Renewable energy for rural development in Ethiopia: the case for new energy policies and institutional reform

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Abstract

This article argues the case for introducing new energy policies in Ethiopia that will ensure energy initiatives for rural development meet the desired expectations. A review of the rural energy sector in Ethiopia is presented. Rural communities have for centuries relied solely on traditional biomass energy sources, human and animal power. In addition, sample findings show that the basic stock of traditional biomass energy resources is dwindling fast for two reasons: one, due to rapid population growth; and two, due to the absence of energy substitutes for traditional energy sources. Renewable energy technologies and other modern energy technologies are almost non-existent. In terms of budgetary allocation, rural energy development has not received a fair share of public investment in comparison to education, rural road construction and health. A key policy recommendation made in this article is the need for commitment from concerned authorities to the use of renewables for spurring rural development. This could be done through increasing the budget allocation to rural energy, which is currently negligible. Other policy recommendations include the modification of existing institutional frameworks for rural energy delivery, and the design and implementation of appropriate rural energy initiatives suitable for productive activities and sustainable development.

Keywords: Renewables; Rural; Ethiopia; Institutional framework

1. Introduction

A potentially rich country, Ethiopia has an area of 1.097 million km², a population of 63.5 million (85% rural), growing at 3% annually and 4.7% in urban areas (World Bank, 2001). The terrain varies from low-lying areas to highlands with the climate ranging from cool temperate localities to tropical regions and semi-desert conditions [see brief country profile (Sources: Business in Africa, 2001; AFREPEN/FWD Database, 2001; Economic Intelligence Unit, 2000; United Nations, 1994)].

The mainstay of the country’s economy is agriculture, based on human and animal power using age-old farming tools on settled farmlands. There are also sizable regions where the source of livelihood is pastoral farming. Land use is mainly for farming staple food items, cash-crops, and grazing a relatively large number of domestic animals. External trade is based on agricultural products constituting coffee, oil seeds, hides and skin and some minerals. Use of fertilizers and improved seeds have been promoted recently with reasonable success. Other than farming and pastoralism, rural communities in Ethiopia are engaged in traditional activities such as small-scale brewing of traditional beverages, retailing of food items, pottery and weaving.

Energy for rural development has been an issue of national interest for quite some time. This issue has received significant attention in most developing countries during the last three decades of the twentieth century (Abdalla, 1994; Byrnes, 1998; Lew, 2000). However, the intensity and attention devoted to rural energy issues in the region varies from country to country. These range from technological innovations and academic interest in well-established research and teaching centres to provision of funding from financing institutions, and finally to growing interests by governments and policy makers in options for addressing the rising costs of modern fuels.

In some countries, equal attention has been given to both rural and urban energy initiatives. Over time, notable measures have been taken in planning and
implementing rural energy initiatives in parts of the developing world. In contrast, rural energy initiatives in Ethiopia have, however, remained undefined, and largely unattended due to economic resource constraints and low levels of technological advancement (Wolde-Ghiorgis, 2001b).

This article appraises the need for introducing new energy policies and institutional modifications in Ethiopia, to improve the performance of energy initiatives for rural development. The article is based on ongoing research work on renewables and energy for rural development undertaken within the framework of the African Energy Policy Research Network (AFREPREN).

The rural energy problem in Ethiopia will continue to be one of the chief causes of underdevelopment and poverty unless timely interventions are made. However, before such findings and conclusions are reached and policy recommendations given, reasons for the low levels of development in the Ethiopian economy, in general, and in the energy sector in particular are explored. Next, rural energy supply and consumption patterns are examined. In addition, investment priorities and patterns are evaluated using available data. Policy gaps and issues that need to be addressed to arrest the continuing decline in the stock of the traditional energy sources (biomass) are discussed. The institutional framework for linking renewables and rural energy with economic growth and sustainable rural development is discussed. Based on the findings and analysis, a set of policy recommendations is proposed.

