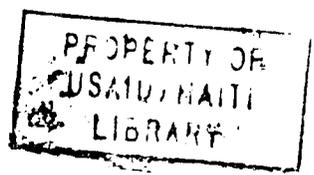


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A STUDY OF THE FUELWOOD SITUATION IN HAITI

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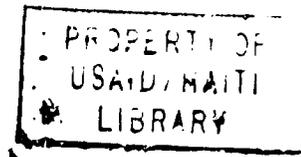
Prepared by
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USAID Mission to Haiti

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Preface

I wish to thank all at the USAID Mission to Haiti whose counsel, cooperation and support made this report possible. I also wish to thank Patrick Fleuret for his most helpful comments on the draft of this report. I deeply appreciate the generosity and care of the informants and research assistants who contributed to the research on fuelwood in Haiti.

This report reflects my own findings, analysis and views as a contractor to the USAID Mission to Haiti. The report does not necessarily reflect the views or position of USAID.

This study is the final product of Contract No. AID-521-C-98.

CHAPTER I

Executive Summary1.1 Summary of Findings.

This study is concerned with problems involved in the procurement and consumption of fuelwood in Haiti. The study includes the procurement and use of non-commercial and commercial firewood and of charcoal in rural areas. In the terms of this study, fuelwood for charcoal production is distinguished from firewood, which is consumed without being transformed.

The research methodology included a review of the literature and field research. The field research was conducted in three separate areas of Haiti: Fonds Parisien, Thomazeau and the Northwest. Anthropological field methods were used, including formal and informal interviews and participant observation of activities involving fuelwood. A survey of 126 households was conducted to obtain data on the economics of domestic fuelwood consumption. An intensive study of nine households was conducted to obtain information about the per capita consumption of firewood and about other consumption patterns. The field research in the Northwestern area of Haiti covered many of the same sites visited by Karl Voltaire for his research on the charcoal industry. The research in Thomazeau was conducted in collaboration with Karl Voltaire.

A study of the firewood procurement system revealed that the quality and accessibility of firewood are decreasing. One result of this has been the increased commercialization of firewood distribution at the local level. Firewood is collected largely by women and children; commercial harvesters of firewood tend to be older women with no other

economic possibilities. Firewood procurement contributed to the deforestation of the country.

A study of the charcoal production system revealed that fuelwood procurement for this purpose is the major factor contributing to deforestation in Haiti. This is true because living trees are harvested for charcoal production. Individuals engage in charcoal production only when they perceive that they have no economic alternatives. It is estimated that fulltime charcoal producers can earn between \$1.05 and \$2.22 (at the extremes) in a six-day work week. Charcoal production fluctuates seasonally, especially as producers switch to attempts at agricultural production.

The most important factors in marketing strategies are capital, means of transport, distance from shipping points and degree of competition. Charcoal producers without any capital are forced to accept lesser payment in advance. Producers without means of transport must sell to intermediaries who make a modest profit on their investment. Intermediaries in turn sell to shippers who transport charcoal to Port-au-Prince via truck or sail boat.

Fuelwood procurement for charcoal production and the setting up of kilns are usually performed by individuals rather than groups. There is some group activity in areas which are still forested and experiencing the first wave of charcoal production.

A review of the history of charcoal production in the various research sites reveals certain similarities. Deforestation takes place more rapidly on public lands than on privately held lands. There is an increase in full-time participation in charcoal production by both men and women as production reaches a peak in an area, especially in time

of drought. At such times there is also an increase in the number of outsiders involved in charcoal production. As deforestation proceeds, there is a decrease in both the quality and the quantity of fuelwood resources.

Most rural households use firewood as their principal source of energy on a daily basis, though there is the widespread use of charcoal when firewood is not available. Rural kitchens use a three-stone fireplace, though there is some flexibility in response to wind and other conditions. Cooking with charcoal requires investment in a charcoal stove. Most preparation of hot food involves boiling water. Cooks maintain that food is not ruined if it remains on a slow fire; therefore, decreased energy supplies are an inconvenience but have apparently not altered cooking habits significantly. Certain species are preferred for fuelwood, and larger specimens are preferred to smaller ones. However, aside from price factors, charcoal is preferred to firewood as a fuel.

Two household surveys were conducted at Fonds Parisien to obtain information about the household economics of fuelwood consumption. A preliminary analysis indicates that the annual per capita consumption of firewood is about $.319 \text{ m}^3$, a figure which should be considered conservative. 32% of the households searched for their own firewood. 48% reported that they sometimes bought firewood and sometimes harvested it themselves. 20% reported that they only bought firewood. Women and children were reported as the largest categories of firewood searchers. It is estimated that a household which purchased firewood daily would spend about \$4.45 per capita each year for this resource. 83% of the households reported that they used occasionally charcoal as a substitute

for firewood. These figures suggest consumption patterns in an area which has undergone advanced deforestation.

Local residents in all of the research sites recognized deforestation as a great problem. Deforestation is seen as contributing to floods and drought. Even young adults can remember when the hillsides, now denuded, were covered with trees. Furthermore, charcoal production is perceived as the cause of this deforestation. More to the point, poverty is seen as the cause of deforestation because only poverty leads a person to make charcoal. Rather than resentment against charcoal makers as destroying a natural resource, there is great sympathy for such people. Almost every discussion of deforestation evokes this response. This sympathy is shared by forestry agents and project workers as well. It is an attitude which should be taken into account and used in programs designed to provide fuelwood resources.

At the same time as deforestation is recognized as a problem, it is not seen as a resolvable problem, especially through local resources. Trees are seen as regenerating by themselves. This attitude persists even in areas where they have clearly not regenerated. Furthermore, reforestation is seen as something which must be done through outside agencies using foreign seedlings.

The future of fuelwood resources is not considered very much. People are more concerned with their day to day fuelwood or cash needs. There was no suggestion from any informant that local communities consider working on this problem.

Local level efforts to insure fuelwood supplies for the future have been inadequate. No individuals were found who had seeded and planted trees of their own initiative. On the other hand, owners of wooded

lands tend to restrict access to the fuelwood resources that they own. Furthermore, fuelwood harvesters prefer techniques which allow stumps and branches to coppice. Communal efforts towards reforestation consist largely of Arbor Day activities and the conservation of certain trees for religious purposes.

Most efforts at reforestation are external in the sense that they originate from agencies outside of the local area. While an evaluation of reforestation projects is outside the scope of this study, some comments are in order. Most current reforestation projects have not been designed with renewable fuelwood resources in mind. Instead, there has been an interest in trees which are valuable for lumber and other purposes, rather than for firewood and charcoal. In some projects there is little attention given to maintaining seedlings to see if they have survived. Lack of irrigation is a serious problem for many reforestation efforts.

Government forestry sub-agents seem able to do little to curb deforestation caused by fuelwood procurement. One of their principal duties is to collect a \$.05 tax on sacks of charcoal as they are transported to market. Their efforts at policing wood-cutting have on the whole been inadequate.

1.2 Statement of Problems.

The study found that the greatest problem involved with fuelwood procurement and consumption in Haiti is deforestation. Charcoal production contributed more to this problem than firewood procurement.

The second major problem is the need to insure adequate supplies of fuelwood. An increase in the demand for all types of fuelwood supplies can be expected for the next several decades; demands for charcoal

can be expected to increase at an even greater rate than demands for firewood.

Management of forest resources is inadequate for several reasons. Among them are insecurity of land tenure and lack of a firmly based forestry administration.

Current measures to insure an adequate fuelwood supply for the future are inadequate. Among the reasons for this are the goals of reforestation projects, which have been more concerned with soil erosion than with fuelwood resources. Reforestation projects tend to reward the distributions of seedlings rather than their successful transplantation.

Perceptions of deforestation and attitudes about forest resources in Haiti are not conducive to resolving the above problems.

Neither firewood nor charcoal are used in the most efficient manner.

1.3 Recommendations.

- It is easier to make fuelwood consumption more efficient than to develop massive forestry projects, if better charcoal cookers and fireplaces can be developed. Research in this direction should continue to find more efficient cooking devices which are very inexpensive, demonstrably superior and attuned to local practices. This research should be coordinated with nutrition research.
- Solar devices could be introduced for boiling water in selected clinics and may be suitable for some rural industrial purposes, such as essential oil plants.
- Program design for reforestation should take into account localized social and ecological conditions, such as:
 - (i) public land used for charcoal production
 - (ii) privately held woodlots used for lumber or charcoal production

(iii) privately held agricultural land which would be suitable for some shade or fruit trees

(iv) land which could be used by the "community" at large.

The results of reforestation projects in these situations might be the same; the approach in each would differ.

- If a reduction in the production of charcoal in a given area is desired, current charcoal producers must be provided with alternative economic opportunities.
- Charcoal producers should be hired to reforest and maintain areas used for charcoal production, especially on state land.
- Forestry projects should be managed by carefully trained and regularly paid supervisors.
- Forestry project managers should be rewarded for their successes in effectively planting and maintaining tree seedlings rather than for merely distributing seedlings.
- Projects with both educational and policing elements should be designed for the conservation of already wooded lands.
- Woodcutting should be banned in limited areas.
- Projects which establish controlled cutting on wooded state land should be designed.
- A forestry expert should explore the possibility of increased use of native species such as mesquite in fuelwood resource reforestation projects.
- The introduction of hybrid fruit trees should be considered for the reforestation of agricultural areas.
- Local community organizations should be encouraged to plant shade trees in public areas.

- Village woodlots for fuelwood are recommended if they are designed with an understanding of differing local interests. These woodlots should combine trees for posts and housepoles with fuelwood. Crops with a more short-term benefit, like sisal, should be planted with the seedlings.
- Rural primary schools should reward children for successfully growing trees and should educate them about forestry and soil conservation.
- The GOH should be made more aware of the seriousness of Haiti's fuelwood problems and should be encouraged in its efforts to improve forestry personnel and services.

CHAPTER II

INTRODUCTION2.1 Overview.

This report is a study of the problems involved in the procurement and consumption of fuelwood in Haiti and of the alternative, socially acceptable solutions to those problems. This report is the final product of Contract No. ALD-521-C-98. This contract called for a study of the non-commercial fuelwood situation in Haiti. However, because the non-commercial fuelwood situation there is best understood as a part of the general fuelwood situation, this study is also concerned with both commercial firewood and charcoal as well as with non-commercial firewood.

The fuelwood situation in Haiti has a number of dimensions which interact to exacerbate the problems of energy resources, deforestation, soil erosion and drought, which impoverish both the land and its people. The overwhelming amount of energy used in Haiti for needs other than transportation is wood-based.

The problem of meeting Haiti's increasing needs for wood-based energy cannot be separated from the problem of stopping and then reversing the devastating trend towards deforestation. Any project concerned with Haiti's wood-based energy needs per se would have an impact on the country's forest resources. Projects concerned with the deforestation problem per se might not (and usually do not) address the energy question. But they ought to, because wood procurement for energy purposes (especially charcoal) is the major cause of deforestation in Haiti.

The solutions to Haiti's fuelwood problems have two aspects, the "technical" and the "human". Possible "technical" solutions are easier

to find than to apply. The "human" aspect of Haiti's problems -- and thus the solutions to those problems -- include not only people's perceptions and attitudes, but also the system of opportunities and rewards, the set of institutions, both local-level and national, and the enormity of the poverty which constrain individual, community and national choices. The findings, the analysis and the recommendations of this report are concerned with the interrelationships between the "human" and "technical" aspects of Haiti's fuelwood situation.

2.2 Summary of Phases One, Two and Three of the Contract.

The contract called for:

- a) a description of fuelwood procurement systems
- b) a description of fuelwood consumption
- c) an overview of the household economics of fuelwood procurement consumption
- d) a description of local perceptions (in different regions) of the non-commercial fuelwood, commercial fuelwood and charcoal energy situations
- e) a determination of factors affecting demand for non-commercial fuelwood
- f) a description of local level efforts to insure fuelwood supplies for the future
- g) a specification (magnitudes) of current and future problems resulting from non-commercial fuelwood use with respect to the natural resource base and consumers, and
- h) an identification of alternative solutions to identified problems and the social acceptability of these solutions.

B

As called for by the contract, the work was carried out in three phases. The first included a review of the literature and of the background material concerning the project, as well as discussions of USAID personnel and others. A choice of field research sites and an initial visit to the primary field site were made during this phase. A detailed outline of the final report was produced at the end of Phase One.

Phase Two included field research in a number of sites over a period of several weeks. The identification and choice of these three field sites are discussed below in 2.4. Phase Two resulted in an interim report which was presented to the project director. The chapters concerning identified problems and tentative alternative solutions to them were circulated among the project development committee, other contractors involved in similar projects, and other USAID personnel. The results of the research were also presented to the project development committee and others orally, and questions about the project were answered. The third phase of the project consisted of preparing the final report. Five copies of the final report were presented to the project director at the end of Phase Three.

2.3 Methodology of the Field Research.

The field research took place in two steps. The first step consisted of a sixteen-day period spent at one site investigating the fuelwood situation there on an intensive basis. The second step of the field research consisted of briefer visits to other areas of Haiti to obtain data on regional variation, especially in the Northwestern peninsula, the major source of charcoal at the present time.

During step one, the basic data collection for the material discussed in the following chapters was conducted. Anthropological field methods, including participant observation, formal and informal interviews and

photography were used as appropriate. In addition, two surveys were conducted. The first survey obtained data from 126 households on the types and quantity of fuelwood consumed, the degree of commercialization and the costs of fuelwood. In the second survey, eight households were studied intensively over a four day period to determine the daily volume of firewood used, the species of wood used, the means by which it was procured, variations in the size of the consuming household, preference in fuelwood types, and other information. A comparison of poorer and wealthier households was made to determine the effect, if any, of purchasing power on fuelwood consumption. Seven local research assistants were trained and hired to help conduct interviews, measure firewood and collate data. The contractor conducted extensive interviews with fuelwood consumers, fuelwood harvesters, charcoal producers and sellers, community leaders and personnel involved in reforestation projects.

Fonds Parisien, east of Croix-des-Bouquest in the Plaine du Cul du Sac (see map, next page) was chosen as the field site because it has been an important center of charcoal production and remains a center of charcoal exchange, because deforestation as a result of fuelwood collection is advanced there, and because the contractor had established rapport through previous research in the area. The last factor was essential in obtaining reliable information in a brief period of time.

The second step of the field research consisted of briefer visits to various sites in the Northwestern part of Haiti, especially Gonaives, Anse Rouse, Jean Rabel, Môle St. Nicholas, Bombardopolis, Des Forges, Souchaude, and Fort-de-Paix over a six-day period. (Karl Voltaire had previously visited these areas for his complementary study of the economics of charcoal in Haiti.) The Northwestern area provided important

contrast to the fuelwood situation at Fonds Parisien, both, as was expected, in the direction of greater deforestation and, surprisingly, in the direction of much less advanced deforestation. Such a brief field trip did not allow for the systematic data collection that was possible at Fonds Parisien. Nevertheless, it was possible, through observations and directed interviews to gain an idea of the fuelwood situation there. (It should be noted that when "Northwest" is used in this report it refers to the geographical area of the Northwestern peninsula and not to the administrative department.) A subsequent visit was made to Thomazeau, in the Plaine du Cul du Sac, with Karl Voltaire.

An effort was made to coordinate the research with Karl Voltaire as much as possible. Our reports on fuelwood and charcoal were part of a research effort which included work on a number of different aspects of deforestation and wood use in Haiti.

2.4 Comments on the Literature.

2.4.a Introduction.

This section is not intended to be a comprehensive review of the literature on fuelwood use, renewable energy and deforestation. Rather, it is a brief commentary on some of the reports and papers which were used in formulating this study. The references for the reports discussed appear in Appendix I.

2.4.b Reports on Haiti.

A number of the reports were concerned with the forestry sector in Haiti. Among these were Burns (1954), Earl (1976) and Bengé (1978). The Burns FAO report to the GOH on forest policy helps to give a time perspective on Haiti's fuelwood problems. Many of his recommendations are relevant twenty-five years after they were written, particularly

those which concern the implementation of forest policy, in part because there has been little improvement in the intervening years.

Burns recommends the establishment of short rotation forest crops, including poles and fuelwood. He recommends a return to agricultural techniques as a second phase in the program, with the possible use of orchard crops as a third. But he cautions that unless there is a general development of the community, forest plantations will be used before they have matured. Burns makes two observations which were confirmed by the research for the present study as well. First, there is significant loss through the careless handling of seedlings; and second, rural residents are reluctant to "pamper" the exotic species given them by reforesters.

Earl's (1976) study of charcoal as a renewable fuel in Haiti has been the principle source of information on that topic. He makes several comments about the benefits of the present charcoal production and distribution system which are often overlooked because of the ecological effects of woodcutting. Not only does the use of a domestic fuel supply conserve Haiti's financial reserves, but it also supports a large number of people in a way that distributes wealth to the poor and to rural areas where its marginal utility is highest. The distributive infrastructure includes not only producers, intermediaries and transporters (using donkeys, sailing vessels and trucks) but also producers of charcoal stoves. Any project concerned with charcoal would have to take this distributive infrastructure into account. Furthermore, Earl maintains, the present technology of charcoal production is adequate.

Earl discusses the financial viability of fuelwood plantations, an aspect of the problem which is outside of the scope of the present study. He maintains that growing trees strictly for charcoal is not financially

viable and recommends plantations for poles, with waste material used for fuel. Earl notes that managing existing forests is not expensive, in comparison with planting new ones. (But see the discussion of Arnold and Jongma's report, below.)

Benge's (1978) report is a further discussion of the need for agro-forestation in Haiti. Benge evaluates various figures for wood consumption in Haiti and concludes that Earl's figure of 4 million m³ in 1976 is the most accurate. Benge's recommendations are concerned with the establishment of a Forest Technology Corporation (Fortec), which would be given a functional monopoly on wood production in Haiti. Fortec would lease land for fuelwood production and control the marketing of charcoal. It would be operated in part by U.S. companies using Haitian state land. There would be a gradual shift to a more capital intensive mode of charcoal production.

The recommendations in Chapter VIII of this report (below) disagree with the Fortec plan on a number of points. While Haiti needs an integrated and capable forest policy administration, the Haitian institutional system is not adequate to assume a monopoly on wood production. The securing of private lands by eminent domain, their placement in the hands of foreign companies, a revamping of the charcoal distribution system, and the development of more capital intensive production techniques are unlikely to be implemented in a socially acceptable manner.

2.4.c Reports on Other Topics.

Fleuret and Fleuret's (1978) paper on fuelwood use in a Tanzanian village is one of the first studies of fuelwood harvesting and consumption in a local context. The Fleurets provide a methodology for measuring fuelwood consumption that was particularly useful for the survey

work at Fonds Parisien. The paper is concerned with household consumption of fuelwood, the amount of labor required in harvesting fuelwood, the personnel involved and seasonal variation. In addition, Patrick Fleuret provided the contractor with an unpublished review of the most important factors involved in community level fuelwood consumption. This document was extremely useful for formulating the research plan for this study.

French's (1978) paper on firewood in Africa was also very helpful in planning the present study. French points out that the interest in forests as providers of fuel is very recent. He discusses in some detail the importance of looking at local energy practices and perceptions in studying fuelwood problems. The extent to which local people view the fuelwood situation as a problem -- and how they view it as a problem (availability, price, inconvenience) -- are important in designing projects. French says that alternative solutions must be sought at both the procurement and consumption phases of fuelwood use. At the procurement phase, techniques must be found which provide both sufficient fuelwood and allow for forest regeneration. At the consumption phase socially acceptable means of obtaining greater energy efficiency must be found.

French discusses the relative energy efficiencies of charcoal and firewood. 50-80% of the energy in fuelwood is lost by converting it into charcoal. But the critical point is that whether charcoal or firewood requires more trees for a given amount of energy may vary according to local energy practices.

