Glenn R. Smucker

Trees and Charcoal in Haitian Peasant Study of Reforestation.

USAID Mission
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TREES and CHARCOAL

in

HAITIAN PEASANT ECONOMY

A Feasibility Study of Reforestation

by

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INTRODUCTION

This report explores the general feasibility of agroforestation projects with special attention to Haiti's northwest region and the island of La Gonave. It provides an assessment of some of the problems and possibilities for carrying out such programs to the benefit of small peasant farmers. Attention is focused on the planting of fast growing hardwoods useful for producing wood charcoal. Of particular interest is the potential these trees might have as a cash crop in the context of Haitian agriculture. Related issues mandated for study include the following:

--the economics of charcoal production and marketing;

--relative incentive for growing trees in peasant economy, particularly in relation to scarce land resources (land tenure problems, public and private), traditional cropping and grazing patterns, and the gathering of uncultivated wood resources;

--exploration of various models and methods for doing reforestation, including the potential role of peasant organizations;

--brief description of existing reforestation programs among private voluntary organizations (PVOs), and assessment of PVO interest in new programming.

The writing of this report coincides with AID discussion of a wide-ranging Project Identification Document (PID) on Forestry and Natural Resource Development (November 1980) and a proposal for a Direct Assistance Grant to the Operation Double Harvest (ODH) for nursery development and experimental pilot plots using fast growing tree species (leucena, cassia siamea, neem, eucalyptus camaldulensis, casuarina). This report is intended to complement these proposals and another research project undertaken during the same time frame: Ron Smith, The Potential of Charcoal Plantations for Haiti, November 1980. See the Appendix to the present report for a brief review and commentary on the latter. This report also includes material on peasant cropping patterns and labor costs pertinent to the Smith findings regarding the economics of fast growing trees and peasant farming.

It is a complicated matter to intervene effectively with new programs. On general principles it is hard to argue with a proposal to do reforestation in Haiti. Thoughtful consideration must take into account a number of other issues which underlie those specifically mandated for study:

1) Rate of deforestation - Benge (1978, 3) estimates that by 1974 Haiti's forests were being cut down at nearly five times their rate of re-growth.

2) Growing urban energy requirements - Haiti is in the enviable position of providing 90 percent of its energy needs from domestic sources. Wood-based energy alone--fuelwood and wood charcoal--provides an overwhelming 85 percent of all energy needs. It is conservatively estimated that half of all charcoal made in Haiti is consumed in Port-au-Prince (Voltaire 1979, 1-8). The actual percentage is probably much higher since Port-au-Prince accounts for at least 58 percent of the total urban population according to the 1971 census figures (Zuvekas 1978, 5), and charcoal is primarily an urban fuel. The annual growth rate of charcoal consumption seems to correspond with the rate of population growth in Port-au-Prince, about 5 percent per annum. What is not consumed in Port-au-Prince is marketed chiefly in the other towns and cities of Haiti. Rural Haiti depends, for the most part, on wood rather than charcoal as fuel. In short, the fundamental structure of the charcoal trade reflects a general feature of Haitian economy: The flow of key primary goods is from peasant producers to urban consumers, the latter making up about one-fourth of the country's population.

3) Food and forest - The growing urban demand for energy and the problem of deforestation in rural areas must not be allowed to obscure the fundamental issu in peasant agriculture--food production. In the face of land scarcity, Haiti's slopes (80 percent of the land) are the country's primary source of food crops. The World Bank (1978, 10) suggests that domestic food production during the 1970s has failed to keep pace with demand. Lundahl's thesis on Haitian poverty (1979) is based on erosion as the key factor in a cumulative process of falling rural incomes accompanied by a shift away from export cropping to food crops. The inescapable conclusion is that food production, not charcoal, accounts most for Haiti's degree of deforestation. Hence, aid programming should not lose sight of what is most crucial:

> Any Haitian assistance program which provides a stable, sustained food yield for these rural poor involved in their own food production, can consider itself successful. (Ewel 1977, 27)

Furthermore, any program geared simply to supplying urban energy needs, regardless of means, is misdirected so far as peasants are concerned. Peasant farming is oriented less to high yield crops (such as fast growing energy trees) than it is to minimizing risk and assuring a food supply. In other words, reforestation among peasant farmers should be tailored first of all to peasant requirements for land and food.

4) Making an impact - Given the size and scope of deforestation, it is appealing to mount a vast national program of reforestation to "turn Haiti around." The difficulty with this is built into the situation: problems of equity, management, peasant economics and the tailoring of projects to local needs. An effective national program may well be unrealistic however desirable it is. Large programs tend to foster dependency, especially if their continuation is to be assured. They lend themselves to charges of foreign meddling. The host government should logically be involved in a national program , especially one based on government-to-government aid. The politics of the matter are unavoidable and complicated.

5) Role of the state - It appears that the Haitian state has neither the will, the management capacity nor the funds to establish a truly national program of reforestation with its fundamental implications for peasant agriculture and land use. I don't see how the USAID mission can hope single-handedly to resolve this problem under the present circumstances. The situation is less one of a host government lobbying heatedly for foreign aid than it is one of donor agencies begging the government for the opportunity to mount programs.

It may be that AID assistance should specifically take into account both the short term and the long term. In this dual strategy, the channel for funding PVOs and community groups, the forestry center, is short term, small in scale and self-liquidating as an institution. This approach has merit but it is not tantamount to a program of large scale reforestation. Truly large scale programs surpass the capacity or interest of most PVOs. The relatively short term character of the proposed forestry center suggests that projects either be self-supporting in concept or else require further input down the line from other sources after withdrawal of AID investments.

This short term approach does not, in and of itself, serve to lobby for government policy changes in favor of peasants, forests and the long term. A logical point of departure in this regard would be the deteriorating national forests already under direct government management, e.g., SHADA, the Foret des

Pins, and the pine forests in the area around La Victoire in border zones between the Departements du Nord and Centre. A long term approach to state managed forests would entail planning for decades rather than a few years. Deforested areas such as the deteriorating sisal stands of SHADA could be made available for fast growing species adapted to arid lands.

6) Plantations and peasants - One of the threads flowing through current discussion is large "energy plantations" versus small peasant farming units as primary beneficiaries of reforestation efforts and the growing demand for charcoal. The issue of large plantations versus small farms has long been a primary theme in Haitian history. The potential profitability of new supplies of wood and charcoal is obvious during an era of growing energy cost. In this context, the question of state land again intrudes. If energy plantations are profitable, the tendency will be for such lands to be made available in large tracts to friends of the state apparatus. In one possible scenario, large energy plantations using factory technology could well encourage the export of charcoal to lucrative North American markets rather than meeting local needs.

In point of fact it is not clear just how much state land exists, nor how much exists in large or small plots. It is clear that at least some state land is available in large units. An AID program could conceivably lobby on behalf of peasant access to such land. In this fashion AID could help stake out small farmer access to government lands in advance of any new appropriations of such lands to large-scale private interests. In this scenario, fast growing hardwoods would be introduced along with land previously unavailable to peasant farmers, and charcoal production with peasant techniques would be geared to the domestic market.

The bibliography at the end of this report serves as a guide to several works pertinent to the issues discussed. The question of charcoal production and Haiti's forests has been the subject of recent reports by AID and the FAO: Raeder-Roitsch and Zenny (1975), Earl (1976), Benge (1978), Conway (1979), Voltaire (1979) and Smith (1980). Useful reports on the erosion problem include Ewel (1977), Zuvekas (May 1978), and most recently Murray (1979) whose work is used in formulating the PID on forestry (USAID 1980).

Preparation for this report has entailed reading numerous documents. Interviews were taken with AID personnel, contractors, PVO and missionary personnel including employees of CARE, Catholic Relief Services, Church World Service, HACHO/Fonds Agricoles, Nazarene Church, American Baptist Mission,

Unevangelized Fields Mission, Mennonite Central Committee, and the Catholic Church. A total of some 100 interviews were undertaken including field interviews with school teachers, agents d'extension agricole, agronomes, community council leaders and members, local farmers and agricultural wage laborers, market ladies, wholesalers and retailers, charcoal merchants and middlemen, truck drivers, sailboat captains, kabouet drivers, charcoal warehousemen, charcoal producers, salt miners, gravel crushers, factory owners, priests and politicians. Field site visits included nurseries and tree plantations at Cazeau (Operation Double Harvest); Limbe and Quartier Morin (American Baptists); Ka Philippe, Jean Rabel, Mole St. Nicolas, Grande Savanne, and Baie de Hennes (HACHO/Fonds Agricoles); La Gonave (Church World Service); Grande Riviere du Nord (Mennonite Central Committee); Thomazeau, L'Etang and la Hatte-Cadette. Charcoal marketing and trans-shipment points were visited in the north, the northwest and Port-au-Prince.

The disciplinary bias in this report is that of cultural anthropology. In this regard, the problems posed for study are viewed in the dual context of peasant economy, and of development goals, programs and consequences. The report examines the charcoal economy, salient characteristics of peasant agriculture, and agency program interests in reforestation.

THE CHARCOAL ECONOMY

All evidence suggests that the production of wood charcoal is still primarily a peasant household industry. In this capacity it is a large and growing employer of peasant labor and an important commercial sector in Haitian economy. One indication of its commercial importance is the increased investment in charcoal by relatively well-to-do peasant entrepreneurs and non-peasants who hire wage laborers, purchase supplies of wood, and produce charcoal on a somewhat larger scale than the small peasant producers. The usual production method continues to be the earthern kiln long favored by peasant producers. In other words charcoal production is still labor intensive, thereby tending to absorb the maximum number of people in terms of employment. There is apparently only one commercial kiln in Haiti which uses capital intensive methods. The Haitian American Charcoal Company near Leogane uses charcoal dust to produce briquets which may be purchased in Port-au-Prince supermarkets.

The commercial viability of charcoal suggests a market demand which is growing faster than the supply. According to Earl (1976, 14), this is indicated by certain trends which my own field observations tend to confirm: 1) The retail price has apparently been rising faster than other domestic products; 2) the supply of what is considered to be good charcoal is decreasing, but the less desirable grades of charcoal are selling well; 3) charcoal operations are moving further away from the market. In terms of relative price wood charcoal continues to sell at a relatively low price when compared with the skyrocketing costs of imported fossil fuels. This is due at least in part to the low level of taxation on charcoal, the cheap labor involved in charcoal production, and the common character of wood as a "free public good" which is gathered rather than cultivated.

Rural scarcity and the monetization of fuelwood. One corollary of growing demand is increased scarcity of fuelwood in arid rural regions. One of the ironies of growing charcoal demand is that monetization of rural fuel resources often serves as a clue to increased rural poverty. Where wood and charcoal are

purchased, there is scarcity of those fuel resources traditionally gathered rather than purchased. The peasant women of Thomazeau recognize that 20 centimes worth of wood goes further than 20 centimes of charcoal. This tends to conform to Earl (1976) and Smith (1980) who discuss energy loss in the reduction of wood to charcoal. Conway (1979) points out that 70 percent of the households in Fond Parisien purchase fuelwood at least part of the time.

When fuel is expensive, there is a tendency for people to purchase prepared foods, that is, food which is manufactured industrially or else prepared in the street for sale. This is inherently more expensive than home prepared foods and predictably less nutritional with fewer calories per unit cost. The problem of scarce fuel in such areas as the Artibonite is also linked to illness from impure water supplies. People who are aware of the health benefits of boiling canal water may be unable to do so because of the great expense of fuel.

In sum, the growing level of monetization, reflected in growing fuel purchase even in rural and semi-rural areas, is linked to a process of impoverishment. The cash economy is making inroads in traditional non-cash sectors of a peasant economy, but without the cushion of an expanding economy. Such communities are often located in former charcoal producing areas of traditional aridity, e.g., "dry forest" areas of the Cul de Sac (e.g., La Hatte-Cadette, Fond Parisien), towns of the northwest such as Anse Rouge (no wood available even for purchase, only charcoal), and Jean Rabel (both wood and charcoal available for purchase). In contrast, "humid forest" areas of the northwest such as Bombardopolis and Terre Neuve still have ready access to "gathered" wood resources. The latter towns are located in relatively less droughty areas in the mountains rather than low lying areas of traditional aridity. The dry forest areas contain less intensive agriculture by comparison to humid forest zones.

<u>Production areas</u>. Interviews with middlemen and local charcoal producers in various areas suggest that larger numbers of people are engaged in charcoal production than in the past. Old production centers are changing as wood resources diminish. The beginnings of charcoal production are easily dated within the living memory of local people in all production areas visited. It appears that Port-au-Prince was first served by the dry forest resources of Delmas before the city expanded. Charcoal production eventually expanded into the Cul de Sac

Plain, especially in the droughty eastern periphera. This is no longer the major charcoal producing area that it once was. This is evident in the testimony of farmers from Thomazeau and in Conway's work on Fond Parisien. Important new producing centers developed in coastal areas to the north of the capital (Cul de Sac, Montrouis, St.-Marc) and the isle of La Gonave. Small craft shipping between the island of La Gonave and the mainland became a crucial transportation artery for charcoal. During the 1950s this pattern shifted readily from the islan to the northwest peninsula, another area isolated by geography and the absence of roads. More recently, the amount of fuelwood coming into Port-au-Prince from the southern peninsula has increased. Nevertheless, the best charcoal coming to the capital is still being produced in the northwest region. In contrast, the fuelwood coming from the south is considered inferior, mostly firewood, some polewood and poor grades of charcoal. Dealers in Port-au-Prince claim that burning techniques in the northwest are generally superior to those of poor grades of charcoal from the south. This testifies to the more recent date of the southern charcoal industry.

Sailboats bring wood and charcoal to Port-au-Prince from the Grande Anse coast (northern coast of the southern peninsula) and from the island of Grande Cayemite. Truck transport hauls charcoal from the Bainet-Cote de Fer area along the southern coast and from the Fond des Negres area of the interior. There is a demand for firewood as well as wood charcoal in the capital since dry cleaning establishments, clairin mills, bakeries and essential oil processors all burn wood.

The sellers of wood in Cité Simone and Croix des Bossales, the major Port-au-Prince markets, report that firewood comes primarily from the south rather than the northwest. No one reports marketing wood or charcoal from the northern departement. Northern fuelwood resources are linked primarily to the Cap-haitien urban agglomeration in a pattern of marketing which runs parallel to Port-au-Princc but smaller in scale. In keeping with old regional patterns which have traditionally set the north apart, the charcoal coming into Cap-haitien comes exclusively from within the departement. Apparently there are no surpluses exported to the capital city or other areas. The charcoal coming into Cap-haitien is produced chiefly in the arid eastern zones of the northern plains, i.e., Derac, Meyac, and Terrier Rouge. The mangrove swamps in coastal areas between Cap-haitien and Bord de Mer-Limonade are an important source of firewood and polewood for

construction. The latter items are transported by boat, but the charcoal is carried by truck or beast of burden.

Changing transport. New roads appear to be a key factor in the larger numbers of people engaged in charcoal production and fuelwood harvest. Surface transport by truck makes extensive wood harvest feasible in formerly inaccessible areas such as the Duverger Plateau near Fond des Negres (see Smucker 1979, 22-35). Jean Rabel made a distinct shift in mode of transport from sailboat to truck with the opening of a commercially viable road in the 1970s. This road system appears to have shifted the preponderance of charcoal harvest in the northwest somewhat away from southern coastal regions. While the northwest region has produced charcoal since the mid-1950s, the Jean Rabel Plain has only been a major charcoal producing area since 1975 following the opening of the road. Trucks presently are able to reach arid highlands as far up as Hatte Dimanche, Lagon and Ka Philippe toward Terre Neuve via the Anse Rouge Commune. The L'Arbre Plain provides passage for trucks to reach the border areas of the communes of Anse Rouge and Jean Rabel including Tete Boeuf at the interior edge of the plain, and Atrel, Nan Maho, Tante, and Chapineau. Sources Chaudes was already depleted of its charcoal resources ten years ago, but other habitations including some further to the interior are presently in full harvest, i.e., Zoranger, Gro Gaiac, Petite Place, Cabane Boeuf, Lahobe, Ti Saline, Parc Melon and Actilouis. The Anse Rouge road gives access to highland interior areas of Baie de Hennes Commune along a new road from Anse Rouge to Ti Riviere. The coastal road to Baie de Hennes is less viable as a commercial roadway, but trucks compete with boat traffic for charcoal from this town and its surrounding hinterlands. Along with La Plateforme and Mole St.-Nicolas, Baie de Hennes is one of three coastal seaports serving the interior highlands of Bombardopolis. There are no commercially viable roads serving the western part of the northwestern peninsula, except occasionally to Baie de Hennes, and between Bombardopolis and Mole St.-Nicolas.

A current shortage of sailboats is another factor favoring the trucking industry. During the year 1980 boats have simply not been available due to the lucrative market for "boat people" going to south Florida in search of work. The demand on small craft reached peak proportions during the spring, summer and fall periods. Areas most affected by this diversion of small craft away from coastal shipping have been La Gonave and the northwest, regions tied to sailboats for the charcoal trade. The island of La Gonave has of course had no recourse

to trucking, but prices for sail transport have gone up. In the northwest, there is no longer an important small craft shipping link between Jean Rabel and Port-au-Prince as coastal shipping has been supplanted by the trucking industry. Mole St.-Nicolas still relies exclusively on sailboats to export local charcoal which is presently far and away the chief commerce in that area.

Case studies in rural production. The phenomenon of whole communities of peasant farmers engaged in the cutting, gathering and carbonization of wood is an unusual sight in rural Haiti. It is certainly not the general case. Where does it happen and under what conditions? Who are the producers, and how is the charcoal marketed? Light is shed on these and related questions by looking briefly at local histories of charcoal, thumbnail sketches of precipitating factors, and the rise and fall of charcoal production.

Charcoal is no longer made in Anse Rouge; nevertheless, the town serves as an important stocking and trans-shipment point for charcoal from hinterland areas. Local informants point to the Magloire administration as the first time charcoal was produced locally, originally after Hurricane Hazel in 1954. The bayahonde (mesquite) grade of charcoal sold for as little as ₵ 0.40 per donkey load by comparision with the more highly valued gaiac selling at ₵ 0.80. The early 1960s saw the dissolution of open range grazing with the promulgation of the Code Rural Dr. Francois Duvalier in 1962 (see GOH 1963). The end of free grazing, the traditional complement to arid lands millet culture, effectively served to boost charcoal production:

Le bet disoud,	When animals were forbidden,
Se la mize antre isit.	That's when hard times began here.

