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The poor man's energy crisis:
Domestic energy in KwaZulu
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The Poor Man's Energy Crisis: Domestic Energy in KwaZulu

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1. Introduction

It may seem trite, but it is a fact of rural life often overlooked: wood is as much a necessity of life as the food it cooks and the shelter it builds. For the majority of people, the staple food is a starch rich cereal. Man does not have the digestive system to cope with this without cooking.

Settlements in the valleys and coastal areas of Zululand date back to 300 AD or earlier (Hall and Vogel, 1978). These early people probably had crops, although livestock may only have followed in \pm 500 AD. The effect of these communities on the vegetation and landscape was possibly very profound (Feely, 1980). Trees were felled for shifting cultivation and wood fuel was needed for domestic energy and iron melting. Ever since the first iron age communities arrived, there has been a complex interaction between man and the environment. The pattern of settlement by early agrarian societies in Zululand was influenced inter alia by resource availability and vice versa.

For six centuries or more the extent of settlement was limited

to areas where trees were plentiful. Much of the inland parts were probably grassland since the last ice age and it is probable that absence of trees delayed settlement of these areas. A 17th century site in open grassland near Babanango revealed considerable use of stone for construction, and charcoal deposits were derived from grass or small shrub (Hall and Maggs, 1979). There was also evidence that animal dung was a major source of fuel, perhaps the main one.

Thus certain rural communities in KwaZulu have lived with firewood shortages for a long time while some others have abundant wood at their disposal, for example in well-wooded Tongaland. For the majority however firewood is a resource which is becoming steadily scarcer by the year. This is the predicament in which the people of Mahlabatini District of KwaZulu find themselves.

2. Study of Domestic Energy in Mahlabatini District

2.1 The gathering and usage of wood

There are essentially two main vegetation types in Mahlabatini District. Valley lowveld, a mixed Acacia and broad-leaved tree savanna, occurs in the lower lying areas, and at higher altitudes are grasslands. The people in the high grasslands either obtain firewood from the nearest wooded hillside or buy firewood grown in plantations which are usually on White owned farms in Natal. They feel the firewood shortage very acutely, while for the lowland communities wood is accessible if not plentiful. What

this means in day to day terms is summarised in Table 1.

TABLE 1

In high grassland areas people spend more time collecting less wood compared to valley lowveld. The total time spent gathering refers only to adults and does not include children who collect between 10% and 15% of the firewood used.

	High grassland areas	Valley lowveld areas
Firewood consumption per capita per year	0,62 tons	0,74 tons
Average time taken to collect one headload	4 hr 30 min	2 hr 35 min
Average time spent gathering wood per household per week	9 hr 05 min	6 hr 45 min
Average distance walked in collecting one headload	8,3 km	3,6 km
Average number of headloads required per household per week	2,0	2,6

The values in the table are averages and are not atypical of those reported for other parts of Africa. However they disguise a lot of variation within the sample. There is much variation in the rate of firewood consumption between households even after allowing for different household sizes. Generally per capita consumption is lower in large households than small but there are exceptions. In some households there are subgroups (e.g. families of married sons) which cook separately thus increasing the number of fires. Some households are more careful in their

use of firewood than others, some augment wood with commercial fuels. A fire is not only for cooking and warming the home, it is a ready source of light and also a kind of social focal point for the household. This may explain why the rate of wood use per capita which I measured in households in which a man lived at home was 15% greater than in those with no resident man. The rate of consumption can change suddenly for a host of reasons, increasing when the weather turns cold for example. One household had ceased using firewood - they had run out of both food and money and had nothing to cook.

The amount of work collecting wood varies too since homesteads are not equidistant from the nearest suitable supply. In one extreme case I encountered, a group of women spent 9,5 hours and walked a total of 19 km in gathering a 40 kg headload each.

From studies elsewhere, some inferences can be made which relate to the situation in Mahlabatini District. Estimates of fuelwood consumption in sub-Saharan Africa range over nearly an order of magnitude from 0,27 t/cap/yr in a Lesotho village (Best, 1979) to 2,27 t/cap/yr in Tanzania (Openshaw, 1971). Although there is no single explanation for the differences, wood availability clearly emerges as the major determinant.

