

**Leach, G. undated. SADCC Energy Development: Fuelwood study.  
ETC Consultants, UK.**

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"SADCC ENERGY DEVELOPMENT: FUELWOOD" STUDY

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POLICY ISSUES AND GUIDELINES

[ Gerard Leach, 11ED ]

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## EXECUTIVE SUMMARY

Woodfuel problems are symptoms of underlying economic, social and environmental conditions which are changing rapidly. They are not general but are specific to places and social groups. Woodfuel supplies come mostly from farms, where they are but one aspect of farming strategies and production objectives. Woodfuel policies and projects must recognise and be based upon these broader contexts.

This calls for integration and coordination across policy sectors to capture the multi-sectoral and fast-changing nature of woodfuel problems and opportunities to resolve them; decentralised approaches to match the local nature of woodfuel issues; and research, training and extension to spread and enhance local initiatives in the woodfuel context and its broader agricultural base.

The major policy and institutional requirements are:

1. Coordinate across sectors, but with clear definitions of institutional responsibilities;
2. Build upon existing, beneficial local experience;
3. Encourage an indicative national wood energy planning process which allows for local autonomy to address local needs and opportunities;
4. Widen participation by encouraging and supporting grass roots activities at the individual and communal levels;
5. Enhance the capabilities of many types of development project to include woodfuel components;
6. Increase training, R & D, and extension on wood energy and woody biomass;
7. For TAU itself, a lead role in the above as well as:
  - \* the coordination of data gathering and evaluation;
  - \* the development of training methods and manuals.

## 1. LOOKING BEYOND WOODFUEL

### 1.1 Introduction

The importance of woodfuels in Southern Africa is clear. Biomass in the form of firewood, charcoal and crop or animal residues, is the largest source of energy in every SADCC country. In some it provides over 90 per cent of all energy supply and use. In SADCC as a whole, woodfuels make up nearly 80 per cent of final energy consumption (see the Table below). For most rural people and the urban poor woodfuels are an indispensable basic need for sustaining life: for cooking food, for warmth and, for a sizeable minority, light.

The symptoms of the woodfuel problem are also well known. In many places woodfuels are scarce or becoming scarcer. The costs of obtaining them, whether in cash or labour, are imposing severe strains on people's welfare and the sustainability of household production, especially for the

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SADCC Energy Flow (1985): final energy consumption

	PJ (1015 Joules)	Percent
Woodfuels	1100	79.0
Oil products	143	10.3
Coal	87	6.2
Electricity	63	4.5

Source: SADCC Energy Sector, Angola

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poor and for women who generally bear the brunt of fuel provision and use. These impacts are not felt everywhere. They are presently confined to some places and some people. But the trend is towards more places and more people.

Equally serious, where woodfuels are not yet felt to be scarce, this is often because natural capital resources are being mined cheaply and without payment of their environmental and other social costs. Rapid deforestation is an alarming feature of all SADCC countries and is helping to undermine the basic environmental systems which sustain life and national economies.

What is not so obvious is how the woodfuel problem can best be tackled; or indeed, whether it is a woodfuel problem at all.

In recent years various policies and projects have been developed within the SADCC region based upon direct approaches to woodfuel supply and demand. As the symptoms of woodfuel scarcity mounted and spread, direct actions were thought to give the best chance of quick and lasting results to bring sustainable woodfuel supplies and demand into balance. Governments and foresters have tried to protect woodland reserves from encroachment by wood cutters. Foresters have concentrated on fuelwood plantations to augment supplies. Energy ministries have tried to curb woodfuel demand by promoting more efficient cooking stoves. In the energy-rich SADCC countries, substitutions of woodfuel by electricity, oil or coal have become a central part of energy planning.

By and large, while there have been some successes, these direct methods have failed to turn the tide of woodfuel

depletion and growing pockets of scarcity. The reason, simply, is that they have not addressed the broad and deep strains in the environmental and social fabric of which woodfuel problems are merely one symptom - the proverbial tip of the iceberg.

As argued in this report, the underlying reasons for woodfuel problems include rural and urban poverty; inequalities in land holding and security of tenure; low agricultural productivity, incentives and support, especially for small and marginal farmers; the collapse of traditional resource-sharing practices and controls over resource use; rapid urbanisation; sharp divisions in the socio-economic roles of women and men; and, in some SADCC countries, external pressures resulting in economic crises and war.

These underlying pressures will not yield to piecemeal or narrowly-based efforts on the woodfuel front. Nor can successful woodfuel policies and projects emerge unless they are firmly rooted in these broader contexts.

This point is also now recognised by policy makers and planners. But the recognition is fairly new and has not spread to all, the linkages involved are quite complex, and the resources to address them are limited. Reasonably enough, the new institutions, the joint policies which address common causes of problems, the new alliances between agencies and new forms of intervention that are required to address fuelwood in a more holistic and relevant way, have generally been slow to emerge.

The challenge to policy makers and planners is thus both difficult and exciting. It is difficult because decision makers in the woodfuel area must break the familiar bounds

of 'energy' and 'forestry' and reach out into perhaps unfamiliar territory. It is exciting because within this new territory many positive things are happening which, to a considerable extent, turn the woodfuel problem into a range of opportunities to support and broaden more fundamental beneficial changes.

The aim of this report is to help speed and strengthen this process of policy change. Its entry point is the 'energy' and 'woodfuel' sector, but for the reasons outlined above it has a strong bearing on most other areas of policy and planning. For this reason, and because it focuses on policies rather than interventions at the project level, it is written for non-specialists in all sectors. It presents only the key woodfuel issues and main policy ideas that emerge from them \*.

For similar reasons, the report provides few details of the woodfuel-related policies and policy structures of individual SADCC countries. The woodfuel problems of SADCC countries are very different; so are the institutions and policies which have been developed to deal with them. Since the emphasis of the report is on the need for multiple policy responses to multi-sector problems, policy needs are treated in a general way. Each country will hopefully be able to adapt these generalities into specific policies and actions.

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\* The companion project report, Planning Issues in Woody Biomass Management, reviews these topics in greater depth. Intended for planners and senior project staff, it focuses on planning rather than policy. Other project reports provide still greater specificity and detail on "wood Production", "Agricultural Residues" and "Stoves".

## 1.2 Six challenges to woodfuel policy

To take these ideas further, this chapter presents a rapid review of the main issues of the woodfuel problem and the policy questions that arise from them. They are based on the experience of many people within the SADCC countries with whom we have worked and shared ideas. Chapters 2 and 3 take up these ideas in greater detail for the rural and urban sectors respectively. Chapter 4 provides a structured discussion and list of suggested policy issues, directions and needs.

Our starting point is with people, especially poor people who are the main consumers - and in rural areas, providers - of woodfuels. The poor face many shortages and have many concerns in their attempts to secure decent livelihoods, including food, water, health, employment, security over basic assets such as land and housing, and cash. Adequate fuel supplies are another concern.

Whether or not people feel that woodfuels are a 'problem' depends on the level of costs in labour or cash for obtaining and consuming woodfuels compared to the many other concerns and costs in their lives. If woodfuel costs are judged to be 'high' one can say there is a significant woodfuel problem in that place and for that group of people. In these circumstances, people will either be responding to woodfuel scarcity in some way or will be open to ideas about how they might respond effectively. However, the poorest are frequently unable to respond appropriately for lack of cash, land or other resources.

If costs are not judged to be high, then woodfuels are not currently a significant problem. Any woodfuel intervention that itself carries a significant cost will in all

probability be rejected or allowed to languish into failure.

In other words, the existence of a current woodfuel problem, the priority given to it, and the readiness to adapt to it, is largely defined by the people who live closest to it. The existence of such problems cannot usefully be decided by outside experts - for example, through estimates of the wood supply-demand 'gap' in a given area. One should note here that where outside estimates do judge woodfuel shortages to be severe, people typically have so many other basic concerns that woodfuels usually appear to be among the least of their problems. There will be little interest by such people in 'fuelwood' solutions unless these are part of a much broader attack on other aspects of production and consumption.

There are many policy implications which flow from all this.

First, woodfuel-related policies and interventions must address people and their needs, opportunities and constraints rather than things such as improved stoves or woodlots.

This calls for new attitudes by professionals who are used to thinking in terms of mechanisms, numbers, single solutions and physical targets. These approaches are necessary but not sufficient. The skills of groups who are used to dealing with people on the ground - such as community health and agricultural extension workers, or non-governmental grassroots organisations - are also needed. A major aim of policy must be to support such groups and help them to be more effective.

Second, woodfuel problems are both diverse and discrete because they are specific to people and place. They are also somewhat invisible, or at least indefinite, from the conventional viewpoint of the central planner. The problems, and opportunities to solve them, exist 'out there' in the minds and hands of myriads of wood consumers and producers. This is another reason why relevant, remedial policies and actions must extend their reach and adopt a highly decentralised and 'bottom up' approach to support local concerns, adaptations and other actions.

One advantage of this approach is that it can greatly reduce the costs of interventions, such as the provision of seedlings for tree-growing initiatives. Another is that it allows recognition and support of the various indigenous responses that are now occurring in all forms of biomass resource management, including some which bear strongly on fuelwood resources and supply.

Some examples of both these points are given in Chapter 2. They show that popular perceptions and responses to fuelwood and related issues often seem to be more urgent and dynamic than those of most governments. This is not surprising when one considers how close individuals are to the problems.

However, this is not to say that more global policies are not also required. If one aim of policy is to provide a strong framework for 'project' interventions which act directly to initiate or support beneficial actions on the ground, another is to work more indirectly by shifting the whole framework in which woodfuel producers and consumers make their decisions. Fuel pricing is an example of such a global policy.

Third, woodfuel problems must usually be approached indirectly, through the more basic contexts in which they occur; The view down onto the rural fuelwood production pyramid described in Chapter 2 exemplifies this point. If one places woodfuel supply at the point of the pyramid and examines the contexts in which it is set, one rapidly progresses to a much broader series of production parameters:

Fuelwood	*single fuel demand
All forms of wood	*multiple wood demands
All forms of woody biomass	*multiple wood sources
Integrated farm/land-use systems	*multiple production
Environment-land access-population	*broad resource base

Issues at the base of the pyramid - such as environmental resource potential, population density and settlement policies, land distribution and tenure rights, the intensity of land use, and access to farm inputs and credit - strongly effect the upper levels of the pyramid and, eventually, matters of fuelwood supply.

