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THE CHARCOAL MARKET IN HAITI:

NORTHWEST TO PORT-AU-PRINCE

by

Donald R. Street  
Resource Economist

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I. Introduction

The Haitian charcoal market represents an important link in the socio-economic fabric of the country. Its demand and supply relationships are reflected in incomes of peasants, costs to the consuming public, environmental impacts on individuals and the country at large, and other wide-ranging elements of Haiti's critical outside dependence on petroleum.

There has been a movement to reduce the dependence on charcoal and wood as cooking fuels in the country to allow recovery of forests. The deforestation in Haiti has allowed serious environmental problems to occur which lead to irreparable losses of productive topsoil as ground cover is lost during garden cropping on steep slopes. In an effort to reduce erosion and other environmental damages associated with deforestation and to provide increased income alternatives to farmers, fast-growing hardwood trees are being planted at present.

Ironically, the pressure to reduce consumption of charcoal to improve environmental problems is a pressure to reduce the incomes of farmers. A decrease in demand for charcoal is an incentive to shift end-use of hardwood trees to posts and poles

in the shorter time period and to saw timber and related uses in the longer time period. The farmer's time preference for money is pertinent to this choice. The socio-economic impact of restructuring the demand-supply situation of charcoal-producing hardwoods must recognize income-redistribution consequences of the venture.

#### Purpose

The purposes of the study were:

1. To determine unit prices of charcoal at various market levels,
2. To describe alternative shipping modes and cost markups by market levels,
3. To appraise the efficiency of the marketing operation for charcoal, and
4. To determine problem areas, implications, and alternatives for improvement.

#### Method and Scope

This study was an attempt to trace the flow of charcoal in the Northwest to its final retail market levels in the Port-au-Prince area. While previous studies have mentioned nominal quantity units, the present research was designed to measure them by weighing sample sacks of charcoal. Ten sacks of charcoal were weighed at random from 20 depot points in the market channel. Nineteen of these depots were located along the main route of supply in the Môle St. Nicolás, Bombardopolis, Baie de Henne route in the Bombardopolis region. One depot was sampled at the final retail point in the suburbs of Port-au-Prince at

Petionville. The principal marketing mechanisms were described in tracing the movement of charcoal from feeder suppliers at the farm level to collecting depots, to Port-au-Prince dealers, and to ultimate consumers. Marketing functions provided at each level were described by a value-added component of costs of the transactions.

### Background

The Haitian charcoal market can be described by the type of consuming clientele in different parts of the country according to income changes on a theoretical level. It can also be related to previous work in the field.

Theoretical. The charcoal market in Haiti has an unusual arrangement with respect to use and income within a demand context. A good whose use increases with the level of income, other things remaining constant, is considered to be a "normal" good in economic terms. Similarly, a good whose use decreases when income increases is considered to be an "inferior" good in economic terms. The latter term should not be considered a quality designator, but only an indicator of behavior with respect to demand and income changes. The designation is determined by the behavior of the individual or the consumer unit, however, and is not inherent in the product itself. What may be inferior for one person may be normal for another. A good whose demand is not changed when incomes change, other things equal, is referred to as a "borderline good." The income-consumption pattern (IC) is shown by the curves in several hypothetical situations in Figures 1 through 4.

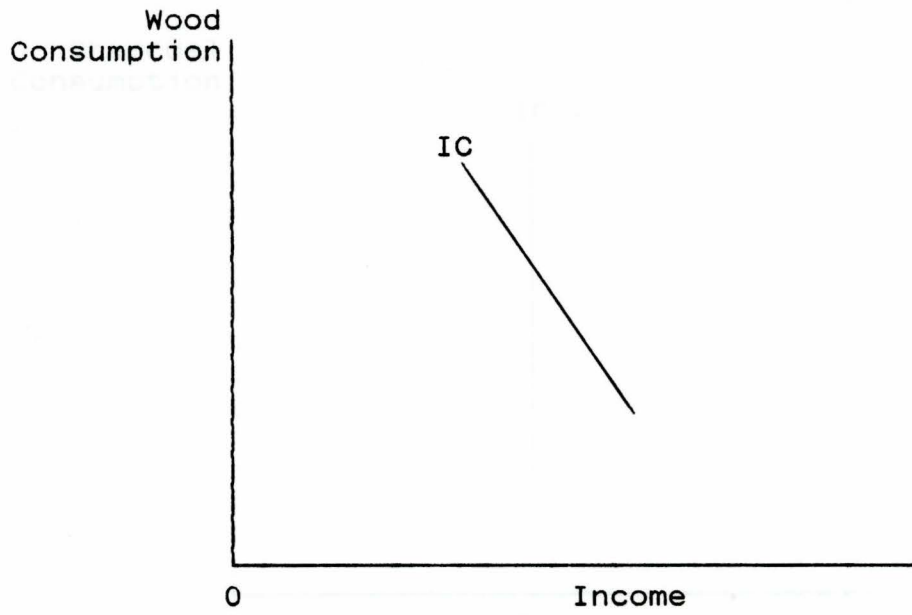


Figure 1. Wood as an Inferior Good in Rural Areas.