Restriction of animals to cord or pen encouraged charcoal production in at least two ways:

1) Wood already cut became available for charcoal due to the diminished need for fencing cultivated areas. (Local fencing is constructed of wood and brush rather than the "living fence" characteristic of other regions.)

2) Lack of access to an open range on public or private lands tended to limit the number of animals a person might be able to keep. Among the land poor, the production of charcoal tended to supplant the grazing of livestock.

The price of meat notably went up during this time as the area's herd decreased in size. Drought in the late 1960s broadened local dependence on

charcoal production, and seasonal labor migration reportedly increased, generally to the Artibonite Valley with its intensive labor demands for both men and women in the rice paddies. People gave up children as ti moun, servant children, in periods of deepening drought. By the 1980s, the Anse Rouge area was producing less charcoal, and some people fired the stumps of trees cut earlier for charcoal. In the rural community of L'Arbre, no charcoal has been made since 1978, and there are no brushwood garden fences left.

Some people in the L'Arbre Plain still go to state lands in Baie de Hennes Commune to cut and gather wood for charcoal during the off-season. The general tendency is for serious commercial production of charcoal to move further inland, near and beyond the borders of Anse Rouge Commune and its rural sections. Mountainous areas such as Boucan Patriot on the road to Jean Rabel have reduced wood resources as a result. Production there has diminished recently since this particular area never had much wood due to its more intensive agriculture by comparison to the more arid zones closer to the coast. In contrast, the more arid interior region of Ti Riviere is a community in full charcoal harvest. It has been opened up by a road from Anse Rouge. In Ti Riviere virtually every family is engaged in charcoal production as a complement to arid lands agriculture. There has not been a strong grazing tradition here. Open range grazing has successfully been controlled since 1957 by peasant farmers resident in the area. Free ranging animals belonging to strangers (lowlanders and townspeople) first began to forage in the area during the mid-1950s. In order to protect their gardens, the farmers of Ti Riviere resisted the incursion of outsiders and successfully restricted open grazing, a policy which they had long practiced themselves due to the prevalence of gardens. In the 1970s the area was stricken by drought. The usual dependence on peanuts and millet as primary cash crops proved inadequate during the drought cycle.

There are ample wood resources in the area as it is not all intensively farmed. The production of charcoal is presently of such importance that every household is involved in charcoal production (not just the "poor"). Labor demand is such that the coumbit, wage labor, and contract labor are all used in the production of charcoal. Ti Riviere is a good example of a community in full charcoal harvest. There is seasonal migration to the Artibonite Valley, but virtually no migration to Miami on small sailboats, in contrast, for example, to Anse Rouge. The community is located in a varied ecological zone: close to

arid zones of millet culture, less arid zones of mountain agriculture, and somewhat wetter highland gardens. In other words, there is an agricultural tradition here of relatively more diversity than the arid lowlands, but nevertheless a marginal tradition in comparison to intensive mountain peasant agriculture.

The arid western zone of the northwest peninsula is characterized by isolation from motorized transport, a low level of agricultural production and the presence of publicly owned badlands. The small coastal port of Baie de Hennes first experienced charcoal production during the period following Hurricane Hazel in 1954. The first charcoal was made by outsiders form Port-au-Prince and Port-de-Paix. Charcoal has surpassed salt mining in economic importance to this town, essentially a non-agricultural zone.

The large charcoal harvest passing through the port of Mole St.-Nicolas has for years made this town the primary commercial center for charcoal production and trans-shipment from the northwest region. All charcoal coming out of this area is carried by sailboat to Port-au-Prince. Boats generally have a carrying capacity of 1,000 sacks of charcoal. The harvest of wood and charcoal is now somewhat reduced. Officials of the Bureau of Contributions report that a decade ago there were 50 to 60 thousand sacks of charcoal exported from Mole each month. By the mid-1970s this diminished to about 15,000 bags, and presently the port handles from 10 to 12 thousand sacks per month on the average. A fleet of several dozen sailboats devoted to transport has been reduced to about 10 boats which regularly make the trip. This is due in part to the reduced demand for charcoal transport, and of course to the greatly increased demand, especially in 1980, for boats going to Miami with emigrant workers. On the Mole Plateau, farmers report less charcoal being made since 3 years ago. Present charcoal supplies come from interior points further removed from the coast road.

Sources Chaudes, at the northeastern edge of the L'Arbre Plain, stopped maintaining charcoal <u>depots</u> about 10 years ago. The first people to make charcoal here came from La Gonave and the Plaine of Gonaives during the period following Hurricane Hazel (1954). Initial interest in charcoal was limited to that made from the high quality <u>gaiac</u>. Local poor people began to make charcoal. It was strictly a low status enterprise attracting those with limited economic

options. Other peasant farmers "made fun" of such people. Eventually the growing profitability of charcoal drew others to this commerce. Virtually everyone became involved during the heyday of charcoal production in the area during the 1960s. All species of hardwood were burned after the supply of gaiac was exhausted. Once the limited supplies of local wood were finished, the trade moved further away from Sources Chaudes to zones more isolated and somewhat higher in altitude on the southern slopes of the peninsular highlands. Finally, the only local people who continued to make charcoal were the poor who dug out and fired the remaining stumps of bayahonde. Charcoal production has subsequently moved beyond Sources Chaudes to the mountains toward Terre Neuve (Ka Philippe). The dry wooded slopes are now being cut for charcoal in uncultivat zones above the upland valley agriculture of Ka Philippe where various crops are cultivated and an old dirt canal system of irrigation has long been in use.

A similar time frame holds for Grande Savanne along the road from Gonaives to Anse Rouge (between La Pierre and L'Etang). Grande Savanne residents verify the Gonaiven origins of the first charcoal makers in this area, strangers to the community in search of wood with a view to exporting charcoal by sailboat to Port-au-Prince and other towns ringing the Gulf of La Gonave. Beginning in the 1950s the charcoal trade has continued as an adjunct to fishing, grazing and very small scale agriculture. There is presently no local charcoal production although charcoal is sold along the roadway by mountain people coming down to the coast to seek truck transport. There is still open grazing here though coastal grazing areas are in fact privately owned as undivided byin mine (family common land). Fishing is the primary economic activity, supplemented by grazing and small scale agriculture. The economic base of this coastal village is the sea. The land is not devoted primarily to cultivation, so open grazing is maintained in spite of official strictures against it. There has not been the economic incentive here to depend on charcoal production in lieu of grazing or failing agriculture, thus the charcoal production has always been a sideline venture when practiced at all, and the bayahonde forest has not been cut down and uprooted despite a 25 year history of charcoal. Fonds Agricoles has an experimental project here to control cutting of the bayahonde in order to safeguard future wood resources. What is remarkable, given the history of charcoal in the L'Arbre Plain, is that the bayahonde forest of Grande Savanne still remains in any form whatsoever. Fuelwood for local use is gathered, never purchased. It is taken from state-owned mountain slopes nearby, badlands lying

behind the coastal bayahonde forest. The explanation for this continuing fuel abundance lies in the particular economic character of the community, fishing-cum-grazing. Open range grazing is freely available on undivided common lands to which all households in the village claim rights as descendents of a common ancestor.

A contrast to arid land charcoal traditions is offered by the well watered highlands further to the east in Haiti's northern department. In Pilate, an area of intensive mountain peasant agriculture, there is considerable coffee grown as the primary cash crop. There is also a complete absence of state land. Land is scarce and expensive. There has not been a tradition of open range grazing within living memory. The only land not under cultivation is either in short term fallow, in which case animals are tied there to graze, or is abandoned due to infertility or erosion of the soil to bedrock.

There is a small amount of charcoal produced, but not generally for "export" out of the community. There is a certain market for it in the town of Pilate. Those engaged in charcoal production do it as an adjunct to peasant farming, especially during the agricultural off-season. This is not dissimilar, in a certain sense, to the common economic role of animal husbandry. Unlike grazing areas such as Grande Savanne or L'Arbre in the northwest, the keeping of animals in Pilate is an adjunct to peasant farming, small in scale and a form of savings from agricultural surpluses. It is not a major occupation in its own right.

A similar pattern may be observed in the mountains around the town of Grande Riviere du Nord. The Grande Riviere Valley is not a major charcoal producing area for the large Cap-haitien market. A few people produce charcoal as a seasonal complement to peasant agriculture. Those doing so are land-poor as in the case of one local farmer who sells directly to one family in Cap-haitien. In effect this farmer has a patron-client relationship to a more well-to-do urban relative. He supplies him with his charcoal needs and thereby supplements his own income from farming by occasionally making charcoal as a sideline. In past years he has generally made more charcoal during the agricultural off-season. On occasion he has also sold charcoal to another buyer, a peasant middlemen who periodically invests surplus cash in stocks of charcoal in order to wholesale it in the city.

The island of La Gonave shows certain similarities to the northwest region: arid coastal areas, more productive highlands, reliance on the sea for transport to Port-au-Prince and other mainland towns. The island has long been a primary supplier of charcoal to the nation's capital. Charcoal production on the island originated somewhat earlier than in the northwest. People remember charcoal first being produced during the Estime administration (1946-1950). The island has a tradition of low population density and relatively heavy forest cover, a pattern rapidly reversing itself. A large percentage of the families on the island trace their origins to mainland areas only a generation or two ago. Ancestors came to the island in search of economic opportunity. Land was readily available here by cession from the state.

Arid coastal areas of the island provide the main source of charcoal whereas the more humid interior highlands support intensive agriculture. There is good reason to believe that a fairly large percentage of the Port-au-Prince market has been supplied by the island of La Gonave, but the flow of charcoal is presently much reduced. Voltaire (1979) estimates that the island supplies 10 percent of Port-au-Prince consumption. Characteristically, the arid lowlands are less cultivated and more heavily wooded than the highlands. There is open range grazing in these arid zones, a pattern which tends to creep further up the mountains during agricultural slack seasons, especially during drought cycles. During the droughty 1970s the dry seasons lasted longer and crops failed. This resulted in less cultivation, more grazing and more charcoal production even in areas further away from the by now depleted coastal areas.

In the mountain peasant community of Zabricot (La Gonave) some charcoal has been made since the mid-50s. Following several years of drought, more o the poorer members of the community began to make charcoal during the late 1970s. These included widows or other women without men living with them. In this mountain community charcoal is still only a sideline, an adjunct to peasant farming. It is unlikely to become a major enterprise as has developed in Ti Riviere (northwest). Though charcoal is now being made here on a scale without precedent, it is still a small scale enterprise limited by the intensity of agriculture with its deforestation of land for cropping. (A more extreme example of radical deforestation for agricultural reasons is the Fermathe-Konscoff area above Petionville, especially in such communities as Godot and Dumisseau.)

The charcoal cycle. Field interviews have elicited brief histories of charcoal production in particular communities. Certain patterns and conditions emerge worthy of note:

1) At present charcoal production is primarily a decentralized peasant household industry. (In the future there may be a trend for capital intensive commercial ventures to make charcoal briquets for domestic consumption and for export.)

2) The largest centers for charcoal production are oriented to supplying the large and growing Port-au-Prince market. In addition, most of the smaller towns in Haiti have a certain amount of local (rural) charcoal production for local (town) use. As a regional metropole Cap-haitien has its own pattern of supply and demand paralleling that of Port-au-Prince but on a smaller scale, i.e., arid wooded hinterlands supply urban needs. In the north, the Derac-Terrier Rouge region, an arid district of the northern plains, serves as the primary supply center for Cap-haitien. The arid northwest peninsula serves as the primary supply center for Port-au-Prince. Notably, the northwest does not supply charcoal to Cap-haitien though it does serve the larger towns of Gonaives and St. Marc which lie along sea and land routes to the capital. Likewise, Cap-haitien with its arid plains to the west does not ship charcoal to the large Port-au-Prince market.

3) Less desirable grades of charcoal are selling well, and the supply centers are moving farther away from the market. The northwest as a region is still far and away the primary supply center. The southern peninsula, especially Grande Anse, is a growing source of firewood and poorer grades of charcoal.

4) Arid rural areas demonstrate a growing scarcity of fuelwood, increasing monetization of fuel resources, and growing levels of poverty in the aftermath of charcoal production. The price of hardwood is up in other forms than fuel.

5) New roads have the effect of opening up new rural areas to the commerce in charcoal and firewood. The tendency is for truck transport to supplant small craft coastal shipping.

6) There is a characteristic pattern in the evolution and devolution of large scale charcoal production wherever there is a confluence of certain key factors including the following:

a)Natural disaster as a precipitating factor: drought, hurricanes and floods. In many communities of the northwest, charcoal was first made after the disastrous passage of Hurricane Hazel in 1954. Haiti's record of natural

disaster is nothing short of catastrophic during the past three decades:

1947	drought
1954	Hurricane Hazel
1956	drought
1958-1959	drought
1963	Hurricane Flora, floods
1964	Hurricane Cleo
1966	Hurricane Inez
1966-1969	drought
1968	floods
1971	floods
1972	drought
1975	drought
1976-1977	drought
1979	Hurricanes David and Frederick
1980	floods

Strommen (1979) notes that the 1970s have generally been drier than the 1950s and 1960s, and that drought patterns in Haiti tend to conform with regional drought in the Caribbean (cf. Conservation Newsletter 1977 and Lundahl 1979). It is clear that the meteorological patterns tend toward periodic drought and rain going beyond the annual cycle of the seasons. Agricultural livelihoods are tenuous high risk ventures dependent on the weather. The more arid zones such as the northwest are not so much characterized by the absence of rain as by its irregularity. There is productive potential in its regional agriculture, but it is higher in risk than other regions of Haiti, hence it is more vulnerable to what outsiders might perceive as only minor changes in the weather. Peasant strategy in arid lands is to even out the odds, to spread around the risk in certain ways which differ markedly from the more intensive cropping zones of humid northern highlands or irrigated lowlands.

Land that is stripped of cover due to natural disaster, farming or wood cutting is slower to recover in arid regions. This gives rise to "agricultural drought" or "pseudo drought" which is distinguished from meteorological drought by water loss due to soil erosion and the resulting loss of water retention capacity (see Ewel 1977 and Strommen 1979). In any peasant agricultural setting, natural disasters have effects which endure long after the time of occurrence. When crops fail, people turn to alternative pursuits such as grazing, local wage labor, seasonal or permanent migration, peasant crafts, charcoal production, irrigation, fishing and salt mining. Where cash needs surpass their means, people may turn to money lenders to meet such emergencies as death or sickness. When storms throw down trees, fruit harvests may be destroyed for a generation and wood is made plentiful for charcoal production.

b) Arid lands agriculture: Animal husbandry is a traditional

complement to arid lands agriculture in Haiti, e.g., millet culture is often linked to open grazing practices in areas not heavily cropped and characterized by relatively long slack seasons for agriculture. As a corollary, millet culture is not generally accompanied by the diversity of cultigens found in more humid mountain peasant agriculture. Dissolution of open range grazing has particularly affected arid land farmers and the land poor. It has helped to make charcoal an attractive alternative to other economic pursuits since wood resources are traditionally more plentiful in arid zones than in heavily cropped humid zones.

c) Animal transport: Where land and sea routes do not exist in hinterland areas, traditional reliance on beasts of burden easily lends itself to transporting charcoal by donkey and mule. The per capita ownership of these animals is higher in these low population density arid regions where distances are farther, water supplies are scarce and the grazing of animals is a way of life.

d) Commercial viability of charcoal: Where charcoal production is introduced in arid agricultural zones, it is quickly adopted by the poor and then by all members of the community if there are sufficient supplies of wood. All other things being equal, the commercial incentive is quite sufficient for the practice to spread rapidly and voluntarily.

7) The cycle: Where there is a confluence of key factors, charcoal production tends to expand from an off-season sideline of poorer peasants to a full harvest sequence involving all members of the community. Optimum factors for extensive charcoal production are arid lands, wooded areas, open range grazing traditions, beasts of burden, less intensive patterns of cultivation (millet culture), access to transportation arteries linked to large urban markets, a stable market demand for charcoal, and crop failure or natural disaster as precipitating factors in the charcoal alternative, and the absence of other significant economic alternatives such as fishing or salt mining.

The charcoal cycle historically goes through a number of stages as follows:

a) a period of abundant wood resources and no charcoal production, with local fuel needs easily met by gathering wood for wood fires;

b) the coming of outsiders in search of fine hardwoods;

c) the introduction of charcoal making by outsiders;

d) seasonal participation of poor people from the local community in the production of charcoal;

e) broadened participation of community members;

f) gradual disappearance of gaiac, the most highly valued hardwood,

and dependence on a broad range of wood species, especially bayahonde;

g) participation of more well-to-do peasants in the local area as buyers, stockers, and wholesalers as well as producers;

h) incorporation of the full range of peasant labor practices in the making of charcoal including the coumbit, the ronn, wage labor, exchange labor, contract work, and "sharecropping" of wood resources;

i) the coming of trucks, as feasible, over seasonal roads;

j) participation of all community members in the charcoal industry as a year-around activity with very little seasonal variation;

k) visible "classes" of peasant producers by scale of production, evident in mode of transport where pedestrian transportation is required to gain access to a trans-shipment point (road or port), e.g., the poorest class of producers carry charcoal on their heads, those somewhat better off have their own animals, and the more well-to-do can afford to rent the animals necessary to carry charcoal to the coastal ports of Mole St.-Nicolas, La Plateforme and Baie de Hennes for shipment to the capital by sailboat;

l) the eventual diminution of local wood resources and curtailment of local production;

m) poorer members of the community continue to work the least desirable wood resources such as softwoods, the tosh cactus, scrub trees and brushwood, stumps and twigs;

n) a few local peasant farmers of means go further afield to buy stocks of charcoal as middlemen;

o) trucks go further inland, following the production of charcoal into more isolated hinterland areas where the charcoal cycle repeats itself;

p) and finally, charcoal production virtually disappears from the local community.

In certain variants, the cessation of charcoal production coincides with the general monetization of fuel resources due to the scarcity of wood even for local fuel since the "gathering stage" has virtually disappeared along with the supply of wood, e.g., the eastern Cul de Sac, or Anse Rouge. In other cases, privately owned land may be protected from further cutting in order to allow re-growth to occur, especially in stands of the naturally coppicing bayahonde. In some areas community councils have become involved in policing the industry to the extent of protecting the local community from outside middlemen, thereby exercising a local monopoly on export out of the community. There is no evidence whatsoever of peasant efforts to re-plant

trees with a view to charcoal production except where outside development agencies have undertaken such efforts.

