Land Use, Soil Degradation, and Farmer Decision-Making:
A Sondeo Report of Cavalier, Despa, Kols, and Saut Mathurine, Haiti

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and

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Organizations: DCCH, IRD, ORE, AND UNICORS

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SONDEO REPORT 1

**CAVALIER, DESPA,
KOLS, SAUT MATHURINE**

INTRODUCTION

This sondeo report focuses on farming systems in the areas of the Proje Sove Te (PST) watersheds. It will provide a review of information learned during the rapid reconnaissance surveys of four sites where work on agricutural development and soil conservation is being carried on by ONGs participating in PST--Saut Mathurine (ORE), Despa, Kols, and Cavalier (UNICORS)--conducted between November 1, 1988 and February 24, 1989.[1] This report will also analyze some of the basic dimensions of farmer decision-making that can be abstracted from these studies. The individual site descriptions presented in this report show that, whereas all the areas are degraded, each has its distinct land use history/ socio-environmental processes that lead to a degraded landscape. Degradation in these areas is caused by many factors; that they all result in the same end is a reflection both of the fragile nature of many of the local environments and the wider socioeconomic processes to which all peasants are subject.[2] The information and analysis presented in this report is oriented towards problem-solving--it includes proposed recommendations for specific interventions that can be used to help meet the many challenges of Proje Sove Te. This document is intended to promote discussion among the technical staffs of the ONGs and ARD in order to reach mutual conclusions as to the most pressing needs and interventions for each area.

METHODS AND GOALS OF THE PST SONDEO

The Proje Sove Te sondeo, or rapid reconnaissance survey, is tied into PST's general philosophy of agricultural research and extension. The sondeo in this model is used to provide preliminary information concerning quality-of-life, land-use and land-use history, cropping and livestock systems, and the socio-economic characteristics of a particular zone. The information obtained in this way is then used to direct project personnel towards the most critical problems hindering agricultural development and soil conservation in an area. These may be problems as perceived by peasants, or as determined by agricultural development workers. In addition to this preliminary diagnosis, the sondeo is designed to elicit information that will provide a starting point to the resolution of these problems. As can be seen in the copy of the interview schedule attached in Annex 5, the sondeo asks many questions about what peasants want in regards to their production and consumption. Furthermore, the interdisciplinary analysis in the sondeo uncovers leverage points in peasant production, or those areas that are most amenable to change or will give an especially positive result. Although this document represents the first complete written record of the sondeo, information gathered during rapid reconnaissance research has been used to inform the content of PST's suggested technical interventions, its proposed incentives and incentive policies, the farming systems content of the PST Hedgerow Manual (forthcoming) and Postharvest Manual (July, 1989), and so on.

The methodology used in the sondeo was a series of structured interviews and observations on cropping and livestock systems, the agricultural calendar, local soil conservation methods, the socioeconomic characteristics of production--including land tenure, labor relations, and credit, and general living conditions. These interviews were carried out between November 1, 1988 and February 24, 1989, in this case, by the

farming systems specialist of Proje Sove Te and her assistant. The researchers interviewed a series of key informants in four zones--Cavalier, Despa, Kols (areas of intervention for UNICORS), and Saut Mathurine (an area of intervention for ORE), taking care to include peasants from a variety of socioeconomic circumstances. These informants were often asked to refer other peasants who would be interested in talking to the researchers in a pyramid sample. The researchers also visited the various types of gardens[3] in the zone in order to observe the major crop associations and their characteristics. Each evening the researchers met to discuss their findings, and to evaluate which subjects needed more investigation.

Sondeo studies are not intended to present statistical reality, but rather are structured narratives of the agricultural situation in particular zones. They are an initial description that can be used as an information base to draw up plans for an area and identify appropriate technical interventions. They can also be used as a qualitative baseline to monitor the progress of Proje Sove Te. As PST personnel become more familiar with these areas, they will be adding to the information presented in this sondeo report.

This report will refer frequently to the term "farming system." As used by farming systems practitioners, this term can refer to any of several levels of the farm production system: the individual farm, a group of farms in a particular area, the sum total of farms, and so on. In this case, I will adopt a convention which will refer to the unit of production and consumption--the household system, in most cases--as a farming system, and the wider system of agricultural production, that is, farms and other institutions connected with farming (be they rural or urban) as the agrarian system.

Farming systems research particularly focuses on the interactions between different components of the farm. This research focuses on how the inputs and outputs of agriculture--labor, land, crops, livestock, and money--affect each other. As such, it recognizes that farming is first and foremost a human activity, with farmer decision-makers deciding how they are going to organize their resources. Farming, however, also takes place in the context of the wider socio-economic sphere. Farmers must make their decisions in light of the constraints and possibilities presented by the wider society and economy. This can be quite straight-forward in that, for example, farmers might decide not to grow a particular crop if there is a limited market for it, but this also means that the choices that farmers make are structured by their understanding of the world and what they need to do to survive in it. It is the agricultural development worker's job to understand the farmer's point-of-view.

The information and analysis herein are presented with the knowledge that differences in the peasant population by lifecycle and economic position affect the opportunities and choices that a particular farmer might have. Haitian peasants' production and consumption circumstances vary--a young farmer often has little land, but much "force," whereas an older peasant may have more land, but less labor available for him to work his land. It is thus common to find younger farmers in the PST watershed areas sharecropping the majority of land that they work from older or richer farmers. Similarly, farmers that have many children to feed and send to school will make different land-use choices than farmers who have no children or whose children are grown. Richer farmers may have the means to hire much of the labor that is available at planting time, while poorer farmers may have to offer their labor to work on others' land, use their own labor, or wait in order to use a *skwad*[4] to plant their own gardens. Other examples of these differences will become clear in the report that follows.

It is also important to note that agricultural production in the PST watershed areas is not traditional in the sense that farmers are just using the practices and crops that their parents used. Farmers are constantly having to adapt to a changing economic situation, both in terms of the market and their own available resources. For example, relative prices of the principal crops produced by peasants in the PST watersheds have shifted dramatically in the past 10 years (Roe, 1978; Jaffe, 1983; Jaffe, forthcoming, 1989).[5] From year to year many peasants, as well, find themselves with a different mix of the amounts of money, labor, and land that they have available to them. They also may have different demands on the outputs of agricultural production. Peasants in the watershed areas also need to change their methods and crop mixes in response to a rapidly changing and degrading environment. The sondeo researchers observed peasants trying new crops and crop varieties, and discussed with them and other farmers how they go about changing their production when confronted with a new situation, such as when land can no longer produce what it could in the previous seasons. Farmers described, for example, changing methods of making *bit patat* (sweet potato ridges or hills) and *bit yanm* (yam ridges or hills) in response to declining soil depth. Among some of the crop tests we observed were farmers trying different varieties of manioc on land that could no longer support sweet potatoes in order to find the one that would produce the best, and farmers comparing new varieties of sweet potatoes (*neg sal*, *ti jojin*--in some areas such as Kols this variety is new, and *tapato*) to their old ones. We found that these tests are largely a system of trial-and-error, but they are trials nonetheless.

We also found that some "traditional" methods have been abandoned, because they no longer fit present circumstances. A good example of this are methods of soil erosion control, such as *kleonnaj*, woven wood structures that are placed in ravines to capture soil. With land fragmentation limiting the ability of individual farmers to respond adequately to erosion on many hillsides, and the increased intensity of erosion with which many farmers are confronted, these structures no longer work in many areas where they were formerly effective.

GENERAL FINDINGS OF THE PST SONDEO

This report will present two levels of findings--those that are generalizable across all the localities included in this study, and those that are specific to a given locality. In our analysis, we see that all of the areas included in this phase of the sondeo have commonalities that we feel offer some general principles vis-a-vis peasant agricultural production and therefore have applicability to other areas in the PST watersheds. We have also observed patterns that can help us explain why some areas are different than others. The particular details of the farming systems of each area are presented in Annexes 1-4. In spite of different physiographic characteristics and land use histories, all of the areas in this study are undergoing processes of severe land degradation that farmers say have been accelerating in recent memory. As mentioned above, although this is undoubtably due to the fragility of the local environments, we also believe that there are more widespread socio-economic processes at work whose end result is soil erosion. In this report we will concentrate on those factors that affect land use and on cropping decision-making.

Population and Land Use

The distribution of population in the PST watershed areas tends to be along the river beds, and paths; one can also see bands of settlement by altitude. Between 200-400 and 700-900 meters (depending on the particular area) are the zones of greatest population concentration. Between and above these two zones are sloping and steeply

sloping mountains that are sparsely populated--these areas are farmed by the people living in the bands of settlement.

Although land use and farming practices are the result of individual decision-making, the constraints and possibilities offered by the environment, land-use history, and the agrarian system tend make farmers' land-use choices similar. These similar individual choices--coupled with the particular distribution of population in space described above--manifest themselves in a landscape which is patterned in terms of cropping systems and degradation. Farmers tend to plant crops with staggered harvesting dates and long-maturing, labor intensive crops such as taro, yams, pumpkin, and vegetables at or near their households. These crops are also ones that have relatively high water and soil organic matter requirements. Fruit trees are also planted near the residence in order to protect them from theft and so that they may be easily harvested over a long period. Crops such as corn, beans, and sorghum, which mature all at once, demand less attention, and will produce with lower soil organic matter are generally planted farther away from the residence. Sweet potatoes, which require heavy labor inputs in land preparation and are usually harvested twice, occupy an intermediate position in the landscape. From this land-use principle it is possible to see that in many areas there are bands of relatively less degraded fields (*zonn vivrie*) near residences which are bordered by bands of more degraded fields (*zonn grenn*) farther away. This landscape pattern of relatively fertile and degraded bands is intensified by an effective transfer of nutrients from far-away gardens to the land around the house in the form of crop residues and animal manure and from the generalized practice of burning fields that will be planted in grains, thus reducing the amount of organic matter that is recycled into the soil, as well as killing beneficial soil micro-organisms. The areas that do not conform to this pattern of near fertile fields and degraded far-away fields tend to be those in which peanuts play an important role in local cropping systems. Peanuts are a crop that is highly labor intensive and therefore often planted near the house, but that is also often highly erosive. This is because peanuts are frequently planted in highly erodable soils that are cultivated intensively at the beginning of and during heavy rains, because they do not provide an effective cover to protect the ground from erosion, and because harvesting of peanuts is accomplished by "tilling" the soil leaving it vulnerable to erosion from the next rains. It is interesting to note, however, that farmers in the two peanut producing areas that were surveyed recognize the erosive effects of peanuts.