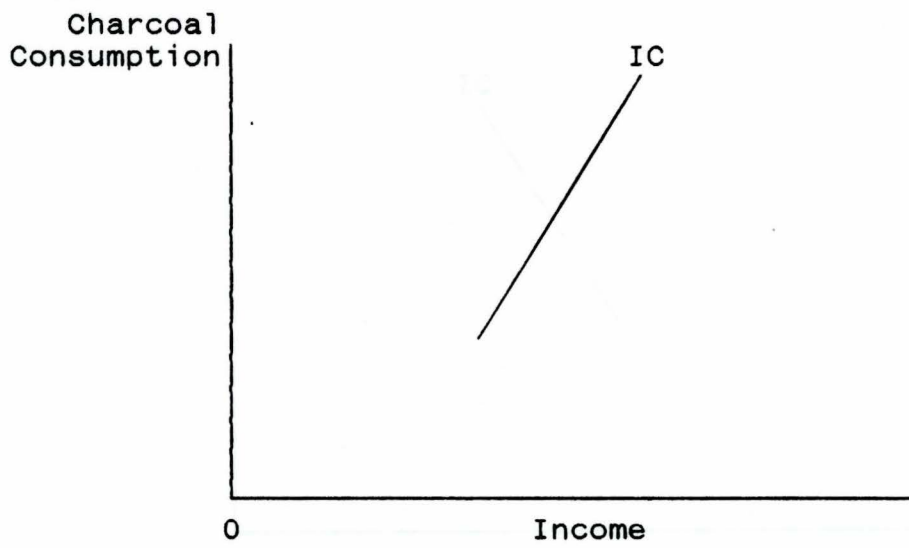


Figure 2. Charcoal as a Normal Good in Rural Areas.

Charcoal  
Consumption

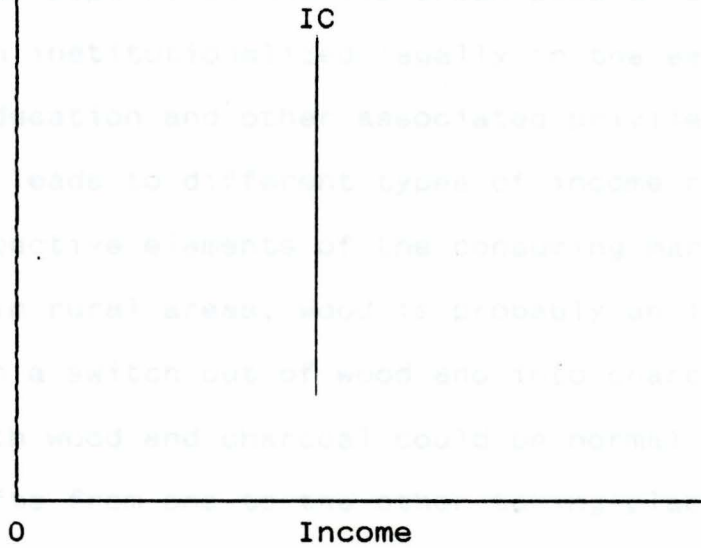


Figure 3. Wood or Charcoal as a Borderline Good.

Charcoal  
Consumption

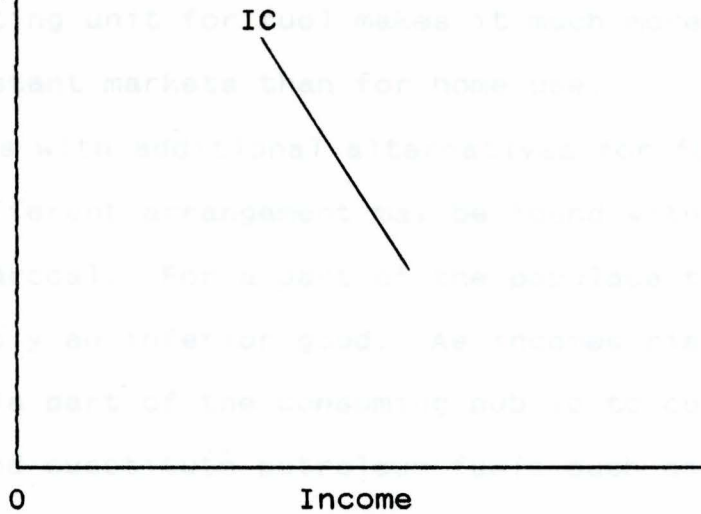


Figure 4. Charcoal as an Inferior Good in Urban Areas.