Arnold and Jenama (1978) have provided an overview of the literature on fuelwood consumption, including regional comparisons. They discuss some of the factors which have been important in making fuelwood planta-

tions successful. These are:

- 1) involving the people concerned
- 2) acceptance that wood is no longer a free good
- 3) availability of adequate technical support.

Arnold and Jongma maintain that tentative results show that increased agricultural productivity because of improved environmental protection is an important factor in the cost benefits of rural fuelwood plantations. This factor is not often included in the computing of financial viability of fuelwood projects. Arnold and Jongma prefer charcoal to firewood as a fuel and say that in terms of efficiency of domestic use it may be cheaper than firewood.

The Club du Sahel (1978) report on energy use in the Sahelian countries takes a different position on charcoal. This report does not see charcoal as a benefit since it is said to use twice as much wood as firewood for the same amount of energy. Furthermore, the report says that firewood may not be more expensive than charcoal to transport, especially where volume rather than weight determines transportation costs. At present in the Sahel, charcoal has the advantage because charcoal stoves are more efficient than fireplaces. If an efficient wood stove were developed, the relative advantage of charcoal use would be eliminated. But French's (1978) point about the importance of local energy is the key factor here. The Club du Sahel report makes an important point about wood-based energy strategies. The Sahelian countries use little energy. Thus energy policy should not set ceilings on the growth of energy use, but should reduce the increase by fostering the use of local energy sources and the better use of all energy, local and imported.

Another report on energy use in Africa, Howe et al. (1977), provides a good overview for understanding fuelwood as an energy problem rather than as an environmental problem. The report is concerned with research and development in alternative energy technologies and in institution building. Howe et al. are concerned with developing intra-village energy sources which are complementary to larger scale conventional energy systems.

French's (1979) report is about the cost-benefit analysis of renewable energy projects. It includes a detailed discussion of the financial and economic analysis of three specific energy projects.

2.5 Note on Haitian Creole and French Terms.

Haitian Creole and French terms are used in this report to help Haitian personnel in discussions with Haitians involved in fuelwood procurement and consumption. It is important, for example to know that the Creole word "débouazman" (French "déboisement") does not necessarily have the bad connotations of "deforestation" in English. Likewise, it is important to mention that "travay" means work, but rural Haitians do not consider charcoal production to be travay.

When the Creole word means roughly the same as its French equivalent, the French spelling is given as well as the Creole spelling. The Creole spelling is relatively phonetic, which should be helpful to those who speak neither Haitian Creole nor French. A glossary of the foreign terms used in this report appears in Appendix II.

CHAPTER III

Description of Fuelwood Procurement Systems

3.1 Introduction

In the discussion of the Haitian fuelwood procurement systems, it is necessary to distinguish between fuelwood which is used for domestic cooking fires and other purposes and fuelwood which is converted into charcoal. The procurement system for each of the two types of fuelwood use is different. For this reason, fuelwood which is consumed directly without being transformed is called firewood in this report. The procurement of firewood will be described first, followed by a description of charcoal production.

3.2 Firewood Procurement

When considering fuelwood procurement, regional variation must be taken into account and must be explained. In the Bombardopolis area for example, much firewood collection is performed by men, while in Fonds Parisien the overwhelming majority of firewood collectors are female. These differences in the personnel involved in firewood collection reflect different states of deforestation, with Fonds Parisien more advanced than Bombardopolis -- and, to extrapolate, with Fonds Parisien representing the future of a relatively wooded area like Bombardopolis if deforestation is not checked. In this section, the firewood procurement system at Fonds Parisien will be discussed first.

3.2a Firewood Procurement at Fonds Parisien: Personnel.

At Fonds Parisien, firewood is collected for both commercial and non-commercial distribution. All of the personnel involved in commercial firewood procurement are female, most of them older women. These women

are recognized by local residents to be among the poorest in the village. It is commonly said that a woman who harvests firewood for sale "has no man and no garden," in other words, she has no other means of support. It might be added that she has no strength and no machete as well, for a poor woman with both would cut green wood for charcoal production rather than pick up dry firewood with her hands. In a survey of 126 households at Fonds Parisien, it was determined that almost 70% of the households purchased firewood at least occasionally. These households, comprising a population of 910, were served by 32 sellers of firewood. One may infer of rough estimate of 35 sellers of firewood per 1,000 rural inhabitants.

The personnel who collect firewood for non-commercial use (that is, for use in the collector's household without cash or other exchange) are also largely female. In the household survey 83% of the non-commercial collectors were female, with at least 30% adult women. The largest category of collectors however, were girls (at least 45%). (The age of 8% of the female collectors was not determined.) 12% of the collectors were boys. Only 5% of the collectors were adult men. There is reason to believe that these men (4 in number) represent the vestiges of a earlier procurement system, which will be discussed below. In terms of sex, then, females predominate. In terms of age, the young predominate, as they comprise at least 57% of the collectors.

3.2.b Firewood Harvesting

The procurement of firewood for both commercial and non-commercial use is performed in an individual basis. When people go out to collect firewood, they may do so as a party, but each individual collects his or her own firewood. Company may be shared, but not the labor or the product of the labor. Nor is there any communal storage of firewood

at Fonds Parisien. If firewood is collected for local sale, the harvester is also the seller; there are no intermediaries. (This is not true in Haitian towns; see below.) Commercial harvesters of firewood are paid by piecework rather than directly for their labor. A paké (meaning in this case a headload) of firewood can be sold at a price that may range from #1.50 (\$.30) to about #2.20 (\$.44), depending on the strength of the harvester and price variations (which are discussed below). An adult harvester can usually carry about #2 (\$.40) worth of wood. This represents the labor of a single morning or afternoon. Some commercial harvesters make two expeditions a day; many, however, have the strength for only one expedition.

For most commercial harvesters, the procurement and sale of firewood is a full-time activity. They collect every day but Sunday. For non-commercial harvesters, procurement is a part-time activity. Some households reported that they looked for firewood every day but Sunday. Most, however, reported that they harvested firewood between two and three times a week, depending on their needs and the availability of wood.

At Fonds Parisien, if a number of people decide to collect firewood they set off on one of the many paths into the rajé (bush). When they arrive at a suitable harvesting site they spread out as individuals, though usually within sight of each other. The harvesters look for dead or dry wood, as green wood is not suitable for firewood. Each picks up or tears off dry branches by hand. Occasionally they dig up a dry root with a rock. Otherwise tools are generally not used, though sometimes an adult may carry a machete for convenience. Some dry wood is found lying on the ground. For the most part, however, collectors tear dry branches off of green plants. Green bushes are uprooted so

that the harvester may get at their dead branches. One informant categorized these bushes as "hard" rather than as "green." Sometimes green bushes are uprooted and then discarded as useless (rather than, for example, stored for drying). Children cause less damage to the vegetation in this way than adults, because they do not have the strength to pull up bushes easily. The small parts of the dry branches are removed and the branches are put in small piles. Each individual makes several small piles as he or she moves along, and then brings these piles to a central place where they are tied with a cord made from straw and placed on the head for the walk home. Individuals neither add to nor take away from each other's piles. At Fonds Parisien, animals are not used to transport firewood. Owners of animals have more profitable uses for them. (A person transporting charcoal on a donkey, however, may also carry a small amount of firewood to be sold.)

Certain species of wood are valued more than others for firewood. At Fonds Parisien, bayaond (mesquite) is the most favored of the available species. Other species are also used for firewood, including boua blan, boua mabi and boua kabrit. Many species are considered useless as firewood, including poufpouf, kaktus and boua pin (though pine is used to start fires). Gaya (gayaie) was highly valued for both firewood and charcoal, but is no longer to be found at Fonds Parisien, one of whose "zones" is called "Gaya."

Larger specimens are preferred to smaller ones because they have more "resistance" that is, they burn for a longer period of time. With small sticks (ti fashinn), more wood is needed, less heat is generated, and the fire must be tended continuously. Fonds Parisien is so deforested that most consumers have to use ti fashinn. In practice, there is

very little selection in firewood collection. The harvester simply stands in a spot, takes everything available, and moves on.

Firewood is collected year-round, with little seasonal variation. The two major factors involved in seasonal variation are rainfall and the school calendar. When it rains heavily, and for a day or two afterwards, no firewood is collected. At these times, households must rely on stored firewood or on charcoal. The distance of good firewood from residential areas is such that many children are unable to collect firewood without being late for school, which is held in the mornings. During school vacations more children collect firewood for their households and they are free to collect it in the morning as well as in the afternoons. The price of commercial firewood rises about 10% during the rainy seasons (May-June; Oct-Nov), which occur during the school year. In times of necessity, very poor quality firewood can be obtained close at hand, in the forms of thorny twigs (pikan) and kandélab, which has replaced wood for fencing. Dung is not collected and is not used as a substitute for firewood.

Informants maintain that firewood collecting expeditions take between two and four hours. The fact that most commercial firewood collectors return to the village around 10 a.m. after an early morning start bears this out. However, an expedition was observed in which five young girls were able to collect sufficient, though mediocre (even by Fonds Parisien standards) firewood in forty minutes. It seems that collectors are usually willing to spend more time to find better quality wood.

Most firewood at Fonds Parisien is collected on what might be called "public" land. The exact legal status of this land has not been firmly established. That at least some of it is state land is acknowledged by

Fonds Parisien residents. Most of this land, however, is locally considered to be jointly held by the "inheritors" (éritié) of the original "owner" of the land. In practice, this means that all residents of the village may use this land. This is apparently also true at Thumazeau. Some firewood is also available on private land. For the most part, access to this wood is restricted to the owners of this land and their kin. This restriction, however, is much greater for green wood than for dry wood. Most owners would not object to firewood collection per se, but they would suspect the intruder of seeking green wood as well as dry wood. In practice, then, even those who are hungry and face considerable work in collecting firewood elsewhere do not enter private property for this purpose. Most firewood on "public" land is available from a distance of about one kilometer to about six kilometers.

Other than acknowledged rights to private property, there are no perceived legal or other institutional constraints on firewood collection. Earl (1976) and other writers mention the burning of trees to avoid taxes on the cutting of live trees. This tactic, called bay flam (setting on fire), is remembered at Fonds Parisien, but is apparently no longer practiced there, in large part because trees for lumber are rare now. Trees cut for charcoal are not now taxed in this way there, so there is no need to burn them before cutting them. Firewood collectors harvest only dead wood even though they may destroy living plants in the process. In any case, Fonds Parisien is so deforested that the living specimens which firewood collectors handle could scarcely be called trees, as they are only a few centimeters in diameter.



3.2.c Distribution of Firewood

Firewood is not processed before distribution. There is no further cutting, as the larger the piece, the greater its usefulness and cash value. Firewood for sale is sometimes broken into lots of ₡0.05 or ₡0.10 (\$.01 or \$.02).

The local distribution of firewood is described in greater detail below in Chapter VI, Overview of Household Economics of Fuelwood Procurement and Consumption. It will suffice here to say that in the Fonds Parisien household survey, 32% of the households interviewed used only firewood, which they collected themselves. 48% of the households reported that they sometimes procured their own firewood and sometimes purchased firewood. 20% of the households reported that they only purchased firewood, never looked for it themselves. Above it was suggested that there are about 35 sellers of firewood per 1000 people at Fonds Parisien. The survey indicated that there were 27 firewood vendors serving 82 households which purchased firewood. Thus there is roughly 1 vendor for three households which purchase firewood. It would be difficult to determine how much of the total volume of wood collected in the village over the course of a year is sold or used directly by the gatherer's household. But clearly a substantial amount of firewood is sold locally for cash. Given the poor quality of firewood at Fonds Parisien, it is not surprising that no firewood is sold outside of the local area. In fact most firewood is sold within the confines of a neighborhood (zonn) of the village. Firewood is sufficiently scarce that vendors rarely lack for customers. Consumers come to the houses of vendors to buy rather than vice versa. Usually a price is agreed upon for the individual sale, though sometimes the firewood is displayed in lots. As mentioned above, prices can vary

seasonally. Firewood does not appear to be exchanged for anything other than cash.

The history of fuelwood procurement at Fonds Parisien will be outlined below. It should be mentioned here that there has been a great decline in the quality and availability of firewood in the past several decades. Forty-five years ago, wood was found in great abundance at Fonds Parisien. The hillsides surrounding the village were covered with many species of hardwoods and fruit trees. As older people recount it, there were no restrictions on wood cutting or gathering. One could spend the day tending animals in the woods without any need to carry food because fruit was there for the picking. Until the past two decades, firewood was easily available in the residential areas themselves. There was no need to walk any distance to find dry wood, and the only people who bought wood were the relatively wealthy households who chose not to gather wood themselves. As the large trees disappeared with the onslaught of charcoal production for urban consumers, so did the large dead branches that would fall from them. Previously, dry wood collection was at least partly men's work because it involved cutting large branches. As large pieces of wood became rare, the collection of firewood became almost exclusively the work of women and children. The few men who collect firewood apparently do so on their own private woodlots, of which few remain. As the work of gathering firewood became the task of women and children, it became more and more onerous. Cutting large branches is hard work. But walking several kilometers in the rain to pick up bits of wood among the thorny bushes is considered more onerous. The decline of firewood has been steady, but not dramatic. The percentage of households buying firewood and the prices they pay have been rising slowly and can be expected to

continue to rise; even as the quality of the product decreases.

3.2.d Firewood Procurement on the Northwestern Peninsula.

The Northwestern peninsula of Haiti provides an informative contrast with Fonds Parisien. The firewood situation in the town of Anse Rouge is much worse than that of Fonds Parisien. It is said, in fact, that no firewood can be found there and that everyone must buy charcoal for cooking purposes. In the Bombardopolis area, on the other hand, firewood is considerably more plentiful than it is in Fonds Parisien. This relative abundance is associated with other differences between the two areas. In the Bombardopolis-Des Forges area, for example, rural informants report that there is relatively little commercial exchange of firewood. In the Des Forges area, most of the firewood is collected by men and is transported by donkey to the residential areas, where it is distributed without commercial exchange. Dry wood is found in the form of dead branches and trunks. These are cut with a machete and split with an axe, tasks which are performed by men rather than women. A household obtains firewood in this way about two or three times per week, according to need. The firewood is procured in areas which are not simply rajé ("bush") as in Fonds Parisien, but where land is cleared for gardens as well. These areas are an hour or two away from the residential areas. When a household runs out of large pieces of firewood from these areas, firewood for immediate use is sought in the residential areas. The firewood found in the residential areas is greatly inferior in size and quality to wood brought in by donkey from the outlying gardens. The procurement of firewood in residential areas is women's work.

The division of male and female roles in firewood harvesting reflects general patterning of male and female spheres of activity. In these wooded

areas, most non-commercial firewood gathering apparently takes place in the course of agricultural work, which is traditionally a male domain. This accounts for firewood procurement by males more than does the presumed inability of women to cut down large trees. Firewood collection by women in the Des Forges area is conducted in the domestic arena -- around the yard and in the course of preparing to cook. In Fonds Parisien, where very little firewood is found in cultivated areas, procurement is almost entirely the work of women and children. The two male collectors in the Fonds Parisien sample were among the few in the village who owned woodlots near their gardens.

In the towns of the Northwestern peninsula other than Anse Rouge, firewood is preferred to charcoal for domestic energy use, even when charcoal distribution is the main economic activity. Most of the firewood used in the towns of the Northwest is obtained through purchase rather than direct harvesting. Households with sufficient cash purchase firewood by "subscription" (abonnan) several times each week. These households purchase regularly from the same vendor, who may be either the harvester or an intermediary. Firewood which is found in the market place is sold either directly by the harvester or by a wholesaler. Wood may be transported on the head, but firewood sold by abonnan or to a wholesaler is usually transported by donkey. This firewood is sold by the donkey load (chay). A donkey load of firewood sells for about ₣5 (\$1.00). The price varies according to the quality of the firewood and whether the donkey is fully loaded. A headload of firewood sells for about ₣2 (\$.40) if it is sold in its entirety, a price which is comparable to that of Fonds Parisien. If the carrier separates the firewood into lots to be sold in the market place, an additional profit of ₣.50 (\$.10) per headload

can be made. The price of firewood sold in the market places of the towns in the Northwest is lower on market days because there is greater competition among vendors. As in Fonds Parisien, vendors of firewood in the towns of the Northwest are almost entirely women.

In Port-de-Paix, Jean Rabel and Môle St. Nicholas, pieces of wood which are very large by Fonds Parisien standards are available in the market place. Most of these pieces had been split from even larger pieces for convenience of transport and sale. The consumer can choose among various species as the wood is lotted according to species. Different species have different prices. Bayaond, the favored species at Fonds Parisien, was third on the list of desirable species of informants at Jean Pabel. It stood behind tandakayo, the most favored ("It's like charcoal," one informant said) and kampèch (logwood). Furthermore, firewood sold in the wooded areas of the Northwest is much cheaper than that sold in Fonds Parisien and is of better quality. While $\text{¢}20$ (\$.04) bought about 1000 cm^3 in Fonds Parisien in 1979, the same amount bought 6000 cm^3 of unidentified wood and 3000 cm^3 of kampèch (logwood) near Port-de-Paix. Moreover, Port-de-Paix firewood consisted of much larger pieces (an average of about 760 cm^3 as opposed to 40 cm^3 at Fonds Parisien).

3.2.e Summary of Firewood Procurement.

The data suggest that the firewood situation at Fonds Parisien is the result of a greater degree of deforestation than is to be found at Bombar-dopolis-Des Forges. Likewise, the firewood situation at Anse Rouge reflects greater deforestation than that at Fonds Parisien. If this is true, than Bombar-dopolis-Des Forges, Fonds Parisien and Anse Rouge form a spectrum of responses to increased deforestation. If deforestation continues unchecked, an area with relatively abundant firewood can expect to experience:

- (1) an increasingly commercialized system of firewood distribution
- (2) a decrease in the quality of firewood in terms of favored species and size of specimens
- (3) a steady but slow decrease in the amount of firewood which can be obtained for a given sum of cash, with a concomitant
- (4) steady but slow increase in the amount of work a commercial harvester must perform to obtain a given sum of cash
- (5) a shift from firewood procurement as labor performed by men to labor performed by women and children
- (6) an increased perception of firewood procurement as an onerous and undesirable task
- (7) a more rapid deforestation of "public" than private land, and
- (8) an increase in the use of charcoal as a substitute for firewood until an end point is reached (apparently represented by the town of Anse Rouge) in which no firewood can be found and the entire population must rely on charcoal which is produced at a considerable distance from residential areas. Port-au-Prince may also represent such an end point.

3.3 Fuelwood Procurement for Charcoal Production

The procurement system for fuelwood which is converted into charcoal is distinct from the procurement system for firewood in both Fonds Parisien and the Northwest. Charcoal production is central to the economy of much of the Northwest, especially in the Anse Rouge-Nôle St. Nicholas-Port-de-Paix area. In the Mare Rouge, Côtes-de-Fer and Bombardopolis areas charcoal production is currently combined with agriculture. Fifty percent of the charcoal consumed in the Port-au-Prince area is said to come from the Northwest. Fonds Parisien has experienced a wave of charcoal production.

which has declined as deforestation has advanced. In Fonds Parisien today, charcoal production is a supplementary economic activity, which is true of other areas of Haiti which are not presently at the center of charcoal production.

3.3.a Personnel

As in the case of firewood procurement, a comparison between charcoal production in Fonds Parisien and in the Northwest is informative. In both regions we may distinguish between those who produce charcoal on a part-time basis and those who have no other livelihood. The latter constitute one of the poorest segments of the rural Haitian population. Individuals enter into the production of charcoal only when they see no economic alternatives for themselves. The only requirements for entry into charcoal production are possession of a machete and a hoe and access to wood, especially to green wood. Only those who collect firewood for commercial sale are poorer than the chabonik (charcoal-makers).

