1979).

This research is intended to demonstrate the extent of fuelwood and energy crisis in a rural area in Kenya and the impact on the community life. It also will contribute to better understanding of fuelwood and energy crisis in relation to community life at the local level of rural areas. Attempt also will be made to suggest an appropriate rural energy strategy for Kenya.

1.2. Context of the Problem

The problem of fuelwood in rural areas is intimately related to the larger environment as well as local community life. This relationship is graphically presented in figure 1 below.

FIGURE 1



SOURCE: AUTHOR

1.2.1 **Relationship in the Traditional Setting**

In traditional settings, the community lived in harmony with nature rather than against it. Kenyatta, 1988; Leakey, 1977; Ngugi, 1968; Achebe, 1988; Vansina, 1966; Muriuki, 1987; Ogot 1967; Odhiambo; 1977, in their studies of traditional African societies, state that African society survived in a rich and competitive biotic community and the relationship between the community and the environment was continuously intimate. The intimate relationship was based on several attributes of the traditional society.

First, the society was characterized by strong cohesiveness and close social organization. Most traditional societies in Africa lived in small groups with a maximum of fifty (50) household units (Vansina, 1988). Authority was dispersed amongst these basic social units, which were made up of villages with a marketplace, shrine and central meeting place where villagers were able to participate in the making of rules and passing of judgment affecting them. Decisions concerning the community were reached through a process, which was arrived at through consensus and were subject to constant re-examination and change (Elias, 1965). This form of social organization promoted communal solidarity (co-operation) and sharing in the hunting and gathering of fuelwood and other basic needs for survival. The basis of community life arose from more than the mere desire for the satisfaction of material needs. Material possession for its own sake was unknown. Being together was a need in itself. It can be explained by the necessity for the individual to share with others the suffering and the joys of life, to give and get affection, to enjoy the company of parents, friends, colleagues or even interesting strangers. This organic balance between the individual and the large community was at the centre of daily lives of these societies. Therefore, nature/environment was used as a communal common with no private or individual ownership in providing the needs of the community including fuelwood. As Ogot says, "the individual had the right of undisturbed use of family or communal land throughout his life, whilst his obligation was to maintain the integrity of land for posterity" (1967:27).

Second, the societies cultivated and preserved detailed knowledge of the total environment. Environment was seen in its totality and not in a compartmentalized form (food, water, forests, air etc.) - as it is presented today (Brokensha, 1980; Wisner, 1977; Jeremy, 1979; Mbiti, 1969). Knowledge was gained through continuous experimentation with reality. It is clear then that while the elders of Africa ensured that every individual had access to land resources, they were also conscious of the fact their ancestral land was a sacred heritage that needed to be conserved, not only to maintain its ecological viability, but also to pass it to their future generations. Through this process, certain animals, trees, landscapes, etc. were not destroyed because they were associated for example in certain African communities with sacredness or rituals. According to Kenyatta (1988:59) in Kikuyu society, a fig tree (Mugumo) was not destroyed for it was associated with rituals. Malicious damage to property, e.g. felling of such trees was not only seen as an offence to the owner, but also as a provocation to the creator and sustainer of humanity (Ibid; op.cit.). Such a provocation could lead to unleashing of God's afflictions or wrath on the whole community in form of drought, pestilence or virulent diseases. We find a parallel to these customs and social control in the use of nature in the Jewish community where according to the book of Leviticus, the early laws of ancient Jews insisted on the application of the concept of human-human and human - land relationships. This was based on the conviction that land was God's heritage and as such human-land relationships had to be kept in a holy balance. Those who tampered with these relationships were admonished and had to be cleansed during the year of the Jubilee so as to re-establish the lost bonds.

Third, traditional societies depended completely on their local natural environment for survival. Population size was limited directly and quickly by the availability of food. If the group became too large, it could split up, with some moving to other areas (Grinnel, 1975). Early human communities undoubtedly produced many ecological imbalances, but because of the above-stated attributes these remained small and localized. Nevertheless, these imbalances in the long run limited and controlled the number of people, creating a new equilibrium with the local environment. The traditional societies thus responded to the environment, than controlling and manipulating it. They are examples of humans in nature - not against it (Berger, 1980).

1.2.2 The Contemporary Setting

With time, togetherness or communal solidarity has been eroded and has in many cases given way to individualism in rural Africa (Knight, 1974). Under the rapidly entrenching ideology of individualism, the traditional society is being reduced to its minimal expression and even complete dislocation.

Contemporary setting denotes the present period whereby traditional African societies are undergoing serious transformation, which affect their material production and social relations as they are being forced from their traditional subsistence niches into a highly insecure surplus-oriented market settings (Amin, 1977; Bernstein, 1971; International Conference on Reproduction and Underdevelopment - Bielefeld University; 1977; Blant, 1977; Bonderstram, 1974; Cliffe, 1976; Leys, 1970; Meillassoux, 1973; Wisner, 1977).

The locus of this transformation is in the form of the commodification of nature (environment/land), which includes fuelwood energy. Commodification is the process whereby a good or a service that was formerly considered 'free' or was allocated by non-market forces (e.g., clan allocation of unsufructory rights to land, or given freely like fuelwood) is now exchanged for a price in the market (Aritho, 1986; Friedmann, 1979). Commodification takes place through the penetration of the monetary economy into subsistence based economies.

Since the beginning of the colonial period, the history of rural Kenya is one of increasing commodification of natural resources and increasing domination of rural lifestyles by the norms of the capitalist exchange economy (Tignor, 1976; Throup, 1988; Leys, 1974; Ngugi, 1974). The process was initiated during the colonial period and has had various manifestations: changes in ownership of the material base of life, i.e. land tenure (through land adjudication, consolidation and registration); changes in distribution, i.e., the rules, norms and attitudes associated with the allocation of that which is produced, favouring the elite who are economically and politically more powerful; changes in consumption desires, e.g. new food habits; changes in the division of labour and reproduction (e.g., new sex roles, educational aspirations, ideas of community self help) thereby affecting the way in which domestic units meet their social reproduction needs, a number of which entail the availability and use of fuelwood energy (Cowen, 1978; Kennedy, 1981; Angelique, 1983; Linsdale, 1980; Brett, 1973; Kitching, 1980; Ogot, 1979; Zwanenberg, 1975).

This process has now intensified throughout the post-colonial period to the point where all rural households presently have some level of involvement with the monetary economy (ILO, 1972; Swainson, 1980). Thus traditional lifestyles in Kenya have been rapidly transformed and new lifestyles based on individualism, market relations and social classes have emerged in their place (Marris, 1975). This transformation has had the following consequences in terms of fuelwood energy availability, social organizations and the quality of life:

(a) the change in land tenure from communal ownership to individual ownership has had the impact of reducing the physical supply of fuelwood in that there are no longer communal woodlots as private enclosures have terminated this arrangement. Under the communal land systems, one could freely collect and cut wood on land which belonged to his or her clan. This accessibility to common resources was altered due to privatization of land. Households are expected to obtain fuelwood from their own land; otherwise permission of the owner must be secured prior to gathering wood or cutting trees on land belonging to someone else. Even on hitherto communal lands (i.e., gazetted forest reserves) authority to collect fuelwood must be granted by the State (Okoth-Ogendo, 1978). Also access to fuelwood energy has been curtailed as land resources have now assumed an exchange value. Given the poverty that exists in rural settings, purchasing power for many is low due to the fierce competition for scarce financial resources by other basic needs like education, health, water and fuelwood. Differential access due to unequal penetration of the market economy is increasingly becoming the heart of community fuelwood problems, and this means that they are not, often, community problems at all, but the problem of the landless and poor smallholders (Winzava, 1981).

Due to privatization of land ownership, a land market has evolved where as a result of the demands of the cash economy, people resort to selling their land and hence their source of livelihood-fuelwood included - is diminished. In cases where wage employment is available, the monetary enumeration cannot adequately meet all the demands of the household unit. This land and cash-poor group remains extremely handicapped in their access to other alternative forms of energy since they cannot afford the high prices. For poor, small-holders and the landless as Wisner puts it: "all roads lead to ruin" (Wisner, 1987:12).

The land squeeze resulting from change in land tenure erodes further the quality of life of the rural poor from two sides: First, the customary balance of reciprocity is upset - those who have cannot share with others who do not have as there is now less to share and little if any security. In traditional settings people assisted those in need - e.g., the sick, elderly and expecting mothers. Also for special occasions like weddings and circumcision celebrations, which required the hostess to have large amounts of fuel for cooking, women also would help her by collecting and donating fuelwood. There was also frequent sharing of fuelwood as well as the responsibility for cooking among co-wives and other women living on the same homestead. The sharing of fuelwood entailed donation of time and labour as well as the product. As land and its output (resources) has acquired a cash value, land pressure has increased, labour has been commoditized and the sharing of fuelwood has been restricted.

Currently one finds that as a result of the upsetting of this arrangement due to privatization of land and its output within homesteads, each housewife is responsible for obtaining her fuelwood supply. If one is sick, she has to resort to using agricultural residues or purchasing fuelwood, frequently paying for both the tree and the labour to fell, haul and split it.

Secondly, as a result of land shortage, competition among the poor over resources that were previously slack - the uncleared land, the common pasturage and crop residues that provided fuel among other things - is on the rise resulting in a serious environmental fatigue.

The demand for money to meet the needs of the people has necessitated the growing of cash crops in areas which were hitherto providing subsistence needs for the family like fuelwood. This new and competitive land use has made it more difficult to set aside enough land to plant trees to supply fuelwood and other domestic needs like building posts (Digerness, 1979). In fact, this intensive land-use pattern resulting from increased demand for land resources accompanied by the high population increase has resulted in a serious ecological imbalance. As one Agricultural Officer on a field visit remarked:

"... the areas shown to me was a most distressing sight. It was a shambles ... most of the topsoil had gone and the subsoil was rapidly following suit. Sheet erosion and gully erosion were eating the land away in almost every direction. The grass cover had almost entirely disappeared" (Maher, 1962:7).

Unlike in the traditional setting where the balance between population increases and nature was maintained by the surplus population moving and settling in new areas, the contemporary situation of human-nature imbalance is very serious as there is not only very little remaining unsettled land but also the little there is has all been privatized. Those who cannot afford to buy remain marginalized with little or no access to natural resources including fuelwood supplies.

Thus with social differentiation arising from privatization of the means of production and social relations, the communal responsibility to nurture nature in order to provide resources for common use has been abandoned. The intimacy between users (people) and provider (nature) is now minimum.

PLATE 1
Gully and sheet erosion because of loss in vegetation in a section of Mai-ai-iihii Village (Kaihinga or rock outcrop area).

Source: Author.

The traditional social relations of production at the inter-household and intra-household levels have undergone profound changes as labour has acquired a monetary value.

In traditional societies there existed in one form or the other communal work parties called <u>Gwatio</u> (Kikuyu); <u>Risaga</u> (Gusii); <u>Mwethia</u> (Kamba), etc. whose co-operative unit was the neighbourhood which had clearly defined membership, established primarily on kinship basis (Chavangi, 1984; Gathigira, 1952; Dundas, 1915; Routledge, 1910). Every member had equal right to request other members to assist with work. In case of fuelwood, when a particular household had special needs - an expecting mother, a sick person or a special ceremony - the other members would join forces and supply the needed basic essentials like fuelwood to see the family through the hardship. With disintegration of this social arrangement the less advantaged members of society have a minimum buffer between themselves and poverty because of lack of basic needs of life, which include fuelwood.

On the other hand, the need for labour in the cash economy has had an adverse effect on fuelwood provision. Traditionally, children, and particularly daughters, assisted their mothers in gathering fuelwood. Nowadays, most households send their children to school with anticipation of better economic returns and by that reducing the amount of domestic labour available for chores such as fuelwood collection. Women are bearing an unimaginable burden not only in gathering fuelwood but also in providing other basic requirements like water, child care, etc., which are needed in the reproduction of rural life (Tinker, 1980).

The expansion of the monetary economy through the process of commodification sets up a cycle of insatiable demand for commodities such as fuelwood. For example, in urban areas, the demands for charcoal (as well as for tree-related products like furniture, baskets, herbal medicine, building poles, timber for house construction, etc.) keep on increasing and call for a continuous supply (Commission of the European Communities Dossier, 1988)

In Kenya, there has grown a thriving industry in the exchange of forestry products, which clearly show the depletion of fuelwood resources (World Bank, 1987). In terms of allocation, the rural economy does not fare well as business people in this industry in their pursuit for high profits tend to favour the inflation-hungry urban market, where prices offered for these commodities are far higher than in the rural sector (O'Keefe, 1984).

The above analysis helps to show that, in traditional society, human activities took place in relatively close concert with nature. Adverse ecological impacts were minimum and localized. Society had evolved coping mechanisms to ease any sufferings to its members. This was because the social organization that existed was based on togetherness (solidarity) where social norms in the production, distribution and consumption of resources (nature) for sake of reproduction of life were based on the principle of common sharing of the resources, goals and aspirations.

PLATE 2
A timber sawmill in Kikuyu Town specializing in sale of forestry products.

Source: Author

PLATE 3
Charcoal being sold at a local trading centre.

Source: Author

PLATE 4
A local timberyard selling timber for house construction and fuelwood energy.

Source: Author.

The aggressiveness and wastage associated with individualism in the use of resources was tightly checked through very elaborate communal code of conduct.

Contemporary society displays the opposite. With individualism being entrenched through privatization in the use of resources, the disruption of community life is now a living reality as nature is no longer commonly used and protected. Human aggression has replaced co-operation and as Garshon and Hearty have argued "this spirit of materialism, individualism and economic greed that places premium on aggressive natural resources' exploitation has led to the loosening of the bonds between man and nature, hence destruction of environmental quality" (1979:15). The end result has been the wasteful use of nature, which manifests itself in various forms like fuelwood energy scarcity.

1.3 SCOPE OF THE STUDY AND HYPOTHESIS

This study is organized around the following main areas:

1. The extent of the fuelwood problem in Mai-ai-ihii. This involves estimating the current demand for fuelwood energy in the village on one hand and on the other, the current and future supply of fuelwood needed to satisfy the demand.

2. Aspects of the socio-economic attributes of the community and household characteristics that have a bearing on the fuelwood problem. This would include issues of demography, land tenure and land use, community organization, social division of labour, household structure and socio-economic stratification.

3. Interaction between the fuelwood problem and quality of community life. This involves looking at issues related to the quality of community life arising from the interaction between fuelwood use, agricultural production (land use), household nutritional habits, the household monetary and time budgets.

In order to understand the woodfuel energy problem in Mai-ai-ihii village along the above lines of investigation, our working hypothesis is that: the shift from communal to commercial fuelwood system had led to scarcity of fuelwood energy and all the associated problems. This proposition will be tested by answering questions related to each of the above three lines of inquiry.

The extent of the fuelwood problem will be examined by looking at whether fuelwood has become more costly in terms of time and money spent in getting it; whether there has been a depletion of the forest resources in the area as a result of increase in commercial needs for the forestry products at the expense of supplying fuelwood to the community; whether there are attempts to switch to other forms of energy supply such as crop residues, dung, bio-gas, etc. as a result of fuelwood energy scarcity, and also whether there has been an increase in growing exotic trees to meet the scarcity of fuelwood.

Issues related to the aspects of the socio-economic attributes which have a bearing on the fuelwood energy problem include looking at whether: there have been changes in the role (or division of labour) played by different members of the family (children, men and women) in the search for fuelwood; the change in land tenure has given rise to scarcity of fuelwood energy by ways of restricting the access; demography has adversely affected fuelwood supply due to the competing demands an increasing population places on land for agriculture and housing needs.

Finally, the issue of interaction between the fuelwood problem and the quality of community life will be addressed by investigating whether: there has been a decline in agricultural productivity as more labour time is devoted to fuelwood collection; there has been a decrease in co-operation and communal activities as a result of the privatization of the resource base; there has been a decline in nutritional levels in the community arising from fuelwood problem due to such habits like switching to fast cooking but less nutritious foods or eating less cooked meals in order to save energy.

1.4 Methodology and Data Base

For this research, secondary and primary data were acquired. Sources of secondary data included the following:-

1. Review of the international literature on the socio-economic context of fuelwood use and planning.

2. Review of the official Government of Kenya data and reports related to the issue of energy and fuelwood energy in particular. These materials included rural and urban energy consumption surveys, demographic projections, agroforestry and charcoal industry studies and studies of improved stove acceptability.

3. Review of the existing publications available at the Church Missionary Society Archives at the Mission Centre in Thogoto.

Primary data were acquired through the following methods:

1. Participant observation and recorded personal oral interviews and discussions. This included living with

families and recording data concerning the fuelwood cycle in the context of the families' patterns of basic needs satisfaction and the overall community energy characteristics and needs. This method of collecting data was supplemented by use of photography and maps as evidenced in the text.

One of the fundamental premises of this study is that rural people understand their environment better than outsiders. Their history, socio-political and economic experiences cannot easily be grasped through the superficiality of the questionnaire, which cannot touch human feelings but by living with the people, listening and understanding how they cope with their daily challenges.

Discussions were also held with relevant non-governmental organizations and government officers involved in the field of energy from national up to the village level.

2. Use of a questionnaire

This was administered to 105 homesteads using both male and female interviewees. It was carried out during the day and in the evenings both on weekdays and weekends. African society is very sensitive and there are issues clearly divided along gender lines. All women were interviewed by young women while old men were interviewed by young men. The questionnaire tried as much as possible to be open-ended with questions designed in such a way as to appear as discussions and not interrogation exercises. This made it much easier to have a structured flow of information.

1.5 Analysis of Data

As stated earlier, data collection was of two types: secondary and primary. Secondary data was compiled in form of reports and recorded where appropriate in this study. Primary data fall into two categories: oral interviews, which were recorded in cassettes and where possible in photographic form as presented in this study. The questionnaire findings were compiled and fed into a computer for analysis. Data results are presented in simple statistical tabulations and graphs.

Time

Fieldwork and data analysis consumed a period of about two years.

1.6 ORGANIZATION OF THE STUDY

The study falls into the following sections:

1. Introduction

Which seeks to state the problem and place the same into a context. The section also spells out the scope of the study and hypotheses.

2. Background

This section presents background to the fuelwood energy problem globally and in Kenya

3. The study Area

This gives information on the background of the study areas using history, both written and oral.

4. This section provides an analysis of data collected on the characteristics of households and the extent of the fuelwood problem in Mai-ai-ihii.

5. Here also, an analysis of data collected is given to show the interaction of the fuelwood problem and the quality of life in Mai-ai-ihii.

6. Current Alternative Approaches

This section spells out the current alternatives that the community has evolved in meeting the energy needs.

These alternatives are evaluated to find out which ones are most 'appropriate' as coping mechanisms on the basis of the preceding analysis of the fuelwood problem in the village.

7. Conclusions and Recommendations

Here an attempt is made to give a summary of principle research findings, recommendations and areas of further research.

8. Appendices

- The questionnaire.
- The Moto Mwaka Fuelwood Awareness Project.

9. Bibliography

NOTES

* The word fuelwood is sometimes used as firewood in literature.

CHAPTER TWO.

BACKGROUND

1. General

Referring to the fuelwood crisis euphemistically as 'the other energy crisis' (Eckholm, 1975), the world community has begun to talk about the fuelwood problem facing many developing countries. Three key reports have highlighted the problem. An U.S.A. Government report entitled 'Global 2000' (1980) has it that:

> "For the one-quarter of humankind that depends primarily on wood for fuel, the outlook is bleak. Needs for fuelwood will exceed available supplies by about 25% before the turn of the century ... sub-Saharan Africa faces the problem of the exhaustion of its resources base in an acute form .... Over-grazing, fuelwood gathering and destructive cropping practices are the principle immediate causes of a series of transitions from open woodland, to scrub, to fragile semi-arid range, to worthless and bare earth" (Council on Environmental Quality, 1980, 1:124).

The World Conservation Strategy in the same vein says:

> "More than 1,500 million people in developing countries depend on wood for cooking and keeping warm. Their annual consumption of wood is estimated to be more than 1,000 million m^3 ... in Africa the contribution of trees to total energy use is 58% ... the effect of such intense demand is to denude the land of wood over large areas ... Fuelwood is now so scarce in Gambia that gathering it takes 360 woman days a year per family ... in widening swaths around their villages the rural poor strip the land of trees and shrubs for fuel so that now many communities do not have enough for wood to cook or to keep warm" (International Union for Conservation of

Nature, 1980, 4:11).

The Brandt Report on the same issue says:

> "In most of the countries in the poverty belts, nine-tenths of the people depend on firewood as their chief source of fuel .... Unrestrained commercial exploitation and increased population have led to soaring wood prices: more and more physical energy is expended to satisfy the basic fuel needs ... and the treeless landscape extends further, with disastrous effects on the ecology .... The destruction of the forests accelerates the erosion of the soil, increasing severe flooding and creeping deserts, and reducing soil fertility" (North-South Dialogue, 1980: 375).

This is the nature of the fuelwood problems in most Third World countries. Ninety per cent of humanity in these countries have depended, and still depend on fuelwood as their main source of energy for cooking, warming air, heating water and for small scale manufacture (Ceselski, 1979). Across the Third World, daily woodfuel consumption is equal to 21 million barrels of oil, or the total pumped by OPEC countries each day (Koeppel, 1990).

In Latin America, fuelwood energy accounts for 20% of the total energy consumption; in Asia it accounts for 10% of the total; in Africa for about 60%. It is estimated that over 1.5 billion cubic metres (m^3) of fuelwood is burned annually in the Third World. This figure will increase to some 2.1 billion by the year 2000 (F.A.O., 1981). Further estimates by F.A.O. are that a total of 11.3 billion hectares of forest disappear every year. The rate of replacement is low, for every hectare of cleared forest, only one tenth hectare is replanted (op. cit). Recently dwindling forest reserves in these countries have led to scarcities leading to severe hardships (Devres, 1980; Hower, 1980).

The global community perceives much less the detrimental effects of the fuelwood crisis on the lives of local communities. Several studies have begun to highlight such effects on: nutritional levels, social structures of the communities and the hitherto well-organized customary provision of basic needs such as fuelwood energy (Markhijian, 1975; F.A.O., 1981; Bajracharga, 1980; Briscoe, 1974; Conway, 1979; Meta Systems Inc., 1978). The economic impact of scarce fuelwood energy manifests itself in may ways:

In the first place, as the supply of burnable wood becomes less abundant, people are obliged to cover longer distances and spend more time gathering fuelwood. At the same time, more of them start paying for what they formerly gathered freely. Some turn to the costly diversion of burning animal manure for cooking rather than using it for fertilizer for agricultural production (Markhijian, 1975). Those who turn to the use of conventional energy - petroleum (kerosene) - find not only their meagre incomes eroded but also contribute in draining of their countries' much needed foreign exchange reserves as oil has to be imported, making these countries more dependant on unreliable energy supply systems and technologies that have no local base.

Nutritionally, fuelwood energy scarcity has caused changes in dietary patterns by which some people are forced to have fewer meals or change to fast but nutritionally low foods to save on energy consumption. Children are the most adversely affected by these changes as they are denied a healthy foundation in their lives (Blank 1975; Wisner, 1977).

The third facet of the fuelwood crisis is in environmental degradation, one that is now perceived to threaten the very survival of entire humankind and the spaceship earth in many ways (United Nations, World Commission on Environment, 1987).

First, extensive areas of forest have been cleared to provide fuelwood not only for domestic consumption but also for sale as charcoal in urban areas (Bowonder, 1985; U.N.D.P., 1987). Soil becomes exposed to erosion and desertification is the result (Grainger, 1982).

In Africa, woodfuel dominates, dwarfing all other energy sources. Trees supply well over 90% of the total energy used and so deforestation and tree loss is crucial to the sustenance of life (Timberlake, 1985). A look at how fast Africa's forests are disappearing demonstrates how the quality of life is being affected in one way or the other.

Liberia, for example, obtained about $84 million from wood exports in 1980, just over 11% of its total exports earnings. About 80,000 hectares of forest were being logged per year out of its remaining 900,000 hectares of primary forest - a rate that would have completely depleted the nation's forests in 11 years (Timberlake, 1985).However,international outcry has assisted in reversing this trend by pressuring the The Liberian Government into lowering the haversting rate to a bare minimum of 15,000 hectares per annum with a very strict reafforestation programme (F.A.O.1990).

In Nigeria, most of the exploitable forests have already been logged. Once a major timber exporter, Nigeria has banned exports and may soon have to import wood for its needs (op. cit.). In Ghana, too, the country's forest resources have almost been depleted due to commercial logging and clearing for agriculture (F.A.O., 1982).

All in all, it is estimated that the total area of replanting in Africa's forests is about 100,000 hectares per year - far below the rate at which forests are being harvested (op. cit.). As a result, neither soil fertility is maintained nor forests returned. The land is lost both as forest and as farmland.

Considering fuelwood energy, cutting of trees for wood and charcoal puts heavy pressure on the wood resource in many areas of Africa. According to F.A.O., the annual rate of consumption of fuelwood now exceeds the rate at which tree stocks are being naturally regenerated or planted over large areas of Africa (op. cit.). In the Sahel region, for instance, it is estimated that fuelwood is being used 30% more than it is regrowing in the accessible woodland areas. In Niger, the rate of cutting for fuelwood is twice that of natural regeneration. (U.S.A.I.D., 1984). Charcoal makers in Rift Valley in Ethiopia are converting the acacia forest to semi-desert at the rate of 60,000 hectares per year (op. cit).

In South America, the situation is not dissimilar to that one in Africa. The destruction of the Amazon, principally for commercial logging, large-scale ranching and farming, has been described by Senators Al Gore of Tennessee and John Chafee of Rhode Island - U.S.A. - after they toured the area in 1989 as :

> " One of the greatest tragedies of all history" (Eugene,1989:44-50).

In 1989 alone, an estimated 12,530 square miles of Brazilian rain forest, an area larger than Belgium, was cleared (Eugene, 1989:46). The devastation in terms of the ecological destruction it brings with it, is overwhelming.

While the problems of fuelwood shortage, deforestation, environmental degradation and famine have gained global attention, few scholars have begun to perceive the inter-relationships that underlie them. Broadly speaking, the debate falls under two categories: a) Those that explain the issue of ecological destruction as a natural phenomenon and b) Those that perceive the issue of ecological destruction as resulting from human activities and organizations in the use of natural resources.

The first school of thought interprets any ecological disaster in two ways: First, ecological destruction is seen as signs and portents of mysterious powers. Heavens are thought to control natural elements and the sins and omissions of humankind anger gods who retaliate by causing natural disasters as punishment.

In some societies when these practices do not yield the desired results, hapless scapegoats are sought out and punished for 'holding the rain' for their own end. In Malawi, in 1949 suspicion fell on old men with grey hair or bald heads and brickmakers (for who else stood to gain by the absence of rain?). The lepers of the fourteenth century Languedoc were blamed for the medieval Europe famine.*

Second, changing global patterns are said to have contributed to the ecological deterioration facing us today (W.M.O., 1967; Lamb, 1974; Winstanley, 1973; Jenkinson, 1977; Mcleod, 1976). What is worrying is the frequency of these changes in recent history resulting in ecological disruptions that manifest themselves in many forms e.g. desertification, etc..

The third school of thought views the problem of ecological disruption as resulting from the interplay between the physical environment and the social processes that exist in humankind's use of nature at a particular time in history.

The emerging argument is that different forms of social organizations in the use of nature yield different results in form of ecological use or misuse (Walker, 1974; Hardin, 1968; Eckholm, 1976; Bryson, 1974; Brown, 1973; Stebbing, 1937; Stamp, 1940; Pitot, 1952; Berhus, 1979; Ball, 1976; Warshafting, 1975; Baier, 1976; Lovejoy, 1976; Meillsioux, 1974; Glantz, 1976; O'Keefe, 1977; Swift, 1977; Stea, 1980; Wayner, 1980; Wisner, 1987).

More specifically for Third World nations, this school of thought argues that the imposition of the colonial economy and its post-colonial dependency relationships has in many ways resulted in natural resource abuse and misuse (Wayner, 1986; Stea, 1980).

Kenyan Situation

In Kenya, fuelwood energy is widely used and the impact on the environment and community life is clearly pronounced. Kenya has a population estimated at 23 million people and growing now at 3.6% (Central Bureau of Statistics, 1989). The annual per capita consumption of fuelwood energy is 1.5-2.0 m^3 (Beijer Institute, 1985).

For the Kenyan economy, woodfuel is a critical energy resource for it alone constitutes 75% of the total energy consumed, compared to electricity which constitutes a mere 1.2%; oil 21.4% and coal 0.038 (op. cit.). Further, in the rural areas woodfuel constitutes 95% of the energy consumption of which 69% is in the form of fuelwood and 29% in the form of burned charcoal. This, in actual amounts, comes to about 12 million tonnes drain on wood resources per year (Beijer Institute

1985).

Bearing in mind the above facts and that the supply of wood resources falls short of the demand for the same, in 1980 demand was 20.41 million tonnes against supply of 20.33 million tonnes, a shortfall of 0.08 million tonnes. In 1985 demand was 26.42 million tonnes, supply 20.35 million tonnes, and with this trend, 1990 demand was 32.37 million tonnes, supply 2.57 million tonnes, a shortfall of 20.80 million tonnes (op. cit.). Charcoal and fuelwood play a major role in drawing down wood resources.

The consequences of large scale use of fuelwood energy in Kenya is acute deforestation. In Kenya, forest land has declined dramatically in recent years. In February 1990, Mr. George Muhoho, the then Minister for Science and Technology in the Republic of Kenya, while addressing an International Conference on Research and Agroforestry, announced that Kenya was losing approximately 19,000 hectares of forest cover per annum which in absolute figures amounts to 1.7

KENYA ENERGY REQUIREMENTS: 1985-2000

('000 TONS EXCEPT FOR ELECTRICITY)

Table No. 1.

	1985	2000	Growth Rate (% P.a.)
Fuelwood	14,972	23,840	3.0
Wood for Charcoal	8,754	17,513	4.7
Commercial Wood	1,077	2,588	6.0
Biomass	1,112	2,177	4.5
Petroleum	2,080	3,821	4.1
Coal/Coke	97	180	4.2
Electricity			
- Kilowatt Hours	2,840	6,077	6.2
- Capacity Megawatts	586	991	3.6

Source: Sessional Paper No. 1, 1986 -p.49

million hectares due to demand for woodfuel energy and wood products (Muhoho, 1990). Addressing the same issue in February 1985, Mr. Paul Ngei, the then Minister for Environment and Natural Resources, indicated that Kenya was losing 15,000 hectares of forest cover per annum due to demand for woodfuel and related wood products (Ngei, 1985). In four years, therefore, loss in forest cover has increased by 4,000 hectares or 27%. Bearing in mind that only 3% of the total area of Kenya (or 2.2 million hectares) is under gazetted forest cover (Nyagah, 1990), the reality is threatening.

The loss of forest cover is exacerbated by the official policy of Kenya Government in clearing of forested areas to provide land for the growing of cash crops - specifically tea. In 1985, for instance, the Government announced that 17,000 hectares of Kenya's natural forests in ten (10) districts would be cut to give way to what is called Nyayo Tea Zones (Republic of Kenya, 1985). The impact of this policy on fuelwood energy supply is not hard to grasp since Kenya has already severe fuelwood energy deficits. The Nyayo Tea Zone scheme called for deforesting near some densely populated areas on the slopes of Mount Kenya, raising fears not only of impending fuelwood energy scarcity but also of severe erosion and reduced groundwater in the highlands. Consequences resulting from this policy are not hard to imagine, especially on the rural poor.

PLATE 5
Forests being cleared to give way to the Nyayo Zone. Notice the presence of an administration policeman to ensure that the work (i.e. deforestation) is carried out without interruption.

Source: Author.

PLATE 6
The sorry state of land after being stripped naked to give way to tea growing. In the background are tea estates.

Source: Author.

PLATE 7
Charcoal being burnt to be sold after clearing the forests.

Source: Author.

Rural people in Kenya rely heavily on fuelwood for their cooking, heating and small-scale industries. Alternative forms of fuel - bottled gas, kerosene, electricity, charcoal etc.- are too costly for most rural residents. Solar energy and biogas are not available except at experimental stations, so wood is still the preferred source of fuel.

A rising population ; change in land tenure systems that establishes individual title to land; increasing distances that people (especially women) must walk; and the rising cost of fuelwood as it becomes a commercial commodity; all create barriers for those searching for fuelwood energy.

In Kenya, the problem of misuse of forests resulting to _inter alia_ fuelwood scarcity comes to the forefront of issues that the nation regards as critical for its survival (Republic of Kenya, 1989).

This has been due to a number of factors. On the one hand, it is becoming increasingly difficult for Kenya to import fossil fuels in sufficient quantities to cover the needs of the modern sector. In the rural sector, energy (principally derived for the use of fuelwood) is becoming more scarce as the forest resources are dwindling at a rapid rate especially in the densely populated regions. On the other hand, the conflict between growth and environment has begun to unfold itself in many forms: deterioration of water catchment areas due to search for forest products causing costly changes in river regimes; pollution resulting not only from urban industrial activities but also from the application of 'inappropriate' farming techniques in the country-side, etc.

The above issues arising from the inter-relationship of the environment, fuelwood energy supply and the consequence of this on community lives have generated a lot of interest within the Government circles, different learning institutions and scholars in Kenya.

From the Government official circles, there is a keen interest in deforestation and the impact it has on community life. President Daniel Arap Moi's speech on Madaraka Day, June 1980 (President Moi, 1980), emphasized the urgent need to ensure fuelwood supplies for the future. The President in the same speech announced that he was establishing a permanent Presidential Commission to "co-ordinate necessary programmes in the general fields of soil conservation and reafforestation .... We cannot afford to go on losing our top soil and forest cover at the rate experienced over the recent years". Although fuelwood and reafforestation are now regarded as being of national importance, there were earlier expressions of concern. For example, in 1919, the District Commissioner of Kiambu urged the people in his district to plant one-quarter acres of trees as a firewood reserve (Hyam, 1919). Then the problem of wood was localized: today it is a national crisis.

The main shortcomings with the official policy stand and the programmes it has initiated to solve the fuelwood energy problem are that the approach and programmes have been compartmentalized. Environment, fuelwood energy problem and the communities have been treated separately and not as one inter-related whole. Thus, first, you have a ministry dealing with forestry and the other totally different dealing with energy. The Ministry of Social Services responsible for community welfare lacks official relationship with the above two ministries. Second, programmes (reafforestation, improved cooking jikos, etc.) initiated to address the fuelwood problem do not take into account the coping mechanisms the communities have developed over time as they wrestle with the issue of fuelwood energy crisis. This lack of community involvement in decision making has created a lot of apathy among the communities as far as these top-down approaches by the Government are concerned so that adaptation has been very low and mostly the programmes have not gone beyond the demonstration sites (Western, 1979).

Institutions and academicians have also expressed their diverse opinions on the issue of deforestation as it affects fuelwood energy supply, among many other things.

The first school of thought views the problem of deforestation in the country as arising from the disequilibrium caused by an explosive population growth rate (3.6%) and the available forest resources (Republic of Kenya, 1989; Ominde, 1975). The remedy this school of thought proposes to reduce the problem of deforestation is population control through family planning programmes.

Lacking in this argument is the discussion about the causes of over-population except the obvious one of birth rate exceeding the death rate. There are other relevant questions on the population growth rate such as why this rate is high in some areas and low in others, and what role poverty plays in population growth. Answers to these questions have to be sought before any plan of action can be attempted. It is true that a quickly-growing population needs more land for settlement, cultivation, forests for fuelwood and more building materials resulting into a severe scarcity. However, it is erroneous to view human beings only as consumers and not as producers. Besides, there is emerging evidence that in situations where attempts have been made to reduce poverty through meaningful land reforms and appropriate changes in political institutional frameworks to allow for equitable distribution of national wealth, etc. population growth levels have been lowered.

The second school of thought views the problem of deforestation in Kenya as arising from mismanagement of the forest resources (Ofori, 1973; Otieno, 1976; Bernard, 1979; Richards, 1980). The line of argument is that lack of 'modern' technology is a constraint on the use of the land by most peasants. The remedy then is seen in the introduction of these modern technologies in managing forests. Some even carry the argument further by proposing changes in land tenure from the customary tenure to individual holdings in order to have access to credit facilities that would facilitate the purchase of these technologies (Heyer, 1976; Kauffman, 1976).

Important as technology is in liberating human beings from the bondage of nature, its introduction should not be viewed as an event, but as a process that involves many issues; such as the problems of ownership and the uses of it, relevance of this technology to local needs; whether or not it can be changed when necessary by the local people; if it stifles local creativity, etc., etc.. There is documented evidence that much of imposed technologies have failed to achieve the desired goals (Schille, 1975).

Change in land tenure has caused over exploitation of land as there is no common concern where profit making becomes the driving motive in land use. This in turn increases the pressure for more land to exploit, which in turn calls for clearing of more forests (Okoth-Ogendo, 1976).

The third school of thought, whose views are characterized as radical, sees the problem of misuse of forests in Kenya as a complex process that cannot be explained by single variables such as demography or land mismanagement. This school attempts to analyze the problem of considering the consequences of the dynamic process of interaction of people and their environment (human ecology) bringing into the picture the social processes that have contributed (still contribute) to the degradation of the African environment (Wisner, 1979; Cowen, 1978; Baird, 1976; Rochlean, 1986; Dewees, 1987; Chambers, 1988; Ngugi, 1989; Wisner, 1988; Collins, 1987; O'Keefe, 1987; Wiliams, 1985). Specifically, it looks into the negative effects of the introduction of a market economy on subsistence economies. The problem has been due to the imposition of colonial and now neo-colonial policies as Kenya becomes more and more integrated into the world market economy. This argument seems to contain more explanatory power than the other arguments and it is important to give it more treatment to increase our perception of the destruction of the environment in Kenya. For our discussions we are going to use Kikuyuland (Central Province) to demonstrate how this process has taken place.

Traditionally the Kikuyu land tenure system was based largely on communal ownership, under the exclusive domain of a particular clan (Leakey, 1977; Muriuki, 1987; Lambert, 1950). Land tenure in the Kikuyu community was an important factor in the social, economic and religious spheres of life (Kenyatta, op. cit.). It is land which supplied them with the material needs of life (which included fuelwood energy), the spiritual and mental contentment. Communion with ancestral spirits was (is) perpetuated through contact with the soil in which ancestors of the community lie buried. Because of this importance attached to land, the system of land tenure was carefully and ceremonially laid down to ensure an individual or family group a peaceful access and settlement on the land (Leakey, 1977).