2. Energy supply and consumption patterns in Ethiopia

2.1. An overview

A clear manifestation of Ethiopia’s underdevelopment and economic backwardness is the meagre use of commercial energy, with about 450 MW of electric power generating capacity, and <1.5 million tons of oil utilization annually (International Resource Group (IRG), 1998). Electricity and oil are critical energy inputs in a developing economy as they contribute greatly to the production process. For economic and financial reasons, these modern energy sources have been made available largely to urban areas. Rural energy requirements, (i.e. domestic, rural-based cottage industries and handicrafts) are mainly supplied by traditional energy sources (ESMAP, 1996).
Except for biomass energy sources, Table 1 shows that the exploitable reserves far exceed the exploited levels. Based on the estimated resources as established in various energy assessments and appraisals (World Bank, 1984; CESEN, 1986), a national energy policy was adopted in 1994, giving priority to harnessing of the immense hydropower potential in the country (Ministry of Mines and Energy, 1994). As will be shown later, the policy does not, however, provide details on exploitation of this resource. Also, the policy does not elaborate the role of hydropower in meeting the requirements for modern energy in rural areas. Coal and natural gas potential exists, but these have remained unexploited and are yet to attract potential developers. Data shown in Table 2, which demonstrates low levels of modern energy consumption, can be regarded as clear indicators for the need to introduce energy policy issues for development in Ethiopia.

As in many other countries in the region, fuel supply in Ethiopia is mainly biomass-based (94.7% of total energy supply, World Bank, 2001). Household consumption constitutes 89% of the total energy supply (Table 3). The other sectors of the national economy, notably agriculture, transport, and industry account for only 7.2% of total energy consumption. The level of grid electrification is extremely low, and therefore insignificant in direct reference to rural development. (This issue is addressed in greater detail in the next subsection.)

The use of coal is non-existent, and consumption of petroleum products in rural areas is restricted to lighting by means of kerosene wick lamps (Wolde-Ghiorgis, 2001b; Tsefaye, 2000).

In Tables 4 and 5, estimates are given for the dissemination of renewable energy technologies ( RETs), and the number of manufacturers/assemblers of the renewable technologies in Ethiopia. In view of the exploitable renewable energy sources other than biomass fuels (Table 1), opportunities exist for introducing a range of RETs. However, Ethiopia is in a unique situation where RETs are unattainable for rural communities. This is due to either the relatively high import

### Table 1

**Indigenous energy resources**

<table>
<thead>
<tr>
<th>Exploitable reserves</th>
<th>Units</th>
<th>Exploited percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro power</td>
<td>30,000 MW</td>
<td>0.9</td>
</tr>
<tr>
<td>Solar/day</td>
<td>5 kW/m²</td>
<td>~0</td>
</tr>
<tr>
<td>Wind speed</td>
<td>3.5–5.5 m/s</td>
<td>~0</td>
</tr>
<tr>
<td>Geothermal</td>
<td>700 MW</td>
<td>~0</td>
</tr>
<tr>
<td>Wood ab</td>
<td>1120 Million tons</td>
<td>50</td>
</tr>
<tr>
<td>Agricultural waste</td>
<td>15–20 Million tons</td>
<td>30</td>
</tr>
<tr>
<td>Natural gas</td>
<td>75 Billion m³</td>
<td>0</td>
</tr>
<tr>
<td>Coal</td>
<td>13.7 Million tons</td>
<td>0</td>
</tr>
</tbody>
</table>

ab Estimate based on a 3% woody cover of surface area of Ethiopia, with one tree per 4 m², and an average weight of 0.2 ton per tree. Source: Ethiopian Rural Energy Development and Promotion Centre (EREDPC), 2000.

### Table 3

**Energy consumption by sector (1996)**

<table>
<thead>
<tr>
<th>Sector</th>
<th>TJ</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>644,749</td>
<td>89</td>
</tr>
<tr>
<td>Rural households</td>
<td>602,184</td>
<td>8</td>
</tr>
<tr>
<td>Urban households</td>
<td>42,565</td>
<td>6</td>
</tr>
<tr>
<td>Agricultureac</td>
<td>816</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Transport</td>
<td>17,918</td>
<td>2.5</td>
</tr>
<tr>
<td>Industry</td>
<td>33,319</td>
<td>4.6</td>
</tr>
<tr>
<td>Services</td>
<td>26,067</td>
<td>3.6</td>
</tr>
<tr>
<td>All sectors</td>
<td>722,870</td>
<td>100</td>
</tr>
</tbody>
</table>

ac Excluding human power, animal power, and fertilizers. Source: EREDPC, 1996.