The great majority of the part-time charcoal producers at Fonds Parisien are women. Charcoal production, like firewood collecting, is now viewed as women's work. This development is quite recent. Local residents related this change to the fact that large trees are no longer available, and women are able to cut the saplings which remain on "public" land. It would be a mistake to take this as the sole explanation, however. There is nothing self-evident or inherent in women's "inability" to cut down large trees: in other countries women charcoal producers cut down very large trees with nothing more than machetes. Other factors have come into play at Fonds Parisien. As the returns on charcoal production decreased with increased deforestation, economically powerful individuals in the village left charcoal production. At the same time, the opportunity costs

for entering into charcoal production decreased. For example, with the use of smaller trees special tools such as axes were no longer needed for green fuelwood procurement. In Fonds Parisien, those who now entered the production of charcoal were women. From one point of view, this economic activity opened up for women; from another, it was left to them by the men. In other areas of Haiti, the poorer individuals entering charcoal production have not been exclusively women and this has not been seen as a female occupation. Two male residents of Fonds Parisien were observed making charcoal. They proved to be important exceptions, as they highlighted the contrast between the "old" system of charcoal production and the "new" one. These two men had both cut wood on some of the few remaining private woodlots in Fonds Parisien.

Only a handful of the residents of Fonds Parisien are full-time producers of charcoal. These full-time producers are all older women. There is, however, another group of full-time producers near Fonds Parisien. These are a group of "mountain people" (mount-ndun) who left their homes in the mountains above Fonds Parisien two decades ago because they were unable to continue agriculture there. They have established residences in the "bush" (rajé) a few kilometers from the village itself. These people, who are both men and women, only produce charcoal and other wood products such as poles. They are out in the rajé from early morning until late afternoon and are forced to leave their young children to fend for themselves. These people are largely dependent for their livelihood on the monetary advances made by Fonds Parisien investors in charcoal, which are described below.

The same kind of distinction between local and "outsider" charcoal production can be made in the Northwestern peninsula. Except in the most desiccated and deforested areas, where most of the native population is

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involved with charcoal production, a distinction can be made between "natives" (abitam) and "outsiders" (étranjé; moun an déyò). The latter tend to be full-time producers and the former part-time producers, especially in the more wooded areas of the Northwest. In the Northwestern peninsula in contrast to Fonds Parisien, the majority of charcoal producers are men, according to informants. At least in the wooded areas of the Northwest, women enter into the raking and bagging phases of charcoal production (see below) more than in the cutting phase. It is probable that, as in Fonds Parisien, women in the Northwest enter into the cutting phase of charcoal production in the most deforested areas. (Unfortunately these areas were too inaccessible to be observed during a brief trip to the Northwest. Charcoal producers in the Anse Rouge area, for example, were reported to walk more than six hours to procure wood in Morne Tanté.)

3.3.b Charcoal Production Patterns

Charcoal production involves several phases: gathering; setting up a kiln; opening the kiln; and packing the charcoal. (These phases are described below.) Any of these might involve a sharing of labor, but the work is usually performed by a single individual. Each person collects his or her own fuelwood, as in firewood procurement, and stores it separately. At Fonds Parisien, a female producer may ask a male relative or friend to help with the kiln. This is considered a favor, however, and is not remunerated. In the Northwest, to the contrary, there is sometimes a division of labor in which a man cuts the wood and sets up the kiln and a woman rakes out the charcoal. Occasionally a producer of charcoal will purchase wood cut by someone else, but at Fonds Parisien this is the exception.

Although workers were hired to produce charcoal in the Jean Rabel - Port-de-Paix area, this is not the usual pattern. Charcoal producers are not paid directly for their labor, but, as with commercial firewood, for their product. At Fonds Parisien, most part-time charcoal producers sell bags of charcoal to intermediaries (machann) who come almost daily from Croix-des-Bouquets in search of charcoal. The relationship of buyer and seller in this case is not one of habitual commerce (pratik) found in other types of exchanges. A producer will sell to any merchant if the price is agreeable.

The situation for full-time producers is often different. These individuals are usually in immediate need of cash for food and other purchases. In order to obtain cash they enter into pratik relationships with Fonds Parisien residents who pay them in advance for a sack or several sacks of charcoal. The investor also provides empty sacks which are marked with his or her initials. At Fonds Parisien, the current price paid for a sack of charcoal in advance is ₵5 (\$1.00). The current price paid by intermediaries who buy from Fonds Parisien residents is ₵7 (\$1.40), rendering the investor a profit of ₵2 (\$.40). The investor runs the risk that the charcoal producer will not remit the charcoal, but this is unusual because the full-time producer cannot afford to alienate investors.

3.3.c Charcoal Marketing.

The full-time producer will try to produce more charcoal than the investor has paid for so that he or she may also sell some at full market prices. The ability of a full-time producer to do this is dependent on the extent of this or her immediate need for cash and on his or her physical endurance.

There are three separate ways in which charcoal is sold at Fonds

Parisien. Charcoal is sold in the village market place at the current rate of ₣6 (\$1.20) per sack. Fonds Parisien residents do not sell charcoal in the market place. The people who do sell in the market place are "mountain people" who have produced charcoal without an advance. At the time of the field study (July-August, 1979), charcoal was in very short supply at the Fonds Parisien market place. Intermediaries from Croix-des-Bouquets (machann La Plènn) would by-pass the market place to intercept "mountain people" before they arrived at the village. Even then many intermediaries were unable to find charcoal. It is at this point that the residents of Fonds Parisien come into play. They store the bags of charcoal they produce in their homes and wait for the intermediaries to go about (promóné) asking for charcoal. Rather than return to Croix-des-Bouquets empty handed, the intermediaries are willing to pay \$7 (\$1.40) for each bag. For a Fonds Parisien resident, selling charcoal in the marketplace would not only mean a diminished profit; it would also engender a sense of shame.

The third way in which Fonds Parisien charcoal is sold involves transportation by truck to Port-au-Prince. Producers of charcoal -- or more frequently investors who have received charcoal after paying for it in advance -- transport the product directly to the Port-au-Prince markets, where they sell it wholesale (and occasionally retail). The center for the transportation of charcoal by truck is not at Fonds Parisien itself, but at a place in the "bush" called Fonds Bayard, which is several kilometers further away from Port-au-Prince. Fonds Bayard is nearer to the areas in which the "mountain people" who have moved near the village collect fuelwood. Fonds Bayard is the collection point for bags of charcoal which have been paid for in advance. A number of producers, both

"mountain people" and Fonds Parisien residents, also set up kilns there.

Direct sale of charcoal in Port-au-Prince is less immediately profitable than the other means of sale, primarily because of the transportation costs. While a bag of charcoal obtained for ₣5 (\$1.00) at Fonds Parisien was selling for about ₣8 (\$1.60) in Port-au-Prince, the seller had to pay for transportation (₣1 or \$.20), for the tax (₣.25 or \$.05) and for unloading (₣.20 or \$.04), leaving a net gain of about ₣1.55 (\$.31) per sack. In addition, the seller must also pay ₣2.50 (\$.50) for her own transportation. On the other hand, she may use her profit to buy commodities in Port-au-Prince which can be resold at Fonds Parisien at a further profit.

Several factors come together in decisions about how to market charcoal at Fonds Parisien. Some of these have been mentioned above. Fonds Bayard, while convenient to charcoal producers, is beyond the limit which donkeys coming from Croix-des-Bouquets can travel in one day. In fact the Fonds Parisien market place is a center of charcoal exchange precisely because it is at the limit of a "donkey day" from Croix-des-Bouquets. Therefore, unless producers or buyers of charcoal have an animal with which they can transport charcoal from Fonds Bayard to Fonds Parisien, they must rely on truck transport. Furthermore, because rather large quantities of charcoal come into Fonds Bayard, it is more convenient to store the bags there and sell them en masse in Port-au-Prince.

The charcoal produced at and near Fonds Bayard is generally heavier than that produced in Fonds Parisien, because Fonds Bayard is closer to larger saplings which could not easily be transported to Fonds Parisien on a person's head. No one making charcoal at Fonds Parisien owned a donkey. As noted earlier, there are more profitable uses for donkeys than trans-

porting charcoal, such as the transport of foodstuffs between Fonds Parisien and markets in the mountains.

Other patterns of charcoal production at Fonds Parisien are seldom seen today, but were once important. For example, when trees were abundant a group of men would work together in a work group for cutting trees (koumbit koupé). Then the organizer of the work group (koumbit) would set up a kiln. Several decades ago large scale charcoal production existed with several truck loads being transported daily to Port-au-Prince.

Another arrangement is also used today on those rare occasions when private woodlots are "cleaned out" of underbrush. This is the dè mouatié ("two halves") sharecropping system where the owner of a woodlot arranges for someone else to clean it out and produce charcoal from the wood which is removed. The charcoal producer keeps 60% of the product and remits 40% to the owner of the lot. (This is less advantageous to the producer than payment in advance, in which the producer obtains between 71% and 77% of the net profit made on the product, depending on whether it is sold to an intermediary or in Port-au-Prince).

1.3.d Earnings of Charcoal Producers.

How much does a producer of charcoal make? An informant who is a full-time charcoal producer estimated that it took five headloads of green fuelwood to make a sack of charcoal. This was corroborated by every other informant.) In one day it is possible to gather two headloads. Therefore it takes 2.5 days of full-time collecting to obtain enough wood for a sack. At the longest, it would take 3.5 days to convert the fuelwood into bagged charcoal. If the charcoal was sold for ₣7 (\$1.40), this would represent a (6-day) week's earnings. At her most productive, the informant estimated that she could amass 30 headloads of green fuelwood

before needing to convert it into charcoal and thus cash. It would take 15 days to collect the wood and 3 days to convert it to bagged charcoal. Thus a total of 23 days of labor would produce 6 bags of charcoal worth 442 (\$8.49). This would represent a (6-day) week's earnings of 411.10 (\$2.22). The range in weekly earnings for a producer selling her own charcoal in Fonds Parisien, then, would be from \$1.40 to \$2.22. A charcoal producer paid in advance would earn about 75% of these amounts, thus ranging from \$1.05 to \$1.68. (These figures represent the extreme range of earnings) These figures accord well with Karl Voltaire's estimate of weekly earnings from \$1.40 to \$2.00 for the Northwest, given differences in the quality of the charcoal produced and the intensity of production.

The principles involved in the economic patterns described above are reproduced in the Northwest as well. As would be expected, the "old" patterns which have almost disappeared at Fonds Parisien are predominant in the wooded areas of the Northwest. For example, in the Bombardopolis-Des Forges-Môle St. Nicholas area, most of the potential fuelwood which remains is on privately held land. Owners of this land sometimes produce charcoal themselves, but de monaté sharecropping and renting (anfômè) of land are common. In the latter case, the owner and the renter agree on a price for a given stand of fuelwood, which the renter is then allowed to exploit as he or she desires.

3.3c Charcoal Production on the Northwestern Peninsula.

As in Fonds Parisien, the relationship of local resident investor to outsider producer is, if not exactly exploitative, at least to the advantage of the local resident. This difference between local residents and outsiders is even greater in the wooded areas of the Northwest, because the local residents are often owners of fuelwood and the outsiders are in

a very tenuous economic position. A lengthy interview with an "outsider" wood cutter in the Northwest revealed some of the abuses to which these people can be subjected. Local residents have confronted outsiders cutting wood on state land and have claimed that the land is owned by them. They present papers to back up their false claims. The outsider, uncertain of the tenure of the land and in any case with few local allies, leaves the site and the self-proclaimed "owner" takes up the wood which has been cut. The informant claimed that even local land owners who have engaged in sharecropping relationships with outsiders sometimes threaten them and take all of the charcoal rather than their due portion of it. For these reasons, this informant had stopped making charcoal and was cutting green wood for stakes (yo1) on what he knew to be state land.

On the Northwestern peninsula, as in Fonds Parisien, the most important factors in marketing strategies are capital, means of transport, distance from shipping points, and the degree of competition. Charcoal producers without any capital are forced to accept lesser payment in advance. Relationships between investors and producers in the Northwest do not have the degree of trust that is seen at Fonds Parisien. Many investors will pay the producer in advance only if they have seen that the wood is already cut and placed in a kiln. In the Anse Rouge area, informants report, some people are so desperate for cash that they sell the charcoal "under the ground," while it is still in the kiln. The purchaser then rakes out the charcoal, much to the disadvantage of the producer. Producers without means of transport (in particular donkeys or the physical strength to carry a headload long distances) must sell to intermediaries. The intermediaries, in turn, sell to shippers who transport the bags of charcoal to Port-au-Prince by boat or truck.

Because they are major shipping points, the coastal towns of Anse Rouge, Môle St. Nicholas and Baie de Henne are almost entirely dependent on the exchange of charcoal for their economic existence.

Charcoal is transported to Port-au-Prince in two sizes of sack, with few exceptions. The sack used at Fonds Parisien (and probably in other areas of moderate production) is a standard 100 lb. sugar sack,

A larger sack is used in the Northwest -- one which reflects the transportation of charcoal to shipping points by donkey. The volume of the larger sack, is the equivalent of a "donkey load" (chavj) of a large straw basket with two pockets (kapay), slung over the donkey. Prices paid for a larger sack in the Northwest were about the same as those paid for a smaller sack in Fonds Parisien -- about \$7. This difference is a reflection of competition and transportation costs. Furthermore, it is not necessarily the case that it takes more work to produce a large sack of charcoal in the Northwest than it does to produce a smaller one in Fonds Parisien, because large pieces of green wood are relatively easier to find in the Northwest.

Charcoal production in both Fonds Parisien and the Northwest changes in response to seasonal variation. During heavy rains it is impossible to collect wood and set up kilns. More importantly, charcoal production is abandoned as soon as producers perceive the possibility of alternative employment. In Fonds Parisien during the period of field study, charcoal production was relatively slight because most potential producers were preparing their fields for the the summer tomato planting. Even in the drier areas of the Northwest, it is reported, farmers plant five or six times a year if they see the possibility of rain. Most of these plantings fail, but this has not discouraged local residents from at least trying to

grow crops. In the Northwest, however, it can be expected that seasonal variations are slighter, not only because there is less rainfall, but also because there are many full-time charcoal producers who have no agricultural opportunities. These producers must continue to make charcoal regardless of seasonal variations. In the Northwest, there are two rainy seasons, one for the highlands (April-June) and one for the lowlands (November-January). In Fonds Parisien, the wettest months are May-June and Oct.-Nov.

The fact that there are seasonal variations in charcoal production indicates that, at least for part-time producers, charcoal is not produced in direct relation to market demand. At just those times when market demand is greatest and the price paid the highest part-time charcoal producers are busy in their gardens. They would rather make the risky and relatively long-term investment in agriculture than make a quick return on charcoal.

Fuelwood procurement for charcoal production differs from firewood procurement in that green wood is desired for the former and dry wood for the latter. In heavily deforested areas, such as Fonds Parisien, most of the green wood which can be found is between two and four inches in diameter. In wooded areas large tree trunks can be found as well. In denuded areas, such as the Anse Rouge region, green wood is almost impossible to find. People are reported to be digging long-dead gayak (guaiacum) roots out of the ground as well as using green cactus, which makes a very inferior type of charcoal. The gathered wood is stored in piles until the producer has collected enough to set up a kiln (monté youn founo).

3.3.7 Techniques of Charcoal Production

A kiln (founo) is made by scraping away an area of dirt with a hoe (gou). Often a kiln is set up on the same spot as previous kilns, so this is not a difficult task. The wood is placed on the dirt. The first layer

consists of a few pieces of wood placed along the length of the kiln. The remaining layers are placed over the first layer across the width of the kiln. If there are especially large or especially green pieces of wood, they are placed in between drier pieces so they will carbonize completely. When the wood has been piled up (ranging from a foot to several feet high), the pile is covered with a layer of green, freshly pulled pay razoua grass (or, in the Northwest, leaves). The wood pile is covered with one thick layer of the plants or leaves. One end, called the "mouth" (bouch), is left open. Several sticks which are very dry (or if sticks are not available, very dry straw) are placed in the mouth of the kiln.

After the straw has been placed on the wood, a covering of dirt is placed with a hoe, shovel or basin on the straw or leaves, about 2-3 inches thick. Again the mouth is left open. A small hollow is dug beneath the bottom layer of dry wood at the opening. This is done to let air in to begin the burning. Some very dry straw is placed on the dry wood at the opening. A burning piece of wood or hot coals are put to the straw, setting it on fire. Once the fire has caught well the "mouth" is covered up with straw and dirt. Openings are made longitudinally along the top of the kiln, on each side, to let some air in to promote the burning. Sometimes this is done at the beginning; sometimes it is done along the way, as the wood carbonizes along the length of the kiln. If too many openings are made, the wood carbonizes too quickly and the charcoal is too light (lége). The kiln is allowed to smoulder from two to about eight days, depending on the size of the kiln and the greenness and size of the wood. The larger and greener the wood the longer the kiln must smoulder. After the kiln has stopped smouldering, it is tamped out with a hoe. Soon afterward the kiln is raked (rulé) with a hoe. The dirt and burnt straw

covering are pulled away. The raking motion sifts through the dirt and ash leaving the freshly carbonized wood exposed. Still-smoking pieces of wood are covered with cold dirt. The charcoal maker then sifts through and removes the pieces of wood which have not completely turned into charcoal. They can either be easily seen or are determined by knocking two sticks together to test for hardness. This wood is called boua rabi (literally, "stunted wood"). It is either placed in another kiln to carbonize completely or is used as firewood. Boua rabi makes very good firewood.

Once the charcoal has cooled enough to be touched, it is placed in bags or into straw donkey baskets (kapay).

The largest possible specimens of green wood are sought because they make better charcoal, that is charcoal which is not light (léjé, pay) and which has "resistance" when it burns. Gayak (guaiacum), now something of the legendary past in Fonds Parisien, makes the best charcoal and commands the highest prices. It can still be found in wooded areas of the Northwest, though large specimens have almost disappeared. When available, hard woods such as chènn (oak) and kanpèch (logwood) are most desired for charcoal. In more deforested areas, such as Fonds Parisien, bayaond (mesquite) is the preferred species.

3.3.2 History of Fuelwood Exploitation.

A brief review of the history of fuelwood exploitation in Fonds Parisien is useful in coming to an understanding of deforestation in Haiti. Forty-five years ago, wood was found in great abundance in Fonds Parisien. As older people recount it, there were no restrictions of wood gathering or cutting. Until the past two decades, firewood was available for the picking even in residential areas. When planks were needed, trees were cut by a group of men working in a cooperative work party (koumbit).

There was no remuneration for this work save the meal they were fed at the end of the work. After a tree was cut, its branches were removed and used for fencing (tiray, klotus) for gardens. Charcoal was unknown.

In 1937, the HASCO sugar company needed ties for its railroad line and chose Fonds Parisien as a lumber site. Outsiders came in, bought tree trunks that were cut by local men, and sawed them into ties on the spot. Trees suddenly came to have a value and restrictions on access to trees on private land became greater. 1937 also saw the beginning of charcoal production in the area. The branches that were cut of the lumber trees were converted into charcoal. Charcoal production began not as a response to poverty, but rather as a byproduct of the HASCO railroad tie industry.

Several years later, HASCO left the area but charcoal production remained. Woodcutting was still performed by koumbit. The dè mouatié sharecropping system was also used in charcoal production. Only men produced charcoal; when women were involved it was as traders. At first only gayak (guaiacum) was used for charcoal production; later most charcoal was made from bayaond (mesquite). Several merchants from Port-au-Prince transported charcoal to the city by truck every day.