Note that there is charcoal production in areas which do not follow the charcoal cycle discussed above. These areas have distinctly different characteristics from the arid lands charcoal industry. Where there is intensive mountain agriculture in humid forest regions, there may be seasonal charcoal production during the slack season for agriculture. Sometimes peasant farmers invest capital in stocking and wholesaling charcoal but this is rare in the well watered zones of intensive agriculture. What is more common is for land-poor peasants to establish client relationships with townsmen to supply one or more urban households with cooking fuel. These small scale, seasonal producers of charcoal engage in the practice because they are cut off from an adequate living in peasant agriculture and have few other alternatives. In the well watered highlands, farmers may employ seasonal charcoal makers to clear wooded fallow for new crops. If they have the wood resources on their land, farmers who send their children to school in the city (e.g., Port-de-Paix, Gonaives, Cap-haitien, Port-au-Prince) may choose to supply them with charcoal rather than purchasing the fuel at a much higher price on the urban markets, even though they themselves do not use charcoal at home in the country. In times of crop failure and drought, there is relatively more cutting of wood for charcoal. Where there is intensive agriculture and a short slack season, there is usually less wood available to cut, less land available for trees due to the land requirements for cropping, less labor available for the heavy labor requirements of charcoal production, and generally less charcoal made.

Peasant labor patterns and costs. The peasant charcoal industry is a labor intensive proposition. Overall, the usual range of monetary and non-monetary options for agricultural labor is used in making charcoal, including the household labor pool, exchange labor, wage and contract labor. Where a community is heavily involved in charcoal production as the predominant "cash crop," the coumbit may be used to clear and cut forested areas. The ronn, a revolving labor team, is incorporated into charcoal production, exchanging labor within the group on a rotating basis, and selling labor as a group to outside purchasers. In addition, labor is available by hiring individuals as daily wage laborers.

Payments are made in the form of cash, charcoal or a combination of the two, e.g., a woman's pay for raking and sacking may be paid in cash or kind, but the latter is usually preferable from the standpoint of the worker. A day's pay may amount to two sacks of charcoal in Garde Cognac (Plaisance). In the mountains of La Gonave (not a primary charcoal producing area), a poor woman without a man's labor available to her may arrange for a man to cut and stack wood (considered "heavy" men's work) in exchange for doing his laundry. In Bombardopolis (northwest), transportation is a costly matter and generally limited to pedestrian traffic. In this case, the owner of a mule carrying three sacks of charcoal may be paid in cash (G 5.00) or in kind (1 sack of charcoal) for a day's animal rental.

The need for access to wood gives rise to sharecropping arrangements akin to the sharecropping of land for agriculture. This is called demouatye and serves to attract labor for charcoal production. In Bombardopolis, Garde Cognac and Zabricot the producer's share of charcoal amounts to two-thirds or three-fourths of total production if he assumes all costs of production; however, if the landowner and the producer share costs, the harvest is also shared equally. In another variation sometimes found in demouatye, the landlord reserves the right to purchase the producer's share of charcoal at a favorable price.

The issue of labor cost may also be approached by examining the prevailing market wage for agricultural labor within peasant economy. Wage labor is generall paid by a daily rate or by contract labor. In the latter case, a certain amount of work is agreed upon for a certain price. This is known as a bout or djob. The worker is then free to work at his own speed and in his own way. If he chooses to take on other workers to do the job, he is free to do so. Where there is high labor demand, contract labor may be standardized by a common measure such as pole's length, a length of cord or a certain number of arm's breadths. In the case of charcoal production, the contract may be established on the basis of number of trees to be cut and stacked. For example, in Ti Riviere a bout consisting of four medium sized bayahonde trees, cut and stacked, is worth about two gourdes. If instead the daily wage rate is used in payment, a half day's work here is worth three gourdes plus food and drink, or five gourdes without food and drink.

In general it seems clear that the prevailing market wage for agricultural labor provides the standard for labor payments in the peasant charcoal industry. My research into peasant labor practices during 1975-77 and 1979-80 suggests that labor costs are on the rise. In the past four years agricultural labor costs have doubled in the Grande Riviere area. Since last year, the cost of labor is up by 25 percent on La Gonave and in the northwest. There is some variation in wage rates depending on the type of work. For example, weeding costs less than turning over the ground (spading, terracing or mounding). Cutting and stacking wood for charcoal is perhaps more akin to clearing land for planting than to turning over the ground so far as labor cost is concerned.

There is also variation by season. Off-season work devoted to clearing and preparing ground for cultivation pays less than the peak labor costs of the coffee harvest in the northern mountain regions. I have observed labor costs to vary as much as 300 percent in this regard, i.e., slack season clearing and burning grassy fallow versus harvesting coffee. The difference in wage reflects both type of work and demand for work. Irrigated land preparation costs are higher than arid land preparation, reflecting the intensive character of irrigatio farming and the amount of earth works required. There is a clear tendency for men to be paid more than women for agricultural work. Where there is low labor demand, it is rare to find women doing agricultural wage labor. In high labor demand situations, both men's and women's labor groups are available. Women are generally hired for lighter agricultural tasks than men, i.e., weeding with a machet rather than moving earth with a hoe. Labor costs also vary in terms of a worker's need. Those less well off may be willing to work for something less than the prevailing wage in order to get work.

Another dimension to peasant wages is the pattern of combining payment in cash with payment in kind. In addition to these permutations in form of payment is the closely related issue of food and drink. In peasant settings a laborer working a daily wage is generally fed something also. (This does not hold for contract work.) If he chooses not to accept food and drink as partial "payment" for his services, he may receive a slightly higher cash wage. For example employers paying a three gourde wage may expect to spend a total of five gourdes to cover the wage plus food costs. On the other hand, the employer may avoid spending five gourdes in cash by using produce from his

garden (corn, plantains, sweet potatoes, yams) rather than purchasing food from the market.

There is some evidence that the rate of payment varies with the regularity of payment. The prospect of regular work for some weeks or months may provoke a willingness to accept a smaller daily rate than that usually paid by peasants for occasional day labor. On the other hand, most peasants do not maintain a regular "hired hand" on a daily wage labor basis. Rather, a small farmer may ally himself with an older and wealthier farmer who calls on him for work as needed. In return he may be given access to land for his own cropping needs.

In peasant Haiti the usual _jnin_ (day) of work is in fact a half-day which generally varies from three to five hours in length. This is in keeping with the fact that most agricultural workers are themselves peasant farmers with their own gardens except in such areas as the Artibonite where itinerant laborers come and go. Taking into account the factors discussed above, what is considered to be a reasonable wage for a full day's work (more or less eight hours) in peasant Haiti amounts to something close to eight gourdes ($1.60) at the present time if food costs are computed into the total wage.

This wage rate tends to be verified by various supplementary data on wage costs. In Cap-haitien, cassava bakers at a manioc grinding mill earn about nine gourdes per day when they have work. Gravel crushers do "piece work" in a manner similar to peasant contract labor, with no food supplements, for a wage equivalent around six gourdes ($1.20) per day. (Workers in the gravel yard above Cap-haitien come from the poorest strata of urban society.) Charcoal workers for a relatively large scale producer who buys wood, makes charcoal and wholesales it in the city of Cap-haitien are paid five gourdes ($1.00) for men and four gourdes ($.80) for women, plus food and drink, for a full day's work. The owners of a modern labor intensive weaving _atelier_ pay eight gourdes to unskilled workers. In the northwest, salt miners may earn about eight gourdes per day though this is not a full day's work. On the other hand, work in the salt ponds is considered particularly hazardous due to the extreme salinity of the water and its prolonged contact with bare skin.

Another way of approaching the problem of agricultural labor is through man-days of work required for certain tasks. There is no good data on this matter since it is difficult to measure due to the time required to research

and verify it. Smith (1980, 14) estimates that 40 man-days are required to clear a carreau of level cane land in the northern plains (1 carreau = 3.19 acres). Murray (1979, 47) estimates 48 man-days of work to clear a carreau for beans or millet. My own recent interviews in Gros-Morne and on La Gonave suggest an estimated 48 to 50 days for this work. Heavier types of work such as terracing (earth moving) require as much as 288 man-days per carreau according to Murray's data, and around 240 man-days according to my data on turning over ground in the hilly fields of La Gonave. Looking at peasant production from the standpoint of annual labor input, Zuvekas (1978, 83-4) estimates that a carreau of irrigated land requires an investment of 340 man-days per annum for active cropping. He cites coffee cultivation as the crop requiring least labor input in Haitian agriculture, 72 man-days per carreau per annum.

Clearly the labor investment in peasant agriculture is an input of major proportions. Similarly, the peasant mode of charcoal production is labor intensive, much more so, in fact, than the labor required for cropping trees, e.g., a coffee crop or fast growing hardwoods. For the sake of discussion, using the bout system of payment in Ti Riviere (1 bout = 2 gourdes to cut 4 bayahondes) on a carreau of land with a stand of bayahonde averaging one tree for each 225 square feet (15' x 15' spacing), the labor required to cut and stack a one carreau stand of trees comes to about 51 man-days, a figure close in magnitude to the estimated cost of clearing land for corn or beans, and much less than the heavier tasks of earth moving for lowland irrigation or mountain vegetable terraces.

The marketing network. There is a definite pattern of charcoal movement from producer to consumer via travelling intermediaries, wholesalers and retailers. The realities of the marketing network, however, are much less homogeneous than this basic structure might suggest. The difficulties of dispersed production for a central urban market allow a broad range of options and complicated manoeuvers in dealing with the problems of stocking, transport and sale to the consumer. Under the circumstances, these complications should not be construed as inefficiencies.

In rural areas of low charcoal production, the producer may sell directly to the consumer in a nearby town. In larger production areas, the small scale producer is more likely to sell to an intermediary engaged in stocking and

transporting charcoal to Port-au-Prince.

This intermediary is most likely a man although some women do engage in such commerce (cf. J. Smucker 1981). There is some confusion in earlier reports on the charcoal trade so far as sex linked roles are concerned, e.g., Voltaire 1979 and Salinas 1980. In general, men cut wood and make the charcoal, women rake and sack it, women predominate in pedestrian transport, men wholesale it, and women retail it. It is important to note that there is considerable flexibility in those roles. Both men and women are known to engage in nearly all aspects of charcoal production and marketing, but the wholesale trade is clearly dominated by men while small scale retailing is dominated by women.

The marketing intermediaries who purchase from peasant producers may be local farmers of means, nearby townspeople with capital to invest, outsiders generally from Port-au-Prince who travel to the producing areas and transshipment points to accumulate stocks of charcoal, or, purchasing agents representing larger scale charcoal merchants from the capital. The chain of intermediaries also includes those who do not travel to hinterland production areas. There are wholesalers in Port-au-Prince who purchase from the travelling intermediaries who ship charcoal by truck and sailboat. Many of these merchants are located near the market of Croix des Bossales. The large charcoal section within this market is composed exclusively of retailers, almost entirely women, who purchase their stocks from the nearby wholesalers. These wholesalers, mostly men, maintain depots on La Saline and other areas surrounding the market.

Client relationships, or pratik, develop at all stages of the charcoal network. Stocks coming by truck are unloaded by the Croix des Bossales market. If coming by sailboat, they are unloaded at the wharf in Cite Simone. The basic unit of trade is the gro sak, an augmented sack which is roughly equivalent to two sugar sacks. This is a unit of volume, but weight and quality of wood are important factors in determining price. Stocks are usually purchased by the bag from the producer. In this way a purchasing agent accumulates a large stock from several small peasant producers. Once past the stage of accumulating a stock for shipment to the city, the standard unit of transport and re-sale is by the lo, a "lot" of 10 gro sak. In the jargon of wholesalers, the going rates for charcoal are generally discussed in terms of the price per lo rather than by the bag.

Travelling intermediaries buy by the gro sak and sell by the lo. Port-au-Prince wholesalers buy their stocks from the travelling intermediaries by the lo, and they prefer to sell by the lo though they also sell by the sack. There is some de-bulking from these large wholesale stocks by smaller scale intermediaries who buy by the lo and sell by the gro sak to retailers who sell, in turn, by units smaller than the bag. The retailers within the Croix des Bossales market generally buy by the lo and sell either by the gro sak or by smaller units of volume, such as the basket or pile. Other retailers buy from the wholesalers near Croix des Bossales and sell in the streets or in neighborhood markets throughout the city. These ambulant retailers sell the charcoal at higher prices the further away they are from Croix des Bossales or from Cite Simone, due to the costs of transport and consumer convenience. Some charcoal middlemen develop a specialized clientele such as the hot food vendors who cook meals and fried foods in the street, e.g., the machann fwitay (sellers of fried food). This constitutes a sizable market in the populous slum quarters of the city due to the commercial viability of hot food and the inability of many poor households to purchase cooking fuel on a regular basis.

Wholesalers in the La Saline-Croix-des-Bossales district usually stock supplies of charcoal in the open air on state land for which they do not pay rent. This includes low lying land fill areas as well as the HASCO railroad right of way. In La Saline near the truck stop there are several dozen wholesalers loosely organized in groups. Each group designates a gardien to unload and guard the stocks of charcoal piled in stacks on the ground. The gardien is paid a flat fee of ₵ 0.50 ($ 0.10) per sack. Other workers hang around the depot area hoping to get work. The gardien takes on such workers for the actual work of unloading and stacking charcoal. He assumes responsibility for guarding the stacks against theft, especially at night when the depot owners are gone.

Depot owners along the HASCO right of way near Croix des Bossales bring in charcoal from the Cite Simone wharf rather than the La Saline truck station. By truck the transport cost is ₵ 1.00 per sack, or ₵ 0.90 per sack for a minimum of 100 sacks. For pedestrian trucks (kabouet hand trucks or wheelbarrows) the cost is ₵ 1.00 per sack for a full load or ₵ 1.50 per sack for less than a fully loaded kabouet (capacities vary in size from 20 to 50 sacks). The charge for carrying a sack of charcoal soutet (on the head) for this distance is ₵ 1.50.

Charcoal merchants in Cite Simone, La Saline and the HASCO right of way expect to pay from $20.00 to $28.00 per lo at present, depending on the quality of the charcoal. The cheapest grades of charcoal which they purchase, the low grade pepe or ti boua, may cost as little as 8 gourdes per sack ($18.00 per lo), and the highest grade of charcoal, the gaiac, costs as much as 20 gourdes per sack or $40.00 per lo when it is available. There is also variation in price for the same quality charcoal, according to transportation costs and the season. When there is a seasonal rise in production, as on La Gonave during the slack period for agriculture, the price may fall a bit. More important, however, are weather conditions, i.e., heavy rain in production areas, and heavy winds which affect sailboat traffic from the northwest. It is clear that a large percentage of charcoal coming into the city still travels by sea. The evidence for this is in the dramatic effect upon supply when boats do not leave the coastal ports of Mole St.-Nicolas, Baie de Hennes, La Plateforme, La Gonave and La Tortue.

Some of the largest charcoal merchants invest considerable capital in stocks of charcoal with a view to speculation. In 1979 a merchant in Cite Simone, dealing in various sectors including charcoal, was able to sell hundreds of sacks of charcoal at inflated prices after the passage of Hurricane David when boats in the northwest did not put out to sea. He had earlier purchased large quantities of ordinary charcoal at $12.00 per lo, and sold these stocks at $40.00 per lo in the aftermath of the hurricane when charcoal shortages broke out in the capital. High winds over coastal shipping lanes is perhaps the single most important seasonal factor in the charcoal trade.

Normally, the average Port-au-Prince wholesaler of modest means expects to make at least one gourde's profit per sack of charcoal. The travelling intermediary who sells to the city wholesaler may make a little more, depending on his skills, contacts and willingness to spend time in the country stocking up. An intermediary who purchases in Fond des Negres for re-sale in the city expects to buy a sak at 6 gourdes and to sell that sack for 12 gourdes. He has certain expenses: transport, tax, container and handling costs. Transportation costs from Fond des Negre are up by a third since 1979. The Port-au-Prince wholesaler who buys at 12 gourdes per sack hopes to sell it for 14 or 15 gourdes. He has expenses of disembarkment, local transport, and surveillance. The buyer who purchases at the wharf expects to pay less for the charcoal there than that coming by truck; however, the cheaper seagoing charcoal requires the added expense

of local transport in the city whereas the truck station is located in the immediate vicinity of the charcoal depots at La Saline, eliminating local transport costs. Furthermore, charcoal coming by sea requires special effort to gain access to it at the wharf for transaction. Since it is much in demand and enters by sea, it arrives at all hours of the day and night, depending on the winds. Prospective buyers must post someone to watch for boats in this competitive market.

An intermediary in this marketing chain has several options in assembling stocks of charcoal for re-sale. He may decide not to travel in pursuit of the merchandise, simply buying from the travelling intermediaries who bring charcoal by land or sea. Or, he may send out a purchasing agent or go himself to the hinterlands to buy charcoal at trans-shipment points, or, further inland at the production site. If he buys at trans-shipment points (usually coastal ports in the northwest), he buys from the producer directly or from a local intermediary who has already assembled stocks from the country in hopes of selling to outsiders coming to purchase. If instead he goes directly to the producing area, he generally rents a piece of ground along a roadway and assembles a stock of charcoal amounting to scores or hundreds of bags. He has the choice of doing this in two ways: by direct purchase from peasant producers, or by purchasing supplies of wood and hiring laborers to make the charcoal for him. Charcoal dealers who make their own charcoal in this way claim to double their investment. Those who purchase directly from producers find an advantage in establishing pratik relationships rather than buying at the market from strangers. Price per sack may ostensibly be the same in either case, but the amount and quality of charcoal is greater when purchasing from the pratik and hence is cheaper.

The chief drawback to depending on pratik, or on making charcoal directly, is a management problem. Aside from management skills, it takes considerable time to assemble large stocks of charcoal, whereas those who purchase from the marketplace or from local middlemen at trans-shipment points may pay more but are able to send large stocks to the city quite rapidly. There are times when this is a clear advantage as when turning over profits by dealing in volume. Those who speculate on any scale are perhaps less concerned about buying at the lowest possible price than they are about assembling large stocks in time to profit from rapid price fluctuations. One merchant points out that he does not

himself have time to travel in search of charcoal. Furthermore he is interested in speculation. He sends out relatives as purchasing agents, knowing in advance approximately how much charcoal he can buy for a certain amount of money. If his relative is able to make additional personal profits within that framework, the merchant does not mind. On the other hand, he will not trust strangers (i.e., non-kin) to do purchasing for him. Further, he refuses to make his own charcoal by proxy since he wishes to avoid disputes over an enterprise that he can't directly supervise.