### Table 4

**Estimated numbers of renewable technologies disseminated in Ethiopia (2001)**

<table>
<thead>
<tr>
<th>Assemblers/manufacturers/dealers</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar cookers and water heaters manufacturers</td>
<td>3</td>
</tr>
<tr>
<td>Mini/micro-hydro power equipment assemblers/manufacturers</td>
<td>3</td>
</tr>
<tr>
<td>Assemblers/manufacturers of windmills for water pumping</td>
<td>3</td>
</tr>
<tr>
<td>Dealers/importers of photovoltaics</td>
<td>3</td>
</tr>
</tbody>
</table>

Sources: ESMAP (1996); AFREPREN (2001); Wolde-Ghiorgis (2001a).

### Table 5

**Estimated numbers of manufacturers, assemblers and dealers of renewable energy technologies in Ethiopia (2001)**

<table>
<thead>
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<th>Assemblers/manufacturers/dealers</th>
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</tr>
</tbody>
</table>

Sources: Wolde-Ghiorgis (2001a); ESMAP (1996).
and customs duties on RETs (notably photovoltaic systems and components in comparison with diesel generator sets), or the indecision by manufacturers/assemblers to invest in the country.

A few wind pumps have been demonstrated through donor funding. Demonstration of PV installations for lighting and village electrification have also been attempted, but these were not sustained (Wolde-Ghiorgis, 1990). Old and new micro-hydro power driven flourmills exist in a few farming communities. However, comprehensive and coordinated introduction and use of RETs is yet to be promoted in line with development goals for rural development.

If Ethiopia is to continue relying on biomass energy resources, the question to be asked is whether such a trend could be expected to be sustainable. More research is required to answer this question conclusively. However, as illustrated in Fig. 1, preliminary findings indicate that the stock of biomass resources is dwindling. In the most affected northern regions, there are ongoing afforestation schemes. In the northeast and northwestern areas, attempts are being made by regional energy bureaus to address the problem. Until the trees grow and the environment is sufficiently rehabilitated, it is imperative to find substitutes for traditional biomass energy sources by resorting to other renewable and non-renewable energy sources (Wolde-Ghiorgis, 1984).

2.2. Electrification levels in Ethiopia

Given the immense hydropower potential, and the relatively significant resources of coal and natural gas (see Table 1), by the end of the twentieth century, Ethiopia’s electricity generating capacity should have exceeded 2000 MW. To date, however, the generating capacity stands at around 450 MW. As shown in Fig. 2, this places Ethiopia at the bottom end of electricity generating capacity per capita, with about 7 W. This is well below that of India (about 100 W), Egypt (about 230 W), and far below that of Brazil (about 366 W) (EEPCO, 2000; World Bank, 2000; International Energy Association (IEA), 2001).

Not only is the electricity generating capacity relatively low, but the pace has also been very slow, as shown in Fig. 3. The electrification levels attained up to 1998 have reached only 10% of the population (Bereket, 2001; Karekezi et al., 2001). Currently, with a production of about 1670 GWh per year, the per capita electrification level is roughly 23 kWh per year (EEPCO, 2000). Again, this figure represents one of the lowest electrification levels among developing countries. For a country with a population of over 63 million, these are extraordinarily low levels of electrification. However, there are ongoing projects that will increase generating capacities by 300 MW by 2003, and committed projects that will provide an additional capacity of 325–450 MW by 2007. This will, however, still leave the electrification level at 25 kWh per capita as the population would have increased (AFREPREN, 2000).

It has been argued that the main reason for the low levels of electrification in Ethiopia is the lack of demand for modern fuels, in general, and electricity in particular, among both the urban and rural populations of the country (Acres, 1994). It can be interpreted that “lack of

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**Woody biomass stock depreciation in selected Weredas**

- Arsi - Robi
- Jimma - Kersa
- Shewa West - Ambo

**Source:** Wolde-Ghiorgis, 2001a

**Fig. 1.** Sample biomass stock depreciation in selected woody districts, showing actual and projected depletions.
demand” possibly means, “lack of ability to pay for electricity installations and consumed energy”. If this has been the crux of the problem, it has been non-developmental and against the benefits of modernization, as confirmed by other positive studies (Acker and Kammen, 1996). These studies show that given opportunities for minimum micro-financing and viable financial schemes, both the urban and rural populations of Ethiopia can afford loans for improved energy supplies and development ventures.

