HAITI PRODUCTIVE LAND USE SYSTEMS PROJECT

SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

AND

AUBURN UNIVERSITY

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FARMER NEEDS ASSESSMENT EXPLORATORY SURVEYS

PADF CAP HAITIEN REGION 3

by
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SECID/Auburn PLUS Report No. 9

June 7-22, 1993
Bedoret (Plaisance Area)
Castagne (Grande Rivière du Nord Area)
LeBlanc (Dondon Area)

FORWARD

This report covers the first of several surveys conducted by a multi-disciplinary team led by Anthropologist, Dr. Richard A. Swanson, of the University of Arkansas. Additional members of the team included Agronomist Yves Jean, Agricultural Economist George Condé, Animal Production Specialist, William Gustave, assisted by Agronomist and SECID Team Leader, Dr. Frank E. Brockman and SECID Agricultural Economist, Dr. J.D. (Zach) Lea. The team was assisted and supplemented on-site by members of the PADF Regional staff.

This survey was part of the on-going effort by SECID/Auburn University and its partners in PLUS, PADF and CARE, to implement a Monitoring and Evaluation System which orients the project towards activities that will bring about sustainable increases in farmer income and crop production, while conserving natural resources. As part of this effort, this survey provides baseline information on farming systems in three watersheds in Northern Haiti, identifies constraints to production and opportunities for PLUS to achieve sustainable increases in production and farm income. The survey also provides information on technologies promoted by PLUS as they are presently implemented in the survey areas. The authors have gone even farther than requested and elaborated a unifying theme for project interventions in this region. This thought-provoking document represents an invaluable contribution to PLUS and our understanding of the farming systems in Northern Haiti and how they relate to interventions available to PLUS. It has raised issues to be addressed in our implementation program and widened our vision of socially acceptable ways to achieve sustainable increases in farmer income and improved conservation of the environment.

Because this report represents only one part of Dr. Swanson's job assignment, an executive summary was not included in this report. The executive summary is published as a separate volume, SECID/Auburn PLUS Report No. 7, which summarizes and integrates the findings of five separate surveys. The present volume contains the detailed findings from surveys in three watersheds in PADF's region 3 in Northern Haiti.

Dennis A. Shannon
Campus Coordinator
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We wish to thank the following SECID and PADF staff for their assistance to the team while in the field:

Yves Archange Gossin:	Agronomist, and Regional PADF team leader
Bossuet Petite-Frere:	Technician, and PADF M/E Leader for region
Clerdieu Michel:	Extensionist in Plaisance
Valius Anelis:	Farmer in Plaisance
Myrto Jerome:	Agronomist, PADF area leader
Jean-Claude Dorcellus:	Technician, and PADF M/E Leader for area

Dr. Frank Brockman was able to spend time with the team in all three watersheds, while Dr. Zach Lea also joined us for part of the time spent in the Grande Riviere area. With exception of Boussuet, who spent a couple days in field with us, no other senior PADF staff participated with the team in the field.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FARMER NEEDS ASSESSMENT EXPLORATORY SURVEYS
PADF/SECID CAP HAITIEN ZONE 1

0.0 Introduction

"The Productive Land Use Systems (PLUS) project is a USAID/Haiti funded project. The project is implemented by CARE International and the Pan American Development Foundation (PADF). The South-East Consortium for International Development (SECID) provides technical services to PLUS " (Scope of Work, p.1).

The project began as an agro-forestry activity directed to small-scale, hill-side farmers (Agro-forestry II project). Farmers "were encouraged to plant trees for various purposes. A mid-course correction (by USAID)...mandated that the two NGO's implement a demand-driven approach to the "development of technical packages or 'interventions' offered to farmers" ((ibid, p.1). The new project implementation strategy was also to focus "on a variety of land use interventions that stimulate crop production in order to provide sustainable income for Haitian hillside farmers and at the same time address the project's conservation objectives of preserving soil and protecting watersheds" (Project Amendment Document, p. 13). The Farmer Needs Assessment survey was developed as one means of determining "what farmers want from the project".