Charcoal intermediaries presently expect to pay about 6 gourdes per gro sak of charcoal in the producing areas from producers in the northwest, La Gonave or Fond des Negres. This price varies in certain ways. The farther away from the production point, the more expensive the price (taking into account the transportation costs which accrue). Some buyers get a better price by advancing money to producers with pratik ties to the buyer. This assures the buyer of his supplies and may give him a slight edge over his competitors in terms of price per bag. When the Port-au-Prince price per bag goes up due to supply shortages, the producer raises his price. It is of some interest to note that the prevailing rate was actually one or two gourdes higher in December of 1979 than it was in December of 1980. It may be that this is indicative of new supplies of charcoal from the northwest and Grande Anse with a resulting increase in production since last year. It appears that the value added to a sack of charcoal between sale in the producing area, & re-sale to another middleman in Port-au-Prince, remains about the same since last year--around 7 gourdes. The most significant variation in these expenses is the cost of transportation.

In the northwestern town of Baie de Hennes, a major coastal shipping point, the going rate for a bag of charcoal is 8 gourdes, but only 6 gourdes in the remote sections of the commune where it is made. Between Mole St.-Nicolas, a major charcoal port, and Bombardopolis in the highlands, the cost of a bag varies from 5 to 8 gourdes depending on whether the bag is purchased at the farm gate, in the mountain town, along the road to Mole, or in the town of Mole. In Mole, townsmen buy charcoal for 8 gourdes from peasant producers travelling by donkey or mule. If "strangers" from Port-au-Prince come to purchase from townsmen, they pay as much as 9 or 9.50 gourdes. On La Gonave the cost of a half bag (the ti sak) varies from 3 gourdes at the farm gate to

5 gourdes in the coastal port of Anse a Galette. The highest transport cost for charcoal is 6 gourdes per bag in some areas of the northwest served by trucks: Ti Riviere, Jean Rabel, Atrel; and 5 gourdes from Anse Rouge. The point is clear: There is a gradual increase in the cost of a bag of charcoal in accord with distance from the production site.

Another transportation principle applies to the mode of transport: The more rapid and the greater the capacity of the means of transport, the higher the cost of transport per bag. A truck sometimes carries charcoal from Bombardopolis to Mole St.-Nicolas for trans-shipment by boat. The truck charges 2 gourdes per sack; donkey transport amounts to 3 gourdes for 3 sacks, and mule transport costs 5 gourdes for a 4 sack load. Between Baie de Henne and Port-au-Prince, transport cost comes to 2 gourdes per sack by boat (taking several days), and 5 gourdes per sack when a truck is available (taking a few hours). Boat transport from La Gonave to Port-au-Prince is half the cost of boat transport from the northwest.

Aside from transportation costs and personal travel expenses, there are other expenses which build up the price of charcoal, including taxes and handling costs. Travelling intermediaries are expected to purchase an identity card and patente (license) from the Bureau of Contributions (reportedly costsing 77 gourdes per annum). In addition they pay Ø 0.25 per bag of charcoal to the agent forestier of the department of agriculture. This tax is usually paid in the commune where the charcoal is produced. It is usually paid by middlemen rather than producer, especially in the large producing areas. Some supplies of charcoal are taken out without this charge actually being levied. Small scale mountain producers in areas of marginal charcoal production are asked to pay the tax in a pattern identical to the tax levied for burning off fields or cutting trees to prepare ground for cultivation. Middleman costs are illustrated in the following examples of good quality charcoal (bayahonde) purchased by the bag in the northwest:

CASE A: Ti Riviere

Ø 6.00	Middleman cost of purchasing a bag of charcoal from produce
.50	Cost of sack (container)
.25	Cost of filling a sack with loose charcoal
.25	Forestry tax
6.00	Truck transport to Port-au-Prince
.50	Off-loading at La Saline truck stop @ Ø 0.20/sack plus cost of surveillance in open air depot
Ø13.50	TOTAL

CASE B: Bombardopolis

G 6.00	Purchase of a bag of charcoal from producer
.50	Cost of sack (container)
.25	Cost of filling sack with loose charcoal
.25	Forestry tax
1.00	Donkey transport to coastal port of La Plateforme
.50	Cost of embarking sack onto sailboat
.50	Cost of disembarking sack onto wharf in Port-au-Prince
2.00	Cost of sail transport from La Plateforme to Port-au-Princ
1.00	Transport from Cite Simone wharf to HASCO right-of-way
G12.00	TOTAL

These costs vary with the quality of charcoal, the nature of relationships between middlemen and charcoal sellers, the number of middleman transactions, the mode and distance involved in transportation, and the skills of the purchaser. The profit margin is greater if the middleman chooses to hire labor and produce charcoal directly. There may be two or three middlemen between producer and retailer, and each intermediary expects a rate of return of at least one gourde per sack and sometimes several gourdes. The middleman who sells to retailers in Croix des Bossales may reasonably expect to gross $30 per lo for bayahonde (15 gourdes per sack), or $20 per lo (10 gourdes per sack) for the most inferior grade of charcoal (ti boua). Ambulant vendors who specialize in providing charcoal to residences and neighborhood markets in far flung corners of the city may in turn sell this standard grade of charcoal purchased at 15 gourdes for up to 20 and 25 gourdes per sack during normal periods of uninterrupted supply. Prices vary according to local transport costs and the clientele.

The Port-au-Prince market is the cornerstone of the charcoal trade; however, the Cap-haitien market is worthy of special note. As mentioned earlier, marketing networks for the northern metropole do not overlap with the northwest/ La Gonave/Port-au-Prince network of supply and demand. Nevertheless, the selling prices for charcoal in Cap-haitien are more or less the same as those in Port-au-Prince. In the north, there appears to be a larger amount of the highest quality charcoal, the watapana comparable to gaiac. This suggests that the north's supply base may be relatively less depleted. On the other hand, the standard price to the producer appears to be higher in the north (8 gourdes) than in the northwest (6 gourdes). This may reflect a higher quality of charcoal being sold, or it may suggest a more limited level of production in a growing urban market. There is evidence that transport costs compose a relatively smaller proportion of the selling price in the north than in the capital. For example, truck transport from Dorac to Cap-haitien is only 2 gourdes per sack

whereas the cost is 6 gourdes from Jean Rabel to Port-au-Prince.

One Cap-haitien middleman indicates that it is not worth his while to market charcoal in Port-au-Prince unless he has sufficient cash and warehouse reserve to speculate on that market's occasional rapid price increases. This is not surprising in light of the prevailing price of charcoal in Cap-haitien and the considerable cost of transportation to Port-au-Prince. This may help to explain the apparent insulation of the northern charcoal market from the rest of the country. Another factor in this regard is the contrasting character of northern supply zones compared to the arid peninsula of the northwest. The arid forested regions of the northern plains are relatively less populated and smaller in area than the charcoal producing areas of the northwest. Large sisal plantations of diminished activity further limit population density, the natural forest cover and access by peasant producers to supplies of wood. Like the northwest, however, the prevailing characteristic of the northern charcoal area is its xerophytic forest reserves, unusual aridity, low population density and the absence of intensive agriculture. Wood (1963, 15) points out that in the arid plains area of the north, food deficiency is more common than surplus. In the sisal plantation area, food surplus is virtually nil in the complete absence of peasant agriculture. On the other hand, unlike the northwest, the larger northern departement is intensively farmed and supports a heavy population density in its humid mountain regions and river valleys. The factors of local charcoal production seem to favor the Cap-haitien market over a more distant national market. The local regional market assures comparatively good prices to a limited producer population.

Any discussion of the market for wood products in Haiti is incomplete without mention of firewood, polewood and bois chandelle used for extracting an essential oil. Middlemen in Cite Simone report the purchase of firewood (boua bouile or boua chofray) coming by boat at $10 per hundred sticks, re-selling at $13 per hundred. Polewood for construction (bois carre or bois chafroday) is purchased off the boat at 11 gourdes (3" x 12') and re-sold for 15 gourdes per dozen poles. In the northwest bois chandelle is purchased by buyers for $5 per cubic meter, transported to the capital for 13 gourdes per cubic meter and sold at the factory on the road north for $13 per cubic meter.

PEASANT AGRICULTURE AND REFORESTATION

Peasant farming is oriented first of all to assuring a basic food supply to the household as the fundamental unit of rural Haitian society. Secondly, it is oriented more strongly to minimizing risk than it is to maximizing production. Thirdly, it is oriented to the market economy as well as to meeting household subsistence requirements. There is no rural area of Haiti which does not participate in the national economy. Peasant cash cropping is often geared to both domestic and international markets for agricultural products. There is some evidence that the decade of the 1970s has seen a shift away from export crops in favor of domestic (food) cash crops.

Any consideration of peasant reforestation must take into account the various crop patterns present in peasant agriculture, Secondly, it is important to note whether or not peasants ever plant trees, and if so, on what occasions and to what ends. Widely varying patterns of rainfall are key to the considerable variation in agricultural seasons, the types of crops planted and the role of livestock in peasant economy.

In a sense there are various peasant "economies" rather than one homogeneous "peasant economy" in Haiti. This is in part the result of immense ecological variation over short distances, as is evident to any traveler passing through provincial Haiti. This factor, combined with dispersed and fragmented holdings in peasant land tenure, gives rise to various micro-agricultural strategies geared to particular ecological niches such as arid lands, well watered highlands, small scale irrigation, moist ravines, rocky grazing areas, etc. The mountainous terrain combines with the prevailing winds to create rain shadows, hence there are humid north-facing slopes and dry south-facing slopes, a pattern duly noted by mountain peasant farmers. Where there is sufficient rain, mountain peasant agriculture is characterized by intensive patterns of intercropping and multicropping. In contrast, arid agriculture tends toward "extensive" crop strategies focusing on fewer crops and fewer growing seasons, and emphasizing livestock as a livelihood during lengthy slack seasons. Irrigation may transform arid culture into intensive multicropped

patterns of agriculture requiring heavy labor investment.

With a view to the potential for reforestation, several peasant "economies" are discussed briefly in the following sections. Different crop strategies show distinct variations in crop rotation, lengths of fallow, land tenure arrangements, slack season strategies, patterns of storage and of monetization. The Creole term te cho (hot soil) refers to dry well drained soil, and te fouet (cold soil) denotes moist or water retaining soil. Certain crops grow best in one or the other, but te fouet is considered preferable.

- Mixed humid and dry mountain slopes. This context is perhaps the archetypal setting for intensive Haitian peasant agriculture since four-fifths of the republic's land area is in mountains inhabited by peasant farmers. Coastal lowland areas are frequently quite dry. The charcoal areas under consideration for reforestation include mountainous areas, but they are not characterized, overall, by the "classic" mountain peasant agriculture. Nevertheless, it is useful here to sketch out briefly the crop patterns on well watered slopes as a standard of comparison with other cropping strategies. Furthermore, there are pockets of intensive mountain cultivation in the northwest and La Gonave. Some zones shift strategies in response to cycles of drought and rainfall. Regions subject to this shift are also those which fall into the category of pseudo-drought whereby the stripping of ground cover through heavy cultivation reduces the moisture retaining qualities of the soil, and intensive cropping disappears. In other words, agricultural drought often extends and exaggerates the effects of temporary meteorological drought.

Terre Neuve is a humid mountain zone of fairly intensive agriculture located in the northwest region. There is an abundance of forest cover, but it is primarily fruit trees rather than hardwoods, and there is some coffee. The most productive crops here are corn, beans, and some plantains. Drier slopes are devoted to millet, manioc and sweet potatoes. The importance of millet suggests that Terre Neuve is not so well watered as mountain communities farther to the east such as Pilate, Plaisance, Limbe and Grande Riviere du Nord where millet is not generally grown.

In Pilate there is considerable forest cover related to the high production of coffee. This is truly a region of intensive mountain agriculture favored by rainfall. The key subsistence crop is not grain but starchy tubers,

chiefly yams. Important cash crops include plantains, beans, corn and mountain rice. No millet is grown here. The most humid soils are devoted to coffee, yams, banannas, taro and malanga.

Limbe and Grande Riviere are comparable areas though both are somewhat less well watered than Pilate and Plaisance. Fertile river bottom land lends itself to heavy intercropping and the production of plantains, rice, corn and taro. The flood plains of these rivers also include high-risk sand bars which are sometimes cropped in sweet potatoes, a dry land crop. On the slopes around Grande Riviere there is variation in crop patterns linked to rain shadow. North-facing slopes are more humid than south-facing slopes. Ravine soils are generally more comparable to the north-facing slopes so far as të fouet and humidity are concerned. In addition to "hot" and "cold" soil types, variations in topsoil depth are recognized by peasant farmers, and the deeper soils, usually found on more level fields, are sometimes turned over in a limited form of spading to enhance production.

On the humid slopes there are red beans, taro, yams, plantains, coffee and cacao. On dry slopes there is usually some corn, drought resistant beans such as the congo and black-eyed peas, peanuts and manioc. Humid slopes with high fertility may support three successive red bean crops, e.g., April, December and April. In a farm unit with several plots on humid and dry slopes, a farmer hopes to plant beans three times within the year including the major spring planting (April-May), late summer (August-September) and the slack season (December) after the fall rains. Plantains, red beans, congo peas, corn, yams and sweet potatoes may be intercropped within one plot. No millet is planted in this area. Manioc is not planted on the more humid slopes, nor are red beans planted on humid slopes during the major planting season (too wet). Red beans are planted on humid slopes during the lesser planting seasons, and on the more droughty slopes during the major season. (1) (2) (1+2)=(3)

Intensive mountain peasant production in these environs is characterized by considerable intercropping and multicropping; forest cover linked to coffee and fruit production; a mix of humid and dry agricultural niches supporting different crops and growing seasons; a mix of tubers, grain, vines and fruit trees; the importance of corn as the grain crop, and sometimes rice; and the importance of tubers in meeting subsistence needs. In comparison to drier areas,

these mountain zones have limited storage needs for the harvest; limited land devoted to grazing livestock, and less dependency on the market to supply househo subsistence needs.

Dry mountain agriculture. Falling mid-way between the arid lowland plains and the more humid zones of intensive mountain agriculture is a form of peasant agriculture which supports only moderately intensive peasant farming. This may be in the mountains of La Gonave and the northwest where the population density is greatest. These zones do not generally sustain a high level of charcoal productic although it is more common here than in the wetter zones. This type of productic is sometimes extended, with some modification, into more droughty areas in close proximity to even drier wooded areas of limited cultivation, e.g., Ka Philippe or Ti Riviere where charcoal production is in full harvest. Dry mountain zones may be less arid than lowlands which bear the full brunt of the rain shadow, e.g., the Plaine de l'Arbre. Dry mountain cultivation, however, has the disadvant of a more shallow topsoil due to the severe erosion sustained by unprotected slopes.

The cropping pattern for dry mountain agriculture is closely related to choices already discussed for dry slopes. A good example of dry mountain agriculture is the populous highland region of La Gonave. The annual cycle of rains is a drier version of what is standard in the north except for the reduction of plantings to two seasons rather than three. (The drought cycle of the 1970s has left La Gonave without a good millet harvest for nine successive years.) There is a spring rainy season in May followed by a droughty summer and fall, and the possibility of some rain in November. December through March is a very dry slack season for agriculture. The key cash crops are well suited to withstand drought: manioc, peanuts and tobacco. There is a history of exporting limes, sisal and watermelons to the mainland. Where the soil is productive, manioc, congo peas and corn are preferred crops. The primary grain is millet. Where beans can be grown, the varieties generally used are the black-eyed pea and the congo pea rather than the more demanding, and more productive, red bean. The key subsistence crop is the dry grain millet, supplemented by corn, manioc, sweet potatoes, and congo peas. Where suitable the black-eyed pea is intercropped with corn, both requiring a two and a half month growing season. The beans are planted in April or May, and corn is planted two weeks after the beans, in the same field. The following 6-year cropping cycle demonstrates how a plot of

productive land in this region might be used:

YEAR I: The "bitter" variety of manioc is planted on land rejuvenated by fallow. It is planted on mounds and grows for at least one year and as long as three years. The long growing period reflects the droughty character of the region. (Fertile plains areas of the north require only 6 months to grow the "sweet" variety of manioc.) This starchy tuber is a valuable subsistence crop. Its long growing period allows it to be stored in the ground and used as needed after it reaches a certain size. Corn and congo peas are intercropped with the manioc and planted about the same time (spring rains). Congo peas planted in May are harvested "green" in December and "dry" in January or February. Harvest of this crop, like many peasant crops, is staggered out over a period of time to meet subsistence needs at home and petty cash needs in the market by sale in small amounts. The corn is harvested during mid-to-late summer following spring planting. Finally, this garden plot is intercropped with millet about 1½ to 2½ months after the main spring planting. The harvesting of the corn a few weeks after the millet is planted allows space for the millet to grow during the dry months ahead, and to be harvested when the supply of corn has long been exhausted. The millet is harvested in December or January, about 5 months after planting.

YEAR II: The leafy top and stalk of the manioc is cut back, leaving the live tuber in the ground but allowing sunlight and space for planting other crops alongside the manioc. Corn and congo peas are planted as in YEAR I with harvests anticipated for early fall and mid-winter respectively. Peanuts are intercropped with the corn and peas, and harvested in late fall (6 month growing season).

YEAR III: With the manioc still in the ground, red beans may be planted after the spring rains and harvested within 2½ months. (These highland valued quick growing beans are generally only a two month crop in the more humid north of Haiti.) Sweet potatoes are planted in mid-summer and/or year's end. They may be stored in the ground for 3 to 5 months and consumed gradually as a subsistence crop. By now the remainder of the manioc has been dug up and sold.

YEAR IV: Corn and congo peas are again intercropped with millet.

YEARS V & VI: If the farmer's land unit permits, the land is left in fallow for about a two year period and used as a grazing area for livestock.

Arid mountain zones of the northwest have patterns similar to the agricult

of La Gonave, with certain local variations. Ka Philippe has its main planting season in April and May, and its driest off-season in February and March. Key cash crops are corn, beans and peanuts. Millet is an important grain and the mainstay of subsistence. The driest soils are devoted to peanuts, millet, corn and manioc, and the wetter soils to peanuts, congo peas, red beans, corn and sweet potatoes. Like La Gonave, there is little or no coffee, cacao or plantains.

