ADDRESSING SRI LANKA'S BIOMASS ENERGY NEEDS: FALSE STARTS AND NEW HORIZONS

Mick Howes

Abstract

During the late 1970's and early 1980's fears of a "second energy crisis" prompted the Government of Sri Lanka to take measures designed to secure the future supply of biomass energy for domestic and industrial purposes. This paper presents evidence to suggest that the nature of the problem was not properly understood, that its extent was exaggerated; and that the major activities undertaken as a result of this incorrect diagnosis have accordingly proved to be flawed. New, more low key and flexible procedures for dealing with future energy needs are advocated.

The Second Energy Crisis and Sri Lanka's First Biomass Energy Strategy

From the mid-1970's, the idea of a "second energy crisis", in the form of generalised shortages of the fuels traditionally used by the poor, predominantly rural, majority of third world households, began to gain increasingly wide acceptance in international development circles.[1]

In Sri Lanka, this was to prompt a series of government and donor supported activities, the most important of which were the Community Forestry Project and the National Fuelwood Conservation Programme. These were planned and executed in almost total isolation from each other; and without any serious investigation having first of all been conducted to determine the precise nature or extent of the crisis within a national context. These shortcomings were subsequently recognised, and proposals advanced for them to be addressed through the formulation of a national Biomass Energy Strategy: but this was never actually implemented.[2]

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1 See Eckholm (1975) and FAO (1981).

2 See Ministry of Power and Energy (1985).

This paper summarises the findings of a study designed to go at least some way towards filling the vacuum which arose as a result.[3] It deals mainly with the rural areas, where most of those affected were believed to live, and where interventions were focussed; and is based upon fieldwork conducted in Sri Lanka in 1987, as well upon the re-interpretation of secondary data.[4]

Following the structure of the main research report from which it is derived,[5] the discussion falls into three major parts. The first identifies the geographical areas and major social groups most likely to be affected by biomass energy shortages. The second examines the record of the two major interventions, and outlines the problems which have arisen in relation to each. The third draws upon the earlier analysis to suggest principles for a re-formulated Strategy.

Identifying Biomass Shortages

(i) Biomass supply

The supply of biomass energy is broadly determined by the way in which land is used for agricultural and other purposes.

The majority of rural households throughout the country have home gardens, and almost irrespective of location, members of this group tend to gather a substantial proportion of their requirements from this convenient source. Beyond this, however, there are marked regional variations in the ways in which fuel is obtained.[6] In the Wet Zone, rubber wood is most widely used in certain districts, and coconut by-products in others. In the tea-growing areas of the Hill country, people rely mainly on clippings from tea bushes. In the Dry Zone, fuel may be obtained from sparsely cultivated upland areas; or directly from remaining forest land. In the extreme north, palmyrah by-products are predominant.

(ii) Biomass demand

The domestic sector accounts for some 88 per cent of all biomas energy consumption, and with average per capita requirements varying relatively little from one place to another, consumption is heaviest in the most densely populated districts of Colombo and Gampaha. It is also comparatively heavy in the Hill Country, and in the more rural, but still quite densely populated districts which comprise the rest of the Wet Zone.

Industries use the remaining 12 per cent, and are a significant factor in the overall energy picture of the localities in which they are most heavily concentrated. These include the tea and tobacco growing parts of the Hill Country, and the brick making area to the north of Colombo.

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[3] The research was funded by the British Overseas Development Administration and conducted under a Visiting Scholar arrangement with the Agrarian Research and Training Institute, Colombo. The author is grateful to both institutions for their valuable support, but the views expressed are his alone.

[4] See especially Ministry of Lands and Land Development (1986).

[5] See Howes (1990).

[6] See Wijesinghe (1984).

(iii) District energy balances

When total biomass demand is compared with potential supply[7], only five districts are found to be in overall deficit (see table). The shortfall is greatest in Colombo; followed in descending order by Kandy, Gampaha, Nuwara Eliya and Badulla. Deficits are made good by "importing" fuel from other districts. Rubber wood from replanting schemes, and forest wood from land clearances in the Dry Zone, provide the primary sources of traded biomass. Both are presently in abundant supply, but this is unlikely to remain the case for very much longer.

(iv) Groups affected by shortage

Most urban consumers in the five districts, who together comprise some 250,000 households, or nine per cent of the national total, have little alternative but to purchase their fuel requirements. Although prices are currently low, this group will be especially vulnerable to any future shortages.

The other category who appear potentially most likely to be affected are the 200,000 rural landless households in the deficit districts, who between them account for a further seven per cent of the national figure. An investigation conducted among members of this group in Kandy and Badulla, whilst revealing considerable variations in individual circumstances and fuel collection strategies; suggested, however, that shortages were not yet a serious problem.