Haiti seems to have a highly dichotomized market with respect to its remote rural population and its urban population. This dichotomy was even institutionalized legally in the early 1800s with respect to education and other associated privileges. The division probably leads to different types of income responses of demand by the respective elements of the consuming market. To many poor people in rural areas, wood is probably an inferior good, resulting in a switch out of wood and into charcoal as incomes rise. Both wood and charcoal could be normal goods, however, with shifts from one to the other taking place only by changes in their relative prices in the market. To the rural poor, charcoal is probably a luxury item and wood grown on the farm, or any scrap that can be picked up locally, is used for household cooking. Charcoal as a cooking fuel is relatively more expensive than firewood in remote rural areas, and its loss of weight per heating unit for fuel makes it much more amenable to shipment to distant markets than for home use.

In urban markets with additional alternatives for fuel sources for cooking, a different arrangement may be found with respect to the demand for charcoal. For a part of the populace there, charcoal is probably an inferior good. As incomes rise, there is a tendency for this part of the consuming public to cut back on charcoal demand and substitute petroleum fuels such as kerosene and propane. Electricity is also an alternative to all of these energy sources. These substitutes are readily available in urban areas, and although subject to disruption, are a viable alternative to both wood and charcoal for household cooking



energy. Charcoal as an inferior good in urban populations is illustrated by Figure 4.

Previous Work. Work by Grosenick (1986a) has shown that real prices of charcoal have been rising substantially in recent years, a result which theory should predict in light of the rapid depletion of the country's forest resources. His last year of comparison of indices with the cost of living was 1985. Grosenick showed that prices of charcoal rose in the Port-au-Prince area at roughly 6 percent faster than prices in general. Similar results were found in other areas and by other organizations. Grosenick's work related prices to a load of charcoal with a nominal weight of 45 kilograms (kgs), an assumption which begs further investigation.

In other work, Grosenick (1986b) conducted an interesting consumer preference test for charcoals made from different tree species. Using Chi-square and Tukey multiple comparison tests, he found significant differences in preferences for several among eight species of wood used for charcoal. The ultimate urban consumer is generally isolated from knowledge of the species purchased and its origin in different parts of the country since no branding or other identification is given for the product.

The present research complements a previous study of the project (Street, 1989) which concentrated on socio-economic conditions at the level of the tree planters themselves in three parts of the country, including the Northwest. That work included information on family composition of tree planters, labor and other resource use, composition of the tree enterprises,

motivation of the farmers in planting trees, and the farmers' appraisals of the success of the ventures. Almost all of the planters were pleased with the tree operations and would like to continue, pending availability of trees and land. The Pan-American Development Foundation and CARE provided the trees and certain related extension services to the cooperators. The tree operations resulted in little conflict with the farmers' use of labor and tools for other cropping enterprises. Charcoal was one product the farmers derived from trees coming from woodlots, border plantings, mixed tree-garden plantings, and hedgerows. Making charcoal can be adjusted timewise not to conflict with labor-short seasons of crop planting and harvest. Other work in progress on the present project is concentrating on the growth of trees and garden crops associated with tree planting enterprises.

## II. Results

Charcoal is a major transmitting device in the creation and solution of economic problems in Haiti. Cutting of trees is the source of many environmental problems, yet the use of tree products for fuel wood and charcoal is a source of sustenance for the mass of the economy's populace. At the same time, the harvesting of trees is a source of income for a large part of the population in Haiti's economy. The Northwest is especially vulnerable to demand-supply changes since it provides a great proportion of the country's charcoal. The environmental problems in the area and the low income of the Northwest have important policy implications on the country's socio-economic balance.

This study entailed the weighing of samples of bags of charcoal at random from twenty "depots," nineteen at the source of supply in the Northwest and one at the Port-au-Prince suburb of Petionville. Ten sacks of charcoal were chosen at random and weighed in the field in order to improve on "nominal" or customary units sold in the market. Since the ten sacks at any depot could have come from any one of dozens of sellers in the area, the 200 observations were considered to be quite representative of the market connecting farm level sellers and the buying public through middlemen.

The mean sack weights, the minimum and maximum weights for the 20 samples, and their respective standard deviations are shown in Table 1. The overall mean of the 200 observations was 39.5 kilograms and the overall standard deviation was 4.9.

Although the sample sacks did not vary greatly from each other in general, there was a considerable variation of weight within some depots, and there was a range of 27 kilograms in the 200 sacks measured, Figures 5 and 6, with a minimum weight of 25 kilograms and a maximum of 52. The minimum size sack was found in the depot at the retail level in Petionville and sold for the same price (45 gourdes) as the 46 kg sack also found in its sample. Only a few extreme "outliers" were found in the total of 200, as shown in the box plot of median, 1st quartile, and 3rd quartile in Figure 7.