Interviews with farmers indicate that there have been some changes in the distribution of population that very likely have important ramifications on soil erosion. Generally speaking, it appears that there is a gradual migration out of the higher altitudes to the lower reaches of the watershed or out of the area entirely. Some of the forces cited that are pulling and pushing the population downwards towards the plains are schools, roads, water, and--ultimately probably the most important cause--degraded lands. For farmers who continue to farm in the higher reaches of the watersheds this means a longer commute to their gardens, which translates into less intensive management, and a further emphasis on crops that can be harvested all at once and are difficult to steal, such as grains. Fields that are planted in these crops require more frequent land preparation than if they were planted in long-maturing or perennial crops. As stated earlier, they are also ususally burned. Grains are not particularly shade-tolerant, which gives further impetus to tree cutting. In the case of beans, the harvest is accomplished by pulling the plant up by the roots thus leaving the soil loose and susceptible to erosion. Furthermore, soils planted in grain crops in the watershed areas spend many months of the year without cover. This trend can therefore be expected to result in further degradation of the higher elevations if there is no change in present farming systems.

There are also other forms of migration that are very important in the watershed areas that were studied during this phase of the sondeo. We observed that in some areas, such as Cavalier, farmers have begun to seasonally migrate into less degraded areas such as Les Irois and Jeremie either to farm land that they have rented or sharecropped, or to work in others' gardens. These farmers are principally those that had depended on access to the land that now encompasses Park Pic Macaya. The land in Les Irois and Jeremie farmed by these in-migrants tends to be planted in simple grain intercrops, such as corn and beans (the pattern of far-away gardens mentioned above), with all the repercussions that come with working a field far from the residence--little surveillance, reliance on labor-saving techniques, burning, planting crops that mature all at once, and so on--that ultimately result in eroded landscapes. As well, because the schedule of planting in these areas is similar to that in the areas from which the migrants originate, this migration further exacerbates the problem of labor shortages during the period of land preparation and planting that we have observed in every area we surveyed. Other forms of migration we observed are vertical migrations into state lands at higher elevations to plant corn and beans in February, and beans in July, and to cut wood for cooking fires and charcoal (important among the Saut Mathurine population); migrations to the Dominican Republic to cut sugar cane on a schedule difficult to predict by the migrators (important among the population of Despa); and in-migrations, particularly during the planting seasons, to areas such as Kols, that have severe seasonal labor shortages.

It must be noted, however, that every area we surveyed has enough of a seasonal labor shortage that it is manifested in higher wages paid to workers during times of most intensive activity. This wage differential is as much as 50% in most areas. In some areas, elevated wages are also paid to the female laborers and *skwads* who most frequently perform weeding and planting tasks during the periods of high demand for their services. The development of this labor shortage seems to be most closely linked to an increasing emphasis on short season crops such as corn and beans in which timeliness of planting has a strong effect on both yield and the market price, and to the degradation of the soil so that it now takes more labor time to create an appropriate planting medium, particularly important for sweet potatoes and yams. As mentioned above, poorer farmers can have difficulty finding timely labor to work their fields and gardens and many farmers try to reduce the amount of labor that they invest in agricultural tasks. It is very likely that burning gardens, for example, is in part due to an effort to reduce labor inputs at the start of the planting season; farmers will also accept reduced yields on low value crops rather than invest in a second or third weeding that would increase production.

Land Tenure and Soil Erosion

Land use and soil erosion are also highly influenced by the tenure of the particular parcel. We have found that certain types of tenure that appear in our watersheds have strong effects on the processes of degradation. We have also found a considerable amount of variation in land tenure arrangements among the areas under study. It is important to note that it is sometimes institutional controls--or the lack thereof--that result in erosion, rather than the actual tenure form itself. A good example of this are undivided (commonly-held) family lands (*te mine*). In Kols, for example, one finds a relative absence of socially agreed upon rules concerning the husbandry of family lands. The presence of a garden that a particular person has planted in undivided family lands is what establishes continuing rights over that piece of land for the farmer. Lack of a garden means that other family members can come in and plant or graze their animals. The result is a strategy towards long-maturing crops such as manioc, and land that is never fallowed. Farmers in this area who try to establish hedgerows on family lands find that they are ripped out by other family members who fear that the hedgerow planter is trying to establish permanent rights over the land.

Land that is shared or rented out is often the most degraded land. One reason for this is because in this capital poor, seasonally labor-short economy, owner-farmers frequently choose their worst land to share or rent out. This is the land that is already eroded and of very low productivity, that demands high labor inputs in order to develop an appropriate planting surface for crops, and returns relatively little. Owners also frequently demand that sharecroppers plant crops that can be harvested all at once such as grains so that the crop can be easily divided. It is more difficult for owners to be aware of an erosion problem if they are not working the land or if they are not directly dependent on the amount of crop produced for income. Short term declines in agricultural production due to erosion are also often masked by variability introduced by other environmental factors, such as rainfall. Furthermore, farmers who sharecrop out their land receive reduced production divided by two so that erosion may not seem as serious a problem as it actually is. Rental prices are related to the value of land and its productive capacity in relation to other land (as well as the relative power between owner and renter) which changes over a longer term.
We did find, however, that in some areas such as Cavalier, owners have mandated periodic fallow for their sharecropped land. Owners do not have such control over the land they have rented out. Renters, too, are known to cut trees on the land they are renting. While it is axiomatic that sharecroppers or renters typically do not want to invest in the land they work, we found that in some areas they are planting hedgerows. Unfortunately, this has sometimes resulted in owners taking the land back, because they expect it to become more fertile or valuable as a result or they suspect that the renter or sharecropper is trying to establish usufruct rights over the land by establishing a permanent culture on it.

The zones of high altitude in the areas we studied tend to be the locations of state lands and/or large landowners. As previously mentioned, farmers in the Saut Mathurine and Cavalier areas have historically been dependent on state land areas for crops and wood. Some farmers in Saut Mathurine hold leases to farm in the areas of Dauphin and Grand Bois, at 500 meters and above. In Cavalier farmers still enter into the area of Park Pic Macaya for wood and gathered foods. It is important to note that every area studied has significant inequality in terms of land-ownership. The best illustration of this is the presence of extremely large holdings in each area. Kols and Cavalier each have holdings of 80-100 *karo*[6] that belong to a single owner; Saut Mathurine and Despa have holdings of 15-30 *karo* that belong to individuals. While most farmers in these areas own at least one of the plots that they farm (including the plot near the house), the mode, or value most frequently found, of amount of land owned is estimated to be .5 *karo* or less.

The situation with state lands in the areas surveyed illustrates some important points vis-a-vis land tenure security and soil degradation. Security over a particular piece of land can be as important as ownership in determining whether farmers husband land for future production. In areas where farmers feel they do not have the security of long-term use over the land, they treat the land as if they are renters with a short-term investment horizon--they get what they can out of the land without regard to maintaining its future production potential. If farmers feel they have security of use over a long period, they treat the land as if it is their own. Regretably, this does not always provide protection against soil erosion.

We have found that in some cases, privately owned (*te pataj*) and worked lands are as eroded as land in other tenure types. While this is particularly widespread in areas such as Despa or Kols where peanuts have been an important crop in farming systems (especially for poorer farmers), one can find severely degraded privately held land in every area studied. This is the case because every area has poor farmers who must

continue to cultivate their land in increasing frequency, but without fallow in spite of diminishing returns; and because every farmer is subject to varying degrees to the constraints of the wider agrarian system that limit possibilities for investment, especially for the long-term. These constraints are many and varied--they include the lack of: infrastructure, local markets to sell goods produced, production credit, widespread agricultural extension services and research, coherent state policy that promotes agriculture, or agribusinesses that depend upon the efficient production of agricultural goods. Farmers are also limited by the low productivity of their most important inputs, labor and land. Furthermore, as explained below, almost all farmers have as their goals for agriculture the satisfaction of household subsistence needs, such as food, clothing, schooling, housing, and so on, rather than the renewal or improvement of production. This lack of orientation towards investment in the long-term continuation of agricultural production is heightened by the perceived lack of a future in agriculture, a concern made all-the-more real by environmental degradation.

Burning and Fallow

Although they are not the only factors to blame, burning and lack of adequate fallow are clearly implicated in the degradation of the landscape in the areas we studied. Whereas fallow is the main method employed by farmers to try to restore soil fertility, a true regenerative fallow is infrequently included in a farmer's land use strategy. When any form of fallow is practiced, it seems to be the result of one of two conditions: either the land is so poor that production can not possibly be sustained year after year, that is, that farmers begin to lose their crop more years than they find a harvest, or farmers have enough land in their portfolio (some farmers estimate that the cut-off point is 1 *karo*) that they can afford to fallow. Even in these cases, the farmer most frequently places an animal to graze on the land that is being "rested." It is unlikely that much of this land receives adequate time or opportunity to regenerate.

It is interesting to note that previous research in the low hills area of the L'Acul watershed (Jaffe, 1988) indicated that the two groups of farmers most implicated in soil degradation are the poorest because of lack of alternatives, and the richest because their land use-labor access strategy often includes sharecropping out. It is very possible that larger farmers are not as sensitive to the reduction in productivity that is the result of erosion as would smaller farmers who are more constrained by limited land resources. They also may not be as aware of the severity of their erosion problem (as outlined above). Those that are the most land conserving seem to be the somewhat well-off farmer whose amount of land ownership closely coincides with his ability to work it under direct supervision. Furthermore, they are not so strongly caught in the cycle of working land without fallow. These farmers also tend to have access to better land.

The motivations for a farmer to burn brush, weeds, and crop residues are clearly complex and span all socio-economic levels. Farmers estimate that it can take up to three times the amount of labor to hand clear, incorporate weeds and brush into the soil, and prepare the land to be planted from a fallow state as it does to burn and prepare the land (depending on how long the land has been fallowed). Even when land has been farmed the previous season, during this period when expenditures on labor, and labor timeliness, are extremely important, burning can be seen to be an attractive alternative to the work and time that it might take to allow weeds or crop residues to decompose and be incorporated in the soil. Farmers also suggest other reasons that it might be desirable to burn. They often burn in anticipation of a particular type of garden they will be planting. Farmers in all areas say they will burn to give their corn additional *potas*, potassium; they burn in some areas to rid their sweet potatoes of what they call potential worm problems. They also burn to fertilize pumpkins, rid their gardens of rats, and to avoid

pest problems in peanuts and grain crops. We also found that in Cavalier, farmers burn their crops to induce a volunteer crop of mustard before other crops are ready to be harvested (this is an area where people's diet are especially dependent on leaf crops) and they burn to dry out their land so that it can produce beans.