Thus one finds that the colder the climate and the greater the need for space heating, the lower the consumption of firewood because trees are often scarce in cold places. That is why the lowest measurement of firewood consumption made anywhere in rural Africa (to my knowledge) comes from a village 2,5 thousand metres above sea level in the mountains of Lesotho where winters are

cold and windy.

On the other hand, measurements of the time spent gathering firewood show a far narrower range of variation than quantities used. The implication is this: as firewood shortages become more and more severe, women are simply unable to devote a proportional amount of time and effort to wood gathering because of commitments to other essential chores. I do not have information about the work pattern in Mahlabatini, but in the Transkei women spent a quarter of the 54 working hours in a week fetching water and wood and stamping maize (Houghton and Walton, 1952). In a rural Tanzanian community, women spent 64 daylight working hours per week as follows:

- 27 hours of housework and cooking
- 20 hours on agriculture
- 11 hours wood gathering
- 6 hours on other chores (Fleuret and Fleuret, 1978).

If wood gathering is counted as part of food preparation, more effort is put into the preparation of food than the growing of it. Women allocate their time carefully: it is a tight budget, with very little flexibility. There is a limit to which the effort in wood gathering can be increased as shortages occur.

2.2 Perceptions of firewood shortages

The time constraint is reflected by the fact that women in

Mahlabatini District were more emphatic about the distances involved in wood gathering than about the arduousness of the task. Many said that they had to "walk very far" but that the work was only "quite hard". This suggests that they see the trees receding but cannot increase the work put into gathering proportionally. The distances increase but the frequency of gathering and the amount of wood burnt decreases.

People said that the severity of the firewood shortage was increasing as was the length of the journeys to find wood. It was not surprising, therefore, to find that old women were significantly more emphatic about the great distances walked than young women who accept the journeys having known no differently. There was no difference, though, between the attitudes of young and old about the amount of work which presumably has remained comparatively constant.

Men and women were equally emphatic about the shortages, distances walked and the amount of work in gathering wood. But when asked why it is hard work, men mentioned only the obvious reasons like the time taken and the weight of the bundles. They did not, as some women did, mention steep terrain, the necessity to go out when ill or in rain, or the risk of being molested by strangers in the woodlands.

2.3 Responses to shortages: non-commercial fuels

What happens when firewood shortages continue becoming more acute, but people have reached the limit to which they can

realistically increase the gathering effort? One or more of the following three things will happen: firstly they will use less wood, secondly they may find other non-commercial fuels and thirdly they may buy fuel including commercialised firewood.

The other non-commercial fuels are mainly dried animal dung and crop residues especially maize cobs. In Mahlabatini District these together make up less than 5% of domestic energy. Even in high grasslands the amount of dung burnt is only 1% of all livestock dung production. The environmental effect of this minor interruption of the nutrient cycle is negligible. In particular localities it might possibly represent a problem but there have been no measurements from KwaZulu which compare with the amounts of dung burnt in Lesotho where it provides up to a third of domestic energy (Best, 1979).

However, the amount of dung available for fuel will be limited by the same time constraint as limits wood since gathering field dung is very time consuming. If there is a temptation to burn this limited supply rather than apply it to fields there will be an adverse effect on agriculture. In fact only a tiny minority of people in Mahlabatini District used dung as a crop fertilizer and their yields were spectacularly higher than the average.

2.4 Responses to shortages: commercial fuels

While the burning of dung and crop residues, though small, is inversely related to wood availability, the extent of paraffin usage was only marginally affected by local wood availability.

It is about 3 l per household per month on average in both high grassland and valley lowveld. The amount of paraffin used in rural communitiis depends more on links between the community and the developed sector than on local energy sources (Best, 1979).

Paraffin is used widely though irregularly with 94% of households using it for lighting on occasions and 80% having primus stoves though many were not in regular use. Paraffin stoves are used mainly for cooking and very occasionally for heating an iron. When people were asked in what situation they chose to use a primus the majority said when in a hurry. Less than a fifth of the replies related to wood shortages. Other replies were for making tea, in hot or wet weather, when ill or when busy with other things.