This crucial point cannot be emphasised too strongly. For example, in most of the SADCC region it is the demand for new agricultural land - not the demand for woodfuel - that is the principal cause of deforestation. Agricultural intensification is thus a major route to reducing tree loss and the woodfuel problems that result from it.

Or again, there are few places where woodfuel supply is a major reason for growing and harvesting trees. Many other objectives are seen as more urgent, ranging from the provision of food, fodder, construction timber and shade to protection of the soil from erosion. Typically, woodfuels are a byproduct of these other objectives.

Policies and interventions at levels which are lower on the pyramid than woodfuels may be outside the remit of energy and woodfuel agencies, but are absolutely critical to their interests.

Woodfuel is therefore a multiple-sector problem - or, rather, set of opportunities. This means that effective, woodfuel policies must often work through or with policies in other sectors. Woodfuel planners need to inform other policy agencies of their own needs and perspectives. They need to assess the implications on 'woodfuel' of policies and events occurring in other areas. New institutions, and especially new forms of institutional cooperation and information, new subjects and methods for training of extension workers; and new centres of responsibility may all be needed to address this issue. - .

Fourth some of the most difficult issues of woodfuel policy arise from avoided costs. The costs of harvesting and using fuels are transferred 'sideways' onto other people or other resources, or forwards onto the future. costs are hidden, or externalised. The sideways displacement of costs hides the need for actions against immediate scarcities. The forward displacement of costs hides the need for any actions at all.

An example of displacement onto others is the indifference of men to the burdens of woodfuel provision borne by women. For instance, in parts of Botswana where firewood is beginning to run short, women have begun to economise on fuel for their cooking fires but have no control over the much larger outdoor 'social' fires which men gather round at night. Such sharp gender divisions run like a chasm through conventional economic and other 'rational' approaches to intervention. A greater role for women in

extension work and project design, as well as in policy making, could do much to correct these difficulties.

True costs are also hidden across resource systems (as with soil erosion resulting from over-cutting woodlands) or by living cheaply today off capital rather than income resources. Although well recognised as problems of resource economics, viable policy solutions are not easily found.

The standard solution of raising prices to match the true costs of production may have devastating impacts on the poor. They may also fail to provide sufficient incentives either to force substitutions into alternative commodities (eg, kerosene for woodfuel) or encourage new supply production (eg, small holder wood production for sale). Furthermore, with traditional 'free for all' resources such as open-access forests providing wood to urban markets, pricing has to be accompanied by enforceable legal or fiscal controls on the threatened resource. These are usually impractical.

All this calls for innovative fiscal, legal and other approaches to sound resource management. This is not easy, but various steps in these directions have been taken in the SADCC region. One solution may be to put open-access woodlands solely, or jointly with government, under the management of local communities - a form of privatisation. Another is to exploit rather than preserve under-used natural forests, using more productive management. A third is to create buffer zones of high yield species around forest reserves to deflect the attack on them. Subsidies to promote small-scale tree planting can also be regarded as investments in 'hidden' environmental benefits or long-term protection of forest resources.

Fifth, policies must be adapted to live with massive and rapid change. Virtually all the basic conditions underlying the woodfuel problem - including urbanisation, the switch from pastoralism to settled agriculture, food and other commodity prices, farm earnings from migrant labour, or innovations in agro-forestry - are altering quickly. Compared to these massive changes, woodfuel seems like a spark in the sky amidst a great movement of stars.

This means that policies and planning have to become well tuned to the concept of rapid change itself. Rather than 'react-and-cure' they must try to anticipate and prevent. Planning needs to be open-ended, trying to keep all options open. Since the outcomes of many changes are unpredictable, policy makers need also to think in terms of direction rather than end points: getting on an upward slope rather than attempting to achieve fixed targets.

This challenge is not easy for policy institutions to grasp. For example, adaptation to rapid change has major implications for policy and project evaluation. Success becomes harder to define when it is measured in terms of processes started rather than targets met. It demands more frequent and yet more flexible methods of data collection and evaluation to monitor trends, detect impending trouble spots and pick out changing responses to energy and associated problems. This need not be as expensive as it sounds if data collection is focused on key trends and areas rather than attempting a blanket coverage. Time lags between the appearance of problems and policy or project responses to them need to be shortened. Decentralised information gathering, planning and authority to act is one way of cutting delays. Closer ties between line agencies may have similar effects. For example, the first signs of a worsening woodfuel situation - or of people's

responses to it which may need to be encouraged - may emerge through women's health clinics or the observations of agricultural extension workers.

Sixth and finally, policy and planning needs to be more responsive to spontaneous adaptations to change.

One of the most striking findings of our study is that a great variety of responses to fuelwood and related deficits are occurring across the SADCC countries. Some concern the use of wood fuels, or fuel management practices. Others, the majority, concern changes in land use management which are related directly or indirectly to woody biomass in general, or woodfuels in particular.

For example, tree planting in and around fields is catching on in a number of places with a view to preventing soil erosion, raising crop yields by increased nutrient cycling, or providing a variety of other benefits, including fuel. Pastoralists have taken to tree planting and have invented ingenious methods of protecting young and vulnerable trees from their cattle. In some dry zones, oases of green are appearing as grazing land is fenced off and allowed to regenerate naturally - in some places at rates much greater than expected. Live fences are often used, providing multiple additional benefits including fodder, timber and fuel. In other places, resource sharing arrangements are beginning to emerge which take pressures off woodland and grazing land at greatest risk.

Some of these adaptations are leading to dramatic improvements in welfare and environmental conditions. In other cases, whilst the responses are no less positive, the pressures on resources are so great that people cannot

keep abreast of them or catch up: environmental degradation and its harmful impacts continue. Elsewhere, positive adaptations have hardly begun; not because there is no perceived need for them but because the constraints are too great. Poverty, which denies people the means to act in their own self-interest, is one such constraint. Sharp differences of gender roles in household economies is another. Poor access to knowledge of what others are doing is a third widely experienced roadblock to change,

Perhaps the central challenges of fuelwood policies is to recognise what responses are occurring, what constraints they face, and how positive responses can be reinforced and multiplied, for example by:

- \* fostering local, beneficial adaptations through projects, extension services and support for grassroots organisations which are often the agents of change;
- \* by improving on the techniques and potentials of local adaptations through research, demonstration and extension;
- \* by providing a supportive national framework of policies, institutions, pricing and legal structures to encourage positive responses;
- \* and also by using all these means to redirect the detrimental adaptations that are also going on.

In summary, woodfuel policies and institutions need to focus on multiple causes and not single symptoms; take an integrated rather than piecemeal approach; think in terms of positive movement rather than achieving targets; and listen to and reach the people on the ground. If energy planners can help create the structures for doing all this they will have helped turn their 'woodfuel problem' into an opportunity for massive and positive change.

## 2. RURAL WOODFUEL ISSUES

### 2.1 Introduction

Devising successful woodfuel policies requires a coherent appreciation of possible policy and project options. It also requires a keen appreciation of the interrelated environmental, economic and social contexts of woodfuel activities. Woodfuel problems cannot be understood in isolation from the contexts in which they occur. This chapter considers the main issues of rural areas, which account for virtually all production and the largest share of woodfuel consumption in SADCC countries. Chapter 3 looks at urban issues.

In rural areas the production and consumption of woodfuels are aspects of localised - and usually integrated - land use production systems. These may be predominantly arable or pastoral or, frequently, a mixture of both. They nearly always involve some level of management of woody biomass, which includes shrubby vegetation, live fences and crop (and animal) residues as well as individual trees and woodlands. In addition, there may be areas of natural forest lying outside the main production system which are harvested and managed to a greater or lesser extent by local people, as well as by state foresters and urban commercial traders. However, most rural people obtain their wood supplies from trees and other biomass outside the forest.

Woody biomass rather than 'forest' is therefore the critical resource. But formal knowledge about woody biomass, which provides the most fuel, is much less than about forests which provide the least fuel. This fact

emphasises the importance to policies and projects of woody biomass and land management systems in general and de-emphasises the potential contribution of conventional forestry solutions. There are no single formulae or blueprints to act as a guide in woody biomass planning. Rather, it is vital to plan for woody biomass maintenance and enhancement within given production systems, based upon local perceptions of problems and abilities to respond to them.

## 2.2 From resource to consumer

The chain from woodfuel resources to consumer thus starts from a very broad and varied base. Patterns of land use (and of natural woodland) are determined firstly by local environmental factors, including climate, soils and topography. These help to determine the local environmental resource potential and hence the types of land management system that have evolved. But this evolution is also profoundly determined by population densities resulting from natural growth, migration or resettlement policies, as well as policies and practices of land allocation and tenure. The level of farming skills, available technologies, access to markets and price incentives also contribute to the type of land use production system.

All these factors help determine the woody biomass resource. But this resource is valued and maintained for multiple purposes, including soil protection and fertility, shade, live fencing, fruit, nuts, animal fodder and wood. For wood there are usually competing demands: as timber for construction and fencing (which may be recycled as fuel), as well as fuel for domestic purposes and income-earning activities such as brewing or charcoal

making. Indeed, it is rare to find that woodfuel supply is the primary reason why rural people grow and harvest woody biomass. Typically, fuelwood is regarded as a useful byproduct of other, more valued woody biomass activities.