In the period 1949-1954, agriculture was booming at Fond-Parisien. The irrigation system had been reconstructed and "three-month" millet had been introduced. Charcoal production all but disappeared during this period. The poorly designed irrigation system was all but destroyed by Hurricane Hazel in 1954, and 1955 charcoal production had begun again. This time, women as well as men were involved in the production phase. The same outsiders who had transported charcoal to Port-au-Prince in the 1930's returned. They added a new element by building a boat which

transported producers and charcoal across l'Etang Saumâtre, near the Dominican border, where trees could be found. This traffic was closed from 1957-1960; it was closed again at the end of 1976 and remains closed today.

Deforestation became noticeable during the administration of Estimé (1946-1950). By the early 1970's, it had reached a point where charcoal production began its present decline.

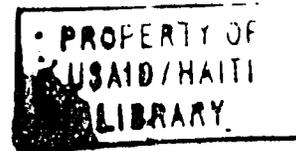
As in Fonds Parisien, charcoal production in the deforested areas of the Northwest reached a peak after a few years and then declined as stocks of fuelwood were depleted without any attempt to replace them. A sign of serious decline is the use of fencing for charcoal production. Wooden fences apparently disappeared in Fonds Parisien in the 1950's. They are disappearing in the Anse Rouge area today. There are important differences between fuelwood exploitation in Fonds Parisien (and similar areas, such as Thomazeau) and in the Anse Rouge - Môle St. Nicholas - Port-de-Paix area. Charcoal production in the Northwest began as a result of serious drought from which much of the area has not recovered. In contrast to the Northwest, agricultural production never completely ceased at Fonds Parisien. Even in its most intensive phase, charcoal production was never the only source of income for the Fonds Parisien. In contrast, deforestation in much of the Northwest has been swifter and more complete; agriculture is still not yet a viable alternative in much of the Northwest.

1.3.h Summary of Charcoal Production.

At the same time, there are important similarities. Among these are the following:

- (1) the more rapid deforestation of public lands than of privately held lands, on which there are greater restrictions of access

- (2) an increase of full-time charcoal production by both men and women as charcoal production reaches a peak
- (3) a period of decline in which dependence on charcoal production remains but there is a smaller cash return for a given amount of labor
- (4) an increase in the numbers of outsiders engaged in charcoal production in a given area, (and perhaps an increase in the amount of abuse to which they are subjected by local residents)
- (5) a decrease in both the quality and quantity of fuelwood resources available for charcoal production
- (6) continued and even increased perception of charcoal production as an undesireable occupation, and
- (7) repeated attempts to return to agricultural production against great odds.



CHAPTER IV

Description of Fuelwood Consumption4.1 Use of Firewood in Domestic Cooking.

Virtually all firewood consumed in the areas under study was used for domestic cooking. The direct consumers of firewood are usually women, although occasionally a man may cook for himself. In all of the areas studied, the "three-stone" fireplace was used for cooking with firewood. This is a simple affair with three stones placed in a triangle. The firewood is placed in the three openings between the stones, and the cooking pot is balanced on the three stones. Those who can afford them build kitchens around their fireplaces. Only the very poor cook on a "three-stone" fireplace in the open air. Rural Haitian fireplaces and kitchens are separate from houses.

The ideal kitchen (kouizinn) is enclosed (klisé) with wattle and has a thatched roof. The fireplace is usually in one corner of the four-walled kitchen. Usually the stones are placed on the ground, but in some kitchens they are placed on a kind of shelf made of stones and cement. Some cooks expressed a preference for the raised fireplace, but ¹most said that they liked both the raised fireplace and the stones on the ground. In a well-built kitchen, the two walls around the fireplace are covered with dried mud to a height of about 18 inches, in order to ventilate the kitchen without letting too much wind blow into the fireplace. Cooks with less elaborate kitchens may place a mat against the outer wall of the shelter to reduce ventilation. Other controls are used to prevent too much ventilation of the fire. If there is too much wind, one of the three openings in the "three-stone" fireplace is closed off with a fourth stone in order to

conserve firewood and prevent the fire from getting too hot. It was evident from interviews with Haitian cooks that they are not fixed in an immemorial tradition of fuelwood use, but enjoy a certain amount of flexibility and even experimentation.

The stones used in the fireplace must be replaced after several months of use, as they tend to split and crumble. There is some discrimination in the kinds of stones chosen for a fireplace. For example, roch (stones) are chosen, but roch pié (limestone?) is rejected. There is a certain amount of care in the size and shape of the stones as there is, of course, no lack of stones to choose from. (Therefore, any improvement on the stone fireplace would have to be either very inexpensive or very demonstrably superior.)

There are strong consumer preferences for different types of firewood, as was mentioned in the last chapter. Large pieces are preferred to small pieces, because the latter have to be tended continuously and produce less heat for the effort. Certain species are preferred to others. At Jean Rabel, tandakayo is preferred because it is "almost like charcoal." At Fonds Parisien (where there is no tandakayo), bayaond (mesquite) is the preferred species.

The economic aspects of the domestic consumption of firewood are discussed in the following chapter,

4.2 Use of Charcoal in Domestic Cooking.

As will be seen in the following chapter, charcoal use for domestic cooking in rural areas is slight in comparison to firewood use. Nevertheless, it is important for several reasons. Charcoal is the preferred type of fuel. Most importantly, a charcoal fire does not have to be tended continuously, in contrast to firewood. As one informant put it, a consumer

of firewood is a "slave" to the fire, unable to leave it to attend to other work. The charcoal user may put a pot of water on the fire to boil, and leave. Charcoal is also preferred because it is "clean", that is, it does not produce the same amount of smoke as firewood, and so does not give food a smoky taste. A number of households used charcoal in preparing food for young children, as they considered it more hygienic.

Because charcoal is burned in a stove (récho), it is more convenient to use than firewood. The récho can be moved to any convenient place; for example, during the rainy season it can be moved inside the house so that the cook does not have to go outside to the kitchen. Furthermore, charcoal is more conveniently stored than firewood.

On the other hand, charcoal is more expensive than firewood and involves investment in a récho. A recho costs about $\text{Ø}1.50$ (\$.30) and lasts for about six months of continuous use. In times of necessity (as during the rainy season, when firewood is in short supply), people make "home-made" stoves by punching holes in old metal basins.

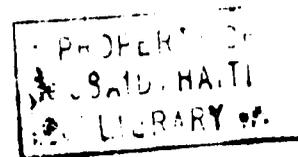
If the expense factor were eliminated, charcoal would be used much more widely in rural areas than is now the case.

4.3 Techniques Used in Cooking.

Almost all food which is cooked on an everyday basis is boiled. Millet, ground corn, rice and beans are the foods which are most commonly cooked for meals. They all involve boiling a pot of water. When meat is eaten, it too is boiled before being grilled. Once the water has boiled, the raw food is placed in it, stirred and often covered until it is cooked. Cooks reported that once the water has boiled, it does not matter how long the food takes to cook completely. That is, it does not matter how hot the fire is, as long as it is not so hot that it burns the food. Only a

very inexperienced cook would produce burned food (manjé sézi). This is an important point in relation to fuelwood resources, because it means that scanty resources (small pieces of wood, inferior species) are an inconvenience in terms of time and labor, but they do not ruin food while it is being cooked. As long as there is enough firewood to make water boil (and sometimes the supply is lacking), traditional meals can be prepared. When firewood is lacking, most households turn to charcoal. A few eat only uncooked foods for a day, such as unrefined sugar (rapadou).

While Haitian cooks would probably be receptive to improvements in fireplaces and fuelwood resources, they would be less receptive to attempts to change their cooking techniques.



CHAPTER V

Overview of the Household Economics
of Fuelwood Procurement and Consumption

5.1 Introduction

In order to obtain an impression of the procurement and consumption of fuelwood at the household level two surveys were undertaken at Fonds Parisien. The first involved a sample of 126 households for which data were obtained concerning population, use of firewood, degree of commercialization, means of procurement, etc. The second survey involved 8 households for which data were obtained concerning the volume of firewood used and the means of procurement over several days. In the latter survey, each researcher choose a poorer and a wealthier household. The information obtained in these surveys should be considered as indicating general trends rather than as definitive. For the purposes of this survey, a household is defined as a group of people for whom food is prepared in a single kitchen.

5.2 Volume of Firewood Consumption.

For the households in the second survey, the reported daily average consumption rate was $.0082 \text{ m}^3$ per day, or about 3 m^3 per year. More importantly, the reported daily average firewood consumption per food consumer (household member) was $.000874 \text{ m}^3$ per day, or $.319 \text{ m}^3$ per year. The figures for which this is an average ranged from $.562 \text{ m}^3$ per capita per year to $.223 \text{ m}^3$ per capita per year. (One household reported a per capita per year figure of $.146 \text{ m}^3$ per year, but this appeared to be significantly underreported.)

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These figures should be considered very conservative for two reasons. First, even though the volumes were carefully measured, additional firewood may have been used which was not reported. Secondly, the survey was conducted in a deforested area of Haiti, and it can be expected that consumption rates are higher in more wooded areas of the country.

The figure of $.319 \text{ m}^3$ firewood consumed per capita per year may be compared with a figure of $.5 \text{ m}^3$ to 1 m^3 for the Sahelian countries (Club du Sahel, 1978) a figure of $.36 \text{ m}^3$ for Central America and the Caribbean (Arnold and Jongma, n.d.).

A comparison with Earl's (1976) figures for Haiti leads to some confusion. Earl estimates that $3,563,200 \text{ m}^3$ of firewood were consumed in Haiti in 1975-4. If we divide this by 4.6 million (his estimation of the population at that time) we get a per capita figure of $.775 \text{ m}^3$, more than twice the figure obtained in the Fonds Parisien survey.

There are several possibilities for this discrepancy. Earl's figure may be highly inflated. The Fonds Parisien informants may have significantly underreported their consumption of firewood. Or the Fonds Parisien figures may indicate the degree to which firewood consumption has declined in a deforested area. If the last explanation is the case, this would indicate that other rural consumers of firewood may be able to suffer declines in consumption without a total disruption of labor and nutritional patterns. Such a conclusion must be taken as a tentative one, however.

It is significant that in three of the four pairs of households, the "wealthier" of the two used more firewood per capita than the poorer, by an average difference of about $.178 \text{ m}^3$ per year. (The fourth pair was not included because of the possible underreporting mentioned above.) In each case the wealthier household purchased its firewood; two of the three

poorer households harvested their own firewood. In the case in which both the wealthier and the poorer household purchased firewood, the wealthier household consumed a full $.334 \text{ m}^3$ per capita per year more than the poorer household. In the two other cases, the poorer households also used less firewood per capita than the wealthier ones, even though the former obtained their firewood without cash.

These figures are suggestive rather than definitive. "Wealthier" and "poorer" were not rigorously operationalized categories, but were rather made on the subjective judgements of the researchers and the contractor. Nevertheless, they do suggest a strong correlation between purchasing power and firewood consumption. The differences in consumption patterns can be expected to increase as deforestation, commercialization and prices increase.

5.3 Firewood Distribution.

The households in the larger survey indicated a variety of firewood procurement strategies. 32% of the households reported that they searched for their own firewood. That is, about a third of the households reported that their firewood procurement was non-commercial. 48% of the households reported that they sometimes bought firewood. That is, one in five households reported that they sometimes bought firewood and sometimes looked for it themselves. 20% of the households only bought firewood. That is, one in five households obtained firewood on an exclusively commercial basis. There is a relatively large degree of commercialization in firewood distribution at Fonds Parisien, a highly deforested area, with almost 70% of the households buying firewood at least occasionally.

5.4 Categories of Firewood Harvesters.

Among the households which looked for their own firewood, at least

occasionally, the majority of the harvesters were children (57%). The girls outnumbered the boys by more than 3 to 1. About 38% of the harvesters were adult women. Less than 5% were adult men. If the harvesters are divided by sex only, 83% were female and 17% were male. Reports on how many harvesting expeditions were made each week varied, but the majority said that they looked for firewood between two and three times in a week.

5.5 Expenditures for Firewood.

Households which purchased firewood reported that they spent an average of \$.09 per day per household, or about \$.012 per food consumer. In a year, then, an average household which purchased firewood daily would spend about \$32.85 for firewood resources, or about \$4.45 per capita. These figures probably represent the high range of expenditures. (Rural per capita personal income is estimated by Zuvekas to have been \$96 in 1975.)

5.6 Firewood Vendors.

Thirty-two sellers of wood served the 82 households in the survey which purchased firewood. As indicated in Chapter IV, this gives a rough estimate of 35 firewood vendors per 1000 residents. In the survey, the vendors named sold to an average of 2.6 households, ranging from one household to nine households. (It should be mentioned, however, that they may well have been selling to households not included in the survey.)

5.7 Charcoal Use.

83% of the households surveyed reported that they occasionally used charcoal. Two households at Fonds Parisien (not included in the survey) reported that they used charcoal exclusively for fuel. These households are among the most well-to-do in the village.

5.8 Household Size.

The average size of the households reporting was 7.6 members. The mode was 6 members. Household size ranged from 2 to 21. Each household depended on one kitchen.

5.9 Meals Prepared.

49% of the households reported that two cooked meals were prepared each day. 42% reported that 3 meals were prepared. Just 9% reported that only one meal was prepared. Informants also reported the principal food prepared in the main meal(s) on the previous day. 52% reported that they had eaten maize (mai); 23% had eaten millet (pitimi); 22% had eaten rice (diri); and 3% had eaten sweet potato (patat). Beans (poua) accompanied the cereals in most of the reported meals.

5.10 Discussion of the Household Data.

The data from these surveys suggest several trends in fuelwood consumption in a rural area which has undergone deforestation. A cross-country study would show that per capita firewood consumption in Fonds Parisien is rather low. At the same time, informants reported that they prepared a higher number of meals per day than is usually reported for Haiti. This suggests that a reduction in the number of cooked meals is not a primary response to deforestation. A number of informants did, however, suggest that they might prepare smaller meals at times when fuelwood is in very short supply. The degree of commercialization in the distribution of firewood is also high: it was probably much lower two decades ago. An average-sized household which purchased firewood regularly would spend a substantial amount of its yearly budget for energy resources. Because this amount is spent in small daily increments, however, it does not appear to be alarming to those who prepare meals. The widespread use

of charcoal when firewood is in short supply is also a reflection of an advanced degree of deforestation.

CHAPTER VI

Local Level Perceptions of the Fuelwood Situation and Efforts to Insure Fuelwood Supplies for the Future

6.1 Local Perceptions of the Fuelwood Situation.

6.1.a Perceptions of Fuelwood Problems.

Local residents in all the research sites recognized that significant deforestation had occurred in recent years. At Fonds Parisien, for example, even young adults remember when the hillsides, now denuded, were covered with trees. Furthermore, charcoal production is perceived as the major immediate cause of deforestation. The production of charcoal was seen as only a link in a chain of causation. Deforestation was seen as a byproduct of more serious problems, especially drought and the subsequent lack of agricultural opportunities.

No informant spoke of entry into charcoal production as something desirable. Instead the necessity to make and sell charcoal was seen as a misfortune. Charcoal production was often contrasted with "work" (travail) by rural informants. Making charcoal is seen as onerous labor, but informants continuously distinguished it from what they considered productive work, saying for example that they had to make charcoal because there was no "work". There is great sympathy for charcoal producers, rather than, for example, resentment towards them for destroying a natural resource. This attitude was evident in almost every discussion of charcoal production and deforestation. This sympathy was shared by forestry agents and reforestation project workers as well as by local current or potential charcoal makers. It is an attitude which must be taken into account and should be built on in the development of programs designed to provide

fuelwood resources.

Many informants perceived that deforestation was related to increased flooding and soil erosion; this information apparently came from forestry and agricultural personnel, the radio and personal observation. A number of informants, especially community leaders and others who had been involved in forestry projects, perceived that deforestation is related to drought. However, they may make too much of this relationship; that is, they seem to think that if trees were planted fairly regularly, there would be no more droughts.

Firewood collection was not seen as a major problem for development, and no informant complained about it unless asked. Problems of firewood collection are seen as a result of deforestation caused by charcoal production. Firewood collection is seen as an inconvenience rather than as a serious problem. In part, this may be a reflection of the fact that women and children are the prime harvesters of firewood, which might lead male community leaders to be unaware of or unconcerned about the problem.

It is important to note that the Creole word "déboisement" (Fr. déboisement) not only means "deforestation" in general, but also "clearing" either agricultural land for planting or pruning wooded areas. The verb "déboiser" is often used with the latter meaning; it is a synonym of the verb taye (Fr. tailler).

6.1.5 Perceptions of Forest Resources.

A number of local perceptions about forest resources were discussed in the last chapter, particularly in regard to fuelwood resources. Some species are preferred to others for firewood and charcoal, because of their "resistance" to burning. Large specimens of wood are preferred to smaller ones for the same reason. Charcoal is preferred to firewood as a fuel.

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In many respects forest resources are seen as a free good. Haiti must now pay for the profligacy of this perception. Fuelwood resources on "public" land are the most "free" in that there are usually no restrictions on access to it. In Fonds Parisien, for example, saplings cut for charcoal production were not considered any more taxable than dead wood collected for firewood. Wood cutting of small trees for charcoal production on privately held land was also not considered taxable in practice. In the Bombardopolis area, on the other hand, wood cutters needed licenses even when they were cutting for charcoal production.

Wood cutting for lumber is another matter. Though legal restraints are not uniformly observed, a cutter of a large tree to be made into lumber would have more reason to be wary than a cutter of a small tree for charcoal. The opportunity costs of lumber production are higher than those for charcoal production in another way as well. Lumber production calls for a specialist, the sawyer, who must be paid to convert the trunk and branches of the tree into planks. Therefore, while lumber production brings much higher returns on a given tree, the opportunity costs are higher. Furthermore, the owner of wood must be prepared to wait until it is mature enough to be harvested for lumber. The cash needs of most rural woodlot owners do not permit the luxury of patience.

When people make charcoal from wood resources that could be used for lumber or food products, they perceive a loss. One can only imagine the anguish of a family that must cut down a fruit tree to make charcoal because of an immediate need for cash. As one informant said, "You can't eat charcoal."

Trees are valued for other reasons besides fuel, lumber and food. As we have seen in the last section, trees are perceived as preventing

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floods and erosion. Trees are highly valued for shade, especially in residential areas, but also in gardens. Trees are also valued as wind-breaks. Trees are also valued for their connections with spirits; most of the large trees remaining in deforested areas related to family spirits.

6.1.c Local Level Perceptions of Reforestation.

The future of fuelwood resources does not seem to be discussed very much in rural communities. There are two reasons for this. In the first place, rural residents do not believe that they have very much control over fuelwood supplies in the present or the future. Secondly, people are more concerned with their day-to-day fuelwood or cash needs than with less immediate problems. General discussions about problems of development are more concerned with irrigation systems, types of seeds, insects, etc. than with deforestation.

Many locally available fuelwood resources are not considered suitable for planting. For example, bayaond (mesquite) and gayak (guaiacum) are seen as sprouting by themselves (i.e. "brought up by God") rather than as being capable of being planted. Informants said that mesquite and guaiacum seedlings could be produced, but that they had not considered planting them because the plants usually grow by themselves. There are two sides to this perception. The first is that trees will grow by themselves under any condition. This perception was held by woodlot owners near Bombardopolis, for example, in the face of the severe deforestation near Anse Rouge, with which they were familiar. The second side of the perception is that local residents cannot do much to promote reforestation with their own resources.

Reforestation is not seen as being connected with fuelwood resources. Local informants perceived reforestation as related to the reduction of

drought and flooding in a rather abstract way. More immediately, they saw reforestation as related to lumber products (in which they may or may not have perceived a possible benefit for themselves).

Reforestation projects, even those proclaimed to be communal forests, were largely perceived to be the work of outside organizations and their agents. The notion of reforestation as a program which would help all community members was not widely shared, except by local agents and others who had an immediate interest in them. Others were doubtful of the extent of community-wide participation in reforestation projects. Reforestation projects were seen to involve exotic species which could reap great profits if successful, using such species as "African mahogany" (kajou afrikenn; Fr. acajou africain) and olive trees. Reforestation projects for fuelwood might have a better chance for a sense of community-wide benefit than projects for lumber or other profitable commodities, if access to the resources were kept open to wide participation.