The degree of commercialisation of firewood is strongly dependent on local shortages and the cost depends on the distance to the nearest local supply. A headload of wattle gathered from White-owned farmers bordering KwaZulu usually costs 10 cents or 30 to 50 cents if delivered. Some farmers paid for casual labour with firewood. Women would work a half-day for a headload which they carried back to KwaZulu and sold for 30 cents.

A trailer load (nearly a ton) cost R25 fifteen kilometres from the plantation and 80% of the cost was transport. People have responded to a need with the technology and means at their disposal. There are a few old tractors which would stand idle for much of the year if not used for transporting wood. Using these helps to secure the position of the tractor contractor so the wood shortage may, in one sense, assist agriculture. The

alternative would be to grow trees but there are many constraints on this which will be discussed later.

The proportion of a household budget which is spent on firewood in lowveld areas is very small. In the high grasslands it is 3,6% of the R55 which each household spends on average on consumables each month. There paraffin and wood together account for 6,8% of the expenditure on consumables or 4,4% of total expenditure. Elsewhere in rural KwaZulu (i.e. Nqutu) 10% of primary expenditure went on fuel (Clark and Ngobese, 1975).

The answers to the question whether it was better to cook with wood or paraffin were influenced by considerations of cost. Most replied "wood" saying the reason was the high cost of paraffin. In some grassland areas people said "no difference, they are both costly".

Firewood was traditionally a free resource to which everyone had a right. The commercialization of wood is therefore more than a simple economic consequence of supply and demand: it involves a fundamental change in traditional outlook.

2.5 Yield of wood from natural woodland

Thus far I have taken the firewood shortage in Mahlabatini District for granted. How severe is the shortage? A typical household of seven people in valley lowveld uses 5 tons of firewood per annum which is almost entirely gathered locally from indigenous savanna woodland. Other uses of wood (building,

fencing, kraals etc.) account for 0,7 tons per household per year, of which 0,1 tons is wattle gum or pine imported into the area mainly for roof construction. In order to compare usage with supply the figures must be converted to weight per unit area. From the population density of 57 persons per km² in this area, we arrive at a mean figure of 0,45 tons/ha/yr of indigenous wood used.

The average annual production of indigenous wood here is 0,87 tons/ha made up as follows:

pieces less than 4 cm diameter including new twigs	0,65 tons
pieces 4 to 8 cm diameter	0,11 tons
pieces 8 to 12 cm diameter	0,06 tons
pieces over 12 cm diameter	0,06 tons

At a glance there appears to be adequate wood in valley lowveld but a closer investigation shows that this is not so. In piles of firewood, 80% of pieces have diameters between 1,5 cm and 4,5 cm. Pieces of firewood have to be trimmed in order to be able to bind them into headloads. The amount wasted in this process is 0,16 tons/ha/yr, mostly small twigs which are not very suitable for fuel anyway. Very large pieces are usually avoided altogether because of their weight and because of the enormous effort required to reduce them to usable proportions. Certain species are avoided because they are too soft (e.g. Scleryocarya caffra), some have unpleasant toxic smoke (e.g. Spirostachys africana) and some are avoided for reasons of superstition (e.g. Euclea spp.). If possible, fruit bearing trees are spared the axe. It seems that even in valley lowveld, wood use has

surpassed supply.

Between aerial surveys made in 1956 and 1975 the density of huts (indicative of population density) increased by a factor of 2,5 in valley lowveld. During most of this period the amount of available dead wood was certainly adequate to meet firewood demand. People will accept long journeys to gather dead wood before they are finally compelled to cut live trees. Now that demand has surpassed the yield, a certain amount of chopping of live wood might be expected. In valley lowveld 8% of firewood comes from live trees. This transition from harvesting dead wood to live wood marks an important change in man's impact on the environment. Firewood gathering changes from being an insignificant impact to being a major one.

In other areas the process has gone much further. The hillside scrub which borders on open grassy areas has been so damaged that its wood yield is less than half that of valley lowveld. Here most of the wood is chopped live.