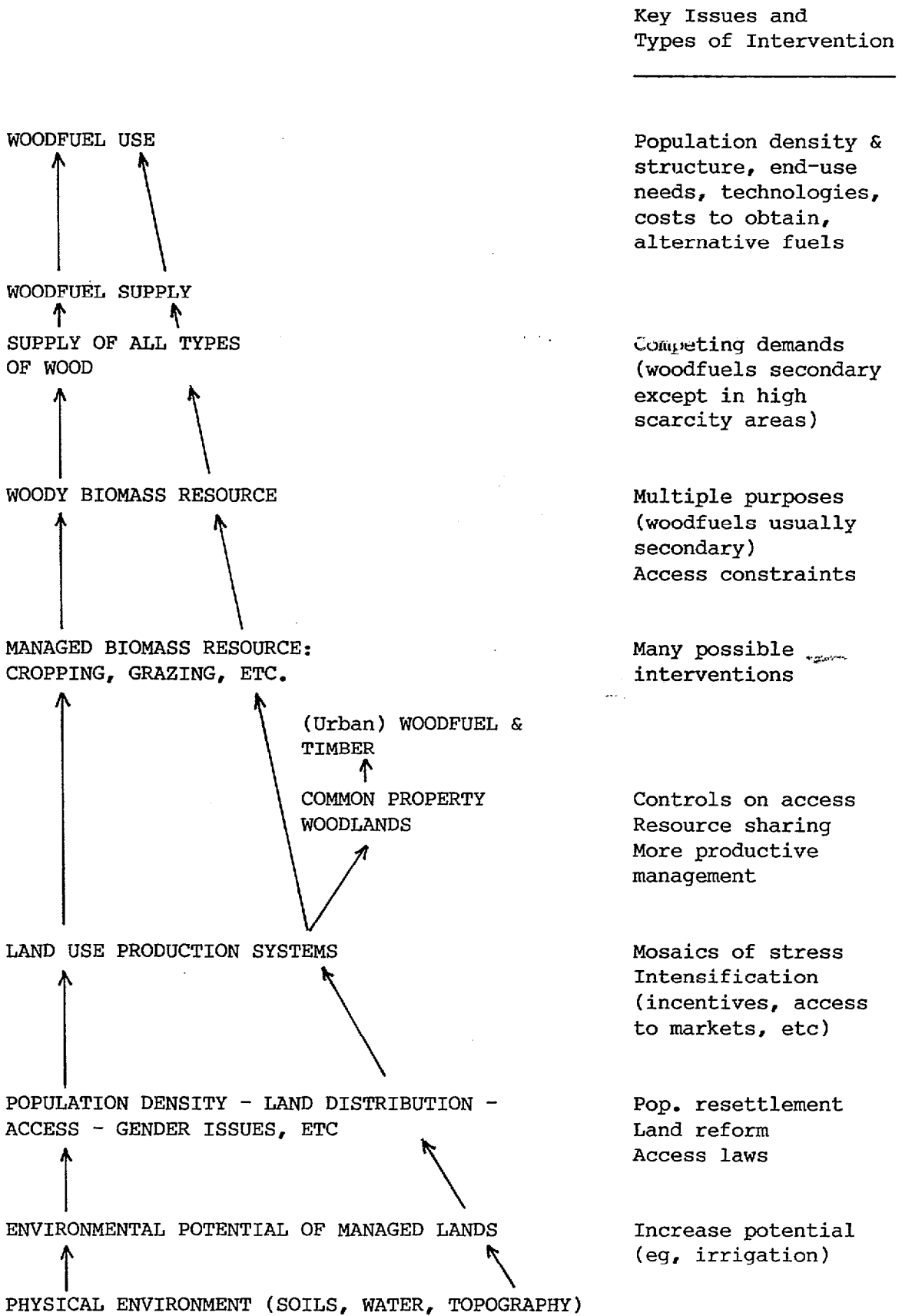
The availability of woody biomass resources to different sectors of the community depends on question of both physical and social access. Physical access is a matter of distance to preferred types of resource and the difficulty in reaching them due to terrain, slopes, etc. Issues of social access include land distribution, enclosure of common land for agriculture and forestry, customary practices concerning the control of common land, and the physical and economic resources of consumers.

All these factors determine the effective supply of woodfuel: the proportion of woody biomass which is available for fuel. It follows from this that woodfuel availability is highly variable both between different places (reflecting great variety in environmental potential and land use systems) and between different sectors of the community (reflecting differing access).

Finally, fuelwood consumption is a consequence of both needs and desires for the services provided by these fuels: notably cooking and other forms of heat. It is obviously a function of population, but also of the technologies employed, the monetary or non-monetary costs of obtaining and consuming fuels, and the availability and costs of alternative energy sources. Rural and urban consumption differs considerably in these respects.

This narrowing, pyramid-shaped set of contexts which influence the flow of woodfuels from resource to consumption is outlined in Figure 1. The Figure also

Figure 1: The Context of Rural Woodfuels



highlights the key issues and types of policy intervention that apply to each layer of the pyramid. Clearly, a focus on fuel alone misses out most of these. In the remainder of the chapter we illustrate those issues which are most relevant to policy with examples taken mainly from SADCC countries.

### 2.3 Mosaics of Stress

Obviously, all the conditions illustrated in Figure 1 vary considerably by place and social group. Woodfuel shortages, or impending shortages, are therefore local: they occur in patchworks or mosaics of stress. The pockets of stress may be large, as in most of tree-scarce Lesotho where rural people long ago turned to crop residues and dung as their primary fuel. Or they may be highly localised: for example, around a town or large village-, or on a settled slope high above a tree-rich valley. Shortages may also be seasonal - for example, before a harvest which provides adequate crop residue fuels - and are clearly worsened by longer term droughts which decimate the entire natural resource base.

One implication of this for policy is that large-scale, aggregate measures, such as estimations of supply and demand 'gaps', have little operational value. They may be a useful guide to broad regions or districts of stress and the scale of efforts required to bring demand and sustainable supplies into balance, but they say nothing about exactly where interventions may be needed and welcomed today. Nor do they say what kinds of intervention would be fruitful. For this a hierarchy of assessment methods is required in order to focus down onto specific sites of stress.

On the intermediate to large scale, existing or worsening areas of stress can be identified at fairly low cost by observations of woody biomass stocks and yields, access issues, population densities, cropping patterns, and the extent of external urban or industrial wood demand. An abbreviated example of such an exercise is presented in the Box entitled "Woodfuel conditions in Malawi",

Once a policy decision is reached that interventions should be made in a particular region, more detailed assessments will be needed. For example, areas of general shortage may contain particularly acute pockets of stress and of relative plenty; variations in land management will dictate what range of interventions or broader policy changes may be needed. Detailed local knowledge obtained through agricultural, forestry or rural development extension workers, village councils or chiefs, or health and other community development agencies, is therefore essential. This is one of the main reasons why the need for decentralised structures of information which reach into the village, with strong integration across line agencies, was emphasised in Chapter 1.

It is also vital to appreciate that unstructured local knowledge of conditions and opportunities for improving them - obtained, for example, from informal observation, participation, group interviews and discussion - are no less relevant than more formal methods of data collection and analysis. An illustration of this point is given in the Box entitled "Signs of Increasing Fuel Scarcity" which lists the variety of behavioural changes that have been observed among rural people as woodfuels become harder to obtain.

The burning of crop or animal residues as fuel is one

## WOODFUEL CONDITIONS IN MALAWI

Three types of area can be identified in Malawi which have no immediate woodfuel shortages:

1. Areas of low population density and extensive woodlands (far north on the Tanzanian border, the hilly region by Lake Malawi in the north and north-centre: and the mountainous Kirk Range on the Mozambique border), The general level of development, population with respect to wood resources, and contact with commercial markets is low.

2. Areas of low population density and sparse woodlands (north of Kasugu and west of the Viphaya mountains and Buranja valley, with pockets elsewhere). Woodfuel collection times are higher than in (1) but severe scarcity is avoided by low population density. This would change if population increased rapidly without concomitant increases in woody biomass production, as has happened in other parts of the country.

3. Areas of high population density and extensive woodlands (two small pockets around Karonge and the Mzuzu-Nkata Bay axis). Woodfuel problems could emerge with further land clearance for high density cultivation of rice, cotton and rubber: or increased urban and rural centre demand, partly due to proposed road developments.

Elsewhere, woodfuel shortages or impending problems are found in areas of high population density and low woody biomass potential. Variations in these can be used to classify woodfuel problems together with other resource constraints such as access to land, soil fertility and water availability:

4a. High population density, with rapid population increase (Lilongwe Plain, middle Shire Valley, Dedza Ntcheu region). In the latter, woodfuel problems are extreme, supply is declining, and there are severe problems of land fragmentation, soil fertility and water availability.

4b. As 4a but less rapid population increase (Phalombe Plains, north and parts of central Shire Valley, much of Lakes Malawi and Malombe shoreline, and the tea plantations around Thyolo), In the latter there are extreme problems of land fragmentation and severe to very severe pressures on the limited resource base are likely to worsen rapidly.

4c. As 4a but with population decline (south Shire Valley, Likoma and Chizmulu Islands). Extreme problems of land fragmentation, soil fertility, water and woodfuel supply are largely the cause of out migration,

4d. Areas of commercial crop estates (tobacco regions of Lilongwe Plain and Thyolo-Mulanje). The rural population on and off the estates may be denied access to wood resources on estate land.

4e. Areas of small-holder commercial vegetable crops (eg, Dedza Ntcheu Highlands). Much of this fertile valley land is given over to intensive vegetable production. This and roadside selling also takes much time which is lost for woodfuel collection (both tasks are done by women). Intra-rural woodfuel purchases are common. A rise in wood prices compared to vegetable prices could be a sign that the woodfuel system is breaking down.

## SIGNS OF INCREASING WOODFUEL SCARCITY

1. Fuel Collection
  - a. increase in collection time
  - b. increase in distance travelled (see also 1 d.)
  - c. change in who collects (eg, more collection by children and men)
  - d. change in means of transport for collection (headloads, animals, animal carts, trucks, rail)
2. Type of Fuel and Extraction Practices
  - a. change from dead to green wood (ie, cutting branches and trees)
  - b. cutting of younger trees
  - c. use of less preferred wood species
  - d. use of less preferred parts of plants (eg, small branches, twigs, roots, instead of split logs)
  - e. increased use of biomass with valued alternative uses (especially crop residues and animal dung)
3. Fuel Using Practices
  - a. increase in time for cooking (ie, slower rate to save fuel)
  - b. deliberate attempts to economise (eg, more careful fuel loading, quenching of fire after use)
  - c. reduction in less essential energy end-uses (eg, water and space heating, social fire)
  - d. introduction of fuel-saving technologies (eg, improved stoves)
4. Enhancement of Woody Biomass Supplies
  - a. planting of on-farm trees, hedges, live fencing, etc, with wood-fuel byproducts as a major consideration
  - b. as above, but on non-farm land (common land, woodlots, roadsides)
  - c. planting of trees specifically for fuel provision
  - d. shortened agricultural rotations (more residues from cropping systems, more natural wood from shifting cultivation)
5. Penetration of Commercial Markets
  - a. increase in volume and range of locally marketed woodfuels
  - b. increase in proportion of purchased woodfuels (also a function of available cash, eg in labour remittance economies)
  - c. increase in the real price of woodfuels
  - d. increase in the proportion of household expenditure devoted to fuels (mainly applies to urban areas)
  - e. substitution by non-biomass commercial fuels and equipment (kerosene, bottled gas, possibly solid fuels and electricity)

significant response by rural households to fuelwood scarcity. It is not common in SADCC countries (compared to other regions such as South Asia) and probably represents only 5 to 10 per cent of household energy use across the region. In some places, however, notably in Lesotho where there are few trees near to villages and cattle kraals make dung collection relatively easy, residue use is extensive.