A second more plausible reason advanced for the low electrification levels is the high costs involved. As in many other countries in the region, the relatively high costs of transmission and distribution to scattered rural settlements and the low generating capacity have mitigated against rural electrification in Ethiopia (Wu and Li, 1995). Rural electrification is defined on the basis of a minimum settlement population of about 5000. In this respect, semi-urban towns in Ethiopia have been steadily electrified as shown in Fig. 4. Access to electricity by rural communities is, however, still very low (see Fig. 5a and b) (EEPCO, 2000).

3. Investment and budgetary allocations in the energy sector in Ethiopia

The development of modern energy in Ethiopia has received substantial financial resources over the years (National Bank of Ethiopia, 1999). However, rural energy development does not appear to have been
allocated a fair share of these resources. On the other hand, education, health and rural road building programs are regarded as the corner stones for building the necessary infrastructure for poverty alleviation. However, energy in general, and rural energy in particular, is yet to be given equal weight to these other development sectors. Inevitably, the rural energy sector has largely remained undeveloped. In order to provide the right framework for appraisal, it is worthwhile to consider the essential aspects of the budgetary allocation process for the key development-related sectors.

3.1. Jurisdictions and responsibilities in the management of the energy sector and sub-sectors

The Federal Democratic Republic of Ethiopia (FDRE) has 11 regional administrative state governments and city council administrations. At the federal level, the Ministry of Mines and Energy (MME) is responsible for the overall development of the energy sector in the country. Policy issues pertaining to the exploration of energy resources and implementation of the national energy policy are under the jurisdiction of the MME. The MME has several departments that deal with energy issues, i.e., Department of Energy Operations (DEO), the Ethiopian Rural Energy Development and Promotion Centre (EREDPC), the Petroleum Explorations Division (PED), and the Coal Exploration Division (CED).

The modern energy sector in Ethiopia has been organized within two enterprises: the Ethiopian Electric Power Corporation (EEPPO) for the electricity sub-sector, and the Ethiopian Petroleum Enterprise (EPE) for the petroleum sub-sector. These two enterprises are public firms that have recently acquired new managerial and operational responsibilities. Up to 1998, the Ministry of Economic Development and Cooperation (MEDAC, 2000) centrally approved their budgetary allocation.

At a regional level, the energy sector is incorporated in the Bureau of Water, Mines and Energy, although in some instances it is grouped under Urban Development.

3.2. Budgetary allocations for investment in the energy sector and sub-sectors: a critical review

Investment in the energy sector has to compete with education, health, rural roads, and other social services sectors.

Investment in the energy sector in the last decade amounted to Birr 5.5 billion of which only 1% was spent on the traditional energy sector. Investment in the rural energy sector in the last 5 years has been 0.1% of total sector investment or only Birr 0.5 million per year. It should be noted that most of this amount was allocated to traditional fuel conservation interventions in mainly urban and semi-urban areas (AFREPREN, 2001; EIU, 2000).

It has been argued that energy cannot be included in infrastructure building and poverty alleviation programs. But the difficulty with this line of thinking is the lumping of traditional energy with modern energy. The latter sub-sector is normally developed under closely prepared and designed projects that meet minimum requirements of financing institutions with stipulated benefit-to-cost ratios greater than unity, and viable financial returns. The traditional and renewable energy sub-sector is, however, typically undefined and can only be grouped with the education and health sub-sectors.

It is possible to argue that investment in the rural energy sector is at par with investment in rural education, health, rural roads, and other social services sectors. If the rural poor cannot afford education and health without interventions, how can they be expected to purchase modern fuels and energy devices without supporting financing schemes? Besides, there is a strong relationship between the education sector and the energy sector as far as rural communities are concerned.

Transfer of technology, such as the installation, maintenance and operation of even the simplest RETs will require literacy-level education and minimum technical exposure. Otherwise basic notions of rural electrification, pumped irrigation and harnessing of renewable energy sources will remain remote and unattainable, eventually perpetuating poverty and backwardness (Rajagopalan and Demaine, 1994).

Fig. 6 shows the comparison of budgetary allocation for three sectors, namely: (1) modern energy, including mining and traditional energy; (2) education; and (3) health. The proportion given to traditional energy...
development including the dissemination and promotion of RETs is, however, not clearly depicted in the energy sector allocations. This is because the share of modern energy is close to 100%.

