Charcoal in Brazil: Economic and Environmental Management

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1. GENERAL OVERVIEW

During the last two decades, several important policies were adopted concerning energy use in Brazil. A number of ideas for development of new and renewable energy sources were proposed in the wake of the oil crisis. One such was the "discovery" of the high energy potential of biomass. Several new programs were created, of which Proálcool is the most salient example. While in the past alcohol and the bagasse resulting from its production had a modest share of the domestic energy market, they now account for approximately 10% of total consumption.

In the early days of biomass use for energy generation, several suggestions came up for development of forest biomass. Almost simultaneously there seemed to be a new awareness about the role of wood as a source of energy. In fact, wood has had a major historical role in Brazilian energy consumption patterns. Prior to 1972, wood was the prime source of energy in the country. Its leadership was challenged and lost in 1973 to oil and fossil fuels, and only in 1978 was it surpassed by hydroelectric power.

This historical and sudden downward trend in wood in the domestic energy matrix did slow down between the seventies and the eighties, mainly because of the oil shock. Despite past forecasts indicating that wood might disappear altogether from the Brazilian energy consumption profile, it is still the third ranking source of energy, roughly 17% of total consumption. The electric power supply crunch forecast for this decade will probably keep wood at its present rank until the turn of the century.

While the position held by wood in the national energy matrix is impressive, absolute consumption figures are even more staggering.

According to the National Energy Balance figures, between 1970 and 1988 fuel wood consumption was approximately 170 million cubic meters per year. Taking 1980 as the baseline, domestic consumption of wood as raw material for sawmills, plywood and

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* This text has been extracted from the special issue of *Estudos Avançados* on Floram Project, published in English in 1995. The original version, in Portuguese, was published in *Estudos Avançados* no. 9, May-Aug. 1990 and in *São Paulo Energia* no. 64, May-June 1990.

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similar products, and the pulp and paper industry came to nearly 40 million cubic meters.

In plain numbers, this indicates that fuel wood consumption exceeds by far the more traditional industrial wood consumers. Very little thought has been given to these hard facts, however. Most often the issue of fuel wood is approached superficially, particularly when strategic decisions are made for the country both in terms of energy and forestry development.

2. THE ROLE OF CHARCOAL

If timber is a major energy source in Brazil it is to a large extent due to the charcoal it produces. In 1988, 114.0 million cubic meters of wood were used in Brazil to produce coal. This amounts to 67% of all the timber consumed domestically that year. Its total output was approximately 11.0 million tons of charcoal. This figure places Brazil as the leading charcoal producer in the world.

Charcoal production in Brazil is channeled to meet the demand of several industrial segments (steel, cement, etc.) and of home users in both cities and country towns. The number one consumer, however, is the steel industry.

In 1988, charcoal consumption by the domestic steel industry was around 7.8 million tons or 86.7% of the total gross domestic consumption.

Charcoal-fired steel mills produce over 1/4 of the total pig iron output and half of all the ferroalloy made in Brazil. The industry totals about a hundred plants, most of them privately owned. Considering the industry as a whole — forestry, charcoal, and steel production — the sector generated over 250,000 jobs in 1988, paid almost US$ 400 million in taxes, and showed a turnover of roughly US$ 3.4 billion in the domestic market plus almost US$ 1 billion from exports.

It should be pointed out that unlike the charcoal-fired steel industry, domestic mills operating on coke are heavily dependent on imports.

Approximately 80% of the coke used in our steel plants are imported, a major drawback in terms of hard currency outflows each year. The domestic output of fossil coal is enough to meet coke demand, but at low quality standards. Steel mills have strong complaints about its high content of impurities, ash, and sulfur.

Charcoal was instrumental in helping create a steel industry in Brazil and its use to meet the demand for energy inputs and reduction agents seems to be irreversible. There are strong technical reasons for this, in addition to the possibility of achieving self-sufficiency

and a steady source of supply. Economic factors also play a role, not just in terms of costs but chiefly with regard to the quality of the end product.

However, the sheer magnitude of charcoal production and consumption figures entail some problems that need to be addressed.

3. THE PROBLEMS

3.1 Raw Materials

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The first and perhaps the most significant problem is the supply of raw material for charcoal production.

Recent statistics indicate that 78% of the raw materials used to produce charcoal domestically come from native forests.

It is true that availability of timber from native forests helped develop a healthy charcoal-based steel industry. Demand for agricultural commodities grew along with the country's population and rising exports, opening new production frontiers. The resulting deforestation either financed by producers or by government programs fed the supply of timber in Minas Gerais, Goiás, southern Bahia, and Mato Grosso. Instead of simply being burned, it is now processed into charcoal.