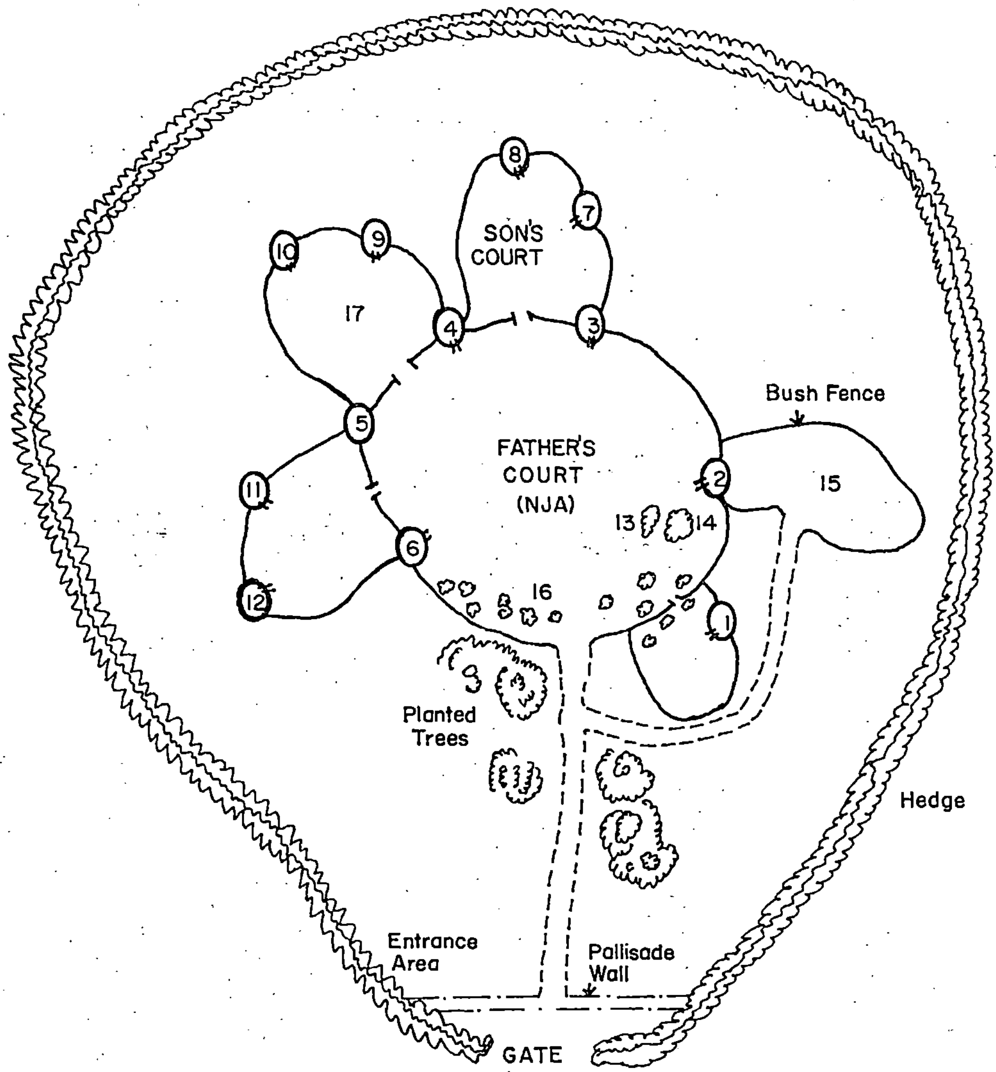
Clan rights to territory, however, could be lost if the group moved away, either voluntarily or by force. Each clan occupied a distinct area, which was isolated from neighbouring groups by buffer zones or unclaimed land.

Clan land was divided into two parts: Settlement with arable fields and the bush end used for common purposes like pasture and source of fuelwood. The settlement area contained separate neighbourhoods (Mbari), which were internally organized for economic co-operation. Young men usually herded cattle jointly and each neighbourhood had a series of common fields composed of individual plots. Every married woman had right of use of her family homestead (Nyumba) farm to produce food for their family and to use the family hedgegrowth, which had multiple uses -security fence, source of fuelwood, provision of shade, roof thatching, posts for building and feeding the livestock (leaves). The homestead was arranged as Fig. No. 2 illustrates (Muriuki, 1987; Lambert, 1980).

Between 1900 and 1950, a new land tenure emerged as a result of a deliberate policy of the colonial government to privatize land ownership (Sorrenson, 1967; British Government, 1934; Swynnerton, 1954). Kikuyu country was (and is) very fertile. Nature provides a very fertile environment for cash crop production and human habitation. The process of privatization of land ownership was very intensive after the Second World War to achieve the following objectives: to facilitate proper farm planning; to enable individual farm owners to have titles, which would facilitate acquisition of loans needed to develop the farms; consolidated farms were easier to protect against plant diseases and develop for the cultivation of cash crops and finally land consolidation was an attempt to meet the Kikuyu people's demands to grow profitable cash crops such as coffee(Swynnerton, 1954). The above objectives over time have contributed to a relatively impressive growth in agricultural production in Central Province albeit at the expense of much injustice and inequality (Cowen, 1978; Mosley, 1983). It is also important to note that the land consolidation model adopted by the colonial government was static as it did not consider the problems associated with population increase, which have resulted over time into a serious land fragmentation problem.

The implication of this process in terms of fuelwood supply was that: the physical stock was curtailed as there were no more communal commons. This put more pressure on family plots since more needs had to be satisfied by them on now less land. Privatization brought with it individualism, which slowly killed the moral economy of community members in terms of assisting each other in times of shortages like that of fuelwood; an active land market emerged with the disastrous consequences of making some people landless and therefore with no source of income (except selling their labour) to meet their basic human needs - (energy) fuelwood included. The need for increased cash crop production meant that the bushes and forests, which hitherto produced fuelwood energy had to be cleared. The scarcity slowly created a market for the sale of charcoal and firewood. Those without adequate income to purchase the commodity had to find alternatives such as trekking for long distance to fetch fuelwood.

A KIKUYU POLYGAMOUS MAN'S HOMESTEAD



LEGEND

1···Widowed Mother's Hut
2···Man's Hut (Thingira)
3···1st Wife's Hut (Nyakiambi)
4···2nd Wife's Hut (Nyakiamburi)
5···3rd Wife's Hut
6···4th Wife's Hut
7···1st Wife's Son's Hut
8···2nd Wife's Son's Hut
9···3rd Wife's Son's Hut
10···4 Wife's Son's Hut
13···Manger
14···Commiphora Tree
15···Cattle Kraal

Fig. 2

Source : Muriuki, 1987; Leakey, 1979; Lambert, 1950.

In other areas of the country where land adjudication has continued, the traditional commons have been disrupted or curtailed by individuals or groups of individuals due to such practices like building of houses, planting of annual crops, grazing of livestock, cutting of fuelwood for sale, cutting of firewood for domestic use, placing of beehives, crossing of land, etc. (Brokensha, 1977).

In recent times, the burden of the rural energy crisis in Kenya falls more on women than on men. The demands for the wage-labour economy has driven most menfolk into urban areas to look for jobs.

Women are closely connected with energy generation and use and other work like agriculture, drawing water, cooking, going to the mills for ground cereals, and on top of these, bear the burden of managing the family (particularly if the husband is away in town, estate or mines). In a recent estimate, women in Africa on average spend close to twelve hours a day on cooking, collecting firewood and drawing water (Tinker, 1987). They have to travel longer and longer distances to collect firewood. Many cook only one meal a day or use quick cooking cereals. Rice and sifted maize flour have replaced the more nutritious food like <u>githeri</u> because energy is so expensive. They boil water less often, jeopardizing the family's nutritional health (Ceselski, 1984). Development, as it has taken place, has inequitably affected women. It has reduced women's power and has stimulated men's access to money, which is linked to outside opportunities. With the loss of control over energy, women become increasingly dependant, alienated and frustrated. This grim picture of women is symbolic of the rural energy crisis.

FIGURE 3
The plight of women in Kenya

source: Author

NOTES

* In England for instance, during the famine of 1315:

> "The Archbishop of Canterbury ordered the clergy to perform solemn, barefoot processions bearing the sacrament and relics, accompanied by the ringing of bell, chanting of the litany and the celebration of the mass. This was in the hope of encouraging the people to atone for their sins and appease the wrath of god by prayer, alms-giving and other charitable works."

When the rains failed in Malawi (Nyasaland) in December 1948, peasants prayed to their ancestors for help:

> "Our dead fathers
> What have we done?
> Forgive us, please, please!
> Have mercy on us
> Do you want us to die?
> Please send us rain."

Religious rituals and ceremonies were performed to appease gods (Arnold, 1988:15-16).

CHAPTER THREE.

STUDY AREA -
MAI-AI-IHII VILLAGE

This chapter attempts to relate the fuelwood energy problem to the history of Mai-ai-ihii village. The aim is to understand more the inter-relationship between environment, the fuelwood energy problem and community life at a micro-level.

3.1. Location and Natural Setting

Mai-ai-ihii village is located in Kikuyuland - which occupies the central region of Kenya. (Fig. No.4 and 5). Ngugi wa Thiong'o describes the natural setting of this region as:

> "Set amid the rolling ridges of Kenya shimmering beneath the equatorial sun. Its green luxuriance hints at a rural splendour nurtured by abundant rainfall and equable temperatures (Ngugi, 1963:28).

This is the natural setting of Mai-ai-ihii village.

The village lies between 1500-2000 metres above sea level in

The village lies between 1500-2000 metres above sea level in a classic ridge and valley area sloping eastwards from the Aberdare Mountains in the East and Ngong Hills in the South towards exploding Nairobi metropolis. The village is located eighteen kilometres from Nairobi city centre.

NATIONAL LOCATION OF KIAMBU DISRICT

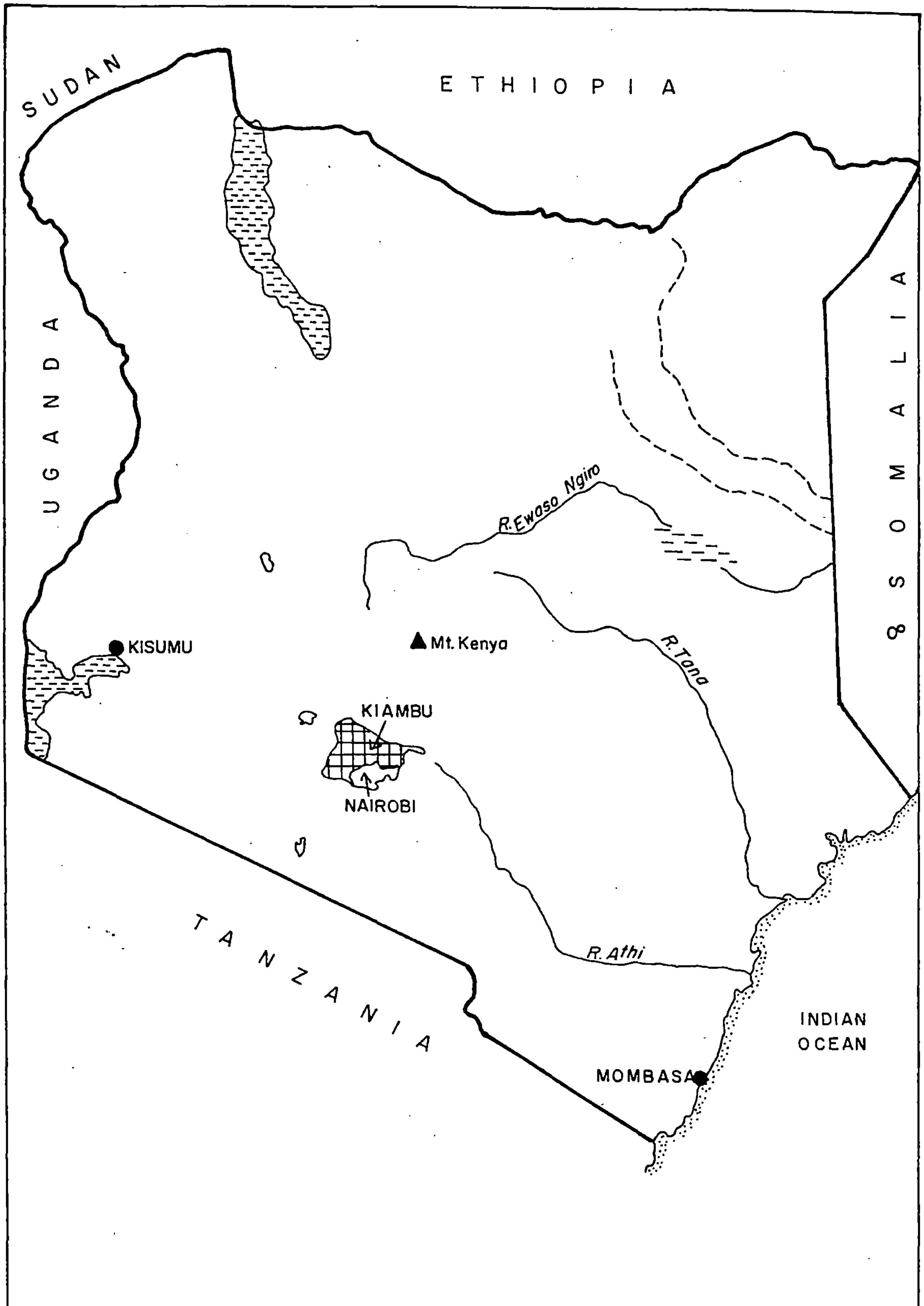


Fig. 4

Source: Author

LOCATION OF STUDY AREA IN RELATION TO KIAMBU DISTRICT

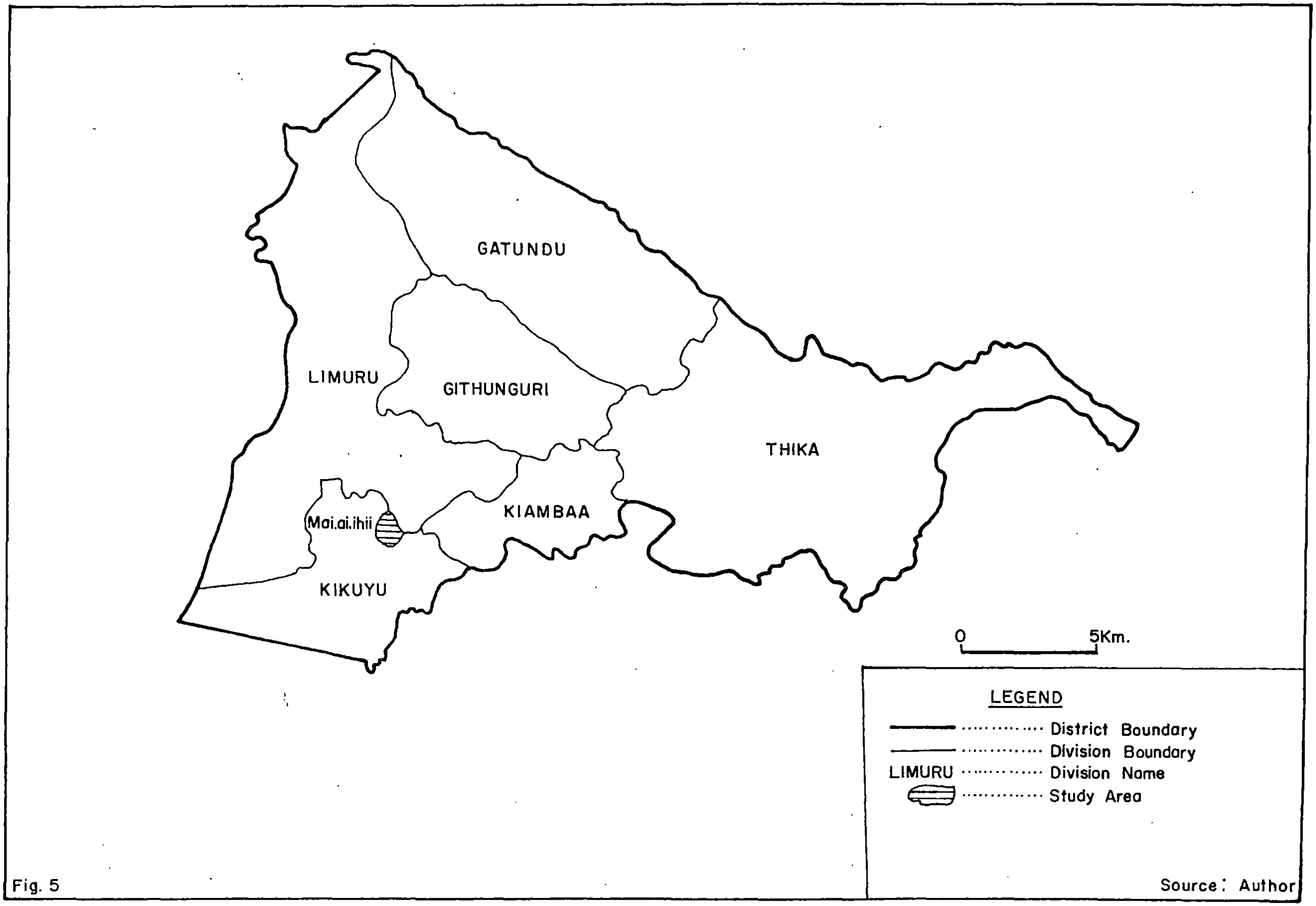
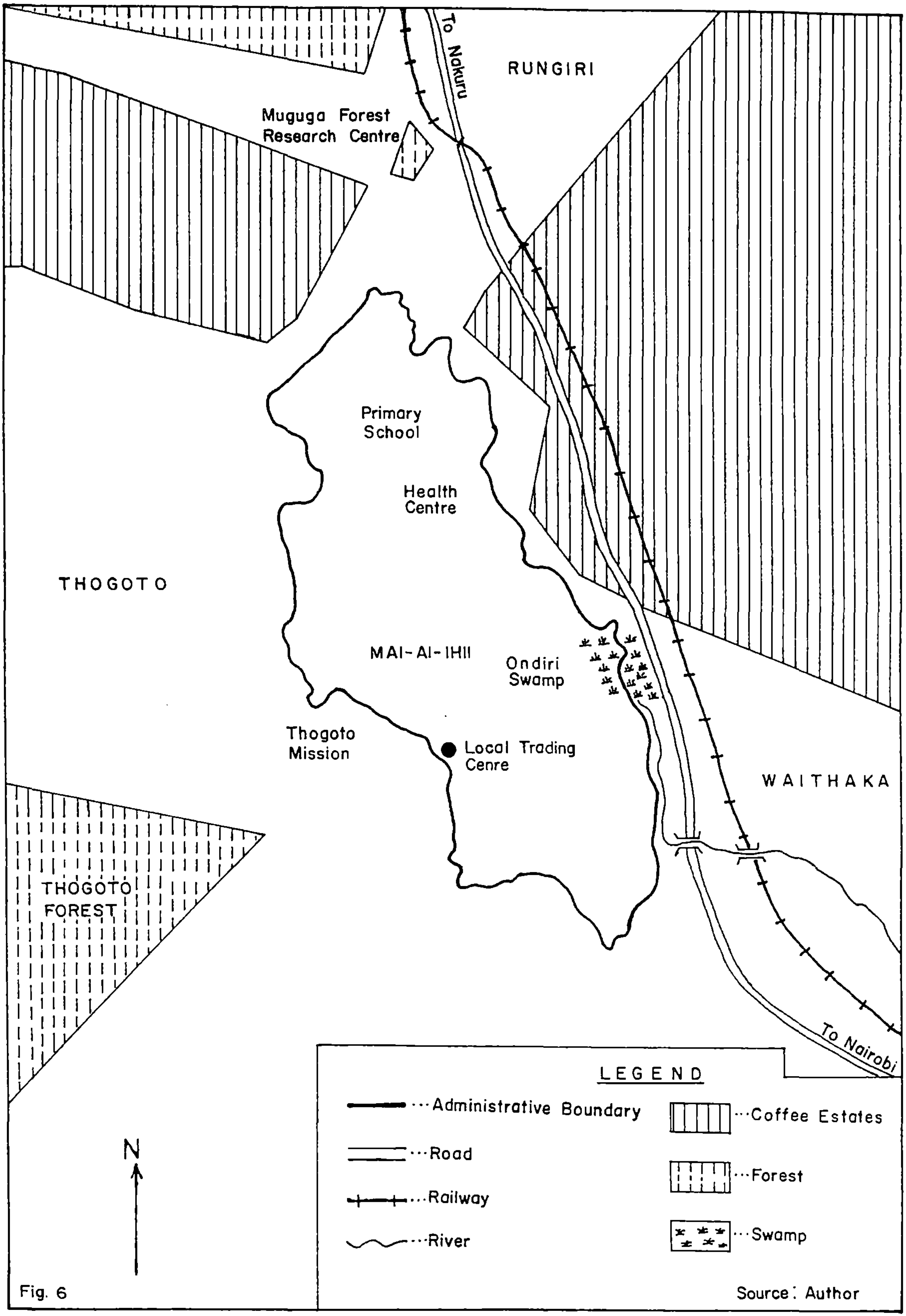


Fig. 5

MAI-AI-IHII AND ITS ENVIRONS



VEGETATION AND DRAINAGE

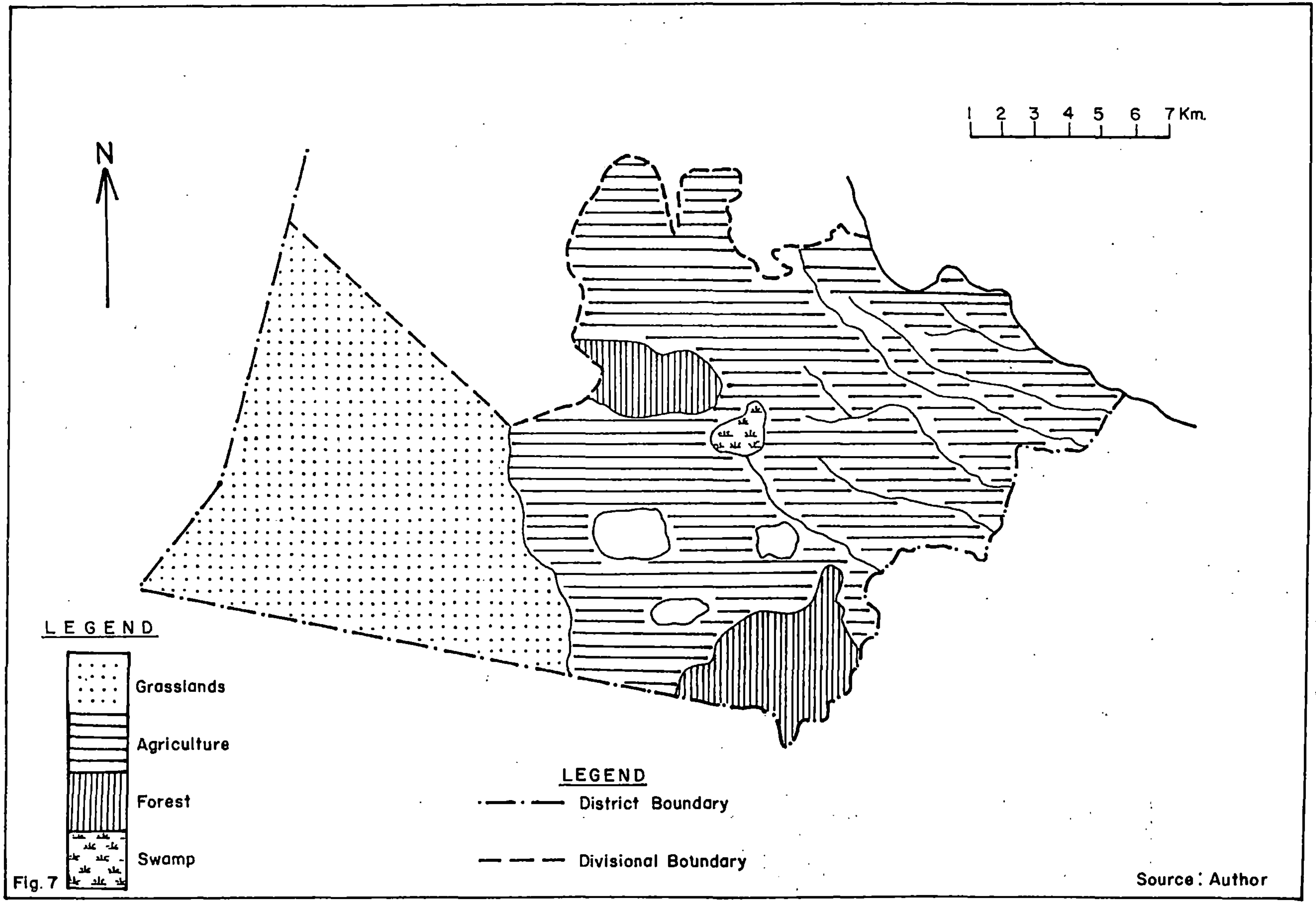


Fig. 7

Source: Author

There are 105 households in the whole village. This means that about 1000 people live here at an average of seven per household. The total area of this village is approximately 11.5 square miles giving an average density of about 600 persons per square mile.

Like the rest of the Highland region, Mai-ai-ihii village has a temperate climate. The mean annual rainfall is 750--1300mm (40-50"). The mean annual temperature is 55 degrees F, allowing a twelve month growing season with two harvests that correspond to the two rainy seasons - the long rainy season (March-May) and the short rainy season (October-November). Due to altitude and rainfall regime, the natural vegetation tends to be temperate grassland and mountain varieties. Winds are fairly constant all year averaging about 7--10 miles per hour. The soils are of volcanic type. There is one stream that flows along the Eastern side of the village (the Nairobi river locally known as Nyongara river). Its source is the Ondiri swamp (see Fig. No 5).

3.2. Traditional-Social-Cultural Setting

The area under study is inhabited by the Kikuyu ethnic group of Central Kenya. The settlement of these people in this area is a recent one. According to written history, this area was previously inhabited by the Dorobo and Gumba; members of the

Okiek ethnic group. The Kikuyu occupation in this area started around the beginning of the 19th Century when they migrated from the densely populated areas around Mount Kenya. The original inhabitants, Dorobo and Gumba who were forest dwellers, were driven out towards the Rift Valley. The few who were left were assimilated through marriage and blood brotherhood rites into Kikuyu cultures (Tate, 1911; Stoneham, 1911; McGregor, 1909).

During the 1880's the Kikuyu migration had reached the areas between the Karura and Nairobi rivers and towards Muguga (Figure No. 6). None of the pioneers had gone beyond the Nairobi River by the time Lugard established his fort (Fort Smith) <u>Kiawariua</u> (Dagoretti) in 1908 (Routledge, 1910). There were no signs of cultivation around the area and the Ngong Hills (Thogoto) forest was almost a stone's throw from Mai-ai-ihii village. Immigration continued unabated with increase of population and this took the Kikuyu people westwards into the Limuru/Ndeiya region and Nyandarua.

The Kikuyu are principally a sedentary group of people (Beach, 1917). They cleared the virgin forests for cultivation and house construction. Clearance of the virgin land (<u>Kuna Githaka)</u> was the traditional basis for land settlement and for staking ownership claims in the future. Once a clan had cleared the land

and settled there, this remained vested in the clan for ever (Cagnolo, 1933).

As in many other African societies, the level of socio-economic organization was the nuclear family centred around the male household head. It is within the family that an individual began to be socialized by learning norms, values and beliefs of the society. To a great extent this would influence his/her outlook on life (Cagnolo, 1933).

The males inherited the father's property upon the latter's death. Women did the gardening, fetching of firewood and water, child care and other household chores. Child labour supplemented the workforce, especially rearing the young children. Household activities for men included house construction and herding.

The Kikuyus have remained a largely patrilineal society. By this social arrangement, the individual traces his lineage from the father's side rather than the mother's side and the children and wife are seen to belong to the man's family or clan. Consequently, this is also a patrilocal society, that is , on marriage the spouses reside in the male spouse's home (Leakey, 1979; Muriuki, 1987). This kind of social organization has tended to influence the pattern of resource ownership and control of accessibility, role definition and decision making within the farm-household. Thus, the man, as the undisputed head of the household is the crucial decision maker especially regarding decisions affecting the use of land, which is generally seen to be a critical resource in society and other resources, which denotes some form of permanence, like trees. Ideally women do not own land, but may hold it in trust for the male children in the event of the husband passing away (Beecher, 1944).

In the same context, division of labour has been basically along gender lines, with the man taking up what is seen as more challenging and 'field-oriented' tasks, while the women undertake the more 'domestic-oriented' tasks, which according to the men were too trivial to deserve male attention. The kitchen, for example, is still regarded as the wife's territory and all that goes on in the kitchen, basically cooking, is left to the discretion of the women. Consequently, the task of fuelwood collection is mainly left to the wife and the female children. It is no wonder that, on marriage, a girl is said to have gone to 'cook' in the place she is married. In traditional setting, a 'circumcised boy could not carry firewood at all; it was <u>mugiro</u> (a prohibition), and an offender would have difficulty in marrying (Cagnolo, op.cit). This kind of social arrangement did not pose any particular problems while the abundance of fuelwood prevailed, but sadly enough this 'macho' attitude by men still lingers even in the face of fuelwood scarcity. The men largely still regard the issue of fuelwood procurement as a women affair.

No wonder that in most homes there exists the paradox of 'scarcity amid plenty', by which there may be plenty of trees on the farm but the kitchen department experiences the problem of inadequate fuelwood because the tree is seen in terms of being a source of building materials and income earner rather than as a source of fuelwood. A similar socio-cultural setting prevails among the Bantu, Luhya communities as the cartoon illustration in the appendix explains.

To guard the division of labour arrangement within the household, there are certain social control mechanisms, central of which is the belief system (Cagnolo, op.cit). Regarding the issues of tree planting, the social belief is still strongly held that:

a) If women plant trees, then they would become barren. And since child bearing, according to customs, is the only guarantee of stability in marriage and because of the high value placed on marriage in society, women fear to plant trees, lest they become barren.
b) If a woman plants a tree, the husband would die, and since the life of widows is a very miserable one, no woman would

dare take action that would result in a possible threat to her husband's life.

c) If a woman plants a tree, she would be directly challenging her husband's supremacy in the household and this could cause a divorce.

d) Women are not supposed to climb trees to fetch for fuelwood. Such an act is an unforgivable sin. If possible, a woman would send an uncircumcised child, or a young circumcised boy, to climb the tree, directing him from below on the branches to cut.

These beliefs had their origin in the purpose for which trees were planted. First, fuel, as sacrifice at the altars at which the sacrifices were undertaken, was monopolized by men. Second, as land marks for boundaries between farms. By planting a tree in a particular place one was claiming ownership of the particular piece of land/ground and since women were not entitled to own land they had no business planting trees. This social arrangement could be accused of being discriminatory against women. However, viewing it as a kind of socially determined resource exploitation control mechanism, it had some positive features. This is so because, while the need for cutting down a tree for the purpose of either selling or building was occasional, the need for cutting down a tree for fuelwood was quite a frequent one so that, in the absence of such socially determined checks in the exploitation of the tree resource, deterioration could have set in much faster and daily requirements of firewood could not have been easily met.

It is also important to briefly discuss here the traditional role of fuelwood in Kikuyu society. First, fuelwood used to be regarded as a 'free' good to all members of the community so long as the above named social restrictions in use were adhered to. The notion of scarcity in contemporary situation was inapplicable to fuelwood and such other commons like water (Kabetu, 1966). Second, was the importance of fuelwood in preparing food and as a social focus. Fuelwood was the centre of life because it was used to prepare food, heat water and in the evening mother and grandmothers would tell stories in an attempt to counsel the young ones. Third, and closely related to the second role in fuelwood, was the symbolic significance of the homestead fire, outside the compound, especially at night, to keep away hyenas and other wild animals, to deter thieves and intruders, and to serve as a focal point for a range of activities such as evening dances and conversation with visitors, or discussion among elders. For older people, the fire (icinga) was especially important as a welcome source of warmth. So important were these log fires that each household had to have enough supplies (Mc

Gall, 1958).

Besides the above traditional uses for fuelwood, there were other specialized uses. These included the use of special trees for firing the clay pots, burning branches as 'torches' to drive away bees when collecting honey, or for smoking out termites, and for certain nocturnal tasks. Women also mentioned the use of burning wood to give light when they needed to attend to a crying baby at night. Minor uses also included the simmering of milk; roasting of meat by hunters and fire-making without the use of matches.

Whoever is intervening in providing alternative forms of energy should look at the whole range of uses that fuelwood energy has been providing to the community, and not just one aspect, as has been the case with introduction of new improved cooking stoves, which emphasize only thermal efficiency.

3.3 The Colonial Encounter

The natural setting of the village hints at a rural splendour nurtured by abundant rainfall and equable temperatures. Yet, this exuberant exterior hides a growing internal crisis in the village generated by the impact of colonialism. To understand this crisis we have to draw a picture of the village starting from Nairobi. From Nairobi City Centre, one takes a N-W direction using the Naivasha- Nakuru road passing Kenyatta National Hospital and Adams Arcade. This is largely a high income residential area with huge detached houses and extensive gardens.

MAI-AI-IHII SETTLEMENT

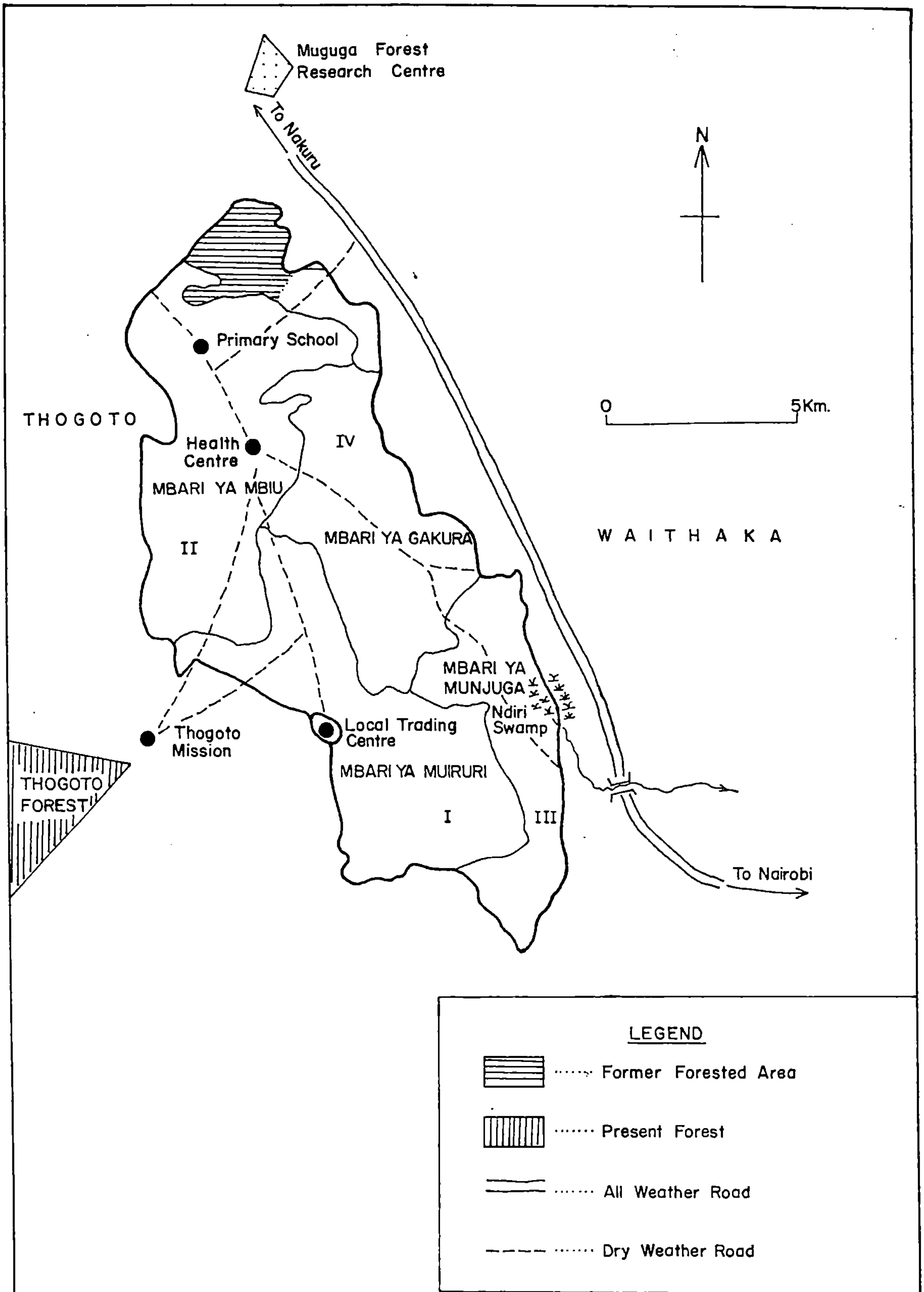


Fig. 8

Source: Author

Down the road, after the Meteorological station at Dagoretti Corner, one traverses through a zone of very high population density living in houses that seem to provide no space between them. This is the Kawangware-Riruta area called by local people the 'Third World'. From this 'Third World', one takes a left-turn towards Kikuyu Trading Centre. The landscape is characterized by vast tracts of land housing mainly institutions like Alliance Boys High School, Alliance Girls High School, Thogoto Teachers' College, Thogoto P.C.E.A. Holdings, Kikuyu Campus of the University of Nairobi, etc. There are also a few vast farms, which used to be owned by white settlers but now belong to the rich. In the midst of this plenty is a densely inhabited village, which stands out like a rock outcrop. A small section of the inhabitants (Mbari I and II see figure NO.6) own the largest share of the land leaving the rest (Mbari III and IV) almost scratching the ground to eke out a living. The fields of the latter are under subsistence crops. There is a shopping centre that looks almost like a ghost town.

The road to Mai-ai-ihii from Nairobi is, therefore, one that has social and ecological demarcation as its twin features. The history and politics of the area best illustrate how this reality has come into being over time.

The contact of this village with the outside world began in early 1900 when the first christian missionaries (The Church Society of Scotland) established a mission - Thogoto Mission (Kimuri - or Church of Torch).

The establishment of this mission centre was a result of the collaboration of the local chiefs, then Waiyaki and Kinyanjui wa Gathirimu who gave over 1300 acres of clan land in exchange for intangibles such as beads for their wives and the promise that they would be protected by the European missionaries. Their children were also to benefit from education and the benefits of employment that the European missionaries brought with then (Routledge, 1990).

The contact with the missionary community had the negative consequence in bringing about division of the villages: as some segment of the population (Mbari I and II - Fig 6) became followers of the Church and others (Mbari NO. III and IV) continued with traditional ways of life (Ainsworth, 1919). Those who associated with the church (I and II) started receiving formal education and the result was that they gained skills, which made them employable not only at the mission centre but also in Nairobi. It did not take long before these two sections in the hitherto relatively homogeneous society were pitted against each other: Athomi (the Christians') on the one side, and the Acenji (non-believers) on the other side.

The occupation of the Kenya highlands by the settlers called for some Africans to be removed from their land and be concentrated in smaller areas. From oral interviews, the village lost about 1,500 acres of land to European settlers in the area (Belvedere Farm, Nicholas Farm, Ondiri Farm, Wells Farm) (Author: oral interview, 1989).

As early as 1910, due to this forceful alienation of the community commons, the land shortage problem had become noticeable. This problem was exacerbated by the institutional grabbing of land (over 1300 acres) from the village by the missionary establishment as stated earlier (op.cit). During the Mau Mau war of independence, land adjudication and registration process intensified the problem of landlessness. The Government rewarded the loyalists (Athomi) by displacing the Mau Mau sympathizers (Acenji) who were languishing in detention camps. This bitterness has never died out and the village is emotionally still very charged with the animosity.

When the colonial government started instituting land reform policies in the Central Province by giving individual titles to replace the previous customary land law practice of holding land communally, the division between the Athomi (I and II) and the Acenji (III and IV) proved not only helpful to the colonial government in implementing these policies, but it also made the antagonism between the two groups more fierce.

The Athomi (I and II) collaborated with the administration and the impact of this was that they got more land than the opposing group after the land reform programme. This land issue created a very serious conflict, which intensified during the nationalist Mau Mau land revolt in the Central Province. During this struggle, the Acenji found themselves pitted against two forces: the colonial government on the one hand and the Athomi on the other. More land was confiscated from the Acenji as a punitive measure and given to the Athomi who by now were serving the colonial administration as local sub-chiefs and chiefs.

When independence was secured, the Acenji not only found themselves with less land, which restricted the physical supplies of essentials like fuelwood, but also their social-economic status was lower. This explains why all these services are presently found in the western side of the village as indicated in Fig. (6).

From the preceeding analysis, it is clear that colonialism and the state affected the settlement pattern by squeezing people into a small area, thereby forcing them to over-exploit their resources of forest and land thus contributing to the current crisis of fuelwood energy and agricultural production in the village.