For a more detailed review of budgetary allocations for the energy sub-sectors, it is necessary to assess the importance attached to the three sub-sectors, namely: (1) electricity; (2) petroleum; and (3) traditional energy. Fig. 7 provides this insight. It is interesting to note that the budgetary allocation for traditional energy sources has been continually decreasing, while the pressure on the dwindling supply has been increasing.

In explaining the low budgetary allocation, it could be argued that since rural energy initiatives come under the responsibilities of the regional governments and city administrations, there is no need for budgetary allocation at the federal level. However, the regional governments and city council administrations receive their budgetary allocation from the federal treasury. Further, it has been argued that the rural energy issue in Ethiopia has mainly been seen as obtaining energy options that secure minimum energy supplies for domestic requirements only. In this sense, investment in rural energy is seen as wastage of scarce resources because it is not used in industry or agriculture. However, in line with agricultural development-led industrialization (ADLI) strategy, rural development implies the launching of cottage and small-scale industries using modern technologies and modern fuels. Therefore, investment in rural energy could also support enterprise development.

4. Need for new energy policy issues and institutional modifications for improved rural energy initiatives

Compared to the state of development of the energy sector in other developing countries, Ethiopia has delayed in taking appropriate action with regard to rural energy problems. Ethiopia lags far behind most African countries in building energy infrastructure. In view of the existing energy scenario and budgetary allocation, we now examine the energy policy in relation to rural energy development.
4.1. Policy issues pertaining to improved performance of rural energy initiatives

The Ethiopian energy policy does not address rural areas, although it is structured on resources covering traditional, modern and alternative energy sources. On the demand side, the main energy consumers are categorized as households, agriculture, industry and transport. However, rural energy is barely mentioned in the policy document. The word “rural” is mentioned only once and only in reference to rural transport technologies. Issues and constraints are addressed in general terms ignoring specific constraints in rural areas. It is further mentioned in the preamble to the policy that “the energy policy is intended to enhance and foster the ADLI strategy and is consistent with other sector policies”. It is evident that to be supportive of this strategy, rural economic activities need to be given high priority in the energy policy. The first policy issue to be considered is therefore the need for complete revision of the current national energy policy with regards to rural energy initiatives.

The second policy issue is the need to strengthen commitment in the implementation of rural energy initiatives. The starting point for this is the institutional arrangement. The key gap in the National Energy Policy of Ethiopia is that there is no authority or organ responsible for introducing rural energy initiatives other than grid electricity and petroleum products. The development and dissemination of options such as mini and micro-hydropower and PV systems are not the responsibility of any specific institution. Without institutional and managerial structures and controls, it is impossible to realize the proposals that have been repeatedly stated as solutions to the energy problem during the last 20 years. Experiences from other developing countries show that successful energy programs have to start at institutional and management levels (Loiter, 1999).

Similarly, the initiatives started for conserving and rationalizing the remaining biomass energy resources of the country should be coordinated by the Ethiopian Rural Energy Development and Promotion Centre (EREDPC) in the Ministry of Mines and Energy (MME), and the Natural Resources Protection Department of the Ministry of Agriculture (MOA). Otherwise, further deforestation will accelerate to unmanageable levels. A sustainable or viable development of the renewable energy resources of the country, in general, could also remain unrealized unless these institutional and management issues are clearly identified and resolved. In other words, responsibilities of the various authorities need to be clearly spelled out.

The third policy issue of concern is the need to draft and approve new policies and regulations. The revised energy policy should address the role of renewable and non-renewable energy sources as substitutes to traditional energy sources. The new policy measures and guidelines for launching and strengthening rural energy initiatives should be compatible with the socio-economic and political policies of the Federal and Regional Governments. Issues such as property rights, local customs and jurisdictions of the Federal and Regional Governments on free forest areas need to be addressed equitably according to the Federal Constitution and the ADLI strategy for industrialization. Further, proper tree production guidelines to farmers, (e.g. location and methodology) should be stipulated in the proposed new policy. Equally important is the issue of charcoal production, which should be regulated in terms of quality and distribution. Experiences of the other countries in the region will provide useful lessons (Karekezi and Ranja, 1997).