Finally, reforestation projects are not perceived to be very successful or easily capable of success. Farmers know all too well the hazards of planting in dry areas. In localities where there have been reforestation projects, the results have not impressed local observers. Any program designer would need to be aware of this rather deep sense of cynicism and helplessness.

3.2 Individuals Efforts.

If we define individual efforts to insure fuelwood supplies as those which are wholly initiated by individuals with an eye to the future energy needs of the nation, then none were observed. No individuals were found, for example, who had seeded and planted trees on their own. On the other hand, certain conservation practices were observed: a) owners of wooded

lands tend to restrict access to the fuelwood (especially green wood resources that they own); b) fuelwood harvesters prefer techniques which allow stumps and branches to coppice (houjone); fuelwood harvesters also avoid very young saplings.

6.3 Communal Efforts.

Very few communal efforts (that is efforts wholly initiated by a local group) to insure future fuelwood supplies were observed.

a) Arbor Day (Fr. Fête de l'Arbre), celebrated on June 24, is the major communal effort towards reforestation. A certain amount of mythology surrounds the activities of Arbor Day. It is believed that if very young children plant seedlings on this holiday the trees will flourish. If anyone other than a very young child plants a seedling on Arbor Day it has little chance of growing. This magical power of children does not extend to other days, however. (It is also believed that if a person cuts his or her hair on Arbor Day it will grow back particularly long.) Fruit and shade trees, rather than fuelwood resources, are planted on Arbor Day.

b) Trees which are commonly believed to be sacred, that is to be associated with spirits, are usually left untouched. If they are harvested at all for fuelwood purposes, it is for religious purposes; even then, only a branch from a sacred tree would be harvested. In terms of fuelwood resources this is a small effort at conservation. It is a significant one, however, because the largest trees in a residential area are usually believed to be associated with spirits.

6.4 External Efforts.

An evaluation of programs involved with reforestation and forest conservation is outside the scope of this study. Nevertheless, it may

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be useful to record some impressions of efforts to insure forest resources for the future. By external efforts is meant activities which originate from some agency outside of the local area. It should be clear from the first two sections of this chapter that most of the reforestation and conservation programs which exist are external efforts. The most striking impression of such external efforts is that they are insufficient to begin to resolve the grave problems of deforestation caused by fuelwood exploitation. Trees planted along a national highway, local groves and communal forests are symbolic efforts which are constructive in as much as they inspire an understanding of the problems involved and a motivation to deal with them. However such projects are not constructive if they are a substitute for a program designed to insure sufficient fuelwood supplies for the future.

A number of interviews with local personnel involved in reforestation programs indicated that they seemed well enough motivated to do their work, but were not sufficiently supported in terms of income and other resources. As was mentioned in the last chapter, these individuals are not working in a local atmosphere where there is spontaneous enthusiasm for reforestation.

There seemed to be a great interest among forestry personnel in foreign seedlings which could produce "valuable" trees. For example, at one field site, olive seedlings had been introduced along with lessons on how to prepare olives for food. There is also great enthusiasm for the distribution of seedlings to community councils, church groups, and individuals. In none of the projects, however, did there appear to be a systematic inspection of the distributed seedlings to see if they had been transplanted successfully.

Another serious problem for the reforestation efforts that were observed was lack of water resources for irrigation. This problem has two aspects. First, transplanted seedlings die because they are not sufficiently irrigated. Secondly, the most appropriate time to plant seedlings is during the onset of the rainy season; but this is just the time when local residents are busiest in their gardens and have the least "leisure" time to plant seedlings.

Government forestry sub-agents seem able to do little to curb deforestation caused by fuelwood procurement. The chief duty of those interviewed is to collect a tax of $\$0.25$ ($\$0.05$) on each bag of charcoal which passes through their territory. This tax is collected from charcoal intermediaries. The other duty of forestry sub-agents is to receive fees and grant permission for tree cutting. In a number of the research sites the sub-agents were ineffective in the latter task, for several reasons. First, the sub-agents are not paid employees, so the temptation to circumvent the regulations is great. Secondly the regulations are more designed to control the cutting of trees for lumber than for charcoal. Not only is it difficult to police woodcutting in remote areas, but the green wood taken for much charcoal production is not perceived as being "trees" in the same sense that wood cut for planks is seen as trees. On the other hand, in the still wooded areas of the Northwest (especially near Bombardopolis and Mole St. Nicholas), sub-agents were requiring that charcoal producers obtain papers which permit them to cut wood and to inspect the cutting areas regularly. This was resisted by wood cutters, but was apparently enforced.

CHAPTER VII

Specification of Current and Future Problems

7.1 Deforestation.

The greatest problem involved with fuelwood procurement and consumption in Haiti is deforestation, which results in increased soil erosion, increased aridity and decreased economic opportunities. Virtually all the problems discussed in this chapter are contingent to the problem of deforestation. The alternative solutions discussed in the following chapter are concerned with deforestation in the context of a growing need for fuelwood resources in Haiti.

7.2 Insuring Wood-Based Energy Resources for the Future.

The second major problem concerning fuelwood in Haiti is the need to insure adequate supplies for Haiti's growing wood-based energy requirements. Almost all of Haiti's energy use at the household level is used for cooking purposes, and almost all of this energy is wood-based.

It seems unlikely that suitable non-wood-based energy resources will be available in the near future. Therefore, it must be assumed that wood supplies, now dwindling, will have to be maintained at their present level and then increased as demand increases.

An increase in the demand for all types of fuelwood supplies can be expected for the next several decades, if only because of the natural increase in the population. Demands for charcoal as a fuel can be expected to increase at an even faster rate than demands for firewood because of higher rates of increase in the urban population than in the rural population.

The problem, to paraphrase a Club du Sahel report, is not that Haiti uses too much energy; so the solution is not to curtail Haiti's energy

consumption, at least at the household level. Haiti's rate of energy consumption is one of the lowest in the world, so such a policy would not only be unfair, but misdirected.

7.3 The Role of Charcoal Production.

The contract for which this study was produced was concerned with non-commercial fuelwood, but has necessarily touched on commercial firewood and charcoal production. While all of these fuelwood uses lead to deforestation, charcoal production has contributed most to the problem. Unlike firewood procurement, in which dead wood is desired, charcoal production entails the destruction of living trees. Furthermore, local perceptions of the deforestation problem see charcoal production as the main culprit as well. The firewood problem has not reached the point where there are major changes in diet or cooking patterns. Therefore, when considering the design of programs which deal with the fuelwood question, planners should place greater emphasis on the charcoal situation than on the firewood procurement situation. Problems involved with firewood procurement should not be minimized, but problems involved with charcoal production should be given the higher priority.

7.4 Motivation for Charcoal Production.

Charcoal is produced not only because there is a market demand for it but also because producers have no economic alternatives. Charcoal producers perceive the destruction caused by intensive woodcutting. However, they see themselves as having no choice but to make charcoal if they are to feed themselves and their families. For charcoal producers, the problem is not so much deforestation and soil erosion, but rather the fact that they are cut off from agricultural production and that they are forced by circumstances to perform undesirable and unrewarding labor.

The charcoal producing population can be expected to increase in the future.

7.5 Fuelwood Resource Management.

There is little management of fuelwood as a resource. This is caused by several factors, among them:

- a) uncertainties in the land tenure system, which result both in the uncontrolled use of wooded land and in a lack of interest in improving the value of land by many land users.
- b) lack of the administrative will and ability to institute an effective national forestry service; this is reflected in a corps of forestry agents and sub-agents (Fr. Agents et Sous-Agents Forestiers) who are insufficiently paid and trained, and who do not adequately enforce conservation measures; instead, these agents and sub-agents collect a $\text{G.}25$ (\$.05) tax on sacks of charcoal, the revenue from which does not appear to be used for forestry or other social policy implementation.

7.6 Harmful Fuelwood Harvesting and Agricultural Techniques.

The harvesting of green wood for charcoal production has already been mentioned as one of the major fuelwood problems in Haiti. In addition, certain techniques used in green fuelwood and firewood procurement are harmful because they do not allow living wood to coppice and regenerate. For example, living stumps are dug out for charcoal production and some green wood is destroyed in the search for dry firewood. Furthermore, there is usually no systematic spacing in the selection of trees to be harvested. These harmful techniques are not so much the result the of ignorance as much as of economic desperation.

Moreover, certain agricultural techniques, such as the clearing of land by fire in the Northwest and other areas, hinder forest regeneration. Such techniques are used on land containing gayak (guaiacum) saplings, for example.

7.7 Current Reforestation Efforts.

A number of current reforestation efforts are ineffective for the renewal of energy resources because:

- a) they are designed for erosion control and purposes other than fuelwood resources
- b) they are based on a system which rewards the distribution of seedlings but not their successful transplantation
- c) they sometimes use exotic seedlings which are not suitable for fuelwood resources
- d) they are sometimes based on an ideal of community cooperation which does not fit with current patterns of fuelwood procurement.

7.8 Perceptions about Fuelwood.

Some perceptions of trees and of reforestation are not conducive to resolving the above problems. Among these are:

- a) the widespread perception that fuelwood resources are, if not free goods, at least very inexpensive ones.
- b) the perception that trees will grow by themselves, even in areas where there has been severe deforestation
- c) the perception that reforestation is an activity initiated by external agencies which use expensive foreign species for the purpose of planting communal forests of no immediate use.

7.9 Labour Involved in Firewood Procurement.

Firewood procurement is becoming increasingly burdensome and expensive. At the same time, firewood is becoming inferior in quality as well as quantity. The task of firewood harvesting often falls to women, who for this work must expend time and energy which could be used in other productive labor. In Port-au-Prince, Anse Rouge and other centers, the labor involved in obtaining firewood has become so great that the population has turned to charcoal as its major domestic fuel. This trend can be expected to continue in other towns, as the distances to available firewood resources become greater and greater. In this way, the rate of demand for charcoal will accelerate even more rapidly than the population of town and urban centers, thus increasing the rate of deforestation.

7.10 Inefficient Fuelwood Consumption.

Neither firewood nor charcoal is consumed in the most efficient manner possible. The open "three-stone" fireplace wastes a great deal of the heat generated by firewood, as does the récho or charcoal cooker. This is a problem of the technical means of conserving heat rather than of some time-honored tradition of fuelwood consumption. The problem here is of finding a more efficient means of burning fuelwood which is cost-effective. The traditional fireplace is a free good and the récho is inexpensive; and Haitians cannot afford to invest in expensive new technologies.

CHAPTER VIII

Socially Acceptable Alternative Solutions to the Problems

The following recommendations with respect to program design have emerged from the study. 8.1 is concerned with problems of fuelwood-based energy consumption. 8.2 through 8.11 are concerned with problems of production.

8.1 While the most serious problems which stem from the fuelwood situation in Haiti are evident at the procurement phase, solutions may emerge from directed changes in the consumption of fuelwood. Increasing the efficiency of fuelwood consumption could significantly reduce the ecological pressures caused by fuelwood procurement, especially for charcoal production. The diffusion of technological improvements in charcoal and firewood cookers would be simpler and more socially acceptable than changes in fuelwood procurement systems or forest management. This does not mean that improved efficiency of fuelwood consumption could be a substitute for reforestation or controlled cutting, but rather that it should be given priority as an important complementary program.

Technical improvements in fireplaces or charcoal cookers could find ready acceptance in Haitian kitchens if they were (1) very inexpensive, (2) demonstrably superior to present technologies, and (3) highly attuned to local tastes, habits and concepts. The difficulties involved are more technical than social and cultural, principally because of the first two requirements. New types of cookers or fireplaces would have to be inexpensive almost beyond the imagination of most Americans; an improved stove which cost "only" \$5 would be irrelevant for the vast majority of Haitian kitchens. The superiority of even an inexpensive cooker would have to be

evident enough to enable Haitians to decide to invest in it, since household income is so low.

Designers of improved fireplaces and cookers should work both with Haitian cooks, experimenting in Haitian kitchens, both rural and urban; and with Haitian artisans. As indicated in Chapter Four, Haitian cooks are often both experimental and articulate. Furthermore, Haitian mechanics and artisans are often both ingenious and frugal, as even a casual observer of the repair shops on the sidewalks of Port-au-Prince can testify.

Any introduction of new cookers would have to take into account the structure of the local artisanal sector. In particular an effort would have to be made not to disrupt the incomes of those presently manufacturing cookers, for example by training programs in the production of the new model of cooker.

8.1.a Charcoal Cookers (rècho) if significantly improved, could have a great impact on reducing the rate of deforestation. Because most charcoal cookers are used in urban areas, especially Port-au-Prince, an improved model would be relatively easy to diffuse. Furthermore, because urban incomes are higher than rural incomes (\$385 vs. \$96 according to Zuvekas) an improved rècho might be marketable for as high as a few dollars (though obviously a less expensive model would have a much greater impact). Because of the relatively high cost of urban fuel, urban consumers would be more highly motivated than rural consumers to invest in a more expensive charcoal cooker. (However, it should be noted that this study did not include urban fuelwood consumption patterns.)

8.1.b An improved stone fireplace would help to reduce firewood consumption in rural areas. Because most present rural fireplaces cost nothing, initial efforts should be made to improve fireplaces made of stone or other free

goods, such as the "five-stone fireplace" suggested by Tibor Nagy. Any manufactured firewood stove which cost more than a few gourdes (\$.40-,60) would be difficult to distribute, however, even in areas with a high degree of commercialization in firewood exchange. Experimentation and introduction of improved models would have a higher chance of success in the more deforested areas.

8.1.c Solar cookers do not appear to be a practicable solution to Haitian energy needs, at least at the present level of solar technology. Nevertheless, experimentation might begin with the use of very simple solar heaters in institutional settings, such as clinics, where they could be used to boil water. The local personnel involved should be highly motivated and should be consulted about any problems and possible improvements in the use of solar heaters. With further advancements in solar technology, a next step would be to determine the feasibility of adapting it to local Haitian industries such as essential oil plants and distilleries. Some use of solar heaters has already begun in Haiti, for example at the Brothers' School in La Vallee de Jacmel.

8.1.d If forest resource projects (see below) are successfully underway and if a more efficient charcoal cooker can be produced, program designers should conduct a study to determine the economic and ecological feasibility of making charcoal more available to rural consumers. It is commonly assumed that charcoal uses more forest resources than does untransformed firewood, but this can vary widely. Charcoal is preferred to firewood as a fuel by rural consumers, as indicated in Chapter Four, and its use would reduce the amount of time and labor required for preparing meals.

8.1.e Research on the design of improved cookers and fireplaces can be fruitfully coordinated with research on nutrition in Haiti because it would

involve detailed examinations of the different kinds of meals cooked, of how long it takes to cook them and of the specific effects of specific new technologies on meal preparation and content. Researchers involved in nutritional studies in Haiti should pay attention to possible changes in diet or food preparation as deforestation increases.

8.1.f The Mission should continue to expand its contacts with others interested in developing appropriate technology for more efficient use of renewable fuelwood-based energy resources. For example, the Club du Sahel report discusses the possible feasibility of transporting wood chips instead of charcoal for urban fuelwood consumption; it would be of interest to know if this idea has been followed up. Other examples, such as the solar technology laboratory associated with the AID-supported Institut d'Economie Rurale in Bamako, Mali, can be cited.

8.2 Forestry Project Design.

The concept of "reforestation" should be understood as a series of related but distinct concepts which are concerned with different local level interests in Haiti. For example, the reforestation or conservation of privately owned woodlots with hardwood trees suitable for lumber is a very different proposition than the establishment of regenerating forests for energy production. At least four different social-ecological situations exist in which reforestation or tree conservation programs might be established.

--The first is state-owned or other "public" land which could be used for charcoal production.

--The second is privately held woodlots which are used for lumber or charcoal production.

--The third is privately held gardens which would be suitable for fruit tree production.

--The fourth is land that could be used by the "community" at large for reforestation projects of various types.

Each of these four situations involves different local interests who should be approached accordingly. In many cases the results of reforestation in these different social situations may be the same (increased erosion control and fuelwood sources, for example), but the approach to program design should be specific for each local situation.

8.3 The Use of Charcoal Producers in Reforestation for Energy Use.

8.3.a People would rather "work" than make charcoal. Therefore, if a reduction in the production of charcoal in a given area is desired, current charcoal producers must be provided with alternative opportunities for making a living. To the extent possible, local resources should be used in providing alternative opportunities. An example is the HACHO crafts workshop program (Fr. artisanat) in the Northwest. In this program, locally available palm fronds, bamboo and cotton are used to produce handicrafts for sale elsewhere.

8.3.b One of the most useful alternative opportunities for charcoal producers would be the reforestation and maintenance of wooded areas which have already been, or are now being, deforested for charcoal production. These former charcoal producers would have to be trained, supervised and paid for their services. The importance of these three elements in such a program cannot be over-emphasized. Without training and supervision, reforestation cannot succeed. If the workers are not paid at least a subsistence wage, they will return to their previous occupation, deforesting the land to make charcoal.

A reforestation project employing former charcoal producers which did not have supervision and safeguards for the proper compensation of laborers would be worse than no project at all, because it would deepen feelings of cynicism and helplessness among to the target population.

8.3.c One consequence of the need to use current charcoal producers in reforestation projects is the necessity of keeping wage levels in such projects attractive to impoverished charcoal producers rather than to other less impoverished local residents. If wage levels are too high, charcoal producers will be pushed aside by more powerful residents eager to enhance their incomes.

8.3.d A project involving replanting by former charcoal producers would be best initiated on state land, though an attempt might later be made to incorporate privately owned land if the project has enjoyed success on state land. The cutting of wood on land designated for such a project would be forbidden or strictly controlled. It can be expected that charcoal makers will respect such orders if they cover a specifically delineated area, as this has been the case already with regard to privately owned land. Nevertheless, a resident forest guard (Fr. gardien forestier) should be hired to maintain vigilance.

8.3.e Such a project would not necessarily reduce the deforestation of an area, at least at the outset. Individuals taken out of charcoal production would probably be replaced by others. Nevertheless, there would now be some people planting and maintaining trees in the given area rather than destroying them.

8.4 Impact on Intermediaries.

Any reforestation project design which involved a massive reduction in charcoal production or major changes in marketing patterns would have

to take into account the impact of these changes on charcoal intermediaries, particularly those in the towns of the major charcoal producing areas which are almost wholly dependent on charcoal. Itinerant charcoal buyers would also be severely affected. Since it is not recommended that project designers attempt to implement massive changes in charcoal production and distribution, these populations should not be unduly affected by modest reforestation or conservation projects.

8.5 The Use of Forestry Agents.

8.5.a No reforestation project will work if it is not directed by carefully trained and regularly paid supervisors who live in the project area. Reforestation projects which employ former charcoal producers will fail if the compensation the workers are to receive for their labor is siphoned off at higher levels. This is not simply a question of values or ideals. If potential charcoal makers are not compensated, they will have to seek another source of income, namely charcoal production.

Therefore, two changes must be made. First, a corps of sufficiently trained local level forest managers must be established. Secondly, a reward system which would contribute to program success must be designed for such managers. Managers should be rewarded for their successes in effectively transplanting seedlings & maintaining the transplants until they reach maturity, perhaps through a bonus system. Currently, forestry agents appear to be rewarded, emotionally, if not financially, by the number of seedlings they produce and distribute rather than by the success of the transplanted seedlings. Furthermore local forestry agents must receive a regular salary which is sufficient to keep them from seeking other part-time work (such as agriculture) or from needing to engage in "hijnes" with project resources. The work of local forestry agents

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should be reviewed by Creole-speaking supervisors directly responsible to the funding agency. These supervisors should be sufficiently attuned to the local scene to be able to detect any abuses which may occur.