The PLUS project already has planned the acquisition of other significant survey information and some of this work is already in progress. This SECID survey work was scheduled at a time when PADF was itself in the process of initiating its work in its newly selected M/E 2 km^2 areas. Within these areas, a census and an exploratory survey were being taken by its field agents who had earlier in the year received FSR/E and rapid rural reconnaissance survey training from the FSR program out of Gainesville, Florida. Review of initial reports completed by PADF staff for the Cap Haitien and Les Cayes area was considered by our team to provide a good introduction to the zone upon which we could build. The availability of this information enabled us to concentrate more of our time on going more deeply into discussions with selected farmers and groups, concerning the opportunities and constraints for development in these areas. Without such information, we would have had to obtain some of it through interviews, before proceeding. We were therefore able to rearrange our schedule of field visits to take advantage of those areas in which PADF had initiated some field reconnaissance. With the CARE program on the other hand, we needed to obtain much of these data ourselves to help provide the context for information sought. In order to distinguish our activities from those less focused exploratory surveys carried out by the PADF field staff therefore, we have chosen to call our activities "farmer needs assessment exploratory surveys".

0.1 Objectives

Most objectives of the farmer needs assessment survey are met through the discussions in sections 2-4 of this document. This is followed by a number of recommendations the survey team would give to the program, with both short and medium term implications for the project. We have attempted to provide what we considered a unifying theme to help to better integrate (given limited time/resources) a number of priority field activities between PLUS project partners, with implications for on-farm research and monitoring & evaluation activities (PADF/SECID). Specific survey objectives as outlined in the scope of work were:

(1) To better understand farmer **attitudes and beliefs** relating to small scale farm crops, enterprises, and project interventions.
(2) To understand production and marketing **opportunities**. Rank these. Identify how each can be addressed. Identify risks associated with each.
(3) To understand production and marketing **constraints**. Rank these. Identify how each could be addressed. Identify risks associated with each.
(4) To identify those **already existing land use interventions** which farmers are already aware of, and/or practicing which promote sustainable use of resources (land, water, vegetation). Seek to understand nature of adoption, spread, production and land value increases, etc. Give farmer assessments of these interventions.
(5) To focus on potential **new land use interventions** that would stimulate sustainable crop/animal production and income generation.
(6) To identify **farmer goals/expectations/needs** so that project interventions can become farmer demand driven;
(7) To identify a number of on-farm **farmer-managed trials** which could be designed for project interventions (themes, crops, type of area/site, tenure). To identify other opportunities for PLUS project implementation.
(8) To identify **questions/methodology** which will help the project in future reconnaissance and M/E surveys, and in process **train** members of PLUS team in doing this.

0.2 Schedule and Multi-Disciplinary Survey Team:

Surveys were planned for the following regions, with dates as follows:

May 26- June 1	Orientation, Initial Survey Instrument Design, Team Formation, Planning
June 2, 3, 4	PADF Jacmel Region #1, Site 1 (Palmiste Avin)
June 7,8,9	PADF Cap Haitien Region #3, Site 1 (Plaisance)
June 10,11,12	PADF Cap Haitien Region #3, Site 2 (Grande Riviere du Nord)
June 14,15,16	PADF Cap Haitien Region #3, Site 3 (Dondon)
June 17-22	Write up of PADF Cape Haitien Site Visits
June 23	Travel to CARE Northwest Region
June 24,25,26	CARE, Northwest Region, La Fond, Site 1
June 27,28,29	CARE, Northwest Region, Passe Catabois, Site 2
July 1,2,3	CARE, Northwest Region, Barbe Pagnole, Site 3
July 4-10	Break/ Some write-up of Northwest Region
July 11-17	Write-up of CARE Northwest Region Site Visits
July 19, 20, 21	PADF Jacmel Region #1, Site 2
July 22, 23, 24	PADF Jacmel Zone #1, Site 3
July 25-31	Write-up of Region #1
Aug.2,3,4	PADF Mirebelais Region #3, Site 1
Aug.5,6,7	PADF Mirebelais Region #3, Site 2
Aug.9,10	PADF Mirebelais Region #3, Site 3
Aug. 11-16	Write-up of Region #3 Site Visits
Aug. 17	To Les Cayes
Aug. 18,19,20	PADF Les Cayes Region #4, Site 1
Aug. 21,23,24	PADF Les Cayes Region #4, Site 2
Aug. 25,26	PADF Les Cayes Region #4, Site 3
Aug. 27	AID Debriefing (Will provide copies of first 4 draft reports and Questionnaire Format Document used in field as survey instrument)
Aug. 28	Swanson Departure
Aug. 30-Sept.10[1]	Final Write-up of Les Cayes Zone #4 Site Visits & Submission of all 5 Reports to SECID Washington for Reproduction and Sending to USAID/SECID Haiti

