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FUELWOOD CONSERVATION IN THE DEVELOPING COUNTRIES

Commission Staff Paper

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I. INTRODUCTION

Wood continues to play the crucial role it has historically played in human life. Although it has been gradually replaced by fossil fuels in the industrialised countries, it remains a major source of energy for the developing countries. At present, more than 2 000 million human beings - mostly inhabitants of the rural areas of these countries - depend on fuelwood and its derivative charcoal.

The United Nations Conference on New and Renewable Sources of Energy, which was held in Nairobi in August 1981 and to which the Community made a significant contribution, acknowledged the seriousness of the existing situation and the importance of fuelwood and charcoal supplies for the developing countries. This problem, directly linked to that of food supplies, is referred to in the Commission's communication to the Council (1) concerning a plan of action against world hunger. In the case of action proposed at regional level, emphasis is laid on priority measures for safeguarding and exploiting the agricultural potential of the developing countries. These measures include the more rational use of wood as an energy source and reafforestation.

The guidelines on fuelwood conservation set out in this document, therefore, are in line with these objectives.

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(1) Doc. COM(81) 560 final

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II. THE FACTS

On the whole, it is becoming increasingly difficult for the developing countries to cope with the effects of the energy crisis. Nevertheless, since a general approach to the problem conceals widely differing local situations, it is extremely difficult to assess the true position. This difficulty is increased by the fact that data on energy consumption and production always relate to commercial energy sources (petroleum products, electricity, etc). The majority of developing countries, however, are large-scale consumers of non-commercial sources of energy, mainly wood and its derivative charcoal, together with certain other fuels of which the most important are agricultural and agro-industrial residues and dried animal dung.

Annex I, which gives details of worldwide fuelwood consumption in 1978, shows that fuelwood energy is estimated to account for a very substantial proportion (16.6% in Asia, 57.9% in Africa) of total energy consumption (fuelwood plus commercial forms of energy). Since these percentages do not take account of any non-commercial energy source other than wood, they underestimate the real situation. In India, for example, agricultural residues and animal dung supply roughly the same amount of energy as fuelwood.

The five Council of the Entente States (Benin, Ivory Coast, Upper Volta, Niger and Togo) provide a particularly significant example in this respect in view of the numerous forms in which wood is present in that region (wooded savanna, tropical rainforest, etc.). The fuelwood and charcoal requirements of these countries*, which are set out in Annex II, are estimated at 3 450 000 toe, representing 63% of their total energy requirements in the domestic, industrial and transport sectors.

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* Source: EDF financed study: "Etude de valorisation des résidus végétaux dans les pays du Conseil de l'Entente" (November 1981)

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These few examples give an idea of the importance of non-commercial forms of energy in developing countries economies. Demand is bound to increase under present circumstances in view of demographic trends in these countries, the financial and commercial constraints affecting the supply of petroleum products and the social and institutional aspects of the introduction of new technologies employing new and renewable energy sources. This increased demand could, however, be checked by the shortage of wood which is gradually becoming a permanent feature of most developing countries as a result of deforestation and the supply problems that considerably increase selling prices.

Fuelwood consumption in the developing countries rose by 200 million m3 (18%) during the period 1971-78.

The largest increase was in Africa, and the smallest in Asia.

The demand for fuelwood is influenced by a large number of factors, such as demographic developments, culinary traditions and customs, climate, income levels and the degree of scarcity. Per capita consumption is estimated at between 0.05 and 2.5 m3 a year. Generally speaking, wood consumption is greater in countries such as Gabon (2.3 m3), which have substantial natural forest resources, than in countries like Mauritania, where per capita consumption is only 0.1 m3 a year.

Since they are virtually the only source from which these needs can be met, natural forests are rapidly declining in the most densely populated regions.

The forests of the Third World which, according to the World Bank, cover an area in excess of 1 000 million hectares are in danger of disappearing within 60 years if the present trend towards rapid agricultural encroachment continues. Between 1900 and 1965, approximately half the forested area in the developing countries was cleared for agricultural use,

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and more than 3 000 million hectares (30%) of the world's arable land is currently under shifting cultivation. Moreover, forests will never regrow on land that has been cultivated. The increasing demand for ligneous fuels and the clearance of afforested areas for agricultural purposes suggest frightening prospects for the world's forests, particularly as domestic wood consumption is underestimated.