This was because many landless households were able to utilise surpluses from their neighbour's gardens, and thus experienced no real difficulty. Others, were obliged to gather further afield; but still suffered relatively little inconvenience, since this could be done at slack times of the year, when the opportunity cost of their labour was low.

Only a small minority — made up primarily of those who lived on the peripheries of tea estates, and used these and adjoining crown land as their primary sources — faced situations where the times when fuel was available coincided with periods of high labour demand. An even smaller minority, living predominantly in peri-urban areas, were already purchasing fuel like their urban counterparts.

(v) The future

There is thus little evidence of a second energy crisis affecting rural Sri Lankan households at present; even in those districts which are in overall biomass deficit. There are, however, some grounds for supposing that what is presently a rather small problem could, in future, become more significant. Poorer people, in a number of locations, reported that restrictions have, for the first time, recently begun to be imposed on the access which they enjoy to their customary fuel sources, and it seems likely that such tendencies will become more pronounced with the passage of time.

The following sections describe the two major interventions promoted by Government and aid donors, and ask to what extent they would be able to address this eventuality.

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[7] Potential supply is a measure of total annual biomass production from currently utilised fuel sources, once present consumption for other more valued uses (eg timber) has been deducted. Potential supply is greater than actual supply since it includes some materials which it would not be economically feasible to extract. Potential supply would be approximately equal to sustainable supply in relation to the 55 per cent of the present figure which is accounted for by non-forest sources, but much greater than sustainable supply in the case of the 45 per cent accounted for by forest wood. For a more detailed explanation see Howes (1989) or Howes (1990).

The Promotion of Farmer's Woodlots under the Community Forestry Project

(i) Activities

The Community Forestry Project is administered by the Forest Department. It began in 1982, and was originally scheduled for completion in seven years. The overall budget was $13.7mn, $10mn of which was provided as a loan by the Asian Development Bank (ADB).

The Project was designed by teams of consultants provided for the ADB by the FAO, and consisted of a number of components. By far the largest of these involved the establishment of extensive, centrally managed fuelwood plantations. These had nothing to do with communities **per se**, but were justified on the grounds that additional production capacity was urgently required, and could best be provided by conventional means, whilst the Department developed the more innovative solutions which would be required to deal with shortages in the longer term.

The discussion here will focus on the Farmer's Woodlots, which although only allocated a small proportion of the total budget, most closely reflected the long term objectives towards which the project as a whole was directed. The intention of this component was that farmers should be encouraged to cultivate fast growing species of eucalyptus for fuelwood, following a broadly uniform system which had been determined in advance.

For this purpose, households were to be granted extended leases on plots of State land, which would vary from between a half and one hectare in size, according to availability and location. Participants would also be offered free seedlings and technical advice, but would be obliged to provide any other inputs themselves, together with the labour required to prepare and tend the land.

(ii) Location of woodlots and biomass shortages

Activities were to be confined to Badulla, Kandy, Nuwara Eliya, Matale and Batticaloa.[8] Three of the five fell within the biomass deficit category identified earlier, but as the table indicates, the geographical match with concentrations of demand was still not very good.

Badulla, where the Project had its' headquarters, and where the largest amount of activity took place, was only marginally in deficit, and nothing at all was planned or implemented within striking distance of the primary deficit district of Colombo. These shortcomings could, to some extent, be attributed to deficiencies in the data available at the time key decisions were made, but were also a function of the simple requirement that woodlots could only be established in places where there was land available to accommodate them.

(iii) Problems encountered

In addition to these locational problems, the woodlots were to encounter a number of other difficulties. These included abnormally low rainfall at the times when seedlings were planted, and competition for scarce resources from other more favorably endowed parts of the project. But even when allowance is made for these "external" constraints, it remains clear that the design and execution of the component itself were, in key respects, defective. Three particular limitations stand out.[9]

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[8] In the event, civil disturbances in the eastern part of Sri Lanka during the mid-1980's made it impossible for any work to go ahead in Batticaloa, and activities were therefore confined to the four Hill Country districts.

[9] For a fuller account of the problems arising, see Gamage (1987).

Firstly, although the sites utilised were all on Crown Land, and thus formally available for the government to allocate at will, the situation, in practice, was invariably complicated by pre-existing claims and uses, which served in various ways to undermine project objectives. This initial obstacle was often then compounded by serious inadequacies in the way in which land surveys were conducted.