Livestock

Although the number and kind of animals in each area are different, we found that animals serve a similar function in all areas. When a farmer is young, animals facilitate his initial accumulation of land. This happens particularly through the institution of *gadinaj* in which owners share out their animals to men that they feel are good caretakers and who have the capacity to feed them. Farmers care for animals in an almost no-cost fashion. There is little labor expended--or little labor with much opportunity cost in the case of children--on their care and the animal adds value to otherwise useless grass and harvest refuse. It has almost become a cliche that in Haiti animals serve as walking bank accounts; this is true insofar as their primary purpose (excluding mules, horses, and donkeys that are used in transport) is to provide the farmer with a source of ready cash, particularly to meet unforeseen expenses or to finance large purchases that would be difficult to pay for with money obtained in crop production. Whereas in some cases these purchases may be of seeds or labor, most animals are sold to pay for funerals, treatments of illnesses, schooling, house improvements, and so on. Farmers who do not own animals are more in danger of losing land or being seriously decapitalized when they experience crises in consumption--and they certainly have more difficulty meeting basic living standards. Farmers who own animals have less of a need to orient their crop production towards covering any eventuality that may arise in the household. It is very possible, therefore, that farmers who own animals are less risk adverse than their neighbors in approximately the same economic categories (that is, that own and work about the same amounts of land). We have the impression that these farmers also have comparatively less need to plant fields that give very little return, a tendency that is reinforced by the additional value that can be found in fallow by putting an animal on a piece of land. Of course, once the animal is sold, there is less wealth available and the household may change its production strategies towards minimization of consumption risks, and/or accumulation to acquire another animal.

In all areas that we studied farmers say their biggest problem with cattle is finding food for them during particular times of the year--usually during the dry season months, or when animals are not allowed to graze in fields planted with gardens. In high, wet areas, feed problems for all animals are less severe than in lower, drier areas. This seems to be because roadside and other non-garden graze is relatively more productive in these areas, and because in some zones, the density of population is relatively less compared to population zones at lower altitudes.

People in high altitude, wet areas like Cavalier are more interested in sheep than goats. Farmers say that goats seem to be more susceptible than sheep to diseases in these zones. In all areas, sheep and goats are subject to predation by dogs, and they also can develop fatal bloating which farmers claim comes from eating graze or browse with too high a water content. Chickens are also subject to periodic epidemics of fever or what is called "pye sech" (dry feet, possibly Newcastle's disease) which, although farmers have developed treatments for it, is almost always fatal. The causes of these diseases have not yet been determined, but will be the focus of further investigation by the livestock specialist of PST/ARD. None of the areas studied had a significant number--if any--of pigs.

Uncultivated Plants

Gathered and wild plants play an important role in people's diets (as well as in animals'). Although it is difficult to quantify their role in farming systems or cropping decision-making, during times of food shortages, farmers in many areas depend on leaves such as *bonbon kodenn* (Trichostigma octandrum), *lyann panye* (Chamissoa altissima), *lanman* (Solanum nigrum), and so on, and other plants, such as *djon-djon* (Boletus aereus) to complement a starch--roots, tubers, plantains, or breadfruit. Farmers also sell these "crops" to receive a bit of cash when no other source is available to them. Unfortunately, they report that many of these plants--particularly *djon-djon*--are becoming rarer with the destruction of their habitats which are wooded areas. Gathered plants are also extremely important in all areas as sources of medicine and teas.

Cropping Systems Decision-Making

Many other reports have spoken about farmer's strategies to diversify their crop mixes and land types, and to minimize risk and uncertainty, but what are some of the decision-making criteria that actually go into crop choice? What factors determine what people plant? We have learned that farmers use a complex set of criteria to choose their crops, the most important of which are described in Table 1, "Classification of Crops Grown in PST Watersheds by Farming Systems Decision-Making Aspects." It is worth noting here that--although these considerations are presented in terms of individual crops--most crops are planted as part of intercrops, which can change their performance. For example, it is well-known that intercrops of maize and beans can "over-yield" (that is, yield more than if they were planted in separate fields) under some circumstances because of the nitrogen-fixing capability of beans. The same is true of manioc and cowpeas. In these cases, crops that might perform marginally if planted alone give acceptable returns when planted together. Other intercrops can over-yield due to the microenvironmental modifications that one species makes for the other.

In addition to the characteristics of crops considered by farmers that are presented in this table, farmers must weigh their personal circumstances in order to strike a balance between them. These considerations are as follows.

1. What consumption needs does the family have?

For many farmers, production is organized first to satisfy the subsistence needs of the family, such as food, clothing, schooling, housing, and so on, rather than to invest in or maximize returns from agricultural production. This is the major reason that farmers--even those who are not "marginal"--appear to have a short time horizon. (Over the longterm, too, farmers often produce so that they or their children will be able to leave agriculture and rural areas, because they see little future in rural Haiti. This intensifies the disinvestment tendencies of many farmers.) Subsistence-oriented farmers receive returns from their production in the form of food and money from crops they have sold which they use to meet family needs and use the remainder for agricultural production; enterprise-oriented farmers receive returns from their production which they use to meet past and future production costs and use the remainder as income. (Which form is dominant in a given locality or country is to a large degree determined by history and the wider economy.)

Farmers satisfy their subsistence needs both through selling crops that are produced in their gardens and by eating what they produce. We have observed in the majority of areas studied that, although farmers say they have less total production to sell, they say they sell a higher percentage of their crop than they did 10 years ago. One

would guess that this is especially true for small farmers, because we and others have observed that--with the exception of the very large farmer--the poorer the farmer the more integrated s/he is into the market.

This subsistence orientation can manifest itself in many different ways in terms of crop decision-making. Of course, what farmers prefer to eat influences their planting decisions somewhat. Farmers will also try to assure a sizable harvest or the sale of an animal at a time when they know they will have major expenses, such as at the beginning of the school year, or for the new year. The harvesting dates for coffee in some parts of the watershed areas allows farmers in these areas to use it to pay (partially) school expenses. This seems to be one reason that farmers keep their coffee trees in spite of low production and low prices.

The schedule of harvests, plantings, schooling, and so on, combine to make the ability to receive a rapid and steady cash flow from the garden an important criterion in crop decision-making. This need for quick return is one of the major reasons we see a shift to annual and short season crops, and has led to the sub-optimal management of crops such as vetiver. Vetiver roots are frequently dug after six months, although peak oil production is reached after 12 to 13. Total cash received in these two sales is less than that in one, but in this case the more frequent cash flow is the overriding objective. It is worth underlining that in this case, as with much other peasant production, profit maximization is not the dominant goal.

The general times during the year that families in the areas studied most need money are indicated below. The exact timing may vary according to individual area. This recapitulation of monthly requirements shows that money is always needed.

End December-beginning January	Christmas/New Year
End January-February	Land Prep/Planting
May-June	Hungry Months
July-August	Land Prep/Planting
August-September-Beginning October	Hungry Months
October	School
End October-Beg. November (some)	Land Prep/Planting

Farmers will often plant (or keep) crops that give them access to loans. It is widely known that many farmers keep some coffee in order to be able to maintain a relationship with a *spekulate* who will loan them money when needed (and then often discount the price of coffee). Farmers have the same relationship with buyers of other export crops, such as vetiver. It is worth noting that in the two areas surveyed where peanuts have been an important part of the farming systems, farmers have almost entirely given up growing them in the area that is not served by a buyer who also loans money. They continue to grow peanuts in the other area where credit is offered by the buyer.

One implication of a subsistence orientation that is particularly important for Proje Sove Te is its effect on a farmer's relation to risk and uncertainty. Risk is the approximate probability that certain events will happen, which a farmer will try to evaluate based upon past knowledge (Cancian, 1980). Farmers assess the likelihood of too much or too little rain at particular times of the gardens' developmental cycle, pest infestations, low prices, and so on. They then make cropping decisions based both upon what they feel are the likely outcomes and how much of a chance they are willing to take that the unexpected outcome will happen. Uncertainty is what is unknown and seems unknowable from the standpoint of the farmer. The benefits of a new farming practice or crop, for example, are uncertain until a farmer has some experience with them. The farmer can also perceive that what was once "known," at least in terms of probabilities, is

now becoming uncertain. For example, this seems to be the case with rainfall in many of the areas of the watersheds according to farmers.

It is expected that farmers with a strong subsistence orientation will be extremely risk averse. This is especially true for the poorest farmers who can most easily fail to satisfy minimum subsistence needs, as well as those farmers with high demands on their resources (because they have children, illness, or relatively high expenses) vis-a-vis their capacity to produce in terms of land, labor, and money available to be invested in agricultural production. A good example of this is the practice of planting of sorghum in many areas that usually have enough total rainfall in the second season to grow corn. Particularly in the early and mid-1980s, farmers could make more money (almost twice as much on average if one measures average yields per unit land versus market price) producing a second crop of corn than they could producing sorghum. Corn is much more risky, however, because it needs higher and more timely rainfall than the variety of sorghum most frequently grown in the watershed areas. It is much more desirable for the consumption-oriented risk-averse farmer to have a low, but dependable income every year, than to have a much higher income 3 years out of four even if the average income is higher. The exception for this expectation is if farmers have a serious shortfall in the amount of a crop that they use in self-provisioning, but whose market price is relatively high, such as malanga, beans, yams, and plantains, they may decide that the possibility of significant gain outweighs the risk. This suggests that PST should direct a part of its efforts towards technical interventions that improve the yields of these high-priced subsistence crops in concert with its soil conservation efforts.

Under conditions of uncertainty, in which farmers cannot easily use past knowledge to inform their decision-making and each farmer has as much chance of losing everything as any other, poor farmers may actually be more willing to experiment than rich farmers because they are gambling with less. This is particularly the case if investment costs are relatively low. While this seems counter-intuitive--particularly in light of what has just been stated about farmers' relationship to risk--it can be explained in this way. Suppose that there are two farmers--a rich one and a poor one. In this example, the rich one is farming seven plots of land; the poor one only two. Each farmer is confronted with the same conditions of uncertainty in that they do not know what crops, if any, will give them a satifactory return from their most degraded piece of land. The costs and risks of planting and not planting this land are different for each of these farmers. If the rich farmer does not plant this land, he still has six other plots from which to obtain his livelihood, therefore he views the cost of planting the land to be great and the cost of not getting a harvest from it to be little. If the poor farmer does not plant this land, he only has one other plot to harvest. Thus the costs of planting this land are relatively small compared to the costs of not receiving anything off the land. Farmers may also decide to experiment on a small scale under conditions of uncertainty. As mentioned above, we have seen this to be the case in trying a variety of new crops that can produce some revenue under degraded environmental and changing market conditions.