Where several depots were sampled in different "localités," there was little variation in mean weights, Table 2. The extreme variation was only 3.8 kgs from smallest to largest. Four

Table 1. Statistics on Charcoal Sample Weights for Twenty Sellers in Haiti, 1989\*

Seller	Weights in Kilograms			
	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Standard Deviation</u>
1	42.0	32	50	5.5
2	38.2	32	40	3.0
3	39.0	32	45	3.8
4	40.2	28	50	7.3
5	41.5	33	50	5.1
6	42.6	35	50	4.3
7	40.3	37	45	2.8
8	35.8	30	42	3.7
9	39.5	32	45	4.2
10	46.6	40	52	3.4
11	37.0	30	40	3.0
12	41.9	37	50	4.3
13	37.6	35	42	2.3
14	38.6	35	42	2.5
15	36.2	25	46	6.9
16	37.1	30	48	5.3
17	35.7	30	40	3.2
18	43.5	40	48	2.7
19	39.3	35	44	3.2
20	36.6	31	42	4.1

\*Ten sacks in sample at each seller depot.

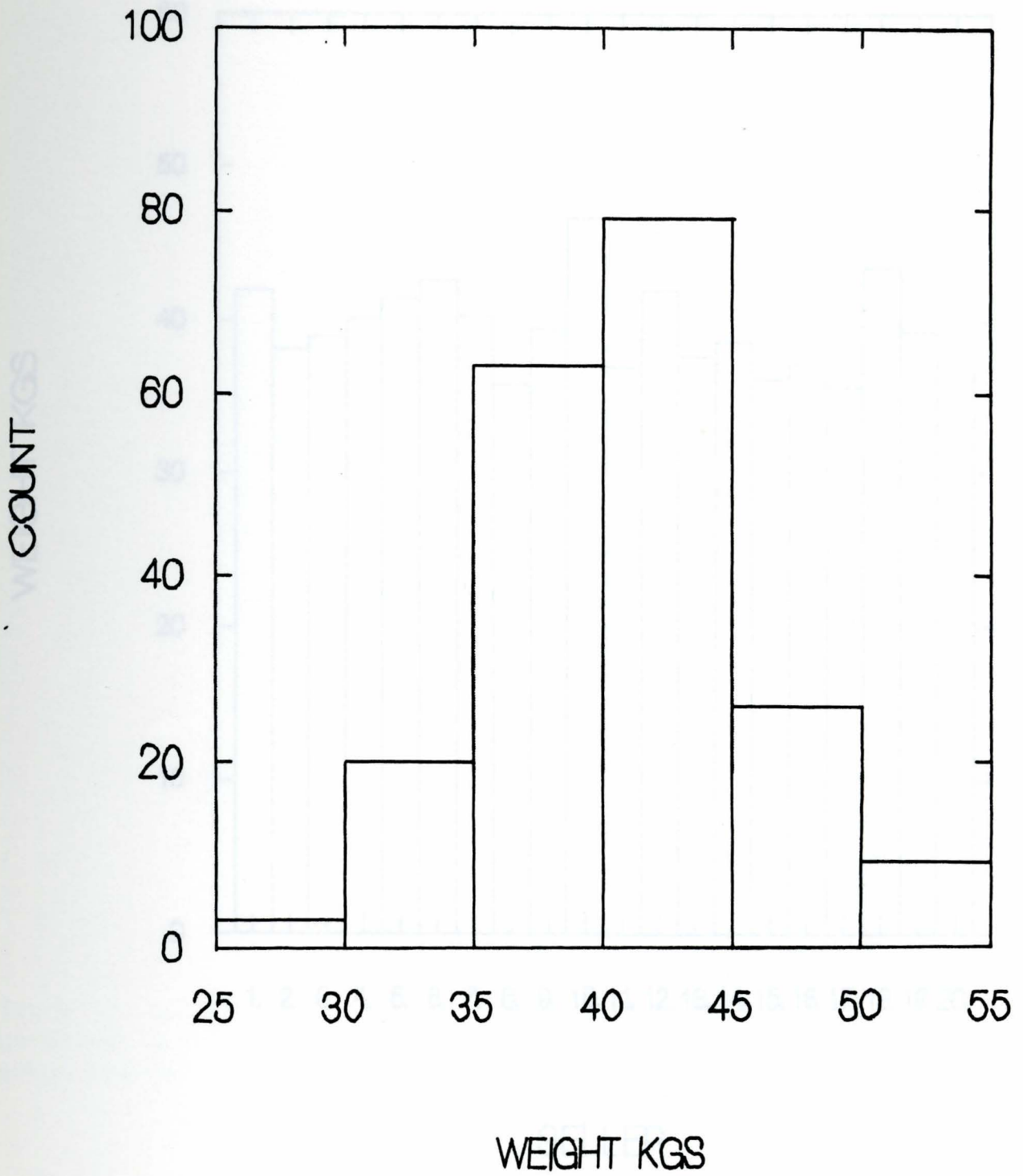
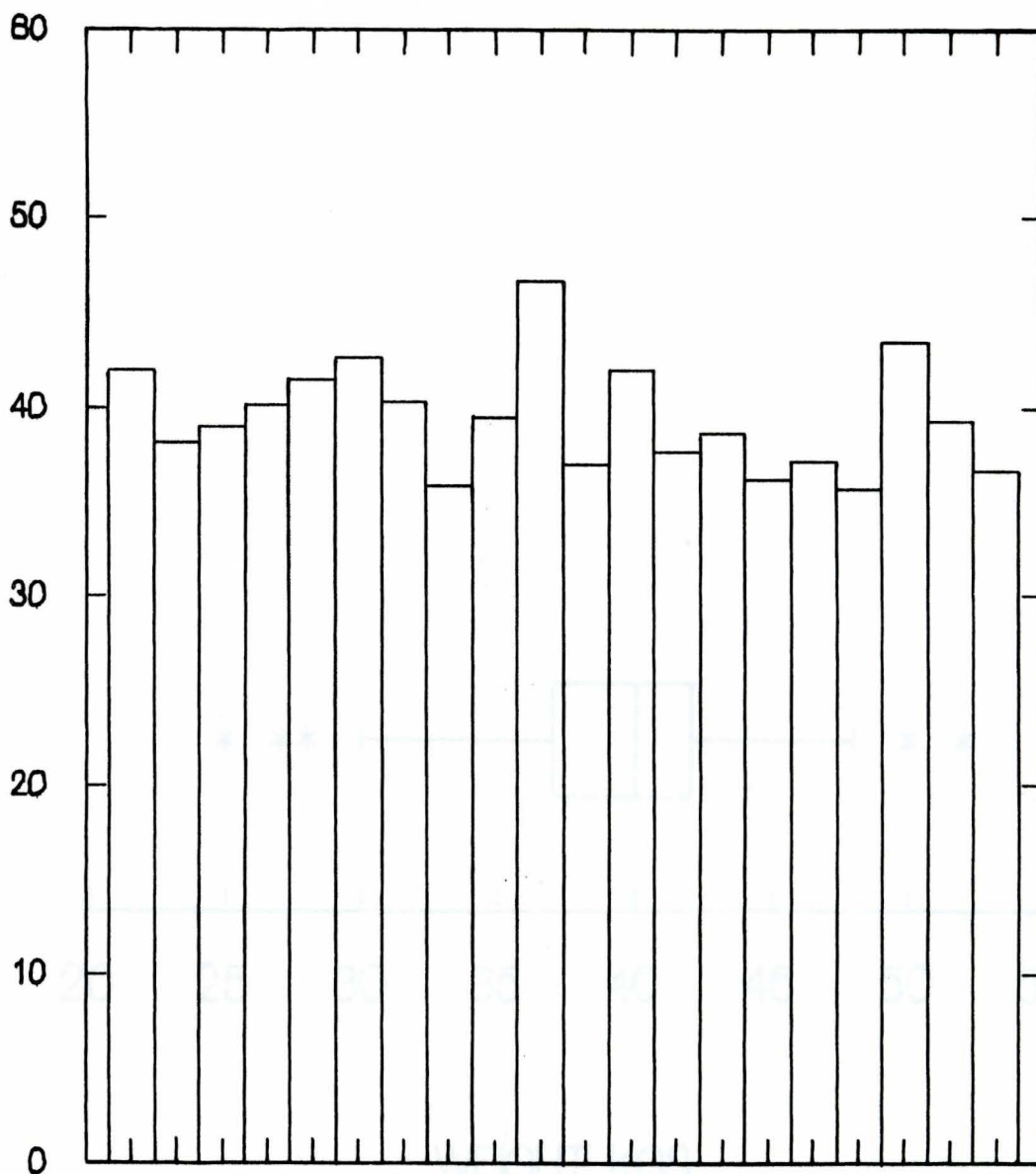


