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CHARCOAL IN HAITI

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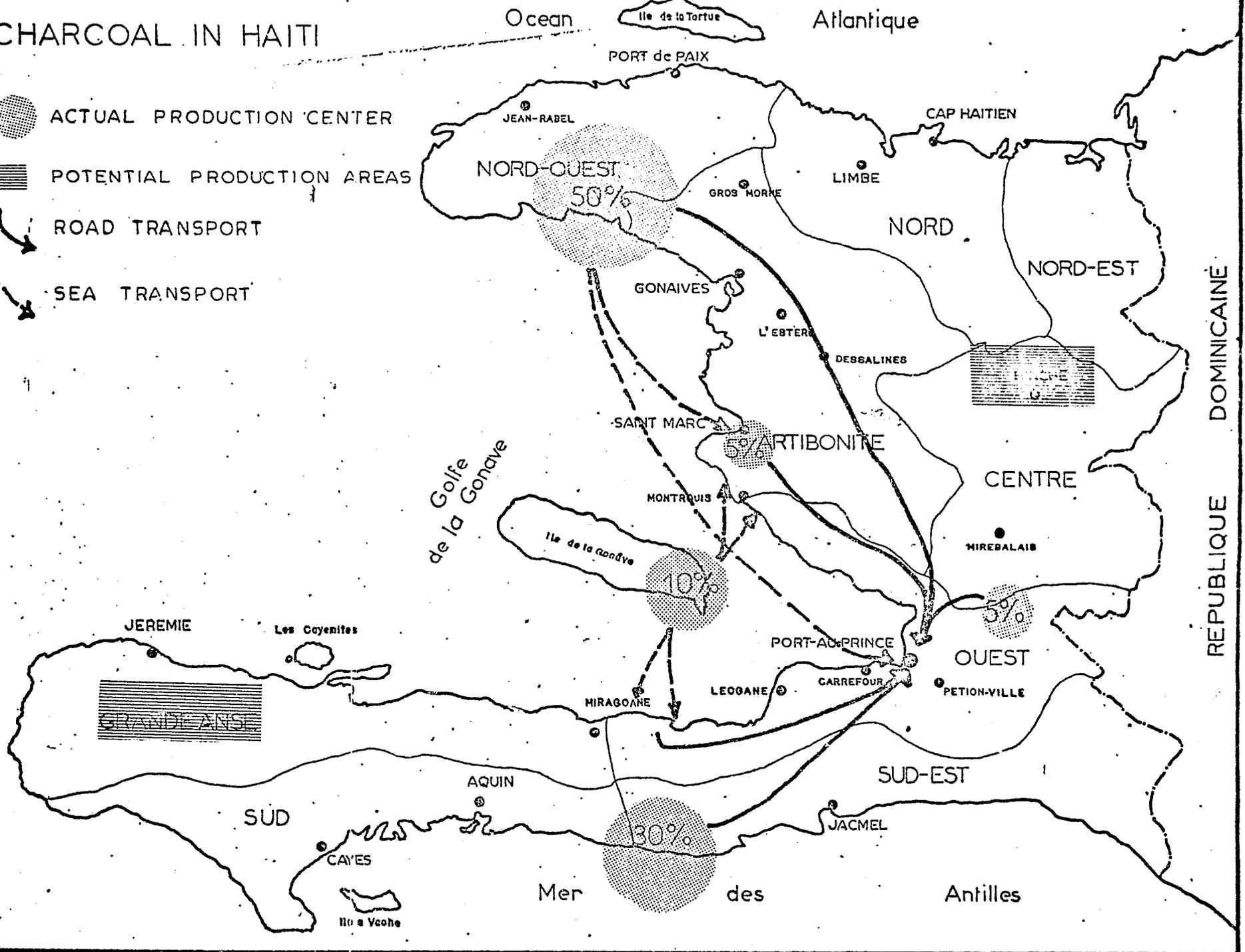
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CHARCOAL IN HAITI

-  ACTUAL PRODUCTION CENTER
-  POTENTIAL PRODUCTION AREAS
-  ROAD TRANSPORT
-  SEA TRANSPORT



CHAPTER . I

THE ENERGY PROBLEM

Haiti's energy needs are met by two kinds of products: imported ones and domestically produced ones. Imported sources are products derived from hydrocarbons. Locally produced sources of energy are of two types: Hydro electric power and the energy derived from wood. Wood is used either directly in some commercial endeavour such as sugar cane distillery or as an input to make charcoal. Rough estimates based on unreliable data suggest that the country is largely self sufficient in terms of meeting its energy requirements. Indeed, imported products account for around 10% of the total energy supply. On the other hand, domestic sources provide 90% of the energy consumed in Haiti with hydro-electricity contributing 5% and fuel wood and charcoal contributing 85% of the total.