2. What investment possibilities does the family have?

This consideration is particularly important as it effects the purchase of plant materials and labor. We have found the most common intercrop in our study areas to be corn, beans, and sweet potatoes, which are most frequently planted in February. The relative importance of each crop in this intercrop, however, is related to the amount of money farmers have to spend on bean seed. Farmers adjust their planting densities of sweet potatoes, and sometimes corn, in order to accommodate the amount of bean seed they have been able to purchase. Many farmers say that they have switched from

planting red beans to black beans because black beans have a smaller seed. Thus, when you need to plant a particular plot of land you need to spend less money on seed. In this case, farmers are minimizing their investment at a time when costs of seeds are high. At harvest time, when many farmers must sell their crop, prices are at their lowest. It is interesting to note that the PST market surveys indicate that the prices of black and red beans per marmite[7] are most often the same (occasionally the price of one bean may be .5 or 1 gourd more expensive per marmite than the other), and that by weight red beans are usually more expensive than black beans. White beans, which are rarely grown in the watershed areas, have the highest price per volume and weight of all beans. Under normal weather conditions black and red beans will return the same volume of harvested bean for a given volume of seed planted. Red beans, however, are more susceptible to pod shattering in extremely heavy rains, thus making them more risky.

In Despa, we find that there are different major intercrops for relatively poorer and relatively richer people. Poorer farmers plant intercrops in which peanuts are the leguminous species; richer farmers plant beans. The primary differences between them in terms of why a farmer would choose to plant one over the other is the cost of seed--beans sell for approximately 3 times the price of peanuts at their respective planting times, the timing of planting--peanuts can be planted when labor is in less demand, and thus cheaper, and that farmers can obtain loans from the people who buy peanuts. The disadvantages to planting peanuts as opposed to beans are many. Peanuts take 8 months to be ready to be harvested as opposed to 2.5 for beans. Farmers receive 1.5-2.5 gourdes per marmite at harvest time (the price may go up to 6 gourdes off-season) versus 10 (and up to 16 when beans are being planted) per marmite. The average return for peanuts in Despa is 2-3 peanuts for each one planted; a very good return is 4:1. An average return for beans in this area is 8-10:1. Of course, many of the fields that are now planted in peanuts can no longer produce beans. Richer farmers are tending to allow this land to fallow every other or 2 out of 3 years and they invest their money in planting beans in less-degraded land. Poorer farmers are not fallowing, or fallowing with much less frequency.

Farmers tend to invest in plots (and crops) that give the highest revenue over the short-term in their portfolio. For example, land that is planted in a corn, sweet potato, and manioc intercrop is unlikely to be the recipient of more than the minimally required investments of money or labor. The addition of beans to the same intercrop mentioned above means that this garden will receive two weedings instead of one, however. Cavalier farmers make compost to apply to their high value chive (*siv*) gardens, but do not use it on any other crop. We have also seen that improvements in productivity of higher value crops encourage farmers to invest in them. The best example of this in the areas under study is farmer willingness to invest time and labor in caring for grafted fruit trees in the Saut Mathurine area and elsewhere, even though trees crops (including coffee) are normally the recipients of very little labor.

Farmers will try to conserve their most scarce investment resource. Our impression is that young farmers with little land and much "force," garden in a more labor intensive fashion than those farmers with relatively more land or who must purchase a significant part of their labor.

3. What is the farmer's land portfolio? What can be grown on which plot?

Farmers will have a set of crops that they wish to plant based upon their eating preferences, investment capabilities, market possibilities, and so on, and will then consider what fields will grow them. The farmer thus weighs the relative advantage of each field versus the other fields in the portfolio vis-a-vis what s/he wants to grow, rather

than the absolute advantage of what will grow the best on each field. A good example of this is sorghum and *pwa kongo* (cajanus cajun). Farmers have explained that if you plant these crops in the same field, one will hinder the growth of the other (which of the two crops is inhibited seems to be based on soil type and rainfall). Farmers who have at least two fields available will plant these crops apart--those who only have one will plant them together, because the farmer needs both *pwa kongo* and sorghum regardless.

As mentioned earlier, the tenure of a plot of land enters into the choice of crop to plant in it. Sharecropped land tends to be planted in grains (including beans) so that the harvest may be easily divided; farmers may try to include late-maturing crops such as manioc in gardens planted in undivided family land so that they can keep control over that particular plot of land.

All of this does not mean that farmers avoid the notion of the vocation of a particular piece of land, but rather that they balance a set of sometimes contradictory needs. Farmers have an effective classification of land types based on their understanding of soils and crop requirements. These categories include color, depth of arable soil layer, moisture-aspect, rockiness, fertility, and texture. Farmers combine these categories with their knowledge of crops and intercrops to allow them to say, "This is corn land; This is land that will produce this kind of yam, but not this other kind of yam; this land will produce two seasons of sweet potatoes--this other plot of land will only produce one, so its sweet potato intercrop will include *pwa kongo* to allow the *pwa kongo* to "remake" the land for the next February planting season. It is important to note that a particular piece of land that can only produce a minimal yield of one crop planted alone may be able to produce a satisfactory yield of several crops planted together. This can be the case, because each of the crops exploits different available resources or because one of the crops provides necessary nutrient or environmental conditions to the other.

We have seen that as land degrades, the crop mix changes and becomes less complex.[8] (Examples of this are shown in the crop calenders in Annex 1.) Hillside gardens planted in the most fertile soils generally contain many crop species--for example: yam, black bean, sweet potato, corn, and perhaps small amounts of other species such as manioc, *kalalou* (okra), pumpkin, and *pwa kongo*. As the plot begins to degrade, manioc will entirely replace yam in the intercrop. In the intermediate, only grains and manioc will be grown. Then, black or red beans will be entirely replaced by *pwa kongo* and/or peanuts (depending on the area) as the land becomes even more degraded. Finally, only *pwa kongo* will be left.

In the PST watersheds there is a wide variation in altitude, rainfall, temperature, topography, aspect, and soils. These variations combine to make a multitude of microenvironments and possible differences in cropping patterns. It is important to note that farmers themselves exploit these differences and thus will try to work land that is suited to different crops or calendars. They also do this to reduce the risk of total crop loss through pest infestations, inadequate rainfall, and so on. Thus farmers themselves encourage a certain amount of fragmentation of landholdings. As in the Cavalier example in which farmers employed many strategies to try to dry out their lands in order to be able to receive a satisfactory yield of beans (this will be discussed in more detail in the section on Site Specific Descriptions), farmers sometimes will actively try to change the characteristics of their plots to change its vocation.

4. Are there agronomic problems connected to a particular crop that would make it uninteresting to grow?

Some crops have particular pests, diseases, or fertility requirements that make the production of the crop difficult or too risky for the farmer.[9] We see, for example, that in many areas yams are no longer grown in the quantities previously because of declining fertility, and rising levels of infestations of *maroka*--soil grubs and nematodes. We also found that in Despa, an area that recently produced mountain rice in quantity, those farmers whose land is still capable of planting rice do not want to grow it in spite of its relatively high yield and price. Now that the majority of plots are incapable of producing rice because of soil erosion, the rice gardens that remain have become inordinately attractive to birds such as Madanm Sara, causing unacceptably high levels of loss. Farmers in Kos have decided to stop growing peanuts, because they have noticed that they cause unacceptably high levels of soil erosion.

5. Does this crop have any particular market problems connected to it? Is there a sufficient market for this crop?

Farmers prefer to grow crops that have a predictable market price and that are easy to sell. We have found that *pwa inkonni* (cowpea) is becoming increasingly rare in the areas we surveyed. One major reason for this seems to be its wildly fluctuating price (possibly due to *spekulate* action in the market). At times, farmers have found themselves planting when prices are extremely high (it has reached up to 20-25 gourdes per marmite according to farmers) and selling when prices are very low (as low as 4 gourdes per marmite). As farmers have thus begun planting less and less, seeds of *pwa inkonni* have become rarer. According to the PST market surveys, during the past year (June 1988-June 1989) the price of *pwa inkonni* in the Ducis market varied between 4.5 and 12 gourdes per marmite.

With limited local demand--and national demand concentrated in Port-au-Prince--we are finding that local markets are extremely supply sensitive for some crops such as corn, vegetables, peanuts, and so on. (This will be discussed in some detail in the market survey reports that will be issued shortly.) Farmers have indicated that they are discouraged by the extreme drops in prices that accompany the harvests of many crops and may hesitate to plant those cash crops that cannot sustain a good price.
A primary contributing factor to the seasonal fluctuations of crop prices is the virtual absence of storage in the watershed areas. (PST has begun addressing this issue with the consultancy on post-harvest and the report that followed it: Wittenburger, June, 1989.) It is also worth noting that with the very limited infrastructure that is found in this region, distance to markets plays an important role in choice of crop. This is particularly the case with perishables, in which profits can be quickly lost through rotting.

We have already underlined the role that "patron-client relations" have played in encouraging people to continue to grow crops such as coffee, vetiver, and in some areas, peanuts. Farmers may grow these crops to assure a source of consumption loans. In turn, this relationship reduces competition between buyers as farmers are constrained to sell to the person who lent them money. Farmers and traders of other crops often establish regular relationships known as *pratik*, in which the farmer finds an assured market and the buyer finds a regular source of goods.

6. Does the farmer have enough experience with this crop or can they find someone locally who does?

Farmers state they are hesitant to plant crops with which they have little familiarity. They are more willing to experiment if there is a chance of significant return over investment costs (see above section on risk and uncertainty), and they can find a local farmer with similar means who is already growing this crop. This fact underlines the importance of farmer-managed experimentation in the PST project and can be facilitated by making the plant materials available at no or low cost to reduce peasant risk and planting costs (see "Discussion Paper: PST Plant Materials Incentives"). It is worth noting that we have found women to be very receptive to the idea of trying a variety of crops in their home gardens--particularly if those crops are high value, like vegetables--even if they demand relatively regular amounts of labor.