Figure 5. Frequencies of Charcoal Weights for 200 Sacks in Haiti's Northwest to Port-au-Prince Market Channel, 1989.

WEIGHT KGS



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

SELLER

Figure 6. Mean Weights of Samples of Charcoal at Twenty Collection Depots in Haiti's Northwest to Port-au-Prince Market Channel, 1989.

Table 2. Mean Weights of Charcoal Bags at Five Depots in Northwest Haiti, by Localité, 1989.

| Localité         | Sample Size | Mean Weight (kilograms) |
|------------------|-------------|-------------------------|
| Citania          | 20          | 29.7                    |
| Saint            | 30          | 41.8                    |
| Yard             | 20          | 37.3                    |
| Bonheurville     | 30          | 33.8                    |
| NOTA-cc, MARIÈRE | 40          | 39.1                    |

\*Two localities had only one sample of charcoal and were not included.

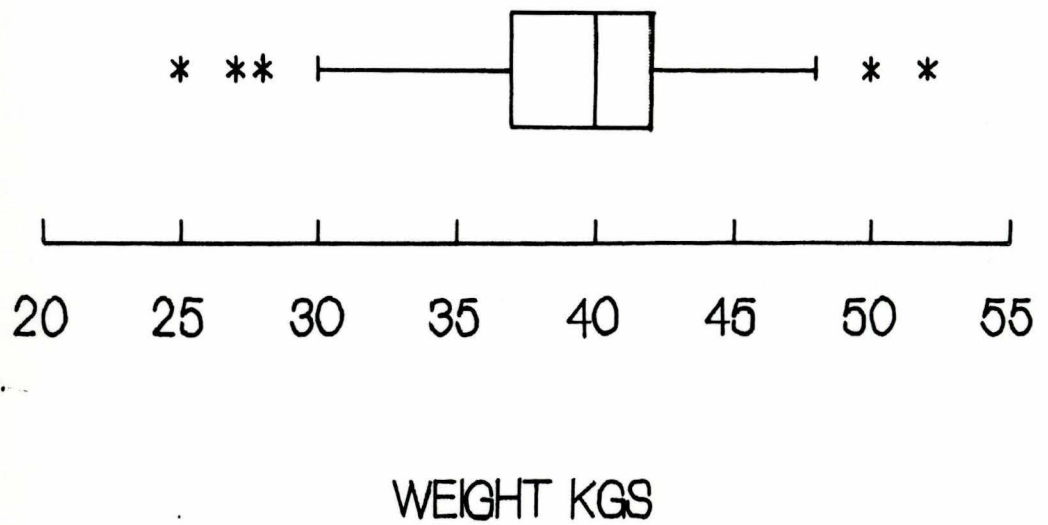


Figure 7. Box Plot Statistics of Charcoal Weights with Median, Quartiles, and Outliers in Haiti's Northwest to Port-au-Prince Market Channel, 1989.

Table 2. Mean Weights of Charcoal Bags at Five Depots  
in Northwest Haiti, By "Localité," 1989\*

| Localité         | Sample Size | Mean Weight in Kilograms |
|------------------|-------------|--------------------------|
| Citerne Remy     | 30          | 39.7                     |
| Bebé             | 30          | 41.4                     |
| Verne            | 20          | 37.6                     |
| Bombardopolis    | 30          | 38.8                     |
| Môle St. Nicolás | 50          | 38.4                     |

\*Two localités had only one sample of ten and were not included.



sacks of pure gaiac (Guaiacum sp.) were weighed at Môle St. Nicolás but were not counted in the sample since they sold for 50 percent more than the other charcoal, which is of mixed species. Little gaiac is available because of depletion of supplies.

The fact that only one of the twenty samples had a mean weight as high as the "nominal" 45 kgs reported by Grosenick (1986a) leads to several questions. Did the quantity reported by Grosenick actually come from a population in the 39 to 40 kg range? Or has the quality of wood deteriorated such that lower density woods are used in charcoal in 1989 when compared with data four years previous? Another question is whether weights were intentionally reduced as a means to camouflage inflation of prices while the stated price stood fast. A positive result is that a base line has been established by which comparisons can be made in the future.

Both exotic species of trees and native species are used for charcoal. While it is known that if charcoal comes out of specific areas it is likely to be made up largely from a high-quality species such as bayawonn (Prosopis julifolia), this result cannot be assured generally in the market. The sellers report only that the species are "mixed," and nothing is known of the inherent properties of the product when bought. Handling manually is the means of inspection, allowing the initiated to judge density to a certain extent.

In an effort to appraise the efficiency of the marketing system for charcoal, the system was examined to see what values were added by various functions as the product passed from the

farm to its ultimate consumer. In observing the market in action, prices were examined at various levels, and charcoal was actually purchased in some cases. While a large number of arrangements are possible in the marketing and transport of charcoal, three from the Northwest area were studied.

In general, there seemed to be a high degree of competition in the market. Both buyers and sellers seem to understand the overall pricing situation for charcoal. There was some lack of knowledge on quality, and this problem was compounded to an extent by variations in weight of the sacks of charcoal sold at the same price.

Three principal methods of transport and marketing of charcoal will be discussed below. These methods are common in the area and are in part determined by the geographic location of depots and their respective farm sources of charcoal. The route extending from Bombardopolis to Môle St. Nicolás and toward Baie de Henne is the supply hub of the Northwest. In the zone of Bombardopolis, truck transportation is available. One method is to acquire charcoal at the depot, then ship it by truck directly to Port-au-Prince. A second method is to transport the product by truck to Baie de Henne, then transfer it to a boat to ship to Port-au-Prince. Beyond Bombardopolis in the Northwest, as one approaches Môle St. Nicolás, poor roads discourage truck shipment of charcoal from that area. Charcoal is collected at depots near Môle St. Nicolás and transported primarily by burros to sailboats for shipping.