In Bombardopolis, a mountainous zone toward the western end of the peninsula, the most important crops are millet and manioc, though peanuts, corn and beans are also of commercial value. Castor beans, leaf fiber from the latanier palm and some fruits are traditional supplements to food crops in this area. In Mapou (Ti Riviere) aridity is more pronounced than other highland communities discussed above, but local farmers have access to some north-facing plots with more humidity where manioc, beans, corn and sweet potatoes may be grown. On the arid slopes, farmers grow millet and peanuts intercropped with minor crops such as melons, pumpkins and sesame, and castor beans as a cash crop. There is no assurance of rain in Ti Riviere, and the 1970s have proved to be especially dry. The main planting season is traditionally spring, with the possibility of minor rains in the fall.

In sum, the arid highlands are an intermediate range of peasant agriculture so far a rainfall is concerned. Rainfall, less than in the humid mountains to the east, permits no more than two planting seasons, and the droughty slack seasons are more enduring. Garden culture tends toward a mix of corn and millet. Subsistence is somewhat less dependent on tubers and more dependent on grains. The key tubers are bitter manioc and sweet potatoes (no yams or taro). There are no export cash crops, and the key cash crops are food crops, especially grains. Agriculture is still intensive in character when the rains fall, but intercropping is somewhat reduced by comparison to the humid mountains.

<u>Arid lands agriculture in lowland areas</u>. There are relatively large arid upland regions in the northwest, but they are nearly empty of resident farmers There are clearly defined arid lowlands in the plains adjacent to both northern and southern coasts. The largest of these are the Plaine de l'Arbre near Anse Rouge and Sources Chaudes, the Plaine de Jean Rabel, and the Savanne Mole St.-Nicolas. In these settings grain is the key to subsistence as well as to cash cropping for the market. Millet is the quintessential grain for

droughty soils. The cropping of millet runs in tandem with the grazing of livestock. These areas, along with some of the dry mountain areas of diminished agriculture, are primary charcoal producing centers (as noted earlier in discussic of the charcoal cycle).

There are three main varieties of millet in use: pitimi chandel, a productive three month variety: gro pitimi, a drought resistant 5 month variety; pitimi estime, a 2 month hybrid which is unpopular since it doesn't conserve well in storage and is less hardy than the others. When there are spring rains on the plains near Anse Rouge, the chandel millet is planted without intercropping. Later, gro millet is planted following the occasional precipitations of summer or fall. When there is winter rain, farmers plant corn and beans intercropped with pumpkins, sesame and sweet potatoes, but only during the cool of mid-winter and with the benefit of shallow dirt canals which slow down and conserve the run-off water. Around Sources Chaudes, corn is sometimes planted in the spring, and beans in the fall, depending on weather conditions.

On the north side of the peninsula, the Plaine de Jean Rabel depends even more on the winter rains than the arid plains to the south. The seasons here are literally reversed from those of the mountains nearby. The Jean Rabel plain has only one agricultural season beginning in December, and there are virtually no spring rains. The plain grows corn and beans rather than millet, and is very productive if the winter rains fall. Given the diminished rainfall and limited growing seasons, the plains presently produce considerable charcoal. Further down the southern coast of the peninsula, the coastal areas of L'Etang and Grande Savanne depend on only one planting season linked in this case to the spring rains. When there are spring rains, millet, cotton, melons and pumpkins are grown.

In the arid plains of the northwest there is relatively little intercropping, low rainfall and as little as one planting season per year. Millet is by far the dominant grain, and there are almost no tubers grown except the sweet potatoe. The growing of various types of millet is traditionally combined with the grazing of livestock. The livestock population has been much reduced since the dissolution of open range grazing. Where agriculture is combined with fishing, there is still open range grazing since agriculture is of little importance. In other areas, the grazing tradition is maintained by building

animal pens rather than fencing garden plots as was done formerly. Whether on dry mountain slopes or even drier coastal plains bearing the full brunt of rain shadow, there are a series of crops adapted to arid culture. They include quick growing crops which can take advantage of irregular rainfall, and short rainy seasons, e.g., beans, pitimi chandel. They also include slow growing crops highly resistant to drought, e.g., manioc, gro pitimi, congo peas. Finally, arid culture requires crops which lend themselves to storage in order to counter the effects of fewer growing seasons per annum, e.g., dry grains stored in storage structures, or, bitter manioc stored in the ground.

Irrigation culture. In scattered communities throughout the northwest there are traditional forms of irrigation based on shallow dirt canals, small streams, and run-off water from dry gulches which fill up and run for days, weeks or months after the rains fall higher up. Some of these systems are discussed in the HACHO report (Smucker & Smucker 1980). Shallots are an important irrigated crop in such places as Figuier-Ramones, Petite Place and l'Etang. Where there is sufficient water for irrigation, other crops are planted, e.g., corn, beans, plantains, taro, millet, manioc and sweet potatoes, or generally the full range of food crops more characteristic of humid mountain agriculture. In irrigated areas where there is a steady supply of water, fruit trees are also cultivated. Irrigation systems require considerable labor investment in canals, terracing and the range of tasks necessary for intensive cultivation.

The land tenure question. This is a complicated issue discussed at length by many researchers, cf. Folsom (1954), Murray (1978), Thome (1978), Zuvekas (1978). My own research in rural Haiti suggests the following:

1) The predominant mode of peasant tenure is overwhelmingly "mixed" in character. Farmers generally work several plots of land under different modes of tenure, simultaneously renting, sharecropping, owning and renting out land. A given farmer's control of garden land may vary from season to season depending on his needs and ability to acquire land, usually through personal and kin ties.

2) Overall, the evidence suggests that peasant Haiti is a society of landowners. The system of legal inheritance and customary practice has the effect of giving almost everyone ownership rights; however, the land a farmer owns is often not adequate to make a living by conventional peasant standards, especially if the farmer is young-to-middle aged. There is no evidence of a

clearly defined "class" of sharecroppers. It may be that there are some local exceptions to this, e.g., the Beaumont Plateau near Jeremie; but such cases are truly exceptional to the general rule.

3) It cannot be assumed that peasant society is a classless society. There appears to be considerable variation in size of holdings even among younger and poorer peasant farmers. Generally, however, the land area of Haiti is characterized by "minifundia" as the predominant mode of tenure. There are also "latifundia" of various types--private estates, government concessions large and small to foreigners and Haitian citizens. The large plantations are usually located in the most desirable agricultural areas, fertile coastal plains, river valleys and the central plateau.

4) As yet there are no good data on the extent of large holdings or of state owned land. It is clear that the state generally maintains ownership of off-shore islands, large sections of lowland plains, and certain mountain forest regions. Off-shore islands are generally farmed by peasant smallholders who pay an annual rent to the Bureau of Contributions for the cessions they farm. At the same time, these peasant land cessions from the state are bought, sold and inherited much as mainland peasants treat land they own outright. In effect, peasant farmers on state land traffick in the rental rights of occupancy for the parcels of land they farm.

5) Peasant land tenure is characterized by a dual system of holding land by "custom" in ways neither provided nor excluded by the law. The system of "custom" versus the "law" serves to protect the moral rights of kin, to avoid or delay the cost of paying taxes on transfer of ownership (notary fees, survey costs, state taxes, court costs) and to avoid the possibility of "abuse" by officials and/or competing claimants, usually kin. Land ownership is ultimatel vested in an original title of purchase or donation which often goes back for several generations, sometimes to the early land distributions of the nineteenth century. Land sales tend to take place within the group of heirs. Alienation of land to "strangers" (non-kin) usually involves legal proceedings, surveying and the consent of all potential heirs. The children of heirs have land rights by virtue of parental recognition. Other kinship related land may remain undivided though temporary use rights are granted to members of the kinship group (heirs).

In light of these generalizations, it is useful to examine briefly some of the land tenure issues salient to reforestation on La Gonave and in the northwest. As an off-shore island, La Gonave is owned by the state. As on the mainland, the local population is predominantly smallholding peasant farmers. Most of these peasant farmers own state cessions for which they pay an annual tax.

The traffick in state cessions is also taxed when formal sale of a cession is undertaken on the basis of land survey. On the whole the system operates with a stability of tenure comparable to the outright ownership in other parts of Haiti. Theoretically, it is easier for the state to refuse the renewal of cessions than it is to exercise rights of eminent domain on the mainland. In practice, expropriation of land is probably no more common on La Gonave than elsewhere, and farmers here have maintained cessions within the family for generations. On the other hand, it is worth taking note of the fact that within the past decade a high government official wrested control of a large block of land through the tax office with a view to establishing a lime orchard. In fact, the right of eminent domain already exists in any case, and state ownership of land on La Gonave functions as simply another variation of that right. Land tenure is not only a matter for potential abuse on the part of outsiders. It is common knowledge on the island that some farmers are able to avoid paying taxes on holdings by claiming a smaller parcel of land than they actually occupy.

Another complication here is the widespread "rent strike" of the late 1970s. Following several years of drought, and the removal of certain taxes under the presidency of Jean-Claude Duvalier (market and slaughter taxes), indigent farmers on La Gonave ceased to pay the annual state tax for occupancy of a cession. Some farmers apparently hoped to be granted outright ownership of their land as in the case of two communities on La Gonave (Mare Sucrin and Grande Source) which were granted land following the promulgation of the Bien Rurale de Famille in 1934. During the period of non-payment, the government apparently made no attempt to remove occupants of unpaid land units. At present, "striking" farmers have resumed payment in the fear of having their cessions taken away for non-payment. What these incidents suggest is that farmers on La Gonave desire the right of outright ownership of land, but are willing to invest labor and long-term planning in land under the cession arrangement.

There are a few absentee landlords of some size on the island. Most of the cessions, however, are held by resident peasant farmers as small holdings. The island has long had a reputation for having land readily available to peasant farmers. This has had the effect of attracting many poor emigrants from the mainland in search of farmland as recently as the last generation or two. Most habitable zones are presently occupied and the population generally resides in the highlands rather than arid coastal regions. All major markets are in the

central highlands of the island where the land is more fertile. The population of the littoral is concentrated in a few small fishing villages which also serve as the transportation centers for movement to and from the island. During the 1970s there has been considerable emigration to Port-au-Prince and abroad. The sizable migration in small sailboats to Miami in 1980 has affected the availability of transport to and from the mainland since sailboats are the sole transport link to the outside world. Certain portions of the island are underpopulated despite some potential for agriculture. These areas remain sparsely populated due to the lack of potable water supplies to sustain residence. Such regions merit further investigation with a view to establishing reforestation projects. These low populated zones include Debalene, Morne Grand Vide, Tamarin, Dent Grient and Trou Louis.

Like the island of La Gonave, land tenure in the peninsular region of the northwest is dominated by peasant landowners. There are large tracts of unoccupied state land. There is some open range grazing on state lands, but the tradition of these practices is also maintained in privately owned areas of limited cultivation. For the most part state lands of the northwest are arid badlands ill suited to cultivation though forested with desert vegetation. Valuable but slow growing hardwoods have mostly been logged out during the last century and the early part of the present century when speculators in campeche and other woods were resident in the region. This past era of speculation in wood sustained the Mole St.-Nicolas as an important regional port and commercial center.

There is more state land within the actual limits of the northwest departement than in other parts of the peninsula. (Note that the departmental boundary on the southerly coast begins west of Anse Rouge, over half way up the peninsula as a geographic entity.) The western tip of the peninsula, from Baie de Hennes around the point to the Mole, reportedly has considerable state land, as does the road from Baie de Hennes to Bombardopolis and other sections of the commune of Mole St.-Nicolas. There is also state land in the Jean Rabel area behind the Jean Rabel Plain, and on the north side of the road to Port-de-Pai after the turn-off at Morne Mulet. At one time the latter tract was reportedly a large cession belonging to the Dauphin Plantation, but the plantation never developed it in any way.

kin. Family names are few and intertwined by marriage. The community councils here are termed "family councils" by their members. Land tenure falls into a similar category as a function of kinship and inheritance. In these communities almost everyone claims descent from a common ancestor who owned an original tract of 100 or more carreaux dating back to the nineteenth century. Portions of these tracts are still held as undivided family land used for grazing and occasional cultivation. Furthermore, land here is held in relatively large plots in keeping with the conditions of arid agriculture. In Grande Savanne, even the "savanna" is privately owned though it is used for open range grazing; it is not divided into small subplots though used by several households. The community council of L'Arbre is readily able to make 70 hectares of land available for a CARE subsidized cotton plantation from such undivided family land. In these and other arid cultural areas of the region, there is good evidence that sizable plots of privately owned land are potentially available for tree farming.

Trees in peasant agriculture. Given the wholesale destruction of forest cover built into peasant agriculture, the impression is sometimes given that peasants do not plant trees. This is of course not the case. Land scarcity in the face of a growing rural population has resulted in the cutting of Haiti's forests to meet the need for cropland. Large scale cutting of trees for charcoal production is a fairly recent phenomenon in most regions of the country. People do not plant trees with a view to charcoal production. Peasant farmers do plant trees for other purposes.

A cultural view of peasants and trees reveals that trees are both material and spiritual goods. Trees which are not purposely planted are often protected where they volunteer to grow. Some trees are linked to strong taboos against cutting under any circumstances, especially those perceived as repositories of the family spirits or the spirits of springs and ravines. Food offerings are hung in trees on ritual occasions to appease the appetites of dead ancestors. Some trees are individually owned though the property on which they stand belongs to another. It is customary to bury the umbilical cord of a newborn close to the house-and-yard of the child's birthplace & then to plant a tree over it. The tree forever belongs to the child, and even as an adult he or she may dispose of its fruit. As a natural phenomenon, trees are perceived as coming from God.

It is of some interest that trees may be owned separately from the land

The issue of securing access to a cession of state land for reforestation is intriguing. Aside from the problem of limited agricultural potential (an advantage in the case of trees being a legitimate use of land unfit for cultivation the state lands do offer potential for land tenure disputes. This is demonstrated by the cession granted to a wealthy Port-au-Prince investor in the plains not far from Sources Chaudes. This tract is reported to be in excess of 100 hectares and is being developed for large scale irrigation agriculture. The enclosure of this tract of land has given rise to land disputes since the borders are not clearly defined in relation to what belongs to the state and what is privately owned. A number of local families claim ownership rights to portions of the land enclosed by the developer.

It is interesting to note that similar problems have arisen in the construction of an irrigation system on private land in l'Etang. The land here is a privately owned area of desert forest. Following construction of the community council irrigation system, the land was greatly enhanced in value, and there are now conflicting claims to the land. Like the Port-au-Prince businessman, the l'Etang council owns the irrigation system and therefore holds the advantage of current occupancy in negotiating settlements.

It might be advisable to survey land in advance, especially if peasant farmers are to be assured of land rights in a project intended to endure beyond the period of active agency presence. It is to be expected however that there would be conflicting claims to land whether or not it is surveyed in advance. These conflicts are built into the system of law and custom surrounding the whole issue of land tenure. Furthermore, people are demonstrably willing to negotiate when they perceive an advantage in doing so. In the case of land on the fertile state cession not far from Sources Chaudes, local peasant farmers with claims to that land indicate a willingness to turn over half of their claim in exchange for irrigation rights for the remaining half. Peasant farmers in L'Arbre and Anse Rouge report inheritance from parents who originally farmed state land a la derive, by squatting, and finally secured ownership by virtue of continuous occupancy over a 20 year period through the "grande prescription." The limits of public and private land are unclear at best, and the older tradition of squatting has complicated the matter.

In l'Arbre and Grande Savanne, people point out that most residents are

on which they stand. This is true of other peasant contexts besides that of personal trees linked to one's birthplace. It is also true of land rentals where land may be rented out with the exception of the trees. The trees in question are usually fruit trees which produce a regular harvest. It is not uncommon to reserve that harvest for the landowner, excluding the renter.

Peasant interests in planting trees tend to revolve around several specific concerns:

1) Living fences: The peasant lakou (house-and-yard, or compound) is usually enclosed by hedging, often kandelab, raket, raket panyol or pingwin. It is not uncommon to use sisal hedging, especially where sisal is grown to provide fiber for cording or for sale on the market. Gardens are sometimes enclosed with hedging, protecting borders and keeping out human and animal intruders. Mintz (1962) discusses this phenomenon as he observed it in Fond des Negres.

2) Boundary markers: Trees and rocks are used to mark property boundaries The cutting of such trees or removal of these rocks is cause for bitter quarrels, court cases and charges of witchcraft. Trees are generally preferred to rocks and are planted on the occasion of surveying land. Trees are planted at corners or in rows. These tree bonn or boua lisye include such varieties as gommier, medecinier, mombin, siwel and calebasse. Fruit bearing trees are not generally used as markers. Important characteristics in tree markers are hardiness and the quality of "taking" if planted. Sisal is sometimes used to mark boundaries in arid zones.

3) Fruit trees: Fruit bearing trees of various kind are planted in two particular settings (where climate and fertility permit): the peasant lakou, and established gardens. The house-and-yard is built up with a variety of trees, shrubs, spices and sometimes vegetables. This botany of the yard serves household needs as well as some marketing outlets. Where coconut palms can be grown, they are planted near the house. This pattern is more elaborate in humid agricultural zones. Garden lands held with ample security (ownership through purchase or inheritance) are frequently built up with a variety of trees interspersed with cropland. Fruit trees provide a hedge against crop failure. Mangos, for example, tend to bear especially well during seasons of drought when crops fail to produce. Breadfruit is a starchy, somewhat lower status replacement for the more highly valued subsistence starches such as taro, malanga, plantains or yams.

4) Coffee production: Shade trees such as the sucrin or pois doux are commonly planted in coffee growing regions as a natural shade against the sun and as a means of conserving humidity. The planting of coffee is itself a kind of forest cover. This pattern is not present in arid lands agriculture.

In general, peasant farmers have a distinct preference for self-regeneratin and self-reproducing trees. Coffee groves are allowed to expand or to become more densely populated but they are not thinned or pruned unless the decision is made to destroy the coffee and plant other crops. Stands of plantains or banannas may be allowed to reproduce year after year from the shoots coming out of the base of the tree. After the fruit has matured, the trunk of the tree is cut off at the base and a new shoot is allowed to grow. Where a valuable hardwood seedling grows in the garden, a farmer may choose to protect it rather than destroy it on the principle that if it volunteers there, it will surely do well there. The bayahonde is notable for its characteristic of coppicing whereby a new trunk grows from the stump of the old one. In charcoal areas of La Gonave, privately owned stands of bayahonde are protected by the restriction of access to the woodlot, allowing stumps to coppice and new saplings to grow. Peasant farmers do not actively plant hardwoods except for boundaries or shade, and these trees are traditionally not the most valued of hardwoods.