7. Can the farmer find all of the inputs necessary to grow these crops?

We have found that every area surveyed cites a severe shortage of tools to be one of its major production problems. These shortages are the result of both lack of availabilty and low farmer income with which to purchase tools. In all areas, informants said that at least half the farmers need to borrow the necessary tools--hoes, mattocks, picks, and so on--to work their fields. All the areas also cited the availability of plant materials as being a determining factor in crop choice. (The details of which plant materials are most short in each region can be found in Annex 1.)

Site Specific Descriptions

The following section includes short descriptions of the zones that were surveyed in this phase of the sondeo. This section is intended to provide a few useful facts about each of the areas; Annexes 1-4 that follow contain further details of the farming systems found there through transcriptions of the collected data, as well as the agricultural calendars for each zone. It is proposed that the technical staff of ARD and each of the ONGs discuss the information presented in order to reach mutual conclusions as to the most pressing needs and interventions for each area.

Cavalier

Cavalier is a zone of steep hills between 750 and 900 meters just below Sou Bois/Formond. It is an area of high rainfall and basaltic soils that are highly weathered. According to farmers, many of these soils are--or were--too wet to successfully grow crops that do not tolerate high amounts of water, such as beans. These wet soils have been very good for growing crops with high water demands such as rice. This land is now, however, subject to extreme and continuing erosion. The reasons for this seem to be several fold.

In the 1940s and 50s there was a negociant in Port-a-Piment who used to sell goods, such as *aran* (smoked herring), on credit. He would take possession of the titles to people's land as security. When they could not pay for the goods they had bought, he would take the titles to be ajudicated and remove a portion of the land in compensation. Informants say he managed to accumulate 125 *karo* in this way. He would then re-rent out the land in 5 *karo* parcels--2.5 *karo* in coffee trees and 2.5 *karo* of cropland--in exchange for 500 lbs. of coffee a year. In 1980, Cyclone Alan hit this area very hard and destroyed a large number of coffee trees. It was at about this time that the price of coffee dropped on the world market and the relative price of beans improved dramatically vis-a-vis other crops. For three years after the hurricane, Cavalier enjoyed an especially

favorable climate for beans and corn in that they had much more sun and less rain than usual. Farmers discovered that they could make more money by not replanting coffee--and, in fact, ripping out many of the trees that were left--and planting the newly cleared land in beans. They would then sell their beans to buy coffee to pay the rent. Farmers were planting 3 crops of beans a year; they burned the land to help it dry out so that it could produce more beans. Soon people started noticing that the land was eroding, but they liked it because it also raised bean yields by drying the land. For several years, farmers continued to receive a good crop of beans through this combination of burning and erosion. In 1984-86, farmers say they were harvesting 20-25 beans for every bean that they planted. Now, however, this land can no longer produce these high yields because it has become too eroded. It is much more common to receive 4-8:1.

It is interesting to note that with the political upheavals of the last two years, farmers have started reclaiming their titles and state that they believe they are still good. Seventy-five *karo* have been taken back from the family of the negociant in the area of Cavalier. This is an area of potential land-based conflicts and should be followed for its impact on PST activities in the zone.

Cultural practices connected to rice also seem to promote erosion in the area. Normally, farmers scrape a fine layer of the topsoil (which contains many weed seeds) along with brush into a pile (*boukan*) for weed control. They then either burn this pile and then plant pumpkin or plant sweet potatoes into the unburnt melange. In either case, the repeated removal of soil from these fields results in a thinner and thinner planting surface and destroys the soil structure.

Some fields in the Cavalier area seem to be very fertile. This is evident since yams--particularly guinea--are an extremely important component in Cavalier intercrops. Farmers also collect refuse and manure to make *fimye* to put on their chive (*siv*) gardens, a major source of revenue for the family. Other major crops grown in the area are sweet potatoes, black and red beans, rice, pumpkin, *pwa kongo*, *manyok*, corn, and *malanga*. There is not much *piti mi* (sorghum) grown in Cavalier, but most areas are also incapable now of producing a second crop of corn. Peasants say they used to grow cabbage and carrots in this area, but they no longer do. Cavalier farmers have a strong diet and market dependence on gathered foods such as leaves and mushrooms during the foggy season of December and January.

More than half the population is migrating into other zones--Jeremie, Grann Plenn, Riviere Ginode, Grand Anse, Tiburon, Iroi--since their access to farmlands in Park Pic Macaya was cut off. They principally migrate in January and July in order to plant black beans. Cavalier has developed many local labor institutions--some of which seem to be in response to seasonal labor shortages--including young boys' *skwads* that work early in the morning with undersized tools. At the time of this survey (three months after Hurricane Gilbert) some farmers in this area were involved in producing quicklime to be used in house building. They were taking advantage of the many trees that had been downed by the storm and were also cutting a number of trees. The production of quicklime demands that a large amount of trees be burned in order to transform lime-bearing rocks. Many houses had been destroyed in the area by the hurricane so the demand for quicklime was high. The farmers are primarily middleclass and richer peasants who are able to invest the large amounts of upfront capital needed to pay labor to haul stone, cut and/or buy wood, and so on.

Despa

Despa is located above Coteaux at approximately 400 meters. Farmers who live in Despa work the surrounding hills up to 800 meters and beyond. The land in the lower elevations is comprised of basaltic soils; the higher altitudes are limestone (Paskett, 1989). Coteaux's rainfall averages 1500 mm (Hargreaves and Samani, 1983) and it is likely that Despa's is somewhat higher.

Despa is somewhat unusual because, in spite of a high degree of private ownership by local farmers, its land is also extremely degraded. As well, its landscape is a reversal of the usual pattern cited above, in that Despa's closer gardens are generally more eroded than its far-away ones. In the lower mountains it is estimated there are approximately 600 *karo* that are only good for the occasional garden of *pwa kongo* or peanut. These fields are planted by very poor farmers with little alternative. The uncultivated remainder functions as group pasture. About one-half of this land is divided and privately held; the other half is undivided (commonly held) family lands. Historically the principal crop on this land has been peanuts.

Although locals say they believe their area has produced peanuts since *tan lontan* (a long time ago), there have been some recent events that have intensified peanut production in the area. They say the broad extent of peanut cultivation is traceable to changes in relative prices in which the price of peanuts became more favorable in relation to other crops at the beginning of this decade and that there has been an intensification of cropping patterns involving peanuts--shortened rotations, less fallow, and so on--since the pig extermination in 1982. This is particularly true for poor peasants. There have also emerged in Despa cropping systems planted by poorer peasants and cropping systems planted by wealthier peasants since the eradication. Poorer peasants, for example, plant peanuts and corn followed by sorghum; richer peasants plant corn and beans followed by corn, beans, and sorghum.

The price of peanuts is highly variable. Farmers usually sell their peanuts in Despa for 1.5-2.5 gourdes a marmite to buyers who give loans to farmers. These buyers discount the price they pay farmers by one gourd a marmite off the market price. They then store the peanuts in bulk and wait for the price to go up--as high as 6 gourdes per marmite in 1988-89--before they themselves sell. It is surprising, but worth noting, that Despa is an area where people say a significant reason for them to borrow is to buy seeds.

Farmers say they plant much less yam and sweet potato now than they did 10 years ago. They also say they plant a larger proportion of their land in crops for sale. It is interesting to note, too, that this area which was once a rice producing zone is no longer. This is because, with advancing erosion, fewer plots are capable of producing a good rice crop. Those that are left become extraordinarily attractive to birds so that soon losses are unacceptable.

Many men--perhaps one quarter--leave Despa every year to cut cane in the Dominican Republic. It is unpredictable when these migrations will take place every year. It is estimated that 100 men migrate to Jeremie, Ansdeno, and Irwa to work in their and other's gardens of rice, corn, beans, malanga, and mazonbel.

Kols

Farmers in the Kols area live at an altitude of around 300 meters; they have gardens on steeply sloping hillsides up to and above 800 meters. Kols is a zone of

basaltic soils at low and mid altitudes. At higher elevations limestone soils predominate (Paskett, 1989). Les Anglais, the town just below Kols to the southwest receives an average of 1100 mm. of rainfall (Hargreaves and Samani, 1983). It is likely that the area of Kols receives a similar amount or perhaps slightly more. Farmers say that the higher areas receive significantly more.

As one approaches Kols, one sees 100s of *karo* that have been severely eroded. We are finding that basaltic soils erode easily and quickly. Once they get down to the "B" horizon in low rainfall areas, they seem to have a low natural capacity for regeneration. Kols, like Despa, has been historically a peanut growing area, but now peasants have almost totally abandoned peanuts. This seems to be because farmers no longer find an acceptable return from peanuts and they recognize that peanuts are an erosion-promoting crop. There is no other reason to continue to produce peanuts in Kols as there is in Despa where there are peanut buyers who also advance loans.

Kols is an area of low population density. Unlike the other areas studied, people migrate into Kols to work local farmers' land. It is estimated that over 100 men come to plant beans, corn, and sweet potato in February and June. They come from Sou Bois, Chantal, Ducis, and the Coteaux plain.

Kols is an area that plants a wide variety of crops, and often several varieties of the same crop. We counted up to 4-5 types of sweet potatoes growing in the same garden. Farmers grow *pwa kongo*, *pwa inkonni*, white, red, and black beans, pumpkin, maize, sorghum, rice, 4 kinds of yams, malanga, mazonbel, manioc *dous* and *ame*--a few farmers even grow potatoes in the area. Farmers also grow a wide variety of vegetables. These crops are distributed by elevation and rainfall. In the lower drier areas farmers plant grains, sweet potatoes, manioc, and so on. In the higher wetter areas, farmers plant complicated intercrops with complex relays and rotations. An example of this is one common association in which the farmer plants beans, corn, sweet potato, yam, and malanga in February; harvests the bean in April and plants rice; and plants beans, corn, sweet potato, and malanga again in July and November.

It is interesting to note that in this area, while it is clear they are strongly integrated into the market, small farmers seem to be more independent from it than their counterparts in other areas. A reason for this is because one response Kols farmers have had to a worsening of their situation is to diversify the type and variety of crops planted.

A large quantity of land has recently been sold in higher areas. There is also some state land in the area, and some very large farmers--the largest recently died leaving 80-100 *karo* to his children. Informants estimate, however, that everyone owns at least a small piece of land.