3.4 Post-Independence Period - Land Use and Environment:

Closely tied up with the cultural arrangement is farming, which constitutes the mainstay of the community, the main enterprises being cattle keeping and crop husbandry. This has greatly influenced the importance the people attach to land and cattle. Cattle are kept both for social and economic purposes. Economically, they are regarded as a way of storing wealth; socially they are used for marriage exchange, paying dowry (Gathigira, 1952). Further to this, the community has a certain attachment to land enshrined within the value system. Land is valued not just as a means of subsistence to the farm household but: first, it is seen to provide one with a base for identity and association with ones's kin; second, it is a measure of wealth and whoever possesses it has a certain level of dignity that is self-fulfilling; and finally land is seen to provide continuity between generations. By occupying a piece of land inherited from the forefathers, one keeps in touch with his ancestral spirits in the spiritual realm (Hobley, 1910).

It is understandable that this socio-cultural arrangement is undergoing changes and modifications as society adopts to modern ways of life. But the process of change is painfully slow as some values linger on, albeit in disguise. Intervention approaches should, to a fair extent, facilitate this change.

Although this area is located in the coffee growing zone of the country, very little of it is grown. The land, 80% of it, is under cultivation for subsistence crops principally maize, beans, peas, sweet potatoes, yams and cassava (Author: field survey). Vegetables are also grown by the well- to- do families. Cattle raising is carried out too. A few people keep pigs and poultry.

The reason coffee is not widely grown is two-fold: political and economic. Up until 1940, the policy of the colonial government was to discourage coffee growing by Africans in order to avoid any competition between the European settlers and the former. This policy was reversed after 1950 (Throup, 1988). In recent times, financial returns from the sale of coffee have declined due to the depressed coffee prices in the world market. This has forced farmers to switch to subsistence farming where they are at least assured of meeting their basic food requirements and a cash outlay from the sale of farm produce if there is any surplus. The other cash crop, wattlebark, which was grown in the depicted former forested areas Fig. 4 was also an exclusive commodity to be grown by multinational companies in the area. The role of the Africans was to provide labour to work on these farms. Due to the trends in the world's market economy, the wattlebark industry in Kenya could not flourish (Cowen, 1978). The plants were closed and the forest area was declared public land to be used for providing fuelwood to the local population and as a grazing ground for the animals. Due to many factors such as population pressure, increased land hunger, increasing prices of fossil fuel (kerosene), etc. much of this area has been deforested and it is only now that the Government has started to launch a serious re-afforestation programme in the area.

3.5 Settlement Pattern

The settlement pattern of the village is dispersed. There are four sub-sections to settlement in the village (Fig. 8), which correspond to the four sub-clan (<u>Mbari</u>) found in the village. Population density is higher in <u>Mbari</u> No. III and IV as compared to Mbari No. I and II (Author: Field Survey).

Compounds accommodate extended families with several houses joined by fences. The houses in sub-class I and II are mostly of modern construction (timber and corrugated iron sheets are used as the main building materials) while most of the houses in Mbari No. III and IV still remain traditional. They are huts constructed in spherical shape. Grass is used for roofing while poles and local soil are mixed with clay imported from outside to constitute the wall materials. Within the compound is a pit latrine and several huts. There is usually one tree to provide a shade especially for children and the elderly .

In the traditional setting, the homestead arrangement was such that the supply of fuelwood for emergency use (e.g. when mothers gave birth or in the case of an unannounced visitor, etc.) could be got from within the compound. There were hedges (Ndumia), which provided this source of fuelwood. Trees planted within the compound could also be under use in such situations. Figure No. 1 illustrates this set up. Currently, if one does not have enough land where he can grow trees alongside other agricultural crops, this supply is not available. One has either to buy or borrow fuelwood from kind neighbours.

It should also be noted that the traditional layout of the homestead made the woody biomass provide for other family needs: building poles; grass for thatching; shade; security; feed for the young calves and goats.

As indicated in Fig. No. 4 the essential village services - school, health and shopping centre - are located in the area occupied by <u>Mbari</u> No. I and II.

This section has attempted to establish that although the study area has quite a favourable geo-physical environment for woody biomass development,because of population pressure and, therefore, increased demand for land for other human basic needs like food crops, cash crops, settlement etc., the exploitation of this resource is becoming constrained. The commodification of land and, therefore, forest products deny access to these resources. This is compounded by the restriction of the use of the existing Government forest (especially Thogoto and Muguga forests).

Finally the socio-cultural arrangement of the local community in the study area could be a constraint to the adequate provision of woodfuel to the farm household.

The following two chapters attempt to demonstrate how the fuelwood energy problem inter-relates with the environment and the community life in Mai-ai-ihii.

CHAPTER FOUR

CHARACTERISTICS OF HOUSEHOLDS AND THE EXTENT OF THE FUELWOOD PROBLEM

4.1 Characteristics and Structure of Households and Community in Mai-ai-ihii.

In this chapter, farm household characteristics (the household size, age-structure, employment patterns, income levels, land-use patterns and socio-cultural attributes) are examined in an attempt to show the context of the fuelwood energy problem in Mai-ai-ihii.

Table No. 2

Household Size

Number of Persons	No. of households	Percentage
2-4	11	10.3
5-9	63	59.8
10-14	28	26.8
>15	3	3.1
TOTAL	105	100.0

Mean household size 7 persons

Source - Author -Field Survey

Several relationships are revealed between domestic energy supply and consumption. First, it is observed that the larger the family size, the more the amount of fuelwood needed to satisfy the domestic energy requirements.

TABLE NO.3 - RELATIONSHIP BETWEEN FAMILY SIZE AND ENERGY CONSUMPTION.

FAMILY SIZE (PERSONS)	ESTIMATED ENERGY CONSUMPTION (Kgs/Annum)
2-4	1,882-3,764
5-9	4,705-8,469
10-14	9,410-13,714
>15	>14,115

At a per capita consumption of 941[1] kg per annum, the household with between 2 to 4 persons will require about 1882 to 3764 kgs. per annum as compared to the households with between 5 to 9 persons (which comprise 60% of the households), which will require approximately 4705 kgs to 8469 kgs per annum. The above results can be explained by the fact that a large family requires more food prepared by large surface cooking devices. This uses more fuelwood to heat and cook than the one that would be used by a smaller size family. It also requires more cooking time and, therefore, more energy consumption. Besides, large families have a larger population of children whose food has to be prepared differently from those of the adults. This requires more energy to enable different pots to cook at different times.

Based on standards on work done by F.A.O.(1980) for Mai-ai-ihii, considering land requirement for on-farm fuelwood supply, the households in the category of 2-4 persons require between 0.47 acres and 0.94 acres committed to fuelwood (tree) production alone, as compared to the households in the category of 5-9 persons, which require between 1.2 acres - 2.1 acres of land committed to fuelwood production to meet annual fuelwood needs.

Second, when we consider land for food production, it is observed that the bigger the household size, the higher is the amount of land required for food production. Taking maize production (which is the main crop grown), the household having 2-4 persons will require 0.4-0,89 acres to meet annual maize requirements[2], whereas the households with 5-9 persons need 1.1-2 acres to meet the same.

From the above analysis, a household with 9 persons requires 2.1 acres of land for fuelwood production and 2 acres for maize production, a total of 4.1 acres. But given an average farm size of 3.1 acres in the study area (as later indicated in this chapter), there is a deficit of 1.0 acre on the average. These results reveal a crisis in the population and land use, creating pressure on land to meet fuel and other needs due to demands of a high population. Two women interviewed orally underlined this fact. They had the following to say:

> 'Only those people with big land will be able to plant more trees and grow food at the same time. The rest will not be able' (Wanjiru wa Kimani - peasant mother).

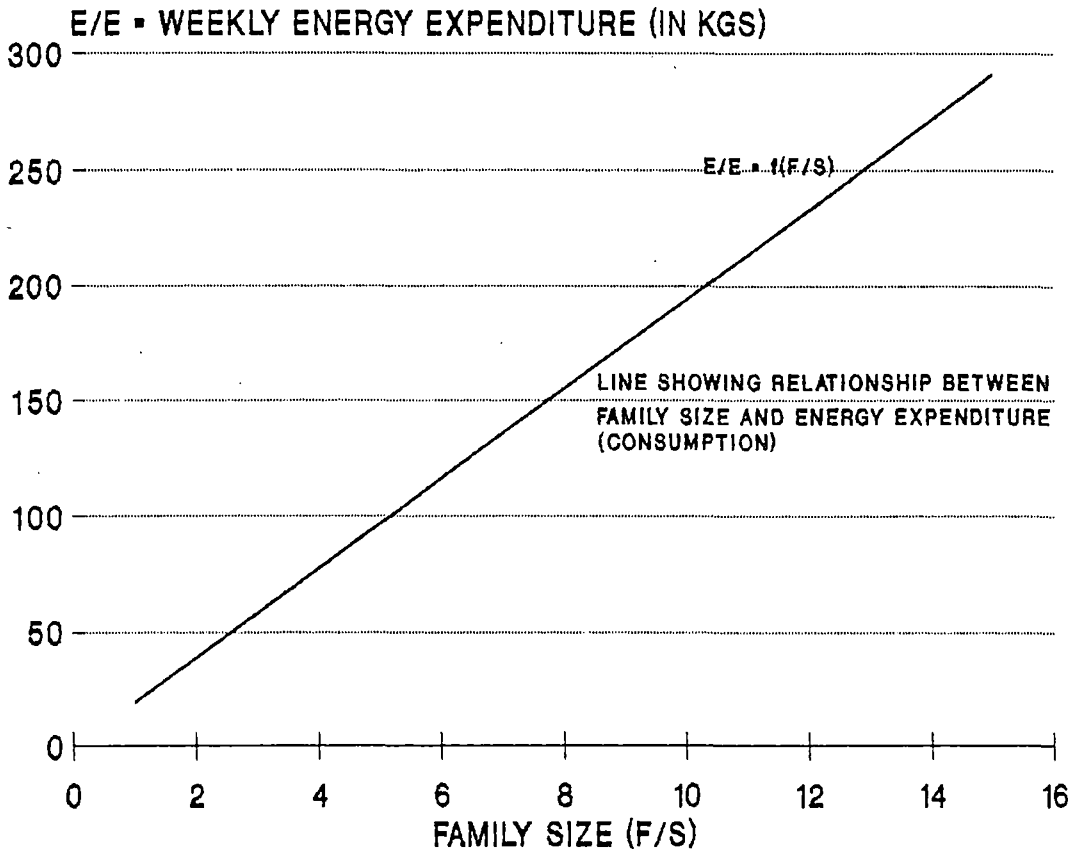
The second was even more critical of the situation:

> 'Those with small parcels of land will be forced to buy firewood from those who have big lands and trees. If they do not have cash, they will be forced to become labourers on their neighbours' farms in order to get firewood for use by their families' (Joyce Kabura - peasant mother).

Third, large household size means higher expenditure on energy (Fig.6) Since energy has to compete with other domestic needs it was found that the bigger the household size, the higher the budget on energy as more energy is expended in cooking for more mouths.

Fourth, considering the high rate of population growth, (3.1%)[3] we can appreciate the seriousness the energy crises resulting from this demographic pressure on land resources-fuelwood included.

Fig. No. 9 RELATIONSHIP BETWEEN HOUSEHOLD SIZE AND ENERGY EXPENDITURE



SOURCE: - FIELD SURVEY/ K.W.D.P. (1986)

Age Structures: The analysis revealed the following information:

Table No. 4 AGE-STRUCTURE AND ENERGY AVAILABILITY.

Age Group	Number	% of each To total	Cumulative
0-9	141	23.6	23.6
10-19	163	27.3	50.9
20-29	134	22.4	73.3
30-39	73	12.2	85.5
40-49	42	7.1	92.6
50-65+	44	7.4	100.0
	597	100.0	

Source: Author - Field Survey.

Energy is only one of the needs of the community, others being education, health, water, roads and agriculture. Thus energy has to compete with other household requirements. For example, the table above suggests that persons falling within 0-19 years of age comprise 51% of the population. This being the school-going age-group, we can expect that school fees take up a large share of the household budget leaving less for other household requirements - energy included.

As population continues to grow rapidly, more sub-divisions of land will take place, further diminishing the resource base for supply of fuelwood and other land-based family needs.

Table No. 5 Adjusted Household Income[4]

Income Bracket (Kshs)	Number	Percentage
<500	38	36.19
501-1000	24	22.86
1001-1500	21	20.00
1501-2000	12	11.43
>2000	10	9.52
TOTAL	105	100.00

Source: Author: Field Survey

The low level of income, which characterizes most of the population,has serious implications on energy use and supply. It is difficult for the majority to purchase and use other alternative sources of energy, which leads to heavy use of woodfuel[5]. The opposite is true for 8% minority who enjoy an income of plus Kshs 2,000. This analysis reveals that the issue of energy supply and use cannot be divorced from the issue of equity or income distribution.

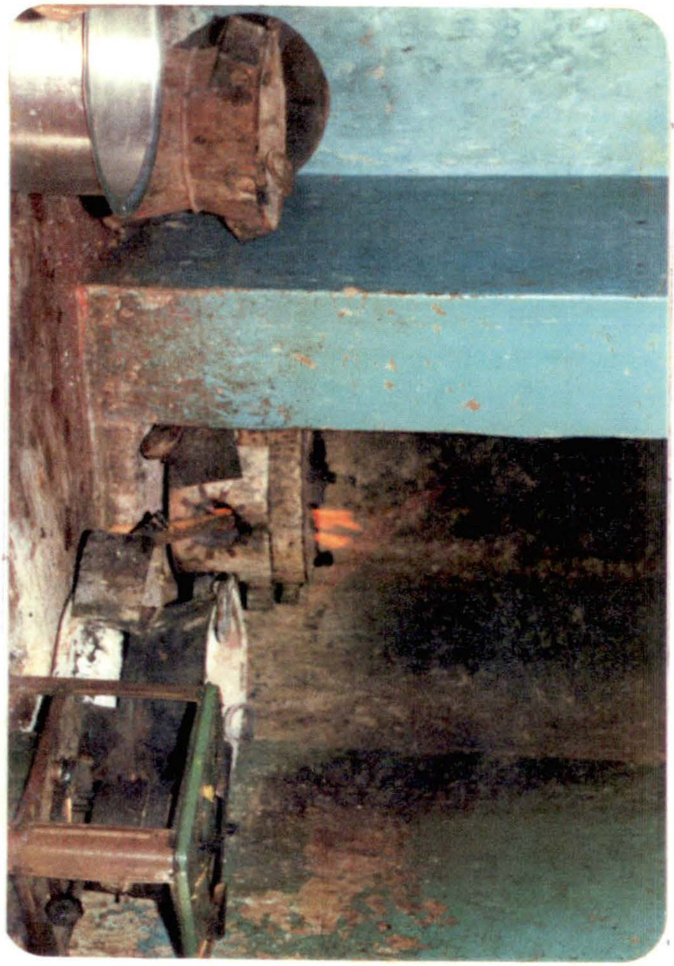


PLATE 8
Observe the range of choices availabale to a salaried urban worker. There are wood, charcoal and kerosene options depending on the level of availability of each.

Source: Author.

Table No. 6 Land Distribution

Land Distribution Among Households

Acres	No. Of Households	% of Total	Cumulative
0-1	14	13.3	13.3
1.1-2	25	23.81	37.11
2.1-3	16	15.24	52.35
3.1-4	38	36.19	88.54
4.1-5	12	11.46	100.0
TOTAL	105	100%	

Source: Field Survey

Land distribution displays a skewed pattern with the majority (88.54%) owning 4 or less acres of land. The modal class is 3.1 -4 acres. Going by the F.A.O./U.N.O. Standards (1981) by which the minimum acceptable size for subsistence is 3.5 acres per household with an average of 5 persons, then it is clear that in the study area, quite a significant portion of the households are operating below this desirable minimum. The consequence is that there is a serious land squeeze due to competing uses of the farms, fuelwood energy included.

This issue of land squeeze is also reflected in the grazing pattern by which 50% of the households that keep cattle have to supplement the pasture on their farms with grazing along the roads, in school play fields, neighbours' farms or even risk arrest by taking their livestock to the Government forest reserve. But this quest for surplus may not be a long time solution since with the population increase even those who had some fallow land will put it to cultivation and it will not be available to the neighbours for grazing purposes. And for those who depend on their farms for grazing,they may be forced to cut down on the number of livestock units. In fact, as few as 2.9% of the households practice zero-grazing while the remaining 97.1% practice either tether or free grazing. At this point it is important to note that the integration of livestock into the farming system increases not only the land labour absorptive capacity, in terms of provision of fertilizer (manure) and production of milk, which can be a profitable enterprise at the level of employment creation and income generation, but also provides the potential for biogas plant development. Therefore, this low level of livestock development has unfavourable implications for alternative forms of energy.

PLATE 9
Observe the grazing of livestock along the road reserve as a result of the severe land shortage within ghe village.

Source: Author.

The analysis conclusively reveals that most households are poor and have less and less land to satisfy their needs. The predominant agricultural practice is mixed farming. This happens in two ways: first, considering livestock rearing and crop farming and second, in the growing of both subsistence and cash crops.

Considering the latter, we find that the level of cash crop production is very low. The survey revealed that only 16.2% grow coffee, 18.1% tea, and 2.9% horticultural crops. This is as opposed to subsistence crops with 97.1% of the households growing maize, 90.5% growing beans and 20% growing bananas. From figures given in the latter section on occupation structure in the village, the fact that 69.3% of the women and 41.6% of the men totally depend on subsistence farming, is a clear indication that the purchasing power in the village is relatively low to facilitate purchase of alternative sources of energy and, therefore, the heavy dependence on fuelwood.

In the final analysis we, therefore, find a situation of severe agricultural stress caused by competing farm needs, increasing land sub-division, which exacerbates the fuelwood crisis due to heavy reliance on existing supplies as ability to purchase alternative forms of energy are limited for the majority of the community members.

4.2 OCCUPATIONAL STRUCTURE

The occupational structure, Table (7) indicates the expected level of income. The category of professionals, indicated in the Table as surveyor/teacher constituted only 4.7% of the respondents, whereas the lower cadre, those in the category driver/clerk and casual/subordinate staff constituted 23.8% of the population. Furthermore, 47.6% were dependant basically on the farm of which 43.8% were entirely subsistence farmers.

This implies that the farm is not only a source of household food requirements but also provides employment for most people in the study area. Competition for land will also include income generating farm enterprises, besides food and fuelwood. Considering the ability to purchase alternative forms of energy, those in the categories of subsistence farms, casual/subordinate staff, and others who comprise 72.4% of the population are disadvantaged given the low levels of income expected. They are most likely to continue to rely heavily on woodfuel as a form of energy, unless more income generating opportunities are created for them. The 2.9% who are unemployed will be the worst hit because they will not be able to afford off-farm energy sources but also other household requirements.

TABLE 7: Occupation Structure (Head of Household)

Occupation	Number	Percentage
Subsistence farmer	46	43.80
Farmer	4	3.80
Surveyor/Teacher	5	4.70
Businessman	4	3.80
Carpentry/Construction	7	6.70
Driver/Clerk	6	5.70
Casual/Subordinate Staff	19	18.10
Unemployed	3	2.90
Others	11	10.44
	N = 105	100.00

Source - Author - Field Survey

The employment structure of the wives (Table 8) reveals that as many as 80.2% of the wives are subsistence farmers, 1.23% are professionals (teacher), and 6.17% engaged in commercial farming. In situations where a husband is not earning a wage or salary, the farm as a source of livelihood is very critical.

TABLE 8: <u>Occupation Structure of the Wives</u>

Occupation	Number	Percentage
Subsistence farmer	65	80.25
Farmer	5	6.17
Petty Trader/Beer Brewing	6	7.41
Teacher	1	1.23
Others	1	1.23
Non-Response	3	3.71
TOTAL	81	100.00

Source -Field Survey

Considering that the task of fuelwood procurement is seen as the responsibility of the wife, the kind of employment structure presented above renders the woman almost helpless considering the ability to purchase either fuelwood or charcoal from the market without having to seek financial assistance from the husband.

4.3 Socio-Cultural Aspects:

As indicated in the background chapter, generally the traditional values hold that men, particularly the heads of households and older members, are the main decision makers on matters concerning the division of labour among different members of the family. Women are generally excluded from the decision making process though they do several of the daily tasks such as preparing food, child care, gathering firewood, drawing water, gardening, helping with planting and caring for the family's chicken, sheep and goats.

The following analysis addresses the gender issues related to fuelwood availability and use within the households. This is addressed at two levels: first, decision making regarding the land-use patterns (or farm enterprises). At this level two questions were posed for respondents. First, they were asked who makes decisions on what tree to plant and in 44.8% of the cases, the decision was taken by the head of the household (husband) against 42,9% of the cases where the wife made the decision, with 11.4% of the cases the decisions being made by both the husband and wife in consultation. The second question was on whom makes the decision on where to plant and again the decision making structure was similar to the first aspect of land-use with 47.1% of the cases the husband making the decisions, the wife 39.4% of the cases and both the husband and the wife in consultation making 12.5% of the cases.

This is in contrast to the aspect of the woody/tree resources where the male dominance in decision making regarding its use is quite apparent. A question was posed to the respondents about whom makes the decision to cut down trees and the following was the structure that emerged. In 60.7% of the cases the decision was made by the husband against 25% of the cases where the wife made the decision and only 8% of the cases where the decision was made by both the husband and wife in consultation. This heavily biased structure of decision making is mainly due to the manner in which the tree is viewed as a source of building materials (and building houses is work for men as defined by the socio-cultural arrangement) and income generating item. A look at the tree species grown reveals a significant preference for the exotic species, which have certain qualities that fulfil the said requirements.

Table 9: Main Tree Species

Species	Percentage
Cypress (Muthithinda)	14.0
Eucalyptus (Mubau)	26.5
Croton (Mukinnduri)	27.8
Grevillea robusta (Mukima)	18.9
Others	12.8
TOTAL	100.0

Source - Author -Field Survey

In Table 9, for example, eucalyptus and cypress tree species were the most preferred - about 60% of the cases against 40% for the other species. This is mainly explained by the fact that the eucalyptus and cypress tree species provide very good building material considering straight poles which are favoured by prospective buyers. Further, the persistence of the cultural aspect in the accessibility to the woody resources at the household level is also revealed by looking at who plants trees on the farm. In 75% of the cases, tree planting was done by either the husband alone or husband and the children as opposed to the rest (25%) of the cases where the wife and the children planted the trees.

Participation in tree planting should be appreciated considering defining the ownership of this woody resource and, therefore, accessibility to its use within the household. This is reflected in the preceding discussion where it was revealed that, in 60% of the cases, it is the husband who makes the decision to cut down trees. Thus, in many instances, women cannot use available firewood for fear of being reprimanded by their household heads. Alternatives include the use of inferior quality of fuelwood like saw-dust, twigs, farm waste, etc.(see plates 7, 8, 9,). An attempt to change this decision structure has caused,in many instances, the disruption of family harmony as the cartoon in the appendix illustrates.

PLATE 10
Young girls collecting dry maize-stalks from a shamba (farm) for use as energy source at home.

Source: Author.

PLATE 11
Women buying saw-dust from a local timber yard to use as a source of energy.

Source: Author.

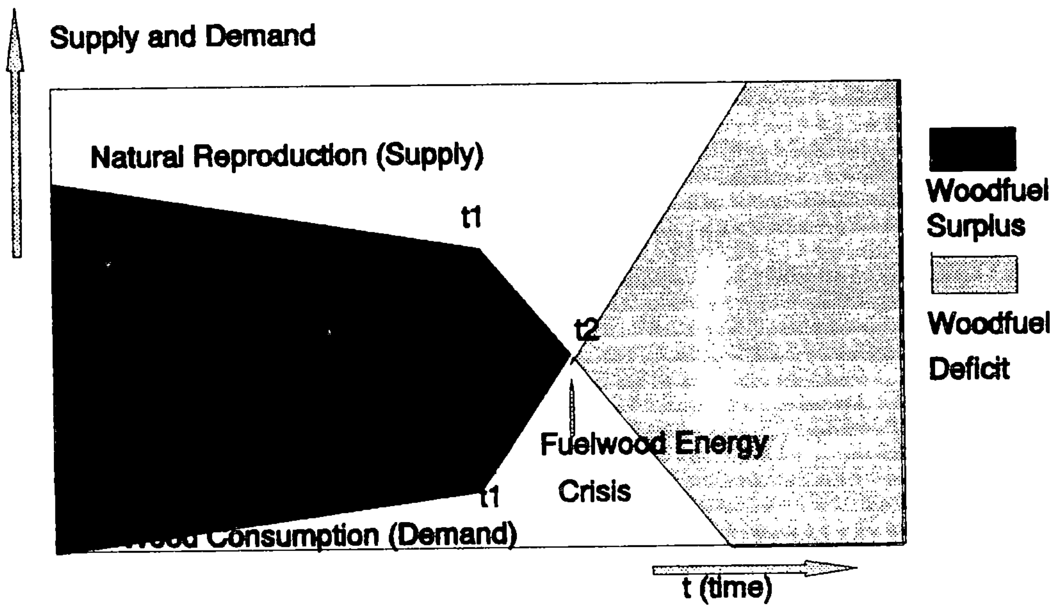
PLATE 12
Twigs and dry maize cobs as a source of energy.

Source: Author

4.4 THE EXTENT OF THE FUELWOOD PROBLEM IN MAI-AI-IHII

The preceding section of this chapter has attempted to demonstrate how various attributes of the household contribute toward the fuelwood energy crisis. In total, the breakdown in woody biomass or the fuelwood energy crisis in Mai-ai-ihii village, as a result of the pressures indicated earlier, can graphically be depicted as follows:

FIGURE 10.



Source - Author

The following analysis will attempt to explain why, on one hand, the supply of wood has been decreasing over time while, on the other hand, wood consumption has been increasing resulting into the current crisis depicted at time t_2 in the above graph.

Over time, there has been a general escalation of prices of various sources of energy in the area as shown by table below.

Table 10 Energy cost

ENERGY SOURCE	COST* (KSHS)			
	1965	1975	1985	1991
Firewood**	20	35	50	100
Charcoal***	10	24	38	120
Kerosene****	5	12	32	55
Gas (L.P.G.)*****	28	32	100	225

Sources: Author - Field Survey; Beijer Institute (1985) p.58

* Real values

** 1 Heap (ibuti) of approximately 150kgs.

*** 1 bag (45 kgs.)

**** 1 gallon (5 litres)

***** 1 bottled gas container (liquified petrol gas (LPG)

****** 1965 is the base year

For fuel, the steep increase in the price can be explained by changes in the supply and consumption (demand) patterns in the area over time.

4.5 Changes in supply patterns:

First, as described in the background chapter, the physical supply of woodfuel in Mai-ai-ihii was adversely affected by the institutional grabbing of land. To compound the problem, the process of land privatization led to the communally- owned land being divided among individual farmers. With increase in population over time, the limited land resources have come under intense pressure for cultivation resulting into lower standing volume of trees on each individual parcel of land.

Table 11 below demonstrates how intensive the pressure is in the use of existing biomass from ones own farm .

Table 11 SUPPLY OF FUELWOOD

Source	Number of Households	Percentage
Own Farm	53	50.00
Buy from market	8	7.69
Around Village	6	5.76
Neighbours' farms	5	4.80
Own farm and Others	28	26.80
Thogoto and Muguga Forests	5	4.95
TOTAL	105	100

Source -Field Survey

In the past, the pressure on land to provide fuelwood, especially for those who have small uneconomical parcels of land, was alleviated by being allowed to fetch for fuelwood on the fringes of Muguga and Ngong Forests. (Oral interview). Currently, this access has been curtailed with introduction of the Nyayo Tea Zones on these fringes. However, it is important to note that commercial loggers continue to be licensed to cut down trees for sale of their products (charcoal and timber) to Nairobi and other nearby towns, therefore, the woodfuel shortage in Mai-ai-ihii cannot be termed as a 'tragedy of the commons' - the fact is that the commons have disappeared.

The question of wood availability is inextricably linked to the processes of determining land use. The proportion of the households (50%) who rely on their farms as the source of supply for fuelwood have to use the same farms to provide other basic needs (like food, livestock rearing etc.). The following table illustrates the restricted farm resource base for the supply of fuelwood due to fierce competition from other land uses.

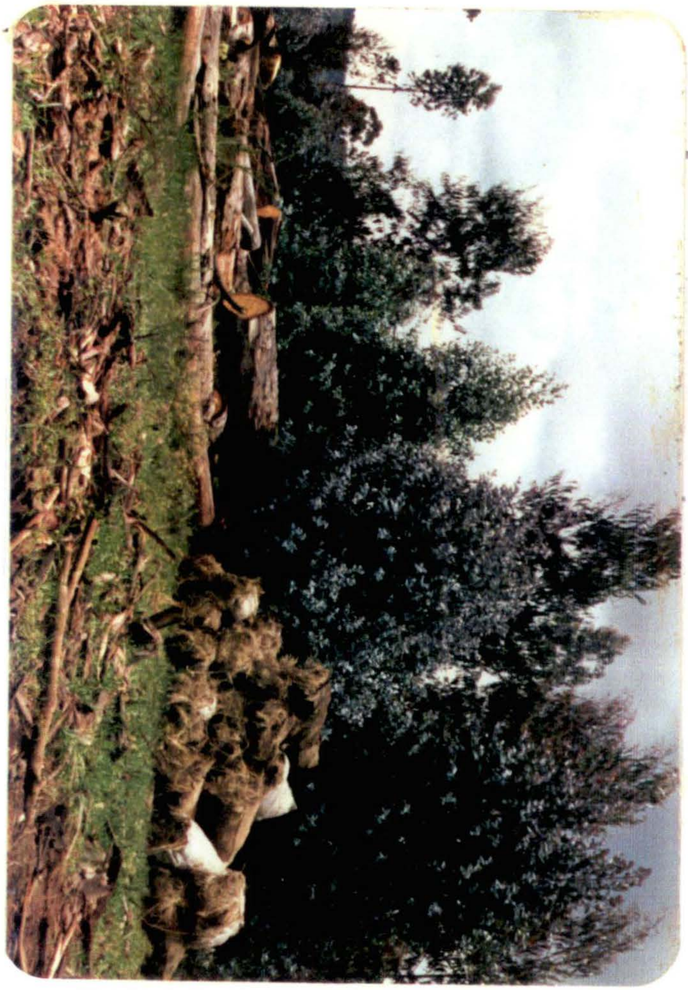


PLATE 13
Authorized commercial logging from Thogoto forest. Notice the charcoal waiting for transportation to Nairobi and other nearby towns for sale.

Source: Author.

PLATE 14
Logs of wood being prepared for charcoal in Muguga Forest.

Source: Author.

PLATE 15
Firewood being sold in Kikuyu Town after being harvested from Muguga and Thogoto forests.

Source: Author.

Table 12

LAND AVAILABILITY[6]

Type of Use	% of total area
Agriculture - Cash and subsistence crops	91
Livestock	6
Biomass - standing trees and shrubs	3

Source - Author - Field Survey

The scarcity of fuelwood caused by this fierce competition has put most of the villagers in a dilemma. A man gave the following answer when asked on how to resolve the issue:

> 'Plant more trees and even eliminate planting food because without firewood we cannot eat*****
> (Kinuthia wa Wanja - Primary school teacher)

Traditionally, only selected tree species were used for fuelwood in this area (Muriuki 1980). With increasing scarcity, all available species have come to be used for fuelwood with the consequence that the practice of sustainable supply has been severely disrupted.

Supply of fuelwood has also dwindled due to the fact that, as the labour force (mainly men), gets absorbed into the monetary economy, more time and distances are covered by wood gatherers (mainly women) in the procurement of fuelwood. On average, women spend two (2) working days of the week (16 hours) fetching fuelwood[7]. The average distance travelled is 6 kilometres8 compared with the national average of 0.5 kilometres (KFC Household Energy Consumption Survey, 1981). This figure is quite high. Considering human energy expended, on average, each mature lady expends 211 calories (Burgess, 1965); Wadsworth, 1960), weekly in fetching for fuelwood.

Economics teaches us that, in case of a dwindling resource base, one has to find substitutes. Dwindling supplies for fuelwood have not been met by switching to other substitutes. For woodfuel, the practical alternatives would be use of paraffin, electricity, bio-gas digesters, solar and wind energy sources. Viewed against the economic background of the village, the fact is that these alternative energy sources are not affordable to the majority. The following tables illustrate this fact:

Table 13

PRICE COMPARISONS OF DIFFERENT FUEL TYPES

Fuel	Unit	(kwh/unit)	Thermal Efficiency	Unit price/ US$	effect.kwh US$
Fuelwood	Kg.	5.23	8.0	3.1	7.4
Charcoal	Kg.	9.06	2.3	9.3	4.5
Paraffin		13.95	50.0	30.0	4.3
LPG	kwh	14.50	60.0	68.6	7.9
Electricity	Kwh	1.00	70.0	10.4	14.8

Source: Arnold (1985), P. 41

Table 14 Cost of Supplying Electricity by Means of Windmill Generators

Base Case	Useful life of windmill generator Lifetime of batteries Effeciency of batteries	15 years 6 years 85%
Equipment Costs	Windmill Generator (10 kW) Wiring, controls Installation Battery storage (100 kW @ 85% effeciency) 118kWh @ Sh 800/kWh Total equipment cost (approx.)	Sh 170,000 Sh 42,000 Sh 42,000 Sh 94,000 Sh 350,000
Financing Costs	Windmill generator, wiring, installation Sh 254,000 @ 10% for 6 years Batteries Sh 94,000 @ 10% for 6 years Total cost of financing (approx.)	 Sh 33,000/yr Sh 22,000/yr Sh 55,000/yr
Cost of Electricity	Total energy generated Unit cost	36,000 kWh Sh 1.5/kWh

(a) Based on amortization of loan in equal yearly instalments.

Note: In many places, maintenance cost estimates of commercial systems usually run about 5 percent of initial capital cost per year. This would add about Sh 0.5 to the cost of electricity per kW. However this can vary either way significantly depending on the location.

Source: National Academy of Sciences Workshop on Energy For the Villages of Africa, p.15.

Table 15 Cost of Supplying Electricity by Means of Photovoltaic Generator

Base Case	Lifetime of silicon solar cells Lifetime of batteries Efficiency of batteries Cost of silicon solar cells Cost of batteries	20 years 6 years 85% Sh 160/W_p(a) Sh 800/kWh
Equipment Costs	Solar-cell array 60kW_p(b) @ Sh 160/W_p Battery storage (300kWh @ 85% efficiency) 353 kWh @ Sh 800/kWh Total equipment costs (approx)	 Sh 9,600,000 Sh 280,000 Sh 10,000,000
Financing Costs (c)	Solar cell array Sh 9,600,000 @ 10% for 20 years Batteries Sh 280,000 @ 10% for 6 years Total cost of financing (approx.)	 Sh 1,100,000/ yr Sh 64,000/yr Sh 1,200,000/ yr
Cost of Electricity	Total energy generated Unit cost	110,000 kWh Sh 11/kWh

(a) Based on amortization of loan in equal yearly instalments.
Note: In many places,maintenance cost estimates of commercial systems usually run about 5 per cent of initial capital cost per year. This would add about Sh 0.5 to the cost of electricity per kW.However, this can vary either way significantly depending on the location.
Source - as Table 13, p.16

Table 16 Cost of Supplying Electricity from Existing Grid

Source: Ibid, p.11

Base Case	Grid voltage Distance from grid to village (assumed) Distribution voltage to substation Local distribution voltage Number of substations assumed (a) Average hook up distance for 45 substations and 300 families in 16km^2 village	33 kV 20 km 11 kV 400 V 45 0.2 km
Equipment Costs	High voltage step-down transformer 33 kV to 11 kV, 500 kW @ Sh 1,000,000 per 500 kW 11 kV transmission line 20 km @ Sh 500 per km Substation transformers 11 kV to 400 V, 50 kW @ sh 10,000/50 kW Local Distribution lines (400 V) 300 families @ 0.2 km/family and shs 12/m Total fixed costs (approx)	Sh 1,000,000 Sh 10,000 Sh 450,000 Sh 720,000 Sh 2,180,000
Financing Costs (b)	Sh 2,180,000 @ 10% for 20 years	Sh 256,000/yr
Cost of Electricity (c)	Total annual capacity 500 kW x 8760 hrs/yr Unit cost at capacity (Load factor = 1) Unit cost at 10% load factor	4,380,000 kWh Sh .06/kWh Sh 0.58/kWh

(a) Because local distribution is so expensive, in this example it is cost effective to under-utilize the substations by using many of them to reduce local hook-up distance.
(b) Based on amortization of loan in equal yearly instalments.
(c) This calculation represents the unit cost of transporting electricity from the 33 kV transmission line to the consumer. It does not consider maintenance costs for the system nor the cost of electricity delivered to the point where the 11 kV line starts.

Table 17 Cost of Supplying Electricity by Small Scale Diesel Generators

Base Data	Operation	5 hr/day
	Useful Life (This means about 10 years)	20, 000 hrs
	Fuel Consumption	0.35 lts/kWh
	Overhaul	Every 5,000 hrs
Fixed Costs	Retail cost, k-kW diesel generator	Sh 29,000
	Overhual costs	Sh 15,000
	Installation	Sh 2,900
Annual Costs	Equipment and Installation Sh 32,000 @ 10% for 10 years (a)	Sh 5,200/yr
	Overhaul Sh 15,000 @ 10% for 3 years(a)	Sh 6,000/yr
	Maintenance, operator	Sh 7,000/yr
	Total annual costs (less fuel) (approx.)	Sh 18,000/yr
Cost of Electricity	Total energy generated annually	11,000 kWh
	Unit cost, less fuel	Sh 1.6/kWh
	Fuel cost @ Sh 2/litre	Sh 0.7/kWh
	Total Unit cost	Sh 2.3/kWh

(a) Based on amortization of loan in equal yearly instalments

Source: Ibid, p.18

Table 18 Cost of Supplying Cooking Fuel, Lighting, Mechanical Power and Electricity by Biogas

Base Cost	Cattle Dung	10 kg/cow/day
	Biogas Production: @ 0.6 m3/kg dung =	0.6 m3/cow/day
	Energy content of biogas @ 60% methane (This means that about 4 kWh of biogas energy is available daily from each cow):	6.4 kWh/m3
	System lifetime:	20 years
	Conversion efficiencies Internal-combustion engine(c): Electrical Generator:	 25% 90%
Plant Cost	Single-family plant (3 m3)	Sh 6,000
Financing Cost(a)	Single-family plant Sh 6,000 @ 10% for 20 years:	Sh 705/yr
	Engine generator to provide 1 kWh/day Sh 5,400 (d) @ 10% (5 hr/day)	Sh 5,940/yr
	Engine to provide 1 kWh/day mechanical energy Sh 3,200 (d) @ 10% (4 hr/day)	Sh 3,520/yr
Energy Costs (b)	Cooking and lighting directly by gas (20 kWh/day)	Sh 0.10/kWh
	Cooking and generation of electricity @ 1 kWh/day	Sh 18.2/kwh
	Cooking and generation of mechanical power @ 1 kWh/day	Sh 11.6/kWh

(a) Based on amortisation of loan in equal yearly instalments.
(b) Cost of energy production only - does not include the cost of appliances, or cost of collecting dung.
(c) Efficiency at peak loading. At lower loading rates, engine efficiency would drop off rapidly, with consequent higher gas requirements.
(d) Retail costs Nairobi, August 1980.

Source Ibid p.19.

Table 19 COST COMPARISON OF ENERGY DELIVERED TO THE COOKING PAN

FUEL	(US$/CJ) Cost/GJ*	Thermal Efficiency	Cost to Pan/CJ
Firewood (open fire)	1.38-3.45	8%	17.2-43.1
Charcoal	5.17-13.8	16%	32.3-86.2
Paraffin	7.93	30%	26.4
LPG(1)	7.33	50%	14.6
Electricity	6.67-36.7	70%	9.5-52.4

(1) Cost of imported fuel

(2) Range of cost from large hydroelectric plant to small inland diesel generating set.