The fourth policy issue that needs to be addressed is the legal framework. Solutions designed for introducing initiatives to address the rural energy problem in Ethiopia will need to be backed by clear, strong and strict legal frameworks. At least 40% of the country’s land is believed to have once been covered with forests. At present, what remains of this green area is estimated to be a mere 3–4% of the land surface. Two reasons have contributed to the rapid deforestation: the first, as extensively discussed earlier, is the dependence of a rising population on fuel wood, and, second, is the absence of legal enforcement against unrestrained wood clearing practices. In the feudal days (some sixty to ninety years ago), folklore in Ethiopia has it that officials in a number of rural settlements had the unwritten legal authority to punish and imprison unlawful woodcutters (O’Keefe, 1981).

However, when Ethiopia was exposed to foreign invasions, and a series of civil wars, customary laws began to lose their weight and authority. Foreign armies and local armed groups took advantage of the situation to cut trees widely and freely. Due to growth in urbanization, rural people began to supply fuelwood to urban markets. Also, during the same period, there was a significant demand for wood poles for use in construction and lumber. With time, uncontrolled wood processing industries sprung up, as small-scale enterprises, putting further pressure on the limited forest resources (ITCs, 1999a, b).

The formulation of the national policy had inherent flaws. The legal frameworks enacted for controlling forest resources were either too weak, or were not precise enough to require loggers and ordinary woodcutters to plant replacements (MME, 1994). All previous legal proclamations therefore need to be reviewed, and newer and more relevant legal provisions created. It is possible that initiatives will not be manageable even with the necessary legal penalties. Transfer or acquisitions of technologies and local entrepreneur interests will need to
be protected by supporting legal provisions. Equally important is the need to guarantee the safety and durability of imported or locally manufactured RETs in line with national and/or international standards (Karekezi and Mackenzie, 1993).

Along with the needed modifications in the institutional and legal frameworks, it is imperative to take into account economic and financial considerations. If RETs are to be promoted as the major component of rural energy initiatives, the financial implications involved in recuperating costs and associated payback periods on per unit energy basis (e.g. kWh) should be considered. RETs are known to be relatively costly in comparison with other energy technologies. On the other hand, if one considers initiatives based on fossil fuels (e.g. imported or locally exploited coal), there is need to carefully weigh short-term financial hardships against long-term economic advantages. Opting to find substitutes for the traditional energy sources will in any case entail known and unknown costs. Using standard economic and financial analysis, it can be demonstrated that modernizing the energy infrastructure in Ethiopia without further delays will ultimately benefit present and future generations. This is irrespective of whether the rural energy initiatives are to be promoted by the Federal and regional Governments, or by non-governmental organizations, NGOs (Abdalla, 1994; Sinha et al., 1994).

Finally, with regard to implementing improved rural energy initiatives, the issue of human resources and technical capability should also be considered. For the successful implementation of rural energy initiatives, it is imperative that the necessary human resources and technical capability is built within the shortest time possible. Rural energy policies should clearly define the role of scientists, hardware and software engineers, as well as supporting technicians, energy economists, accountants and managers in rural energy development. At present, there is a large number of academic, vocational and comprehensive secondary school graduates who can be easily trained on assembling and maintenance of RETs. At the post secondary school level, national energy issues could be incorporated into the curriculum, possibly in the same way as other training programs. In the process, it should be the aim of the policy also to replace expatriate energy consultants and experts with nationals within the shortest possible time (CESEN, 1986).

4.2. Policies to accelerate rural energy initiatives directed at economically productive activities and small-scale enterprises

Judging from the experiences of other developing countries, the core goal and concept for promoting improved rural energy initiatives should basically be to provide energy for rural small and large-scale enterprises.

If rural energy initiatives are directed at viable economic activities, they need not be welfare-focused or uneconomic. All they require are the necessary regulations, tariff structures, low tax considerations and incentives. However, it is necessary to consider special support if rural energy initiatives are to be promoted on a sustainable basis. Tariffs and quality of service for small suppliers to small markets in rural areas cannot be expected to be similar to urban areas. Uniform tariff structure for urban and rural customers will be unaffordable to the latter. Regulations and tariffs set for urban operators would not, however, be suitable for numerous micro-suppliers in rural areas (Byrne et al., 1998). The electricity regulation, however, deals with supply issues uniformly, including enforcement of standards. Less stringent standards (e.g. allowable voltage drops) will therefore need to be applied to rural areas to reduce costs of supply to at least ensure cost recovery (Sinha et al., 1994). Still, costs will generally be higher for rural areas, and pay back periods will be longer.