Saut Mathurine

The zone of Saut Mathurine ranges from 300-600 meters. This zone contains deep red basaltic soils associated with limestone that tend to be highly weathered. Saut Mathurine is a high rainfall area with an average of 4000 mm a year (Hargreaves and Samani, 1983) although it is unclear if this intensity of rainfall has persisted in the last few years. It has relatively high average temperatures.

Saut Mathurine is interesting because it seems to be the type case of poor peasants migrating into state lands (areas of Grand Bois and Dauphin) to cut trees in order to make charcoal that is then often bought by richer peasants and (for the most part) resold.

Informants say that charcoal is an important source of revenue for most families in the area. Many Saut Mathurinois also go to the state lands to plant black beans and corn (January), black beans alone (July), or to graze animals on rented parcels. Peasants also need to go into state lands to find wood to burn in their kitchens. It is a three to four hour walk to enter the areas where Saut Mathurinois hold state lands.

The agricultural geography of the Saut Mathurine area is somewhat complex. One can notice a *zonn vivrie* in the areas of Marc and Duversin where the dominant crops are yam, *mazonbel*, *bannann*, *patat*, *malanga*, *manyok*, and coffee. These tend to be the most populated, lower altitude areas where the soil appears to be more fertile. In the higher regions, where the soils are highly eroded, grains--corn and *piti mi*, are the dominant crops along with *pwa kongo*, even in fields that are near people's houses (but not their lakou). According to informants, land that now is planted in *piti mi* and *mayi* was planted in coffee, yanm, and bananas 35-45 years ago. Now (particularly the top of the mountain in the Marc area) this land is so dry and poor that they have to let it rest every other year in order to produce a crop of *piti mi*.

Peasants grow both *chiken korn* and five month corn; in general, *chiken korn* is grown on soils with better water-holding capacity and five month corn is more commonly seen in drier soils and as part of more complex intercrops. The variety of corn called *bwa rouj* is occasionally grown in the area and when it is, it is grown as a remedy for children stomach problems and colic. Both zones plant black beans in intercrop which mature in 2.5 months.

It is worth noting that peasants say they grow much more corn, beans, *piti mi*, *patat*, and *bannann* now than they did 10 years ago; they say they grow much less rice and coffee. According to local informants, this is particularly evidenced by the fact that *revandez ki sot lot kote* used to come to the Saut Mathurine area to buy rice and to sell rice seed; now local people must perform this task themselves. Many peasants said that coffee is still very important to them--they still depend on coffee to get loans from *spekulate* and to have the money to send their children to school in October--even though they do not produce as much as they used to. Their trees are old, and at the time of this survey claimed they had trouble finding a sufficient number of new ones to replant. As well, some trees in the Saut Mathurine area have a disease (evidenced by leaf yellowing and pitting) that peasants say reduces yields. A few peasants in the area have tried the Caturra variety, but they say that it only yields for two to three years and then its leaves drop off and it dies. Peasants say they sell a higher proportion of all their crops than they did 10 years ago. While a portion of all crops will be sold, peasants sell the majority of their production of beans, *patat*, rice, *manyok*, coffee, and yams.

The agricultural calender holds a few surprises. As in many places in the south, February is the time to plant corn and beans. After the ground has been cultivated, the *pay* and *raje* are gathered into piles and burned. It is in these spots that *jiromon* is planted in the fields (rather than around the house) in order that it may profit from the *bon fimye* that the fire has produced. Many peasants also plant *zepina* along with corn and beans, which they start to harvest after 15 days. If peasants are planning to intercrop *piti mi* in this field with *pwa kongo* in the next rotation, they will plant *pwa kongo* at this time, too. Planted together, *pwa kongo* will *manje piti mi*. February is also the time to plant rice intercropped with the occasional bean, and with patat widely spaced in hills.

Fields that have been planted in corn and beans will be planted in *piti mi* or *pwa kongo* in July. These fields may have the occasional *manyok* or *jiromon* planted amongst them, but they remain virtual monocrops. Sometimes the *piti mi* is intercropped with *pwa kongo* (as mentioned earlier) or with corn (!) and perhaps black beans. The other

most common intercrop for the July planting season is *patat* and *manyok* (both *dous* and *ame*), which may also have *pwa nwa* planted in it. Depending on the variety, the *patat* will be ready in 3.5-5 months. The *manyok dous* will be ready in 8 months and the *manyok ame* in 11. These fields also often have *jiromon* planted in them. This same intercrop is planted in October in those fields that had previously grown rice. Other fields are planted in intercrops of yam--*iral* (also known as yam *bwa* or *bakala*) and *gine--karayib*, and *pwa nwa*.

Very few vegetables are grown in the area--one can find the sporadic eggplant or tomato (although the weed, *zamoret* is quite common) and *militon*, although as mentioned earlier, *jiromon* and *zepina* are widely grown. *Zepina* is only available for a short time during the year. At other times people look for wild leaves, particularly *bonbon kodenn* and *kweson* (watercress). People say they buy eggplants, *militon* (chayote or christophene), carrots, cabbage, potatoes, and beets, although the level of consumption/local demand is probably not very high for any of these. Fruits most commonly found in the area are avocados, mangos, breadfruit, coconuts, the citruses, and to a lesser degree *grenadia* (passion fruit) and *grenadin* (grenadilla).

Informants say the hungry months for people are particularly April, May, and June; for animals they are March, April, May, June, and November--when animals can not enter into gardens to eat refuse and weeds. A few large landholders plant *zeb gine* and *zeb gwatemala* on hillsides for their animals to eat. The most commonly held animals in the area are (in order) chickens, goats, and cattle, with equines, sheep, pigs, and rabbits occurring rarely. Only a few of the pigs that were in the *groupment pocherie* were distributed--of those that were, many were sold to *spekulate* on credit which has never been repaid. Of those that remained in the *pocherie*, many have died of illness (probably in the Erysipsylas epidemic) and the rest seem to be malnourished, as food is expensive and difficult to find. Chickens regularly succumb to *lafiev* twice a year during the drier seasons. The local remedy for *lafiev* is castor oil, bicarbonate of soda, and sour orange juice. Goats get diarrhea during the rainy seasons and die. The biggest problem for cattle is lack of food.

As is probably obvious from the agricultural calender, labor is most short during January/February, July, and November. *Skwads* are very common in Saut Mathurine--settlements of money owed to each member are made in December. Local informants say that they believe that each household has at least a small piece of land to work, but that probably one-fourth of the population only has that small piece. At least a half of Saut Mathurine households have no access to relatively flat land to work. There are few absentee-owned lands in the area.

Conclusions

The information and analysis presented in this study further justifies the emphasis on revenue-increasing as a full partner to soil conservation in PST. They also underline the need for a two-pronged approach on the part of PST. One side of our work should directly address the problem of conservation and rehabilitation, while the other needs to intervene in the causes of soil erosion. PST should help to break the link between impoverishment leading to degradation leading to further impoverishment. It is important to note that this is so on a regional basis, not just for the poorest farmers. Even richer farmers end up being penalized by this structure of impoverishment-degradation through limited local markets to sell the goods they produce, low productivity of labor and land which limits their possibilities for accumulation, lack of rural infrastructure and outside investment in agriculture, the sense there is no rural future which leads to further disinvestment, and so on. The following recommendations are intended in the spirit of

this process. (There are explanations of particular suggested hillside interventions that can be tested in project managed research or farmer managed experimentation in the paper "Suggested Interventions for the Upcoming Planting Season.")

Recommendations

This study has underlined the importance of structural interventions--interventions that change the conditions under which people produce. These interventions are in the domain of land tenure, storage, input availability, markets, transformation of agricultural products, and so on. Other interventions more directly tackle the problems of agricultural production and soil conservation. From a farming systems perspective, the agricultural interventions we should be emphasizing will:

1) Valorize green manures/reduced soil loss--in other words, we should find crops/crop associations that will justify the increased investment that hedgerows represent by showing revenue or yield increases due to their association with hedgerows, and will provide a motivating force for farmers to incorporate at least part of the organic material in the soil.

2) Allow farmers to obtain a fairly rapid and steady cash flow, will reduce risk, will produce in periods of hunger or no cash, or will allow farmers to meet other specific objectives in their production.

3) Motivate farmers in terms of their economic understanding and objectives to take highly sloped/low return fields either out of production, plant them in pastures or permanent cover such as trees, or fallow over a longer period. Ultimately PST cannot avoid the conclusion that some fields are unsuitable for annual cropping, but it will have to develop long-term alternatives for farmers so that this goal can be met.

This field survey has discovered that farmers are, in general, sensitive to the fact that erosion is occuring in the fields that they are farming. In some cases, however, farmers--particularly owners of fields that are being rented or sharecropped out--are not aware of the rapidity of the rate of soil loss and its effects on future crop production. It is also doubtful that farmers in some areas are aware of the benefits of soil conservation in improving the crop field under normal production circumstances. This indicates that part of PST's efforts should be directed towards animation field-days in which particular fields with soil conservation technologies installed and control fields (both with local farming practices) are monitored with simple methods for erosion and crop production. It would also be a good idea to directly address the widespread feeling that there is little future in agricultural production in rural Haiti and little hope of making a change (this obviously must go hand-in-hand with interventions that can help farmers conserve their fields and improve their quality of life). It is suggested that PST emphasize that individuals and groups of farmers can make a difference in their own, and the watersheds', future. Furthermore, PST should underscore that soil conservation, tree planting, and improved farming systems are an investment in consumption, both present and future.[10] This process can be enhanced through visits by peasants in the PST watersheds to peasants in other successful project zones.

The observations of farmers trying new crops and methods made during this sondeo lend support to on-farm trials (farmer managed experimentation) as the vehicle for change in Proje Sove Te. PST has every reason to be optimistic that farmers will be willing to perform--and be able to understand--simple on-farm trials, and that these trials can result in technology adoption, particularly in light of the fact that many farmers feel that the environment is becoming more uncertain. PST will have to cover much of the

risk of the trials. Findings of the sondeo also underline the need for peasants to have a local person of similar means familiar with new techniques to support their efforts. This suggests that PST should further emphasize in-depth formation in soil conservation and selected topics in agriculture for some peasants (such as livestock raising, vegetables, storage, selection of seeds, and so on). It is suggested that the ONGs choose several people in each zone of intervention to receive additional training. These people would be trained in different subjects in order to avoid a monopoly of prestige and information in any one person, and to spread information/extension availability.