* GJ is a unit of measuring energy consumption.
GJ = 10^9 joules.

Source Ibid, p.20

The preceding tables demonstrate that the various alternative sources of energy cannot be available to a majority of the population within the community due to the relative high costs involved in installations and appliances needed to use the energy[9]. Reliability of some of these energy as sources is also a limiting factor in their use. Solar power, for instance, cannot be used reliably at night while kerosene availability is dictated by the vagaries of the international petroleum market and politics.

Associated with the cost of element is the issue of technology. The type of technology that comes with the available energy alternatives is sophisticated given the skills that the villagers currently possess. In the short run, this would give rise to maintenance and operational problems during use.

4.6 Demand (Consumption) Patterns:

From the demand side, the following factors have in one way or another contributed to the rising cost of fuelwood energy over time:

First, traditionally, fuelwood was considered a 'free' good in the sense that no price tag in form of money was attached to it. This belief has led to heavy reliance on the use of fuelwood for domestic use especially for cooking purpose as the following data from the field in the table demonstrates.

Table 20 TYPES OF ENERGY USED IN COOKING

Type	Household Number	% of Total Energy Consumed
Firewood	91	87
Kerosene	3	3
Charcoal	2	2
Combination	9	8
Total	105	100

Source: Author - Field Survey.

Even now, despite it's threatening scarcity, fuelwood is in much demand given the disposable income levels of the inhabitants of Mai-ai-ihii and the cost involved in installing and use of alternative energy sources as earlier indicated. The dominance of firewood is also demonstrated when examining the devices used in cooking.

Table 21 COOKING TECHNOLOGY

Cooking Technology	Household Number	% of Total
Three-stone fireplace	82	78.1
Three-stone fireplace and ordinary metal jiko	18	17.1
Three-stone fireplace, Ordinary jiko and a Kerosene stove	2	1.9
Energy Saving Jiko	1	0.95
Other Combinations	2	1.95
Total	105	100.0

Source: Field Survey - Author.

The three stone fireplace is preferred for various reasons. First, it can accommodate all size of '<u>sufurias</u>'[10] as need may arise given the large family sizes and varying age-groups whose needs are different. It also facilitates space, heating simultaneously with cooking. It also serves as a preservative for food like maize and medical materials. The other advantage is that it is easily made by anyone from soil and does not require any financial outlay. It serves also as a social focus in the evening where mothers tell stories to their children.

However, against these positive attributes associated with the use of this technology, one should hasten to mention the ill-health effects that also accompany it. The open-fire place use causes the smoke to irritate the eyes and is injurious to the respiratory system as smoke has high contents of carbon monoxide.

Another and more relevant aspect in the use of the open three-stone technology in relation to contributing to rising scarcity of fuelwood is its thermal wastefulness. As the technical surveys demonstrated in table 18 earlier, it has a thermal useful conversion ratio of only 8%. The metal jiko is even worse with a ratio of 4.8% (Ibid) - the energy saving ceramic lined charcoal jiko has a ratio of 40% (Ibid).

An added factor that contributes toward a very heavy demand for fuelwood is the dietary pattern of Mai-ai-ihiians.

The main staple food for the inhabitants is <u>Githeri</u>

To prepare a well cooked maize and bean meal requires at least three (3) hours of cooking with 'heavy' fire thus consuming a lot of fuelwood.

Reasons given by the respondents why they preferred Githeri to other meals included: One, the fact that Githeri is able to sustain one for a long time before one should need to have another meal (28%); it is easy to get (22%); it is a traditional meal (16%); sweet to children (14%); nutritious (12%) and the fact that it is easy to prepare (2%).

We also asked which meal took the longest time to prepare and why. Githeri was identified as taking a long time by 65% followed by Ugali at 32%. Responses to the former question included that the meal is hard to boil and there is not enough fuelwood.

Fuelwood energy balance is also upset due to heavy demand created by an explosive population growth rate (3.1%)* in the area.

The amount of woodfuel required to sustain a household was

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* This is the Kiambu District Average - Central Bureau of Statistics 1989.

estimated at 194kg/day, which corresponds roughly to five (5) tonnes of fuelwood per year. This is very high when compared with the national average of 2.5 tonnes (Akinga, 1980).

Table 22PROJECTIONS** OF DOMESTIC WOODFUEL CONSUMPTION (USING 3% GROWTH RATE)

YEAR	CONSUMPTION (Tonnes)
1990	525
1995	609
2000	706
2025	818

Considering the shrinking land resource base in the area as earlier demonstrated, one can safely project that with this kind of trend in demand, the woodfuel imbalance in the area will become much worse unless urgent measures are put into

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**
$E_n = E_o(1+r)^n$
E_n = Future consumption.
E_o = Current consumption.
r = Rate of consumption.
n = Number of years.

place to check it.

Finally, the increased demand for woodfuel in neighbouring small towns like Kikuyu and Thogoto by traders and institutions (hotels, hospitals, schools, etc). has placed even more a heavy demand for woodfuel resources in the area as they compete with the village in the consumption of the woodfuel that is either supplied from the neighbouring forests or other areas by traders.

The crisis resulting from the above supply and demand factors has affected the quality of life within the Mai-ai-ihii community. The next chapter spells out the main problems.

NOTES

1. Assumption: Per capita fuelwood consumption is 941 Kgs/Annum. (Bradley, P.N., 1986-Kenya Woodfuel Development Programme Kenya Energy Survey Report p.19)

2. Ibid op.cit.

3. This is the average for Kiambu District.

4. Income is here defined to include both cash (wages/salaries) and non-cash (gifts and/or remittances by family members working in towns; estimated value of home-grown produce sold at the local markets etc.) incomes.
Where information was not willingly offered, the author used such surrogates like the type of construction materials used in buildings ; the type of appliances found within each household; the level of farm development etc. to estimate the income levels.

5. See comparative costs of various energy sources as provided in tables 12-18.

6. Land covering the homestead was not considered in these computations

7. Field survey.

8. Field survey.

9. Reliability of some of these energy sources is also a limiting factor in their use.

10. Cooking pots.

CHAPTER FIVE

Interaction of the Fuelwood Problem and Quality of Life in Mai-ai-ihii

In light of the preceeding analysis, this chapter will highlight how the fuelwood shortage has influenced or altered the lives of the people in Mai-ai-ihii. The discussion will be based on:

i) how the fuelwood shortage has affected the dietary pattern(s) of the community.

ii) how the shortage has affected land-use;

iii) how scarcity of fuelwood has resulted in not only increased distances in the procurement of fuelwood but also in increased cost both in terms of time and financial resources.

The argument here is that, the above impacts resulting from fuelwood shortage are not even but that they adversely affect more the poorer group than the other relatively richer groups in the village.

First, the dietary pattern of the community was compared with the income level of the community as depicted in Table 5 in chapter 4. The analysis revealed the following results:

Table 22 FREQUENCIES IN CONSUMPTION OF EACH DIETARY PATTERN BY DIFFERENT INCOME GROUP

Income Groups	1	2	3	4	5	TOTAL
DIET	Ksh 500	501-1000	1001-1500	1501-2000	2000	
BREAKFAST						
Porridge	35	10	5	4	3	57
Tea/Coffee	6	7	18	21	26	77
Others*	-	-	5	14	25	44
LUNCH						
Githeri	40	32	12	10	5	99
Ugali	35	28	8	4	1	75
Others*	-	5	17	18	31	71
DINNER						
Githeri	39	24	11	3	1	77
Ugali	40	33	14	4	1	91
Others*	-	2	5	14	20	41

Source: Author - Field survey
To show the above data in percentages:

*Others include

Breakfast:

- Chocolate/Cocoa
- Milk
- Eggs
- Bread
- Fruits

Lunch

- Meat
- Greens
- Milk
- Fruits
- Rice
- Chapati

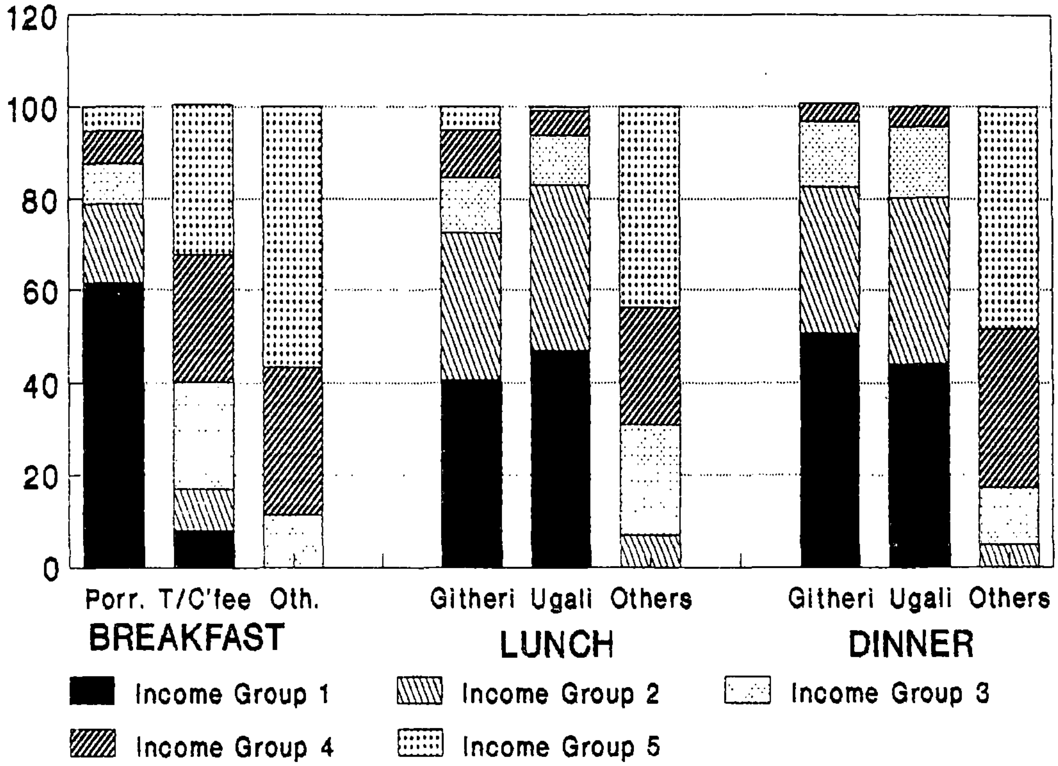
Dinner

- Rice
- Meat
- Chapati
- Milk

Source: Author - Field survey.

FIGURE 11

FREQUENCIES IN CONSUMPTION OF EACH DIETARY PATTERN BY EACH INCOME GROUP.



SOURCE: AUTHOR - FIELD SURVEY

The author cannot pretend to have adequate training in the health implications of the above dietary patterns for the various income groups. However, the following observations are pertinent to our study:

First, as the income level rises, there is an increase in the variety of food eaten. This is because, as stated earlier, there is not only adequate financial outlays for the rich to buy a variety of other foodstuffs, but also there is enough fuelwood and other alternative sources of energy to facilitate cooking of various foodstuffs. The converse is true for the low income groups. So the higher income groups seem to enjoy a more diversified diet than the low income groups. (Hoskins, 1980, Kaale, 1987).

Second, the shift in the dietary pattern from traditional <u>Githeri</u> to new types (<u>Ugali</u> from sifted maize meal, rice, etc.), which cook fast and hence save on fuelwood is done at the expense of foregoing the rich nutritious value of the former. The poorer members of the community are more affected by this shift because the rich people supplement Ugali with other foods like milk, meat, etc. which they can afford. Tea/Coffee and porridge by the rich families is taken with milk, which they can afford either through their dairy or by purchasing.

Low income mothers use simple maize meal porridge with no supplement (like milk) as a weaning food. Weaning being the period of highest nutritional risk for children, one can only imagine the health risk children from poor families face (see Central Bureau of Statistics - Child Nutrition Survey 1978 - 1979 p. 30-31). The rich families can prepare fresh meals daily because fuelwood and other alternative sources of energy are within reach. The poor, however, have to store meals (Githeri especially) for two or three days in order to save on fuelwood consumption. Given the fact the poor cannot afford modern refrigerators (there is no electricity anyway!)the food often goes bad.

Table number 6 in chapter 4 revealed a skewed picture of land distribution in the village. This state of affair has altered the community way of life because of the concomitant fuelwood shortage in the following manner.

First, unlike the past when traditional rights and obligations necessitated that communal resources including fuelwood be accessible to all, relations are now more economic in nature. The relatively well off members of the community no longer regard themselves as being obliged to underwrite the security of those without resources. The position of members of the poorer groups has become more precarious where they are forced to use inferior fuelwood types - saw-dust, crop residues which they either buy or scavenge (and sometimes steal) from their neighbours's farms or nearby forests reserves so the poorer households consume fast cooking but less nutritious food (like ugali) instead of the more nutritious food, which requires more time and fuelwood to prepare. They are, therefore, more at risk of nutrition deficiency diseases.

As the shortage of fuelwood has brought the need to buy the same or other alternative sources of energy, men who largely control the purse of the household are now forced to start discussing woodfuel problems and treating it with more seriousness as an important item of expenditure in the household income budget.

Finally, we look into how the quality of life in the village has been altered due to the distance(s) covered and the cost (time and money) involved in the procurement of fuelwood by the various income groups.

Data on the distance covered by various income groups revealed the following:

Table 23: Distance Travelled To Obtain Fuelwood

Income	Distance Travelled (kms) (No. of Households)			
	0 - 4	5 - 6	7 - 8	9 - 12
<= 500	4	12	8	14
501 - 1000	4	7	5	8
1001 - 1500	4	7	5	5
1501 - 2000	2	3	4	3
>= 2000	3	3	2	2

Total No. of Households = 105

Source: Author

The data reveals that most of the inhabitants travel more than five kilometres to fetch fuelwood.

As indicated earlier, the burden of fetching fuelwood by and large falls on women. For the women members belonging to the poorer families, the drudgery of travelling over 9 kilometres with bundles of fuelwood on their back is sad especially as they also have to fetch water using the same backs, feed children and cultivate.

Second, longer distances have necessitated the use of donkeys to supplement human energy in the transportation of fuelwood. This trend has had negative impacts especially on the poorer members of the community: First, donkeys have now become more expensivel unlike in the past when the community would barter them for cattle or goats with the neighbouring Maasai community. For the poor households, this means foregoing other necessities of life in order to purchase one. Second, donkeys are very hardy in carrying out other household activities like fetching water, transportation of agricultural produce and animal feeds etc. If then, they are used to fetch fuelwood for longer distances, they cannot have enough time and energy to help in these other household activities. Of necessity they have to be replaced by human labour especially women- which means less time will be spent on other critical household activities like agricultural production.

The last aspect is of cost. Earlier, it was demonstrated that the higher income groups spend less in terms of money in the purchase of fuelwood for, not only do they have access to other alternative sources of energy but also they have larger farms to grow trees for fuelwood and other uses. The opposite was true for the lower income groups. In this section we are going to treat cost in terms of time spent in the procurement and the impact this has had on community life.

Table 24: Time Spent in Obtaining Firewood

Income	Time Spent (Hrs/Week) (No. of Households)			
	0 - 4	5 - 9	10 - 14	15
<= 500	5	11	9	13
501 - 1000	5	6	5	8
1001 - 1500	5	8	4	4
1501 - 2000	2	4	3	3
>= 2000	3	3	2	2

Total No. of Households = 105
Source: Author

The picture is the same as that one revealed earlier of distance and income, i.e. the higher the income level, the less the time spent in obtaining fuelwood and vice versa.

This state of affair has the following effects on community life: This being a rural community, it means that the higher income group has more time at its disposal to spend on other household activities as compared to the low income group. The latter, especially women, find themselves operating on a very tight time budget trying to meet the basic needs of the family. It is common practice to find child labour being used to help in carrying out household work like looking after the younger children, herding and also fetching water. In an environment where education is perceived as the only avenue to break away from the vicious cycle of material poverty, children from low income families do not have enough time to study, which may result in poor performance in national examinations. Thus their poverty is sustained due to lack of enough time to study.

The above analysis demonstrates the intricate relationship between the energy (fuelwood) problem and the quality of life in Mai-ai-ihii village. It adds credence to our contention that the fuelwood energy problem in rural areas like Mai-ai-ihii in Kenya is a symptom of the underlying crisis of poverty or underdevelopment, which is a consequence of the transformation from a communal or subsistence economy into a market economy. The revelations found here conform to findings carried elsewhere in rural settings (Briscoe, 1979; Chirattananon, 1983; Alla-el-Din, 1981; Babiker, 1981; Digerness, 1977; Fleuret, 1978; Nkonoki, 1983; Ojo, 1981; Newcombe, 1981; Soesastro; 1983; Skar, 1985; Ceselski, 1984; Devres, 1980).

The next chapter illustrates the coping mechanisms the community has evolved to alleviate the fuelwood energy crisis.

NOTES

[1]. The value of a donkey is currently Kshs 2,500.

CHAPTER 6

ALTERNATIVE SOLUTIONS

This chapter attempts to identify and review current approaches, which can be used to curb the fuelwood problem in the village. The measures are geared toward either supply enhancement of fuelwood and/or demand mitigation. There are three main approaches:

<u>A</u> - Individual Approach - either through the market or individual farm holdings.

<u>B</u> - The State Approach - through the various arms of the government - Forestry Department, Agriculture and National Environment and

<u>C</u> - The Community Approach - through collective community woodlots.

Drawing from the preceding analysis, the advantage(s) and/or disadvantage(s) of each of the above current programs can be viewed based on the following framework:

TABLE NO. 25 Evaluation Framework (Source:Author)

	Village/Community level	Household/Family level
1.Aquisition	Can the village as a whole be able to buy or build? If yes, how are the costs and benefits to be shared? Will the technology increase or alleviate the problem of differential access to energy?	Can each family afford to buy or build the proposed alternative?
2.Rights	Does every villager have equal rights in the use and decision making?	Do the women or men retain the full rights to the programme both in use and in deciding what to do with it? Are the rights equal to both sexes?
3.Use	Does every villager have equal use?	Which persons in the family can use?
4.Disposition	If the village is moved, what becomes of the equipment and the programme?	What happens if a head of a houshold dies? Is the inheritance of the programme (e.g. trees) going to be a man or a woman?
5.Socio-Cultural	Is the alternative compatible with the multiple use patterns characteristic of the community, the local physical environment, land and labour supply? That is, does the project take into account the full range of uses that people attribute to different kinds of alternatives and the independence of these uses?	- same as at village level -
6.Equity	Will the new energy alternative benefit the poor members of the community?	Will women equally share with men the benefits of a new energy alternative?
7.Technology	How does the new technology fare in terms of simplicity; its ability to build on existing local knowledge; the opportunity it offers for further development; cost; thermal efficiency and social efficiency?	- Same as at the village level -
8.Partici-pation	Is the alternative local and perticipatory in nature? Will the alternative disrupt the positive aspects of the communal set up? How late or early are the local people involved in the planning process? Are the local people involved in evaluating the consequences of each alternative?	Are women equally involved in the decision making with men?

A The Individual Approaches:

Current individual approaches to fuelwood problem in Mai-ai-ihii comprise of the following:

a) Use of improved cook-stoves (jiko);

b) Sale and purchase of firewood and charcoal from nearby markets;

c) Increased planting of trees on individual farms and

d) Interfuel substitution.

The use of the improved cook-stove (jiko) is aimed at:

i) reducing the quantity of wood used because of its relatively higher thermal efficiency compared with the open three stone traditional cooking method (see Table 18 in Chapter 4)

ii) by achieving i), the technology aids as well as shortening the time needed to collect fuelwood as less of it now is required and

iii) healthwise, the use of the improved jiko helps to reduce the amount of smoke produced by traditional stoves thus alleviating would be respiratory associated problems such as lung cancer.

The use of improved cook-stoves has been limited by: First,cost.Many households still use the traditional three stones stoves because they just don't have the money to purchase the improved jiko. The former is free while the latter costs around Kshs 450 in the market. This a substantial cash outlay, especially for the low income families and considering other expenses the household has to make.

Second, male dominance. In a community where the purse-strings are largely controlled by men, women have little say in the procurement of this technology. Yet, they (women) are the ones who bear heavily the woodfuel burden as previously explained.

Third, inexperience in technology. Though improved jiko technology is simple, it is a by-product of the jua-kali artisans in urban areas. It lacks a local base. The Field survey revealed that most people experienced difficulties in lighting and cutting the wood into specific size in order to use this technology. Some villagers do not posses even essential wood-cutting equipment like saws to cut the wood into required sizes. The technology is therefore not popular.

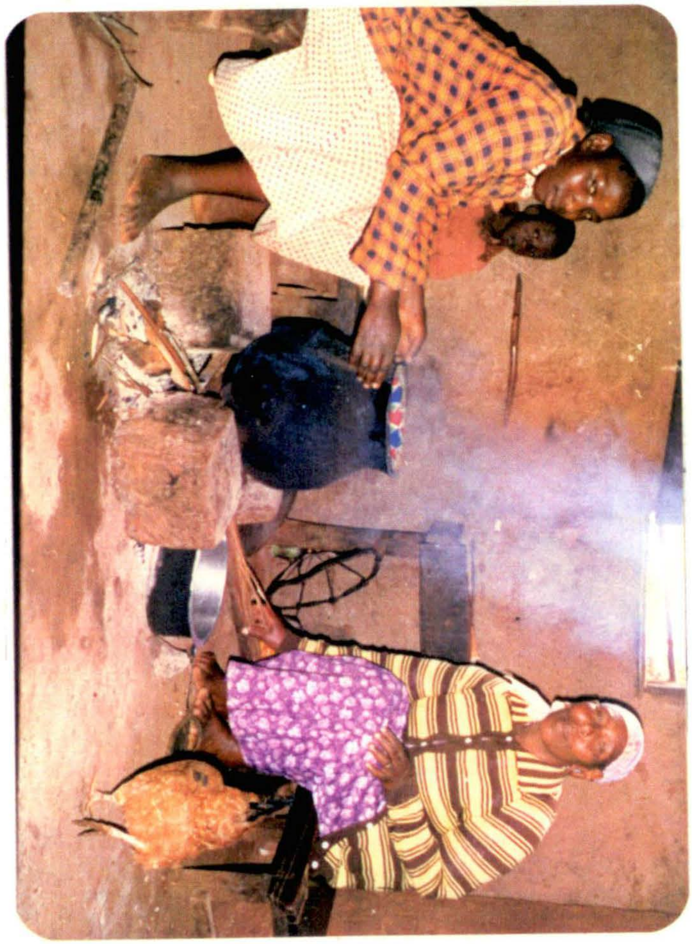


PLATE 16
A traditional open three stone cooking stove. Food can be prepared and at the same time water boiled for tea or porridge. It is also a source of heating for the house and a social focus point for the family.

Source: Author.

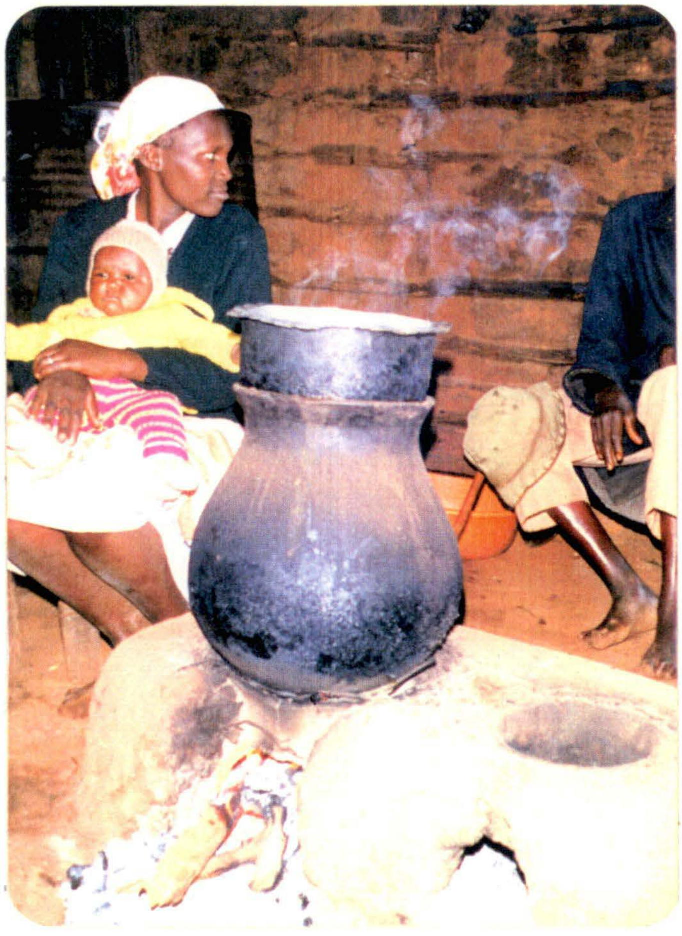


PLATE 17
An improved open fire stove, which takes care of all the end - uses of the traditional open fire stove.

Source: Author.

Fourth, narrow range of usefulness.The principle interest of the improved jiko is fuel or thermal efficiency. Important as this is, it can only be achieved if the more diverse values of the user are first satisfied. In the Mai-ai-ihii village community, the traditional open fire, as earlier described, is used for cooking, rapid boiling, lighting, space heating, maintenance of thatch, reducing of insect populations, preserving and flavouring food and providing a social focus. The improved jiko design closes the combustion chamber in order to improve the thermal efficiency in cooking at the expense of many of these uses.

Purchase of Firewood/Charcoal From the Market and Individuals

Sale of fuelwood and charcoal is undertaken by either the individuals who have a surplus on their farms or have become wood and charcoal traders and have their supplies from nearby Muguga and Thogoto forests or even from distant places for sale in nearby towns.

This option faces some same problems of cost and male control over expenditure as the improved jiko.

The commodification of firewood energy related products also necessitates the cutting of more trees or the growing of exotic trees (like eucalyptus) to maximize returns from the trade. Ecologically, this is destructive as increased deforestation in the absence of sound land use management brings in its wake soil erosion problems, which lowers the land carrying capacity. Growing of exotic trees like Eucalyptus (Munyua Mai) in the long run lowers the area's water table thus further degrading the environment (F.A.O., 1986).

In the traditional setting, many mechanisms existed to support the reproduction of life, fuelwood being one. The penetration of market mechanism in the sale of wood related products has eroded a relative healthy balance within the community where people supported each other. Those, who, because of lack of income do not fall within the market nexus of willing buyer and seller face serious hardship. They have to find alternative means of satisfying their fuelwood energy needs through either selling their labour, more travelling or poaching in government forest reserves.

Planting of Trees On Individual Farms.

This is the third option available at household level in the effort to meet the fuelwood energy needs.

Data from field survey revealed that the village community has responded very well by increasing the woody biomass on the farms.

Table No. 26

Woody Biomass Plantation

Where Trees Are Planted	No.of Household	% Total/Households
Round the House	42	40%
Hedge Along Boundary Fence	25	25%
Individual Farm Woodlot	14	15%
Combination of All Three Above	14	15%
On Cropland	5	5%
TOTAL	105	100%

Source: Author: Field Survey.

For the purpose of government intervention in terms of agro-forestry or rural afforestation, the preceding analysis is important to bear in mind.

PLATE 18
A plantation of trees at the edge of the farm to provide timber for house construction, fuelwood and also as windbreaker thus preventing soil erosion.

Source: Author.

Plate 19
Intercropping of maize with tree species that not only provide fuelwood but also soil nutrients, shade and a check against soil erosion.

Source: Author.

PLATE 20
Notice the trees grown around the house for shade, source of building materials and fuelwood energy.

Source: Author

PLATE 21
Even in traditional homesteads, people's awareness of the importance of trees in their daily lives is very high as evidenced above.

Source: Author.

It reveals that the package of government afforestation efforts should consider what the farmers have been able to do for themselves and how this can be used to stimulate them to do more. In a community like Mai-ai-ihii, the message should go further than merely telling farmers to plant trees, it should concentrate on how to accommodate tree planting in the land/spaces budget and choosing appropriate tree species. The statistics on source of seedlings reveal, for example, that, as many as 50% of the households get seedlings from their nurseries indicating that this category of farmers, in the event of agroforestry or afforestation programme, would need the seeds than the seedlings because they are already a step ahead. In fact, among the problems identified by the respondents were the difficulty in obtaining seeds and because the government nurseries were too far.

Other added advantages of this option apart from its popularity include:

First, environmentally, increase in vegetation serves as a check against soil erosion.

Second, socially, trees also provide other household needs like building poles, animal fodder and shade.

Third, technologically, no elaborate skills are required and it relies very much on local indigenous knowledge. It can be developed further with the assistance of modern science, which can aid in seed propagation etc.

One of the drawbacks of this option is again male dominance over decisions about trees. Although fuelwood procurement and use is mainly a female task, men retain the upper hand in deciding what type of trees are to be grown, where the use and when the trees are to be cut. In particular, there is a strict male domination and control of economic oriented trees (especially Eucalyptus and Grevillea). Thus, there would in most cases be abundant trees physically but access is limited by male domination.

Secondly, this option is best suited to those families with relatively big farms as they do not face stiff land use competition compared with those with small farms or no land. The latter still face problems, as other pressing needs of the family especially food have to be met. Unlike the past, when the well placed members would assist those in need, the needy now have either to work on the farms of those who have enough, in order to get fuelwood in return, or they simply have to resort to buying, walking long distances or scavenging on government forest reserves.

Interfuel Substitution

This is the fourth available option available in meeting household fuelwood energy needs in Mai-ai-ihii. Because of the dwindling fuelwood resources, the community members have had to switch to other energy alternatives notably paraffin, and liquid petro gas (LPG).

Positive attributes of this option include:

i) they reduce the drudgery especially of women in the procurement of fuelwood

ii) the saved time can be used in carrying out other household chores, and

iii) environmental degradation resulting from deforestation can be halted.

Despite the above positive aspects, this option suffers from many of the serious drawbacks mentioned earlier. Poor families cannot afford the cash outlay: a kerosene cooker costs Kshs.540; a 13 Kg

L.P.G bottled gas cost Kshs. 2200 (Field Survey).

Second, these fuels are only useful for cooking, and therefore suffer the same socio-cultural drawbacks as improved jikos.

Finally, the use of these technologies has a major import content from outside Kenya. We have no local oil resources at the moment. Import of petroleum products not only erode our meagre foreign exchange reserves, which retards development but also the supply of these products is unreliable. The latter factor makes traders take advantage of scarcity and charge exorbitant prices, out of the reach of majority of the members of the society.

B: The Role Of The State

This is the second major avenue through which the villagers meet their fuelwood energy needs. It comes in two ways:

a) Sale of firewood and charcoal from the nearby forest reserves and

b) State afforestation programme efforts through extension officers.

The first state programme aids in supplementing household's fuelwood supply by providing extra supplies from the forests. An evaluation of this alternative based on the proceeding framework reveals the following: First, in terms of access, the forestry department favours big forest industrial concerns at the expense of the local villagers, through the denial of licenses to cut trees to the latter (Oral Interviews). This state of affairs has created much resentment among the villagers.

The local community considers Muguga and Ngong forest reserves as a God-given common resource to which they have a right of access. This fact should not be ignored but as a matter of policy the local community should be provided for in an attempt to conserve such resources. In other areas of the world this kind of arrangement has worked very well (Leach, 1987). An interview with the Forest office in Muguga seemed to suggest that the local citizens were allowed to collect fuelwood, especially deadwood, from the forest, but many respondents complained of harassment by the forest guards and in some instances have to run for their lives (Field survey).

The second option by the state involves encouraging farmers to plant trees on their individual farm holdings. This is effected through provision of seedlings and technical advice to farmers. The exercise, if successfully carried out, has some positive attributes especially in the area of environmental conservation and the provision of fuelwood and other wood related household needs like building posts. It also would make it affordable for farmers to prepare these products for they are grown on the farm.

However, this programme suffers from the following drawbacks.

First, over the years, the species of trees the government offers for planting are exotic (Eucalyptus mainly). This emphasis has been due to their quick growth and their income generating potential. Despite this, these trees are very destructive ecologically for they consume a lot of water and thus lower the water table. Second, due to their income generation attribute, they remain the property of men who, control the income of the household. Thus, this government programme reinforces gender inequality.

Second, the training programmes at the research centres are largely designed by men and mainly for men. Thus land-use practices become male-dominated and women are at the receiving end only to swallow information and directives from their husbands- instead of effectively participating in these programmes.

The Community Approach: The Karai Women Agroforestry Project

Mai-ai-ihii community is kin-based and despite the serious transformation due to forces of privatization of land and increasing individualism, elements of the moral economy that allow mutual aid persists to various degrees. It is not unusual for a family member to offer fuelwood in case of extreme needs. The co-operative spirit is very strong among women-through such formalized avenues like church-groups, farming groups (Itati); housing groups (mabati); and child support groups (Matega).

It is with this spirit of solidarity that the communal woodlot described in the following pages was founded.
As one woman puts it:

> 'We women have for years been literally risking our lives by endlessly breaking our backs collecting fuelwood, water, toiling on the farm not to mention child bearing and rearing'. - Wanjiru wa Kiongo - Peasant mother

Realizing their plight, the women of Mai-ai-ihii village and four other neighbouring villages, which constitute the larger Administrative Unit called Karai location decided not be passive to the forces adversely affecting their lives and families. There was a clear need to try to alleviate the fuelwood energy problem before it got completely out of hand.

Brief History of the Project

The project is situated at approximately ten (10) kilometres west of Mai-ai-ihii village. This is a part of a hitherto dry-lake bed on the leeward side of Ngong Hills a very dry area.

The total area of the project is slightly over 200 hectares. As of 1989, it was serving a catchment population of about 250 household (approximately 1,750 people).

The project was initiated in 1981 through the assistance of a non-governmental organization movement - the Greenbelt movement.

Initially about 300 women from the four villages approached the central government for permission to use the dry lake areas as an agroforestry project. The administration without much hesitation gave its permission to the villages for use of this hitherto unused barren land.

Greening of the Dry-Lake Bed

The basic ideological premise of the Green Belt Movement according to one of its members is:

> "that women and the poor for generations have been excluded from decision making, oppressed by conditions of poverty, disabled from understanding existing reality and paralysed by a culture of silence and very real climate of fear . In this context, people participation in an effort to change the status quo, is held to be the most effective means

through which development can be achieved. It is the first stage in overcoming these conditions so that people can stand up to defend themselves and later wield power to determine their future". (Wangari Mathai)

The movement's vision of a more desirable society is not through easy academic appeals to generalizations about peoples' power and popular participation, but has a requirement to proceed from critique of the existing situation into a better future based on action, i.e. praxis. Field survey (Oral Interview).

The first step in the greening effect was to create a framework for meaningful and effective participation by the community. To achieve this, a deliberate effort was made to present the rationale of the energy project at a series of meetings (Barazas) with the community and the central administration. An attempt was made to incorporate opinions of women, men and the village elders. The administration was represented by the subchiefs, village level extension workers, such as soil conservation assistants, junior agricultural extension offices, junior technicians' from Ministry of Livestock and junior forest officers. Debate was facilitated by the formation of various committees.

This approach was adopted partly to win the confidence of the community by removing any suspicious of the outsiders, which made the discussion of the fuelwood energy problem in the context of rural development more fruitful.

The discussions emphasized certain specific topics:
First, the nature of the fuelwood problem was defined in terms of cost involved in labour, time and money spent in the procurement of firewood.

Second, the problems the community is experiencing because of this shortage were to be discussed and also ways of coping with the problem were to be debated.

Third, discussions were held on how to promote self-reliance instead of fostering the so-called aid mentality through tapping people's own experience and accumulated knowledge.

Fourth, the role of external actors, if any, in solving the problem was outlined.

Fifth, evaluation of existing traditional internal organizations and viewpoints to facilitate adoption of new technologies was carried out. Gender relations in terms of fuelwood and other domestic were discussed in a free atmosphere. Sensitivity was high among men that women truly bear the drudgery of rural work.

As one of them remarked.

> 'We need energy in order to improve the future of our children. Our wives spend every hour from the moment the cock crows till eight or nine in the evening cooking, cultivating, fetching for fuelwood and water, caring for children and us. We the men should show more concern by assisting in some of these tasks. Times have changed and we should not be ashamed to perform these tasks hand in hand with our wives and families. By saving on their labour, they will be able to get relaxation or be involved in some activities' like adult education programmes, nutrition programmes, small scale off-farm projects, which can earn extra incomes to supplement the meagre incomes we are getting now etc. ' (Wachuhi wa Muriu - Peasant farmer).

The outcome of these meetings was a strategy reached through a protracted process that had the following main elements:
First, that the conventional forestry approaches (where only trees selected by extension workers in research stations), were not to be applied in the task of 'greening' the Karai lakebed area. In its stead, an integrated approach to fuelwood supply that incorporated other aspects of the needs of the people, especially food, was to be adopted. Trees were side by side with other crops.

Second, local knowledge of agricultural systems, especially the type of vegetation that were in existence in the past, was tapped and applied. Oral interviews were carried out with the old generation (wazee) of the area to gather and form this scientific data base. Seedlings of selected tree species were procured

from the Government nurseries initially, but finally the community was to develop its own nursery on the farm.
Third, decision making for the project was not to be segmented along gender lines but would incorporate the views of both male and female.

Fourth, labour on the farm was provided by both off-farm employed men (during weekends) and unemployed men and women during weekdays.

Fifth, personnel from the Movement and the Government were to work in solidarity with the community and not for them. Toward the end, the project was to be left under the full command of the villagers. This was to safeguard against creating a new bureaucracy, which would stifle the local initiative.

Sixth, resources derived from the project were shared equitably, with the labour hours spent on the project being the main basis of how much each individual household would get. With these understandings, the project took off.

Evaluation of the project since its inception in 1981 reveals the following:

First, in terms of access to fuelwood, the Karai Agro-forestry project has made it possible for many poor households to obtain firewood[1]. Other added benefits include the acquisition of building poles, which have started to be harvested; access to extra food supplies - maize and beans, which are available after the short and long rains. Livestock also has benefitted as the crop residues and branches of the trees are now being used as fodder.

Second, in terms of right of use, both men and women have full right of use of the benefits of the programme. In decision making on what to grow, when and what to harvest, women's and men's opinions are equally considered and decision reached are based on a consensus without any intimidations. The benefits accruing from the project are shared based on the hours an individual family has spent on the project and not based on sex.

Third, on the issue of inheritance, the death of a male in a household does not affect the family's participation in the project. The woman continues to be recognized as owner of the family rights and upon her death these rights are passed on to the older daughters and sons.

Fourth, the project to a large extent address itself to the multiple needs of the community. The trees grown, mainly Mikima (croton) and Mibau (grevillia), are indigenous and in conformity with the local physical environment; land is now being rehabilitated and labour for the project is not only adequate but is equally divided along gender lines. The project provides added food supplies, fodder for animals and building materials. Thus the project meets increasing local needs.

Fifth, the technology involved in this project is simple, and builds on local knowledge. Although propagation of seeds is done by forest officers, the selection of variety of seeds to be grown involves members of the village. With increased participation, the community will be able to handle the tree nursery on their own. Outside assistance is therefore not commandist in nature but participatorial. In terms of equality, the disadvantaged members of the community (old, sick,) are sympathized with and fuelwood is delivered to them free of charge.

All in all, the project has heightened local perception of a critical need, which touches on other aspects of community welfare. This has facilitated the creation of a degree of political organization within the community to facilitate effective management. Local control has been emphasized throughout the life of the project and decision making at all levels has incorporated the views of the local people.

Over and above all else, the project has aided in a gradual restoration of community cohesiveness due to its co-operative nature. The project has addressed fairly the gender issue in a hitherto rigid male -dominated community.