The typical Bombardopolis, Baie de Henne, Port-au-Prince truck-boat plan includes the following costs in gourdes for the marketer:

|                                     |            |
|-------------------------------------|------------|
| Charcoal                            | 10.0       |
| Sack                                | 2.0        |
| Buyer's fee                         | 1.0        |
| Filling sack                        | 1.0        |
| Transport to wharf at Baie de Henne | 2.5        |
| Tax                                 | 1.0        |
| Boat transport                      | 3.0        |
| Offloading at Port-au-Prince        | <u>1.0</u> |
| Total cost at Port-au-Prince        | 21.5       |

The seller may receive 35 gourdes per sack for the charcoal at Carrefour; 40 gourdes per sack at Maché Salomon and Petionville. The costs of transportation of the product from the Port-au-Prince wharf to three respective markets are 5 gourdes to Carrefour, 2 gourdes to Maché Salomon, and 5 gourdes to Petionville. The price discrepancy between Carrefour and the other two markets seems large, especially in view of the high cost of transportation to Carrefour. Closer proximity to the charcoal supplies from the South may keep prices low in the Carrefour area. Also, some of the buyers in the central city at the Maché Salomon and Petionville markets buy in small quantities to resell by the can (marmit), a kg or two at a time. In the outskirts of Petionville on Montagne Noire the price per sack was 45 gourdes. The 5 gourdes extra is roughly the price of transport from downtown Petionville or Port-au-Prince to that

point. The marketer is then left with roughly 8.5 to 16.5 gourdes (or \$1.70 to \$3.30 at the official rate of exchange) to cover his activities in handling the charcoal, depreciation of facilities, taking risks, and profits. The middlemen do not seem to be taking excessive markups within a competitive market due to their opportunity costs of resources committed to the venture. When charcoal is sold by market ladies (machanns) to individuals a kg or two at the time, a sack commands a total price in the 50 gourde range, a very low markup.

In shipping by truck only from Bombardopolis to Port-au-Prince, the costs in gourdes were slightly higher as follows:

|                              |            |
|------------------------------|------------|
| Charcoal                     | 10.0       |
| Sack                         | 2.0        |
| Buyer's fee                  | 1.0        |
| Transport to Port-au-Prince  | 10.0       |
| Loading truck                | 0.5        |
| Unloading truck              | 0.5        |
| Tax                          | 1.0        |
| Filling sack                 | <u>1.0</u> |
| Total cost at Port-au-Prince | 26.0       |

Additional transportation costs to the three markets of Carrefour, Maché Salomon, and Petionville were 5 gourdes, 2 gourdes, and 5 gourdes, respectively. The charcoal is purportedly of better quality when it is shipped by truck than when it is shipped by boat because of reduced breakage since it is handled two times less in loading and unloading. No quality comparison was made to test this hypothesis.

The boat only shipment of charcoal in the marketing system is similar to the previous methods. The farm price is roughly the same, but the charcoal is often bought at depots near the wharf for 14 gourdes per sack. Farmers may bring it to Môle St. Nicolás or pay someone to bring it to that point. The costs in gourdes to Port-au-Prince are then determined as follows:

|   |            |
|---|------------|
| Charcoal price transported to Môle depots | 14.0       |
| Sack                                      | 2.0        |
| Filling sack                              | 1.0        |
| Buyer's fee                               | 1.0        |
| Transport to wharf                        | 1.5        |
| Tax                                       | 1.0        |
| Boat transport to Port-au-Prince          | <u>2.5</u> |
| Total cost at Port-au-Prince              | 23.0       |

The payments for charcoal at the farm level and to the ultimate consumer are modal prices. Sometimes they were as high as eleven or twelve gourdes and at times they were lower than ten gourdes. The prices agreed with amounts shown in a previous study (Street, 1989) in which tree planters were interviewed. There is some variation in prices seasonally at the farm level and some variation of prices at end retailing points where sacks of charcoal are sold. Seasonal farm work and weather affecting shipping can have small influences on supply, and weather can have small influences on the demand for charcoal. The costs of services between the farm and the ultimate consumer seem to be quite stable, however. Various degrees of vertical integration are visible in the markets. Some sellers at the Port-au-Prince

wharf buy direct from the Northwest. Others buy from dealers who ship to Port-au-Prince on a regular basis. The system seems to be competitive enough that there is little difference in cost according to who performs which function in the market.

The ten or so gourdes which the farmer receives for a sack of charcoal must cover his own costs. According to Grosenick (1986c), if a farmer in the South used a hired operator to burn the charcoal, the farmer would get 55 percent of the farm gate retail price of the product. The amount of the total price of the product going to the farmer is an incentive for the ubiquitous claims of middlemen gouging farm-level sellers who have no market power. The farmer's incentive to engage in charcoal production is based largely on excesses of on-farm labor and low-opportunity cost land in trees.

The price of charcoal at the farm level in the Northwest is greatly different from what Grosenick predicted for the South. He predicted a real price of \$2.70 for a 30 kg sack of charcoal in 1989 based on his assumption of a 4 percent real price increase from his base of four years previous (Grosenick, 1986c). This \$2.70, when inflated to current dollars, would be much greater in view of recent eight percent or so annual inflation rates in Haiti. Conversion to a 39.5 kg sack weight would bring the real price at the farm level to about \$3.56. Inflation rates and an overvalued gourde commanding some 30 to 35 percent premium for exchange to dollars in mid 1989 indicate a much smaller return in the Northwest than Grosenick predicted in the South. Better access to good roads and easier access to Port-au-Prince

markets could account for a part or all of this regional difference, but the price in the South at present needs to be examined against the predicted values.