An agent forestier maintains a nursery in Nan Cafe on La Gonave. His experience with this nursery is an indication of peasant attitudes towards trees. He reports that local farmers are willing to purchase coffee seedlings from the nursery. They actively request fruit seedlings but are not willing to purchase them. Finally, they are willing to take hardwood seedlings and plant them, but they neither request nor purchase them.

Peasants traditonally plant fruit trees by seeding directly into the ground rather than making seedbeds or nurseries; however, the concept of seedbed is not unknown in certain regions for other purposes than planting trees. I have observed numerous raised seedbeds on La Gonave and other areas where tobacco is grown. Similar wood structures are used for tomato seedlings in Bois Neuf (St. Marc). The centers of vegetable production around Fermathe and Kenscoff construct plak bann terraces directly on the ground as seedbeds for various vegetable seedlings.

In arid agricultural zones there are seasonal problems in transplanting delicate seedlings. In part, this has to do with the droughty conditions which require hardy plants and the presence of rainy seasons or availability of other water resources for transplanting. Secondly, there is traditionally an abundance of livestock in these areas. Even where open range grazing has been stopped, there are seasons when animals are left to wander at least part of the day in empty garden lands. Tree seedlings are fair game for browsing animals unless carefully protected. The people of the l'Arbre plain now use holding pens and cords to restrict animals from uncontrolled grazing. Farmers bring millet stalks and guinea grass to animals penned or tied; however, the problem of grazing is still a significant barrier to reforestatation in the region. Finally, another problem raised by peasant traditions is the customary treatment of tree seedlings. The attitude is a passive one, hence hardwood trees are not so carefully weeded as food crops are. In this case, the problem can be approached by intercropping. Arid lands crops such as bitter manioc (2 or 3 year growing period) may be intercropped with tree seedlings, effectively safeguarding the seedlings from both weeds and browsing animals by the farmer's incentive to protect his food crops.

AGENCIES AND REFORESTATION

In order to make program plans it is helpful to examine current proposals and existing programs in reforestation. This approach suggests various models, strategies and potential problem areas. It also explores the general interest of private voluntary agencies in tree programming and the problem of fuelwood.

Northwest region. The most significant work being done here in reforestation is that undertaken by HACHO-Fonds Agricoles. The Fonds Agricoles builds tree planting programs into its various irrigation projects and it also has shown an interest in planting trees for charcoal production. The agency presently maintains tree nurseries at Riviere de Hennes, Mole St. Nicolas, Ti Riviere, Ka Philippe and Bayonnais.

The most interesting of these projects is the work in Ti Riviere with four neighboring community councils. Fonds Agricoles began its program here in 1978 by establishing subsidized tree plantations on private land. The council perceives the reforestation program as a means of assuring an income to the counci in the future when Fonds Agricoles is no longer present.

The program has two facets: tree plantations, and charcoal production. Both facets are tied to the community council treasury. The plantations are established on private land on a sharecropping basis with half of the proceeds of harvest going to the council and half to the landowner. The approach has been to plant trees on a large block of land made up of several adjoining private parcels. The largest plantation of this kind is about 100 hectares in size and it belongs to over 60 council members as holders of smaller private plots Another block has 10 hectares and 6 contiguous landowners. The agency subsidizes every aspect of the work, paying daily wages in food for work (rice, beans and oil equivalent in value to the official minimum wage) for tasks of nursery upkeep, clearing and deforesting, digging holes, transportation, planting, watering, weeding and guarding the seedlings from destruction by intruders. Some tasks are paid through contract arrangements where payment is made for so much

work to be accomplished. One person is paid as watchman and another as monitor responsible for overseeing the watering.

The initial trees planted were traditional local varieties such as mahogany, bois blanc, bayahonde and samand. Since then, other varieties transplan include leucena, frene, neem. The nursery also has capable and rosalie. Two species have failed to thrive: jojoba and tcha-tcha. The transplanting of seedlingshas been done regardless of the rains. Consequently, considerable labor effort has gone into watering the seedlings after transplanting. In some cases there has been daily watering for three weeks, then once a week and every two weeks in the absence of rain. Some watering has continued for as long as six months. The slow growing saman was planted at 2 x 2 meters, leucena at 2 x 3 meters, the latter species showing a trunk size of 1½ inches after 20 months. This tree plantation is on land used occasionally for arid lands cultivation: millet, castor beans, melons and pumpkins. The land has a natural cover of arid species including bayahonde, pikan, tosh and galata.

On another plot of more fertile moist ground nearby, trees have been intercropped with corn, millet, peanuts, melons, manioc and pumpkins. Leucena and neem were planted at 2 x 3 meter spacing and appear to be growing faster than the more arid plantation above (1 inch trunk in 12 months growth). Local farmers attribute better success here to more favorable soil and water characteris and to the fact that the trees here are weeded regularly.

The four councils in Ti Riviere have banded together as a group to buy charcoal in an attempt to cut out middlemen coming into their area to purchase. In this way they can increase their profits from charcoal since virtually all members of the community are engaged in charcoal production. As a middleman cooperative, the councils buy charcoal and keep it in storage until a sufficient quantity is accumulated to ship it to Port-au-Prince by the truckload. They have set a date after which buyers coming from Anse Rouge into the area will not be able to purchase charcoal any longer. The plan depends upon the cooperation of local people, their incentive as members of the cooperative and their resistance to outside buyers by refusing to sell charcoal or to rent roadside depot space. An attempt is made to insure local incentive by assuring extra income to cooperative members. The councils intend for 40 percent of the middleman profits to go into additional reforestation, 40 percent into other community projects (store, dispensary), and 20 percent to be returned to the charcoal

sellers as dividends.

The project is in early stages of progress, and it is too soon to determin success. The deadline for outside purchasers has not yet passed (at the time of field visits), and the overall system has not yet proven itself in the necessar buying, warehousing, transporting, re-sale of charcoal in the capital, and the return of profits to the community. Problems emerging so far include the organized theft of community stocks of charcoal by rival middlemen cut out of the market, and the misuse of funds by one of the participating community council presidents. Furthermore, the issue of planting trees to be harvested for charcoal production has not yet been tested. There has not yet been a tree harvest, and all work on reforestation thus far has been heavily subsidized by the agency. The principle of planting trees rather than simply harvesting the natural supply underlies the whole project. An agency agronomist feels that there is a reasonable chance of success in view of the fact that the area has a commercially successful charcoal industry in full harvest. Consquently people have commercial incentive to assure the success of tree planting. Secondly, this is an arid zone minus the open grazing tradition of other arid zones. Given the problems of animal control experienced by the agency elsewhere, the tied grazing pattern here is felt to be a clear advantage. Finally, according to this agronome, there is a strong commitment on the part of key council leadership.

Fonds Agricoles has other reforestation projects but without the direct links to charcoal production as in the case of Ti Riviere. In Ka Philippe the tree nursery was set up after experiencing difficulty maintaining a nursery in Petite Place due to the ravages of goats. Reforestation in Ka Philippe is part of a large agricultural package including a spring fed irrigation system, a demonstration center, agricultural credit and two resident agricultural agents. About 80 hectares are currently under irrigation through concrete canals, and Fonds Agricoles and the community councils have planted about 150,000 trees. The nursery presently has the following species: frêne, acajou, leucena, taverneau, tcha-tcha, condine, neem, campeche, capable. There has been an attempt to incorporate trees into local patterns of intercropping. Some leucena are growing in millet fields. Spacing varies from 3 x 3 meters to 7 x 7 meters. There are plans to plant closel/ spaced forest areas (2 x 2 m.) in areas where animals graze on fallow land. The general pattern has been to transplant seedlings when they are ready rather than when the rains fall. This has proved to be expensive in terms of loss and watering costs. Current plans are to transplant with the rains.

Trees have been planted in the immediate area of Mole St.-Nicolas, but special problems arise here due to the extreme aridity. Leucena does not seem to do well here. The characteristics required for such arid zones are resistance to animal foraging, and resistance to drought. Species most resistant to drought are the bayahonde and parkinsonia (also known as the palo verde). Other species in the nursery include gaiac, neem, and camesa. Some plantings have been made on state land readily available to the nursery. There is no disposition, however, for the end results of trees on state land. As in other communities, Fonds Agricoles subsidizes all work involved, usually through the community councils. Councils coming here for seedlings include Bombardopolis, Mare Rouge, Morne Blanc, and Cote de Fer. The community council movement in the town of Mole is dormant, without a broad base of community support, as HACHO has found in various other projects undertaken here.

In Grande Savanne, there is an interesting experiment with bayahonde. Fonds Agricoles pays someone to restrict access to a large stand of bayahonde for cutting, and hires workers to weed around the bayahonde. This has proven successful in encouraging the growth of existing trees and coppicing stumps. The council has no plans for this project beyond providing wage labor to Fonds Agricoles. The bayahonde trees are on privately owned land which was used for grazing and some charcoal production in the past. The cleared stand of bayahonde is presently considered as the "foreigners' field" by local people.

In sum, Fonds Agricoles and HACHO are doing projects of interest in the northwest region. Some projects are undertaken with a view to experimenting to see what works and what does not work. The various projects provide a useful set of data regarding special problems and approaches to reforestation.

1) The necessity of changing nurseries near the Riviere de Hennes suggests that nursery plots, and other plots under council auspices, should be carefully protected by an understanding or written agreement, a common practice in such dealings when undertaken by peasants as rental arrangements. In this case it became necessary to change the nursery when the council president who owned the nursery land lost his position as council president. In other words, project land should not be "tied" to a particular person's fortunes but rather to the group. Any agency must deal with the sticky problems of council leadership and the question of trust and responsibility. This is a common problem in the politics of peasant community and council leadership. Closely

related is the issue of local identification with a project introduced by an outside agency. Projects are often perceived as the "foreigners' project" rather than belonging to the community. This requires a close working relationship between agency and community people from a social or community organization perspective.

2) Another point of significance is the problem of grazing animals, nurseries and tree plantations. Fonds Agricoles reports more than one situation where projects have failed due to the ravages of foraging animals. On the one hand, it is appealing to plant trees on fallow or barren lands used for little more than grazing. On the other hand, grazing is a major threat to trees and seedlings. The agency has found it necessary to pay for surveillance of tree plantations for up to two years after planting.

3) Fonds Agricoles does not lack funds for labor intensive public works, hence there is little attempt made to encourage unpaid labor. The agency wishes to provide wage labor as an input into the feeble economy of the region. Yet, the reliance on heavy labor inputs for seedling sacks rather than root trainers, and the extensive watering of transplanted seedlings rather than planting with the rains, has been costly in terms of project success.

4) There have been efforts to plant trees on state lands, but the key drawback here seems to be that where state land is readily available, it is of little use (badlands). Where it is arable, it is otherwise occupied by peasant agriculture, and in at least one case, by plantation agriculture. Finally, state lands are traditionally used for open range grazing where gardening is only occasional or altogether absent. The most desirable fast growing hardwood tree species may well not be suitable in the most arid regions.

5) The experimental character of some projects is such that there is no fixed plan for the end results of a given project, e.g., reforestation on state land in Mole, or protection of wood lots in Grande Savanne.

6) Another problem reported by Fonds Agricoles is the unavailability of land to plant trees in zones of intensive cultivation such as Bayonnais.

7) The agency also reports a potential problem with government officers and community councils pursuing a policy of suppressing charcoal production in order to control deforestation (such an incident was cause for conflict in Sauval-Jean Rabel). This is a complicated issue since it involves competing strategies for conservation and reforestation. Private and public community

development agencies have long looked with disfavor on the practice of unbridled destruction of tree cover for charcoal. A strategy of rational long term forest management is a positive alternative to the older short term strategy, but it requires more intensive program input and consistent personal contact with people in the field.

8) In terms of plans for the future, Fonds Agricoles is doing a project self-evaluation which may have the effect of modifying the direction of its programs. A report is due for completion sometime in 1981, and policy will be reviewed at that time. It may be that Fonds Agricoles will choose to concentrate its projects somewhat more to the eastern zones of the northwest region, i.e., from Ka Philippe to points farther east. The agency has shown a willingness to dialogue with other agencies as is evident in its longstanding relationship with HACHO as umbrella agency in the region.

Aside from Fonds Agricoles, another key program in the region is the nursery project at Nan Vincent near Jean Rabel. This project was formerly staffed by graduate research assistants from the Virginia Polytechnical Institute (VPI), cf. Lantagne (1978). The nursery has had close ties to various agencies working in the area including HACHO, CARE, Fonds Agricoles, the ministry of agriculture and presently the PDAI. The nursery is directly supervised by an agent agricole who reports that townsmen come to him requesting hardwoods, and peasant farmers seek fruit seedlings. Trees from this nursery are also planted in the PDAI watershed area. Labor for the watershed reforestation in the area is paid by food for work from CARE and Fonds Agricoles. Monitors are also employed for surveillance of transplanted areas as long as six to twelve months after planting.

Under VPI representatives, this nursery/research/reforestation project built up a central nursery in Nan Vincent, and smaller community council nurseries at Debauche, Cote de Fer, Nan Solon and Nan Dige. The main program thrust was oriented to watershed protection through plantations on the Jean Rabel River, the town cemetery, and the foret communal. These projects were operated as labor intensive public works paid in food for work from CARE. The community nurseries were operated on a voluntary community basis (no food for work) subsidized by materials, equipment and technical aid.

The VPI technicians set up research plots at Nan Vincent, the town

cemetery, the spring at Nan Digo, and on the Mare Rouge Plateau. Various patterns of spacing were used experimentally according to slope, crops present, and degree of erosion: 1 meter by 1 meter, 2 x 2, 3 x 3, 6 x 1, 6 x 2, 1 x 3. Some contour plantings were done on lesser slopes at intervals of 6 meters (1 x 2 meter spacing). Tree species included such hardwoods as mahogany, cedar, eucalyptus and leucena as well as a variety of fruit trees.

In terms of overall project operation, the VPI technicians reported special problems of transport, water supply, shading for nurseries, irregular delivery of materials, and limited contact with others operating tree programs in Haiti. They felt that there were special problems of motivation and unrealistic expectations in community councils. They recommended that food for work not be used in small community nurseries. Councils motivated to build nurseries and transplant trees without the benefit of work payments were more successful in their projects than those receiving payment. For example, the council of Lacoma was motivated to plant trees to protect their irrigation canals, and the council at Solon oriented its volunteer program to coffee production.

Future programs in the region would do well to follow up on the Jean Rabel work, the progress of its tree plantations and various experiments with different species, topography, intercropping and spacing. The oldest existing stands of leucena in the region are at Jean Rabel. In terms of strategy, both community council and public works approaches were used here including tree plantings on natural drainage systems extending across private property lines.

A general point of contact for reforestation in the northwest is the community council movement. Quite aside from the issue of what approach works best, groupement versus conseil, or donated labor versus labor payment, it is clear from talking to council members that there is definite interest in subsidized reforestation efforts. This is not surprising given the history of councils and agencies in the region. The community councils are accustomed to foreign agencies and mission groups coming into the area. Secondly, they associate wage labor and the provision of various services with the presence of those agencies. Thirdly, there are several prototypes for reforestation projects, especially those operated by HACHO, Fonds Agricoles, CARE and PDAI. Finally, there is an intrinsic interest in planting fruit trees on peasant farms where climatic conditions and space permit.

One of the current prototypes for reforestation is the CARE cotton, sisal, latanier palm, and bamboo plantations introduced through community councils with a view to supplying the fiber needs of the CARE/CANO crafts project. The labor is paid with food for work, and the plantations are on private land. It is the general concensus of farmers and council leaders queried that most people are unwilling to plant trees on any large scale unless paid to do so, but they will do it readily if paid.

The community council of Bombardopolis has shown an interest in large scale coffee plantations based on council initiative and privately owned land. Project income would cover expenses, land rentals, a share of profits to the council treasury and another share to the project workers. Farmers here and elsewhere find the idea of charcoal forests unusual. So far as hardwoods are concerned, they express more interest in the sale of mature trees for lumber. In Ti Riviere, a zone of great charcoal activity with a "charcoal forest" underwritten by Fonds Agricoles, the council leaders do not feel that it would be a wise investment of one's own funds to plant trees for charcoal. Even more far fetched is the notion that state land might be rented for charcoal plantations: First of all, state land in the area is arid and unproductive; secondly, planting trees is not perceived as a good risk to provide a return sufficient to cover the costs of renting state land and putting it into production. The notion of a charcoal forest is simply not a proven case.

In Bombardopolis, land reported to be available for trees is not suitable for normal agricultural use. On the other hand, relatively large amounts of land (200 hectares) are said to be readily available for coffee plantations. Where there are communal forests under council auspices, as in Sources Chaudes, the stand of trees is not perceived as a money earner. It is more of a community "park" or demonstration plot for soil and water conservation. There are at least several reasons for this. First of all, councils are not accustomed to managing commercial forests. Secondly, it is a matter of considerable delicacy for the council to cut trees and sell them under the present circumstances Council leaders are reluctant to do so since there is automatic suspicion of misuse of the funds generated by cutting "communal" trees. Thirdly, reforestation projects have traditionally been done with the rhetoric of erosion control rather than cash cropping. Finally, at Sources Chaudes the matter of jurisdiction intrudes on the question since the trees stand on state land.

Aside from community councils, another institution for planting trees is the church: Catholic priests, Protestant pastors and missionaries. The parish priest of Jean Rabel gives free baptism to his parishioners in exchange for planting several trees. Protestant missionaries in Bombardopolis and Jean Rabel are also interested in reforestation. The Catholic parish of Bombardopolis has two lay workers from Europe who work closely with groupements of around 10 people. They are very interested in planting trees. Their approach is oriented strongly to intrinsic motivation rather than wage labor inducements. The groupement is the organizational link to local farmers as a conscious alternative to the community councils. The technicians working with groupements view the distributio of food for work in nearby councils as damaging to their own work based on voluntarism, education and intensive personal contact. The community workers in the parish of Bombardopolis appear to be highly motivated and successful in reaching local peasant farmers through the medium of the groupement. They have indicated a definite interest in receiving certain kinds of financial, technical and material aid.

La Gonave. There are numerous Protestant mission groups on the island but the key development agency is Church World Service (CWS). CWS works primarily through community councils and a large paid staff including agents agricoles. There is presently a sizable nursery under CWS supervision at Nan Cafe in the central highlands on land controlled by the department of agriculture. Peasants pay for coffee seedlings and are able to get fruit and hardwood seedlings free of charge. The most popular of hardwood seedlings are oak and taverneau. There are no trees planted with a view to producing charcoal.