Responsibilities have been shared in decision making through barazas (public meetings) where issues related to the project are discussed at length and a consensus reached. Each family is represented by a member- either father, wife, elder son or daughter. This sense of sharing responsibilities in decision making has paid off very well since the inception of the project as it has heightened interest. A short verse sung by some school children from one of the local primary schools is a fitting tribute:

> 'Ngũ riũ ciunagwo hakuhi na kwa ũingi matara maitu riu
> ni maiyũru, ii minoga ya a maitu,
> Ni undu wa thina wa ngũ riu ni munyinyi' (Gicharani Primary School)
>
> 'Firewood is now obtained nearby and in plenty,
> Our firewood stores are now full,
> Yes, our mothers burden due to firewood problem are now minimum'

The project suggests that answer to the fuelwood crisis in rural settings such as Mai-ai-ihii village lies in the ability of the people to have access to the resource base through their capacity in designing and controlling their lives, with constructive support from the state and other outsiders. For a long time, this energy has not been recognised, leave alone being used.

NOTES

1. Membership has risen from the initial fifty three (53) households in 1978 to more than two hundred and fifty (250) in 1989 - Source: Field Survey.

CHAPTER SEVEN

CONCLUSION

7.1 Re-casting the research problem

This research project has been an attempt to examine, in a holistic manner, the factors which determine and relate to the woodfuel crisis and its resolution in a rural community- Mai-ai-ihii village in Kenya.

7.2 Methodology followed:

In response to the stated problem and the broad objectives, the following methodology was developed. First, secondary data on the previous work in the area was explored and government policies and programmes were examined. This involved the review of local and international literature related to the fuelwood energy problem.

Second, the history of the area was assembled based upon literature review, archival research and oral interviews with the local community, especially the elders.

Third, a general environmental description of the area was carried out based upon field visits, participant observations and use of photography. An inventory of existing bio-physical, land-use and socio-economic information was assembled.

Fourth, a questionnaire was administered to all the 105 households within the village. The process involved, first carrying out a pilot survey, refining the same and finally administering the final questionnaire.

Finally, the secondary and primary data was assembled and analyzed using descriptive and inferential statistics to throw light on the key questions raised in the study objectives.

7.3 Principal Findings/Summary

The principal findings of this project can be summarized as follows:

First, the fuelwood needs in the village are basic and inter-relate with other basic needs like food production, child development, education etc.

Second, deforestation in the form of a physical crisis of fuelwood supply brings with it distortion in the family cash and labour budgets, land use and a combination of increasing problems of access resulting into a serious socio-environmental crisis.

Third, the fuelwood crisis is essentially a women's problem for they shoulder the main burden. One cannot, therefore, discuss the fuelwood problem by ignoring the gender issue.
Fourth, a rapid increase in population has pushed fuel requirement swiftly past the critical levels.

Fifth, the fuelwood energy crisis is a consequence of the transformation from a communal or subsistent economy into a market economy.

Sixth, the fuelwood affects the poorer sections of the population more and is now a real threat to their quality of life and not just an inconvenience.

Seventh, fuelwood scarcity has far reaching consequences like failing to cook food adequately, reducing the numbers of hot meals served per day and avoiding foodstuffs requiring lengthy cooking. Such actions have negative implications on the nutrition, health and hygiene of the people especially the most vulnerable - children.

Fuelwood scarcity is also associated with physical and economic burdens. As the supply sources become more depleted, villagers have now to travel long distances to reach new fuelwood supply sources. The fuelwood gatherers mainly being women and children become subjected to terrible strain in both walking and carrying the wood. Simultaneously, such labour is diverted from more productive alternatives like farming and domestic chores. School children do not have adequate time to attend to their school work and adults cannot be able to attend adult education classes.

Eighth, if measures based on community experience in coping with the problem are not urgently implemented, the fuelwood shortage, based on projected trend, will get more pronounced in the future. Gas and kerosene will remain too expensive and adjusted or alternative energies like biogas, electricity, solar and windpower will call for higher investments and, therefore, in the really poor sections of the community be slow to diffuse.

Finally, based on the preceding factor re-afforestation, fuelwood plantations and communal schemes of forest management came out as the most promising ways out but their successful use requires difficult changes in mentality, land ownership and government policy.

7.4 Key issues of contention and what the research suggests/recommendations

From the preceding analysis, the study raises the following key issues as they relate to the fuelwood problem:

The first contention is that the fuelwood energy problem in Mai-ai-ihii is a symptom of the underlying crisis i.e. poverty or underdevelopment, which, to a large extent, is a consequence of two main factors : transformation from a communal or subsistent economy into a market economy and a rapid population growth, which exerts severe pressure on the available resources.

Poverty as argued earlier, has a bearing on the inaccessibility to energy to quite a sizeable section of the villagers. To improve this situation, the state has to introduce programmes aimed at improving productivity and security for the poorer members of the community. A programmatic fuelwood plan must be carried out within the overall framework of a national commitment to basic needs satisfaction and redistribution with growth. The internal logic of national goals would suggest direct state involvement in both production and distribution at strategic point. Such involvement would include inter alia the combination of rural public works in afforestation, road building, dip construction etc; some basic needs subsidy for the poorest groups (e.g., waiver of school fees, health fees etc.) In such basic needs and redistribution context, the energy plan would have a better chance of enhancing accessible supply of energy needs to the community.

Second, in the settlement policies, the state can influence positive accessibility to fuelwood needs by allowing the villagers to selectively harvest forest produce from the nearby Government Forest Reserves (Ngong and Muguga). It is true that the Government has a duty to protect the natural environment for the benefit of the entire society and not only Mai-ai-ihii villagers. However, ways and means exist that can be implemented to ensure that the harvesting of forest products (twigs, old trees) can be done in a sustainable manner. This would, on one hand, enhance the image of the Government in the eyes of the community and secondly, the community would reciprocate by treating a forest reserve as their good and discard such practices like the 'rational poaching' of the forest products without any due care.

Third, in the field of forest management, the State through its various arms - the Forest Department, Agricultural Department, Department of Applied Sciences and Technology- can increase energy supplies through proper dissemination of knowledge relevant to local situations.
It is imperative to repeat the earlier warning that the Government and Non governmental field officers must strip

themselves of all the arrogance and criticism and be humble to engage in dialogue with the local community in trying to arrive at the optimum solutions for the energy problem. This calls for shedding away of the top-down management to social planning.

PLATE 22
Young girls doing 'rational' poaching in nearby government forest reserves to supplement fuelwood energy at home.

Source: Author.

Local knowledge should be tapped and built on rather than be discarded altogether. Past traditional land-use systems must be given their proper place in land-use planning to increase fuelwood.

Supply of wood resources can also be enhanced through dissemination of appropriate technology on soil conservation, afforestation and water-shed management.

We argue that because of the irreversible process of land adjudication and the consequent privatization of land, farm forestry is the best option to follow to alleviate the pressing woodfuel shortage at the farm (household) level. This option builds upon existing initiatives, knowledge and practices at the household level. Decision making on new initiatives or a re-evaluation of the old is already being carried out at the household level. Solutions are, therefore, bound to comply with actual felt needs.

Woodfuel demand can be mitigated through the introduction of energy-saving devices, which build upon the traditional ways of cooking and the social uses of energy.
Inter fuel substitution (use of biogas, solar, electricity etc.) should take the above criterion into account.

To untie the yoke of the energy crisis, the community has to re-evaluate the in-built constraints within itself. These are briefly discussed below.

Socio/Cultural

It was argued earlier that the fuelwood crisis is essentially a women's problem. Yet, despite this, decisions on energy issues (who plants trees, when to cut them and from where etc.) have long been viewed as basically men's. Awareness should be encouraged through such media as peoples' theatre to demonstrate that the energy problem is a total family issue and not segmented at the social expense of dominating and subordinating the womenfolk. Such a programme has been carried out by the Kenya Woodfuel Programme (K.W.D.P.) for some communities in Western Kenya with very successful results in shedding these inhibiting cultural barriers. As a result of these programmes women now in most cases jointly with men select tree seedlings, plant them and share also in deciding when, how and what to cut them for. (See Appendix).

Second, although land privatization through the process of land adjudication has greatly affected fuelwood availability, an attempt should be made to re-kindle the spirit of community solidarity through encouraging the moral economy where the more advantaged group(s) in the community assist others. The people with more land and, therefore, more biomass should help the less fortunate even if the latter have to offer their services on an equitable basis to the former. The elderly and handicapped members of the society should be helped in getting fuelwood. In the past, as described earlier, young members of the community used to be morally compelled to spend some of their spare time in supplying this disadvantaged group with such basic needs like fuelwood, water, repair of houses, cooking and even washing them. All is not lost. Kinship co-operation can be resurrected if the assistance of elders is sought.

Third, the community should be aware that they are in charge of their physical environment, which is the biological bank of their woodfuel needs. Either on the individual farms or in communal woodlot (like the Karai one discussed earlier) land-use practices should be in harmony with the conservation of the natural environment. Interaction with the state in this effect to learn the new and appropriate technologies should be encouraged.

The above suggestions are inherently political as they deal with the issue of allocation of resources and are also open-ended. They form a terrain on which peoples' struggle can take place in an effort to transform their lives in the right direction. Graphically, the issues raised above can be put in the following manner:

ELEMENTS OF AN ENERGY PLAN FOR MAI-AI-IHII VILLAGE

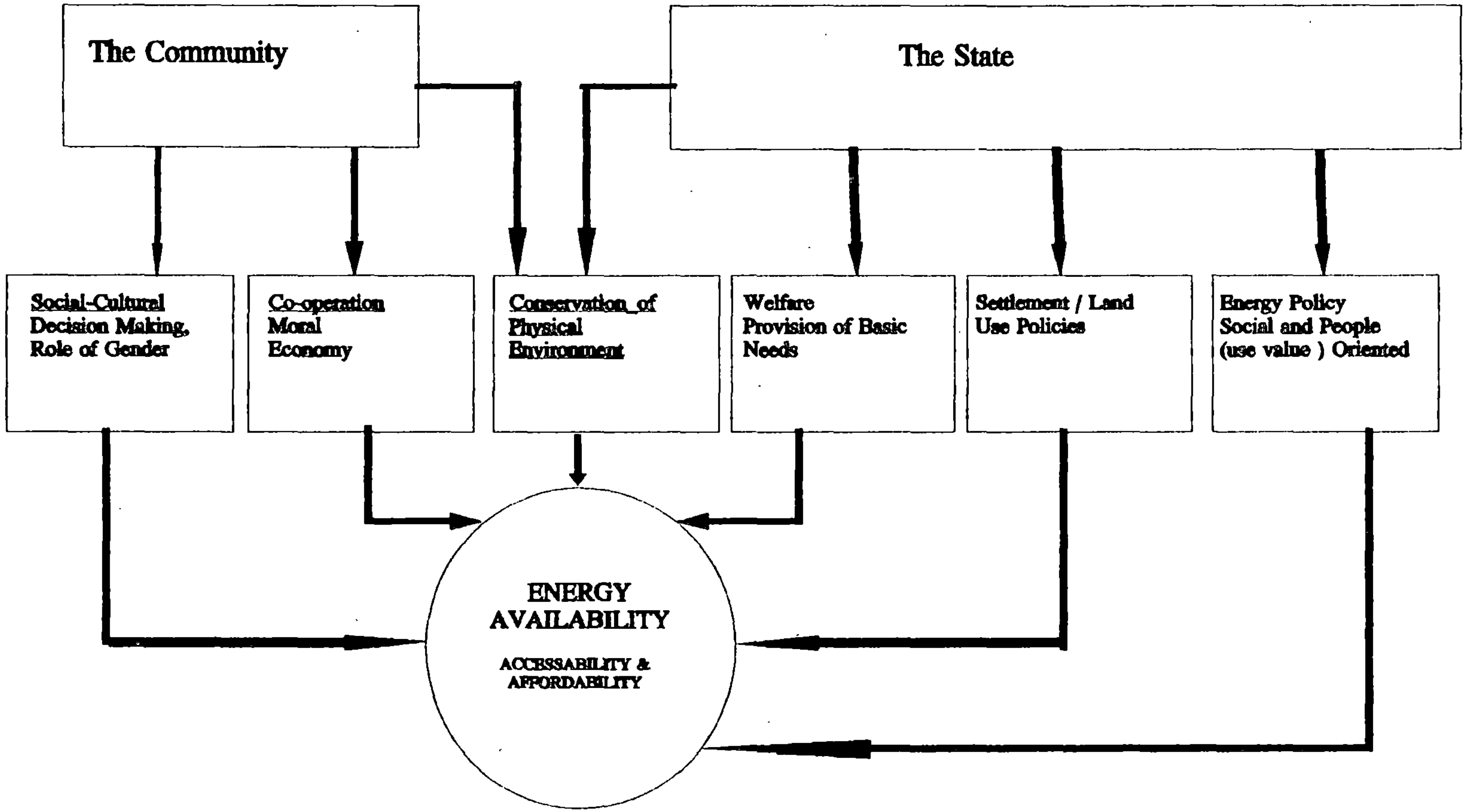


FIGURE 12

7.5 CONCLUSION

Over the past fifteen years, large policy planning and donor aid structures have been created and hundreds of millions of dollars committed to addressing the woodfuel crisis directly as a problem of energy supply and demand. This issue appeared quite simple and the remedies self-evident. Where trees and woodfuel were "scarce" or getting "scarcer" many direct solutions seemed to offer a good chance of quickly bringing forests and woodlands, woodfuel supplies and woodfuel demand into balance. This would both improve welfare by reducing the costs of obtaining fuels and "save the trees."

Government and foresters set about trying to protect public forests and woodlands from encroachment by woodfuel cutters. Foresters tried to increase woodfuel supplies with peri-urban plantations and village energy woodlots. Energy ministries tried to curb rising consumption by promoting more energy-efficient cooking stoves, or reducing pressure on the forests with more efficient charcoal kilns. Attempts to promote the use of oil and electricity instead of woodfuel became key elements of African and other Third World energy strategies (Leach, opp. cit.)

While there have been a few successes with these energy-focused effort, most have failed to turn the tide of wood depletion or prevent growing fuel scarcity. But as one expensive disappointment has led to another and simple certainties have begun to evaporate, important lessons are now being learned.

We have attempted in this study to show that many of the most basic assumptions on which these efforts are based are false or highly misleading: for instance, that the use of woodfuels is normally the principal cause of deforestation. The issue is viewed in a compartmentalized form separating community life, fuelwood energy and the environment. Such approach, as argued here, is misleading for the three elements are inter-related.

At the same time, it is now increasingly recognized that by focusing so closely on woodfuels and the symptoms of their scarcity, these direct approaches look only at the tip of the proverbial iceberg and ignore the much broader and deeper strains in the environmental, social economics and political fabric of which woodfuel scarcity is only one manifestation. They obscure the fact that woodfuels are only one of many basic needs and their provision - for example by "tree growing" - is only one aspect of household coping strategies and land-use systems on the farm or in the village. Indeed, these top-down and over-specialized approaches often fail to notice that, in many places, rural (and urban) people are already responding to woodfuel and other land-use stresses in ways that are imaginative, innovative and with far lower cost than most project interventions.

The view of woodfuels, which emerges from this study, recognizes that there are no single, simple answers and that the problems surrounding them are inseparably linked to the complex, diverse, extreme dynamic and multi-sectoral issues underlying the broader underdevelopment crisis of population, food poverty, land and natural resource management. Equally, successful remedies for woodfuel problems must be firmly rooted in these broader contexts. In particular, if planning, projects of other types of intervention are to create lasting successes they must recognize at least three basic factors:

1. The need for local assessments and actions and the unhelpful nature of adopting outside tailored projects. The "landscapes" and "peoplescapes" are extremely diverse and problems are location-specific and, therefore, opportunities to solve them are specific to place and to social groups in each case.

2. The need for indirect approaches to woodfuel issues and greater participation by local people at every stage to help them to prioritize and solve their problems. This follows from the

first point, and from the fact that success normally depends on starting and strengthening processes rather than delivering technical packages: on "how" rather than "what" things are done;

3. The need for decentralized and multi-disciplinary approaches, including the use of competent and trusted "grassroots" agencies, to facilitate the two points.

The actual implementation of such a "bottom-up" approach (Friedmann, 1979) or rural participatory rural energy planning process raises critical issues of implementation.

First of all, planners (usually men) would have to deal with directly and in depth with rural women. This has not been part of planning experience in the past. Dialogue has to be facilitated with the existing womens' groups in the context of which many rural women have been gaining self-confidence in making their needs and ideas known.

Second, the planning process has to be initiated and take place at the village level as opposed to the existing practice where plans are hatched in a distant city or district headquarters.

7.6 Areas for further research

During this study, the following areas appeared to warrant further research to enrich more the understanding of the fuelwood problem and how to resolve it.

First, research should be carried out to unearth the considerable localized environmental and socio-economic understanding that is extremely useful to planners to incorporate the same into local development strategies. For instance, knowledge concerning the properties and use of local trees, the most effective modes of local trees propagation, the disease and pest vulnerability in seedling and problems associated with using existing government tree nurseries should be investigated to formulate appropriate forest management programmes.

Second, the issue of cooperative groups especially among women, should be researched further as it forms the natural communal bedrock of sharing work and resources. Cooperative groups in form of mutual aid teams and formalized self-help groups is widespread in Kenya but has not received significant attention especially by scholars. Such groups seem to offer the greatest potential for supporting initiatives in supply enhancement (e.g., co-operative woodlot or tree nurseries) or demand mitigation (e.g. construction of improved stoves in one another's houses). Such groups seem to have important features that fit fuelwood activities. First, they are highly local and participatory. Second, they are flexible and tend to go from one project to another. Third, they involve women, that is, the group that bears the burden of fuelwood procurement. Finally, any cash returns go directly to women and thus into the basic needs funds, unlike the financial rewards associated with mixed male-female or household targeted projects.

APPENDICES

MAI-AI-IHII VILLAGE FUELWOOD ENERGY SURVEY

GENERAL INFORMATION

1. Name of village --
2. Respondent male or female ------------------------------
3. Respondent head of household, Yes/No--------------------
4. Occupation type
   a) Husband----------------
   b) Wife -------------------
5. Place of employment
   a) Husband-----------------
   b) Wife -------------------
6. Estimated total income per month Kshs --------------
7. Household size -------------------

   ages -------------------

LAND USE

8. Is your land
   a) Your land----------------------
   b) Bought-----------------------
   c) Rent -----------------------

d) Inherited ---------------------

e) Squatted ----------------------

9. Do you have a title deed for your land Yes/No. ---

10. Total acreage of farm ------------------------

11. Acreage under:

a) Crops ---------------

b) Grazing/pasture---------------

c) Trees/agro-forestry ----------

d) Non arable ------------------

12. Most important crops on farm:

a) Cash Crops ------------, ----------,-----------

b) Subsistence Crops: --------,----------,---------

c) What are your yields for the most important cash crop-

---,

yield -

-

crop -----------, yield --------------

d) What are your yields for the 3 most important

subsistence crops?

crop------------, yield -------------

crop -----------, yield -------------

crop -----------, yield -------------

13. Do you intercrop? Yes/No ------------------

which crops ------------------------------

and --------------------------------------

14. Type of livestock kept on farm:

(a) Exotic and cross-breeds -----------------------

(b) Local breeds/Number ---------------------------

(c) Goats and sheep/Number ------------------------

(d) Any other (specify) ---------------------------

15. (i) Do you practise zero grazing Yes/No ----------

(ii) If yes, what are the sources of fodder --------

----

16. Where do you graze your livestock

(a) Own farm --------------------------------------

(b) Along the road or around the village -----------

(c) Neighbours' farms -----------------------------

(d) Government Forest -----------------------------

(e) Any other (specify) ---------------------------

17. (a) Is this where you have always grazed Yes/No

(b) If No, specify where and reason for the change of grazing area

----

----

18. Sources of information on crop planting and livestock keeping

(a) Own experience -----------------------------------

(b) Neighbour ---

(c) Agricultural extension officer -----------------

(d) Others (specify) --------------------------------

19. If Agricultural Extension officer, how many times in a year does he visit you

----

20. Marketing of farm produce

(a) Individually

(b) Cooperative

21. Means of transporting farm produce to and from market

----

22. What are the main problems encountered on the farm?

1. --

2. --

3. --

23. Suggest possible solutions to these problems -------

ENERGY SUPPLY, PRODUCTION AND CONSUMPTION

24. (a) What are the main meals eaten:

For Breakfast ----------------------------------

Lunch ---

Supper --

(b) Which of the meals mentioned (in 'a') takes the longest time to prepare

----

(c) Explain why it takes the longest time ----------

----

25. Which meal (food) is most preferred ----------------

Explain why it is most preferred -------------------

----

26. What is the form of energy supply for:

CookingHeatingLighting(a) Charcoal

(b) Fuelwood

(c) Kerosene

(d) Others (specify)

27. Of the following which do you use for cooking?

(a) Three stone hearth (open fire) -----------------

(b) Ordinary jiko ----------------------------------

(c) Energy saving jiko -----------------------------

(d) Kerosene stove ----------------------------------

(e) Others (specify) --------------------------------

28. (i) Where do you get your fuelwood?

(a) Own farm --

(b) Neighbours' farm --------------------------------

(c) Around the village ------------------------------

(d) Government Forest -------------------------------

(e) Buy from market ---------------------------------

(f) Other (specify) ---------------------------------

(ii) If (d) how far is it from home ------------ Km.

How long does it take to and from the forest?

(iii) If (e) How much do you spend in a day --------

in a week -------

(iv) How long does it take in a day to collect firewood?

----

29. (i) What problems are encountered in the procurement of fuelwood?

1. ---

2. ---

3. ---

(ii) Suggest possible solutions

1. ---

2. --

3. --

30. Where trees are grown:

(a) Cropland

(b) Hedge

(c) Woodlot

(d) Round the House

(e) Other (specify)

31. Main tree species on the farm and their uses:

Species --------------------- Uses ---------------

Species --------------------- Uses ---------------

Species --------------------- Uses ---------------

Species --------------------- Uses ---------------

32. Who plants trees:

(a) Husband

(b) Wife

(c) Children

(d) Others (specify)

33. Sources of information on tree planting:

(a) Own experience

(b) Neighbour

(c) Government officer

(d) Baraza

(e) Other (specify)

34. Sources of seedlings:

(a) Own nursery

(b) Given by neighbour

(c) Collect wildlings

(d) Government nurseries

(e) Others (specify)

35. (a) Do you encounter problems in getting seedlings? Yes/No

(b) If Yes, list the problems

1. ---

2. ---

3. ---

(c) Suggest possible solutions to these problems

1. ---

2. ---

3. ---

36. (a) Did you cut any trees on your farm

(i) in the last 1 week Yes/No ---------------

(ii) in the last 1 month Yes/No --------------

(iii) in the last 3 or so months Yes/No -------

(b) If Yes, for what specific purpose did you cut them (or it) ---

----

(ii) If for firewood, which part of the trees was used for fuelwood

----

(iii) Who made the decision to cut the tree(s)

(a) Husband

(b) Wife

(c) Other (specify)

37. During the time for planting crops who decides on :

(a) What to plant? ----------------------------------

(b) Where to plant it? ------------------------------

38. (a) Have you sold any item in your household (e.g. a cow, hen or sheep) in the last 1 week or month or two month Yes/No --

(b) If Yes, why did you sell it? --------------------

----

39. (a) In your opinion, what are the main problems encountered by the people in this area? (list in order of importance)

1. --

2. --

3. --

40. Other information not covered by the questionnaire

MOTO MWAKA PROJECT

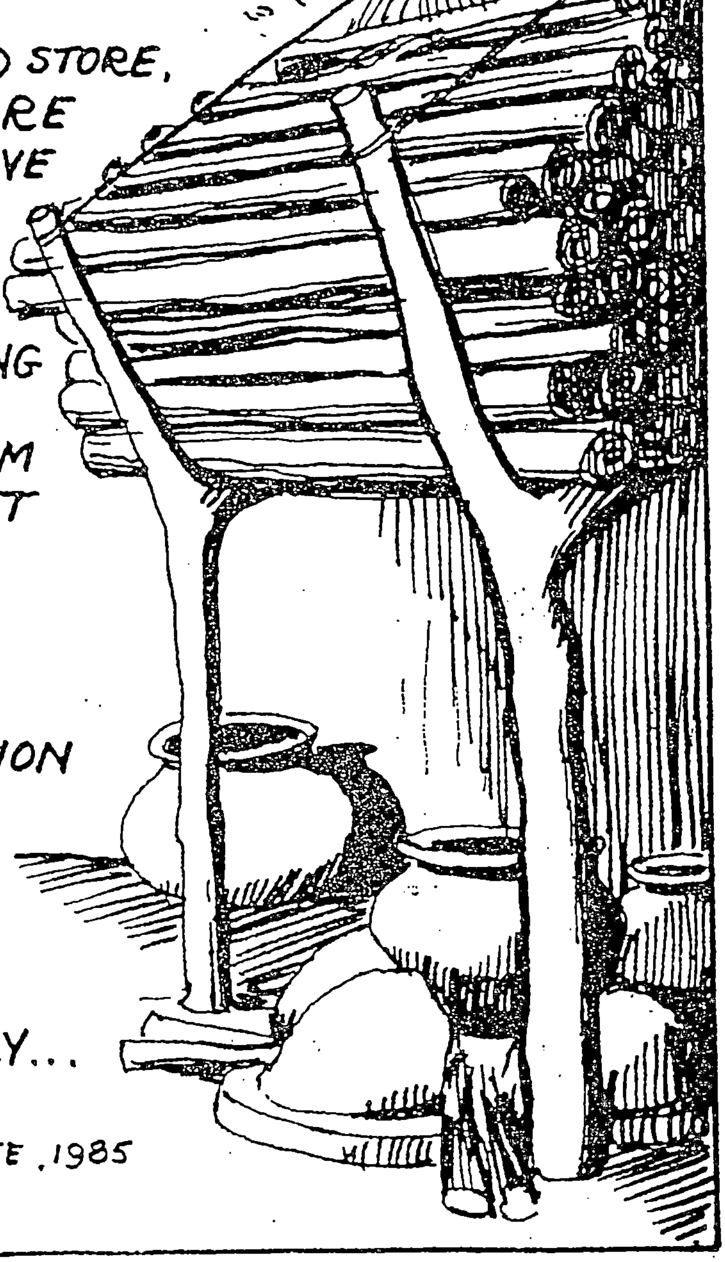

...SO, FIREWOOD CAN WRECK A HOME?

PROLOGUE

SINCE OLDEN TIMES, IN WESTERN KENYA, WOMEN STORED FIREWOOD IN 'LILUNGO', SO THAT THERE WOULD ALWAYS BE FIRE IN THE HOMESTEAD, AND HOT FOOD FOR THEIR MEN TO COME HOME TO...

TODAY, THE FIREWOOD STORE, 'LILUNGO' IS NO MORE - AND TROUBLES HAVE COME IN ITS PLACE! DAILY FIREWOOD GATHERING IS A BIG PROBLEM FACING THE WOMEN. IT IS SUCH A BIG PROBLEM THAT IT CAN ALMOST DESTROY A HOME!

IT IS A PROBLEM THAT NEEDS AN URGENT SOLUTION FROM US ALL!



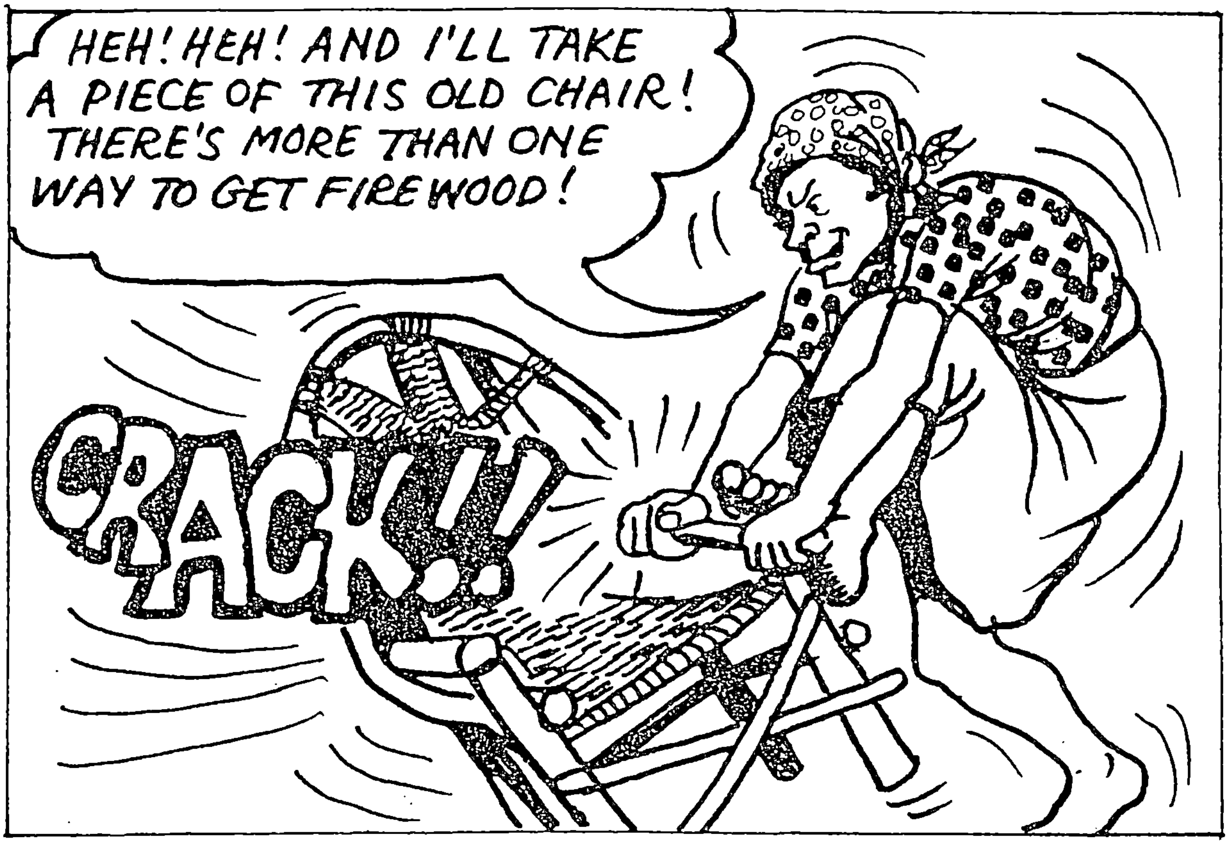
NOWooo

HERE IS OUR STORY...

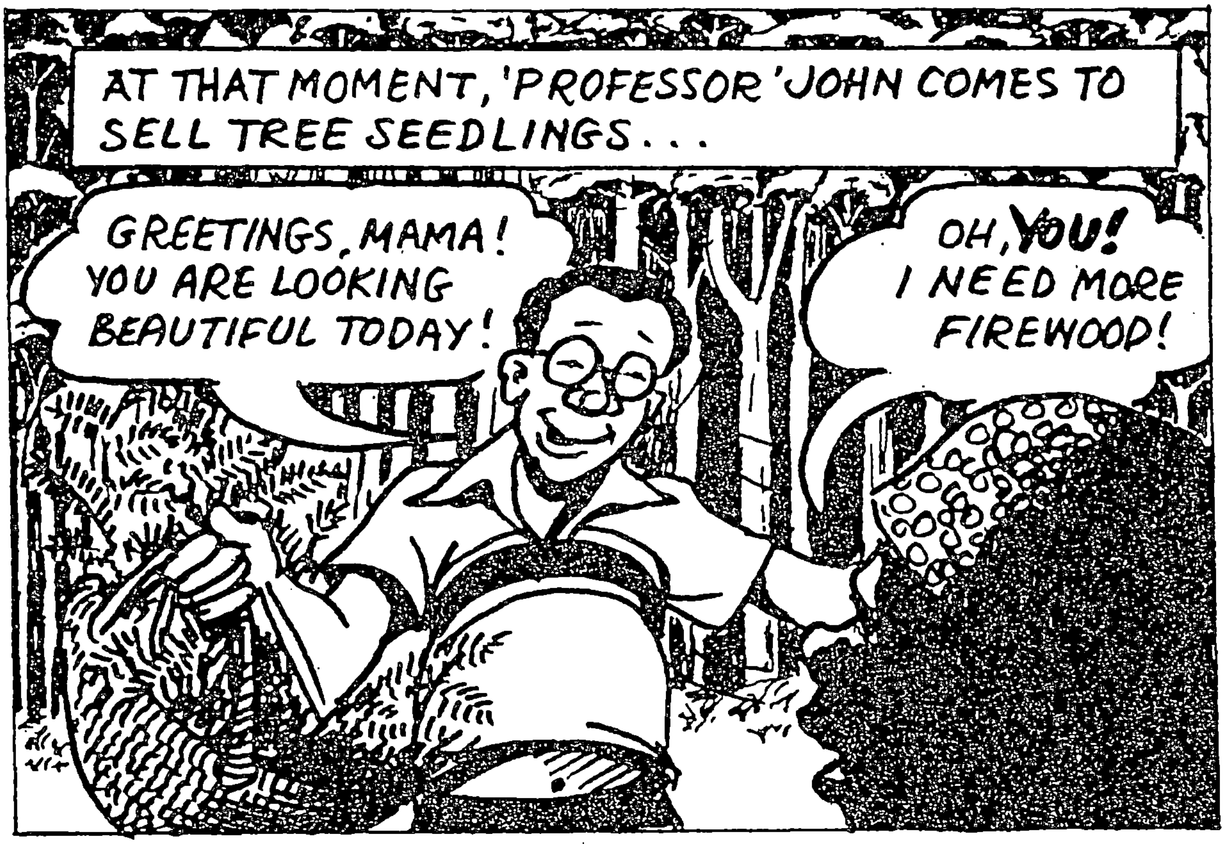

YESTERDAY HE DIDN'T STOP RAGING! IT WAS 'ESHIFINDI, WHERE'S MY HOT WATER?!'
'ESHIFINDI, WHY IS MY UGALI COLD? WHY, WOMAN, WHY?' HEH! I TELL YOU!
TODAY IT WILL BE DIFFERENT! MY OLD MAN WILL HAVE HIS FIRE, AND HIS HOT WATER, AND HIS HOT FOOD! I'LL SEE TO IT! I REALLY WILL...
BUT, MY HUSBAND, TODAY THE WEEVIL IN YOUR HEAD WILL POP OUT!!


THIS IS OKUNYANYI'S HOMESTEAD. HIS WIFE, ESHIFINDI, A RATHER FOOLISH WOMAN, IS BEING DRIVEN TO DISTRACTION BY THE LACK OF FIREWOOD...
FIREWOOD! FIREWOOD! OH, THIS FIREWOOD!
WHAT AM I GOING TO DO ABOUT IT?
CRACK!


(SIGH!) THERE ARE SO MANY TREES HERE - LIKE A FOREST! BUT I CAN'T TOUCH ANY OF THEM...OR I'LL BE FOR IT!
EVERYTHING IS BOOKED FOR EITHER BUILDING WITH - OR SELLING!
BUT I HAVE A SECRET! SSH! I HOPE HE WON'T FIND OUT!
HERE'S THE STICK I JUST BROKE FROM THE WALL! HEH! HEH! SSH!


HEH! HEH! AND I'LL TAKE A PIECE OF THIS OLD CHAIR! THERE'S MORE THAN ONE WAY TO GET FIREWOOD!
CRACK!!


THERE! THAT'S ENOUGH TO START A FIRE...
TODAY ATLEAST WE'LL HAVE FIRE IN THIS HOUSE! HEH! HEH!

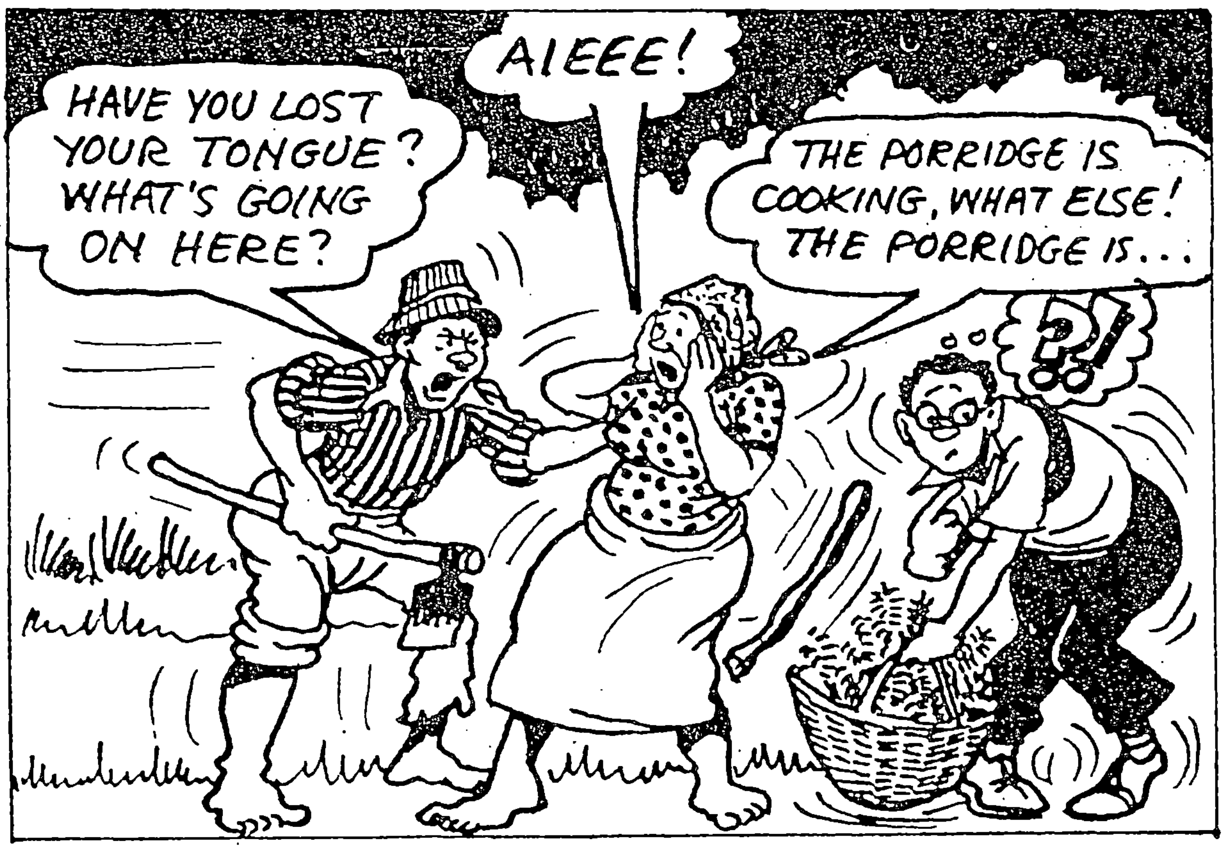

AT THAT MOMENT, 'PROFESSOR' JOHN COMES TO SELL TREE SEEDLINGS...
GREETINGS, MAMA! YOU ARE LOOKING BEAUTIFUL TODAY!
OH, YOU! I NEED MORE FIREWOOD!


BUT, MAMA ESHIFINDI, YOU CAN'T HAVE FIREWOOD WITHOUT TREES! BUY MY SEEDLINGS-AND GROW YOUR OWN FIREWOOD!
...HERE, LOOK AT THIS BEAUTY? ..OR THIS ONE? BUY, MAMA, THE FIRE MUST BE LIT!


LEAVE ME ALONE, YOU TRICKSTER! YOU THINK I HAVE EVEN A CENT TO BUY FIREWOOD?
COME ON, MAMA! YOU ARE NOT THAT POOR! FIREWOOD IS LIFE! I'M 'PROFESSOR' JOHN - I KNOW THESE THINGS! I'M THE PIONEER OF LIFE!


HUH! SOME PIONEER! THE STICK IN THE HAND IS THE ONE THAT KILLS THE SNAKE!
HOW LONG WILL THEY TAKE TO GROW? THIS STICK IS ALREADY HERE - AND WILL BURN TODAY!