An interdisciplinary expatriate and Haitian team was formed to implement the exploratory surveys. These were:

Dr. Richard Swanson, SECID Survey Leader and Anthropologist (26/5 - 4/8)
Dr. George Condé, Agricultural Economist (1/6 - 23/6)
William Gustave, Animal Production (1/6 - 4/8)
Yves Jean, Agronomist (1/6 - 4/8)
Roosevelt Saint-Dic, Agricultural Economist (24/6 - 4/8)

Dr. Frank Brockman, SECID PLUS Team Leader and Agronomist and Dr. Zach Lea, SECID PLUS team Agricultural Economist both participated as their time permitted. The team was also assisted by Dr. Dennis Shannon, SECID PLUS team Auburn University project manager, for two days during the initial week in Palmiste Avin.

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[1] Six work days to be used during this period. Information faxed from Haiti from other team members by no later than September 2 for inclusion in final report for Les Cayes. Reports for other 4 Regions should have been completed in advanced draft stage before Swanson departure and left with SECID/Haiti.

0.3 Methodology

Much of the information sought through the exploratory surveys is qualitative in nature. This is clear by the objectives which speak of "better understanding farmer attitudes and beliefs", which will require an understanding of the principal production and marketing constraints of the areas identified. The PLUS project wishes to determine "what farmers want" from the project, and how some of these stated "needs" or "demands" can be met through project interventions. Attention will be directed at "focusing on a variety of land use interventions" which could potentially stimulate crop production in a sustainable, ecologically safe manner, while providing increased income potential for the concerned farmers.

0.3.1 PLUS Project Potential Interventions List

The initial list of PLUS interventions include:

(1) Hedge rows (vegetative barriers on contours). This includes leucaena, sugar cane, pineapple)
(2) Dead (plant material) barriers ("rempe paille")
(3) Rock Walls/Terraces
(4) Gully plugs (Rock and/or Vegetative)
(5) Bio-intensive Vegetable Gardens
(6) Improved Seed (Tamazulapa, sugar cane, corn)
(7) Seed Banks
(8) Individual Trees
(9) Local tree nurseries
(10) Deep Tillage
(11) Cover Crops (engrain vert)

Needs Assessment Team Additions:

(12) Gully Ditches (Deep) for Water Harvesting
(13) Contour Ditches (eg. Palmist Avin)
(14) Plantain in contour ditches or canals, or gully plugs (also bamboo, rice)

At each field site, both individual and groups of farmers were contacted by members of the team. Because of the large number of individuals (5-6) involved in this effort, it was necessary to split the group into two, and sometimes three groups, to permit better contact with farmers and wider contact within each site. We tried to avoid more than 4 people meeting with the farmer (one of whom would be PADF/CARE "extensionist/guide"). The PADF/CARE M/E person for the area would also join one of these groups. Farmer contact with the team was voluntary and an effort was made not to significantly disrupt on-going farmer activities. All questions were asked in a free-style conversational manner with farmers regarding the major information needs outlined below. It was important that answers be followed up (Why? When? Specifics?).

Field observations were particularly important. Considerable time was spent with farmers on their land, looking at crops, animals, etc. A list of topics and key questions was used to guide the survey team in the interviews, with notes usually taken in a personal notebook for later write-up in journal style on laptop PCs. Consideration of these notes formed the substance of this report.