Without overlooking safety issues, other license requirements could be waived for prospective micro and small energy suppliers in rural areas. Based on priority policies, duties and taxes should be rationalized and lowered. Taxes on energy equipment that are especially suitable for rural areas are high. For example, import duty on PV equipment is as high as 30%. A new policy is recommended to provide lower tax considerations and provide incentives (Karekezi and Ranja, 1997).

The need for lowering constraints of access to energy services in the rural areas is not implied in the present national energy policy. In line with adopted standards and economic measures for poverty reduction, rural infrastructure has significantly been upgraded through public expenditures in building roads, health centres, schools, and telecommunication. However, energy has not been given similar attention. The same economic reasons often forwarded for supporting the expansion of the road sector can also be forwarded for expansion of the non-conventional energy sector. Changes in the economic activities of many rural areas connected by new roads are marginal in the short term, and if taken on purely cost-benefit indices, very few rural areas would be viable for connection. However, billions have been invested in less than a decade on the road sector.

Another important policy issue is technology transfer. Managerial skills and capacity in the engineering and sciences of renewable energy sub-sector should be enhanced. Thus, technologies especially suited for local manufacture should be supported and protected. These include the assembling and manufacturing of small hydro, wind, solar and human or animal powered
equipment. Solar pumping for irrigation and drinking water will definitely depend on imported technologies, i.e. the PVs, the motors and pumps. PV stands; pipes and hoses need not, however, be imported. Similarly, solar lighting for rural-based commercial operators will use mainly imported technologies, but other accessories like cables and stands could be purchased locally (Hankins, 1995). The local manufacture of the aforementioned components will lead to the growth of small and micro-enterprises for rural people.

The presence of rural productive enterprises will improve commerce and the viability of rural electrification. Scattered settlements will also be transformed into semi-urban concentrations. Increases in profitability with cheaper sources of energy will guarantee sustainable developments (Barnes, 1988).

The idea of income generation using renewables has successfully been implemented in many developing countries. Solar energy and hydropower are abundant in Ethiopia. The question is whether exploiting these resources can spur the growth of income generating activities for rural communities. Rehabilitation of old hydro-powered mills can be an income-generating activity. There are reports of old water mills being resurrected by some NGOs after decades of neglect. Potential exists for developing micro-hydro power resources at many sites in the western, central and southeastern parts of the country. The main economic activity in these areas is cattle rearing where people move frequently in search of water for themselves and their animals. Provision of cheap water pumping technologies based on local resources and technologies can improve cattle and crop productivity. Reliable wind pumping machines can be designed, manufactured and assembled locally in nearby rural towns, or in major urban centres. Attractive wind resources are available in north, east, and southern and southeastern parts of the country. There are potential sites for electricity generation by wind power for 9–10 months in a year (Wolde-Ghiorgis, 2000a–d). Therefore, chances of high economic success and favourable financial returns are high. At most, though, the aim should be cost recovery, with a benefit-to-cost ratio of at least one.

Finally, there should be a clear policy to sponsor and promote pilot RET projects so as to familiarize operators, promoters and consumers with the operations and uses of RETs. The dissemination of RETs should be need-driven, as opposed to donor-driven. The skills needed for designing, installing, maintaining and managing RETs should be taught to energy technicians with general and specialized skills. Communities could also be organized as business enterprises to coordinate the sustainable growth of rural energy systems. Manufacturers and assemblers of basic and advanced RETs should also be given incentives to make their activities profitable (Shanko, 2000).

5. Concluding remarks

The findings of this study show that the current national energy policy for Ethiopia needs complete revision. The major finding is that it does not address energy requirements for subsistence and development, especially energy requirements in rural areas for modern productive activities. This fundamental gap in the national energy policy is known to the relevant authorities at the Ministry of Mines and Energy and possibly also at the Ministry of Economic Development and Cooperation. Why this major problem has not been addressed is possibly due to the fact that it is a responsibility shared commonly between the Ministry and the Regional Energy Bureaus and therefore no one feels responsible. Additionally, it is probable that the problem’s complexities and intricacies are just beginning to be grasped.

Rural economic activities need to be given high priority in energy policy. New policies and regulations on traditional energy resources should be drafted. These should be compatible with the socio-economic, political and economic policies of the Federal and Regional Governments. Human resources and capacity should be developed through supporting training policies. Finally, possibilities for lowering constraints of access to energy services by the rural poor should be investigated.

References