The tree planting programs operated by CWS have depended on food for work payments to community council members. The most significant program of tree planting was undertaken several years ago to plant large numbers of the benzolive. This is not a hardwood species but is useful for its oil, animal forage, human consumption of leaves as a nutritious vegetable. No oil is actually extracted from the thousands of benzolive planted on La Gonave, and it does not appear to be commonly used for human or animal consumption. Peasant motivation for planting the trees was the wage labor payments (food for work) based on a contract system for numbers of trees cared for in the nursery and numbers of trees effectively transplanted.

In the current program people are willing to plant coffee and fruit trees without the incentive of wage payments of any kind. Some payments are made to encourage people to plant hardwoods along roadways and garden boundaries, in the house-and-yard, intercropped in field gardens, and on slopes in 5 meter bands at intervals of 15 to 20 meters. The hardwoods include oak, mahogany, taverneau, capable and frene. CWS has not been introducing the fast growing hardwoods such as leucena. Some flamboyant trees have been planted on saline soils.

In terms of plans for the future, CWS administration is oriented less to increasing the emphasis on reforestation than it is to phasing down the community development and agriculture staff. This is linked to a CWS policy of transition in the direction of Haitian Protestant control of the CWS program rather than the New York CWS office. Such an administrative re-orientation could well result in a reduced emphasis on community development and greater focus on providing services to constituent churches and related institutions such as schools and dispensaries. In principle, CWS maintains an ongoing interest in reforestation, at least for the present, but the agency is not inclined to serve as a coordinating agency for large scale reforestation or energy plantations on La Gonave.

Aside from the CWS activities, there are significant church sponsored efforts in community development, public health and agriculture. The Methodist Church works directly with community council members regardless of church affiliation. The geographic focus of Methodist work is the northwestern third of the island. This program is oriented to planting trees and is a likely candidate for funding. The Methodists have planted leucena in saline soils at Source a Philippe. The trees have shown some growth but are stunted by as much as 50 percent from normal growth under more favorable conditions.

COMPASSION has informally indicated an interest in reforestation, a natural complement to potable water systems through the consortium's efforts under AID funding. COMPASSION has weak links to community councils and strong ties to Protestant churches. Staff members report that the key problems in La Gonave water systems are poor maintenance and soil and water erosion. The Grace Mountain Mission has planted benzolive, neem and Australian pine in saline soils at Chorissable and Anse a Galette. The Wesleyan Mission has planted trees on

mission property and rocky hillsides subject to salt spray from the sea. The Nazarene Mision has mounted a serious effort to plant sisal, a traditional cash crop on La Gonave. About 2,000,000 sisal plants were put out in 1975-1976.

Other private voluntary agencies. Aside from La Gonave and the northwest region, there are other parts of Haiti where PVO programming takes reforestation into account. These have been discussed in other reports. Perhaps the most significant of these efforts are those of the Conservative Baptist Mission in Fermathe, the American Baptist Mission in Limbe and Quartier Morin, and more recently the Operation Double Harvest.

In general it is evident that there is a growing reservoir of interest in doing reforestation in Haiti. There is growing interest in new fast growing species of hardwood. Public and private agencies, and the commercial sector in some measure, are taking an interest in trees. In 1978 a project was proposed by DARNDR/CONADEP/IICA-BID for the organization of charcoal production in the northwest region by rationalizing all levels of production, including forest management and energy plantations. The World Bank has proposed a pilot fuelwood project oriented to building up GOH capabilities for large scale efforts in the future. Various reports have recommended the establishment of a large semi-autonomous government corporation to manage forests and manufacture charcoal. A commercial canning operation in Cap-haitien is reportedly mounting a program to pay peasant farmers to plant mangos and cherries in the Grande Riviere Valley.

The SDA officer in the AID office has received requests from community councils for aid in reforestation, and one request is oriented to the Upper Artibonite Watershed. The Boy Scout program in Haiti has a membership of 10,000 scouts, with a high concentration in smaller towns of the provinces. The 1980-1981 program calls for instruction in literacy and reforestation. The national leadership has indicated an interest in securing additional funding for this program.

Through the work of Ron Smith, the American Baptist Mission has planted over 60,000 trees in the past year. In this approach, contact is made with farmers who have prepared land for planting. They are encouraged to intercrop fast growing hardwoods along with the food crops to be planted. The mission provides seedlings, technicians and some workers to the farmer. The farmer

provides garden land, his own labor and other workers he may bring to the work site to transplant trees. The receipient does not receive payment for his labor nor for his workers. In his experience, Ron Smith feels that grazing land is a poor risk for trees, that farmers are most likely to make marginal agricultural land available for trees, that intercropping is the ideal context for assuring the proper care of young trees. He estimates that trees planted on mountain land require about 24 months before shading over adjacent land growing food crops, and 12 months for the trees to shade over adjacent food crops in lowland areas. Trees are spaced at intervals of 2 meters by 2 meters. The result is a densely cropped tree plantation which allows food cropping until the trees are close to maturity.

CARE has long shown an interest in reforestation, emphasizing soil and water conservation. It uses food for work in growing craft fibers , nurseries and tree plantations. Furthermore, CARE has at least one proposal on file for larger scale efforts in the area of reforestation. With regard to the possibility of new funds for reforestation, CARE is not oriented to setting up energy plantations. It seeks rather to focus on using trees to complement erosion control structures. In general terms, CARE administration would seek to orient a larger scale reforestation program to the long term for a project duration of five to eight years. The agency would seek regional responsibility for such an effort, and would maintain direct control over its own program and nurseries. CARE does not support the creation of a cumbersome bureaucracy to do reforestation.

In its current program a CARE agronome provides technical support to crafts plantations using food for work, and to CINEC schools setting up small nurseries (without food for work). CARE's tree planting programs generally emphasize protection of the rural environment, soil conservation, windbreaks, fencing and protection of potable water supplies. It also supports three coffee nurseries in the northwest with food for work. The crafts nurseries receive support for surveillance, equipment, fencing, labor costs of clearing land, watering, transplanting and weeding. CARE staff report strong local demand in the northwest for plantations of latanier and sisal. Crafts plantations have been established on both council land and private plots. Individual land owners are given a 5 carreaux limit in such projects. There is reported to be greater incentive for maintenance of projects on private land than on communally owned plantations.

The Catholic Relief Services (CRS) has long given food for work and other resources to reforestation. For a time it provided support to the Operation Coumbite. Its support for tree planting is oriented primarily to community councils and other community groups. It has supported the introduction of fast growing hardwoods in the mountains around Kenscoff through the work of Afe Neg Coumbit. Pere Cicaut seeks additional funds for this program. CRS has also received a request for funding from the Institut haitien de developpement et d'etudes sociales (IHDES) for a five year tree plantation project on state land, a proposal budgeted at $90,000.

CRS has used food for work in Grande Anse and Les Cayes for tree projects including neem and mahogany. Trees have been planted in mountainous areas of Grande Anse on noncultivated land, on the contour and as a complement to dry wall terraces. Trees were planted in the Jeremie watershed following the floods of last year. CRS is not presently orienting any of its resources to projects geared to produce fuelwood. Most of its support for reforestation goes for projects oriented to soil and water conservation and agriculture. Some thought has been given to establishing school nurseries. In general terms, CRS indicates support for introducing fast growing hardwoods with a view to fuelwood production.

CONCLUSIONS

Summary

1. The production of wood charcoal is primarily a decentralized peasant household industry using the technology of the earthern kiln. Under the circumstances, the production technology is reasonably efficient. Charcoal is a large and growing employer of peasant labor and an important commercial sector of the Haitian economy. Production operations are continuing to move farther away from the market. The general flow of charcoal is from rural peasant producers to urban consumers, mostly in Port-au-Prince.

2. Historically, the usual conditions of extensive charcoal production are agriculture, wooded areas, grazing traditions, beasts of burden, less intensive patterns of cultivation (millet culture), access to transportation arteries linked to large urban markets, a stable market demand, crop failure or natural disaster as precipitating factors, and the absence of other significant economic alternatives such as fishing or salt mining.

3. Charcoal producing communities tend to go through a series of production cycles. Where there is a confluence of key factors, charcoal production tends to expand from an off-season sideline of poorer peasants to a full harvest sequence involving all members of the community, and a final stage characterized by the virtual disappearance of charcoal production.

4. Not all rural areas of Haiti are charcoal producing areas of significance. Where there is intensive agriculture and a short slack season, there is usually less wood available to cut, less land available for trees due to the land requirements for cropping, less labor available for the charcoal production, and generally less charcoal made. In such areas charcoal is seasonal at best, a sideline activity of poorer peasant farmers.

5. The peasant charcoal industry is a labor intensive proposition. Overall the usual range of monetary and non-monetary options for agricultural labor is used in making charcoal. This includes the household labor pool, exchange labor, wage and contract labor, sharecropping, and payment in cash or kind. The prevailing market wage for agricultural labor sets the standard for labor payments in the charcoal industry. Labor costs are presently on the rise.

6. In the marketing network, charcoal moves from producer to consumer via travelling intermediaries, wholesalers, and retailers. Within this overall structure there is a broad range of options to deal with problems of stocking, transport, and sale to consumers. Given the nature of demand and of transport facilities, this system functions adequately and efficiently. Charcoal costs vary with the quality of the charcoal, the nature of relationships between middleman and producer, the number of middleman transactions, the mode and distance involved in transport, and the skills of purchasers at all points of transaction. Transportation is the single most important cost added to the original price of purchase except for periods of speculative pricing during temporary supply shortages.

7. Crop patterns on mixed humid and dry mountain slopes: Intensive mountain peasant production is characterized by considerable intercropping and multicropping; forest cover linked primarily to coffee and fruit production; a mix of humid and dry agricultural niches, each with its own crops and growing seasons; a mix of tubers, grains, vines and fruit trees; relative importance of tubers for subsistence needs. In comparison to drier areas, these mountain zones have limited storage needs for the harvest: They depend on tubers stored in the ground, short slack seasons, and three growing seasons. Land for grazing livestock is limited, and there is less dependency on the market to supply household food requirements.

8. Dry mountain agriculture: The arid highlands are an intermediate range of peasant agriculture. Slack agricultural seasons are more enduring and there are fewer growing seasons than in the humid range. There is less intercropping. Garden culture tends toward a mix of corn and millet. Subsistence is dependent chiefly on grains. The key tubers are bitter manioc and sweet potatoes. There are few or no export cash crops, and the key cash crops are food grains.

9. Arid lowlands: There is relatively little intercropping, low rainfall and as little as one planting season per year. The growing of millet is traditionally combined with grazing livestock. Arid culture depends on quick growing crops able to make use of short rainy seasons, slow growing crops resistant to extended periods of drought, and crops which lend themselves to storage during long slack seasons.

10. Land tenure: There are different classes of peasant farmers, but peasant Haiti is a society of landowners; nevertheless, most peasant land units are characterized by mixed forms of tenure. Land dealings are manipulated through a dual system of holding land by "custom" in ways neither provided for nor excluded by the law. There is no good data on the extent of large plantation holdings nor of state owned lands.

State lands of the northwest are for the most part arid badlands ill suited to cultivation, especially in the western third of the peninsula. The presence of large plantation interests in two specific areas further east suggests that additional investigation is pertinent to locating more favorable state lands.

There is an active tradition of undivided family land in the region, especially in zones of arid cultivation where peasant holdings tend to lie in relatively large plots. It is clear that the structure of land tenure in any given community cannot be taken for granted without detailed investigation.

Some arid soils of la Gonave and the northwest pose special problems of salinity, a pattern most visible in the coastal salt flats. The island of La Gonave is mostly state land. Some land on the island appears to be under-utilized for agriculture due to the absence of potable water to sustain habitation.

11. Peasants and trees: As a natural phenomenon, trees are perceived as "coming from God." They are also repositories of spirits, and in certain cases are protected by taboos against cutting. Trees may be owned separately from the land on which they stand. Peasants traditionally take initiative to plant trees for certain purposes: living fences, boundary markers, fruit and coffe production. There is a distinct preference for self-regenerating and self-reproducing varieties. Valuable hardwoods are frequently protected if they volunteer but they are rarely planted with a view to harvest and never for the production of charcoal. Peasants do not have traditions of tree nurseries,

but in some areas seedbeds are constructed for tobacco, tomato and vegetable seedlings.

12. PVO presence in AID target areas:

Northwest region.

Fonds Agricoles: At present this agency is doing the most significant reforestation work in the region. It may be that future policy will shift the agency's geographic focus somewhat further to the east, possibly leaving a program gap in the western third of the peninsula. An amicable working relationship with other agencies, via HACHO, lends itself to the possibility of coordinating reforestation efforts in the region.

HACHO: This regional agency is a natural point of contact for reaching community councils in the northwest.

PDAI: In Jean Rabel the Nan Vincent nursery project has been an important pilot project which requires follow-up in order to benefit from the data generated by experimental plots and working precedents under VPI technicians.

CARE: The use of food for work in reforestation constitutes one prototype for working with community councils in the area. CAREs program of fiber plantations to supply the crafts project is a useful model for growing trees on private land. The agency's overall reforestation work has been oriented to soil and water conservation and subsidized labor.

Churches: Parish priests in Bombardopolis and Jean Rabel are interested in reforestation. Community organizers in Bombarde are working intensively with peasant farmers through the groupement approach. Protestant missions in Bombarde and Jean Rabel have an interest in reforestation, and church pastors are a natural point of contact for planting trees in the region.

La Gonave.

Church World Service: This agency is in a transition phase which may limit expansion of reforestation efforts. The nursery project at Nan Cafe is a key point of contact for tree distribution on the island. The agency is a natural conduit for contacts with community councils.

COMPASSION: The work with a mission consortium doing potable water projects (AID grant) is a significant point of contact for reforestation needed to complement and protect water distribution systems.

Churches: There are numerous churches and Protestant mission groups on the island who have shown interest in reforestation projects. The

Methodist Church works closely with community councils in the northern third of the island, and would be a useful channel for additional reforestation efforts. The Nazarenes have engaged in a major effort to plant sisal.

13. Outside of the target regions PVOs are generally open to additional funding channels for reforestation. These agencies include CARE, CWS, CRS, Boy Scouts of Haiti, the American Baptist Mission, and the Institut Haitien de Developpement and d'Etudes Socials (IHDES).

Program Recommendations

1. In program planning it is important to keep in mind key constraints to successful program realization:

--peasant food requirements and land scarcity;

--peasant orientation to minimizing risk;

--the need in peasant farming for short term cash crops;

--grazing requirements and the protection of trees from animals;

--weeding practices inimical to planting trees;

--adverse soil and climate factors;

--peasant personalism versus bureaucratic collectivism;

--political pressures and public policy conflicts;

--project maintenance (it often happens that development projects are not inherently self-propagating);

--conflicting agendas between development agencies and peasant clients, e.g., project success versus access to wage labor;

--land tenure disputes.

2. Focus: The focus should be on how best to incorporate trees into peasant farming for the benefit of peasant farmers. How this takes place varies with the circumstances and may serve several possible goals in varying degrees, i.e., soil and water conservation, cash cropping trees, charcoal production, rural employment, etc. This orientation is decidedly different, for example, from the simple goal of planting as many trees as possible.

It cannot be assumed that cropping trees for energy production is a viable economic proposition for all peasant farmers. It is an excellent idea in principle, especially for farmers with sufficient land and food resources. It may not be a viable option for others because of various constraints built

into the fabric of peasant society. The idea is still in the stage of experimentation. Empirically there has not yet been a successful demonstration of its success, particularly in following through a total cycle of planting, maintenance, harvest, coppicing, secondary harvests, and charcoal production. If it does prove to be a successful economic proposition, then it is likely to expand freely by voluntary adoption. At the present time, peasant perceptions of the economic value of planting fast growing hardwoods are linked to lumber rather than to charcoal production.

3. Flexibility: Planning by a forestry center should be based on the principle of flexibility so projects can be tailored to particular needs of specific regions and communities. Both ecology and land tenure vary greatly within short distances in Haiti. Social structure and local institutions are highly variable. It is important to think in terms of different peasant economies rather than one homogeneous peasant economy. The concept of energy plantation is a new one in Haiti where peasants have never planted hardwoods as a crop to be harvested. There are circumstances where trees may be appropriate but energy plantations are not.

4. Risk management: One of the fundamental advantages which an agency can offer peasant farmers is the willingness to underwrite risk, or at least to share the risk with a cooperating farmer especially where personal risks are incurred by virtue of program intervention. One way of safeguarding against this problem is to plan carefully for each cooperating farmer by using program staff in farm planning around the issue of trees. Secondly, tree planting of an experimental character should be subsidized or insured by the agency.

5. Safeguarding against weeding and trimming practices in peasant farming: There is every reason to use intercropping as a fundamental technique in reforestation. There is, however, a certain risk of damaging tree roots or destroying young seedlings in this setting. Untrained field laborers may inadvertently cut down young seedlings when weeding garden land. Furthermore, large trees are customarily de-branched in order to permit adequate sunlight and space for intercropping.

6. Plan for special problems of soil and climate: Saline soils and extreme aridity require special attention to techniques and varieties adapted to those conditions. In arid zones there is a problem of access to sufficient rainfall or surface water to maintain nurseries and transplant seedlings.

7. Colleagues and rival strategies: There should be collegial working relationships established so that competing strategies and projects do not come into conflict as in the case of HACHO versus PIRNO, or, strategies for "suppressing" versus "managing" charcoal production. Projects should seek to incorporate or develop a mutual understanding with agents forestiers, agents agricoles, ONAAC and DARNDR animateurs working in local communities.

8. Agency and client: Peasants are oriented to "personalism" rather than bureaucratic entities such as community councils, cooperatives, "client population" or "members of the community." Hence project personnel should develop close ties to peasant clients in order to foster education, group process, and a clear understanding of goals and details required for carrying out projects. Peasants see themselves--not incorrectly--as being in a political relationship to any and all agencies working in their communities. The agency is perceived as wealthy and powerful: it has special ties to civil and public authorities, it has jobs and material resources to distribute. The peasant client often seeks to develop special relationships to agency representatives in order to take advantage of these opportunities. The development "process" is not perceived generally as an altruistic endeavor. Rather, it is an opportunity for personal or family gain. The circumstance is socially ambivalent and contains within it the possibility of political risk: Success in manipulating agencies and projects may incur jealousies from others, inviting "abuse" from members of rival factions, either other peasant families or government officials. Community councils are a useful channel for certain services and programs, but the issue of factionalism and distrust of leaders is always a potential problem, especially in the realm of paid labor, collective funds and disposition of project benefits.