Domestically produced sources could be increased by the following ways:

a) further hydro electric developments, including one or two additional sites on the Artibonite. Added capacity could more than double the current installed capacity of around 50 Megawatts. One problem with future hydro electric development is linked with the proper protection of critical watershed bassin in order to prevent silting and to insure the availability of the water supply in the long range. Another problem might be the heavy capital expenditures involved in dam construction although some intermediate solutions that avoid building huge dams are technically feasible.

b) The Exploitation of the lignite deposit in Maissade.

Fourteen Millions of tons of reserves have already been proven on the deposit. The material has an energy content of 3.5 k calories per kilogram as compared with 3 for drywood, 7 for charcoal, 10 for petroleum. If actual reserves were to be exploited over 25 years, the deposit could support an electric generation capacity of 45 Megawatts. One of the main issue in the development of the deposit has to do with the location of the power plant. If it is located at the mine site, there is a problem of very costly transmission line especially if the power generated must be sent away to the Port-au-Prince area which consumes a disproportionate share of the energy produced in the country. The location of the power plant away from the mine site would, on the other hand, pose the problem of the development of an important road network since the location of the mine is completely isolated.

c) The development of non conventional sources such as solar and eolian energy on a scale appropriate to Haitian conditions.

Turning now to the products derived from petroleum that account for 10% of the domestic supply, the following elements characterize this market.

1) The market is supplied by one company: Shell Oil but two other companies participate in the distribution of the products at the retail level: Esso and Texaco. The latter company has a "swap agreement"

with Shell while the former purchase from it. However, Texaco has the monopoly of supplying aviation fuel and it furnishes about 50 to 60,000 of barrels of turben fuel for jets per year and 30,000 bls of aviation gasoline. Three big local consumers are supplied directly by Shell West-Indies: Le Ciment d'Haiti with a storage capacity of 84,000 barrels, Reynold's Metal with a capacity of 80,000 barrels and the new thermal plant of Vareux with a capacity of 16,000 barrels.

2) The products are landed at a port whose capacity increased from 18,000 tons to 30,000 tons between 1976 and 1978.

3) Each of the three companies has a storage capacity of 100,000 barrels and this is equivalent to 6 to 8 weeks of consumption.

4) Over the past 3 years, the annual consumption of the main products has been as follows:

	<u>1976</u>	<u>1977</u>	<u>1978</u>
Gasoline	300,000 bls	333,000 bls	383,000 bls
Kerosine	35,000 bls	42,000 bls	60,000 bls
Gas-oil	486,000 bls	532,000 bls	560,000 bls
Fuel-oil	83,000 bls	88,000 bls	127,000 bls
Lubricants	22,000 bls	23,000 bls	23,000 bls
Asphalt	63,000 bls	35,000 bls	29,000 bls

5) These products are subject to different level of taxation. Taxation is made of an excise tax and of a custom tax. Since around 1973-74, both taxes were abolished on Kerosine and gas oil and there are no custom levies on fuel oil and asphalt. While the one on lubricants amount to 25-35 cents per gallon depending on the product. The excise tax on fuel oil is 2 cents per gallon, 3 cents per gallon on lubricants and 2 cents per gallon on asphalt.

Gasoline is now subject to a 42% levy on the CIF price.

As we mentioned it before, the heavy consumption of fuelwood and of charcoal insures a relatively high level of national self-sufficiency. Since the main input for these products, the trees, are renewable resources, this situation would appear theoretically attractive at a first glance. However, the problem is that the stock of trees is being depleted because it is not renewed as fast as the growth rate of consumption. Indeed, there is no systematic effort to produce a supply of trees in a commercially viable way: Only the natural rate of regeneration contributes to the increase in the stock. In order to explain the lack of incentive for the commercial production of trees, two elements can be mentioned.

(a) Given the strong population pressure on the available land, the opportunity cost of using some land space to grow trees may be perceived to be too high in relations with the alternative of growing food.

(b) Trees are clearly underpriced as no property rights are claimed or enforced on them as we explain it in the second chapter, they are free goods. Thus their growing scarcity is not reflected by a price raise. For instance, both in the Northwest and on the Island of La Gonâve, the charcoal produced uses trees that grow on state land. Yet, despite clear overharvesting, the tax on tree cutting has remained at a very low level of 4 to five cents per tree.

Thus, in a real sense, the input for the charcoal industry is not really a renewable resource in the sense that the existing stock of resources is declining relative to the consumption level. At another level, one recognizes that when a resource is becoming scarcer, its price usually goes up, thus rationing consumption and stimulating the search for a substitute. This is true when we are dealing with a competitive industry with no externalities. But in the case of charcoal, there is no relationship between growing scarcity of the input and the behaviors of the price. Then, one theoretical outcome of such a situation is that the growth of consumption will result in a sudden collapse of the supply with the depletion of the stock, assuming, of course, no public policy intervention in the mean time.

Before closing up this chapter, we would like to mention another problem that is usually thought as a side effect of charcoal production: That is erosion. Available evidence would suggest that erosion is much more the consequence of heavy cultivation on land that is unsuitable for it. In fact, all wood growing at altitude above 1,000 meter is unsuitable for charcoal production. Yet even at that height, erosion is very severe as can be seen in the area around Kenscoff, for instance. The reason is that land is cleared to grow corn and millet and these crops cannot hold the land.