This generally low level of use reflects both the relative abundance of wood in the region and the inferior qualities of residue fuels, most of which smoke, smell, and burn too fast for cooking tasks such as simmering. They are often considered to be socially inferior and there is considerable resistance against using them, even where wood is scarce. In Mozambique, for example, there is evidence that people minimise woodfuel use before switching to residues.

The importance of residues is that they do provide a fuel safety net for rural people when fuelwood collection becomes too difficult. Interventions which destroy this function should be made with the greatest caution. Further points about residues, including their use in industry and production of briquetted residue fuels are reviewed in the project sector report on "Agricultural Residues".

## 2.4 Integrated Production Systems

A great variety of arable, pastoral and arable-pastoral farming systems have evolved in Southern Africa, reflecting both the basic environmental conditions and the physical and cultural needs of communities, This evolution has also been determined by factors such as population density, the distribution of private and

communal land and cultural controls over resource use. Where products are sold, access to technologies and markets are also major determining factors. People's primary economic and social concern in managing these systems is food production and, with pastoral people, the maintenance of livestock assets. Strategies are also designed to minimise risks of failure in particularly adverse climatic conditions.

Woody biomass normally plays an important but generally subsidiary role in such systems. Similarly, woodfuels are usually a secondary or even lesser component in people's concern for increasing or maintaining woody biomass resources. For example, a 1984 survey in Zimbabwe found that 70% of households had planted trees, two thirds of them on their own initiative. Of the trees planted, 60% were primarily for fruit, 17% for construction poles, 14% for shade, 6% for fuelwood and 3% for sawn timber. In more arid zones or areas of high population pressure, the prevention of soil erosion is often the primary objective of tree management.

Another key feature of system variation is that intensive woody biomass management usually coincides with intensive cropping and/or grazing systems. Such areas are the most fertile ground for agro-forestry initiatives, with multiple outputs as the incentive. However, the real challenge of agro-forestry is to extend its take-up and raise its production potential not only in these areas but also beyond them into the much more widespread, less intensively-managed regions.

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Yemi Katerere (1986): Tree planting activities in Zimbabwe's rural areas. Annex 1, Report on Zimbabwe, "SADCC Energy Development: Fuelwood" Study.

These examples support our central thesis that woody biomass management - and not woodfuel production - is the critical entry point for woodfuel policies and interventions.

However, the examples understate the complexity and ingenuity that are often seen in such strategies. Although rather little is known about these for the SADCC region, our study has provided several specific case histories of evolving land management practices. These emphasise the great diversity of indigenous responses that are occurring as conditions change. They also allow these to be categorised according to types of intervention to support these responses. Interventions that best match the general characteristics of the indigenous responses are the most likely to succeed

Broadly speaking, interventions to enhance woody biomass production can be described by the characteristics shown as ranges in Table 1. A major finding of our case studies is that the most successful indigenous responses - or, in some cases, government interventions - tend to fall on the left end of the ranges. One might call this the 'soft' end, since it includes characteristics such as: indirect, integrated, low capital cost and multiple purpose. The 'hard' end, in contrast, is typified by a single purpose, formal, high cost, peri-urban woodfuel plantation.

A classic example of multiple 'soft' indigenous responses which can be encouraged in the harsh, over-grazed region of Shinyanga, Tanzania, is presented in the Box entitled "Shinyanga: multiple responses to crisis". Interventions to support these would be characterised as indirect, integrated and low cost. Other examples which illustrate various mixes in the style of indigenous response and

Table 1: Characteristics of Woody Biomass Projects  
to Match Indigenous Responses

Project Stages/Design Features	Project Characteristics	
	'Soft'	'Hard'
Intervention	Indirect	- Direct
Capital cost	Low	- High
Technology/Management	Multiple purpose (eg, integrated land use)	- Single purpose (eg, tree plantation)
Output(s)	Multiple products	- Single product
Activity	Immeasurable	- Measurable
Environmental impact	Positive	- (Negative ?)
Niche	Integrated, diffuse	- Firm project boundary
Objectives	Broad goals	- Narrow goals

## SHINYANGA: MULTIPLE RESPONSES TO CRISIS

Shinyanga is one of the most desertified regions of Tanzania. Tree planting has been encouraged and farmers now plant an average of 3 trees per hectare each year. This is one tenth of the rate needed to close the calculated woodfuel deficit. Communal planting has been tried without great success. The Forest Division is therefore planning to provide over 100 nurseries (one per ward) to increase greatly seedling production of agroforestry species for individual planting. This traditional approach is unlikely to succeed due to (1) severe water shortages in most villages, which makes seedling care very difficult, (2) impassable roads and expensive transport to nurseries at water points, and (3) lack of protection of young trees from cattle which graze freely on fallow and common land. Land around homesteads is fenced off from cattle and supports trees - virtually the only ones visible - but is typically less than one acre per family and is used for shade and poles as well as fuel. Common grazing constitutes 95% of all land.

Alternatives to seedling nurseries: Farmers have invented several ways of propagating woody biomass other than growing from seedlings. Live fences of euphorbia and cassava-like species are universally grown from cuttings along paths and near houses. Both are used as fuel. At least 10 species of 'real' trees are also grown from cuttings - including acacia, pomegranates, commiphora, ficus and gliricidia species. Guava trees are grown from root cuttings, Direct seeding is practised for even more tree species, including 3 acacia species, leucaena, mango, custard apple, tamarind and cashew. Some of these are nitrogen-fixing and enhance soil fertility. Much more could be done to spread these low cost techniques. Foresters are trained in them but tend to forget them because of the emphasis on nurseries and seedling distribution,

Alternatives to tree planting: Shinyanga was deforested by clearance for tsetse fly control, followed by heavy grazing and the practice of early burning. This prevents the regrowth of natural acacia. The carrying capacity of one livestock unit per 4 hectare is exceeded by a factor of 4 over the region as a whole. Since large cattle herds are maintained to spread risks during drought periods, destocking is not presently a feasible solution. However, while the Shinyanga plains are bare of trees, there is a 40-50 hectare Forest Division reserve from which cattle have been excluded since 1981. The rate of acacia regrowth in this area, which has adequate water, has been phenomenal. After 5 years the canopy is about 5 metres in height, Natural regeneration is the key, given the vast areas of grazing land. The question is then how to keep selected areas free from cattle and burning. Again, several spontaneous approaches have emerged. Some villages have established thorn hedges to protect young acacia saplings; some have forbidden grazing on limited tracts of land (with heavy fines as penalties); some have set aside special areas for firewood gathering, which is banned everywhere else.

These initiatives need to be supported, built up and spread in every way possible. Exclusion of grazing from public land could be imposed by village councils if this were part of a deal which provided popular government inputs such as veterinary services and water supply.

project intervention are provided in the companion report:  
Planning Issues in Woody Biomass Management.

These concepts tend to make the task of woodfuel policy and planning more difficult by increasing the number of factors and linkages that need to be considered. However, adopting this perspective on types of intervention should lead to more relevant and effective policies and projects, for several reasons:

- \* policies and projects are more likely to derive from and match the perspectives of rural people themselves;
- \* initiatives can be more precise in addressing the opportunities and constraints of 'woodfuel' in its relation to wider production systems;
- \* a broader range of possible options may emerge from this perspective;
- \* it helps policy makers and planners decide who should intervene, and how.

Finally, it is worth noting that increasing pressures on resources will force policies towards achieving high rates of woody biomass production (and the intensification of all land use), Traditional high rate production methods - notably plantations and woodlots of fast-growing species - tend to be more costly than the support of indigenous methods of integrated woody biomass management, where high yields are rarely a primary concern.

This puts a high priority on seeking out, spreading, and helping to make more effective some particular forms of productive tree growing and management. Our studies of conditions in the SADCC region suggest the following priorities:

For small private farmers:

- \* various agroforestry options in crop and pasture lands, for individual farmers. Many agroforestry approaches have been adopted in the SADCC region and other parts of Africa: see the project report on 'Wood Production'. Besides providing multi-purpose wood, including fuel, primary objectives of agroforestry include provision of animal fodder, prevention of soil erosion and the increase of soil fertility and crop yields.
- \* woodlots for construction poles and fuel (and fodder in some cases) where (a) labour shortages are so acute that they threaten normal arable/pastoral production (woodlots are not labour-intensive); and (b) where people can be assured of access to the resource or cash returns from it. Generally, communal woodlots have proved less popular in SADCC countries than individual tree planting but may have an important role to play in some places.

For the more arid communal tenure areas, where the greatest concentrations of the poor and resource pressures are normally found:

- \* the more productive management of indigenous woodland is normally the key. This can lead to simultaneous improvements in pasture, environmental protection, timber and fuel. Techniques include controlled grazing of cattle in forested areas, and strict exclusion of cattle from some areas to allow natural pasture and woody regeneration.
- \* Tree planting (for multiple purposes) is a major option where tree clearance has been extensive, But techniques have to recognise constraints such as lack of water, poor access to traditional seedling nurseries, etc.
- \* Increasing livestock quality to allow partial destocking

without loss of income, food or wealth from cattle.

- \* Intensification of arable production to reduce demands upon land and woody biomass, while increasing production of residues for burning or animal fodder.

## 2.5 Access to resources

Access to land and woody biomass resources includes some of the most important factors which dictate the nature of woodfuel problems and what can be done about them. It reflects the distribution and control of resources and, as we outlined above, can take many forms. Some access factors are specific to individual problem areas, where they exert great influence and are a crucial component of site-specific opportunities for and constraints upon successful fuelwood projects. These are of only minor concern to broader policy questions. Other factors, however, have a more pervasive influence and are issues which policies can address directly and beneficially. Although these include physical factors of access, we focus here on the more problematical social factors.