9. Labor payments: Where there has been food for work programs, the precedent constitutes an expectation for its continuation, even in circumstances that an agency might deem inappropriate. Clearly there is a potential role for food for work, especially in the context of public works projects which are relatively large in scale and where project benefits are general rather than personal.

Communities which are accustomed to working for pay are unlikely to work without pay. Where programs build payment into their execution, there is

likely to be a problem setting up alternative programs to do similar work without labor payment. The situation in Bombardopolis come to mind where both community councils and groupements are organized independently of each other, and with a sense of potential rivalry.

In general it may be assumed that most peasant farmers are unwilling to plant trees on any large scale unless they are paid to do so. Furthermore, they will readily plant trees if they are paid, so long as land is available for trees. Finally, there are tree planting approaches of more limited scope for which peasant farmers would be willing to plant trees without pay. In the latter case, the crux of the matter is intrinsic incentive (coffee, fruit, irrigation, boundaries, etc.), backed by a close working relationship with technicians and the availability of non-wage forms of input (technical aid, seedlings, tools).

10. Land: The issue of access to land has several facets.

a) State land: The matter of state land merits further investigation in sub-project development. There are state lands in the northwest which are available for reforestation, but they are arid and would require drought resistant species. The arrondissement of Mole St.-Nicolas is a prime target since it is a zone of arid agriculture, sparse population, state land and immense production of charcoal. This target area would include the following districts: the Savanne Mole between the town and Mare Rouge, the rocky slopes along the road from Mole to Bombardopolis, and westerly coastal regions extending around the point from Mole to Baie de Hennes. There should be investigation of what may be more productive state land adjoining the Morne-Mulet/Port-de-Paix road near the Jean Rabel Plain, and any additional land in the vicinity of the Thebaud plantation, a state concession along the Coridon-Anse Rouge road.

b) Private land: Agencies may potentially work with relatively large tracts of private land, especially undivided family land in Bombardopolis, Plaine de L'Arbre and Ti Riviere. Also, the Jean Rabel Plain is of interest for project development: it lies adjacent to the Nan Vincent nursery, there is sufficient water to grow leucena, there is a significant charcoal industry. There are two clear precedents for establishing larger blocks of land for tree production on private land: i) undivided family land, ii) several contiguous landowners. Finally, smaller tree plantations should be tailored to individual peasant farm units.

c) Land use agreements: Enclosures of land in the form of plantations managed by outside agencies should be protected by written agreements

and satisfactory verbal understandings. In the case of state land intended to be held for the long term and turned over to peasant occupancy, the land should be surveyed in order to avoid later disputes. The expense of negotiating for land and surveying it could be an important agency contribution to the ultimate success of a program designed to avoid difficulties in the aftermath of a development project.

11. Strategy: Development approaches to planting trees have tended to concentrate on soil and water conservation and fruit production, especially coffee In general terms tree projects may be oriented to strategies of conservation or of commerce. One doesn't exclude the other but there are circumstances where one is preferable to the other.

a) Conservation: Watersheds, irrigation, potable water systems and hillside erosion control structures are natural objects of a reforestation project geared to conservation. These may be large in scale extending across several private and public land boundaries. This suggests a public works approach to planting trees. In some areas this approach has concentrated on producing and distributing seedlings, but paid little attention to transplanting and maintaining them. Instead, public works approaches would best use labor payments to transplant trees and monitor plantations to protect them from damage.

b) Commerce: An approach oriented to commerce has it uses in zones of arid culture as well as more intensive agriculture, but tactics vary. In general, a strategy of commerce is likely to have much more intrinsic motivation, from the standpoint of peasant farmers, than a strategy oriented chiefly to conservation. The incentive may be coffee and fruit production (traditional preoccupations of mountain peasants), fiber for peasant crafts, protection of irrigation systems from flooding (along the Jean Rabel river), lumber, polewood or charcoal production.

12. Peasant contexts for planting trees: There are small scale approaches which appeal to both commercial and practical requirements of peasant farming. They apply to cropland and to marginal grazing land. The idea would be to introduce certain innovations in the context of traditional peasant practices, i.e., boundary maintenance, fruit and coffee production, intercropping, living fences, and animal forage.

a) Grazing: Livestock are a major hindrance to tree farming.

In grazing areas where there is no open range, animal feed is sometimes gathered and carried to tied or penned animals. In the L'Arbre Plain, for example, it would be useful to plant trees for forage. The pruning of trees could be a source of animal feed where grazing animals tend to sabotage tree farming. On land customarily used for grazing it would also seem appropriate to space trees quite closely rather than using wider spacing more pertinent to cropland where ongoing intercropping could be maintained. Animals could be tied nearby without being in the midst of trees. Forage from the trees would be available for feeding. Another option is to fence in forested areas with living fence even as gardens are protected in areas of open range grazing.

b) Intercropping: Another solution to the problem of losing seedlings to grazing is to plant trees in cultivated plots where special attention is taken to keep animals away from food crops. This would have the additional advantage of assuring the weeding of trees by virtue of their association with other crops. In this option the seedlings should be planted with the rains along with other crops. Another variation on intercropping is the use of closely spaced plantations, intercropping until the trees shade over the garden after one or two years. Leucena is a useful garden tree because of its nitrogen fixation qualities. Fast growing hardwoods would tend to go well with the production of coffee which requires shade trees. Finally, another form of intercropping is to plant trees on the contours of sloping garden lands.

c) Boundary maintenance: Peasant farmers are very concerned about boundaries. This concern may be a point of entry into the peasant garden for additional trees. Surveyors travel throughout rural sections to set boundary markers into place. The availability of fast growing hardwoods would be appropriate under these circumstances. One possible drawback to this approach is that farmers are reluctant to cut down trees used as boundary markers. On the other hand, a row of leucena could effectively maintain boundaries through coppicing and staggered cuttings. Another drawback to boundary trees is the potential for disputes over the shading of a neighbor's garden. One solution to this problem (used in the Grande Riviere valley) is to negotiate <u>dedommagement</u> for loss of crop land through shading: Two neighbors make a written agreement to share the trees. The neighbor planting boundary trees may promise one-fourth of the trees to his neighbor, even designating which trees are to be his at maturity. Another variation on this is to share the labor of planting trees directly on the boundary line and to split the ownership half and half as in sharecropping.

d) House-and-yard: Trees are customarily planted in the lakou of peasant homes. This is an obvious point of entry for introducing hardwoo along with fruit traditionally planted. A variation on this is the use of living fence. Fast growing hardwoods could readily be incorporated into lak fences and gates since these trees "take" easily.

e) Marginal land: Farmers with river bottom land plant planta where feasible, and on droughty sand bars they plant sweet potatoes. Rivers actively change position, creating and destroying garden lands. Such high ris settings are potentially available for planting trees. Closely related is th changing character of ravines subject to erosion through torrential downpour The principle here is one of high risk land where trees would be more favorab considered by peasant farmers than productive cropland where harvest is more assured.

f) Cash crop substitution: It is not customary to plant trees a cash crop, but all peasant farmers plant cash crops in their gardens. If i can be demonstrated, for example, that trees are a better bet than sugar cane it is quite possible that peasants would venture a portion of land to cash cropping trees instead of cane.

13. Community nurseries: The VPI technicians and the Mennonite Central Committee have successfully worked with decentralized nurseries in lo communities. This works when there is intensive working relationships betwee active field technicians and local councils and/or farmers. This does not le itself to large scale projects. It does lend itself to fundamental educatio and innovative agricultural work without the use of labor payments.

14. Charcoal plantations: Large cooperative plantations are one approach to energy forests, but they are fraught with the most complications in terms of traditional peasant suspicion of non-kin groups. They are also generally dependent on wealthy outsiders to subsidize and manage such project The most successful groups of planters working together are likely to be those organized as contiguous landowners in a block of land devoted to forest Charcoal forests of any kind, whether on private or collectively managed land are unlikely to have much of a chance of success unless done under the optimu conditions for charcoal industry.

A community woodlot stands little chance of success outside of intens involvment on the part of concientious field technicians with agency support.

Community councils are logical points of contact for planting trees even if the trees are planted chiefly on small private plots. Broader scale efforts lend themselves to public works approaches with paid labor. Undivided family land is a logical point of entry for planting closely spaced forests on marginal land. The concern about creating disputes on family land need not be a serious consideration since the matter of woodlots on undivided family land is an issue with traditional modes of resolution in the northwest. State land is a logical objective for establishing forests, especially in arid zones of limited cultivation. If such land can be brought into production by peasant farmers, a useful contribution can be made to the problem of rural poverty and the scarcity of land. The conditions most likely to create support for tree projects are the following: a) agency willingness to carry the burden of risk, b) peasant access to land in the form of private plots even if only subplots of a larger block of land under general forest management.

15. Personnel and Training: The personnel dimension is crucial to the successful operation of any program large or small. Larger scale public works approaches require effective management skills. Smaller scale approaches oriented to individual farmers and local communities require intensive working relationships and close field contacts. Both approaches need committed field personnel and adequate supervision.

One potential strength in doing reforestation is the agent agricole. This resource could be incorporated into projects both directly and indirectly. These extension agents are generally of farming background and are more accustomed to country living than faculty trained agronomists. Agents are currently playing useful roles at Nan Vincent and other nurseries of the northwest, and they are part of the CWS program on La Gonave.

A key factor in the problem of personnel is an unwillingness to live in the countryside, and a lack of sympathetic understanding of peasant farmers. Nationality and language skills are not in and of themselves sufficient criteria for effective community work. A Haitian citizen may well be as ignorant of peasant life as are American experts who arrive with no previous experience of Haiti.

Training programs may have a certain use in carrying out effective grass roots programs but I do not see the benefit of sending large numbers of people abroad for training. One effect of living abroad is to encourage the exodus of university trained personnel. Another unintended effect is to decrease

the willingness of highly trained people to live in close proximity to rural areas and work closely with peasant farmers. Furthermore, there are limited positions available within the country for graduate trained personnel. A training program at this level must take seriously the credible possibilities of employment for those trained. It is unlikely that there will be much of a demand for highly trained foresters unless there is a serious effort to manage government forests.

It seems to me that the real need for personnel lies in the realm of program management and of intensive day to day work with local people. In terms of the proposed forestry center, the management problem is resolved in part by channelling funds through PVOs.

It is apparent from past reforestation projects in Haiti that there is need for an exchange of information and ideas among people operating tree and nursery programs within the country. Tree experiments in Limbe or Jean Rabel may be useful to personnel operating projects in Cayes. Such projects are an opportunity for short term field training for agents agricoles and field personnel as well as administrators.

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APPENDIX

Notes Regarding Ron Smith's report, The Potential of Charcoal Plantations for Haiti. Port-au-Prince: USAID, November 1980:

Ron Smith's report does an excellent job of bringing together experimental information on fast growing hardwoods in Haiti, information which heretofore has been unavailable in printed form. Furthermore, it presents intriguing comparisons of peasant cropping and tree farming. In tribute to Smith's work, I would like to make certain comments growing out of my own fieldwork information which may serve to qualify and complement the Smith data.

1. It is of particular interest to note that large scale tree plantations for charcoal production may be able to compete successfully with plantation agriculture producing traditional export crops. Secondly, large scale plantations for charcoal may well be unable to operate with any significant profit margin over that of small scale peasant farms devoted to tree farming-cum-charcoal production.

2. Smith's findings regarding the advantages of intercropping trees with food crops are pertinent to Haitian peasant agriculture. Tree farming with food crops could prove to be an effective innovation in traditional peasant farms in a symbiotic relationship of mutual benefit.

3. Another advantage of fast growing hardwoods is the possibility of designing spacing and harvest with a view to fast cutting and intermediate term profits. This deals directly with peasant concern for risk, and the structural inability of peasant farming to be oriented primarily to the long term investment. There is necessarily a primary concern for the short and intermediate term in peasant agriculture.

4. On page i. of the Smith report reference is made to "subsistence farming." For the sake of non-specialized readers of these reports, it should be noted that "peasant farming" is not equivalent to "subsistence farming" in anthropological terms. Rather, "subsistence" concerns are built into peasant farm strategies along with a view to "cash cropping" for the market, both domestic and foreign. Food crops generally serve both subsistence and cash needs: A portion of the harvest is consumed within the household and a portion is sold for cash. It is important to note, in this regard, that one can't eat trees. Peasant interests in trees have traditionally been fruit trees which do provide an edible harvest. The introduction of fast growing hardwoods is linked directly to cash cropping rather than subsistence per se, whereas most peasant crops are used for both.

5. It should be duly noted that the Smith tree experiments are not based on data from the arid farming zones more typical of La Gonave and the northwest. In other words, there is a need for supplementary data along those lines, taking arid peasant agriculture into account and exploring the usefulness of data from international arid technology research centers. Secondly, the best experimental data in the report is based on closely spaced

plantations rather than intercropping with widely spaced trees. There is generally a paucity of data based on actual trials and experimental plots using a variety of intercropping strategies. Furthermore, there is not sufficient time depth in the experimental plots thus far to assess the use of various strategies in secondary and tertiary growths of coppicing species. It is clear from Smith's work that intercropping strategies of a particular type are practical with closely spaced tree plantations, that is until the trees shade over the land between trees until after they are harvested.

7. There may be some room for variation in the determinations computed on the basis of assumed patterns of peasant cropping. The data used are from DARNDR reports of expermental plots on controlled land rather than from actual field observations of particular plots on peasant farms. Under the circumstances these data are useful for comparative purposes, but it should not be assumed that they necessarily reflect actual field conditions of peasant farms under independent peasant management. The latter data are very hard to elicit and time consuming to observe. In general there is little quantitative data in print, and it is next to impossible to get accurate information given the nature of the data. Peasant harvests are almost impossible to quantify since all food crops are used both for household subsistence and for the market, and most crops are harvested piecemeal at different stages of growth, leaving only a portion of the crop in the field at the final harvest time.

8. In terms of patterns of intercropping used to compute production levels for comparative use, the division of land areas into humid and dry forest regions is an important distinction. It may be that arid lowland regions of the northwest are somewhat less productive than those reported, despite favorable soil depth, because of the severity of the rain shadow effect. As a corollary it may be that some arid upland zones are somewhat more productive than arid lowlands nearby, despite limited soil depth, because of a slight advantage in rainfall (on La Gonave and in the northwest). On page 27 and 28 of the Smith report, the crop cycle for a 6 year period does not include reference to using the "bitter" variety of manioc, an arid lands crop left in the ground for one to three years, or peanuts, an important cash crop on both La Gonave and in the northwest. Furthermore, the most arid zones of the northwest are sometimes able to support cotton and castor beans as arid cash crops. In the arid Jean Rabel Plain there is but one planting season per year, but it supports corn and beans rather than relying on the usual arid grain, millet. In other words the corn and beans do not always fade out of the picture in arid regions. There are pockets of these cultigens when the rains are sufficient.

Of further note, the DARNDR data on humid mountain forest does not mention the importance of starchy tubers in intercropping, e.g., yams, taro, and malanga. As for manioc it is important to distinguish between the fast growing "sweet" variety planted in humid soils and eaten as a starchy tuber, and the bitter manioc planted in more droughty zones (leeward slopes, arid lowlands) and used to make cassave flatbread. The table on page 25 contains a typographical error with reference to manioc (it should be $8 rather than $5 per charge) which brings to mind a larger problem: underestimating the value of manioc as a cash-cum-subsistence crop. While manioc is sometimes sold by the "load," it also may be home processed, in the case of bitter manioc, and made into cassava before it is sold adding considerable value as a cash crop.

9. Labor costs: It may be that inter-peasant labor costs are somewhat understimated in the comparative income data used in the Smith report (page 14). The price of occasional day labor in peasant farming may be closer to $1.60 than to $1.00 although there is clear variation according to circumstances. Also, the estimate of 40 man-days to clear land on the northern plains may well not be directly transferable to similar work on rocky mountain slopes where it would likely be somewhat higher (see page 24 of this report). Ideally the figures for labor cost should be based upon man-days rather than the prevailing wage. The labor costs of growing trees in very arid zones may also be somewhat higher if watering costs of any kind are included in the costs. Smith does not recommend watering of transplanted trees in the case of drought. Due to the prohibitive labor cost of watering, he suggests re-planting instead. This is undoubtedly a wise policy, though there may be circumstances where trees could grow in the case of early watering where otherwise they would not. Fonds Agricoles reports difficulty growing leucena on desert land in one area near Mole St.-Nicolas.

10. Charcoal price: At the time of my fieldwork for this report, the prevailing price for a gro sak of bayahonde charcoal was 6 gourdes in the north-west, La Gonave and the south, and somewhat higher in the northern department. Computations in the Smith report assume 7 gourdes, tending to skew the income data upwards during this particular time frame. On the other hand, the prevailing cost of a sack of charcoal in 1979 was 7 gourdes. The price clearly varies. With regard to transportation, I feel the Smith report tends to underestimate cost (see page 28). Transport costs per bag in the northwest clearly rise above 5 gourdes in most cases, although it is somewhat cheaper in producing regions closer to Port-au-Prince (La Gonave, Cul de Sac, the south).

11. RE: Food for work: (Smith page 39): There are many problems with the administration of food for work as there are with the administration of cash, but I feel that it is not categorically true that peasants accustomed to cash are reluctant to take food. In my experience, this depends on the relative wage rate in either case. There are more well to do people who are reluctant to take payment of wages in food, but there are also documented cases of skilled technicians paid exclusively in bags of food. In any case, it is highly unusual to find a rural community in Haiti where there are not willing wage earners for food payment. In terms of interpeasant labor arrangements, the notion of being paid in kind is a traditionally acceptable form of payment.

12. Perhaps the key unresolved issue is the relative incentive to grow trees for charcoal as opposed to lumber. What is the comparative market advantage of processing trees for charcoal versus processing for lumber or selling mature trees for lumber? At present Haiti continues to supply most of its fuel needs from domestically produced charcoal, whereas lumber is imported on a growing scale. This is a question a second Smith report might investigate in terms of camparative data on land use and reforestation. In this regard it is of some interest to note firewood being sold in Cap-haitien at $50 per truck-load. In my research of 1979 I found firewood from Fond des Negres selling in Leogane and Port-au-Prince at prices ranging from $100 to $140 per truckload and being sold to truckers by peasant woodcutters at 7 gourdes per cubic meter (30 to 34 cubic meters per truckload).