8.5.b Several possibilities exist for the recruitment of such forestry agents or managers. Individuals currently working as forestry agents might be recruited, as they are part of an already existing system. However, in order to be effective they would have to be trained to do more than collect taxes on charcoal and tree-cutting. They would have to adjust to the new reward system. Before deciding to employ already existing (Fr.) agents forestiers, it would be advisable to review the work of the Fonds Agricole, which is beginning such recruitment in the Northwest area. Another possibility for the recruitment of such personnel is to hire and train people from outside the local area for forestry work. This approach has advantages and disadvantages. On the one hand, the agent would probably be more responsible to the funding agency and its reforestation goals and less influenced by local interests which might interfere with the project. On the other hand, the agent would have to be sufficiently motivated and rewarded to accept a position in an unfamiliar rural locality.

8.6 Forest Conservation Projects.

8.6.a In addition to reforestation projects involving former charcoal producers, projects should be designed for the conservation of already existing wood, whether on public or privately held lands. Such a project should include an educational element and a policing element. While a total ban on all woodcutting over a large area would be difficult to police, the banning of woodcutting in much more restricted local areas could be maintained -- if they were visited frequently by the kind of local forest agent discussed in 8.5.

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8.6.b The area to the Northeast of l'Etang Samumatre, which was an important center of charcoal production, has been effectively removed from cutting since the end of 1976. Program designers should seek permission for a forestry expert to visit this area to determine what kind of natural regeneration can occur in such an area if cutting is banned.

8.6.c A second method for conservation would not be a ban on cutting, but rather the establishment of controlled cutting on public lands. While it is difficult to forbid the cutting of wood to people who have no other livelihood, it should be possible to make it more attractive for them to cut wood in one area than in another, through the availability of favorable species and larger specimens, and the removal of nuisances like cacti. If an area was sufficiently attractive to charcoal producers, they would be willing to submit to controlled cutting regulations.

A pilot project for the controlled cutting of standing wood is being established at Grande Savanne, a coastal village in the Northwest between Gonaives and Anse Rouge. This project, funded by the Fonds Agricole (working in collaboration with RACHO), involves the "cleaning" of a wooded area of cactus and the controlled cutting of mesquite for charcoal production. This project has begun with the cooperation of the local community council, but the project designer expects to attract charcoal producers to the area once it has been cleared of cactus. The progress of this pilot project should be reviewed before similar ones are designed.

8.6.d Owners of existing woodlots which produce charcoal can be encouraged to conserve their food supplies. Education is an important factor. Many owners of woodlots do not now see the importance of conserving wood, even if they knew that a longer term investment in lumber for planks or posts has a higher rate of return than short-term investment in wood for charcoal.

In the Northwest, farmers regularly burn gayak (Guaiacum) saplings as a means of clearing land for planting. An attempt should be made to introduce better land-clearing techniques. The attitude that tree planting is not necessary because many species of "trees grow by themselves" is common. An attempt should be made to convince land owners that they can intervene to increase their stocks of trees. While some woodlot owners must destroy their standing wood out of economic necessity, others might be responsive to education through demonstration, especially in areas which have enjoyed successful reforestation projects. Because of increased use of Creole by radio stations, the radio should be explored as a medium of education about reforestation and conservation as well. Such education should stress the immediate interests of farmers in conserving their standing wood at least as much as discussing deforestation as a national problem. Emphasis should be placed on the economic benefits to the owner of woodlots which can be regenerated to produce charcoal periodically instead of completely denuded. (Without adequate land tenure and restricted access to privately held woodlots, however, it may be in the interest of some land holders not to improve their land by planting or conserving trees.)

8.7 The Use of Mesquite as a Fuelwood Resource.

A forestry expert should explore the possibility of increased use of mesquite (bayaond) in reforestation projects, especially those intended for fuelwood resources. Mesquite grows in the most arid regions of Haiti. It produces charcoal, firewood and house posts of good quality. In a communal woodlot, for example, crooked specimens could be used for fuelwood, while straight specimens could be used for posts. Furthermore, animals such as goats do not eat mesquite seedlings because of their bitter

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taste, according to informants. Even though it is not as fast-growing as some imported species, such as leucaena, mesquite seedlings can be easily produced almost anywhere in Haiti without the need to rely on foreign species and nurseries. Too often, "reforestation" in Haiti means the planting of exotic species such as olive trees, which, while valuable, do not meet the immediate needs of local residents (especially for fuel-wood). This encourages the idea that reforestation must involve "fancy" species and foreign donors, when "ordinary" species can often give a more tangible return on the investment of time and labor.

8.8 The Use of Fruit Trees in Reforestation Projects.

Project designers should consider the more widespread distribution of fruit trees to agricultural landholders in rural areas. Here (in contrast to 8.7) consideration should be given to the introduction of hybrid species and especially to the grafting of hybrid species onto a sour orange base. Garden owners can be reluctant to plant even fruit trees in areas in which they might compete with other agricultural produce. The introduction of foreign species of orange, grapefruit, etc. would probably increase the return of the investment in trees, especially in areas with access to urban centers like Port-au-Prince, Cap Haitien and Jacmel. While such a project is not directly related to energy resources, it might increase confidence in the possibility of reforestation.

8.9 Communal Reforestation Projects.

8.9.a Project designers should consider working with local community councils for the planting of trees in public areas. If shade trees were planted along paths and roadways (areas known as teras) as well

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as along irrigation canals, river margins, spring basins, and hilltops, they would benefit all local residents and, if successful, would contribute to confidence in reforestation projects. Such projects require the persistent management of a responsible forestry agent.

8.9.b Once a local community council or other local group is aware of the real possibilities of reforestation and has demonstrated its ability to carry out reforestation projects, the possibility of introducing village woodlots should be considered. The village woodlot is an attractive idea, but program designers should be aware of possible complications. In many Haitian villages, a sense of "communal" interest is low and different rural classes can be expected to have different expectations of a community woodlot. For example, while some rural residents would desire a woodlot for fuelwood, others would want to see it planted for lumber. It cannot be expected that community councils necessarily reflect the interests and aspirations of the rural population at large. For example, we have seen that land owners and charcoal producers may be antagonistic. A project designed to attract the former might not attract the latter and vice versa. This could be a problem with woodlots designed for charcoal resources. Woodlots designed for firewood resources have the additional problem of a relatively long delay between planting and the appearance of suitable dead wood. Perhaps the best type of community woodlot would combine wood resources for posts and poles (poto) with firewood resources. The former are increasingly expensive and difficult to transport. For a more immediate short-term benefit for local residents, it would be advisable to also plant a more fast-growing crop such as sisal (pit) which could be harvested by community residents. Associating the long-term benefits of a communal sisal (or other type of) plantation would

improve the chances for success of the project.

8.10 Reforestation and Primary Education.

Children have been employed as agents of reforestation with some success. Primary schools have been used as distribution points for seedlings, which children usually plant in their yards (lakes) to produce shade trees. This can be a useful practice since, if successful, it can give a child a sense of pride at having grown a tree and a sense of importance of trees. Taking care of one seedling a year is not too onerous for rural Haitian school children, even if they have many other chores to perform. The distribution of seedlings to school children should continue, but a reward system for successful transplants should be established. One possibility is to give each child a seedling at the beginning of the school year and then a certificate of some kind if the tree is still growing at the end of the school year nine months later. (If a child's seedling dies, others should be made available to him or her.) In addition, every rural Haitian school yard should be lined with shade trees.

Furthermore, the curriculum in rural schools should include an expanded introduction to soil and forest conservation. The approach of this curriculum should be as practical as possible.

8.11 Institutional Changes.

If recommendations about institutional changes are found at the end of this report, it is not because they are not important, but rather because other reports over the past several decades have treated them in some detail. It is clear that the recommended alternative solutions discussed above cannot have a major impact on Haiti's fuelwood problems unless the COH has a heightened awareness of the seriousness of the problems

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and strengthens of its administrative capacity to address those problems. Some specific recommendations about forestry services and personnel were made in sections 8.3 and 8.5. Program designers should not only consider training programs for forestry personnel at the regional and local levels; they should make an effort, perhaps through a series of seminars, to increase the awareness and concern of officials at the highest levels of the GOH about the future in Haiti if deforestation is allowed to continue and increase.

In his report, Bengé (1978) recommends the establishment of a Forest Technology Corporation (Fortec) which would have control over fuelwood production in Haiti. While in an ideal situation, the Fortec plan might have some advantages, Haiti does not now have the institutional capacity to absorb such a massive program. An attempt to institute Fortec now could cause disruptions in the fuelwood distributing system on which many people depend.

In Earl's report (1976), he recommends that the ₣.25 (\$.05) tax on sacks of charcoal should be increased. Others have suggested that it be abolished. The important thing is that forestry personnel (agents and sub-agents) who are currently involved in this and other forms of taxation should be retained and rewarded for enforcing constructive forestry laws and conservation techniques. If forestry agents can be rewarded for enforcing taxation on woodcutting and charcoal production -- and if the revenues involved can be appropriated to the improvement of forestry services -- then the taxes should be retained. Otherwise they divert attention and energy from needed services and regulation. Project design emphasis, however, should be geared towards making it attractive to fuelwood harvesters to cut in controlled areas rather than towards restraints which can be enforced only with difficulty.

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Appendix I

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Appendix II

Glossary of Haitian Creole and French Terms

This glossary is provided to help Mission personnel in their discussions with Haitians about the fuelwood situation. The Haitian Creole and French terms used in this report are listed. French equivalents are given when the meaning of the words is the same in both languages. Because the Creole orthography is relatively phonetic, it should be useful to those who speak neither Haitian Creole nor French.

- abitan (Fr. habitant) - rural resident
abonman (Fr. abonnement) - "subscription", contract
(Fr.) agent forestier - forestry agent
anfèmè - lease
(Fr.) artisanat - artisan workshop
- bay flam - set on fire
boub (Fr. bombe) - kettle
boua rabi - "stunted" (i.e. partially carbonized) wood
bouch (Fr. bouche) - "mouth" or opening of a charcoal kiln
boujoné (Fr. bourgeonner) - coppice, sprout up
bout boua - piece of wood
- chabon (Fr. charbon de bois) - charcoal
chaboné (Fr. charbonnier) - charcoal producer
chaj (chaj) (Fr. charge) - donkey load
chodiè (Fr. chaudiere) - cooking pot
- dé mouatié (Fr. deux moitiés) - sharecropping system
débouzman (Fr. déboisement) - removal of trees; pruning; deforestation
diri (Fr. riz) - rice
- éritié (Fr. héritier) - inheritant
étranjé (Fr. étranger) - outsider
- (Fr.) Fête de l'Arbre - Arbor Day
founo (Fr. four, fourneau) - kiln
- (Fr.) gardien forestier - forest guard
gol (Fr. gaule) - wooden stake
- jéran (Fr. gérant) - land manager
- kapay - straw sack for donkey
klisé - enclosed with wattle

klotur (Fr. clôture) - enclosure, fencing
kouizim (Fr. cuisine) - kitchen
koumbit - cooperative work group
koumbit koupé - cooperative work group for tree cutting

lakou - yard; household
léjé (Fr. léger) - light

machann (Fr. marchande) - trader
maï (Fr. maïs) - maize, corn
manjé déni - burnt food
menté youn founo - set up a kiln
moun an depò - from outside (the local area)
moun mèn - from the mountains

paké (Fr. paquet) - headload
patat (Fr. patate) - sweet potato
pay (Fr. paille) - "straw", meaning light
pay razoua - a kind of straw used in charcoal kilns
pikan (Fr. piquant) - thorn; thorny wood species
pit - sisal
pitimi (Fr. petit mil) - millet
poto (Fr. poteau) - post
poua (Fr. pois) - bean
pratik - established trading client
proméné (Fr. promener) - walk around looking for customers

rajé - uncultivated area, "bush"
ralé - to rake
rapadou - raw sugar
récho (Fr. réchaud) - charcoal stove or cooker
roch (Fr. roche) - stone
roch pié - limestone (?)
rou (Fr. roue) - hoe

tayé (Fr. tailler) - to clear of trees; prune
téras - public passageway
ti fachim - small sticks
tiray - fencing
travay - productive work

Appendix III

Glossary of Floral Species

Some of the floral species mentioned by informants are listed below in Creole, French, English and Latin. The information is from Barker and Dardau (1966) and Pierre-Noël (1971). Additional comments are made where relevant.

akajou

(Fr.) acajou

(Eng.) mahogany

(Lat.) Swietenia mahogani (L.)

akasia

(Fr.) acacia

(Eng.) acacia

(Lat.) Acacia lutea (Mill.)

Used for firewood and charcoal. When young it is thorny (pikan) and is removed from woodlots with mahogany and oak.

bayacé

(Fr.) bayakonde

(Eng.) mesquite

(Lat.) Prosopis juliflora (L.)

Preferred for charcoal and firewood. Coppices easily; when young considered a pikan.

boua blan

(Fr.) bois blanc

(Eng.) boxwood or bitter ash

(Lat.) Phyllostylon brasiliense or Simaruba officinalis (L.)

Used for firewood.

boua fè (Fr. bois de fer) - See boua mabi

boua kabrit

(Fr.) bois cabrit

(Eng.) yellow candlewood or ?

(Lat.) Cassia emarginata or Croton sidifolius or Psychotria (L.)

Used for firewood. Goats use for fodder.

boua nabi (also called boua fè)

(Fr.) bois nabi or bois de fer

(Eng.) ironwood

(Lat.) *Colubrina racinata* (Brazn.)

Used for firewood and stakes; goats do not eat. Leaves used for a bitter drink, drunk for refreshment and for fevers.

boua nègres

(Fr.) bois nègresse

(Eng.) wild sarssepilla

(Lat.) *Gilberta arborea* (R & P)

Used for firewood.

boua panvol

(Fr.) bois espagnol

(Eng.) black plum

(Lat.) *Comochadia cuneata* (L.)

Not used for firewood. One of the few trees remaining near the Dominican border. (A possibility for prevention of soil erosion?)

boua pin

(Fr.) bois pin

(Eng.) pine

(Lat.) *Pinus occidentalis* (L.)

Used to kindle fires. Not preferred for firewood itself. The wood of this tree is called boua chandel (Fr. bois chandelle).

chandel - See boua pin

chènn

(Fr.) chêne

(Eng.) oak

(Lat.) *Catalpa longissima*

Preferred for lumber.

flanté

perhaps?

(Fr.) bois flambeau

(Eng.) white torch

(Lat.) *Amyris bolamifera* (L.)

Not good for firewood; a last resort.

frènn

(Fr.) frêne

(Eng.) ash

(Lat.) *Simaruba glauca* (D.C.)

Preferred for lumber.

gavak or gava

(Fr.) galac

(Eng.) guaiacum; lignum vitae

(Lat.) guaiacum officinale (L.)

Most preferred species for charcoal.

gomie

(Fr.) gommier

(Eng.) West Indian birch

(Lat.) Bursera simaruba (L.)

Used for fencing.

gro nèg

(Fr.) gros nègre

(Eng.) ?

(Lat.) ?

Preferred for shade.

kadas

(Fr.) ?

(Eng.) ?

(Lat.) ?

A large cactus sometimes used for firewood after the thorns have been removed.

kaktous or kaptous (one species of which is rakèt)

(Fr.) cactier en raquette and other species

(Eng.) prickly pear and other species

(Lat.) Opuntia antillana (Britt. & Rose) and other species

Used for charcoal production as a last resort in the Northwest.

kandélab

(Fr.) candélabre

(Eng.) milkstripe euphorbia

(Lat.) Euphorbia lactea (L.)

Used as fencing in place of other species; often left in deforested areas.

kanpèch

(Fr.) campêche

(Eng.) logwood

(Lat.) Haematoxylon (L.)

Used for firewood and charcoal production.

latanié - see tonvin

piken

(Fr.) piquant

A general term used for thorns and thorny species, including akasia and bayond as well as many species not considered useful.

poufreuf

(Fr.) ?

(Eng.) ?

(Lat.) ?

A species considered very poor for firewood, as its name might suggest.

séd

(Fr.) ?

(Eng.) ?

(Lat.) ?

Considered good for lumber.

tandakavo

(Fr.) ?

(Eng.) ?

(Lat.) ?

The preferred species for firewood in the Northwest.

tochan

(Fr.) torchon

(Eng.) dish-cloth gourd; vegetable sponge.

(Lat.) *Luffa cylindrica* (Adans.)

Sometimes used for firewood as a last resort; used for cattle fodder on occasion.

tenrin

(Fr.) latanier

(Eng.) Puerto Rican hat-palm or California Washington palm

(Lat.) *Sabal causarium* (Cock) or *Washingtonia filifera* (Lind.)

The inner fronds of this species are called latanié in Creole; they are used for hats, etc. The bark, called zo latanié (palm bone) is used for firewood as a last resort.

Appendix IV

Photographs

1a (top)