CHAPTER II

ECONOMICS OF THE CHARCOAL INDUSTRY

2.1. GENERAL DESCRIPTIVE BACKGROUND

The purpose of this chapter is to give an overall and detailed view of the Charcoal industry. As we have said in the first chapter, charcoal and firewood contribute up to 85% of Haiti's energy needs and with the dramatic increase in the price of their closest substitutes, only physical constraints (i.e. availability of trees) would prevent the increasing use of wood products.

Virtually all areas in the country, below 1,000 m in elevation, experience charcoal producing activities. The level of production varies considerably from one region to another depending mostly on such characteristics as: annual rainfall, level of soil destruction, agricultural production and so forth. The three largest producing areas are:

a) The Region delimited by the Triangle: Anse Rouge -
Port-de-Paix - Môle St.Nicolas.

b) The Island of La Gonâve.

c) The Côtes de Fer area in the southern peninsula. As we have just said before, the principal reasons explaining the importance of these regions in the production of charcoal

are:

1) The lack of adequate rainfall, which coupled with the inexistence of any irrigation scheme is a severe hindrance on any agricultural activity.

2) The impossibility for the peasants in these areas to find other sources of income, other from charcoal or fuelwood.

In these forementioned areas, charcoal producing and marketing activities represent almost the only source of income for the peasants and middlemen involved in this activity. Whereas in some other parts of the country, i.e. the North, the regions around Jacmel..the proceeds from its sale are just part of the peasant's total income. Charcoal is used almost exclusively for cooking purposes, whereas fuelwood has also industrial uses (Bakeries, Essential Oils Refineries, Clairin Distilleries). A table is given that shows the annual consumption of charcoal in the Port-au-Prince area. The figures for fuelwood could not be found since no detailed account of this is kept anywhere (some estimates given by official bodies seemed like pure fantasy and were disregarded by the author).^{*} Following some previous work, notably those of Raeder-Roitsch, and Earl we estimated

* In 1970-71 following the DARNDR, total wood consumption was 10 millions m³. Whereas as R.R. and Zenny point out, the figure was 20 millions for Germany with a forest area 7 times that of Haiti and more properly managed!

the total consumption of charcoal in Haiti to be twice that of the Port-au-Prince area. This is a bit conservative in outlook, but it does also reflect the increase in the use of charcoal by part of the rural population. This increase has some explanation in the fact that: (i) charcoal is a much better fuel, more efficient, smokeless (ii) free firewood, i.e. firewood obtained by gathering activities not far from the peasant's home is becoming scarcer.

Before going into the supply and demand analysis, we should stress the numerical importance of the producing regions. We will examine this with reference to the main centers of charcoal consumption, i.e. Port-au-Prince.

- (i) Northwest Region-Gonaives: 50% of the volume consumed in Port-au-Prince.
- (ii) Côtes de Fer - Aquin: 30%
- (iii) La Gonâve: 10%
- (iv) St.Marc-Montrouis-Fond Parisien: 10%
Ganthier-Thomazeau.

Transportation to Port-au-Prince from the Northwest is divided equally between the trucks and sailing vessels. These trucks are in general used only for charcoal transport and in most cases belong to independent owners who are not involved in the marketing of charcoal. The same is true for those ships which depart from La Tortue, Moustique, Le Môle, Anse Rouge, although it's not infrequent to find some ship

captains going into the business for their own sake. In the areas near Port-au-Prince, it is much more common to find wholesalers of the Port-au-Prince involved in charcoal transport.

2.2. CHARCOAL PRODUCTION

As said earlier, the type of wood used in charcoal production grows at an altitude below 1,000 m. and mostly in arid regions. Charcoal is done mostly with green wood (at least the best quality) of a certain size. The trees that are most heavily used now are: the Bayahonde, a wild bush which grows in most areas (deserted or not) of Haiti, the Bois-Cabrit (medium sized), the Candelon and when still present in some parts of the South the Bois-Gaiac. This latest specie has almost completely disappeared (it takes about 50 yrs. for a Gaiac to regenerate entirely) now; it used to be the favorite tree of the charcoal producing peasant and commanded the highest price and the best quality charcoal. When the trees are not burned completely, the Bayahonde regenerate every 3 years.