0.3.2 Questionnaire Formats

Questionnaire forms of two kinds were prepared and a special document prepared with the types of questions asked and the tables used in the field for report preparation.

(1) General guideline questions, with leading questions expected to direct conversations in the directions needed. Team members kept their own notes on the responses to the information obtained. Leading questions led to further questions, as greater detail was sought on specific issues. Here, the inter-disciplinary nature of the team was important to provide a more complete technical understanding of the information obtained.

(2) Prepared Questionnaire/Table Formats. Here, specific information on specific cropping patterns, prices/yields, land & livestock management were prepared and were filled out for several farmers and fields in each area. Purpose: to provide more specific objective data to complement the more qualitative information obtained in the other question formats.

0.3.3 Persons/Groups Interviewed

Within each of the three sub-watersheds of each Zone, the team met with at least:

(1) 10-15 individual farmers for discussions and viewing household fields with farmer (husband - and wife, where appropriate). Half were to be progressive farmers/innovators, half representing "typical" farmer (chosen by PADF/CARE). The main requirement was their willingness to speak to us, and their ability to express themselves, and having fields on the hillsides of the M/E evaluation sub-watershed.

(2) 2 group meetings (should represent a good cross-section of the farmers in the area) in each micro-watershed. In some cases, a "group meeting" would evolve during one or other of the individual farmer interviews, as passing farmers would join us under a tree or observing some field.

(3) as many other individual farmers, on their fields, as possible, who have had past experience with soil conservation interventions. It was our intent to visit these sites (even if not within the specific site of the monitoring/evaluation efforts). In some cases, we met such farmers on the way to or from fields of other farmers.

PADF and CARE had both selected 3 micro-watersheds, with area of about 2 km^2, within a total of 5 zones of Haiti (4 for PADF, 1 for CARE) for M/E purposes. The Farmer Needs Assessment team was given 3 days for each micro-watershed. When possible, the first two days were spent on the watershed with farmers, and the third day used for team/project discussion and initial write-up of field notes into a more legible form.

At each field site, the team initially met with pre-selected (by PADF/CARE) individual farmers. These farmers were selected, as much as possible, on the basis of their being considered to be progressive farmers in the site area, farmers who are innovators, farmers who are considered good role models, and project cooperating farmers. When meeting with these farmers, other farmers were sometimes present. This did not pose a problem, but the focus of these early interviews was to obtain insight into a specific farmer household's farming system. If this could be initially held at the farmer's residence, this was considered preferable - to permit the team to observe the "material" well-being of the farmer, in relationship to others in the area, and to also permit some discussion with female members of the household as well. We then would ask this farmer to take us to one or more of his/her fields in the site area for direct observation and further questioning (and filling out information sheets). In some cases, it proved more convenient to conduct individual farmer interviews at the field locations, asking questions and taking measurements there. On the way to such fields, we would often stop and discuss other fields/plots, even calling over the farmer of the field if available. The on-field observations and questioning often took more than 2 hours.

During the first day or two, while working with the first individual farmers, arrangements were made to meet with at least two small groups of farmers in the area during the coming days. Rather than the entire team organizing a meeting with one large group for a "meeting", it is important that it be understood that the meetings would be informal and small (4-5 farmers). One such group meeting would be held by each of the two field teams at each site. These meetings would not last longer than 1 hour, and usually led to contacts for further individual, more intensive interviews on field locations.

If farmers in the area of the field site were found to have had experience with past program interventions (similar to those listed above), or if farmers have on their own practiced any

interventions of this nature, these individuals were identified early on in the site visit. Plans made to visit with them in the fields concerned to develop information about past experiences, what has worked and why, and what has not worked and why. An attempt was made to quantify positive gains to production and income as a result of these interventions.