Social access factors essentially concern the extent to which a resource is open or closed to consumers. In most cases these distinctions are rather fuzzy, due to various possibilities for sharing, trade or poaching across the resource boundary. At one extreme are fully closed resources, typified by well-guarded private lands or state-owned forest reserves; at the other, fully open resources which are available to all-comers by custom and law, as with much nominally state-owned miombo woodland or Savannah.

In between, access may be more or less restricted by devices such as licenses and permits, official or

'unofficial' payments, customary rights within village communal systems, reciprocal resource sharing arrangements, or good neighbourliness in which resource owners open their land to people facing absolute hardship. Within this range there is often social differentiation of access which favours the rich and influential at the expense of the poor and weak. For example, old age, sickness, disability and small family size may all restrict the ability to reach biomass resources which are otherwise equally shared.

Table 2 illustrates these concepts by displaying the range of woodfuel resource-sharing methods that are found in the SADCC region.

Since most woody biomass (and grazing) resources are to some extent open or shared, the crucial issue of resource management is how effective but just controls can be applied in order to obtain the optimum and sustainable use of communal resources. The breakdown of such controls due both to local pressures on resources and external commercial pressures from cities and industry is common across Africa (as elsewhere) and is having devastating environmental impacts in many places. The Box entitled "The True Tragedy of the Commons" highlights this point,

## 2.6 Gender issues

In much of rural Africa women bear the full burdens of household maintenance, including woodfuel provision and cooking. They usually provide much of the productive labour too, but have little or no say in decisions on land use, production or cash expenditures. They frequently have no entitlement to land or rights to plant trees; and rarely have any say in village planning.

Table 2: Range of Woodfuel Resource Sharing in the SADCC region:  
existing practices and possible options

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1. Illegal (existing practices)
    - 1a. Poaching with strict legislation and strict policing
    - 1b. Poaching with strict legislation and lax policing
    - 1c. Poaching with official legislation but 'permission' from the authorities, either as a result of implicit policy or insufficient resources to enforce the law (by government, parastatal, private or customary authorities)
  2. Legal (existing practices)
    - 2a. The granting of free access to woody biomass resources.
    - 2b. The granting of access by licence or permit specifying conditions of gathering (eg, quantities, species),
    - 2c. The granting of access with payment of a nominal fee (or unofficial payment).
    - 2d. The granting of access by the payment of a more than nominal fee which is less than the replacement cost of the resource.
  3. Reciprocal benefit arrangements (existing and possible)
    - 3a. Access is granted on the basis of 'good neighbourliness'; for example, to avert absolute fuel and other poverty or hardship.
    - 3b. Tax concessions or other forms of payment for owners of un- or under-utilised resources (eg, large commercial farmers, Forest Department) if they enter sharing arrangements with neighbours on poorer land.
    - 3c. Rents paid by resource-poor farmers for the managed use of un- or under-utilised wood resources (eg, commercial farm land, state forest or rangeland).
    - 3d. Leasing of state land on the condition that it is managed productively.
    - 3e. Use of state land by small-holders with sharing of costs and benefits between them and the state (eg, joint venture tree planting).
    - 3f. Land reform and redistribution to favour people facing resource scarcities, with compensation for the dispossessed.

There are also methods of resource management that fall under this heading, notably:

    - 3g. Planting of high yield buffer zones around protected forest reserves to deflect destructive illegal attacks on them.
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## THE TRUE TRAGEDY OF THE COMMONS

Across Africa grazing and forest land has long been shared on a communal basis. These resource-sharing systems are often said to be doomed to collapse under the weight of growing population, since each individual gains from additional use of the commons while the resulting damage to the resource is imperceptible. This is the "tragedy of the commons", a phrase popularised by the US biologist Garrett Hardin. The argument is often used to support the case for the privatisation of common land.

In fact, the truth is more complex. Communal systems have been most successful in exploiting fragile natural environments for long periods, provided they are not disturbed by external pressures. This is because access is restricted to the commoners, for their benefit, and is carefully controlled. For example, Swiss villagers have used communally-managed alpine grazing and forest land for 700 years without any signs of deterioration. In Japan, over 3 million hectare of village commons have been successfully managed without any degradation for over 350 years. In the Andes and Himalayas the most vulnerable upland grazing and forest land is often managed communally, while private ownership is restricted to the less fragile valley floors. Ironically, the English village commons on which Hardin based his essay gave rise to the expression "by hook or by crook". Today this suggests unscrupulous and exploitative behaviour. Originally, the term described the allowed ways of collecting fuelwood: ie, by gathering only twigs and dead branches.

The true tragedy of the commons is that these traditional, controlled systems have been weakened or destroyed, mostly by-external political or commercial domination. For example, in much of Africa colonial rule destroyed the political power of nomadic pastoralists, their trading roles and their access to the best pasture lands through enclosure and resettlement. Over-grazing and soil erosion all too often followed. On the other hand, it must also be recognised that in many rural societies there are gross inequities in access to common land and other resource assets which are perpetuated by village chiefs and other power elites.

Equally important is the process of resource commercialisation. Once a 'free' good acquires a price, a subsistence demand is frequently turned into an 'insatiable' and uncontrolled commercial demand. This process is now occurring with Africa's woodlands. Furthermore, to protect resources from over-exploitation in this way, traditional controls - and the benefits derived from the resource - are frequently transferred from local people to government agencies. This can be successful. But usually the combination of high demand and ineffective policing and other legal controls simply creates an uncontrolled open-access resource, or 'free for all'.

The privatisation of all common lands may be one solution: this is now being considered in Tanzania. More flexible methods of preserving common resources is another, as outlined in the Shinyanga case study. There are also many options for sharing communal resources more effectively: see Table 2 and further discussion in Chapter 4.

Although the severity of these gender divisions varies considerably, they generally impose large barriers to change. In the woodfuel context particularly, they block the usual demand-supply signals that lead to appropriate actions. Woodfuel is seen by society - that is, by men - as a 'women's problem' of little interest or concern; decisions on land use are focused on what men want. With woody biomass that means, for example, trees for construction poles, products such as fruit that can be sold, or maybe fuelwood and charcoal for sale.

The introduction of alternative woodfuel strategies has to be seen in this context. For example, they will primarily affect women's labour, while decisions about women's labour are largely in the hands of men. Touching the interests of both men and women is therefore of crucial importance - for example, by enhancing agricultural production through community or agroforestry schemes that provide multiple benefits including fuelwood for home use.

All too often these issues have been relegated to the back end of project implementation, where they are seen merely as awkward impediments to (male-oriented) technical fixes. This applies at the policy level too. It is not only in the field and homestead that women lack decision-making power: women are rare in district or national government.

At the project level, it is essential to start with a full understanding of the differences in men's and women's needs and interests, work patterns and decision processes. At the woodfuel policy level, anything that can be done to increase the status, rights and voice of women, and an awareness of women's problems, can hardly fail to be beneficial.

## 2.7 Rural woodfuel consumption

Rather little is known about rural energy use in most SADCC countries. Although this lack of information is not a critical impediment to effective project implementation it does have serious implications for macro-policies.

The data that do exist on rural consumption of wood and alternative fuels are generally rough estimates that may be subject to large errors. They are usually based on estimation rather than measurement, short time periods without allowance for seasonal variations, a few localities when spatial variations are large, and with little regard to non-household uses of fuel.

Above all, there is almost no information on consumption trends over time; nor on the all-important relationships between the costs of obtaining supplies and resource levels and - on the other hand - consumption levels and consumption behaviour such as fuel switching or economising on fuel. It is known that rural woodfuel use is generally high in SADCC countries - compared, for example, to that of Asia. But it is clearly important for policy-makers to know whether this is due to inherent demand factors (such as high space heating needs), or the relative abundance of supplies (or the low value placed on women's time for gathering fuel), as well as knowing how consumption might alter spontaneously as supplies change or be induced to alter by policy initiatives.

Although 'perfect' data on these issues is an unattainable and unnecessary goal, better data on fuel use, its causes and trends, cannot help but improve policy formulation. We therefore suggest in Chapter 4 that the collection and evaluation of data is itself a major policy issue.

### 3. URBAN WOODFUEL ISSUES

#### 3.1 Introduction

For rural areas the main task of energy policy is to stimulate and coordinate the work of other planning sectors. For urban areas, energy departments can address woodfuel issues directly and take a leading role in policy formulation.

Woodfuels are used in towns alongside the alternative non-traditional fuels which energy departments are used to. Woodfuel is mostly commercialised and so consumers and suppliers employ much the same rules of economic behaviour as for other energy sources. Patterns of consumption and fuel switching are driven by familiar factors of income, price and availability; supply follows market forces.

However, for effective policies it is just as necessary as it is for rural areas to appreciate fully the contexts of urban woodfuel demand and supply. Past experience in the SADCC region of urban woodfuel policies, with their focus on forestry and peri-urban plantations to enhance supplies and on improved stoves and fuel switching to mitigate demand, suggests that this has not always been the case.

#### 3.2 Urban woodfuel contexts

The most basic context of urban woodfuels is the economic and political dominance of urban areas and the very rapid urbanisation trends in all SADCC countries. This urban growth consists largely of rural migrants who swell the impoverished ranks of the unemployed and semi-employed; people who are used to using woodfuels and who cannot

afford otherwise, Although urban woodfuel consumption per person is typically lower than in rural areas, if current trends continue urban woodfuel consumption will surpass rural consumption within 20 years for most SADCC member states.

This fact plus the greater purchasing power, political influence and investment support of urban areas means that urban populations will increasingly dominate and outbid rural people in any competition for resources. Rapid urbanisation both reflects this urban dominance and ensures that it will become more marked over time unless macro-economic policies change drastically.

One sign of this dominance is that there are, presently, few indications of absolute woodfuel scarcity in the cities of the SADCC region - although shortages do exist and are increasing. Consumption tends to be higher, and prices lower, than in other regions such as Asia. Substantial increases of woodfuel prices (in real terms) are comparatively rare. By and large, the cities are able to get the woodfuels they need at relatively low prices - although at substantial cost to others.