As pointed out by Earl, the technology used by the peasants for producing charcoal is very efficient compared to the other alternatives. The first step involves the cutting of fresh wood with the roots generally left so that regeneration can occur (in some cases, charcoal production is linked with agricultural activities, i.e. the peasant clears a lot, uses the wood to make charcoal and burns everything left in the ground so that he may

proceed with his planting); next is to arrange in a grid the wood slicks, cover these with a bed of straws and green leaves then various layers of earth. A fire is then put on the straws and the kiln left to itself until all the wood is transformed into charcoal. Estimates of productivities in various regions and using different types of trees are given by Earl. It takes anything between 3 days and a week for the whole process to be over. Charcoal production is heavily decentralized and done by a multitude of small producers. In some villages, i.e. Bassin Bleu in the Northwest and Anse Rouge in the Gonaives district, 90% of the active population is involved in this activity. Other areas where agricultural crops are grown and charcoal production is a marginal activity, only the poorest peasants are producers. Most of the land used for production is state owned, and, therefore, freely available (except as we'll see later when the law is strictly enforced and no one is allowed to cut trees). There are no significant economics of scale involved in the production process, since: a) The trees used are basically "free goods" and not paid for by the producers.

b) Time is not scarce since the opportunity cost of labor is virtually nil, except during agricultural peaks. The relative simplicity of the technology used, as well as the availability of land with enough trees prevent any barriers to entry in that segment of the industry. It is very difficult to assess the

amount of income derived by the people which have charcoal-making as their principal activity. At any rate, it's no different or even worse than that of those poorest living in the rural areas. The author estimates that in two areas, namely Bassin Bleu and Anse Rouge, a peasant involved in charcoal making activities gets between 7-10 gdes. for a week's work in 1979. This is not very different from Earl's 1.50/day but that was in 1976! This also confirms the fact that in real terms we have seen a dramatic fall of income of the poorest in rural areas (Mats Lundahl). The growing population pressure as well as the increasing scarcity of wood have contributed to the increase in competition at the producer's level: more and more people are involved in charcoal-producing activities making it very difficult for everyone to survive on it.* At another level, evidence of some linkages (forward) between the producers and the middlemen (or more precisely women, the "madame sara") has begun to show up very often, through the use of Credit. The increasing demand for charcoal coupled with its limited supply (at least in the producing areas now) has made attractive the extension of loans or advances to the producers, who then have the incentive to go farther and farther to look after wood. There is no reason to believe that this is some sort of bond by which the peasant is completely at the mercy of the middlemen. A slight rebate may be given by the beneficiary of the loan to the one who extends it, but the

* Also the increase in nominal price might have been sufficient to induce peasants to continue producing charcoal by going into more remote areas, meaning that somehow those peasants suffer from monetary illusion.

charcoal still sells at its market price (almost). More the omnipresence of market places in the rural areas as well as the competitions among the "madam saras" prevent any type of exploitative behavior from the part of the latter. One notable exception to the production pattern described above needs to be mentioned here; it occurred in the area between Port-de-Paix and Jean-Rabel, where the production was organized almost on an industrial scale by outsiders (wholesalers from the Port-au-Prince area). Peasants from other regions were brought by trucks in the area, to make charcoal. In that peculiar circumstance, these peasants were paid a small salary, were fed, would work 8 hrs. a day so as to produce as much as possible. An outcry of the local population put an end to this, the result being a Presidential ban on charcoal-making activity in the whole area.

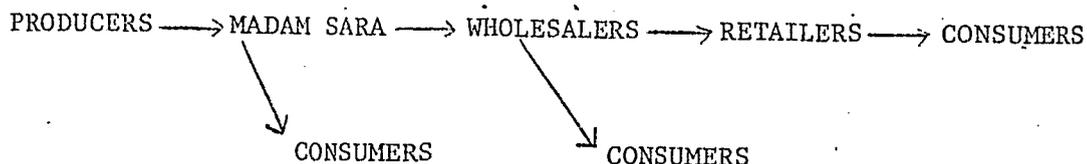
One question which will arise again later on is what are the economic costs involved in charcoal production? Part of these costs can be measured, i.e. labor costs. Also there does not seem to be any loss to Society due to the inefficiency of the technology used since it is an extremely labor intensive process. The main problem is, however, the case of the wood. We are here in the presence of a clear case of externalities, whereas the wood is being cut and not paid for, there is no serious reforestation program, the end result being an increase in erosion and soil destruction. Clearly charcoal production is not the only responsible

for this state of affairs and no partial solution will solve the problem, we should, however, bear in mind that if these externalities were taken into account, than the true price of charcoal should be higher since the peasant would have to buy the wood and, therefore, include this in the selling price.

2.3. MARKETING CHANNELS

So far, we have looked at one piece of the chain. Our attention will now shift to the marketing channels and those involved in that part of the industry. Generally, the peasants producers do not sell directly to the consumers even in small rural areas.

This business is conducted by the "madam sara" and in large centers by wholesalers. The typical link in the Port-au-Prince case is the following:



A. The "Madam Sara" are omnipresent in the trade in the rural areas. Their activity does not follow any standard pattern: i.e. some of them deal only in charcoal, for others, charcoal is only part of their total business. They are usually from the same geographic areas as the producers, although in some cases like Anse-Rouge, they come very far to buy the charcoal. At the smaller scale, they conduct their businesses on donkeys

(buying a "charge" of charcoal 45 kgs.) on the other end, they buy large amounts of charcoal, and make shipments to Port-au-Prince. As in the production process, the number of "Madam Sara" is fairly large in any specific area so as to insure great competition between them. Table (VA) show the typical breakdown of costs for a ton of charcoal. The term agent's profits is here exaggerated; in fact, the available evidence regarding profit levels clearly shows that what these intermediaries receive is mainly a remuneration for their labor expended and not a profit. The situation in the charcoal industry is no different from what it is in the marketing of Agricultural Crops. We saw earlier that some links through the use of Credit existed with the peasants producers; in terms of forward linkages with the wholesalers, there are very tight but informal links through the "Pratik" or clientele system. This sometimes result (although it's rare) through credit extended also to the Madam Sara by some of the wholesalers. Since competitive bidding is very strong, by no means does this represent any hindrance to the free market. There are virtually no barriers to entry in that category, since the requirements in capital to start the trade are quite modest, and enough potential entrants are there: free entry and exit are common rule here.