0.3.4 Survey Team Information Sharing

Team information sharing took place in several ways. The drive to and from the sites were always well used in sometimes lively discussion. At the end of each day, a short session (up to an hour) was held at the location where the survey team would be spending the night. During this time, we would discuss the days activities, significant issues about which we had learned, modifications which might be needed in the program or question formats for subsequent visits. This could also take place around the dinner table. Each team member was expected to try to keep a daily journal, written every evening on a laptop provided for this purpose, on significant things learned, and organizing information obtained in that day's field notes. To the extent possible, each team members also began writing sections for the draft report in an on-going fashion, so that when the ten days reserved for each survey region were over, portions of the report would already be in preparation for the initial draft. Because of the long and hot days spent in the field (10-12 hours), however, team members were too exhausted to do much in the late evening. It is for this reason that we early on attempted to reserve the third day (of each watershed) for better write-up of field notes on our laptops (which could be printed out and passed around for comments). This material was then more useful during the final week in preparing the initial draft of the final report. Team members were expected to review each other's draft reports during this time to provide additional insights and comments. By the end of the week following the survey at each field site, a rough draft of the report for each zone was completed.

1.0 General Description of Micro-Watersheds in Cap Haitien Region

TABLE 1: COMPARATIVE INDICATORS BY WATERSHED

ITEM \ AREA	BEDORET	CASTAGNE	LEBLANC
Department Arrondissement Commune Section Communale	Nord Plaisance Plaisance La Trouble	Nord La Grande-Riviere du Nord La Grande-Riviere du Nord La Grande-Riviere du Nord	Nord La Grand Riviere du Nord Dondon Bassin Caiman
Persons/Household	5	6 - 7	5 - 6
Elevation (meters)	300-500 m	200 - 700	450 - 800
Rainfall (X) (mm)	2000	1400	2000 - 2800
Soil Characteristics Erosion Depth	Red, high clay content, fertile Fersialitique calcaire tendre Medium to high ?	Brown/Grey Sandy Very High ?	Black Vertisols Fertile Low to high 1 m (20-80)
Cultivated Slopes	25% - 75%	40% - 60%	20% - 70%
Land tenure[2]	owners 71% rented 13% sharecrop 16%	owners 86% rented 9% sharecrop 5%	owners 83% rented 9% sharecrop 8%
Land value (.32 ha, 1/4 cx)[3]	40-50,000 gdes.	3850 gdes	1875-2500 gdes
Land rent (.32 ha, 1/4 cx)	500 gdes./year[4]	NA	NA
Pressure on Hillside Land	Low, extensive, long fallows	Low, extensive	Low, extensive
Daily Labor Rate[5]	4 - 4.5 gdes	5 gdes	5 gdes
Important Infrastructure in Area	Paved Cape Haitien-PAP road	Hospital Primary school Cocoa cooperative	Near Dondon 3 Coffee cooperatives
Key Sources of Income	Yams, Beans, Plantain	Pigs,Cocoa,Peanuts,Beans	Pigs, Coffee,Beans, Plantain
Key Consumption	Beans & Tubers	Beans & Tubers	Beans & Tubers
Key Animal	High pot. for pig	Pig	Pig
Handy craft	basket	castor oil chocolate	basket

[2] These data come from PADF 1993, #1 (purchased and inherited land combined). Statistically valid data from the Department du Nord, which includes these three sites (ADS-II, 1988) give the following: land directly owned: 68%; sharecropped: 6%; rented: 7%; undivided inheritance: 13%; other: 6%.

[3] Land value/rent was asked for 1/4 carreaux of land. Rarely were land units of larger size rented, though land units purchased were. One carreaux of land = 2.29 ha.

[4] A good field, having been in fallow for past 3 years.

[5] For 5-6 hours a day. Sometimes food is provided as incentive to acquire the labor.

1.1 Bedoret/Plaisance Area

Bedoret is located just off the paved road some 40 kilometers from Cap Haitien, near one of the high mountain passes on the road to Port-au-Prince. The watershed selected by PADF in January 1993 (work began in April), is off to the north-east of the road, below and above the homesteads which are scattered along the road. As is usually the case in Haiti, homes are surrounded by fairly dense vegetation, made up mostly of various tree crops (avocado, citrus, mango, plantain and banana, yams, coffee, breadfruit). Most of the watershed has a southern exposure. To the right (south, south-west) of the road, the mountain rises to great heights, and many of the residents working within this watershed area also have fields in this area as well. Table 1 above gives some of the major attributes of this watershed as compared to the other two visited (cf. Appendix 3 for photographic overview of sites visited).