Other important issues that were highlighted by the sondeo are the seasonal labor shortages at the time of land preparation and planting, and the inability of many farmers to make further investments in their land--particularly during this period. These facts suggest that soil conservation be performed at non-peak labor demand periods--in the case of the initial establishment of hedgerows, that they be planted before the rest of the field is worked. They also suggest that many individual farmers will have difficulty in obtaining and paying the necessary labor to install soil conservation. UNICORS' use of *skwads* is considered an excellent solution to this problem, and it also helps to simplify logistical, organizational, and technology transfer problems, as well. PST might want to consider targeting young male farmers for interventions that may be labor intensive, but improve revenues and yields, and targeting older farmers and some women for interventions that reduce or stabilize the amount of labor investment needed in the land. It is also suggested that the cost of interventions to farmers be analyzed. If they do not have a low initial cost, their adoption should be encouraged through appropriate incentives.

Some other recommendations from this study are:

1. Develop market interventions that aim to stabilize or raise the price received by farmers for crops that have an unstable market price or that have very low prices at harvest, such as peanuts, beans, corn, and cowpeas. These can be storage interventions, group marketing or transport schemes (including mules), and so on. With the introduction and promotion of vegetables, these interventions will also become important to efficiently tap into markets and to avoid unacceptably high levels of loss through rotting.

2. Investigate the possibilities for producing vegetables and other crops for local markets according to the period during the year that the south is importing these crops from other regions of Haiti.

3. Consider making tools and planting materials available (details as enumerated in Annex 1) through rotating tool banks--these can be held in common by the *skwads* or groups participating in PST and serve as a resource that can be managed together, thus facilitating group solidarity and cooperation, boutiques that have the economic viability to remain after the project, and so on. ONGs may want to consider working with some farmers or groups of farmers in mountain areas to help them become "certified" seed producers of selected crops, such as corn, beans, sweet potatoes, and yams. These farmers and their fields would have to meet certain standards (in part, depending on the crop they would be producing), but would be the recipients of technical training on seed selection and crop husbandry.

4. Develop land tenure interventions that address the issue of the relative lack of investments in sharecropped, rented, and commonly-held lands. It is suggested that PST try a pilot program that will help negociate agreements between those who own and work land to make land improvements. Among other details, the agreements should specify

who bears the cost of improvements, who is responsible for maintenance of a structure or management of hedgerows, the amount of time the land-holder is able to benefit from the improvements by continuing to work the land, who has the rights over the products of hedgerows or trees, and what the distribution of benefits will be over the longer term.

5. Reduce cost of planting materials--particularly yams, *pwa inkonni*, and beans. Emphasize seed selection and storage as an intervention in order to improve the quality of seed and reduce planting costs.

6. Interventions should focus on improving the whole farming system. For example, taking into account the link between location of garden plots and cropping systems described above, PST can aim to intensify production on plots that are high fertility; protect and increase revenues on plots that still have an agricultural vocation; and rehabilitate plots that have lost their ability to produce. Some interventions that are being tried or promoted by PST that fit this concept are:

a) the intensification of production through fertility management and compost which would allow more frequent cropping, vegetables, fruit trees, and small animal production in home gardens.

b) the introduction of high revenue crops or high-yielding varieties to demonstrate the capacity of the soil to produce, along with hedgerows and techniques that enhance fertility.

c) the improvement of farmer's ability to produce and make money from animals. PST's animal health program is essential to this effort in that it will reduce the risk of animal production and will allow farmers to realize returns more quickly by increasing their animals' rate of gain. It is suggested that animals be staked onto hillside plots (away from hedgerows). Livestock can be raised on-site with grass and leguminous hedgerows as feed, and their manure can be used in compost, that can then used on high value crop(s), such as yams, beans, and/or other high revenue/quickly-maturing crops such as vegetables.

d) interventions that address both soil and water conservation in soils to improve yields and reduce risk of crop loss from lack of soil moisture. These interventions emphasize ground covers and cultivation between the hedgerows on the contour. ARD is at present running trials on local sorghum, improved sorghum (variety 50009), and velvet bean. As a leguminous species, velvet bean might increase the production of sorghum. We also think this intercrop is particularly interesting because farmers let animals into their gardens to graze after the sorghum harvest. Velvet bean will enhance the nutritional content of the graze and we hope that the animals will help control the spread of the velvet bean. Sorghum does not, however, tend to be the type of crop that justifies increased investments as it is low revenue and oriented towards family consumption. Farmers tend to grow it on land that is sloped and degraded, and therefore has low water-holding capacity. Variety 50009 is more highly demanding of water, and needs it in a more timely fashion, as compared to the local variety. (That means it is more risky for farmers to plant 50009.) It also may be more demanding in terms of nutrients. If it gets what it needs to produce, however, 50009 produces at a much higher level than the local variety. Some farmers have complained, however, that when they are the only ones planting 50009, their yields are heavily reduced by birds who are attracted to this sole-source of food. Our intervention should be oriented towards showing farmers that given proper conservation on some fields, they can get dramatically increased yields of sorghum.

We are also investigating yield differences that result from planting sweet potato on the contour. ARD will shortly issue a fiche technique that explains a simple method that farmers can use to estimate contours (within an acceptable tolerance) for sweet potato *bit*.

e) the production of castor bean (*maskriti*) planted behind leguminous hedgerow. Castor bean has the potential to significantly increase revenues from some hillside plots. It has the additional advantage of being a perennial whose root system could further enhance the conservation benefits of hedgerows.

f) investigate the possibilty for production of high value per weight crops such as garlic, black pepper, spices, and so on. ARD has obtained a trial quantity of garlic seed that is able to tolerate more humid conditions than most other garlic varieties.

g) the management of brush fallow for economic returns from the existing wood species and through strip-cropping of annual crops with fallowed land.

h) rehabilitative block plantings of pigeon pea with direct seeded forestry trees and intercrops of peanuts and *bayahon* (prosopis) that are managed for the sustainable production of poles, wood, or charcoal. In both of these suggested interventions, farmers are able to continue to receive revenue from their fields while they are waiting for the trees to mature. At the same time, the presence of the garden signifies that animals may not be grazed in these fields.

g) improved pastures. PST should compare the production of grasses and legumes on a given piece of degraded land and its feed potential for particular animals to the other things that could be grown on that same piece of land.

7. This research has shown that PST needs to devote a significant effort to understanding and improving the productivity and returns of intercropping systems. Some suggested areas of intervention in this area are as follows.

a) Once PST has established which environmental conditions are appropriate for the Tapato sweet potato (it is also suggested that PST investigate the variety *neg sal* to the same end), it needs to be tried in polyculture, such as corn and beans. PST needs to determine that the possibly higher nutrient or water demands of the improved sweet potato do not result in reduced yields, particularly for the bean component of the polyculture.

b) Trials of the Salagnac 90 bean--a small, resistant, and high altitude adapted bean--in different soils. We will be receiving some information from trials on this bean this season. These beans will need to be tried in local intercrops to accurately test their performance.

c) Improved planting density of beans and corn with high germination seed. Given the information obtained in the sondeo on farmers' desire to limit investment costs, it would be desirable to establish the optimum planting densities vis-a-vis costs and revenues if farmers plant their fields with high germination seed. PST will be receiving some information from trials on this intercrop this season.

As is shown in the crop calendars in Annexes 1-4, the zones that plant corn as a second season grain are generally limited to high altitude, high rainfall areas. As well, second season corn is sometimes planted at "off" times, such as April or September, or in unconventional intercrops, such as corn, sorghum, and beans. Corn and beans are often

intercropped with sweet potato in both seasons, however. It is suggested that a PST "package" should eventually be oriented towards corn, beans, and sweet potatoes planted with improved densities/high germination seed in contour tillage with hedgerow prunings timed to provide fertilizer for the beans (the highest revenue component of the package). The above trials are oriented towards developing this package.

d) A comparison of economic and agronomic yields of manioc intercrops on poor soils. The species that will be compared are *pwa inkonni* (cowpeas), beans, peanuts, and *pwa kongo* (depending on location and soil type). Reports by CIAT indicate that cowpeas have on average 45% higher nitrogen-fixing ability than black or red beans, and 60% more than peanuts. Cowpeas are also particularly adapted to poor soils, and tolerate acidity. PST is at present comparing yields of manioc with various bean species. Included in these tests are a local manioc variety, a variety found during the Despa sondeo called "poul-poul" that produces shallowly and horizontally, and a CIAT variety that produces as a sweet manioc within six months and then can be harvested as a bitter manioc at eight months. It is suggested that PST also test improved cultivation practices for manioc.

8. Investigate the possibilities of improved planting and cultivation practices for yams. This trial would be aimed at minimizing the costs of production of yams through the use of small seed pieces and/or minisets. (The information obtained in the sondeo flags a potential pitfall in farmer acceptance of miniset technology due to a significant lengthening of the period from planting to harvest as compared to "normal" yam production.) It would incorporate the concept of "tied ridges," where appropriate in order to reduce erosion and enhance production.

9. Verify that *maroka* in yams and bananas are indeed nematodes. If so, perform trials of crotolaria--a natural nematicide and green manure--interplanted with yams and with bananas.

10. Investigate the possibilities of improving yields of the following crops or make it possible for farmers to produce for home consumption or sale if they were previously not able--beans, yams, bananas (particularly *bannann fran*), malanga, carrots, onions. These are crops that are relatively expensive, but fairly regularly consumed in peasant households. One possibility that will be investigated by ARD is the use of bit/canal system on the contour to produce banana and malanga. These will be intercropped with other crops, such as yam.

11. This survey has shown that alternatives to burning crop residues and weeds needs to be a focus of PST efforts. One possible answer to this problem is to emphasize *ramp pay*, as is already happening in some areas.

12. Target some production for the hungry months for both people and animals. Some possibilities being explored are varieties of *pwa kongo* that produce in April or November, *pwa inkonni*, sorghum 50009, and some of the crops to be planted in home gardens, such as vegetables and alternative sources of leaves (*legim fey*). These are the times when people have the most need for food and money.

13. Target those cultural practices for improvement that contribute significantly to soil erosion. One example of this is the introduction of a tool for harvesting beans rather than pulling them out by the roots.