B. Another category of intermediaries, that is of crucial importance are the wholesalers in urban areas. Specifically, in Port-au-Prince. By wholesalers, we mean, people who have their own transportation, warehouses and are in charge of channeling the charcoal through the various markets in Port-au-Prince or directly through the Consumers. The pattern of consumption in Port-au-Prince is different from the one we observed in the rural areas. Almost no firewood is used for cooking and from a certain level of income, people buy charcoal by the bag, at the market places, or have it delivered to their houses. Also there has been an increasing demand for charcoal due to the increase in prices of its close substitutes like kerosene or propane gas. Table I & III show consumption for the Port-au-Prince area along with the prices per ton. A series of interviews and checks conducted by the author showed that one of the biggest wholesaler in the Port-au-Prince area did not have more than 1% of the market and the first 6 more than 10%. Competition is here also very keen and there is free entry and exit (in the last 10 yrs. out of group of 20 wholesalers, only one of the original group was left in the business). A typical breakdown of costs for that category is shown on Table (VF). Transportation costs are here more important than they are for the middlemen since, in general, the trucks belong to the wholesalers. There are high capital requirements in that segment and those already in the business have comparative

advantages over potential new entrants; however, these are by no means a hindrance to competitions as is shown by the low profit margin in that business (one of the wholesalers calculated that taking everything into account, he could earn something like \$200/mo. barely earning a living!).

The paucity of data, and their validity when available, makes this a rather qualitative assessment and one might consider presumptuous some generalisations made here. However, it is the author's opinion that like what we have in the Agricultural Crop Marketing, the free market works fairly well, i.e. competition is present at all levels in the charcoal industry. One might have slight objections, concerning transportation, for example, as being an obstacle to competition in the rural areas. But the performance of the industry has been fairly good and consistent as far as efficiency is concerned. A major problem, however, arises, one which we mentioned earlier: the growing scarcity of wood, which is not reflected in the price of charcoal. Wood being basically a free good* (\$0.20/m³ paid to the forest Dept.) No one pays for it, but everybody does since its scarcity is linked to Haiti environmental degradation. To support this view table (III) shows the series of price/ton of charcoal from 1974 on. As an

* Scarcity leads to an increase in price when property rights are enforced. Here we are in the presence of an over exploitation of a free good.

example from 1974 to 1978, the price of charcoal increased by 43%, whereas the GDP deflator rose by 50%, thus the price of charcoal did not even adjust to the inflation rate let alone reflect wood scarcity!

2.4. DEMAND FOR CHARCOAL

Table (D) shows the quantity of charcoal consumed in Port-au-Prince and the country. The Demand for charcoal is mostly concentrated in urban areas and is basically a demand for hot meals. All layers of the population (aside from the rural poors who use firewood) use charcoal as a fuel. Estimates of the price elasticity can at best be tentative. If we use Earl's figures for 1970 and 1971, we note that a 10% increase in the Cost of Living, the price of charcoal rose by only 4%, which means that relative to other prices, the price of charcoal actually decreased, but at the same time, its consumption rose by 21%, which seem to indicate that charcoal is highly price elastic! (contrarily to Earl's opinion). However, if we look at Table IV and Table II, a 22%* decrease in real terms of the price only corresponded to a 4.5% increase in consumption which seems to indicate that charcoal is a highly inelastic commodity. We should, therefore, be very cautious in estimating elasticity, since from one year to another, we are not sure whether the demand curve for charcoal is stable or not.

* Why is there a decrease in the real price? One possible explanation is the fact that the Cost of Living in rural areas has not increased so dramatically as in Port-au-Prince, therefore, this decrease in price might be much less in the rural areas than it appears to be here.

As far as income elasticity is concerned, an intuitive answer should be that charcoal is income elastic: the more income you have, the more food you consume. This is not quite so obvious since we are not sure that nutrition habits greatly change with an increase in income (at what income level do people change from the one meal a day pattern). What can be said is that with the increasing urbanization, the demand for charcoal will certainly increase, but again it is not that obvious that supply will adjust.