According to Moreau de St Mery (1797:631), a French writer and historian, La Trouble, a south eastern canton of Plaisance parish during colonial times was described as having clay in the lower lands, with stagnant water, cracked earth during droughts, while, in the highlands surrounding it, water, soil, temperature joined together to give an area auspicious to vegetables and coffee. St. Mery added that alternate periods of high humidity and drought were unhealthy for inhabitants. Even today, residents speak of the major climatic/seasonal changes producing "bad seasons".

There appear to be about 50 homesteads located within the watershed area, though people actually exploiting the land of this micro-watershed come from not only the local residents, but from elsewhere as well. Members of these households also work land in many different watersheds in the region around Bedoret. A number of the members of the local community move seasonally (July - September) to the rice producing area of the Artibonite valley (Ester, Pont Sondé) and to the Dominican Republic.

The lower parts of the micro-watershed are well wooded with fruit trees and other economically important trees. We noticed considerable charcoal creating activity within this wooded area as well. A small stream flows in the lower part of the watershed, from which the population obtains drinking water, washes its clothes, and irrigates a few small plots of terraced rice.

The cropping system includes a great deal of intercropping. Soil erosion problems are most certainly one reason that farmers say they have been experiencing declining yields in recent years. A number of the fields visited had benefitted from trees provided through the AgroForestry II project, though no hedge rows had been created. Many of these trees had already been harvested (18 inch cassia) and had secondary branchings well on the way to becoming trees themselves. The massive FAO agro-forestry/soil conservation

project "just across the hill" in the Limbe area had benefitted a number of the men in this area who were employed for creating the contour canals and hedge rows put into that area. They had not brought home any of these ideas or experience.

Most farmers we met had permanent access to the lands they were cultivating (mostly through inheritance, some purchased), though many had some plots under a share-cropping arrangement (1/4 for land owner, 3/4 for farmer). Women and children also inherit land and may use the sharecropping system to obtain income/food from their land.

Rainfall is bimodal, with a fairly dry period from the end of November to early March, and another shorter period between June/July.

Most of the land was received by exploiting farmers through the system of land inheritance, though a number of farmers were interviewed who had purchased one or two plots. The fact that many of the fields fell within the "undivided inheritance" category does not seem to pose any particular problems.

1.2 Castagne/Grande Riviere Area

To reach this watershed, one must wade across the Grande Riviere (Castagne is reached by following the left tributary). The river actually defines the south/western side of the watershed, which can be clearly seen from the dirt road. It is located about 5 km. from the large town of Grande Riviere du Nord (formerly called Sainte Rose [St. Mery, 1977]), towards the east. The area looks like a row of 'bald' domes jutting out one from the other, with densely wooded gorges in-between. We split up into two groups (sometimes 3) during two days and were able to cover every part of the watershed. There are wooded areas in which the people live (between foot of mountains and river). We did not see any households located in the hills themselves. The ravines leading down from the mountains were generally heavily wooded (all economically important trees), and we walked up several of these, until the trees ran out, while going up into the higher areas where many fields were located.

The slopes of the defined watershed are orientated differently: the north east slope (first dome) faces the river and partially the west; the second dome slope faces south east; the third dome slope faces the east. At the top of the latter dome it looks like a circular stadium with an excellent panorama.

Young people from this area were said to migrate to Santo Domingo. According to the French historian, St. Mery, the Grande Riviere du Nord area was a very productive region for a wide range of food crops (cassava, plantain, vegetables), with beautiful

flowers.

PADF had already done some good work in creating gully plugs out of vegetative matter. Though only several months old, many of the main posts had taken root and were already sprouting branches.