The impact of urban woodfuel demand on rural people is thus one critical contextual issue. A second is that energy planners still have time to make determined efforts to adjust consumption before severe energy shortages get the upper hand.

Beyond this, urban energy issues can be understood by looking at four related themes: micro-economic decisions affecting fuel choice, the provision of alternatives to woodfuels, woodfuel markets and prices, and urban woodfuel supply sources.

### 3.3 Fuel choice

Cities offer a choice of fuels. Which fuels are used, and in what quantities, depends among other things on the cash costs of fuels and the equipment to use them in relation to income; the time required to obtain and use fuels; various access factors such as availability and reliability of supply; and a range of 'ideal' fuel preferences. The latter include convenience, cleanliness and storability. Electricity and piped gas generally score highest in these respects; bottled gas and kerosene come next; and fuelwood last. Charcoal has a variable position depending on dietary choice and food tastes. For those who can afford to climb it, the 'ladder' of fuel preferences also leads to much greater efficiency of fuel use: by a factor of roughly ten in the case of cooking, from 5-10 per cent for fuelwood on an open fire with clay pots to 55-75 per cent for electric cooking. This helps greatly to hold down energy costs.

In general, the urban poor rely on woodfuels - the lowest quality, least efficient and, very often, the highest cost fuels (in terms of useful heat supplied) - to achieve the lowest standards of energy service. They often spend a much higher proportion of their income on energy than rich families (eg, up to 30 per cent in Dar es Salaam). Their fuel supplies are often precarious, since they lack the safety net of the rural poor who can usually find fuelwood to gather and who can turn to crop residues or animal dung if fuelwood supplies fail. Fuel hardship is common, and the disparities between rich and poor in energy provision are much more visible than in rural areas.

However, it is important to recognise that there is not a sharp polarity between those who have and do not have fuel

problems, but rather a spectrum of difficulties. This characteristic of income or class variation - both in energy problems and opportunities for change - is a key feature of urban energy issues, far more so than in rural areas.

It follows that urban energy is largely a problem of welfare and distributional justice, in which some sections of the community face real hardship in meeting even basic energy needs. The point at which costs become detrimental is a matter of judgement, but clear guidelines for making such policy judgements are necessary.

For this reason, interventions such as fuel pricing to lower demand or encourage fuel switching, or conservation measures such as improved cookstove programmes, should be based on welfare notions. They should aim at lowering costs (or, at least, not raising them) for key hardship groups. This is likely to entail not only subsidies, but differing levels of subsidy for different consumer groups.

In turn, this has obvious implications for data collection in order to identify sensitive groups. In many cities of the SADCC region there is also a more general lack of vital data for policy formulation, notably on consumer prices of all fuels and their trends in real terms or relative to income, and on consumption trends by income and over time. Fuel use patterns are not static and interventions will influence the pace and direction of energy substitutions. It is essential to know about these influences as well as the broader demographic and economic determinants of future demand.

In this context, spatial as well as income variations may also be important. This is especially true of the

situation in the peri-urban fringes and shanty towns compared with the urban core. In the urban fringes of Dar es Salaam, for example, woodfuels are now commoditised and difficult to gather 'free' while the price of the only practical alternative, kerosene, is higher than in the central city. Finally, few cities have adequate data on woodfuel market price structures, including prices for producers, wholesalers and retailers; transport and other costs; and profit margins. We return to this point in Section 3.5.

#### 3.4 Alternatives to woodfuels

Energy policies have given a high priority to the introduction or expansion of conventional fuels in urban (and also in rural) areas as a solution to woodfuel problems. This is a perfectly reasonable position. As argued above, the woodfuel-conventional fuel transition has inherent attractions for consumers and has been followed by all high income societies. Several SADCC countries have large or adequate conventional fuel resources, including hydro-electricity, oil and coal, while these sources are under the direct control of planners, unlike woodfuels.

Clearly, these options will and should remain a major part of woodfuel and energy strategies. Equally obviously, their feasibility varies greatly by country, city and urban or rural region, and can be assessed only by detailed investigations which are beyond the scope of this report.

However, a number of important aspects of these options are sometimes overlooked and deserve greater attention. We shall consider five here.

First, fuel transition policy has been based on the assumption that consumers will take to 'modern' energy sources as their incomes rise, In many cities this is not happening; in others, large sections of the population are becoming poorer and are consequently switching back to woodfuels. Policies need to address this dynamic in the short term, to provide interim solutions, and in the longer term through flexible supply planning.

Second, it is no good supplying a fuel if the equipment to use it is unobtainable or too expensive. In some SADCC countries (eg, Angola) the manufacture of kerosene, LPG and electric cooking appliances has virtually ceased; in others, equipment is hard to get or too costly for the majority who might otherwise be tempted to switch out of woodfuels. Attention is needed to these end-use aspects of fuel switching as well as the more familiar supply-side energy questions.

Third, the distribution of existing conventional energy sources is often inequitable. This is understandable in the case of electricity, where distribution is economic only to areas where substantial demand can be expected. But with liquid fuels - the primary alternative to woodfuels for most consumers - adequate and reliable urban supplies are often skewed to favour higher income districts or larger consumers. Problems in obtaining supplies are a major reason why people do not use these fuels. Policies need to address this issue for small-scale commercial and artisanal woodfuel consumers as well as the residential market.

Fourth, there are large variations - and anomalies - across the SADCC region in fuel pricing policies. Some conventional fuels are taxed at several points, others are

subsidised, or have fixed market prices, or are priced differently by end-use sector. However, rather little attention appears to have been given to the welfare implications of fuel pricing or welfare-based pricing options, such as cross subsidies from luxury fossil fuels and electricity to conventional fuels (or woodfuels) used by the poor, In general, running state utilities on commercial lines without subsidies will operate to the detriment of the poor.

Fifth, the full economic costs and benefits of producing or importing and distributing conventional energy compared with the costs and benefits of woodfuel supply are not known. For example, it is often thought that one major advantage of peri-urban plantations to increase woodfuel supplies is that they will save foreign exchange by reducing the switch to imported petroleum fuels. However, peri-urban plantations also entail substantial foreign exchange costs for fuel and spare parts for trucks, etc. Thorough comparisons of this kind are difficult to make, but we think that policy-makers should be aware that their decisions may be sub-optimal without them.

### 3.5 Woodfuel markets and prices

Governments have found it notoriously difficult to intervene effectively in urban woodfuel markets, either to control prices or control the sources of supply. Angola's attempts to license urban woodfuel traders provide good examples of these difficulties. While much of the woodfuel market may be beyond the control of planners - because there are too many actors, each with too many ways of evading supervision or controls that are imposed - another reason for failure is that little has been done to find out about the markets themselves. For example, who

controls the transport system? Is there monopolistic or competitive pricing? How much value is added at what stages from source to final sale? Who depends on it for their livelihood? Where does woodfuel come from?

As an illustration, the little information that does exist suggests that woodfuel distribution mark-ups are frequent and high. For instance, in Luanda, Angola, producers in 1986 were selling charcoal at the roadside for about 125 kwanza per kilogram, transport costs were up to 40 kwanza, urban retailers were paying 250-375 kwanza, but they were selling to consumers for 800-1200 kwanza per kilogram. Furthermore, it is common to find much higher prices (and profits?) for sales of small quantities - a factor which impacts particularly hard on the poor. In Maputo, Mozambique, charcoal in early 1986 was 60-120 metical per kilogram when sold in 40 kg sacks but 335-670 metical per kilogram for two litre (300 gram) tins.

It might be thought that these prices could be reduced by regulation or streamlining of the supply system; for example, by encouraging producer cooperatives which cut out the middle men. However, this cannot be done until it is known whether mark-ups are in fact excessive. There are real movement, packaging and handling costs involved; trade-offs between these and the diversity of selling points in cities, with major implications for market access by poor people without transport; considerable commercial risks for most medium level traders; and obvious employment implications to consider.

In summary, a good knowledge of woodfuel markets - at least comparable to that of conventional energy systems - is a primary need for effective policies on woodfuel pricing and other market interventions.

A crucial aspect of pricing policy concerns the impact of urban markets and prices on rural resources and producers. In most cities, woodfuel prices are too low to encourage sustainable production for the market either by small farmers or larger commercial enterprises (eg, peri-urban plantations), when transport and other costs are allowed for. Low stumpage prices for cutting wood on government or customary land have the same effect. Obviously, if stumpage or retail prices can be raised, sustainable production will tend to replace resource mining (although it may also encourage mining in remoter areas due to the relative decline in transport costs). At the same time, higher prices will tend to reduce the growth of woodfuel demand through economy measures and fuel switching.

This broad approach is being adopted in some SADCC countries and is supported by major donor agencies such as the World Bank. The ultimate aim is to raise stumpage and market prices towards the point where they match the cost of bringing on new, sustainable supplies.

While it has much to be said for it, this approach is not as simple as it seems. First, price rises sufficient to meet the stated objectives are likely to have devastating impacts on poorer urban consumers. Conversely, tolerable price rises may do little to stimulate new production. In Malawi, for example, the stumpage price of 1.5 kwacha per cubic metre was raised to K. 2.8 in 1986 as a first step in this direction. However, the cost of fuelwood from peri-urban plantations is estimated to be over six times greater than this, or K. 18 per cubic metre. Second, the policy assumes an effective system of revenue collection: our estimates suggest that revenue is presently paid on only a small fraction of wood from government forests in Malawi.

Third, and most importantly, this policy approach is based on a narrow view of the benefits and costs of alternative supply systems. Why, for example, use peri-urban plantations as the benchmark when other systems with greater benefits and/or lower costs may exist? The fact that woodfuels have a price at all, let alone a 'high' price, may be sufficient to trigger extra production. A survey in Malawi, for instance, found a strong relationship between commercialisation of firewood and willingness to plant trees: 31 per cent of tree growers who purchased wood planted more than 100 trees in a given period, while only 20 per cent of wood gatherers did so.

This brings us to the fourth and final interrelated urban woodfuel issue.

### 3.6 Urban supply enhancement

There are four obvious possibilities for increasing the supply of urban woodfuels; namely production from (1) natural forests, (2) (state) peri-urban plantations, (3) medium to large-scale commercial farms, and (4) small-scale peasant farms.