2.5. GOVERNMENT INTERVENTION

As far as government regulation or intervention in the charcoal/fuelwood industry, the present situation is the following: Legally all wood cutting whether on private or state land has to be approved by one of the Agricultural Agents of the 13 agricultural districts. In the case of charcoal, there is a royalty of 0.05 cts. per bag (0.02 cts.) for cutting the tree, 0.03 cts. (as a levy on charcoal transportation). Levied by the govt. and collected by the agricultural agent. This levy is paid by the middlemen to the agent and never by the producers themselves. As happens in similar cases in Haiti, people seldom ask for authorization for wood cutting and the law is not enforced. With regards to the 0.05 cts. tax per bag (\$1.65/ton), there are some strong incentives from the part of the agent to cheat: An agent's salary runs around \$60 and gets 10% of the proceeds of the fees he collects;

but when compared with the sheer size of charcoal traffic in the Northwest, for example, (where there are some 5 agents) for the whole district, those 5 cts. per bag can really make a large difference in his total income. Clandestine charcoal activities are also an all too familiar part of the picture. In the island of La Tortue, there is no agricultural agent and no account is kept on production and transportation of charcoal. The same is true for other potential producing regions like the Grande Anse, whereas the government perceiving the area as a sufficiently wooded region adopts a "benign neglect" attitude towards charcoal producing activities. To sum up neither the royalty levied by the State nor the present state of regulation seems to be a barrier to charcoal activity.

2.6. FORECASTING SUPPLY AND DEMAND

We now turn our attention to the medium and long term prospects in the industry. What valid projections can one make in terms of supply and demand of charcoal? Clearly, if one adopts Earl's point of view, we will be facing a major crisis in the 1980's yrs. if no immediate action is taken. However, it is the author's opinion that although the problems seem formidable (wood is indeed becoming increasingly scarcer), the solutions are built in the system. Two possible scenarios might occur: (1) Looking at Table II, we can note that except for the period 73-74 to 74-75 which saw a tremendous increase in charcoal consumption of about 45% (which

can be explained either as a statistical discrepancy or as a true increase in demand created by the new group of workers in the assembly line industry). The annual increase in consumption has been around 4-5%, which roughly corresponds to the population growth rate in the Port-au-Prince area. Using the 5% as the average growth rate in demand, the forecasts for the next 5 and 10 years are:

<u>YEAR</u>	<u>TOTAL CONSUMPTION</u>
1980	83,000 T
1985	105,900 T
1990	135,000 T

As far as the price of charcoal is concerned, if we assume that, it will closely follow the inflation rate (which we take at 20%) the figures are:

1980	\$ 105/Ton
1985	\$ 261/Ton

These numbers should be cautiously taken since, as we have said earlier, there is no component of the price increase which reflects here wood scarcity.

(ii) In the second scenario (which will not be quantified) a much more higher growth rate could be taken, leading to an explosion in charcoal demand (due to increasing use of charcoal in the rural areas also). Prices would probably go much higher than shown.

Having said all this, we are now faced with the adjustment of the supply of charcoal to meet the demand for the next 5 and 10 years. First, if we assume as we did in (i) that charcoal price will follow the rate of inflation, then the price will not play the rationing role in restricting charcoal consumption. In order to meet the demand, production of charcoal will shift from the wood depleted areas of the N.W. and La Gonâve to other more wooded areas in the Grande Anse, Plateau Central and so on. There are enough wood reserves in these areas to cope with the increase in demand (at least according to the Ministry of Agriculture). In the absence of any formal and enforced prohibition by the State, the main obstacle to such development would be the transportation problem (but with the creation of penetration roads in these areas this might be a purely academic view).

On the other hand, if an effective ban is placed on charcoal production in new potential producing areas, it is then clearly possible that we may face a situation where shortages might occur. But the price system will adjust to reflect that situation.

The issues concerning the welfare aspects of these problems will be dealt within a more comprehensive manner in the next chapter.

CHAPTER III

ALTERNATIVES TO THE EXISTING SYSTEM AND POLICY RECOMMENDATIONS

The issues which arise at this stage are central to the whole study. Up to now, our main concern has been the present situation in the charcoal industry, and if it weren't for two major problems, namely

- a) the growing scarcity of wood used to produce charcoal and
- b) the environmental degradation associated with charcoal production;

there should not be any point in trying to come up with solutions. Indeed, any outside intervention or government regulation would probably create a misallocation of resources, if we had not these externalities. Also, if the producers themselves were planting and reforesting, there would not be any problems; but as Lundahl points out (using game theoretic methods), these peasants producers typically face a prisoner's dilemma situation, whereas in a two person-game, one player has no incentives to cooperate unless the other one does so. Therefore, both peasants will remain inactive and both of them will be worse-off than, before. Another reason given by the same author is that it does not necessarily pay for the individual to invest in tree planting (or erosion control) since somebody else may be reaping the benefits, i.e. if the peasant does not own his land.

Given the situation only through government intervention can this problem be tackled efficiently. As said in Chapter 2, wood reserves in existing production areas and potential areas (through production shifting from one zone to the other) are probably sufficient to meet demands for the next term or 20 years; but by then, the irreversibility of the damage done would have become a fact and the apocalypse would not be too far away for the population. Two clear axes of government intervention (and through it the foreign donors - It is this author's opinion that no aid program, however, large it might be will be efficient unless there is very strong political will to go along with it)..