The tax paid by charcoal middlemen is a point of political contention in the economy. This amount is not a cost in the sense of a payment for factors of production. There was a suspension of collection of the tax for several months beginning in February 1988, but it was recently reinstated.

One impediment to an improved marketing operation appears at the macro level in terms of high-cost transportation. Since transportation costs comprised anywhere from twenty-five to forty percent of the retail prices of charcoal, this component of the cost needs further examination. Lack of roads passable for trucks in some areas, poor roads in general, and serious maintenance problems on others offer resistance to reductions in costs of transportation.

The consequences of poor roads lead to poor fuel efficiency of carriers, excessive and costly breakdowns, long waits for passage from place to place, and to serious risks of personnel involved physically in the operation. These inefficiencies will exist regardless of who performs the transportation service.

Many bridges are out on main routes, such as several in the Port-au-Prince area and hinterlands. Potholes, washouts, cave ins, slides, and other impediments exist in many forms on roads throughout the country. Bridges do not exist at many river crossings in various parts of the country, and sudden flooding can occur to stop traffic completely or delay it considerably and

at the same time endanger the lives of personnel and that of equipment.

Poor road conditions are partly the effect of lack of traffic laws and their enforcement. The roadways are endemic with drivers with no responsible concern for safety of themselves and others, as well as incompetent drivers who pose the same risks. Wrecks are frequent and in many cases lethal. These problems are accompanied by poorly inspected vehicles which are on the road in obviously dangerous states of disrepair. Overloaded vehicles and pothole-riddled roads form a mutually compounding cost element in their maintenance. Roads break up prematurely because of apparent overloading and broken up roads further damage vehicles.

The World Bank (1987) gives a vivid portrayal of Haiti's transportation problems in its report, Haiti Public Expenditure Review. Criticisms in this report include the following:

1. Lack of coordination in the myriad government organizations involved in transportation;
2. Poor planning on the part of the Ministry of Planning;
3. Improper review and revision of plans as needed in the Department of Transportation;
4. Lack of experienced transport planners and economists;
5. Poor accountability and statistics on spending;
6. Poor review of budget requests concerning justification of expenditures;
7. Over emphasis of salary components in budgets; and
8. Over staffing at professional and non-professional levels (World Bank, 1987, pp. 58-61).



All of these problems have an important bearing on the efficiency of the charcoal market as well as that of marketing in other sectors of the total economy.

### III. Summary and Conclusions

The segment of the charcoal market from the Northwest to Port-au-Prince and vicinity is an important link to different components of Haiti's economy. Changes in the charcoal market may affect the economy's environmental problems at the same time it affects incomes of producers and middlemen and costs to ultimate consumers. The present study attempts to examine the charcoal by unit sold, to determine prices of the product at different market levels by payment to marketing functions, to appraise the efficiency of the market, and to isolate problems in the marketing process.

Sacks of charcoal were chosen at random among 20 "depots" or concentration points of the product in the market chain. The sacks were weighed and statistics calculated to establish a baseline for comparison in the future. The main supply route in the zone of Bombardopolis was the primary source of the samples weighed. Three different shipping methods were studied in the Northwest to Port-au-Prince route.

The following conclusions can be drawn from the study:

1. The mean weight of sacks of charcoal was 39.5 kg, considerably less than has been reported in the literature;

2. There was a considerable variation in weights as expressed by range, but only a few extreme values appeared;
3. The prices of the mixed species bags of charcoal were the same at the depots regardless of weight;
4. Farm level prices centered around ten gourdes per sack for the mixed species;
5. Prices in the Port-au-Prince vicinity varied from 35 to 45 gourdes in one-sack lots and were in the fifty gourde range if sold in small quantities;
6. Market margins seem to be reasonable within an efficiency context;
7. Non-standard weights and varying quality of charcoal tend to reduce the efficiency of the marketing operation;
8. Transportation comprised from about twenty-five to forty percent of retail prices of charcoal for three methods of shipping;
9. Many problems on transportation costs are of a macro nature related to poor roads and need attention from the level of the Haitian government and from foreign donors;
10. Charcoal processing can be adjusted timewise to utilize family labor with a minimum of conflict with other farming activities;
11. Reductions in demand for wood and charcoal by promotion of substitute fuels would tend to reduce incomes of tree farmers in the Northwest.

Work parallel to the present investigation is in progress on productivity of trees on Haitian farmers' land. Work is also in progress on the markets for poles and lumber from trees in Haiti.

Further work is needed on the farmers' choice of end use of tree products. A part of this work would be to study the time preference for money for the tree planters. It is also recommended that the charcoal marketing study be extended to other areas of the country. This work could be expanded to investigate farm prices of charcoal with respect to distance from and ease of transportation to different consuming centers. The relationship of caloric content of wood to its weight is also a possible topic for further investigation. Income response of demand is a phenomenon that needs to be studied with respect to wood products in the economy. Approaches to change the demand-supply situation of wood and charcoal by substituting petroleum derivatives should be monitored as a part of future research.

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