The main problems and potentials for natural woodlands are similar to those for their use by rural people. These include:

- \* the scale of resources and the economics of accessing them (eg, transport costs);
- \* available volumes and associated costs from short term exploitation, from medium-term sustainable extraction (eg, through improved management), and from long term positive development (eg, research and development on indigenous species, interplanting with exotics, and more

productive harvesting regimes);

\* the fact that costs and benefits cannot be separated from subsequent uses of cleared land for farming.

Peri-urban plantations have generally turned out to be high cost options which produce woodfuels at well above current market prices. This is typically due to the high opportunity costs of land near to cities, with its many high value alternative uses for food production, housing and recreation, etc; and the high establishment and operating costs for production methods optimised to achieve high yields. Generally, these costs have more than offset comparatively low transport costs to the urban markets. If these costs are subsidised, as is sometimes the case, one needs to ask whether other approaches would not be more viable with similar levels of subsidy. Nevertheless, there may well be a place for peri-urban forestry in some locations as economic conditions or R & D leads to cheaper production methods. They should not be dropped altogether as a policy option.

Similar arguments apply to large-scale commercial production in rural areas reasonably close to cities. Woodfuels are unlikely to be competitive with production of timber, cash crops or food crops. However, the economics can be favourable if woodfuel prices are particularly high, there is efficient and cheap transport to urban markets, cheap labour, or available land which is unsuitable for alternative types of production.

Small-scale woodfuel production by peasant farmers - notably agro-forestry methods in urban 'green belts' - has certain advantages lacking in these other approaches. There is more potential for expanding rural employment; it provides an additional income for small farmers, who may

therefore be willing to sell at fairly low prices: and production costs are typically lower than large-scale commercial methods because farmers can better utilise their accumulated indigenous knowledge, while costs are partly hidden within the other activities of the domestic economy.

On the other hand, there are some problems with this approach; notably the high costs of collection and transport from many, scattered small producers and, again, competition over the use of land and labour for different activities. These problems are linked, since competition for land is usually fiercer the closer one gets to the city. Small-scale woodfuel production can rarely compete with market gardening, dairy, pigs or other high value food production in the urban periphery.

To summarise, no urban woodfuel supply options have a monopoly of advantage or disadvantage. Generalisations are unhelpful. The aim of policy should be to keep options open and to foster thorough appraisals of a wide range of options, for each key location, under different economic conditions. As potential options emerge from this appraisal, further studies on mechanisms to promote them are likely to be needed. These might include fiscal measures such as subsidies, laws or other measures in the field of urban planning and land zoning around cities, fuel pricing policies, or measures to increase the economic efficiency of urban woodfuel markets.

### 3.7 Improved cooking stoves

There is a rich and varied experience of improved cooking stove programmes across the SADCC member states. In particular, the principle that stove designs must meet a

wide range of user criteria is well understood. In Lesotho, for example, stove designs have emerged from 'basic needs' surveys. In wood surplus areas of Zimbabwe, designs and promotion focus on hygiene and safety rather than wood saving. In Tanzania, a wide range of solutions has emerged to address differing user needs, while there is a high level of local manufacturing skills.

However, in other countries stove development has tended to focus on rural consumers, with the primary objective of saving wood. Broadly speaking, these efforts have been misdirected. In the rural stove target areas there is usually a large, untapped potential for economising on woodfuels by better fire management practices, such as shielding the fire from the wind, moving the cooking fire indoors, or matching the size of the fire to the cooking task. Until such basic economies are adopted as standard practice, opportunities for introducing improved stoves or saving fuel with them are likely to be extremely limited.

The major opportunities for improved stoves that save fuel (as well as providing other benefits) lie in urban areas. In cities and towns, fire management to save fuel is already widely practised; fuels and cooking equipment are commoditised, so that purchasing an improved stove is not a novel step; and there are local skills and materials to allow cost-reducing mass production either on a large or small manufacturing scale. The development of urban stove designs, promotion programmes and manufacture, is thus a major woodfuel option that should be considered by all SADCC countries.

## 4. POLICY GUIDELINES

### 4.1 Introduction

The previous chapters have raised a large number of policy issues and questions. Some of them have been broad: on how to think about woodfuel issues and their underlying causes. Some have been more sharply focused on policy options such as fuel pricing. Little has been said about how to put these ideas into practice: for example, through improved institutional structures, policy coordination between sectors, or training.

This chapter does that. It provides a structured list of suggestions for the key policy issues and improved policy structures in the woodfuel area. It is addressed to energy and woodfuel policy-makers but also, through them, to senior planners in all spheres. As we have stressed repeatedly, the woodfuel problem raises much broader and deeper issues than are encompassed by the words 'energy', 'woodfuel' or 'forestry'. The suggestions also attempt to be realistic by recognising that one must start with what exists and that human and financial resources for expanded policy activities on woodfuel issues are not limitless.

### 4.2 Attending to basics

Most woodfuel problems are reflections of poverty and lack of investment in the poor. They also impact hardest on the poor. They persist not because they are insoluble but because they have not been seriously addressed. At the deepest level they reflect the biases found in virtually every society and its planning system: the urban-rural or centre-periphery bias, the powerful-weak bias, the male-

female bias, or the bias which favours measurable things at the expense of the unmeasured. Why, for example, is the labour of women for gathering fuelwood, or the monetary value of that wood, excluded from the national accounts? We say no more about the implications of this point but urge that they are not overlooked.

#### 4.3 Central Institutions

Energy and forestry agencies which bear the responsibility for woodfuel planning must obviously have sufficient human and financial resources to carry out these duties adequately. In most SADCC countries these resources need to be substantially increased, especially if the following arguments are accepted that closer coordination between and involvement by other planning agencies is required.

The fragmentation of institutional structures, interests and responsibilities is widely recognised as a major problem in biomass energy planning. Many issues of urban woodfuel demand (including fuel substitution, the availability of alternative fuels and technologies, and energy pricing) can be dealt with adequately by energy departments, as in the past. But, as we have argued earlier (in Chapters 1 and 21, for most woodfuel supply issues, other agencies have to be closely involved because of the vital need for an integrated approach across many sectors, notably agriculture in its broadest definition, environment and natural resources, rural development, land use planning, forestry and energy.

A basic policy need is to strengthen coordination between these and other ministries; and between government and other experienced people, such as academics or parts of the business community. Regular meetings of these parties

are needed at a high level in order to:

- \* Provide a strong collective lead from the top.
- \* Give consideration to woody biomass in all programmes involving the use of land and natural resources. The integration of woodfuel and forestry issues into land-use and conservation strategies must take place at their start and as they develop, not as an add-on at the end.
- \* Develop joint projects on environmental monitoring and resource assessment which include an energy/woodfuel component. Combined efforts not only save money but help to ensure that woodfuel issues are seen as an integral part of land use, environmental and broader resource planning. For example, joint exercises in remote sensing could be carried out; or woodfuel components included into existing survey structures, such as agricultural production and land use surveys.
- \* Develop joint exercises for data collection on energy consumption and its trends, fuel price trends, etc. Again, energy can be added to the objectives of existing or planned surveys, such as Censuses or consumer income and expenditure surveys. (This need not be expensive provided data is collected to answer policy questions rather than for its own sake; and collection is confined to critical areas of present or expected woodfuel stress. For example, in some Asian countries local teachers provide central planners with regular, monthly information on fuel and other commodity prices at the district level, at very low cost).
- \* Develop joint exercises in resource modelling, using methods such as LEAP which provide a common accounting framework and information for key sectors such as energy, forestry, agriculture and land use planning.
- \* Formulate joint projects to meet the need for horizontal integration.

- \* Promote longer range, integrated planning. Long time horizons are particularly important for energy and forestry with their long lead times from project initiation to results.
- \* Promote joint training and dissemination of information (see below).
- \* Promote public education and interest, such as national tree planting days and media campaigns.

To help start this process, energy agencies may need increased staff, especially with knowledge of woodfuel and forestry issues. In this context, it is worth noting that in Malawi the Wood Energy Division is placed with the Customary Lands Division, within the Ministry of Forestry and Natural Resources.

It is also important that closer coordination does not become an excuse for evading responsibilities and avoiding line decisions and actions. Coordinated activities need to be accompanied by clear assignments of responsibilities.

To provide a sound basis for sectoral planning and policy development, energy/woodfuel agencies might also consider conducting - or leading joint studies - on the following wood energy sector topics:

- \* Consumption of woodfuels and alternatives by households in relation to income or equivalent measures, prices or measures of labour to obtain fuels, in urban and rural areas. Trends over time are generally more important for policy formulation than detail. A focus on problem locations is more important than complete statistical coverage.
- \* Consumption (and production) of woody biomass fuels - actual or potential - by non-household sectors, such as

commercial farms (including tea, coffee tobacco, etc), agro-processing industries, general industry including the informal artisanal sector, and the commercial and service sectors.

- \* Analysis of urban market structures and the woodfuel trade.
- \* Analysis of energy substitution behaviour (with respect to income, prices, the availability of alternative fuels and equipment, etc).
- \* Analysis of costs, trade-offs and required incentives for increasing tree and woodfuel production in near-urban areas (including small-holder 'agro-forestry' and small and large scale commercial plantations, etc).

#### 4.4 Decentralised Institutions

Extending the reach of policies and interventions to people on the ground, initiating and spreading successful innovations, and detecting trends and trouble spots, calls for decentralised networks of information and expertise. Decentralised approaches are not only more effective in their reach than centralised institutions; they are very often much cheaper. For example, in Zimbabwe tree seedling production by schools has cost only one tenth as much as in Forest Department nurseries, while indigenous methods of tree propagation from cuttings, etc, cost virtually nothing.