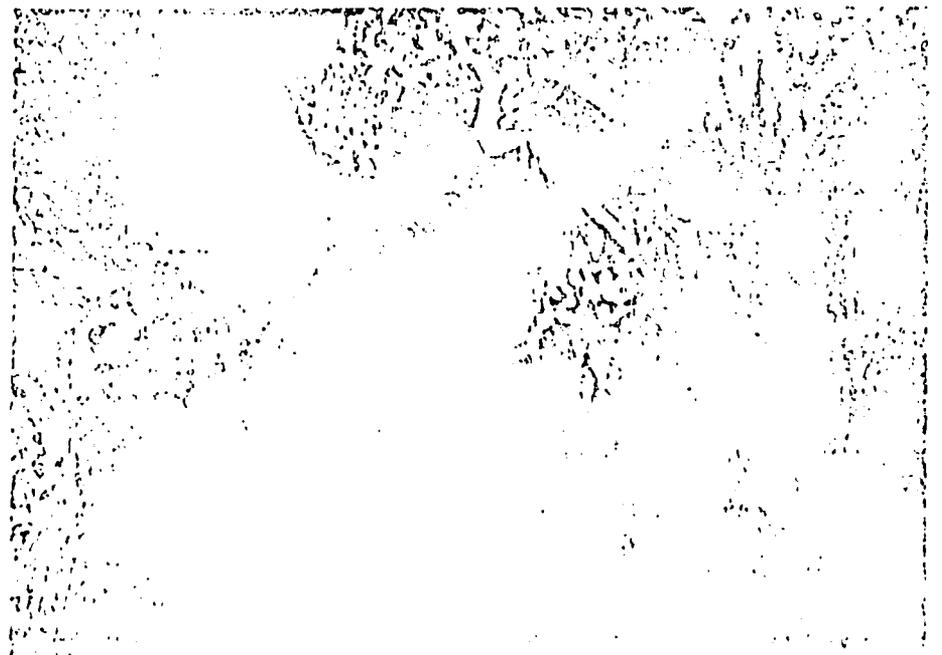
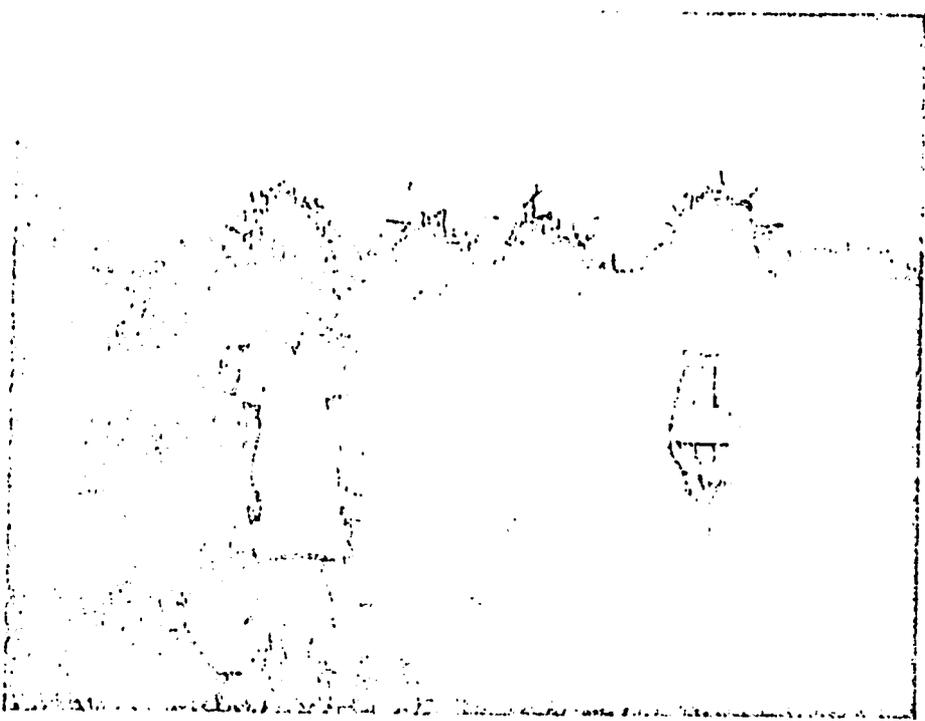
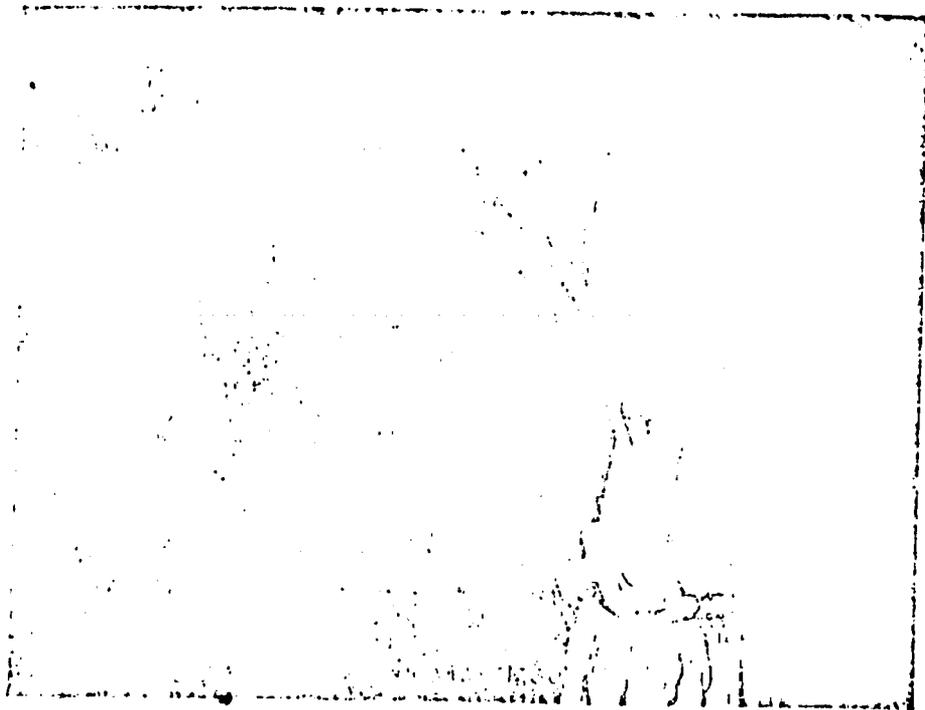
A girl at Fonds Parisien harvesting firewood in the "bush" (rajó). She is tearing the green parts from the dead parts of the wood she has picked. Note the lack of full-grown trees in this and the following photograph.

1b (center)

Four girls at Fonds Parisien carrying headloads of harvested firewood. The expedition took only forty minutes, but the firewood was of inferior quality, even for Fonds Parisien. These headloads would probably bring less than \$1.50 (\$.30) if sold. However, they were procured for direct domestic use, not commercial exchange.

1c (bottom)

An adult full-time wood harvester at Fonds Parisien, using a machete to shear leaves off a green branch. On this expedition she is harvesting both firewood and green wood for garden stakes (gòl) which a client has ordered.



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2a (top)

An enclosed (klisè) kitchen at Fonds Parisien. On the right is a cooking pot (chodiè) on a standard "three-stone" fireplace. In the center is a covered kettle (bonb) which rests on a "four-stone" fireplace to demonstrate how the "three-stone" fireplace is closed up during very windy weather. The dark pieces of firewood beneath the kettle are partially carbonized wood (beaa rabi) which have been taken from a kiln. They are prized as firewood. At the left is a charcoal stove (récho) containing ashes and bits of charcoal. One of its three legs and one of the two handles can be seen.

2b (center)

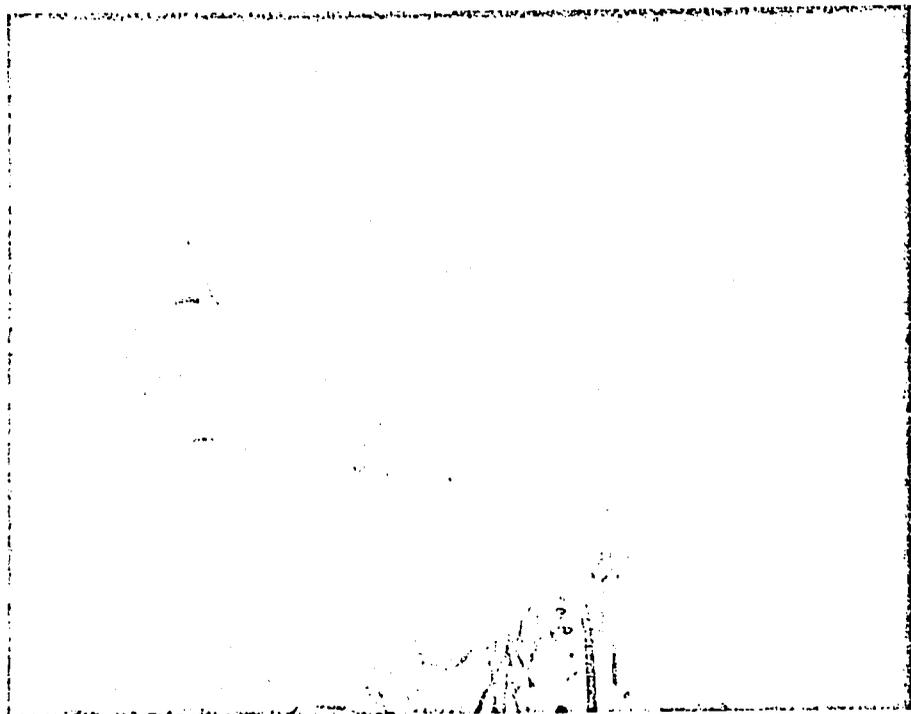
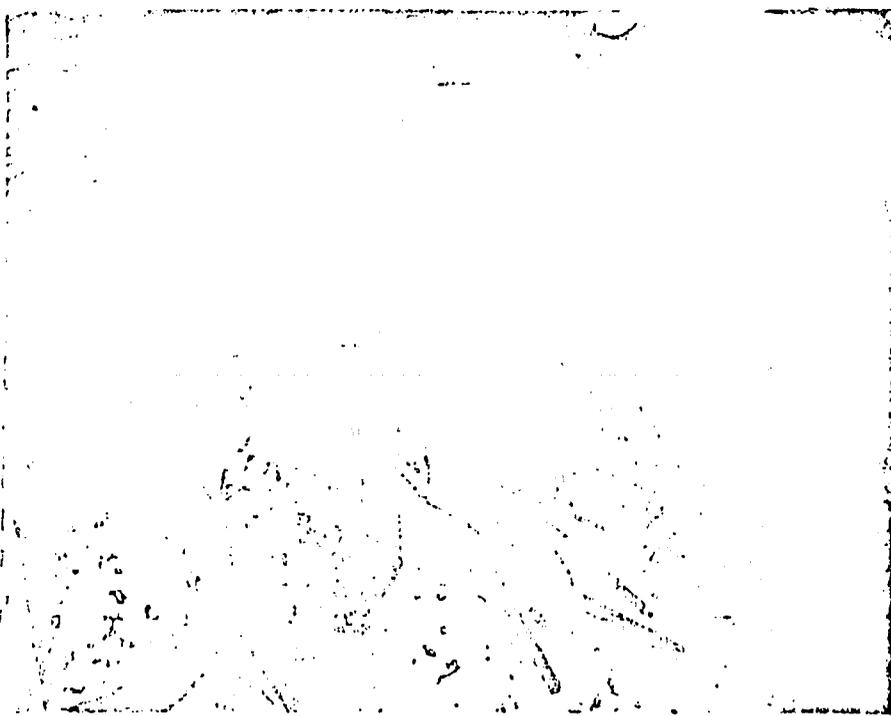
A young girl preparing a three-stone fire on the Northwestern peninsula. Though this is a wooded area, the household was temporarily out of firewood, usually procured by a man in cultivated areas. The firewood seen in this photograph was procured by the girl and her mother near the kitchen.

2c (bottom, left)

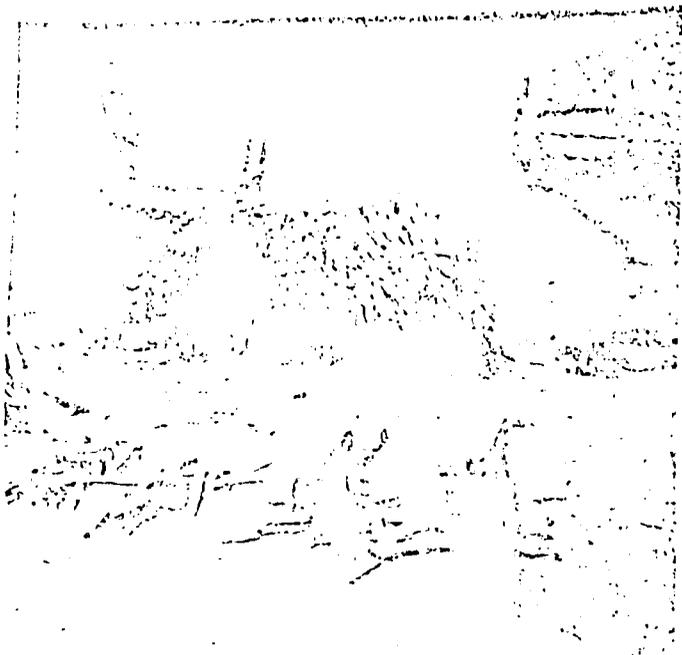
Firewood for sale in "lots" in the market place at Thomazeau in the Plaine du Cul de Sac. In the left foreground are two lots of firewood for sale. In the right foreground are two lots of dried roots for sale. Note the large headloads of firewood stored in the background. To the right of these headloads is a small amount of lotted charcoal, also for sale.

2d (bottom, right)

Firewood for sale in the market place at Jean Rabel in the Northwest. The large pieces of firewood in the foreground are lotted according to species. The more reddish wood on the left is kampèch (logwood). Compare this wood with that available at Thomazeau, a more deforested area.



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3a (top)

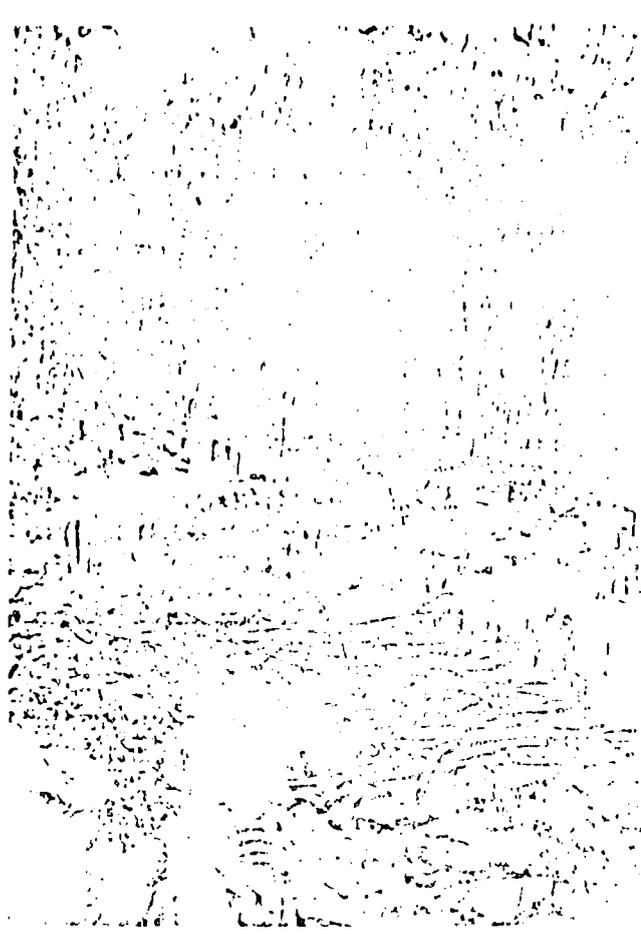
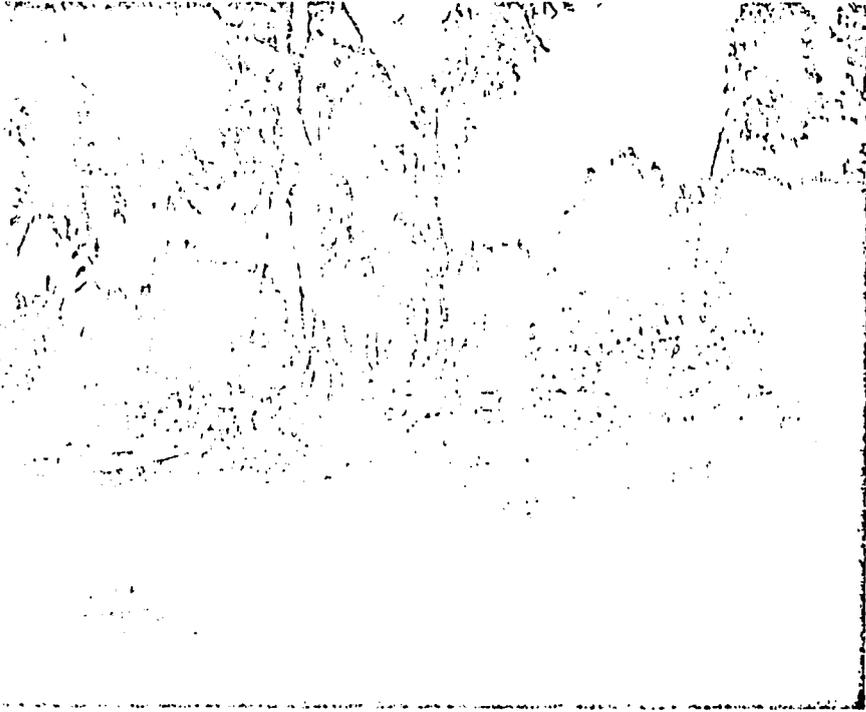
A fuelwood expedition returns from the mountains near Fonds Parisien. The four women in the foreground are carrying green wood for charcoal production. Each will set up her own kiln. The women are part-time producers who collected wood over a three-week period. The young boy in the background is carrying dry wood for firewood.

3b (center)

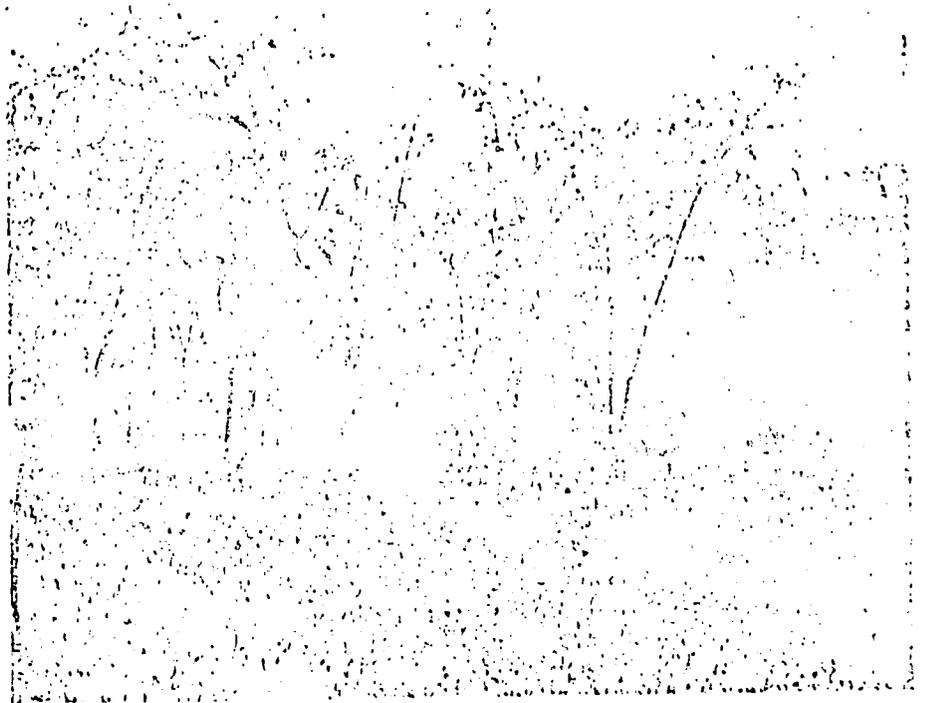
Two of the charcoal producers return from the "bush" (rajé) with loads of grass (pay razoua) to be used in their kilns. Some of the green wood they have collected previously is in the foreground. Note the mesquite in the background; this is a residential area where there is relatively restricted access on fuelwood procurement and mesquite is allowed to grow to maturity.

3c (bottom)

The male cousin of the woman in the red dress (seen in the photographs above) is helping to stack her fuelwood. The green wood of the woman in the black dress has already been stacked in a smaller kiln (in the foreground, right side). Note the two piles of grass (pay razoua) on the extreme right side of the photograph. Wood stored by another charcoal producer can be seen just behind the man in the center of the photograph. In the background is an animal pen.