- a) Launch a massive erosion control program
- b) Provide substitutes to wood based fuel.

Point a) is without any doubt of the highest priority, and as have been said by various authors (Raeder-Roitsch et Zenny, Earl, Benge) time here is of essence. The problem of substitutes is more complicated and will be dealt with later on. If one considers various proposals that have been made (since the 1949 U.N. Mission) to counter erosion, we are struck by the fact that almost nothing has been done. Yet the GOH repeatedly reasserts everyone that erosion is indeed the main problem Haiti and that it is ready to tackle it up front. The alarming situation we face speaks

eloquently for itself.

The reason why one should insist on a global solution is, that why charcoal production is not the principal cause of erosion, it greatly contributes to it, so that any solution to the charcoal-fuelwood problem is part of the overall erosion control program. The typical alternative presented by Earl and subsequently Bengé is through the fast growing tree plantation system. Bengé's proposition of establishment of a forest technology corporation (FORTEC) merits special consideration here. Its attractiveness stems from the fact that it requires less government intervention than other possible schemes (in theory at least), but it does confer a virtual monopoly to the Corporation in the production and marketing of charcoal. However, one would be willing to accept such a monopoly in order to prevent further degradation of the environment. Also in order for the scheme to be effective, the GOH has to enforce very strictly the law prohibiting wood cutting and charcoal making. Law enforcement in Haiti is directly proportionnal to the benefits that accrue to the GOH by enforcing the law. Therefore, if GOH is part of the venture, there is no doubt that illegal charcoal making will be put to an end. From a welfare point of view, this scheme eliminates completely the middlemen; the producers become salaried employees and the consumers will probably end up paying more. This last point is the least of concern, since we have already argued that the true price of charcoal should be higher than it is. However, the

disappearance of a certain class of intermediaries is of special concern (the Mad m Sara) since it implies a transfer of income from the rural poor to either the GOH, the company or the urban dwellers. The suggestion that the marketing of charcoal be done through FORTEC, probably reflected Benge's view that middlemen were reaping the Lion's share of the profits in the business. We have seen that this is not the case. An altered version would be for FORTEC to concern itself only with the production of charcoal and let the marketing be done through regular channels. Another alternative scheme would be for the GOH and foreign donors to establish selected wood lots in regions (namely the Northwest, Thomazeau - Fond Parisien, the Côte de Fer region, La Gonâve) using fast-growing species with good charcoal making potential under the joint supervision of the DAKNDR-AID Agencies and the Conseils Communautaires. Landless peasants and charcoal producers would be paid (this point is essential) and trained to work on the lots. Wood would be sold to these producers and the basic structure of the industry would remain the same. As a practical consideration, charcoal could be imported (from Brazil, Guyana or the U.S.) during the initial stages of the process (5-6 years). Also no wood cutting for charcoal production would be permitted in any area in the country. The import of charcoal could be done through a government subsidy program or through foreign aid channels to alleviate

for its cost.

As far as charcoal substitutes are concerned, only two can be thought of having practical significance in Haiti:

- a) Kerosene
- b) Lignite Briquettes

Actually kerosene is almost never used in Haiti for cooking purposes. The Bulk of it is used for lamps, since the increase in price of most oil related products has been a deterrent for more extensive use. In order for kerosene to be a valid substitute of charcoal, there should not be any tariff on it and the GOH would have to subsidize it. The GOH would also have to subsidize the cookers which use kerosene; whereas one might consider such thing possible in urban areas, this is a quasi-impossibility at the scale of the country. In 1978, the country as a whole consumed 75,000 of charcoal which give us an oil equivalent of 53,250 T at 1978 market prices this corresponded roughly to \$6 millions. Adding the costs of the cookers, this could only increase the country's dependency on foreign oil and aggravate the Trade Balance deficit (Had we included fuelwood, the figures would have been much higher, \$60 millions in 1975 using Earl's data!)

The second substitute, i.e. the lignite briquettes, although it is used extensively in some countries (some parts of India) finds its most interesting use as a fuel in thermal power generation. There are two lignite deposits, one at Maissade (with reserves

around 15 millions of ton) the other one at Camp-Perrin (100,000 tons). Haitians Lignite is a very low grade brown coal with a high sulfur content: this last characteristic make it almost improper to gasification and worse may be the most severe hindrance to its use for cooking purposes (the smell during combustion might be unbearable to any one!)

CONCLUSIONS AND RECOMMENDATIONS

- 1) Haiti's energy balance is heavily dependent on charcoal and fuelwood (at 80%). This creates tremendous problems since wood-based fuel consumption contribute largely to the Erosion problem. Also mismanagement of wood resources has greatly increased its scarcity.
- 2) The charcoal industry is a competitive industry in its various segments. No high barriers to entry seem to exist at any stage, and there is free entry and exit at all the stages.
- 3) Since wood is basically a free good in Haiti, the true price of charcoal should be higher than it is now.
- 4) If present trends continue, with no outside intervention, supply will probably shift from wood depleted areas in the Northwest to the Grande Anse and Plateau Central.