MEANWHILE, OKUNYANYI RETURNS FROM THE FIELDS, UNNOTICED...
UH, HAH! WHAT'S THIS? IT'S TRUE THAT THE LION ON TIP-TOES CATCHES THE MEAT!
WOMAN! WHERE'S THE UJI ?! HEH?!


HAVE YOU LOST YOUR TONGUE? WHAT'S GOING ON HERE?
AIEEE!
THE PORRIDGE IS COOKING, WHAT ELSE! THE PORRIDGE IS...
?!


SHUT UP! YOU SOUND LIKE A PARROT, WOMAN! WHAT'S GOING ON, I SAY!?
AIEEE!?
WHAT'S THIS? MY FAVOURITE CHAIR - BROKEN!
OKUNYANYI-I-I! (GULP!) IT GOT BROKEN BY ITSELF! IT GOT BROKEN FOR.. HOT WATER, HOT PORRIDGE, HOT UGALI! - BY ITSELF! SO THERE!

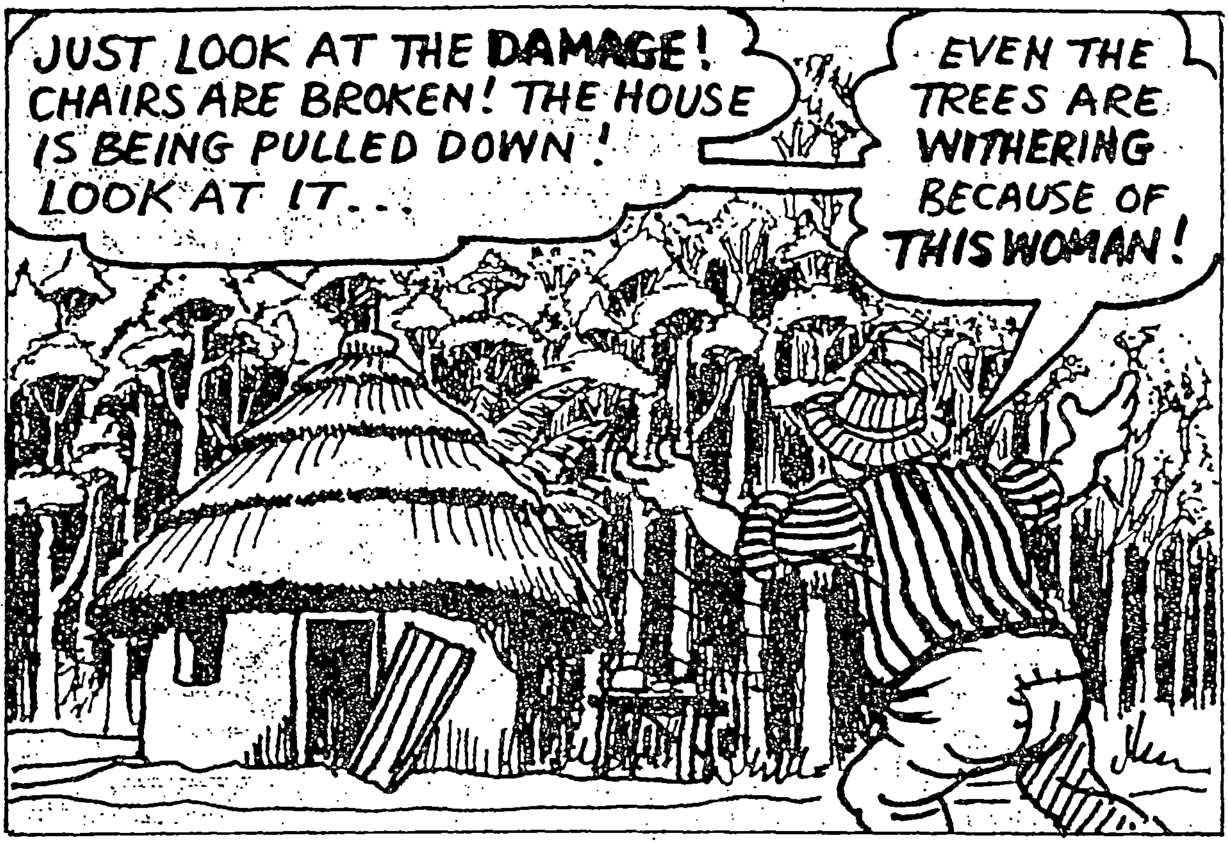

THAT'S THE LAST STRAW! I'VE REALLY HAD ENOUGH OF YOU, WOMAN! ... GET OUT!!
GO BACK TO YOUR MOTHER - TO LEARN HOW A WIFE SHOULD BEHAVE! OUT!!

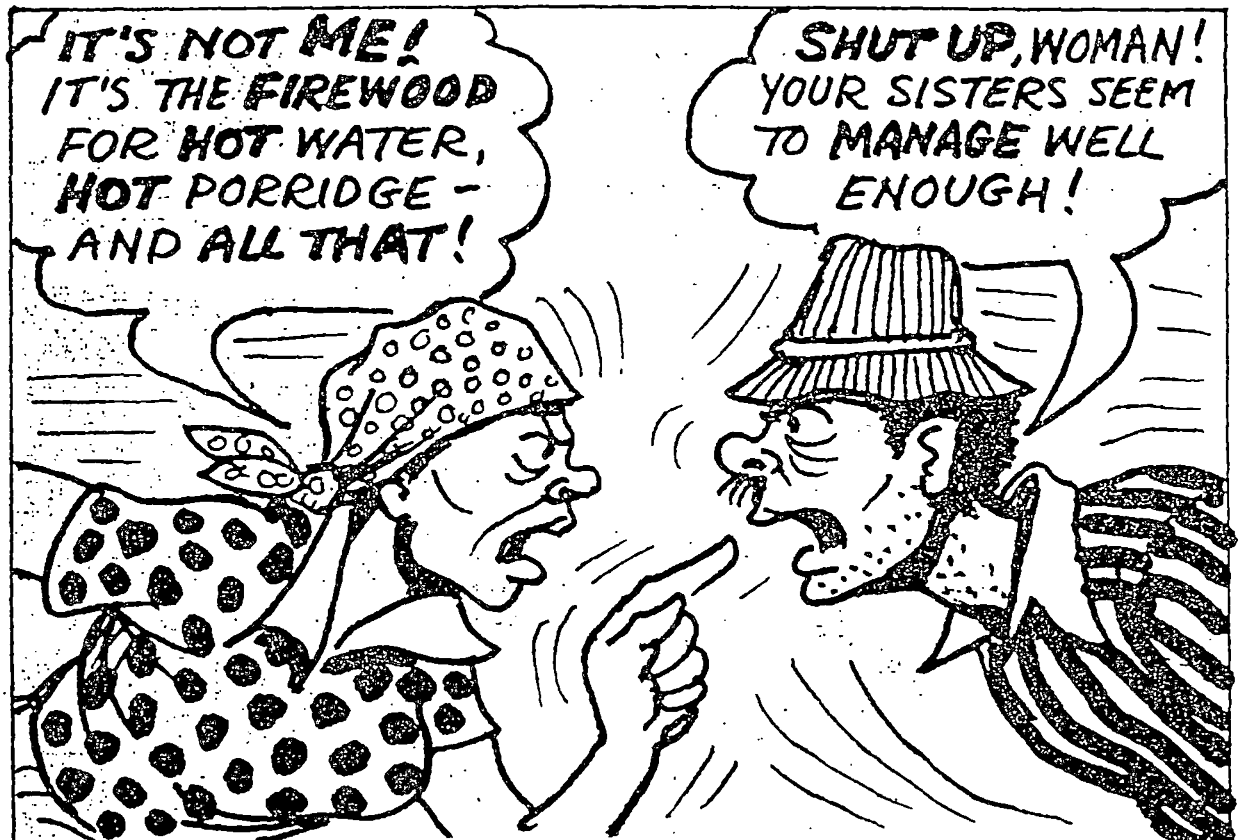

TAKE IT EASY, BROTHER! ONE MISTAKE...
OKUNYANYI! (SOB!) PLEASE?
HUH! ...EVEN YOU GET OUT!!

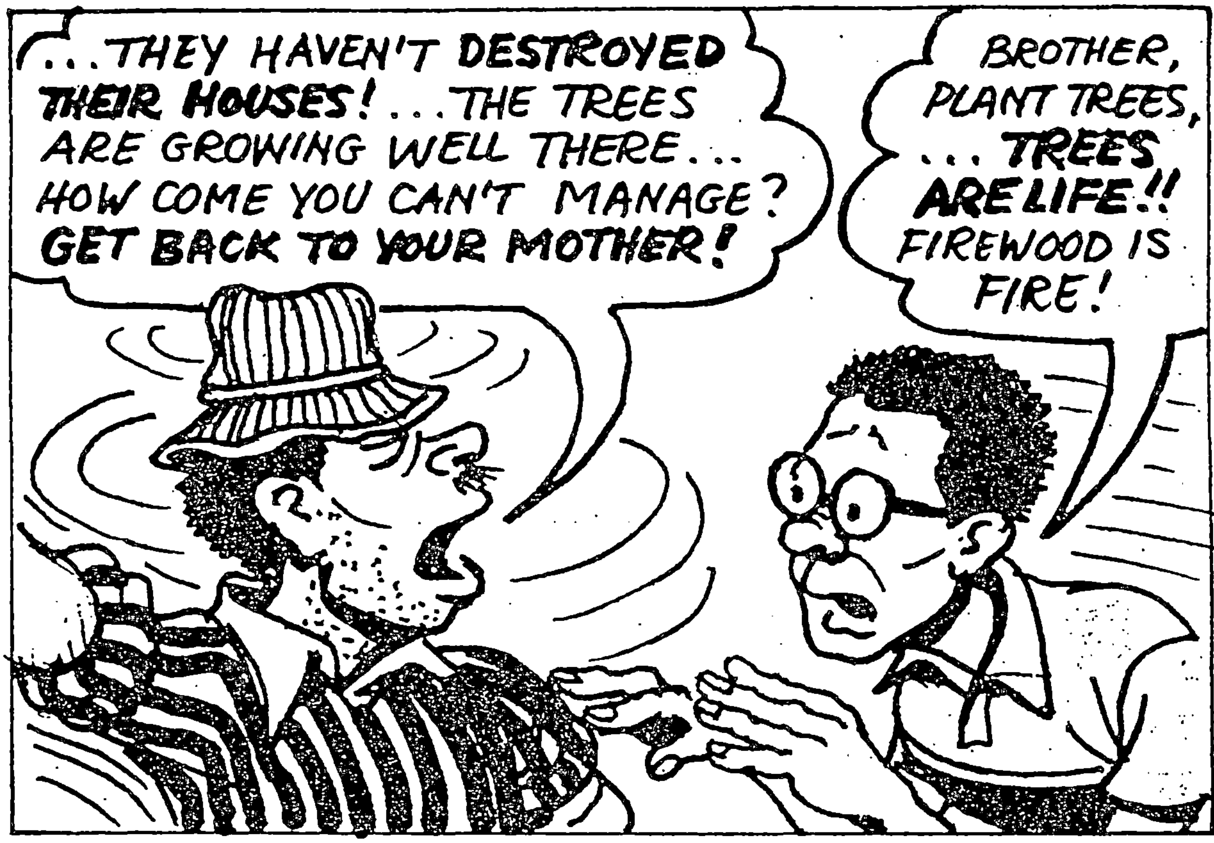

YOU COME SNEAKING LIKE A MOLE AROUND HOMES WHEN MEN ARE WORKING! EH?! GET OUT! AND SHE GOES TOO!
I'LL COUNT TO FIVE - AND YOU WILL BOTH BE GONE...
ONE!
OKUNYANYI! PLEASE.!!
BUT, MAN, LISTEN! IS ONE MISTAKE GROUNDS FOR A DIVORCE..?
TWO!


BE REASONABLE, OKUNYANYI!
THREE!
FOUR!

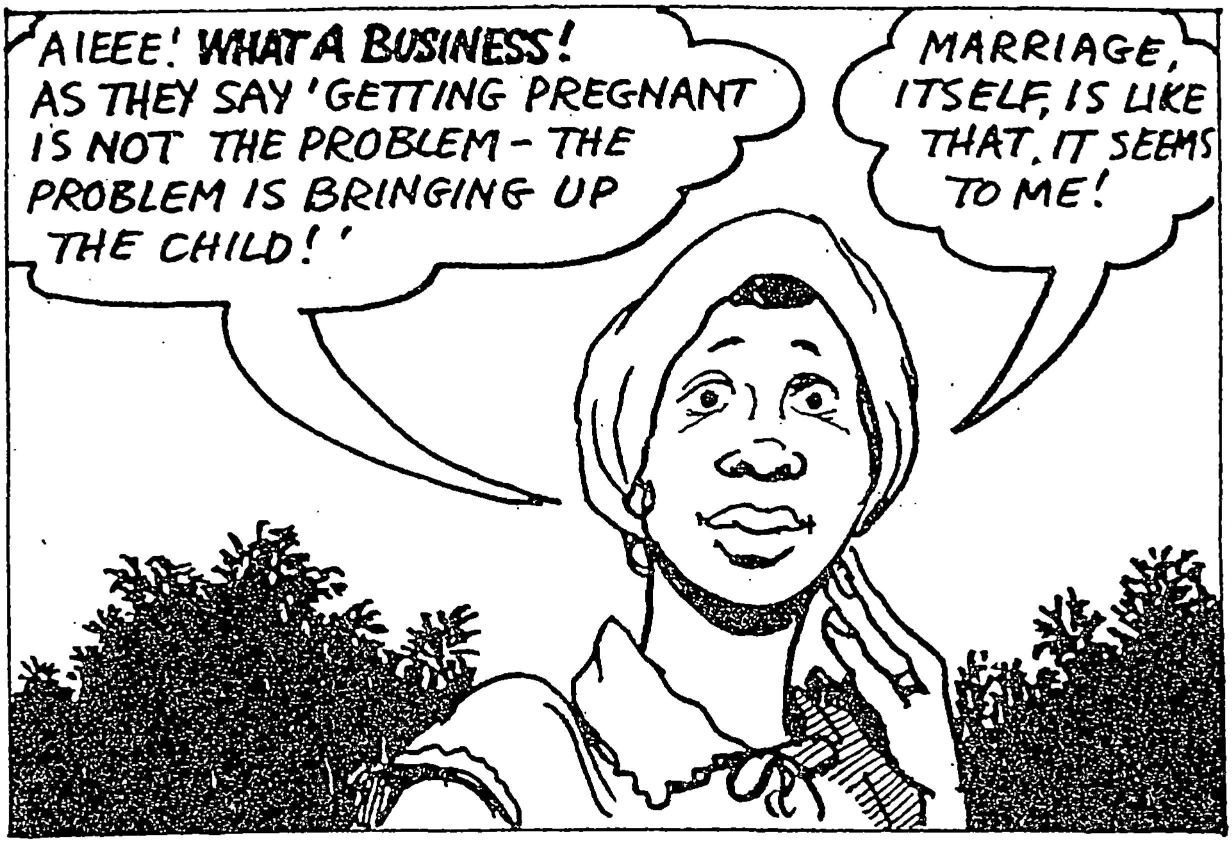

MAMA KWALANDA, A NEIGHBOUR, COMES IN...
OKUNYANYI, WHAT ON EARTH IS GOING ON?
NO!
...YOU STAY OUT OF THIS!


JUST LOOK AT THE DAMAGE! CHAIRS ARE BROKEN! THE HOUSE IS BEING PULLED DOWN! LOOK AT IT...
EVEN THE TREES ARE WITHERING BECAUSE OF THIS WOMAN!

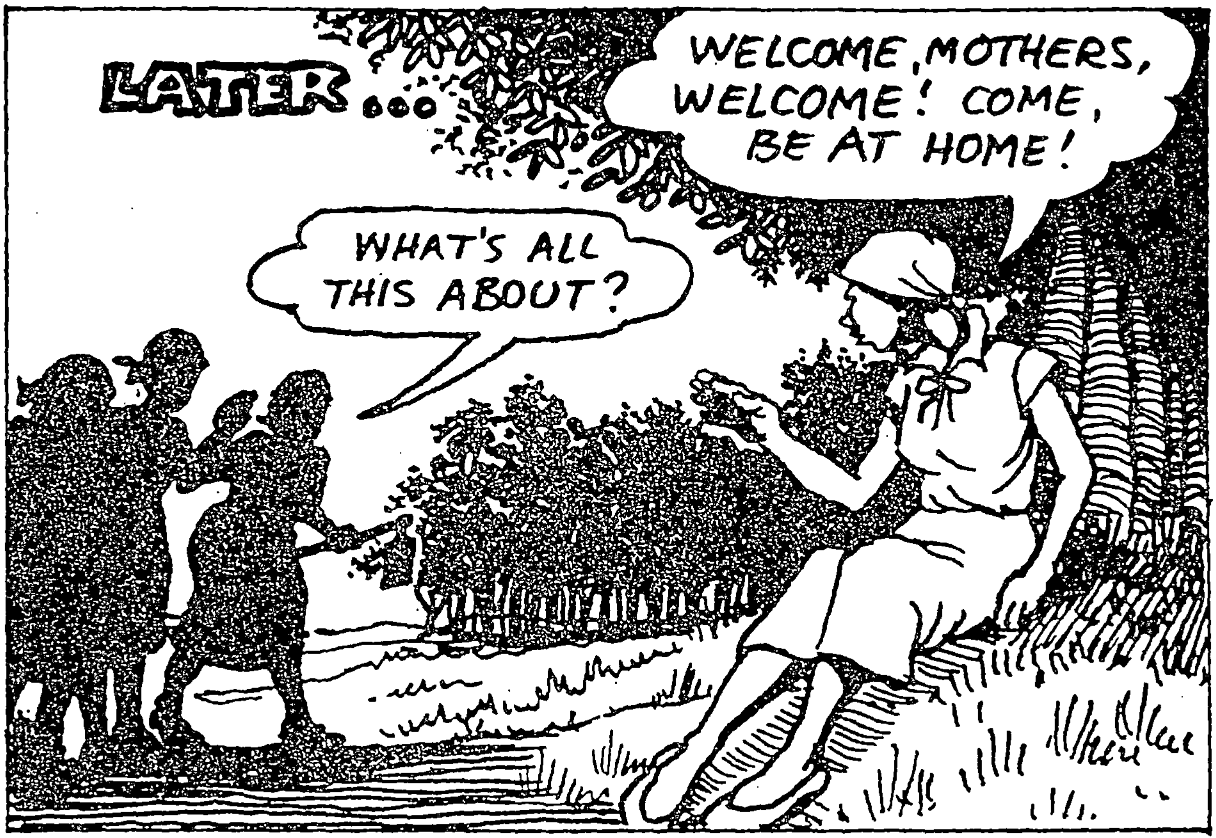

IT'S NOT ME! IT'S THE FIREWOOD FOR HOT WATER, HOT PORRIDGE - AND ALL THAT!
SHUT UP, WOMAN! YOUR SISTERS SEEM TO MANAGE WELL ENOUGH!


...THEY HAVEN'T DESTROYED THEIR HOUSES! ...THE TREES ARE GROWING WELL THERE... HOW COME YOU CAN'T MANAGE? GET BACK TO YOUR MOTHER!
BROTHER, PLANT TREES, ... TREES ARE LIFE!! FIREWOOD IS FIRE!


YOU DARE TELL ME TO PLANT TREES?! HUH! YOU DONKEYS! GO AND GET MARRIED TO EACH OTHER! .GET...
OUT!


AIEEE! WHAT A BUSINESS! AS THEY SAY 'GETTING PREGNANT IS NOT THE PROBLEM - THE PROBLEM IS BRINGING UP THE CHILD!'
MARRIAGE, ITSELF, IS LIKE THAT, IT SEEMS TO ME!

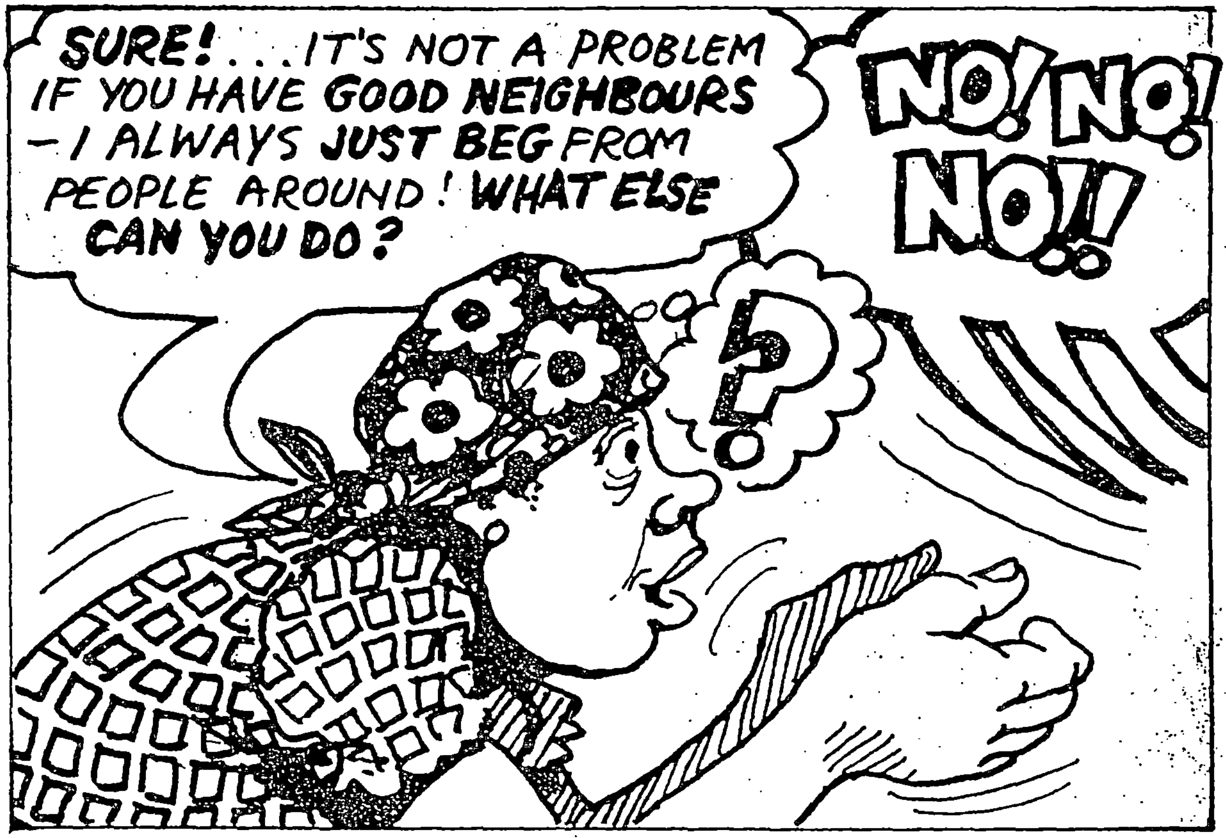

...BUT I CAN'T HELP ESHIFINDI OR OKUNYANYI BY MYSELF - 'ONE FINGER CAN'T CRACK A LOUSE!'
...IT'S TIME WE HAD A LITTLE MEETING TO DISCUSS THIS MATTER - I CAN ARRANGE THAT, ATLEAST!

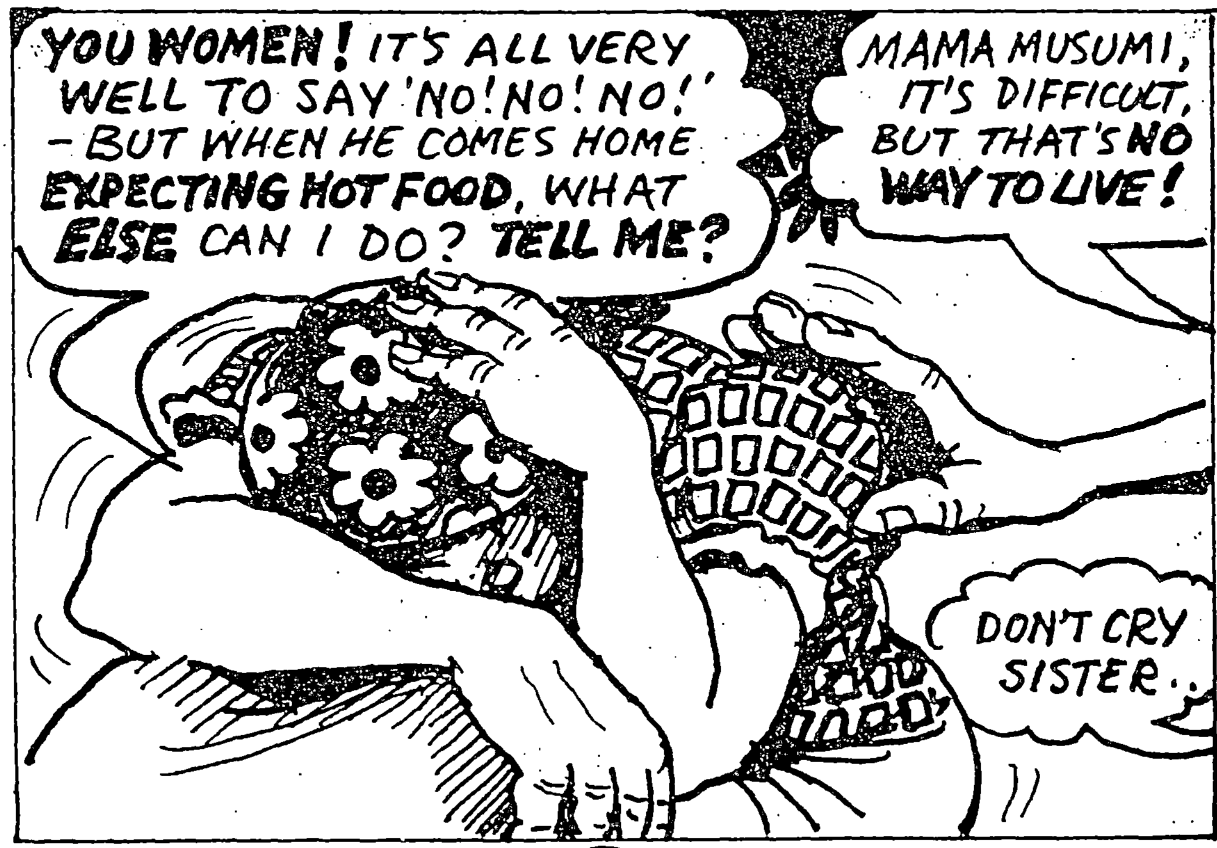

LATER...
WELCOME, MOTHERS, WELCOME! COME, BE AT HOME!
WHAT'S ALL THIS ABOUT?


SISTERS, WE HAVE A REAL PROBLEM BEFORE US...
WELL, WE ARE WAITING...
YES! TELL US ALL ABOUT IT!


NOW, ... IT'S LIKE THIS THE FIREWOOD PROBLEM HAS DESTROYED OKUNYANYI AND ESHIFINDI'S HOME!
HEH? THEN I'M NOT THE ONE TO HELP - I HAVE THE SAME PROBLEM!


WHO HASN'T? ... BUT IT'S NO BIG PROBLEM, REALLY, IS IT?
WHAT!?
MAMA MUSUMI, PLEASE EXPLAIN YOURSELF?

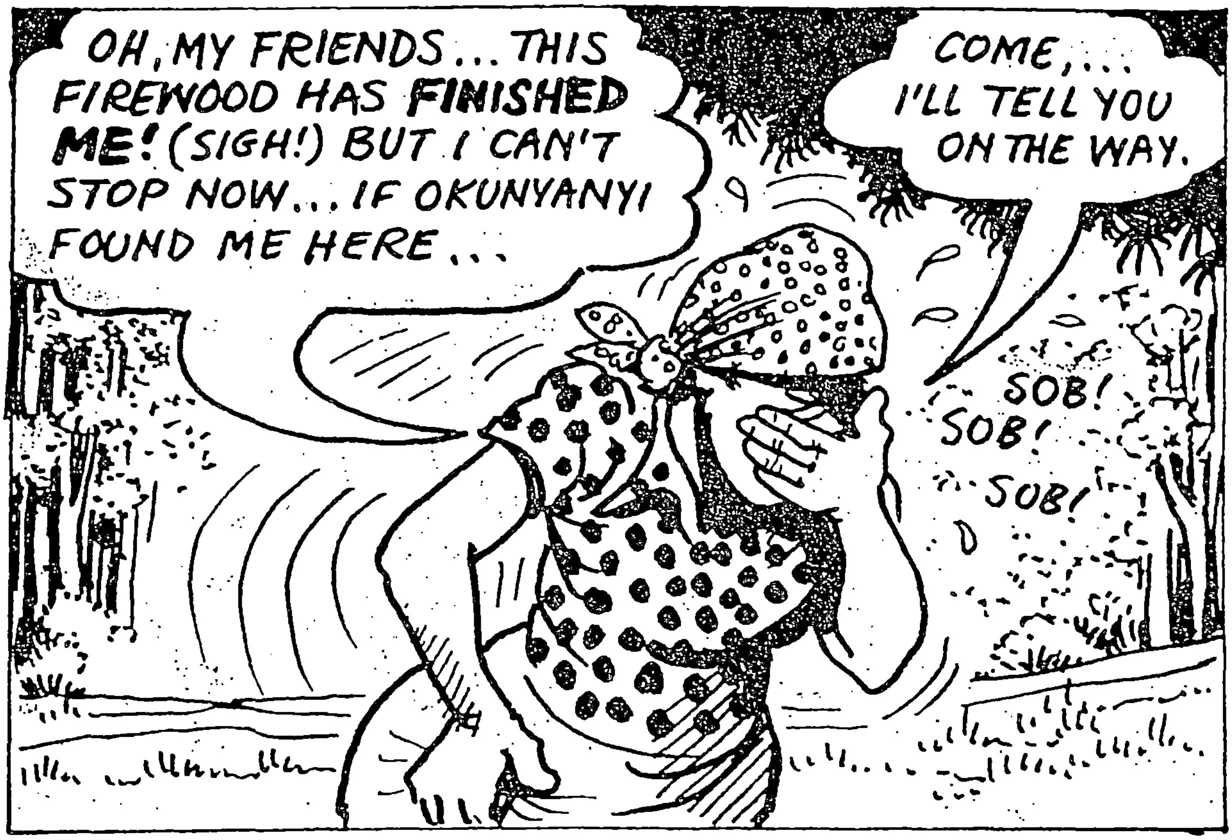

SURE! ...IT'S NOT A PROBLEM IF YOU HAVE GOOD NEIGHBOURS – I ALWAYS JUST BEG FROM PEOPLE AROUND! WHAT ELSE CAN YOU DO?
NO! NO! NO!!
?

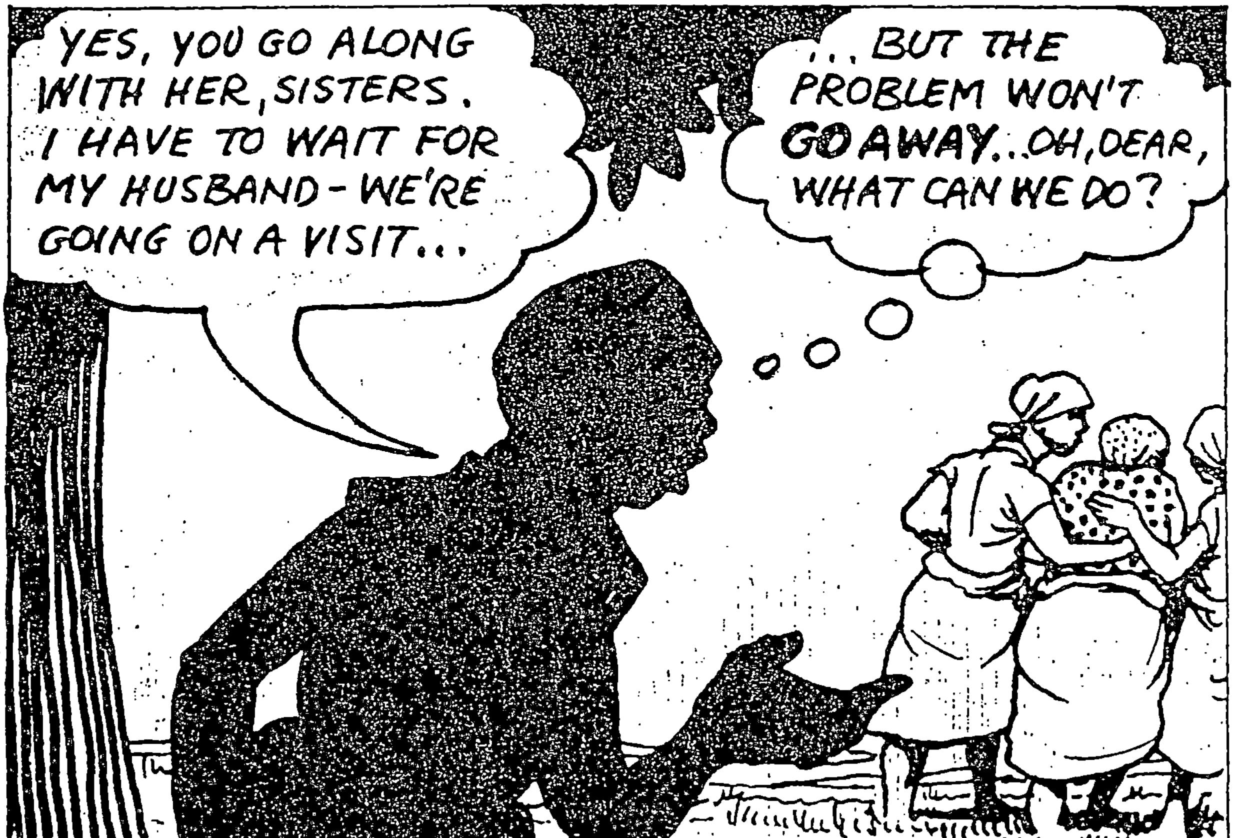

YOU WOMEN! IT'S ALL VERY WELL TO SAY 'NO! NO! NO!' – BUT WHEN HE COMES HOME EXPECTING HOT FOOD, WHAT ELSE CAN I DO? TELL ME?
MAMA MUSUMI, IT'S DIFFICULT, BUT THAT'S NO WAY TO LIVE!
DON'T CRY SISTER..


WELL, I SOMETIMES USE DRY MAIZE COBS, BUT THEY DON'T LAST LONG...OF COURSE, EVEN I COULD BREAK A CHAIR OR SOMETHING...
WHO COULDN'T?
TRUE!


...BUT MY HUSBAND IS AS HOT AS PEPPER ABOUT SUCH THINGS...AND IF HE CAUGHT ME AT IT... HEH!!
POOR ESHIFINDI! BUT SHE'S LUCKY TO BE ONLY... CHASED AWAY!
HEH! HEH! HEH! HEH! HEH!
HEH! HEH! HEH!
SLAP!

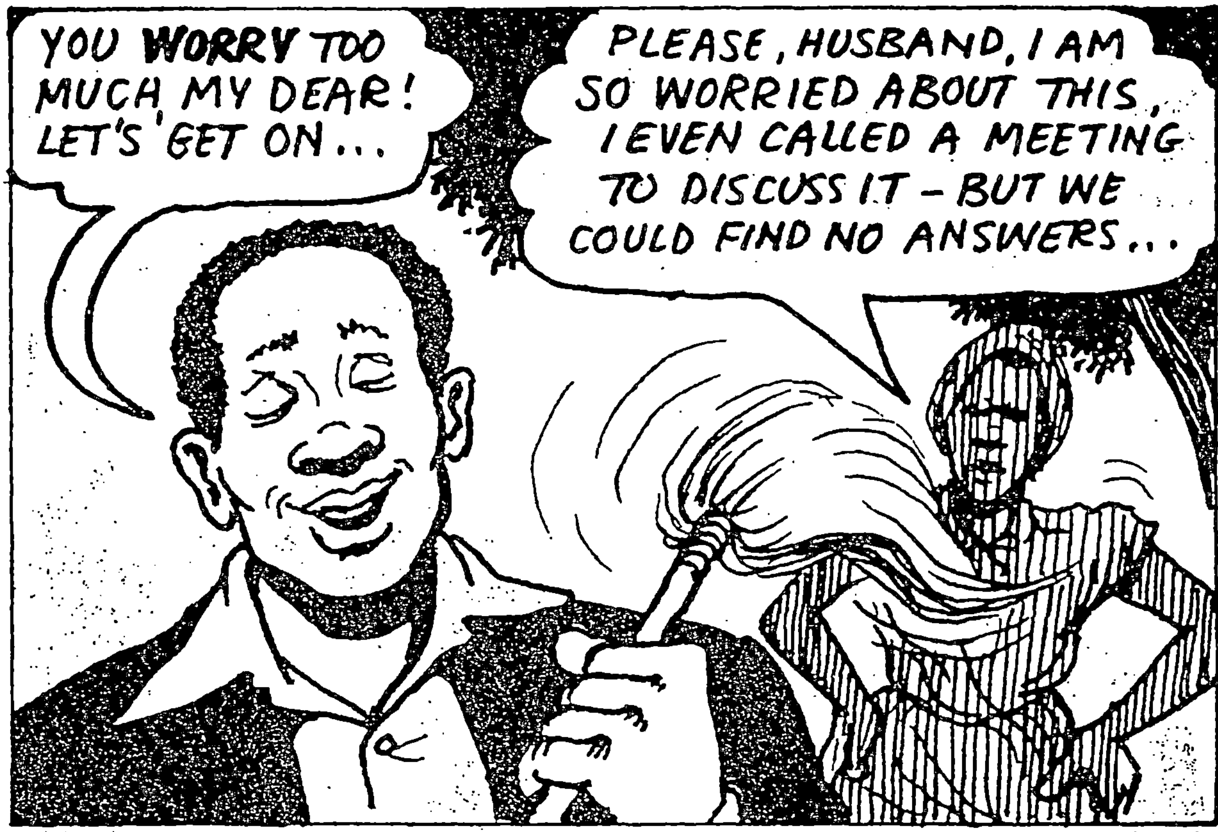

YOU SEE! IT'S LIKE I SAID... IT'S BETTER TO GO BEGGING – AND STAY HEALTHY!!
... BUT SUCH THINGS DON'T SOLVE THE PROBLEM, SISTER! THEY ONLY POSTPONE IT A LITTLE...
THAT'S TRUE! AND LONGING FOR SOMEONE ELSE'S SUPPER KILLED THE HYENA, AFTER ALL! YOU COULD END UP THE SAME WAY! EH?!
HEH! HEH! HEH! HEH! HEH!
HEH! HEH! HEH!
AH, HERE COMES POOR ESHIFINDI...
ESHIFINDI, WHAT'S THE NEWS?