This area is well favored in available land and a wide range of food and tree crops from which to obtain food. The head of a 765 member cacao cooperative lived in the area. He owned a relatively large amount of land (admitted to 7 cx), with more than a dozen pigs, and a great deal of land in productive trees (plantain, cocoa, bread fruit, mango, etc.). Our general impression was of an area having some very large land owners who chiefly exploited their rich lands between the mountain slopes and river (maybe 1/2 mile of fairly flat land). These large landowners also owned large portions in the mountains which they permitted other farmers (often relatives) to use in a share cropping arrangement. A major issue for PADF is the extent to which such farmers will be motivated to create the necessary structures for soil conservation and to maintain them. Even though several of those interviewed said they would create such structures, it remains to be seen if they will in fact do so. Land ownership and a willingness to undertake soil conservation measures are inter-related; this is particularly true for the more long term conservation measures needed (trees, contour ditches), which probably will not be done by people without clear titles to the land.

Of the 26 farmers with whom PADF had already assisted to build the modified "rempe paille[6]" structure, only one of these was not done on land owned by the farmer of that plot. In this case, the first field was done as a "training exercise", where the people were given a meal to help support the work.

The soils on the slopes have very little clay and are sandy/gravely in consistency. As a result, the shallow contour ditches created by the project will probably not last longer than the season, mainly because there is still too much soil and gravel washing down over these. Many of the ones seen had already filled up or been washed out. In some areas pineapple and sugar cane had been planted in the contour. We saw a few strips of leguminous bushes on some fields as well. In no farmer's field had an entire plot, top to bottom received complete modified contours, with either sugar cane, pineapple or a tree/bush crop planted. Farmers were given "several dozen" pineapple plants by the project (at no cost to farmer), as well as a pickup load of sugar cane (a variety which was not the one farmers would have preferred -"canne ananas". However the introduced variety was resistant to charbon.

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[6] These are strips of dead plant materials held in place by wooden pegs and covered with a small mound of dirt along the contour, which creates a very shallow ditch on the up-side of hill.

1.3 LeBlanc/Dondon Area

The watershed area selected by PADF for the M/E activity, as well as for this needs assessment, is located in the upper reaches of a large watershed system, about one hour drive from Cap Haitien. The last half hour is over a poor dirt road which follows the southern branching major tributary of the Grande Riviere up to the large town of Dondon. About 1 kilometer beyond Dondon, on the left side of the road, we were shown the outlines of the selected sub-watershed (basically the flanks of part of one large mountain dome, whose top was bare of trees, and with a southern exposure. The lower reaches of the mountain sides, however, and all the ravines, were heavily wooded with economically important tree species. The area had a look of prosperity. Homes were solidly built, with metal roofs. Once again, this was an area of many large land owners, as well as those who either rented or share-cropped their lands upper slopes.

This was the only watershed area visited in this Department that had significant numbers of large rocks on some hillsides and in the ravines, making the construction of truly permanent rock terraces possible. PADF has already made some important progress in this area and is taking maximum benefit of this possibility.

Like Castagne, many young people from this area migrate to Santo Domingo (as well as Cap Haitien and PAP). Most of the homesteads are located near the road, with few in the upper reaches of the hills/mountain. This was attributed to a problem in (personal) security during the last few years. Another important reason would be that, as most the areas in which people might live are owned by large land owners, people could not settle there without risk. Land ownership issues are complex and very volatile in this region.

2.0 General Description of the Farming System

2.1 Crops

Table 2 shows the most common cropping associations present in the three micro-watershed areas visited. It is rare to find fields with a short term cropping cycle of less than 12 months and with less than two or three crops.

TABLE 2: CROPPING ASSOCIATIONS & TIME LAND IS UNDER CROP COVER, WHERE FREQUENTLY FOUND

AREA	ASSOCIATIONS[7]	GROWING CYCLE Months	SLOPE[8]
BEDORET	Bean-Bitter Manioc-Sweet Potato-Pigeon Pea	12 - 24	medium, steep
	Corn-Pigeon Pea-Plantain-Yam-Taro-Rice	36+	level, gradual
	Corn-Bean-Bitter Manioc-Yam-Taro-Sugar Cane	36+	level, gradual, medium
CASTAGNE	Corn-Bean-Bitter Manioc-Pigeon Pea-Peanut	12 - 24	medium, steep
	Corn-Bitter Manioc-Pigeon Pea-Peanut	12 -24	medium, steep
	Corn-Bean-Bitter Manioc	12 - 24	medium, steep
	Corn-Bean-Sweet Manioc-Plantain-Pigeon Pea-Taro	36+	gorges
LEBLANC	Corn-Bean-Pigeon Pea	7 - 21	medium, steep
	Corn-Pigeon Pea	7 - 21	medium, steep
	Corn-Bean-Sweet Potato-Plantain-Yam-Sugarcane	36+	gorge & valley