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CROPPING CALENDAR--MAJOR ASSOCIATIONS

SAUT MATHURINE

ASSOCIATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAYI	PREP/PLANT-WD----------											
												HVST
PWA KONGO	PREP/PLANT-WD----------											
												HVST
PWA NWA	PREP/PLANT-WD--HVST											
PATAT	PREP/PLANT-WD----------											
												HVST
MANYOK AME***	PREP/PLANT-WD----------											
												----------HVST
PWA NWA	PREP/PLANT-WD--HVST											
YANM	PREP/PLANT-WD----------					WD----------						
												HVST
MALANGA	PREP/PLANT-WD----------					WD----------						
												HVST--HVST
PWA NWA	PREP/PLANT-WD--HVST											
PITI MI							PREP/PLANT--WD--WD--------HVST-					
												HVST
MAYI*							PREP/PLANT--WD--WD--------HVST					
PWA*							PREP/PLANT--WD--HVST					
PATAT	**PREP-PLANT--WD----------						HVST PREP-PLANT------WD--					
												-----HVST
MANYOK AME***									PREP-PLANT------WD--			
												----------HVST
MANYOK DOUS									PREP-PLANT------WD--			
												----------HVST
DIRI	PREP-PLANT--WD----WD----------HVST											
PWA NWA*	PREP-PLANT--WD-HVST											
JOUMOU												PLANT-
												-------WD----------HVST----HVST
PATAT	PREP/PT-WD----------											
												HVST
PWA NWA	PREP/PT-WD---HVST											
MANYOK***	PREP/PT-WD----------											
												---------HVST

*This crop is commonly, but not not always, present in this intercrop.
**This crop sequence is repeated twice in this intercrop.
***This garden may be planted in mayi or piti mi in the second season (See above association).

CROPPING CALENDAR--MAJOR ASSOCIATIONS

KAVALYE

ASSOCIATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YANM	PR/PT--WD--WD----------HVST HVST HVST											
PWA KONGO	PR/PT--WD--WD----------HVST-											
	HVST											
JOUMOU*	PR/PT--WD--WD--HVST (PR/PT-WD------HVST)											
YANM	PR/PT--WD--WD----------HVST HVST HVST											
PWA KONGO	PR/PT--WD--WD----------HVST-											
	HVST											
PATAT	PR/PT--WD--WD----------HVST(----------HVST)											
MANYOK AME	PR/PT--WD--WD----------											
	-HVST----------HVST											
JOUMOU*	PR/PT--WD--WD--HVST (PR/PT-WD------HVST)											
PWA NWA (ROUJ)	PR/PT--WD-WD-HVST											
MAYI	PR/PT--WD--WD---HVST											
PATAT	PR/PT--WD--WD----------HVST(----------HVST)											
YANM*(oubyen)	PR/PT--WD--WD----------HVST HVST HVST											
MANYOK AME*	PR/PT--WD--WD----------											
	-HVST----------HVST											
MAYI				PR/PT-WD--WD---HVST								
PWA KONGO				PR/PT-WD--WD----------HVST-								
	-HVST											
MANYOK DOUS				PR/PT WD WD								HVST
PATAT	PR/PT-WD-WD----------HVST											
PWA NWA	PR/PT-WD-WD--HVST											
PATAT							PR/PT-WD-WD----------HVST					
PWA NWA							PR/PT-WD-WD--HVST					
PATAT										PR/PT-WD-WD----		
	----------HVST											
PWA NWA										PR/PT-WD-WD----		
	HVST											
DIRI				PR/PT-WD--WD--------WD-(HVST)----HVST								
PATAT				PR/PT-WD--WD----------HVST-								
	HVST											

DIRI** PR/PT-WD--WD--------WD-(HVST)----HVST
MALANGA PR/PT-WD----------WD--------WD----------
----------HVST-HVST-HVST-HVST-
HVST-HVST

*This crop is commonly, but not not always, present in this intercrop.
**This crop sequence is repeated twice in this intercrop.
***Monocropped piti mi is usually planted in April in Kavalye.

DESPA

ASSOCIATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MANYOK AME			PR/PLANT--WD----------HVST-HVST									
PISTACH			PR/PLANT--WD----------HVST-HVST									
PWA KONGO			PR/PLANT--WD----------HVST-									
	HVST											
MAYI		PR/PT-WD-WD----HVST-----(HVST)										
PWA		PR/PT-WD-WD-HVST										
PATAT		PR/PT-WD-WD----------HVST										
MANYOK* oubyen		PR/PT-WD-WD----------HVST-HVST-------										
		(HVST)										
YANM*		PR/PT-WD-WD----------(HVST)HVST-HVST-HVST										
PWA KONGO		PR/PT-WD-WD----------HVST-										
	HVST											
MAYI		PR/PT-WD-WD----HVST				PR/PT-WD-WD----HVST						
PWA		PR/PT-WD-WD-HVST				PR/PT-WD-WD-HVST						
PITI MI						PR/PT-WD-WD----------HVST-						
	HVST											
MAYI	PR/PT-WD-----HVST---(HVST)											
PISTACH		PR/PT-WD----------WD---------HVST-HVST										
PITI MI						PR/PT-WD-WD----------HVST-						
	HVST											
PWA						PR/PLANT-WD----HVST PR/PT-WD----HV-						
	HVST											
PATAT						PR/PLANT-WD----------HVST-						
	HVST											
MAYI						PR/PLANT-WD--------HVST						
MAYI									PT/PLANT-WD-WD----			
	----HVST											
PWA*									PT/PLANT-WD-WD-HVS			
PITI MI			PR/PLANT--WD----------HVST-									
	HVST											

*This crop is commonly, but not not always, present in this intercrop.
**This crop sequence is repeated twice in this intercrop.
***Rice used to be an important association in Despa, but it is now only planted by 2-3 farmers.

KOS

ASSOCIATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAYI							PT--WD----------HVST					
PATAT						PR/PT-WD--WD----------HVST						
DIRI*						PR/PT-----WD----WD----------HVST-						
	HVST											
KALALOU							PT---WD----HVST-HVST					
JOUMOU						PR/PT-----WD----HVST						
MAZONBEL						PR/PT-WD----------						
	----------HVST											

(This association can also be planted in August.)

PWA		PR/PT-WD--HVST					PR/PT-WD--HVST					
MAYI		PR/PT-WD----------HVST				PR/PT-WD----------HVST						
PATAT*		PR/PT-WD----------HVST				PR/PT-WD----------HVST						

(At high altitudes, this intercrop is planted in April, with a second season pwa planted in November.)

MAYI		PR/PT-WD------HVST			PR/PT-WD-------HVST		PR/PT-WD---					
	-----HVST											
PWA		PR/PT-WD---HVST			PR/PT-WD---HVST			PR/PT-WD---				
	HVST											
DIRI					PR/PT--WD--WD----------HVST-							
	HVST											
PATAT		PR/PT-WD----------HVST			PR/PT-WD----------HVST							
YANM		PR/PT-WD----------HVST-HVST-HVST										
MALANGA		PR/PT-WD----------PR/PT-WD----------PR/PT-WD---										
	----------HVST-HVST-HVST-HVST-HVST-											
	HVST-HVST-HVST-HVST-HVST											

(This intercrop is particular to high altitude, wet areas.)

PATAT**		PR/PT-WD----------HVST(-----HVST)										
YANM**		PR/PT-WD----------HVST-HVST-HVST										
MALANGA		PR/PT----WD----WD----------										
	----------HVST											
MANYOK		PR/PT----WD----WD--------HVST-HVST-HVST----------										
	----------HVST-HVST-HVST-HVST-HVST--											

PWA NWA							PR/PT-WD--HVST					
PITI MI							PR/PT-WD----------HVST-					
	HVST											

PITI MI							PR/PT-WD----------HVST-					
	HVST											
MANYOK					PR/PT-----WD----------							
	----------HVST----------+											

PISTACH				PR/PT----WD--------HVST-HVST								

MANYOK PR/PT----WD--------HVST-HVST-HVST
PITI MI* (PR/PT)-PR/PT----------HVST-
HVST

PWA KONGO PR/PT(PR/PT)----------HVST-
HVST

*This crop is commonly, but not not always, present in this intercrop.
**This crop sequence may be repeated twice in this intercrop.
***It is not unusual to find several different varieties of sweet potatoes grown together in a sweet potato "monocrop" in Kos.

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[1] I would like to thank the personnel of UNICORS and ORE who graciously offered their collaboration. I would also like to acknowledge Jean-Robert Edouarzin, PST/ARD Technician in Farming Systems, who worked with me in the field.

[2] Because this report is fundamentally "micro" in orientation--that is, it concerns issues of individual farmer decision-making and practice--it will not address many of the larger issues that profoundly influence the evolution of agriculture in Haiti. This is not to deny their importance. They are rather not in the scope of this report. See, for example, D'Ans, 1988; Girault, 1981; Jaffe, 1988; 1983; Lundahl, 1983; 1979; Pierre-Louis, 1989.

[3] This report follows the Kreyol convention in referring to a field or plot (*te* or *moso te*) as a piece of land itself, and a garden (*jaden*) as the crops planted in the field or, in some usages, a field with a particular crop on it. The owner of a plot of land (*met te*) may or may not be the owner of the garden (*met jaden*) planted on that land.

[4] A *skwad* is a type of reciprocal labor group of (usually) four to eight people that is frequently found in the PST watershed areas. The *skwad* rotates its workdays among the fields of its members--Monday the *skwad* works for one member; Tuesday it works for another, and so on. If a member has a day due to him, but no labor to perform on his own land or garden, he may sell that day's labor to someone else and keep all the money earned for himself.

[5] The years 1979-1989, for example, have seen significant declines in the average relative prices of coffee, corn, plantains, and rice, and increases in the average relative prices of beans and sorghum. (Baseline data are not available for yams, manioc, malanga, or mazonbel.) Many other prices have fluctuated wildly in the period. It also appears that seasonal prices for almost all crops have become much more unstable since 1975 (Roe, 1978; Jaffe, 1983; Jaffe, Forthcoming 1989).

[6] One *karo* equals 1.29 hectares.

[7] The basic unit of measurement in the Haitian market system is the marmite, a volumetric measurement based upon the standard no. 10 can. The mode weight of a marmite of beans in the PST market surveys is between 2.8 and 2.9 kilos.

[8] This has been observed in other parts of Haiti as well.

[9] This section cites only some examples of agronomic problems mentioned by farmers. The two sondeo researchers do not have the expertise to make an independent agronomic evaluation of pests, diseases, and soil fertility requirements of crops.

[10] For a further explanation of these issues, see the section on "Animation," ARD Proje Sove Te Work Plan, August 1, 1988-January 31, 1989.