Charcoal making practices, as they stand today in areas adjacent to the new agricultural developments, have been detrimental to the environment. From another angle, however, the activity has brought some benefits to those newly developed areas in particular. In addition to the economic gains obtained from the timber business, gas emissions — particularly CO2 — are probably lower than is normally the case when wood is burned to ashes as in big forest fires. In coal production, 30 to 40% of the wood is recovered in the form of charcoal and therefore not converted into gases. Gas emissions are not only lower but also spread out along the entire year rather than heavily concentrated during the dry season, as in the case of slash-and-burn activities.

Furthermore, keeping up with the demands of the steel industry solely on the basis of charcoal produced by native forest is increasingly difficult. Pristine forests are dwindling, especially near steel mill, impinged upon by expanding agricultural and cattle breeding developments.

As a result charcoal producing areas are being pushed farther away, often 1,000 km from major consumer centers. This situation is forcing users to establish reforestation developments with fast growing species to meet their own demand for wood. From a

broader national perspective, reforestation already supplies 22% of the charcoal consumed domestically. Some of the leading steel companies have reached 100% self-sufficiency.

Between 1979 and 1988, charcoal consumption rates from native forests increased by 189%, while charcoal from planted forests jumped by 369% during the same period. In 1988 alone reforestation developments supplied 16 million cubic meters of wood for charcoal production.

Another important consideration in connection with timber supply for charcoal production is the issue of sustained management of native forests.

The possibility of reclaiming the Minas Gerais *cerrados* for increased and steadier supply of wood for charcoal production has been examined for a number of years. In some areas of Minas Gerais, charcoal makers are already acting upon it and there are successful examples of rehabilitation of *cerrado* land 8 to 10 years after clearing but not burning. Often the output is higher now than in the past. If it were not for the profit-seekers stimulated by agricultural expansion, this practice might be more widespread in the overall charcoal industry. A zoning program requiring sustained management practices for the *cerrados* in selected parts of Minas Gerais could bring highly positive results. A steady supply of wood would be available to feed charcoal producers and at the same time the environment would be spared from the destruction of more forest cover.

3.2. Production Technology

The second problem involving charcoal has to do with the production technology employed.

Coal is still made today the same way as it was a hundred years ago. The technology is quite primitive, there is very little control over kiln operations, and there is no qualitative or quantitative production control.

To make matters worse, the current technology wastes thousands of tons of chemical compounds in exhaust gases. As stated above, only 30 to 40% of the timber is turned into charcoal in the kiln. The remainder is simply released to the atmosphere in gas form. It has already been shown that over one hundred organic compounds are present in the gases released by wood burning.

Considering the main groups of chemical compounds present in these gases and the Brazilian charcoal consumption in 1988, the following amounts were dumped into the atmosphere:

- 1.79 million tons of fuel gases containing approximately 0.5 million tons of CO2;

- 0.22 million tons of acetic acid;
- 0.15 million tons of methanol;
- 0.37 million tons of light products;
- 0.84 million tons of tar.

Some companies are now routinely recovering part of the combustion products in the form of tar fuels.

Although the activity is not concentrated at a single location because rural production centers are quite scattered, total gas emissions are substantial. They have both an economic impact in terms of valuable chemicals that might be recovered and environmental implications.

Several industry leaders are concerned with the *status quo*. For years now they have been taking action, looking into and effectively installing gas recovery systems to generate chemical and power inputs. Some companies are now routinely recovering part of the combustion products in the form of tar fuels. Technologies to recover waste gases are easily available and have been in use for years in many parts of the world.

Evidently the adoption of longer term solutions to recover other charcoal by-products requires sweeping changes in Brazilian practices. These changes involve first of all modern technologies and modern agribusiness approaches. Charcoal production can no longer be seen in Brazil as a second rate appendage to agriculture. More substantial seed money is also needed, especially in comparison to amounts required for charcoal production via traditional methods. Furthermore, contemporary society demands efforts to minimize environmental impacts, whatever the situation or field of activity. The time is ripe for charcoal while investments may be higher, environmental benefits are correspondingly greater. There are remarkable examples of how charcoal can be produced in an environmentally-friendly way at several plants located in European countries such as France, Germany, the United Kingdom, Belgium, Yugoslavia, etc.

These technologies are available in Brazil, either developed directly by domestic companies or through the acquisition of foreign technologies adapted to local conditions.

4. CHANGE

Brazil will certainly maintain a charcoal-based steel industry and other consumer segments will continue to show strong growth. It is also a fact that major changes can be expected in the standards and practices of the charcoal industry. And surely environmental and economic concerns will contribute enormously to such changes.

Any effort toward change will necessarily lead to expansion of reforestation developments throughout the country. It will push for the use of more rational forestry management and exploitation techniques in tune with modern recommended ecological practices. In regard to charcoal production techniques, they will move in the direction of recovery and reuse of combustion waste gases. This will minimize pollutant emissions and, at the same time, take maximum advantage of timber as a raw material.

The technological solutions to most of these issues are already available. All that is needed now is a proper set of policies for the industry and the will to put them into practice.