Secondly, no provision was made to compensate farmers for income foregone in the course of land preparation. This served as a powerful disincentive to whole-hearted participation; especially in view of the long period of time which would have had to elapse before harvesting. It also discriminated against people who were allocated land in more difficult locations, where the amount of work entailed could be much greater than elsewhere.

Thirdly, most participants were not clearly informed that the central purpose of the woodlots was for fuelwood production. Since this objective did not figure prominently among their own priorities, a vaccum was thus created. This, in turn, was then filled in a range of ways, which reflected the diverse needs and preferences of individual farmers. In extreme cases, people were actually found to be pursuing strategies designed to prevent any tree growth at all from taking place on the land in question.

(iv) Assessment

As a consequence of these problems, only three per cent of the land initially targetted for woodlots had actually been planted successfully by the end of the fifth year of the project.[10] Equally significantly, the procedures followed had ensured that none of that area was under the control of poor households which would previously have fallen into the fuel deficit category. This part of the project had, in other words, almost entirely failed to address any present, or likely future, biomass energy shortages.

The Promotion of Fuelwood Efficient Stoves Under the National Fuelwood Conservation Programme

(i) The development of the Sarvodaya stove

Government and donor supported attempts to promote the widescale dissemination of more efficient stoves did not begin in earnest until 1984, but the design which was selected at that time was the outcome of a sequence of events first set in motion in 1979. At that point, Sarvodaya, Sri Lanka's largest NGO, had begun to explore the possibility of designing a new stove, which might help, in various ways, to improve the conditions of the rural women with whom it was already working.

With this purpose in mind, Sarvodaya enlisted the support of the Intermediate Technology Group (ITDG). Operating from the regional headquarters in the Hill Country District of Kandy, the two organisations then embarked on a process of design and testing, in which local potters and intended users were both closely involved.

The outcome was a model which was inexpensive, but offered significant fuel and time saving; whilst reducing smoke emmissions and retaining the more desirable features of the traditional stove it was intended to replace. This proved popular with local women, but Sarvodaya lacked the independent infrastructure which would be required for dissemination upon a more extensive scale[11].

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[10] The figures are from project records. Success is defined as 80 per cent survival at the end of the first year.

[11] See Howes (et al) (1983).

It was at this point that the Ministry of Power and Energy stepped in. Arriving on the scene at a time of growing concern in Government circles with deforestation and potential biomass energy shortages, the new stove appeared to be exactly what was required, and was rapidly installed as the central element in a National Fuelwood Conservation Programme (NFCP).

(ii) Mass dissemination under the National Fuelwood Conservation Programme

In its' earlier versions, the NFCP envisaged saturation coverage of the country within a period of five years.[12] This was to be achieved through providing training for potters to produce the liners around which the stove was constructed; through cash incentives for the local level government officials who would promote it; and through substantial subsidies to encourage adoption.

The Government, however, lacked the resources to put its' ambitious ideas into effect, and was obliged to look elsewhere for most of the funding which was required. Several donors, including the Dutch, the Swedes, the Norwegians and the World Bank, proved sympathetic; but rather than being channeled through the Ministry of Power and Energy, funds were made available through the various district level Integrated Rural Development Projects (IRDP) which the donors were already supporting.

(iii) Problems

The Programme has proved to be partially successful. By 1987, more than 100,000 stoves had been installed, and although this fell a long way short of earlier targets, it still compared very favourable with what has generally been achieved by attempts to promote stoves elsewhere. This, however, tells only part of the story, and on closer inspection, at least two important limitations become apparent.

Firstly, the de-centralised system of funding created a situation where it was the enthusiasm felt by individual donors and IRDP Directors, rather than relative biomass energy scarcity, which became the primary determinant of where stoves would be promoted. The table, which enables distribution to be compared, district by district, with need, indicates that this was to lead to some quite glaring anomalies. At one extreme, Colombo, which had no IRDP programme, got no stoves at all. At the other, Kurunegala, which with the exception of only four sparsely populated Dry Zone Districts, has the greatest biomass energy surpluses found in the country, ended up with the largest concentration of all.

Secondly, most users attached much greater importance to the saving in cooking time which the new stove made possible than to the fuel savings which were also achieved. This would seem partly to be a function of many stoves being located in places where biomass remains in relatively abundant supply, but also reflected the fact that disproportionately few adopters were drawn from the poorer households who were most likely to be affected by shortage.

In the light of these two factors, it appears that, whilst certain other benefits may be attributed to the NFCP, it has been only slightly more effective than the woodlots in addressing present, or potential future, needs for energy conservation.

Towards a New Biomass Energy Strategy

(i) The common limitations of current approaches

The failure of either intervention to have a significant impact upon fuel shortages may be traced back to common underlying limitations.