Annex III shows that by the year 2000, the forest resources of the developing countries will be seriously depleted, 40% of woodland being threatened with disappearance.

At present, 2 000 million of the world's inhabitants, mainly in rural areas, are dependent on fuelwood and agricultural residues.

Wood accounts for 5.4% of total world energy consumption, representing 0.7% of total consumption in the industrialised countries and 20% in the developing countries, with considerable variations from one continent to another.

Fuelwood supplies 60% of Africa's energy requirements, and some countries, such as those of the Sahel, are 95% dependent on this energy source. India, the world's eleventh industrial power, depends on wood for 53% of its energy and in some rural regions this figure is as high as 93%.

Cooking and heating account for 90% of the wood used in the developing countries.

A recent FAO study indicates that approximately 100 million inhabitants of the developing countries are unable to satisfy their minimum energy requirements. The shortage of fuelwood affects 1 100 million inhabitants of the Third World, i.e. 33% of the total population of the developing countries or 25% of the world's population (see Annex IV).

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Similarly, fuelwood appears as a major debit item in the trading account of industries deriving their energy from wood (e.g. tea factories).

The increasing scarcity and rising price of wood may even compel some craftsmen to cease their activities.

c. Ecological effects

Intensive wood-gathering in deforested areas leads to a complete depletion of forest resources and this rapidly produces soil erosion and sterility. Erosion, which gives rise to large-scale sedimentation, causes pollution in nearby pools. Similarly, groundwater levels fall as plant cover decreases.

The fuelwood crisis has therefore had numerous effects and the examples set out above indicate the magnitude of the problem.

IV. TECHNICAL SOLUTIONS

The seriousness of the problem calls for immediate action which because of the scale of the task, will require the large-scale involvement of the people affected. Fuelwood and charcoal will remain indispensable energy sources for growth in the developing countries for a long time to come. Any proposal seeking to put an end entirely to the consumption of wood would be unrealistic in view of ingrained habits and the difficulties encountered in introducing replacement facilities (problems relating to costs, maintenance, management, marketing, finance, etc).

Savings in fuelwood should therefore be made gradually, and should be accompanied as far as possible by increased wood production.

Wood and charcoal are produced and consumed in a process which involves several stages: production(level of productivity and charcoal yields), transfer, marketing and use (level of combustion and processing efficiency).

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The elements in this chain should not be dealt with in isolation, i.e. instead of piecemeal action, an overall strategy should be adopted.

For example, in Upper Volta fuelwood consumption of 10 million m3 is forecast for the year 2000. If it is assumed that the 5 million m3 currently consumed are obtained from natural forest resources, it will be necessary to produce a further 5 million m3 in the year 2000, which will require the planting of 500 000 ha of forest or the installation of 1 million improved cookers in 20 years. Neither of these solutions would be feasible in isolation. However, the implementation of a comprehensive policy involving reafforestation, the development of natural forests, the installation of improved cooking facilities, the manufacture of more suitable cooking pots and the introduction of replacement industrial equipment would be an acceptable solution to the fuelwood problem in this country.

Research relating to the improvement of cookers provides another example. This research, which could commence with the design of a model stove fired by small pieces of wood, would have important consequences for the species of wood selected and particularly for the period of rotation decided on.

Within this general framework, several possible technical solutions for reducing fuelwood consumption are currently available. Three basic guidelines have been laid down in this connection:-

- reduction of wood and charcoal consumption through improved efficiency,
- replacement of wood and its derivatives by other equivalent fuels,
- installation of replacement equipment which uses certain forms of new and renewable energy.

a. Improving efficiency

Two consumers must be considered, namely domestic and industrial users. In the domestic sector, the improvement of efficiency should be concerned

with cookers and the manufacture of charcoal.