- 5) The Author suggests that two proposals be evaluated and compared:
 - a) Establishment of the Forest Technology Corporation
 - b) Creation of a multipartite committee to implement regional wood lots for charcoal production.
- 6) It is this author's very strong opinion, that no aid program destined to the rural poors will be effective if the erosion problem is not dealt with. Since only the GOH can unlock the situation, permanent moral suasion should be used to change the present "laissez-faire".

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TABLE I(CHARCOAL CONSUMPTION IN HAITI (Metric Tons Fiscal Years))

	<u>PORT-AU-PRINCE</u>	<u>TOTAL CONSUMPTION FOR HAITI</u>
1973-74	21,750	43,500
1974-75	31,500	63,000
1975-76	32,940	65,880
1976-77	36,000	72,000
1977-78	37,500	75,000
Oct.78 - June 79	22,800	

(Source Ministry of Agriculture)

TABLE IIPERCENTAGE INCREASE IN CONSUMPTION

1973-74 to 1974-75	44.8%
1974-75 to 1975-76	4.5%
1975-76 to 1976-77	9.3%
1976-77 to 1977-78	4.2%

1974 to 1978	72.4%
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(Source Table I)

TABLE III
AVERAGE PRICE (TON) OF CHARCOAL
IN THE PORT-AU-PRINCE AREA (CURRENT U.S. DOL.)

		<u>INCREASE FROM THE PRECEDING</u>
		<u>YEAR</u>
1973-74	\$ 51	
1974-75	58	13.2%
1975-76	53	8.6%
1976-77	64	20.2%
1977-78	73	14.%
1978-79	87	19.2%
PRICE INCREASE FROM 1974 to 1979		70.6%

Source (Ministry of Commerce
and Industry)

TABLE IV

AVERAGE PRICE/TON OF CHARCOAL IN CONSTANT 1955 U.S. DOLS

		<u>PERCENTAGE INCREASE</u> <u>(DECREASE)</u> <u>FROM THE PREVIOUS YEAR</u>
1973-74	25	
1974-75	23.46	(6%)
1975-76	18.27	(22%)

(Source Table III (Cost of Living Index from IHS))

(TABLE V A)

BREAK DOWN OF COSTS FOR CHARCOAL PER TON (U.S. DOLS)

A. MIDDLEMEN IN RURAL AREAS (Transportation by Truck from N.W.)

		Year 1979
		<u>Percentage of Selling Price</u>
Producer	\$ 40	46%
Govt. Royalty	1.65	
Charcoal Bags	6.65	
Transport plus Loading	20.	23%
Middlemen	18.7	22%
Profits		

Price Received \$ 87
in Port--au-Prince

(Source (Interviews conducted) in the Northwest area)

TABLE V B

BREAK DOWN OF COSTS FOR CHARCOAL PER TON

B. Wholesaler in the Port-au-Prince Area (Transport by Truck from St.Marc)

		<u>PERCENTAGE OF SELLING PRICE</u>
<u>Producer</u>	\$ 44	50.6%
<u>Royalty</u>	1.65	
<u>Charcoal Bags</u>	2.2	
<u>Transport plus</u> <u> Loading</u>	26.6	30.6%
Wholesaler's Profit	12.55	14.4%
Price Received in Port-au-Prince	87	

(Source Interviews in the Port-au-Prince Region)

TABLE VI

FUELWOOD AND CHARCOAL CONSUMPTION IN THE NORTHWEST

OCT 78 - MAR 79

(Cubic Meters)

	<u>FUELWOOD</u>	<u>CHARCOAL</u>
HOUSEHOLDS	125,843	2,444 bags of 30 Kg.
BAKERIES	6,912	--
GUILDIVES	360	--
ESSENTIAL OIL REFINERIES	90	--

(Source Soil Conservationist in Port-de-Paix)

SUPPLY RESPONSE TO FIREWOOD AND CHARCOAL DEMAND

Paeder-Boitsch and Zerny estimate that the annual consumption rate of fuelwood and charcoal is around $0.7\text{m}^3/\text{capita}$. The range given by the FAO for various African countries is 0.8 to 1.0m^3 . The same authors (pp. and 7) estimate the total stock of wood in Haiti to vary between 100 to 200 millions of m^3 , with a natural rate of regeneration of $1\text{m}^3/\text{ha}/\text{yr}$. Assuming a 2.5% growth rate in wood consumption (same as the population growth rate), then all wood resources will be depleted by the yr. 2,000, if no reforestation program is undertaken.

Current charcoal production runs around 2 millions of bags per yr., which represents $200,000\text{m}^3$ of solid wood. Properly managed plantations of fast-growing trees yield around 80 to $100\text{m}^3/\text{ha}$ of solid wood every 4 yrs, which means that between 8,000 to 10,000 ha could support all the ongoing charcoal production. Assuming that the production of 1 ha of managed forest corresponds to 10 to 20 ha of that of unmanaged land, then the total area used for charcoal production would not exceed 200,000 ha.