3. Environmental consequences

While savanna woodland has considerable ecological resilience, it cannot withstand such pressure indefinitely. Forests on the other hand are ecologically fragile. In the KwaZulu areas, 250 forests were proclaimed in the Land Act of 1936, but today all but 50 have either disappeared or been so severely damaged that they are no longer worthy of being called forests. It is wrong to blame their demise entirely on firewood gatherers though some

last vestiges end up under cooking pots.

Since this paper is concerned with the human dimension of the problem I shall only mention a couple of environmental consequences which impinge directly on the quality of life. The so-called sponge effect of forests enables them to act as regulators of our water supply. When they are removed, previously perennial rivers then alternately flood and desiccate. The flooding is physically destructive and desiccation disastrous for man and beast. The increase in erosion causes silting of river bottoms. A rocky river bed turns and aerates water so bacteria can perform the important function of purifying water.

4. Other areas of KwaZulu

There are reasons to believe the situation in Mahlabatini District is typical of many areas of rural KwaZulu but there is not much information available to back this assertion. In Mashunika, Msinga District, Best (1979) measured a comparable rate of firewood consumption per household but because of the smaller households there, the per capita consumption was 1,12 tonnes per year. His estimate of the amount of time spent collecting wood (11 hours per household per week) is higher than mine but I did not include the work done by children. Two litres of paraffin were used per household per month but no other fuels were recorded, so wood provided 99% of domestic energy.

KwaZulu also includes urban and periurban communities. A

survey five years ago in Umlazi (Rivett-Carnac, 1979) revealed a totally different domestic energy pattern. Of the average monthly income of R262, the amount spent on energy was R41,40 or 16%. Just over half of this was on paraffin of which 47 l per household per month was used. The remainder included coal, gas, candles and batteries. Wood was a very minor source of energy, a small minority of households obtaining free wood. Given the large expenditure on expensive forms of energy, Rivett-Carnac concluded that the issue was not whether people in Umlazi could afford electricity, but whether they could continue to afford not having electricity. Electrification would reduce the household energy bill by more than 50%.

5. Meeting KwaZulu's firewood needs

The firewood consumption of KwaZulu as a whole is about 2 million tonnes per year, taking 150 million man (woman) hours to collect. In a very rough estimate, indigenous woodland can provide about half without deleterious effects and without the transporting of wood over large distances. This leaves a shortfall of 1 million tonnes. To provide this on a sustained yield basis will require about 125 000 hectares of woodlots! This is about 100 times the existing area of woodlots and is clearly an unobtainable goal.

The cost of establishing a two hectare woodlot is of the order of R2000. Apart from the economic constraints there are logistical ones such as difficulties in obtaining seedlings. The

organisational structures to establish and maintain woodlots are usually lacking. The local politics of land allocation is often a major obstacle. Even if the direct costs are subsidised, there is an opportunity cost of the land and labour required. The most serious constraints are social and economic rather than technical. While woodlot establishment is of the utmost urgency, it cannot solve the problem in itself.

Other measures are necessary. The productivity of woodlots could be improved by choosing species and management systems best suited to fuel production. Commercial forestry, which produces firewood as a byproduct should be vigorously encouraged. Management can be applied to indigenous woodland to optimise yield, and wood can be obtained from veld improvement schemes. Wood production and agricultural production can be blended using some of the principles of agroforestry. Forestry and agriculture need not be regarded as antagonistic competing for limited land. A concentrated development effort could increase buying power allowing greater use of commercial fuels or purchase of efficient wood stoves. Although the contribution of other energy sources such as solar and wind power and biogas will not make a large total contribution they can potentially have important specific uses.

Wood is the main domestic fuel in KwaZulu and will remain so for the foreseeable future. Although there are severe shortages, it is misleading to speak of "a firewood problem". It is not a separate problem with its own set of solutions. It interacts in a complex manner with other environmental stresses. It is

inextricably woven into the social, demographic, cultural and landuse patterns. It will never be solved in isolation. Any truly meaningful solution must be part of an integrated rural strategy.

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