Improved cookers, replacing the "three stone" type open fires, whose overall efficiency (combustion plus cooking) is no more than 5%, have already been successfully introduced as part of demonstration schemes in a number of countries, in particular thanks to Community financial support (Commission/NGO project in Upper Volta), where some 1 500 of these cookers have been brought into service. Depending on the type adopted, the efficiency of these new cookers varies between 10% and 40%, which means savings on wood of 50% to 87.5%.

Promoting the widespread use of these improved cookers is not easy, as it is important to respect culinary traditions and to adjust to the socioeconomic and material conditions in the country or region where such cookers are to be introduced.

A distinction must be made between urban areas, where consideration can be given to manufacturing and distributing fairly elaborate, high-performance models, and the rural areas, where penetration of this kind of cooker is more delicate and more rudimentary models need to be supplied, even if this means sacrificing some of the efficiency.

The Commission/NGO project in Upper Volta shows that the use of clay for producing improved cookers for rural areas is the best approach. This clay still needs to be stabilised with a little cement, basically for sociological reasons, (the skilled stoneworker suffers a loss of status if he works without cement). Since one of these cookers costs less than CFAF 5 000, it can pay for itself in two months * although its life expectancy is about a year. Other items such as pressure cookers, curved-bottom pots and dolo (millet beer) stoves are still being developed under this project.

* Price of one cubic meter of wood in Upper Volta:-

- 6 500 CFAF in city
- 3 000 CFAF in rural area

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The equipment thus developed cannot be transposed from one region to another (the cooker tested in Upper Volta is not accepted in Burundi in its original form). This is one of the reasons why small intermediate technology centres should be set up in each country to develop and disseminate new equipment. Such centres already exist in a number of countries but they all suffer from a lack of information regarding the results achieved by their opposite numbers in other countries. The Community could exercise a significant influence here (setting up of centres and dissemination of know-how) via the EDF and aid to the NGO's.

Efforts to improve the efficiency of charcoal must be concerned with the way in which it is manufactured. A modern charcoal burner produces 220 kg of charcoal per tonne of wood instead of 80 to 100 kg produced by small-scale traditional stacks, thus saving at least 50% of the wood. This process has the advantage of enabling the by-products (combustible pyroligneous vapours) to be recovered. This industrial-type system does, however, need skilled labour and the establishment of more elaborate marketing networks. An evaluation of the pilot projects in operation in the developing countries is essential before any action in this field is decided.

In the <u>industrial sector</u>, improving the wood conversion efficiency (combustion, heat transfer, etc) means optimising the renewal, transformation and substitution of the existing facilities (boilers, drying kilns) by using high-performance equipment. This approach, which is followed almost systematically in the industrialised countries, is more difficult to implement in the developing countries because of local conditions (absence of controls, financial constraints, etc). Studies, should however, be made of the new projects in order to identify the best technical solutions that are compatible with the desired objective (introduction of solar drying in the tea-drying process, for instance). In this particular case, the social aspects are less important than in the domestic sector as the operators are normally skilled and organised and may be helped by adequate technical assistance.

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b. Introduction of new fuels

Another approach consists of replacing wood and charcoal by other fuels that are at least equivalent in terms of heating power and price. The use of ligneous waste, which is renewable and very often available in large quantities in most developing countries, provides a partial, though still significant response to domestic and industrial energy requirements in these countries. Such a solution would make it possible to maximise recovery of most ligneous agro-industrial waste not used for food or in soil regeneration in order to make manufacturing plants self-sufficient in energy and provide the wood consumers' market with a product that is good value.

Ultimately, one could even imagine the setting up of mobile processing units which would move around in rural areas to process waste for re-use locally.

The example already referred to above of the Council of the Entente States (see Annex V) shows that the five countries' potential in terms of available vegetable waste is far greater than the overall requirement (9 141 000 toe of waste, compared with 5 462 000 toe consumed as oil, wood or gas, 68% of which in the domestic sector).

Of course, not all this waste can be recovered under satisfactory socioeconomic conditions. Nevertheless, a major effort must be made here, as today no agro-industrial residue is marketed as a fuel. At the very most these residues are partly used in the factories which produce them in order to provide a sometimes sizeable energy supplement but without consideration for optimum efficiency.

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