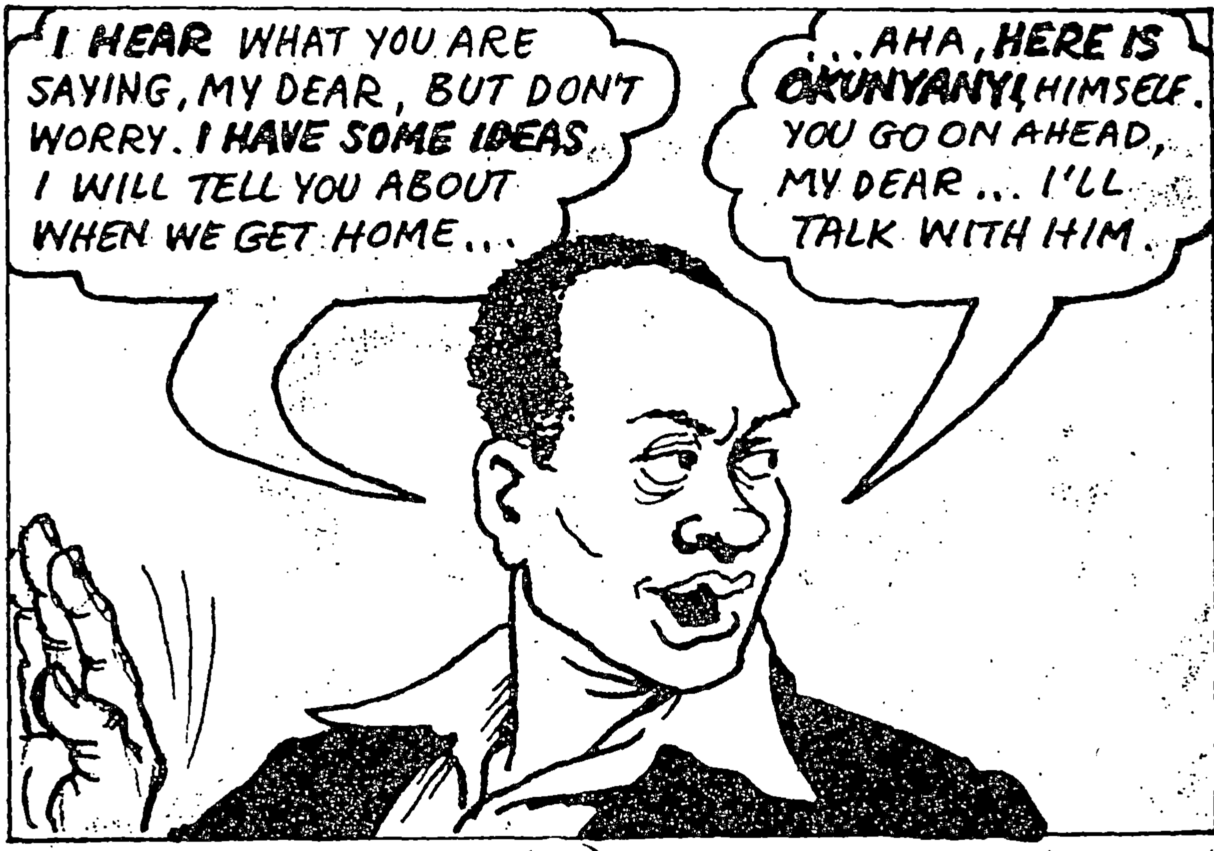

OH, MY FRIENDS... THIS FIREWOOD HAS FINISHED ME! (SIGH!) BUT I CAN'T STOP NOW... IF OKUNYANYI FOUND ME HERE...
COME,... I'LL TELL YOU ON THE WAY.
SOB! SOB! SOB!


YES, YOU GO ALONG WITH HER, SISTERS. I HAVE TO WAIT FOR MY HUSBAND - WE'RE GOING ON A VISIT...
...BUT THE PROBLEM WON'T GO AWAY...OH, DEAR, WHAT CAN WE DO?

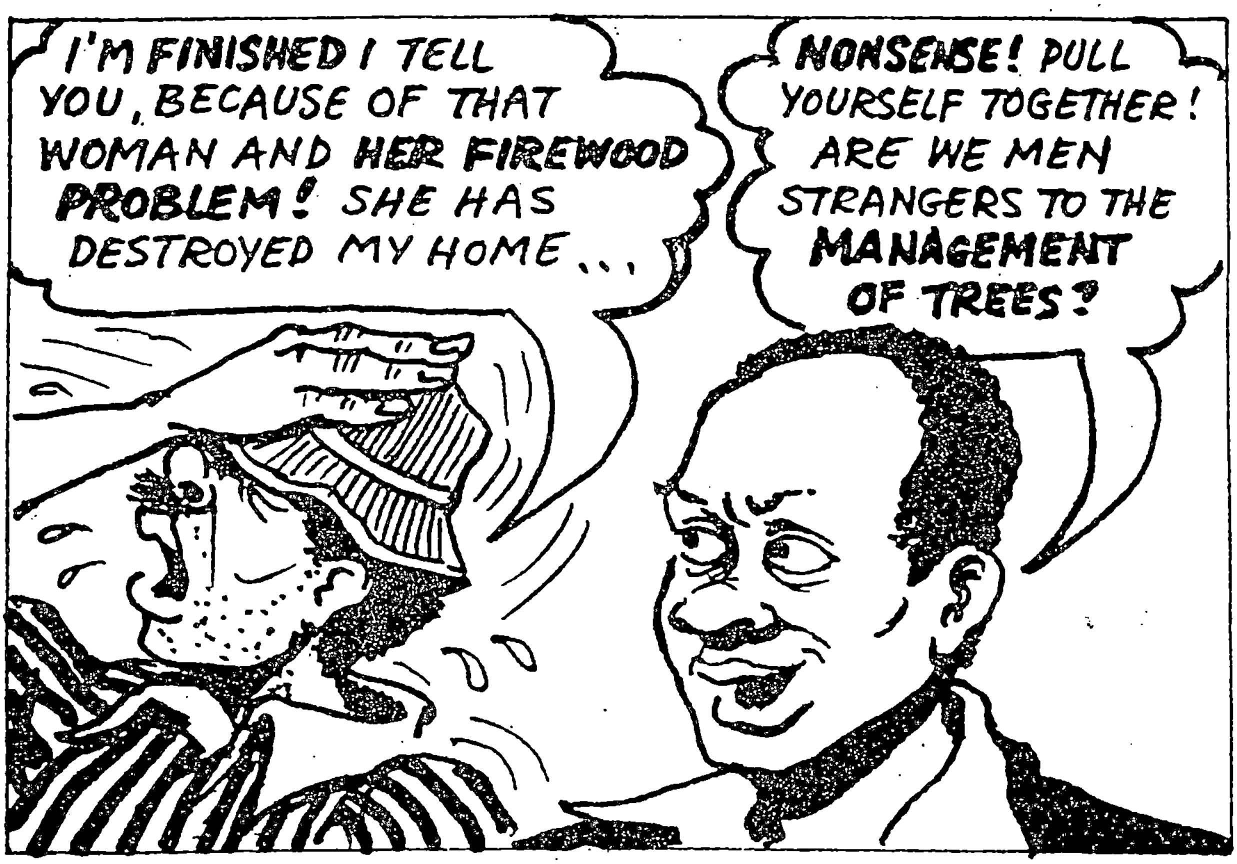

WHAT CAN WE DO? BEGGING FROM NEIGHBOURS IS NO ANSWER, NEITHER IS BURNING MAIZE COBS ... AND WHO HAS THE MONEY TO BUY ALL THE TIME?
... I REALLY WISH I KNEW WHAT THE ANSWER IS!
AS SHE SADLY AWAITS HER HUSBAND, KWALANDA SINGS A SAD SONG... WHICH NABONGO HEARS AS HE ARRIVES...
AH, NOW, MY DEAR WIFE, WHY SO SAD A SONG?
OH, HUSBAND, A SAD THING HAS HAPPENED...


...FIREWOOD HAS DESTROYED OKUNYANYI'S HOME!
WHAT? ALL BY ITSELF? HOW ODD! HEH! HEH!
SERIOUSLY, HUSBAND. IT HAS HAPPENED!
...ESHIFINDI HAS BEEN CHASED AWAY BECAUSE OF IT! ...OH, HUSBAND, I BEGIN TO FEAR FOR MYSELF...
...WILL YOU ALSO CHASE ME AWAY-WHEN I CAN NO LONGER FIND FIREWOOD?


YOU WORRY TOO MUCH MY DEAR! LET'S GET ON...
PLEASE, HUSBAND, I AM SO WORRIED ABOUT THIS, I EVEN CALLED A MEETING TO DISCUSS IT - BUT WE COULD FIND NO ANSWERS...


I HEAR WHAT YOU ARE SAYING, MY DEAR, BUT DON'T WORRY. I HAVE SOME IDEAS I WILL TELL YOU ABOUT WHEN WE GET HOME...
...AHA, HERE IS OKUNYANYI, HIMSELF. YOU GO ON AHEAD, MY DEAR... I'LL TALK WITH HIM.


GREETINGS, HONOURABLE NABONGO... YOU ARE LOOKING AT A RUINED MAN! THAT WOMAN HAS DESTROYED MY HOME! AIEE!
GREETINGS, OKUNYANYI, BUT TAKE IT EASY... DON'T BE SO HASTY WITH HER...


I'M FINISHED I TELL YOU, BECAUSE OF THAT WOMAN AND HER FIREWOOD PROBLEM! SHE HAS DESTROYED MY HOME...
NONSENSE! PULL YOURSELF TOGETHER! ARE WE MEN STRANGERS TO THE MANAGEMENT OF TREES?


THE M..MANAGEMENT OF...TREES ...TREES ?!
CERTAINLY! DID YOU LEARN NOTHING IN YOUR GRANDFATHER'S HOUSE? TREES ARE CENTRAL TO OUR TRADITIONAL CULTURE!
TRUE!
?!
WE LEARNED HOW TO SELECT AND FELL THE SPECIAL TREES NEEDED FOR COMMUNITY FIRES AND OTHER RITUALS...
...AND THE WOMEN GLEANED THE SMALL BRANCHES TO STOCK THEIR 'LILUNGO'.
TRUE!


SO, TIMES CHANGE - AS THEY ALWAYS WILL, AND NOW WE HAVE NEW PROBLEMS OF TREE MANAGEMENT - COME ON! THINK IT OUT, MAN!
BUT...BUT, I'M RUINED! LOOK... AROUND HERE!
NONSENSE! WERE OUR FOREFATHERS SO EASILY DEFEATED BY THEIR PROBLEMS? ...THINK ABOUT THESE NEW FAST-GROWING FUELWOOD TREES.. FIND OUT ABOUT THEM - AND THEN, THINK AND PLAN!
BUT..BUT, WHERE?... HOW?*

* SEE PAGE 32!


REALLY! MUST I GIVE YOU FOOD FOR THOUGHT - AND THEN CHEW IT FOR YOU? THINK! I'VE NO TIME NOW...
BUT, NABONGO, I HAVE SO LITTLE LAND... HOW? ...WHERE CAN I AFFORD TO PLANT FIREWOOD TREES?
DO I HAVE NO PROBLEMS OF MY OWN? USE THE HEDGES, MAKE SCREENS, USE SMALL CORNERS... THINK IT OUT FOR YOURSELF, MAN!
?!


HUH! THAT'S EASY FOR HIM TO SAY...
?!
...BUT IS IT REALLY POSSIBLE? IT DOESN'T SOUND SO DIFFICULT.!?
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I'D LIKE TO BRING ESHIFINDI HOME!
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(OR IS IT, REALLY, A NEW BEGINING?)

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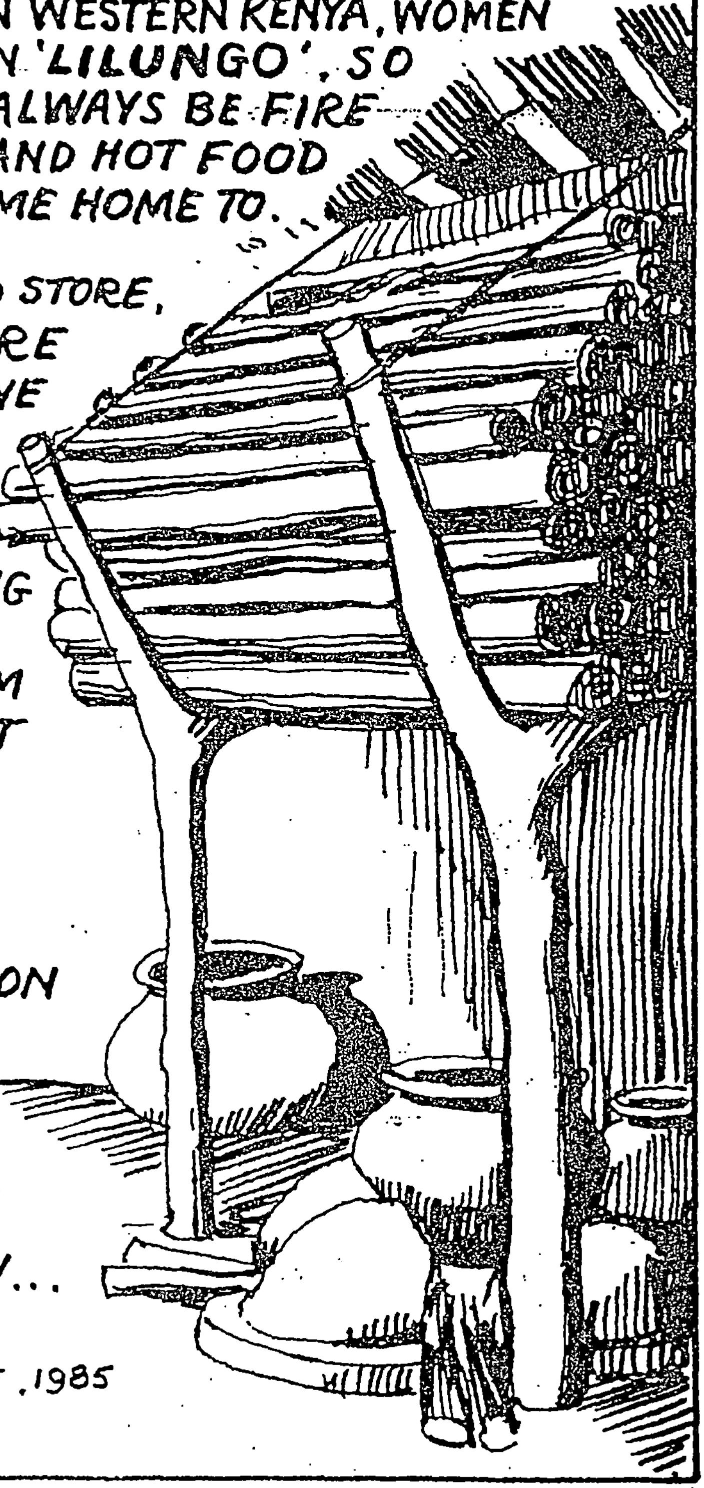
...SO, FIREWOOD CAN WRECK A HOME?

PROLOGUE

SINCE OLDEN TIMES, IN WESTERN KENYA, WOMEN STORED FIREWOOD IN 'LILUNGO', SO THAT THERE WOULD ALWAYS BE FIRE IN THE HOMESTEAD, AND HOT FOOD FOR THEIR MEN TO COME HOME TO...



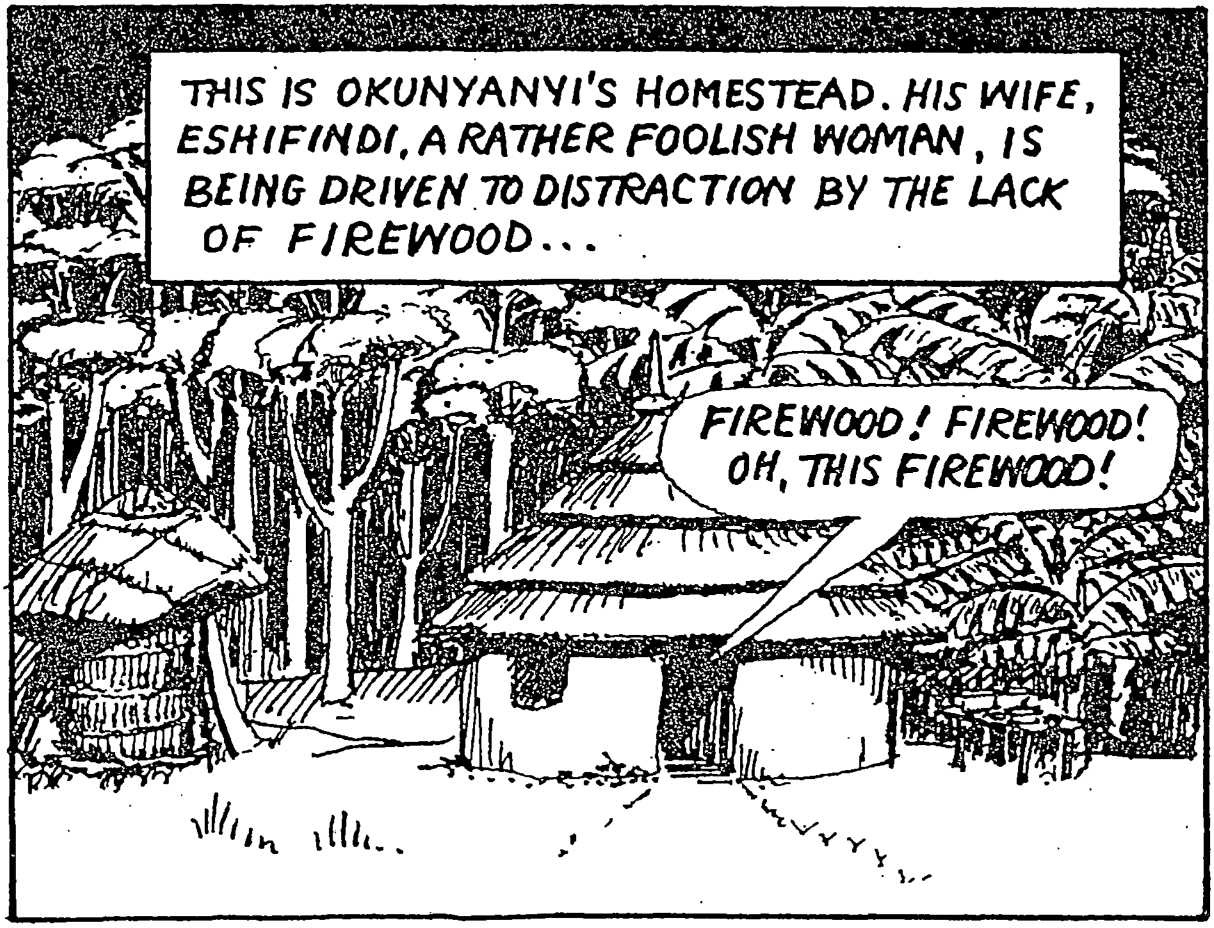
TODAY, THE FIREWOOD STORE, 'LILUNGO' IS NO MORE – AND TROUBLES HAVE COME IN ITS PLACE! DAILY FIREWOOD GATHERING IS A BIG PROBLEM FACING THE WOMEN. IT IS SUCH A BIG PROBLEM THAT IT CAN ALMOST DESTROY A HOME!

IT IS A PROBLEM THAT NEEDS AN URGENT SOLUTION FROM US ALL!

NOW...

HERE IS OUR STORY...

YESTERDAY HE DIDN'T STOP RAGING! IT WAS 'ESHIFINDI, WHERE'S MY HOT WATER?!'
'ESHIFINDI, WHY IS MY UGALI COLD? WHY, WOMAN, WHY?' HEH! I TELL YOU!
TODAY IT WILL BE DIFFERENT! MY OLD MAN WILL HAVE HIS FIRE, AND HIS HOT WATER, AND HIS HOT FOOD! I'LL SEE TO IT! I REALLY WILL...
BUT, MY HUSBAND, TODAY THE WEEVIL IN YOUR HEAD WILL POP OUT!!


THIS IS OKUNYANYI'S HOMESTEAD. HIS WIFE, ESHIFINDI, A RATHER FOOLISH WOMAN, IS BEING DRIVEN TO DISTRACTION BY THE LACK OF FIREWOOD...
FIREWOOD! FIREWOOD! OH, THIS FIREWOOD!

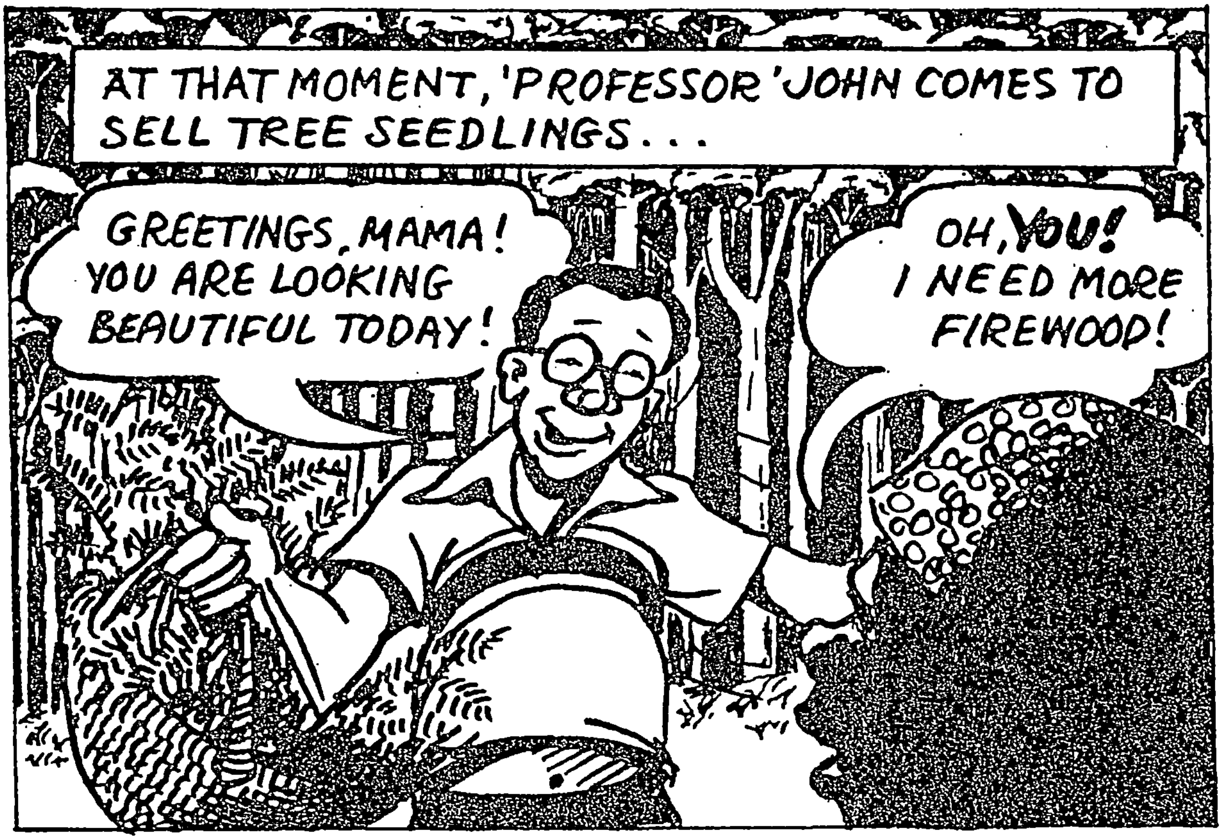

WHAT AM I GOING TO DO ABOUT IT?

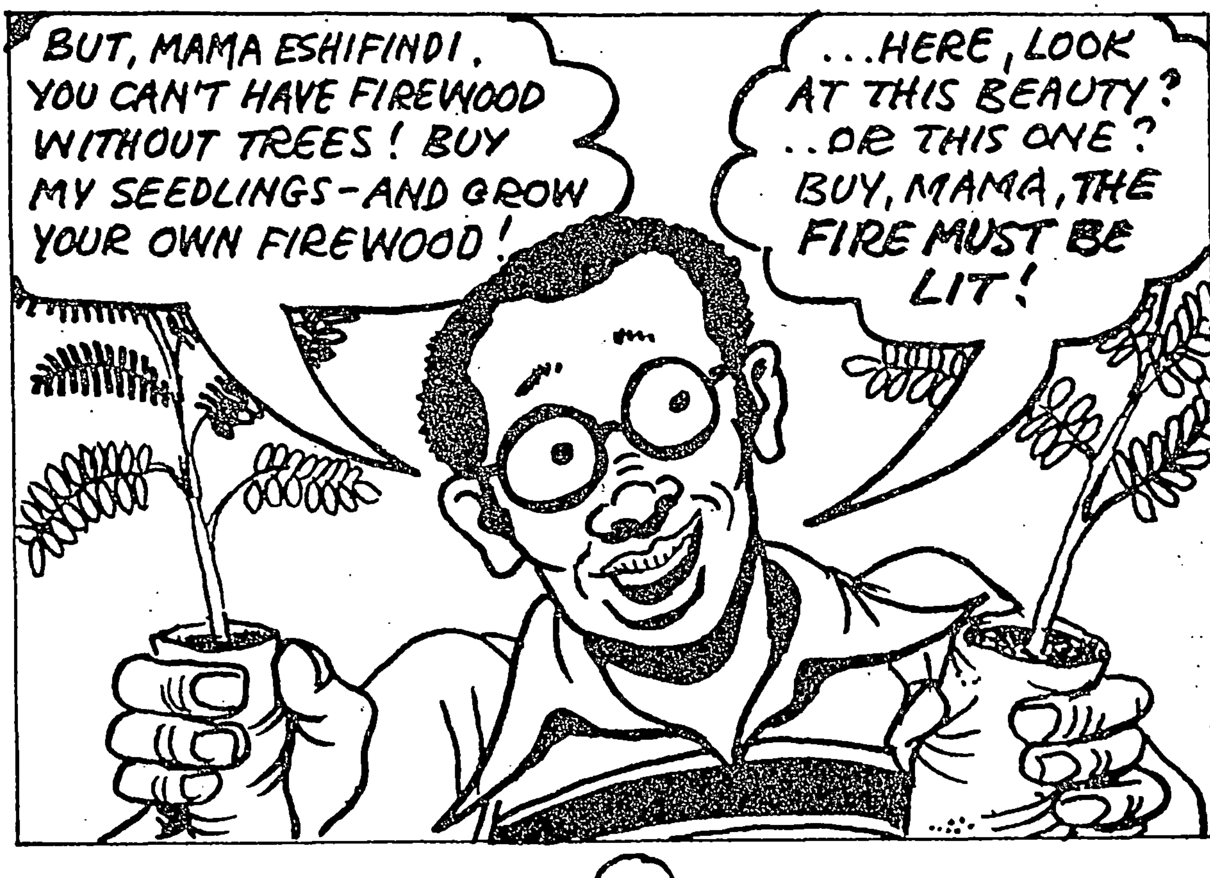

CRACK!


(SIGH!) THERE ARE SO MANY TREES HERE - LIKE A FOREST! BUT I CAN'T TOUCH ANY OF THEM...OR I'LL BE FOR IT!
EVERYTHING IS BOOKED FOR EITHER BUILDING WITH - OR SELLING!
BUT I HAVE A SECRET! SSH! I HOPE HE WON'T FIND OUT!
HERE'S THE STICK I JUST BROKE FROM THE WALL! HEH! HEH! SSH!


HEH! HEH! AND I'LL TAKE A PIECE OF THIS OLD CHAIR! THERE'S MORE THAN ONE WAY TO GET FIREWOOD!
CRACK!!

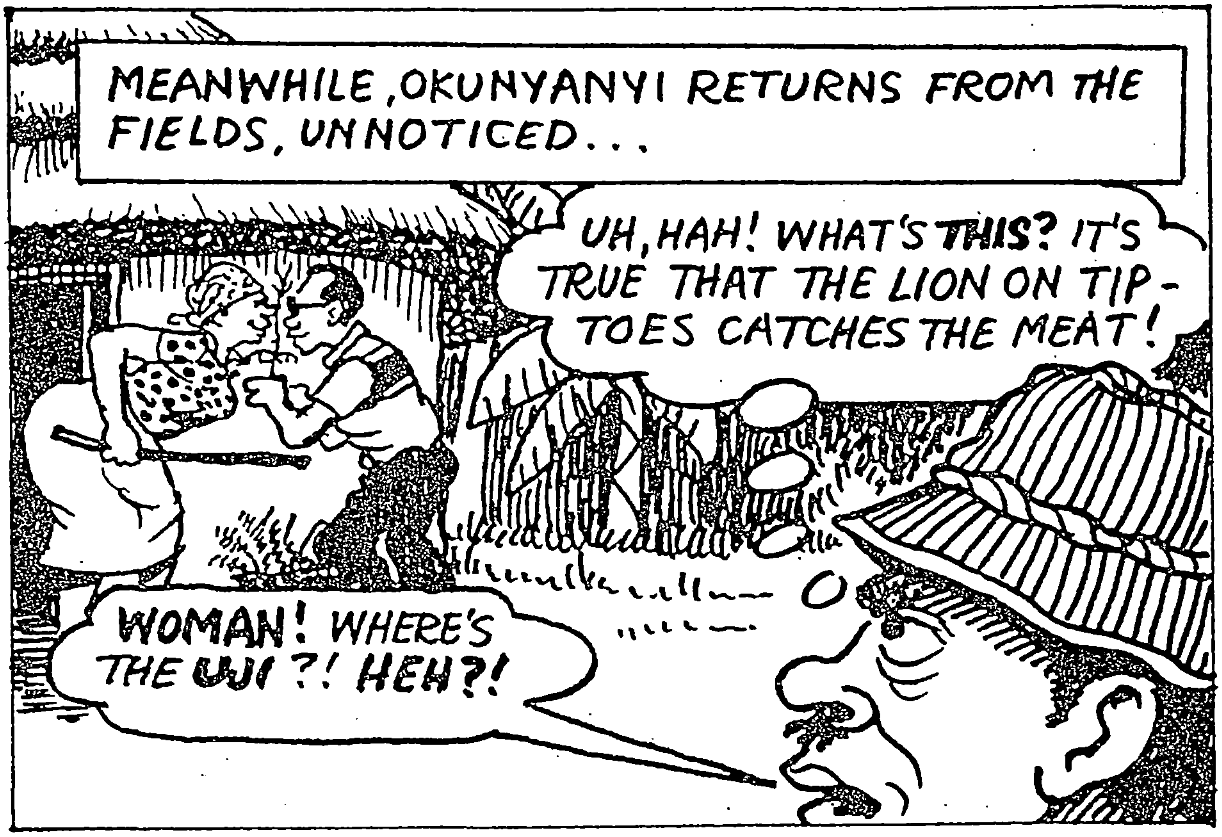

THERE! THAT'S ENOUGH TO START A FIRE...
TODAY ATLEAST WE'LL HAVE FIRE IN THIS HOUSE! HEH! HEH!


AT THAT MOMENT, 'PROFESSOR' JOHN COMES TO SELL TREE SEEDLINGS...
GREETINGS, MAMA! YOU ARE LOOKING BEAUTIFUL TODAY!
OH, YOU! I NEED MORE FIREWOOD!


BUT, MAMA ESHIFINDI, YOU CAN'T HAVE FIREWOOD WITHOUT TREES! BUY MY SEEDLINGS-AND GROW YOUR OWN FIREWOOD!
...HERE, LOOK AT THIS BEAUTY? ..OR THIS ONE? BUY, MAMA, THE FIRE MUST BE LIT!


LEAVE ME ALONE, YOU TRICKSTER! YOU THINK I HAVE EVEN A CENT TO BUY FIREWOOD?
COME ON, MAMA! YOU ARE NOT THAT POOR! FIREWOOD IS LIFE! I'M 'PROFESSOR' JOHN - I KNOW THESE THINGS! I'M THE PIONEER OF LIFE!


HUH! SOME PIONEER! THE STICK IN THE HAND IS THE ONE THAT KILLS THE SNAKE!
HOW LONG WILL THEY TAKE TO GROW? THIS STICK IS ALREADY HERE - AND WILL BURN TODAY!


MEANWHILE, OKUNYANYI RETURNS FROM THE FIELDS, UNNOTICED...
UH, HAH! WHAT'S THIS? IT'S TRUE THAT THE LION ON TIP-TOES CATCHES THE MEAT!
WOMAN! WHERE'S THE UJI ?! HEH?!

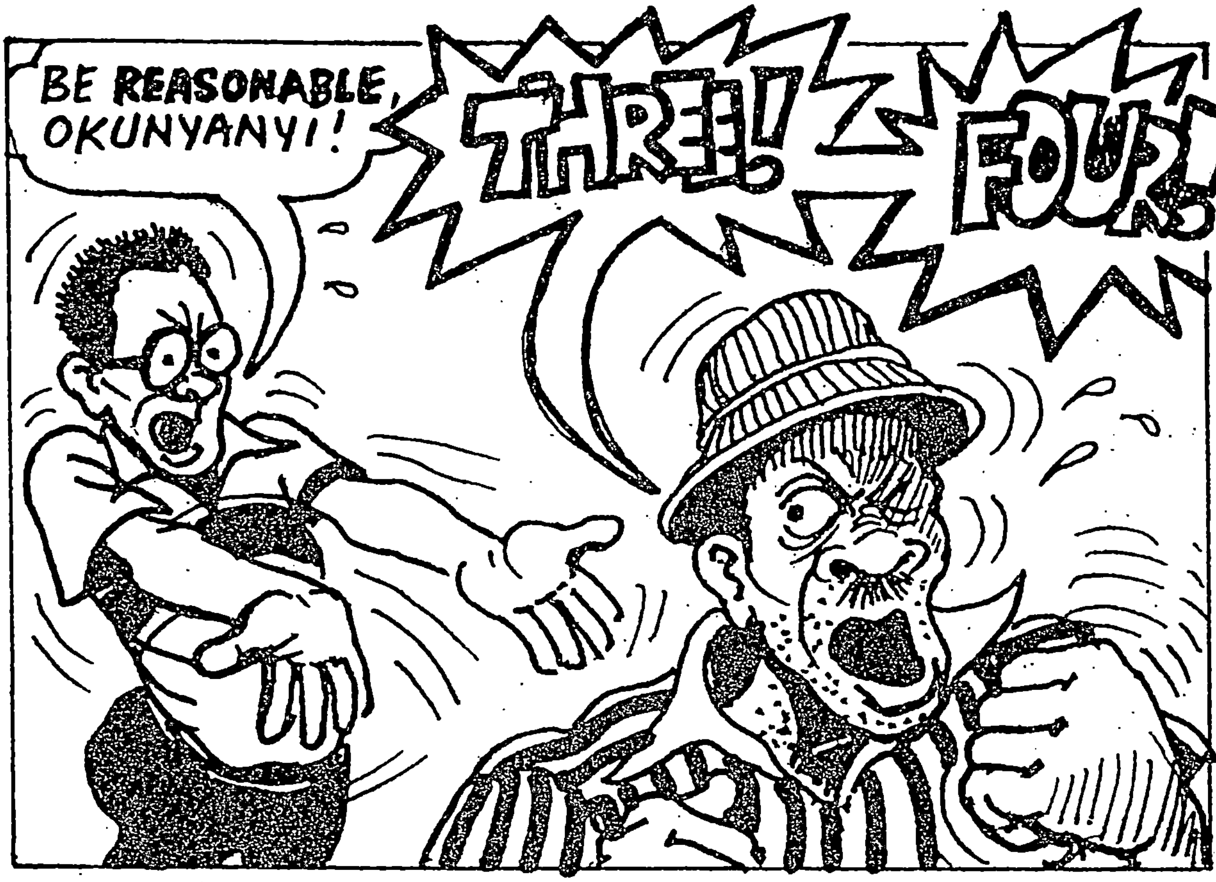

HAVE YOU LOST YOUR TONGUE? WHAT'S GOING ON HERE?
AIEEE!
THE PORRIDGE IS COOKING, WHAT ELSE! THE PORRIDGE IS...
?!


SHUT UP! YOU SOUND LIKE A PARROT, WOMAN! WHAT'S GOING ON, I SAY!?
AIEEE!?
WHAT'S THIS? MY FAVOURITE CHAIR - BROKEN!
OKUNYANYI-I-I! (GULP!) IT GOT BROKEN BY ITSELF! IT GOT BROKEN FOR.. HOT WATER, HOT PORRIDGE, HOT UGALI! - BY ITSELF! SO THERE!

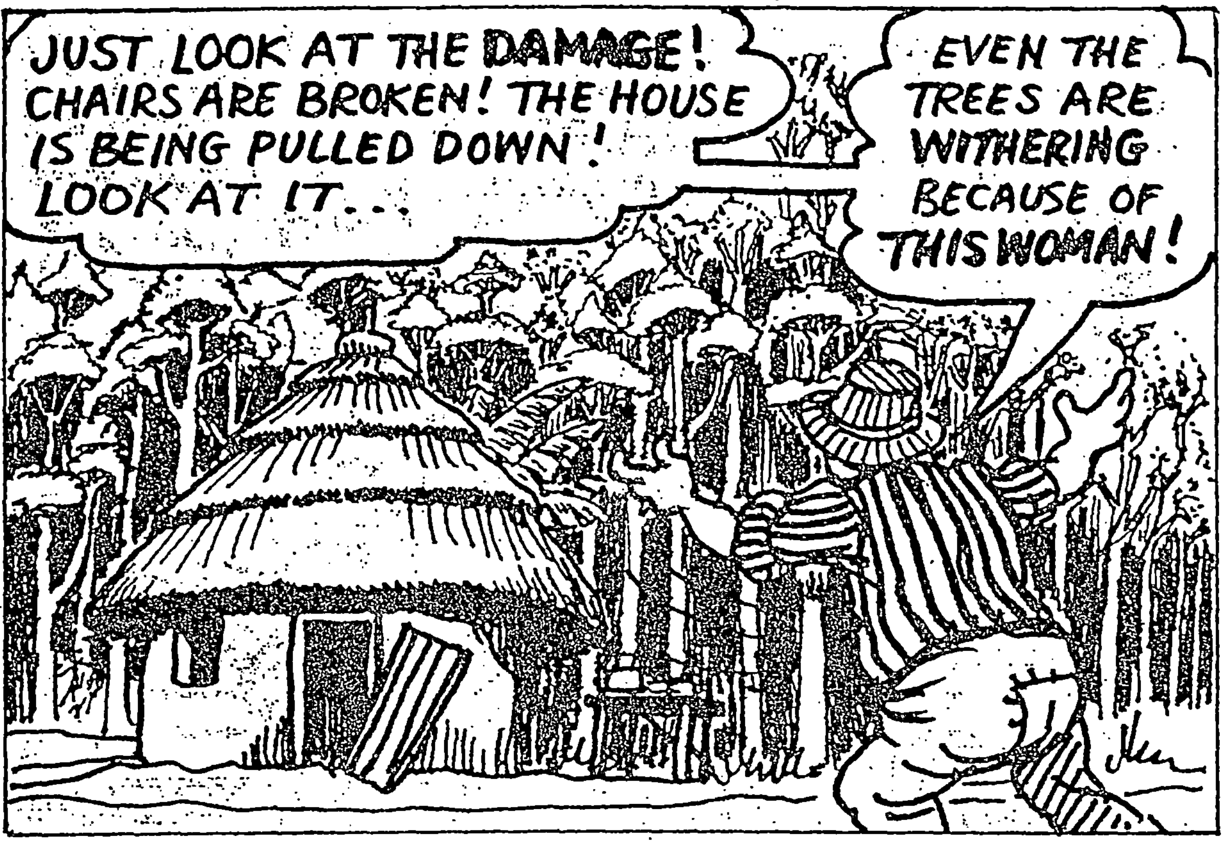

THAT'S THE LAST STRAW! I'VE REALLY HAD ENOUGH OF YOU, WOMAN! ... GET OUT!!
GO BACK TO YOUR MOTHER - TO LEARN HOW A WIFE SHOULD BEHAVE! OUT!!


TAKE IT EASY, BROTHER! ONE MISTAKE...
OKUNYANYI! (SOB!) PLEASE?
HUH! ...EVEN YOU GET OUT!!


YOU COME SNEAKING LIKE A MOLE AROUND HOMES WHEN MEN ARE WORKING! EH?! GET OUT! AND SHE GOES TOO!
I'LL COUNT TO FIVE - AND YOU WILL BOTH BE GONE...
ONE!
OKUNYANYI! PLEASE.!!
BUT, MAN, LISTEN! IS ONE MISTAKE GROUNDS FOR A DIVORCE..?
TWO!