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[12] See Munasinge (1986).

In the first place, both took, as their point of departure, the unfounded assumption that fuel shortages were serious, widely distributed, and most pervasive in their effects in the rural areas, where the majority of the population lived. From this, it then appeared to follow that "command style" solutions, based on uniform technical packages, and ambitious, centrally determined dissemination targets, represented the only appropriate way forward.

It has been argued here, by contrast, that shortages are, as yet, neither very serious, nor general in their impact. It has also been suggested that, in so far as there is a problem at all, it is confined mainly to urban households, and to the landless in fuel deficit districts: groups which have largely been excluded from participation in the interventions which have been reviewed. Finally, it has also been suggested that even if these other difficulties had been dealt with, problems would still have remained as the result of trying to promote uniform solutions to populations with widely diverging circumstances and needs.

The measure of success achieved in the case of stoves actually reinforces the point, since this may be attributed to the fact that the new design, whilst subsequently promoted in an inappropriate "blueprint" fashion, was first arrived at through a process of experimentation, which ensured that the needs and preferences of at least some rural people were taken into account.

(ii) New priorities and reversals

In so far as future action needs to be directed towards the rural areas at all, it is clear that the initial requirement should be for subsequent interventions to be more purposefully targetted towards the locations and groups most affected by shortage. Beyond that, there is a need for reversals in the way in which officials and donors presently think about biomass energy.

Two principles, in particular, should be recognised. The first — as a comparison of the performance of the two interventions which have been reviewed demonstrates — is that conservation measures are easier to implement, and should generally enjoy priority over supply enhancing options. The second, in the light of the degree to which decisions about fuel production and use are embedded in a wider range of highly location specific considerations about resource allocation, is that rural people themselves should play a far more central role in any future search for new solutions.

Their potential for innovation has already been demonstrated[13] and their own ideas about conservation and new stove design could now be reviewed and documented; and then, where appropriate, made more widely available. The same would apply to the possibilities of producing fuel from home gardens, or other land already under cultivation; although this would have no direct pay-offs for the poorest, unless they could be allowed access to fuel under new types of labour hiring arrangement.

Proceeding in this fashion, a portfolio of options could be constructed which would provide the means for government to respond with sensitivity to more extensive rural biomass energy shortages, as and when these might arise. Only where such wholly

[13] In the Hatton area, for example, where local conditions make fuel conservation unusually important, villagers have designed and constructed a number of different types of stove to reflect their particular needs. Enquiries in Kandy and Badulla indicated that farmers are interested in the possibilities of re-designing their home gardens, and that whilst some of the suggestions which they make may be infeasible, others are potentially promising.

DISTRICT FUEL BALANCES AND INTERVENTION PRIORITIES

District	Fuel Balance '000 tonnes (1)	Stove Programme Priority Ranking (2)	Forestry Programme Priority Ranking (3)
Colombo	−373		
Kandy	−333	4	3
Gampaha	−228	7	
Nuwara Eliya	−176	8	3
Badulla	−90		1
Matale	4	9	3
Matara	71	6	
Galle	77		
Jaffna	81		
Hambantota	111	3	
Batticaloa	123		2
Kalutara	178	10	
Ratnapura	270	2	
Kegalle	403	5	
Trincomalee	513		
Mannar	570		
Vavuniya	578		
Amparai	591		
Puttalam	640		
Kurunegala	774	1	
Polonnaruwa	808		
Anuradhapura	809		
Mullaitivu	853		
Moneragala	1110		

(1) See footnote (7) for an explanation of how this figure is derived. Districts are listed with the one in largest deficit at the top and the largest surplus at the bottom.

(2) This refers to the situation at the end of 1987. The district with the largest number of stoves installed under the programme is given the number "1", the second largest "2", and so forth. A blank indicates no stoves. The urban programme, focussed initially on Colombo and Gampaha did not start until 1987, and is therefore not included.

(3) Priority is based upon the total areas earmarked for planting in the initial project document, and includes block fuelwood plantations, as well as farmers' woodlots.

"internal" possibilities proved unequal to the demands of new situations, would more active forms of intervention have to be considered. Even then, there would be no automatic need to revert to a blueprint approach, since there would still remain the "intermediate" option of collaboration between outsiders and rural people along the lines of the original stove programme described earlier.

Such a relatively low key, but flexible, approach would accord far better with present and likely future rural biomass energy needs than current strategies. At the same time, it would release resources which could then be re-deployed to strengthen the search for solutions to more immediately pressing urban problems.[14]

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[14] This would build upon the urban stoves programme launched in 1987 by the Ministry of Power and Energy, with assistance from ITDG and financial support from the ODA.