Energy departments cannot develop these approaches on their own but must work through existing planning and extension networks: notably those of agriculture, forestry and rural development. A major need is therefore to strengthen knowledge, through training, and involvement, through new allocations of responsibility, across these agency structures. Some suggestions are:

- \* Energy/woodfuel agencies need a higher profile at the regional and district planning level, both to improve their information on local needs for woodfuel actions and make interventions more effective. The most realistic approach is not to station energy/woodfuel personnel at local planning levels but to make existing planning and extension staff more aware of energy issues and opportunities. In this case, staff must be given clear responsibilities to report back to the central energy/woodfuel agency.
- \* Agricultural (or rural development) extension services should pay more attention to and have greater capacities for evaluating woody biomass issues and opportunities.
- \* Foresters need to pay more attention and have greater capacity to promote and assist farm forestry on private lands, by both spreading and improving on formal and informally-developed successful techniques. This will involve learning from and integration with agricultural extension workers.
- \* Woodfuel issues could usefully be added to the agenda of other agencies, such as health and education, which reach further down towards the individual farmer and household than does district level planning. For example, hygiene and health problems are closely related to fuel management issues such as the use of smokey open fires and improved stoves; growing fruit and other food trees is connected to nutrition and health education; women's groups or health clinics can act as sources of information on emerging woodfuel problems. Grassroots organisations also have a big part to play here.
- \* Governments could do more to support and work with voluntary organisations concerned with woody biomass and other aspects of woodfuels; for example, tree growing and wood marketing cooperatives, or school afforestation schemes.

- \* Agricultural extension is often focused on progressive farmers. More could be done to reach small farmers, especially in the least productive areas where woodfuel problems are generally most severe, not only to pass on experience but to learn from them.
- \* Agro-forestry efforts are usually focused on high-intensive farm areas. Major benefits could be gained from extending agro-forestry to the more difficult regions of intermediate- (and low-) intensity farming.

#### 4.5 Training and Information Dissemination

As some of the foregoing remarks suggest, we see the transfer of experience and knowledge across sectors - and between government, non-governmental organisations and the public - as a vital ingredient of success. Energy departments need to know more about woody biomass and its basis in agricultural systems, Agriculture needs to know more about woody biomass management and woodfuel issues. Forestry needs to lose its traditional 'engineering' focus and learn more about agroforestry and other woody biomass management strategies practised by smallholders and pastoral people. Farmers, too, need to know more about what other farmers are up to.

All this calls for various efforts to increase training and the dissemination of information. We suggest that priority areas are:

- \* Curriculum development for the formal education of foresters and agricultural extension workers.
- \* The design of curricula and methods for periodic, short 'mid career' training and education courses for foresters, agricultural extension workers and local planners.

We propose that these tasks should be adopted as a joint SADCC project.

- \* Development of information packs for energy, agriculture and forestry professionals, particularly to disseminate news of successful indigenous responses and project interventions in the woodfuel and woody biomass area.
- \* The addition of news on woody biomass developments and approaches into existing professional newsletters, etc. (We think this would be more effective and less costly than floating new media on woody biomass alone).

We propose that a study on how this might be done should be adopted as a joint SADCC project.

- \* National (or multi-country SADCC) seminars for \*training the trainers' would be a relatively cheap and effective means of meeting the same objectives. Africa-based organisations outside the SADCC region, such as the International Centre for Research on Agro-forestry (ICRAF) could make valuable contributions to this process.
- \* Media coverage of environmental and woodfuel/energy issues could be promoted, especially about local problems and initiatives on local radio. Malawi and Tanzania have made significant moves in this direction.

#### 4.6 Research

Many innovations are occurring across Africa, especially in arid and semi-arid lands, on improved techniques of woody biomass management. They include developments in the more productive use of closed forests and woodlands in the public sector and a large range of smaller scale initiatives by farmers and local communities. These were

reviewed very briefly in Chapter 2 and are discussed in greater detail in the companion report Planning\_Issues in Woody Biomass Management and the project report on 'Wood Production'. Many of these innovations are taking place outside the SADCC region, where research on some critical topics has not received the attention they deserve, including dry land strategies, agro-forestry, mixed cropping/grazing/silvicultural systems, and subsistence survival strategies.

Broadly speaking, areas where greater research efforts should be rewarding are:

(1) basic research , such as species trials in various ecological conditions, especially of single purpose exotics versus multi-purpose exotics versus indigenous trees: propagation methods for woody biomass; burning practices for woodland and grassland management; and more productive management systems for various types of woodland or forest.

(2) adaptive research, including pilot field studies, to improve on and learn from methods already adopted in the field, especially by small-holders and pastoralists. The integration of local knowledge and experience into the formal research agenda, as well as project and policy design, is a vital ingredient of success. Results from adaptive research need to be fed back to extension workers, as suggested above.

(3) the systematic recording, evaluation and dissemination of research results, especially of successes.

(4) research on social science issues, such as gender and the structures of village and farm decision-making.

Policy initiatives to address these issues can only be treated here in the most general way:

\* Existing research capabilities and institutions in SADCC member states should be reviewed as a first step towards formulation of a SADCC region woody biomass research strategy. This review should include a study on the links between national and international research institutions, and the links between these and line agencies such as agriculture and forestry, with proposals for strengthening them. The review might also consider the establishment of scholarships to encourage adaptive research and the study of indigenous woody biomass strategies.

We propose that a review of this kind should be adopted as a joint SADCC project.

#### 4.7 Prices and subsidies

It is well known that pricing is a crucial but difficult aspect of woodfuel policies. High wood and woodfuel prices encourage tree growing and sustainable wood production, but they also encourage the mining of 'protected' biomass resources and hurt the poor. It is not easy to impose price or associated legal controls on informal woodfuel markets, while any controls that are imposed are easily evaded. However, there are some key policy issues that need to be considered.

In the urban sector substitution away from woodfuels is a major medium or long term objective in the SADCC region. This is partly a matter of relative prices for woodfuels and alternatives, but is also strongly determined by the availability of alternative fuels and equipment for using

them and the Price of the latter. Woodfuel prices cannot be raised significantly unless alternatives are available to the poor. However, low urban prices constitute a large subsidy to urban populations at the expense of rural people and - in many cases - the environment. All this raises several issues of Pricing, subsidy and allocation of resources:

- \* Substitutions of woodfuels by premium fuels, notably kerosene and LPG, may well have the lowest social cost when all factors are considered (eg, foreign exchange costs of woodfuel trucks and fuel, environmental impacts of woodfuel use, etc). There are also major income and employment implications on either side.

High priority should be given to conducting thorough economic assessments of fuel switching options as a vital input to energy policy formulation. A higher priority should be given to short run options (kerosene, LPG, urban electricity in some cities) than longer term options such as coal and rural electrification.

- \* Alternatives to woodfuels are already the lowest cost option for consumers in many cities. This is likely to increase as or if woodfuels become scarcer. However, a major constraint is the low availability and reliability of alternative fuels such as kerosene and bottled gas - especially in low income areas - and in some cases the lack of or cost of suitable cooking equipment. Efforts should be made to correct this by improving the supply and distribution networks of liquid cooking fuels and encouraging local manufacture of equipment, perhaps using subsidies. Subsidies on alternative fuels can be seen as alternatives to investments in greater woodfuel production or the costs of policing forest resources.

In the rural sector (and for the impact of urban demand on rural areas) the main pricing policy considerations and options are:

- \* Subsidies may be needed to promote agro-forestry, which is often associated with an initial fall in crop yields before longer term yield increases as well as products from the trees are obtained.
- \* Subsidies or credit financing for rural and near-urban tree planting by small farmers may be needed to bridge the gap between initial expenditures and eventual returns. Subsidies are likely to be very much cheaper than investing in conventional forestry options, although this conjecture should clearly be examined case by case.
- \* Where systems of crop support pricing are used, it is worth considering whether to extend them to supporting farm production of commercial timber and fuelwood.
- \* Favoured treatment of industrial consumers who pay very low prices for woodfuels from state forests and plantations needs to be corrected - even though this may mean taking on powerful vested interests.
- \* Consider subsidising the long range transport of woodfuels (and timber, etc) from wood surplus areas to cities in deficit areas.

#### 4.8 --- Legislation

The most severe woodfuel problems frequently arise from basic issues of inequity and inequitable rights.

Gender divisions, discussed briefly in Chapter 2, are an important example. Although they may be deeply rooted in local customs, it is nevertheless possible to legislate on them. Any laws that increase the status of women and their

rights to own or use land are bound to have beneficial effects on woodfuel problems (and much else besides). At the very least, project interventions that give greater autonomy to women are a move in the right direction and should be encouraged.

The other major forms of inequity concern the distribution of land ownership and access to land and other natural resources. Many of these are hang-overs from the colonial period which no longer fit post-independence values. Yet they persist. Solutions to these problems are not easy, but they may be more effective than present attempts to maintain the *status quo* and protect resources by 'policing against poachers', for example. Various policy approaches to the more equitable sharing of resources are presented below for consideration. Although some of them include fiscal measures, they are grouped here because they would either require legislation or are hard to distinguish from purely legal measures.

- \* Taxing unutilised or under-utilised land owned by large commercial farmers or forestry enterprises.
- \* Tax concessions for these owners if they enter resource sharing arrangements with neighbours on poorer land.
- \* Rents paid by small farmers (or the state) for the managed use of un/under-utilised commercial farm land or state-controlled woodland and rangeland.
- \* Leasing of state land by smallholders or others, on the condition that it is managed productively.
- \* Land reforms that require more intensive use of good land by large farmers living in land and resource deficit areas. Freed land can then be purchased by the state.
- \* Legal requirements for large commercial wood producers to replant trees cut for sale.

- \* Legal requirements for large commercial woodfuel users (notably tea, coffee and tobacco estates, brick makers and other industries) to grow a substantial fraction of their woodfuel needs.
- \* Stricter controls on commercial cutters and traders in threatened areas together with licenses to cut in surplus or highly productive areas.

#### 4.9 Implications for TAU, Angola

Due to its pivotal position within the SADCC energy policy and planning framework, the SADCC Energy Sector Technical and Administrative Unit (TAU), in Angola, should consider taking the lead on some of the foregoing initiatives. We suggest that the broad areas which have the strongest bearing on TAU's overview role are:

1. Data collection and evaluation, especially through coordination across sector agencies and countries.
2. Woodfuel conservations especially through sharing of experience on urban stove programmes, fuel switching and its underlying causes, and spontaneous woodfuel economies and their underlying causes.
3. Training and the development of training curricula and methods. Two specific projects are proposed in Section 4.5 (Training and Information).
4. Improved coordination between 'energy' and other sector agencies; especially in the area of extension services (e.g., for agro-forestry).
5. Research and development specific to woody biomass and wood energy. A specific proposal to review research capabilities leading to a joint SADCC RESEARCH STRATEGY is given in Section 4.6 (Research).