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8a (top)

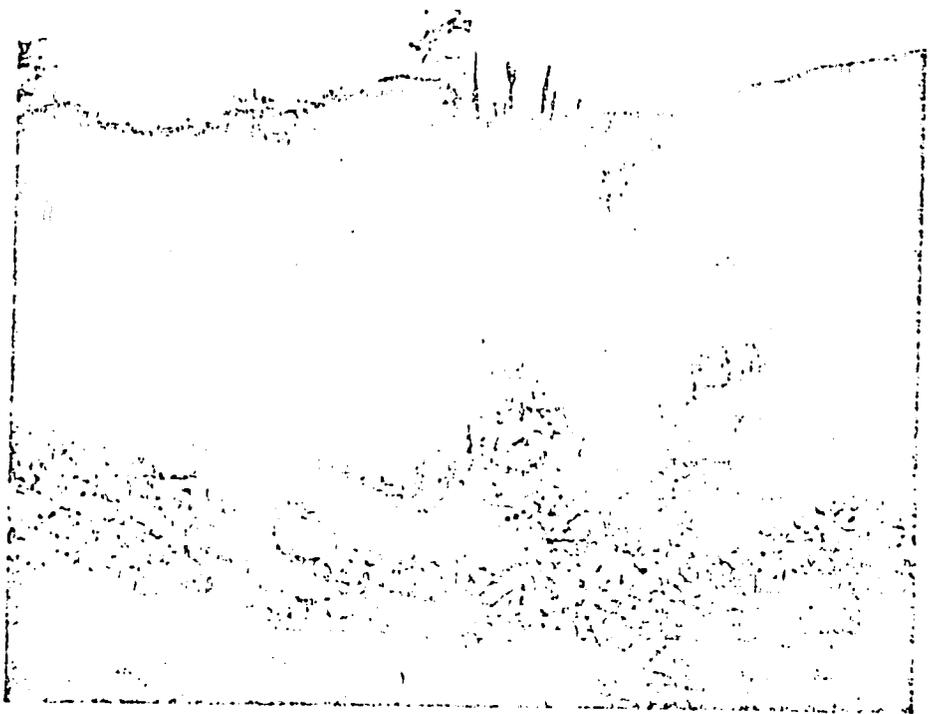
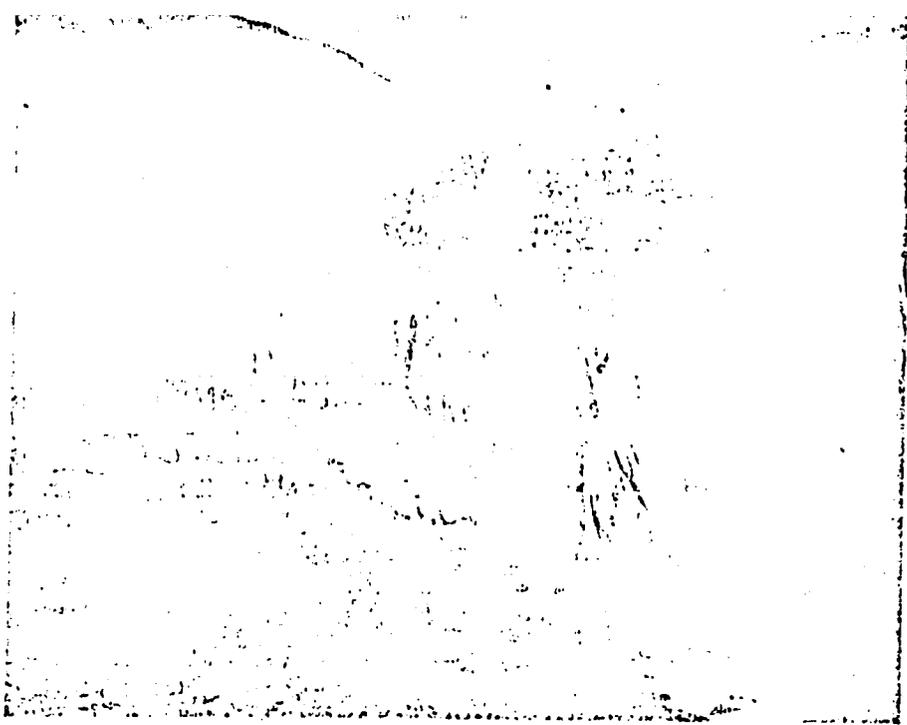
A charcoal production site near Bombardopolis in the Northwest. This area has been cleared for planting. The saplings have been cut and converted to charcoal. The kiln had just been opened and some of the charcoal placed in a sack, lower left. The dark pieces of wood are incompletely carbonized (boua rabi) and will be placed in another kiln. This form of land clearing is a significant cause of deforestation in the Northwest.

8b (center)

A large tree that has been partially harvested for charcoal production in a heavily wooded area of the Northwest. Branches of the tree have been cut off and lie on the ground waiting to be placed in a kiln.

8c (bottom)

A very large kiln in a heavily wooded area of the Northwest. Tree trunks are stacked in a kiln that stands several feet high. The wood has been partially covered with leaves.



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4a (top)

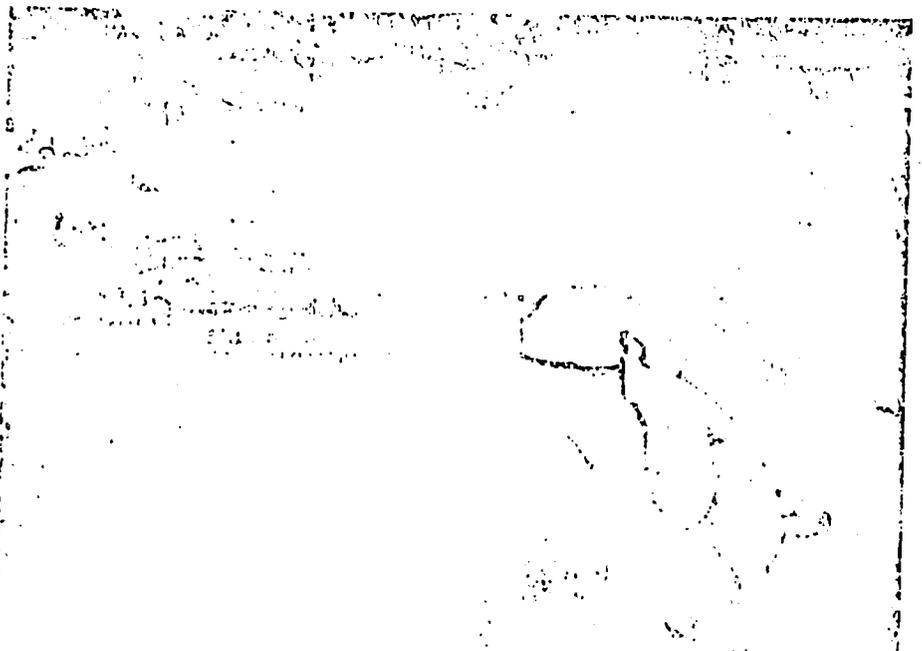
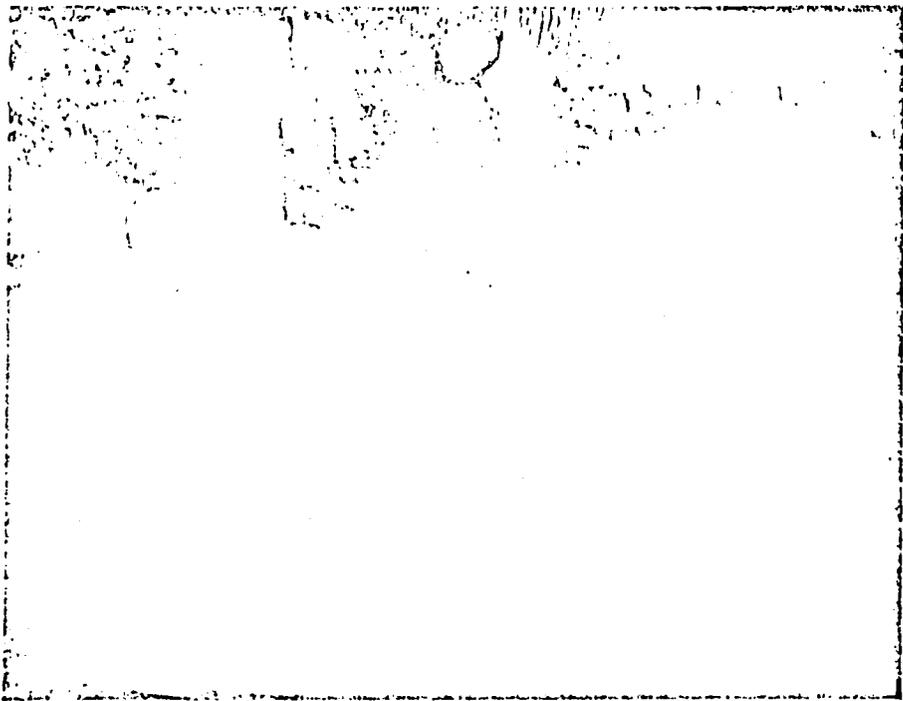
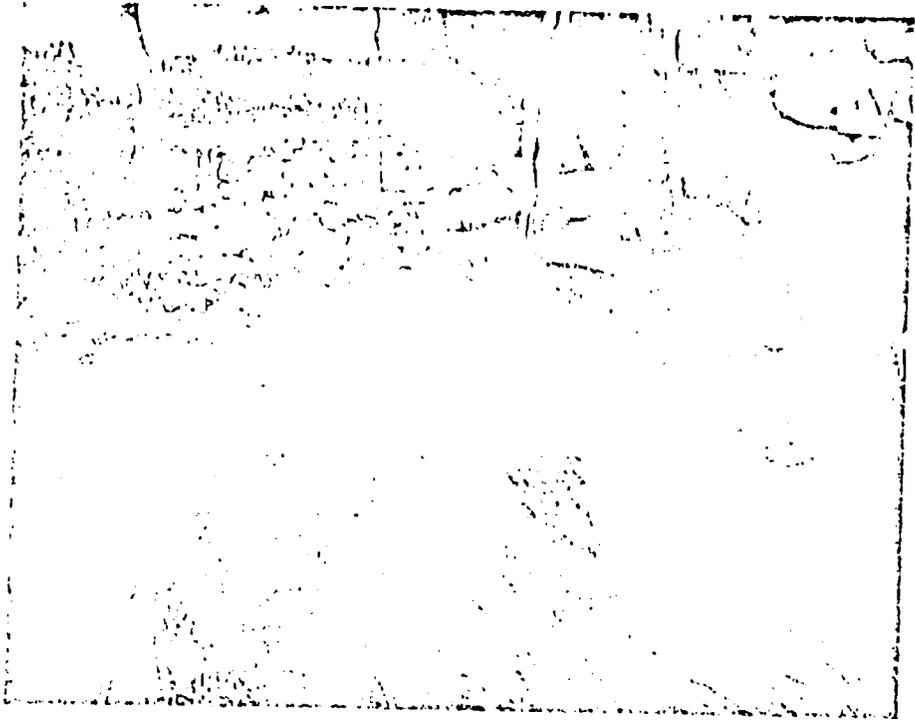
The woman in the black dress has covered her green wood with grass (pay razoua) and is now covering the grass with dirt, using a shovel.

4b (center)

Several days later, the woman in the black dress uses a hoe to rake (ralé) her charcoal after the wood has carbonized. In the background, the woman in the red dress picks out pieces of incompletely carbonized wood (boua rabi) from her own separate kiln.

4c (bottom)

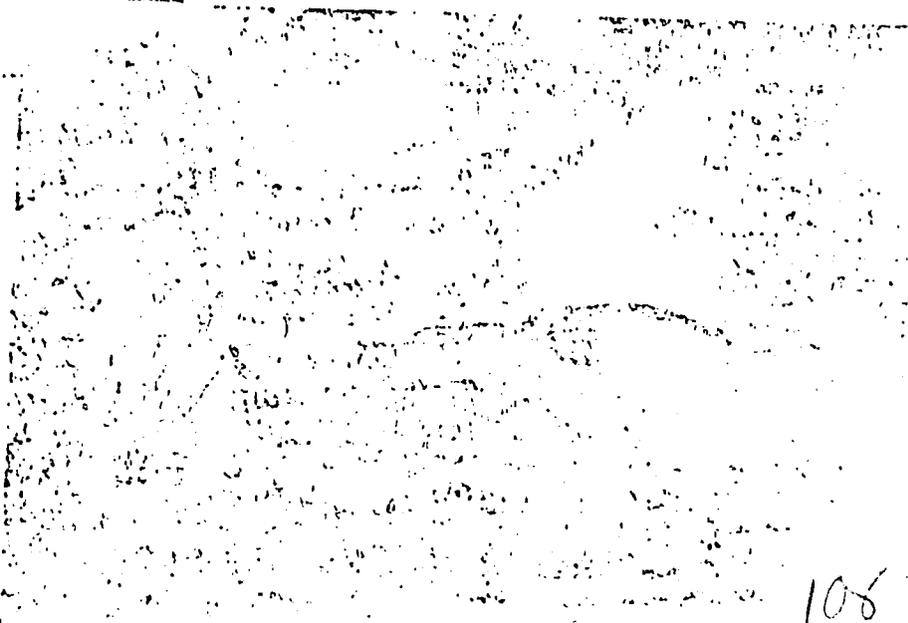
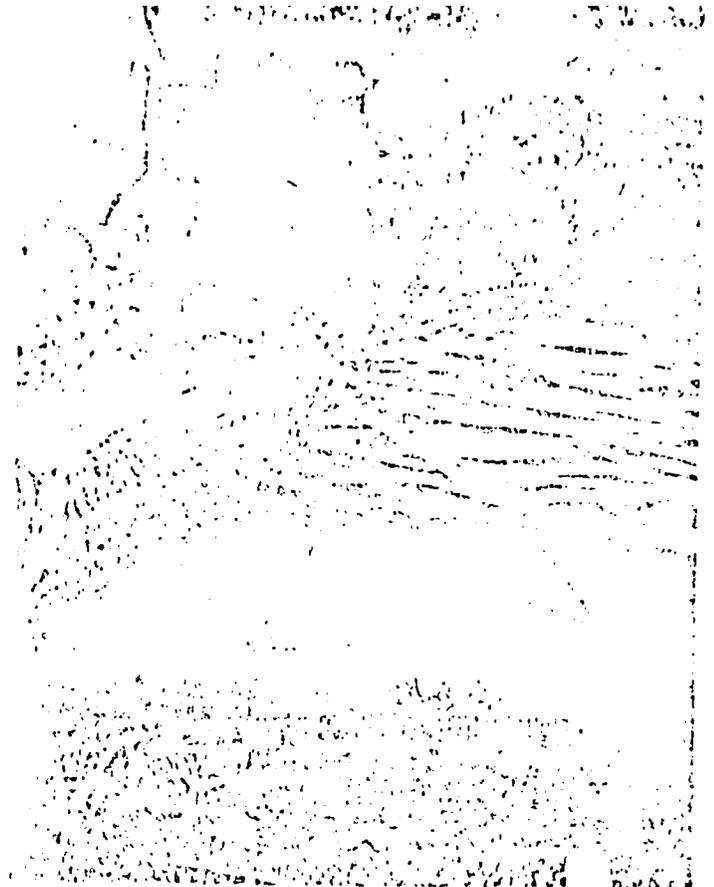
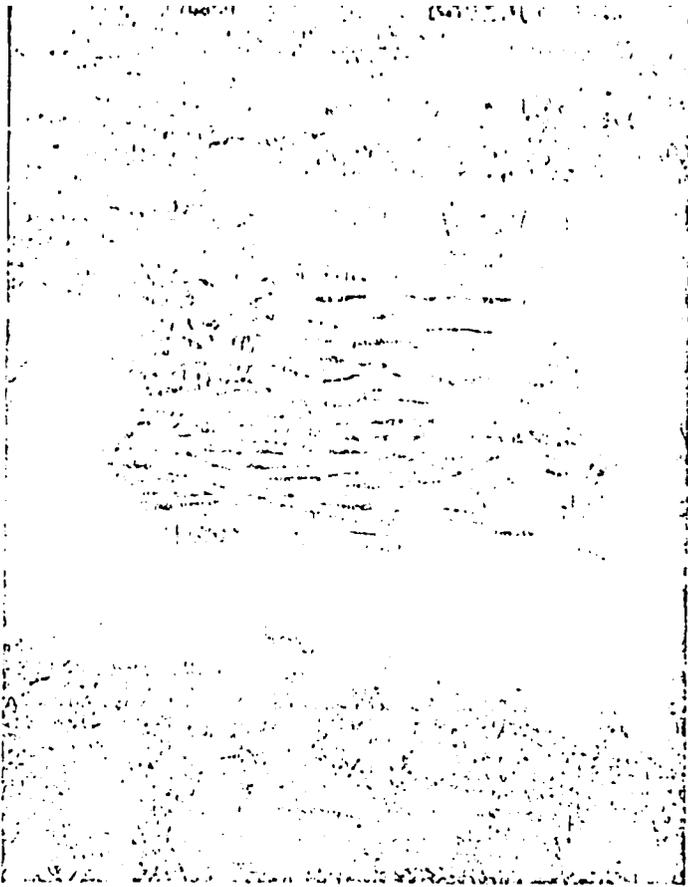
The woman in the red dress places the charcoal from her kiln into a sack.



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10

- 5a (top, left) Another part-time charcoal producer at Fonds Parisien stacks fuelwood on the cleared dirt which forms the base of her kiln. The first layer of wood (not seen) is placed perpendicular to the layers above it. Note the stack of grass in the background.
- 5b (top, right) The stacked fuelwood is covered with grass (pay razoua).
- 5c (center) The grass, weighted down with stones, is covered with dirt. The woman uses a hoe and an old basin (seen lying on top of the kiln) to move the dirt.
- 5d (bottom) A kiln (founo) at Fonds Parisien which has been partially carbonized. The left half of the kiln has carbonized and has been tamped down with a hoe. The right half of the kiln continues to smoulder. To the left of the kiln is a mesquite (bayaond) stump which has begun to coppice (boujoné).



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6a (top)

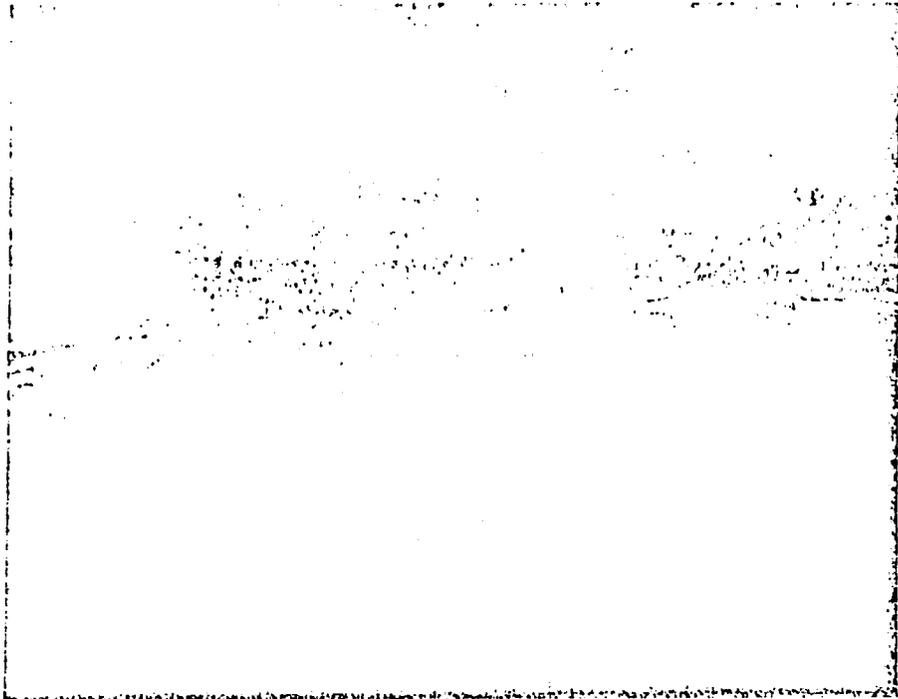
A part-time male charcoal producer at Fonds Parisien raking a large kiln with a hoe. The man is the manager (jéran) of a woodlot, which he has recently cleared of thorny bushes (pikan) (including young mesquite and acacia) to permit oak and mahogany trees to mature.

6b (center)

Land tenure and access to fuelwood at Fonds Parisien. The land on the left side of the road is privately held. Land on the right side is "public". Even in this rather dark reproduction, the effects of restricted and unrestricted access to fuelwood can be seen. Large trees can be seen on the private land on the left. Only shrubs and cactus can be seen on the "public" land on the right. (Photo 6a was taken in the wooded area to the left.)

6c (bottom)

Land tenure and access to fuelwood at Thomazeau. The mountainside in the background of the photograph is "public" land much like that of Fonds Parisien. It is heavily deforested. In the foreground, mesquite is regenerating on privately held land. The dark area on the mountainside, heavily wooded, belonged to a politically powerful person in the area, according to our main informant. He banned wood procurement on his land.



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7a (top)

The Northwestern peninsula. A deforested area between Morne Chien and Baie de Henne.

7b (center)

The Northwestern peninsula. A "wooded" area on Morne Chien, north of Baie de Henne. An informant recalled that thirty years ago guaiacum (gayak) trees in this area were so large that travellers spent the night under their spreading branches.

7c (bottom)

Farmers on the Northwestern peninsula make repeated attempts at agricultural production even in dry areas. Their gardens, like this one, often fail. This photograph was taken in an area with the now ironic name of Plaine de l'Arbre (Tree Plain).