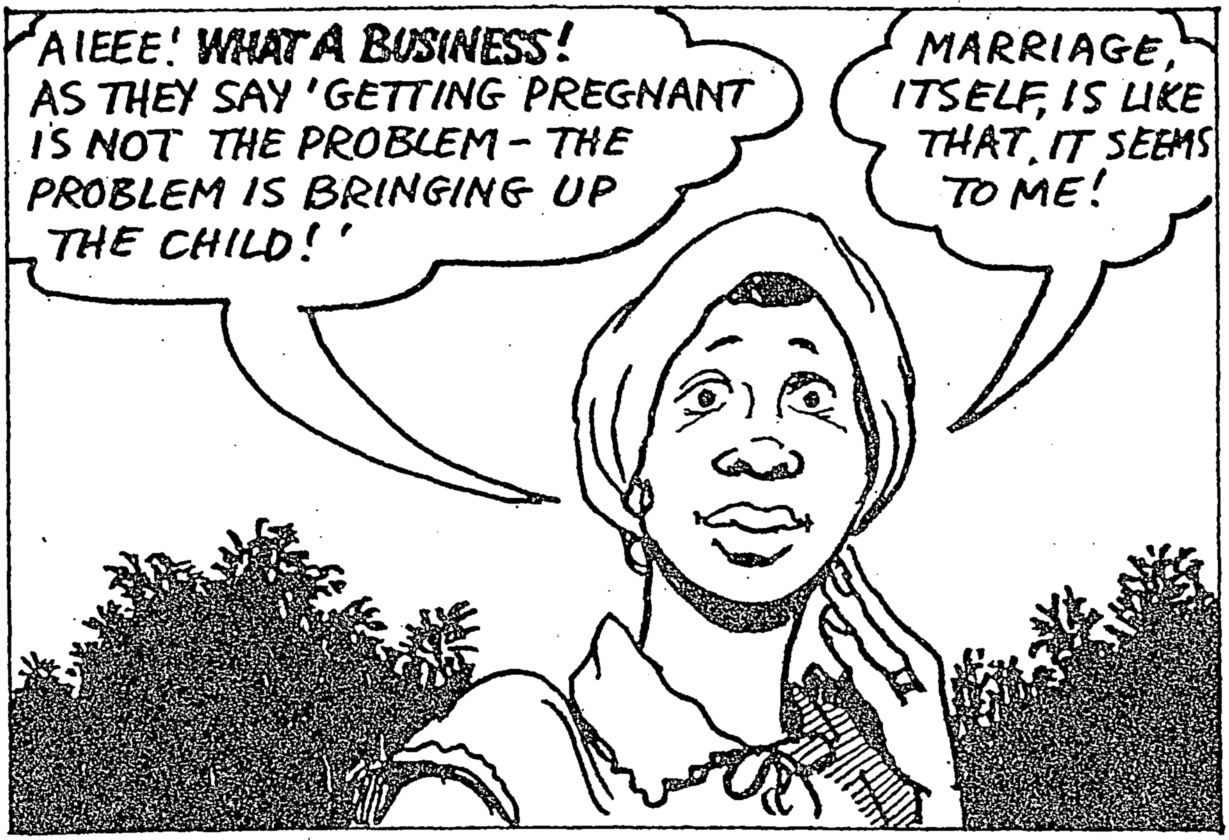

BE REASONABLE, OKUNYANYI!
THREE!
FOUR!

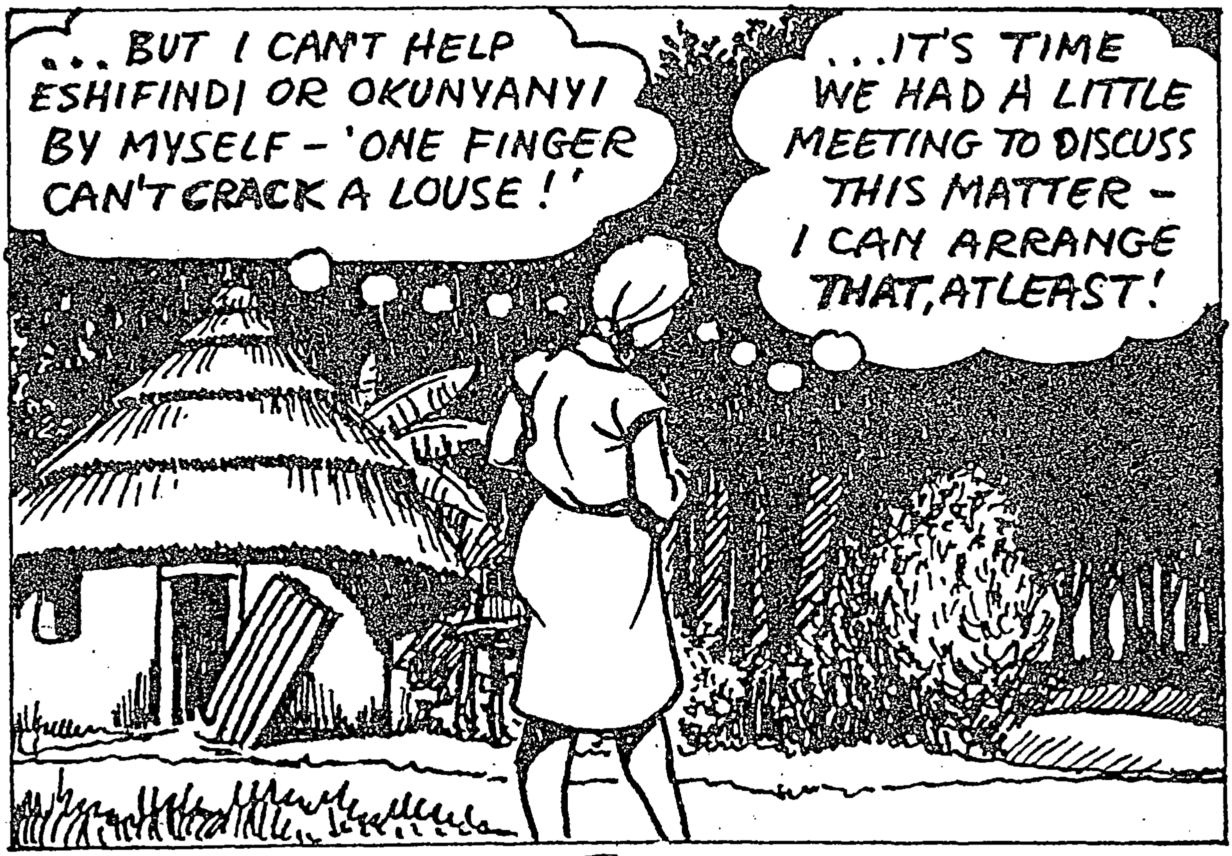

MAMA KWALANDA, A NEIGHBOUR, COMES IN...
OKUNYANYI, WHAT ON EARTH IS GOING ON?
NO!
...YOU STAY OUT OF THIS!

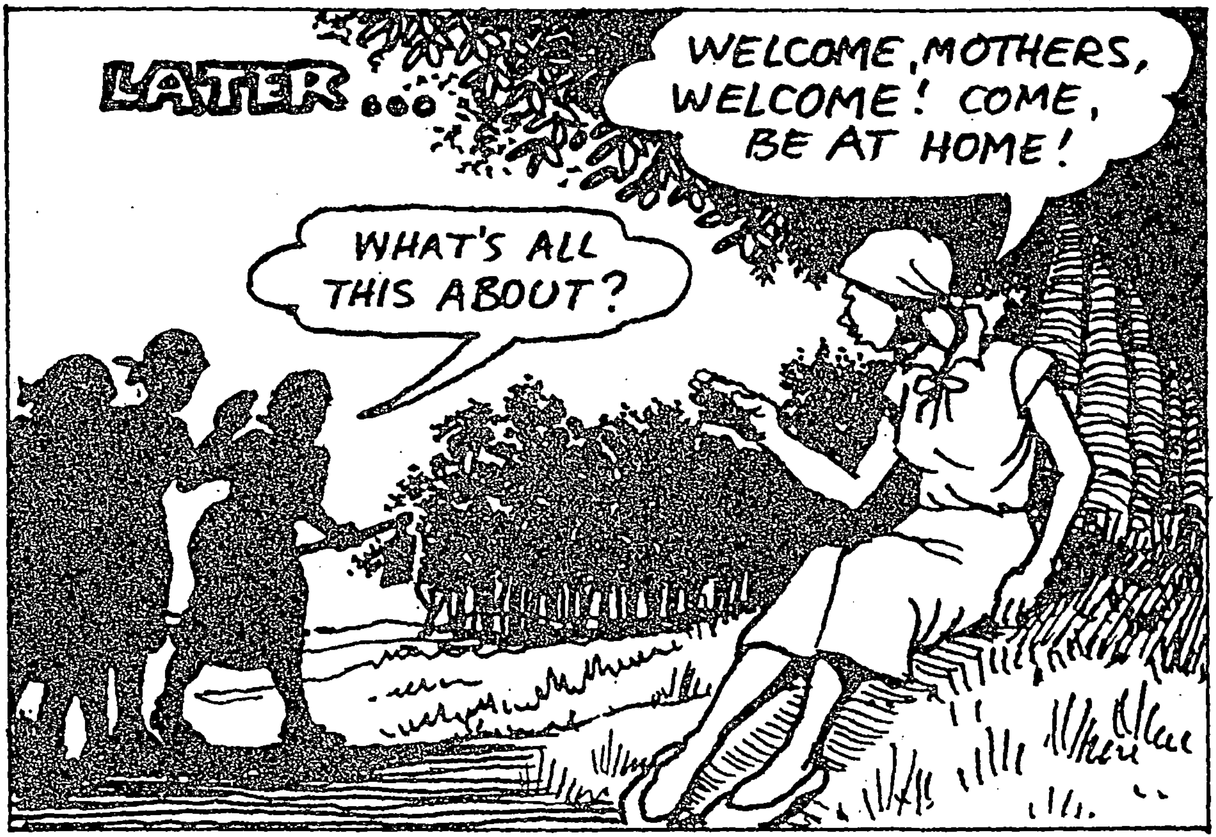

JUST LOOK AT THE DAMAGE! CHAIRS ARE BROKEN! THE HOUSE IS BEING PULLED DOWN! LOOK AT IT...
EVEN THE TREES ARE WITHERING BECAUSE OF THIS WOMAN!


IT'S NOT ME! IT'S THE FIREWOOD FOR HOT WATER, HOT PORRIDGE - AND ALL THAT!
SHUT UP, WOMAN! YOUR SISTERS SEEM TO MANAGE WELL ENOUGH!


...THEY HAVEN'T DESTROYED THEIR HOUSES! ...THE TREES ARE GROWING WELL THERE... HOW COME YOU CAN'T MANAGE? GET BACK TO YOUR MOTHER!
BROTHER, PLANT TREES, ... TREES ARE LIFE!! FIREWOOD IS FIRE!
YOU DARE TELL ME TO PLANT TREES?! HUH! YOU DONKEYS! GO AND GET MARRIED TO EACH OTHER! ..GET...
OUT!


AIEEE! WHAT A BUSINESS! AS THEY SAY 'GETTING PREGNANT IS NOT THE PROBLEM - THE PROBLEM IS BRINGING UP THE CHILD!'
MARRIAGE, ITSELF, IS LIKE THAT, IT SEEMS TO ME!

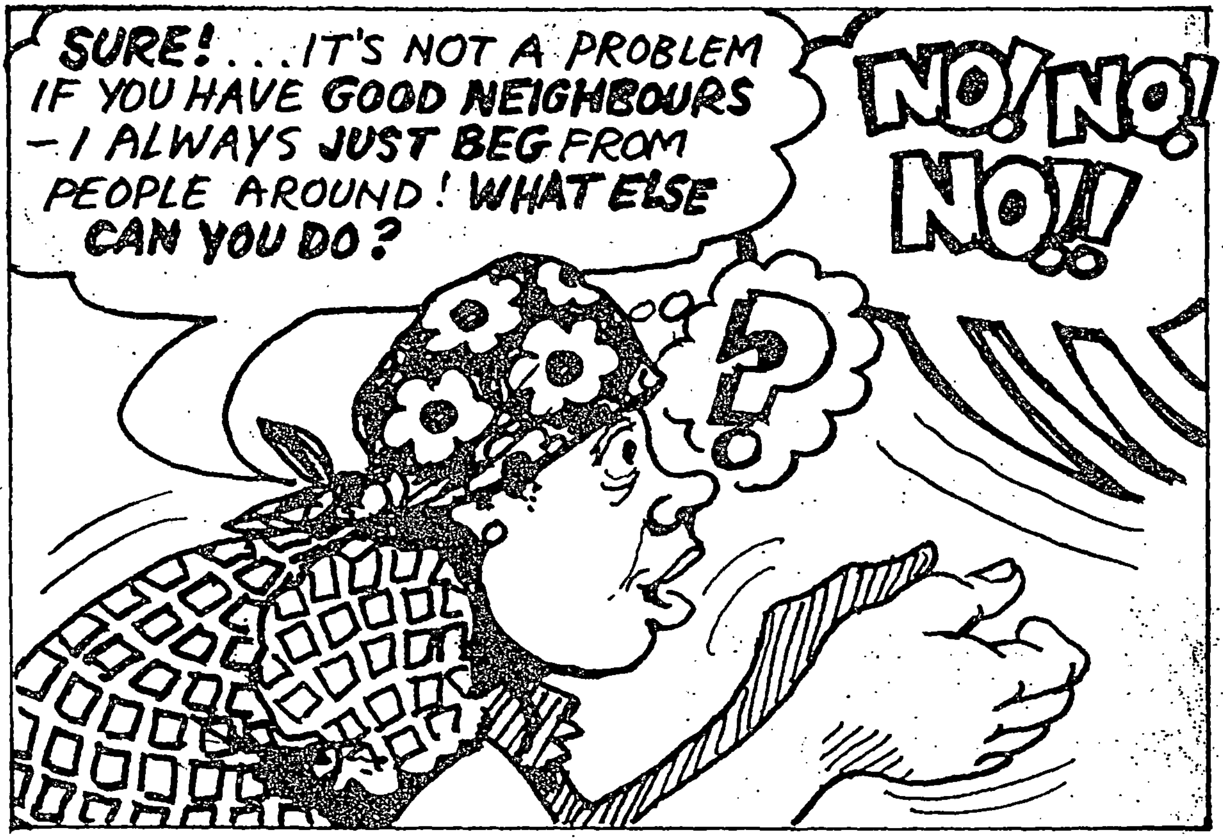

...BUT I CAN'T HELP ESHIFINDI OR OKUNYANYI BY MYSELF - 'ONE FINGER CAN'T CRACK A LOUSE!'
...IT'S TIME WE HAD A LITTLE MEETING TO DISCUSS THIS MATTER - I CAN ARRANGE THAT, AT LEAST!

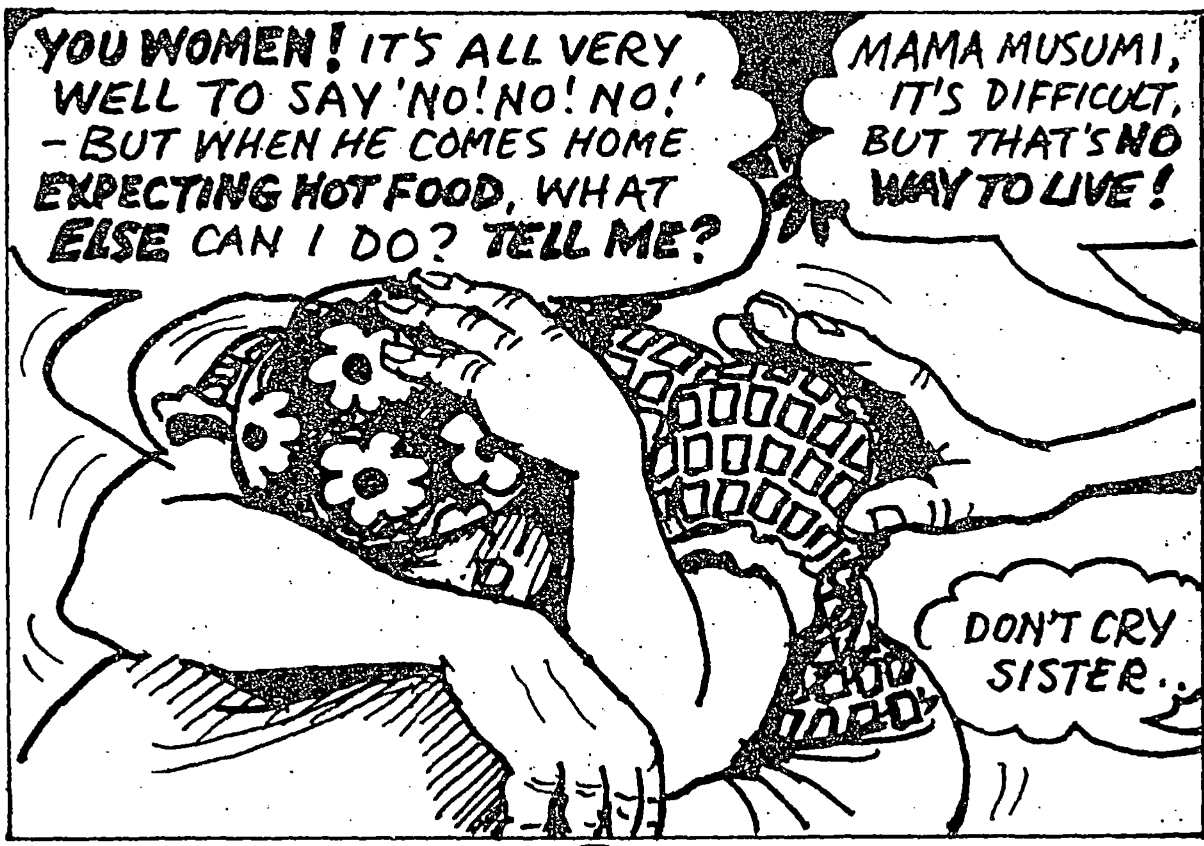

LATER...
WELCOME, MOTHERS, WELCOME! COME, BE AT HOME!
WHAT'S ALL THIS ABOUT?


SISTERS, WE HAVE A REAL PROBLEM BEFORE US...
WELL, WE ARE WAITING...
YES! TELL US ALL ABOUT IT!


NOW, ... IT'S LIKE THIS THE FIREWOOD PROBLEM HAS DESTROYED OKUNYANYI AND ESHIFINDI'S HOME!
HEH? THEN I'M NOT THE ONE TO HELP - I HAVE THE SAME PROBLEM!


WHO HASN'T? ... BUT IT'S NO BIG PROBLEM, REALLY, IS IT?
WHAT!?
MAMA MUSUMI, PLEASE EXPLAIN YOURSELF?
?!

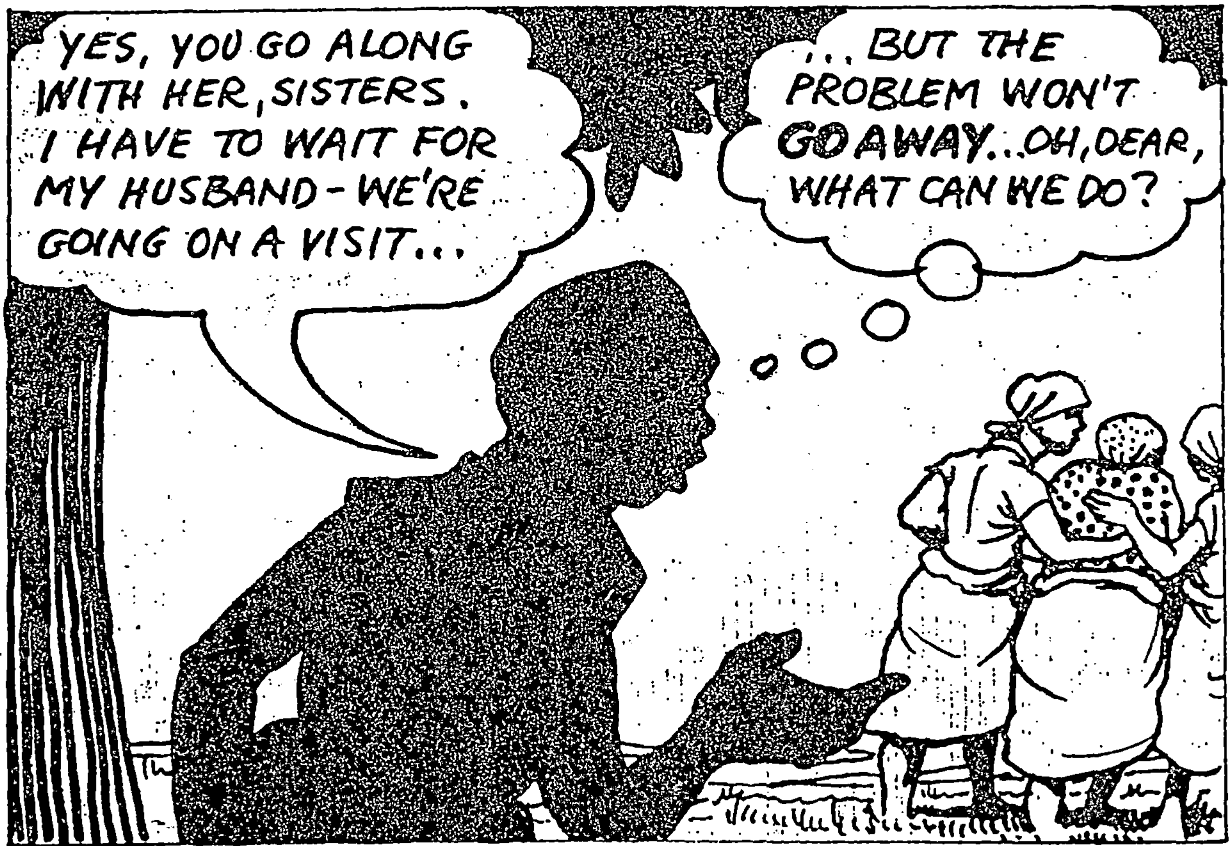

SURE! ...IT'S NOT A PROBLEM IF YOU HAVE GOOD NEIGHBOURS — I ALWAYS JUST BEG FROM PEOPLE AROUND! WHAT ELSE CAN YOU DO?
NO! NO! NO!!
?


YOU WOMEN! IT'S ALL VERY WELL TO SAY 'NO! NO! NO!' — BUT WHEN HE COMES HOME EXPECTING HOT FOOD, WHAT ELSE CAN I DO? TELL ME?
MAMA MUSUMI, IT'S DIFFICULT, BUT THAT'S NO WAY TO LIVE!
DON'T CRY SISTER..


WELL, I SOMETIMES USE DRY MAIZE COBS, BUT THEY DON'T LAST LONG...OF COURSE, EVEN I COULD BREAK A CHAIR OR SOMETHING...
WHO COULDN'T?
TRUE!
...BUT MY HUSBAND IS AS HOT AS PEPPER ABOUT SUCH THINGS...AND IF HE CAUGHT ME AT IT... HEH!!
POOR ESHIFINDI! BUT SHE'S LUCKY TO BE ONLY... CHASED AWAY!
HEH! HEH! HEH! HEH! HEH!
HEH! HEH! HEH!
SLAP!


YOU SEE! IT'S LIKE I SAID... IT'S BETTER TO GO BEGGING – AND STAY HEALTHY!!
... BUT SUCH THINGS DON'T SOLVE THE PROBLEM, SISTER! THEY ONLY POSTPONE IT A LITTLE...
THAT'S TRUE! AND LONGING FOR SOMEONE ELSE'S SUPPER KILLED THE HYENA, AFTER ALL! YOU COULD END UP THE SAME WAY! EH?!
AH, HERE COMES POOR ESHIFINDI...
ESHIFINDI, WHAT'S THE NEWS?
HEH! HEH! HEH! HEH! HEH!
HEH! HEH! HEH!


OH, MY FRIENDS... THIS FIREWOOD HAS FINISHED ME! (SIGH!) BUT I CAN'T STOP NOW... IF OKUNYANYI FOUND ME HERE...
COME,... I'LL TELL YOU ON THE WAY.
SOB! SOB! SOB!


YES, YOU GO ALONG WITH HER, SISTERS. I HAVE TO WAIT FOR MY HUSBAND - WE'RE GOING ON A VISIT...
... BUT THE PROBLEM WON'T GO AWAY... OH, DEAR, WHAT CAN WE DO?


WHAT CAN WE DO? BEGGING FROM NEIGHBOURS IS NO ANSWER, NEITHER IS BURNING MAIZE COBS ... AND WHO HAS THE MONEY TO BUY ALL THE TIME?
... I REALLY WISH I KNEW WHAT THE ANSWER IS!
AS SHE SADLY AWAITS HER HUSBAND, KWALANDA SINGS A SAD SONG... WHICH NABONGO HEARS AS HE ARRIVES...
AH, NOW, MY DEAR WIFE, WHY SO SAD A SONG?
OH, HUSBAND, A SAD THING HAS HAPPENED...


...FIREWOOD HAS DESTROYED OKUNYANNI'S HOME!
WHAT? ALL BY ITSELF? HOW ODD! HEH! HEH!
SERIOUSLY, HUSBAND, IT HAS HAPPENED!
...ESHIFINDI HAS BEEN CHASED AWAY BECAUSE OF IT! ...OH, HUSBAND, I BEGIN TO FEAR FOR MYSELF...
...WILL YOU ALSO CHASE ME AWAY-WHEN I CAN NO LONGER FIND FIREWOOD?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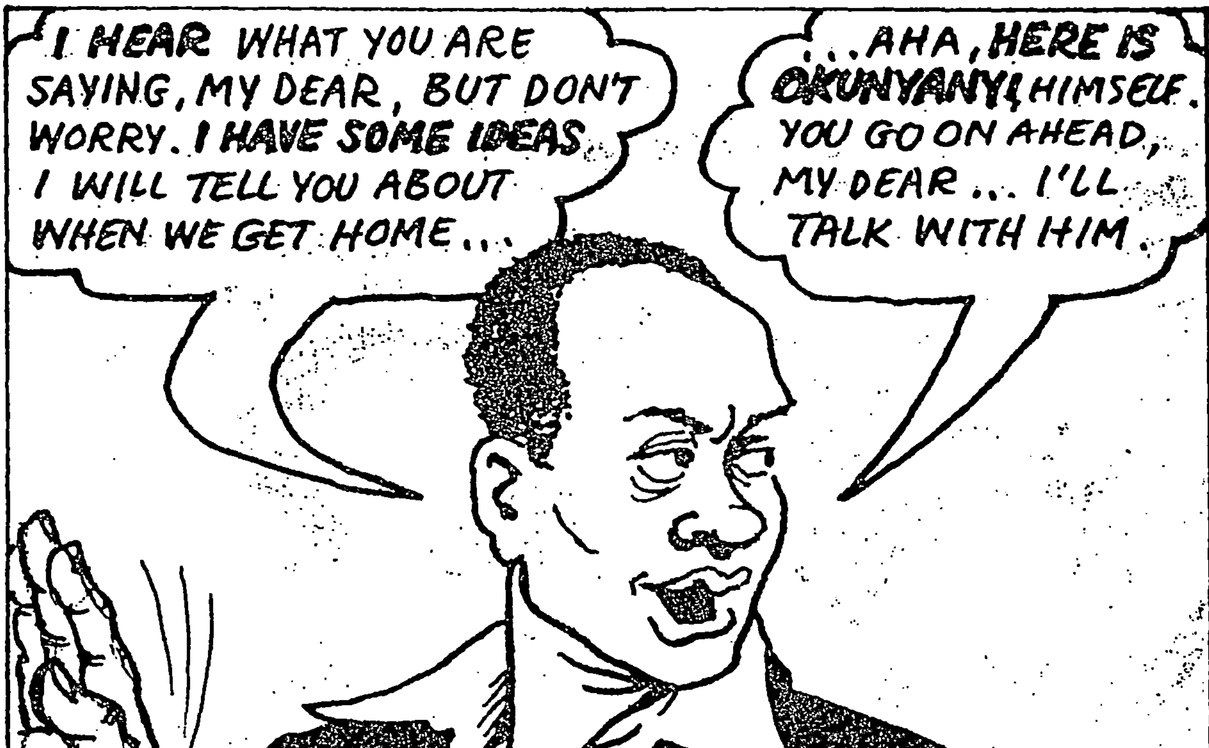
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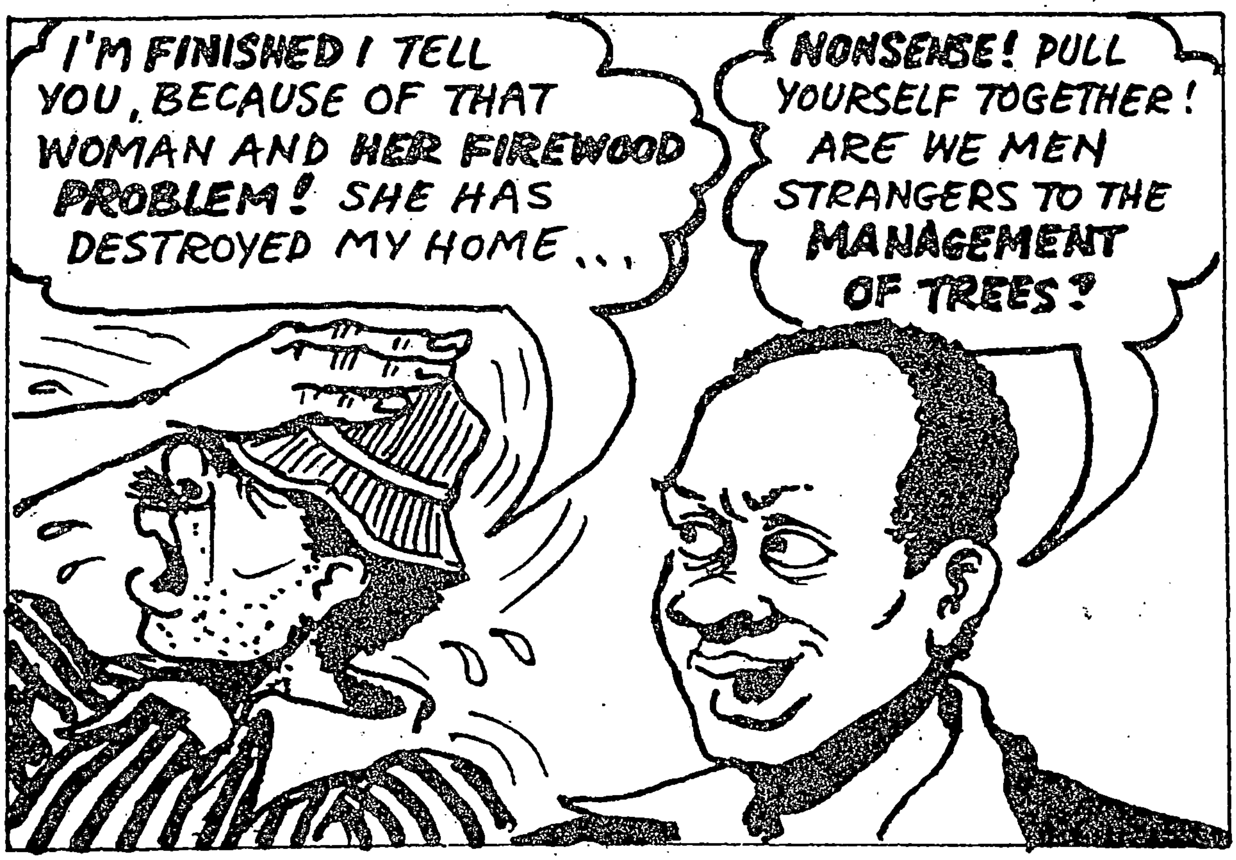
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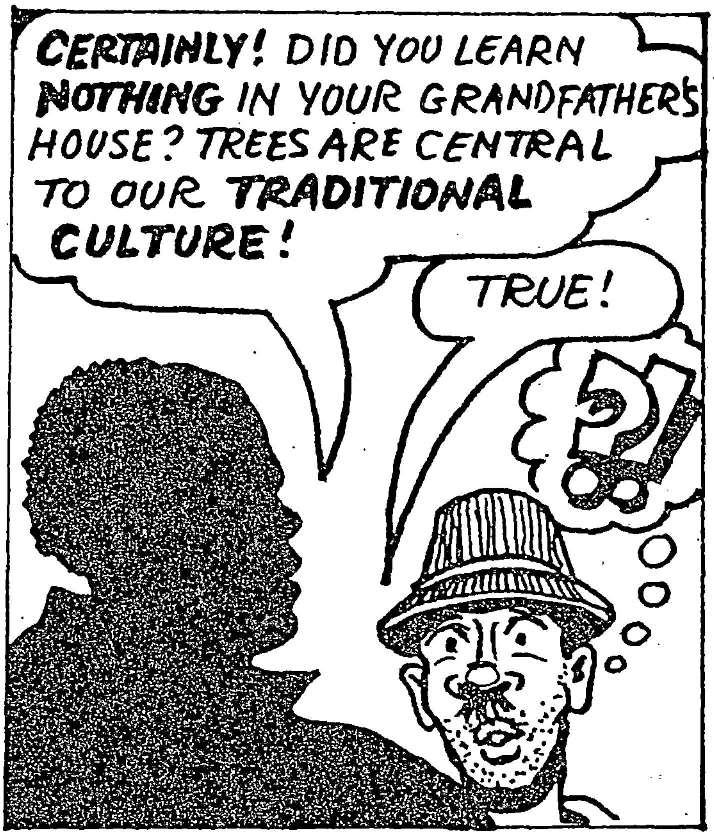
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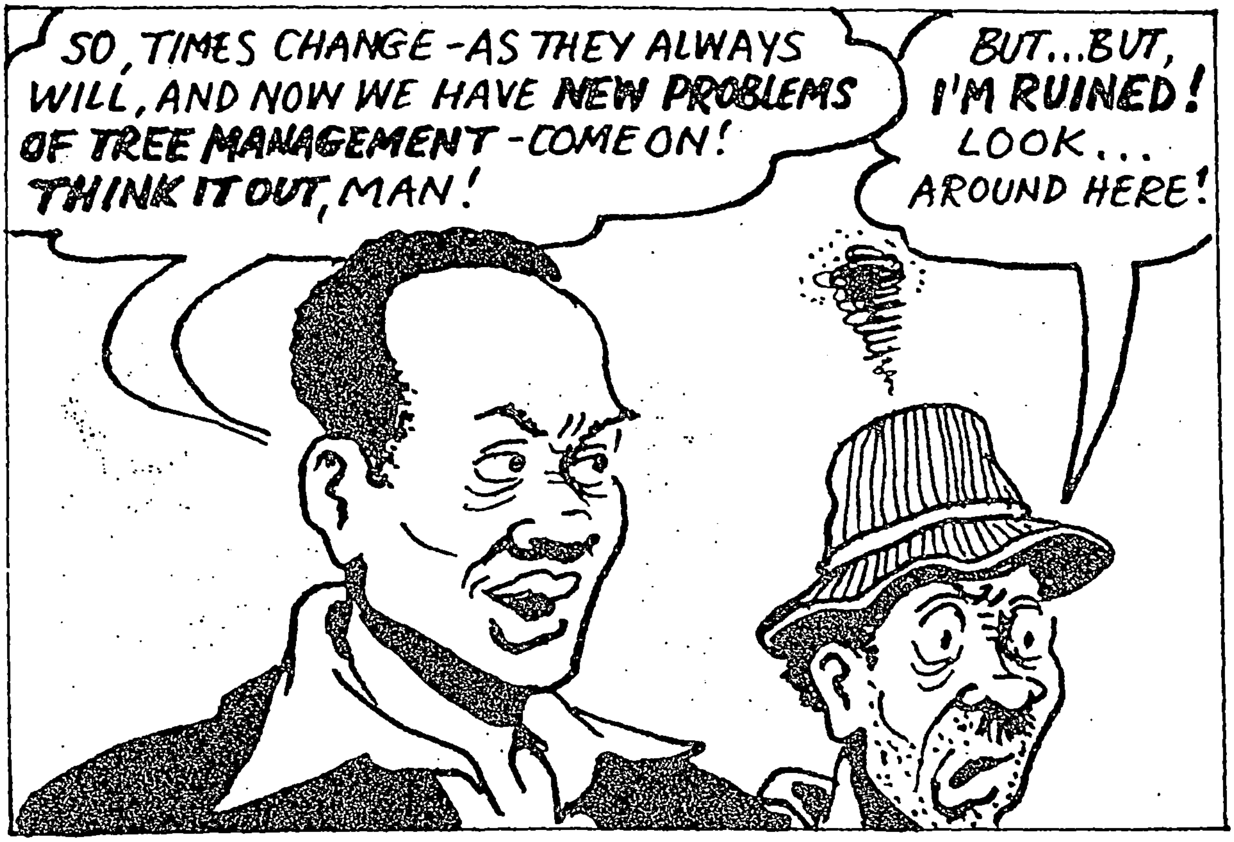
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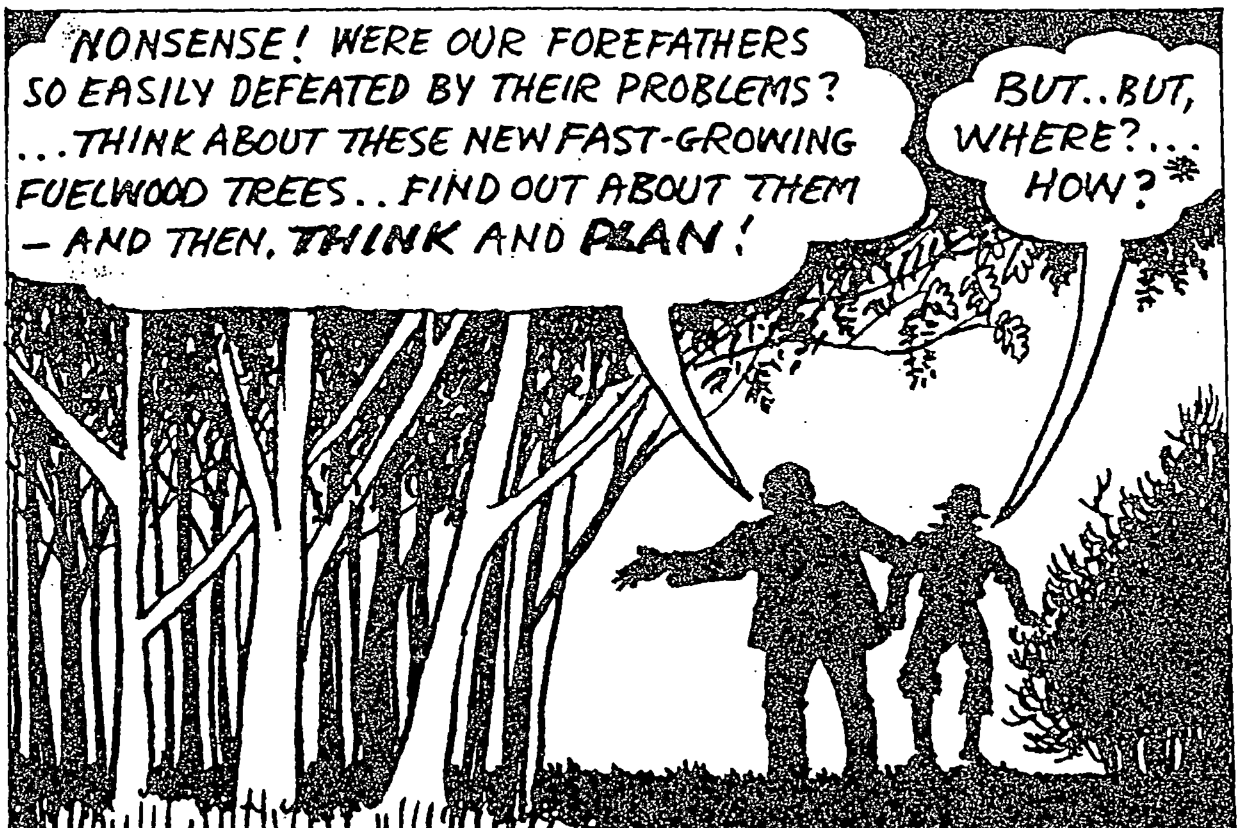
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