To the extent that vegetative cover of hillside fields can be prolonged, it will be possible to improve soil protection on these slopes. A number of key crops (Table 2) contribute to long term coverage of this kind (pigeon pea, sugar cane, taro, plantain). Once the short term crops (corn, beans) are harvested from fields containing associations of these crops, farmers often leave fields unweeded, resulting in complete coverage of the soil and maximum soil protection. Farmers consider such fields as to be in a kind of fallow. While some fields are at this stage in the cropping cycle, the farmer must have other fields where he is starting this cycle all over again, beginning with the corn and beans.

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[7] The cropping systems practiced in these regions are very complex. The associations cited here represent some of the dominant crops. However within any particular field one might find any combination of the following crops: corn, beans (several varieties), bitter manioc, sweet manioc, plantain, pigeon pea, peanuts, yams (up to 5 varieties), taro, sugar cane (up to 4 varieties), rice, lima beans, banana, cowpeas (several varieties, sesame. Besides this, most fields had one or more of the following trees either within the field or along the borders: mango, avocado, orange, chadeque (grapefruit), corosol (soursop), breadfruit (arbre-a-pain, arbre veritable), cashew, calabash, oak, mahogany, cocoa, coconut palm, other wood species).

[8] We defined slope into four classes: (1) Level: 0-5%; (2) Gradual: 5-20%; (3) Medium: 20%-40%; and (4) Steep: 40% - 75%+.

Including these long term crops as principal elements of vegetative barriers, and leaving the intervening area for more continuous cropping of corn and beans (and sweet potatoes, yam) does represent a change in the current farming system. Including tree crops within these strips would also promote the long term shift of part of such fields to other productive uses.

Some detailed data were obtained from a number of the fields on crop spacing and arrangement and the ratio of seed planted to product harvested (see Appendix 1). Farmers in all three micro-watersheds in the Department du Nord complained about the unusual rains they have received during the past two years which were detrimental to crop growth and led to higher soil loss from erosion.

Table 3 below summarizes information on the principal crops cultivated by farmers in this region, with specific variety names, where these have come from, and why they are cultivated (other than for consumption).

TABLE 3: CROP VARIETIES AND PREFERENCES

AREA	CROPS	VARIETIES	ORIGIN	INTEREST
BEDORET	YAM	siguin	local	marketing
		guinin	local	marketing
		real	local	
		blanc	local	
		kaopagnol	local	rustic
	taro	_____	local	
	corn	3 months	local	
	bean	red and black	local	marketing
	sugar cane	ananas	local	marketing
	manioc	_____	local	
	rice	mila	local	
	sweet potato	_____	local	
	pigeon pea	_____	local	
	plantain	_____	local	marketing
CASTAGNE	yam			
	plantain	miske	local	
	taro	diamacou	local	well adapted
	cow pea	pwa neg	local	marketing
		pwa kouri	local	marketing
		pwa enkoni	local	marketing
		pwa malere	PADF/S.A[9]	
	peanut	2 1/2 months	Dominican rep	easier harvest[10]
		5 months	local	
				marketing
	corn	shada	ODN	
	sugar cane	roseau	local	early maturing
		mon blanc	PADF	insect resistance
		ananas	PADF	
	manioc			
		doux	local	
		bouke rat	local	
		MC 40	ODN	
		Ti limbe	local	
		fey vet	local	
		cabrit	local	
	pigeon pea		local	
	bean	red , black	local	

[9] Salagnac - Aquin.

[10] It can be harvested by pulling out as a clump, with peanuts attached.

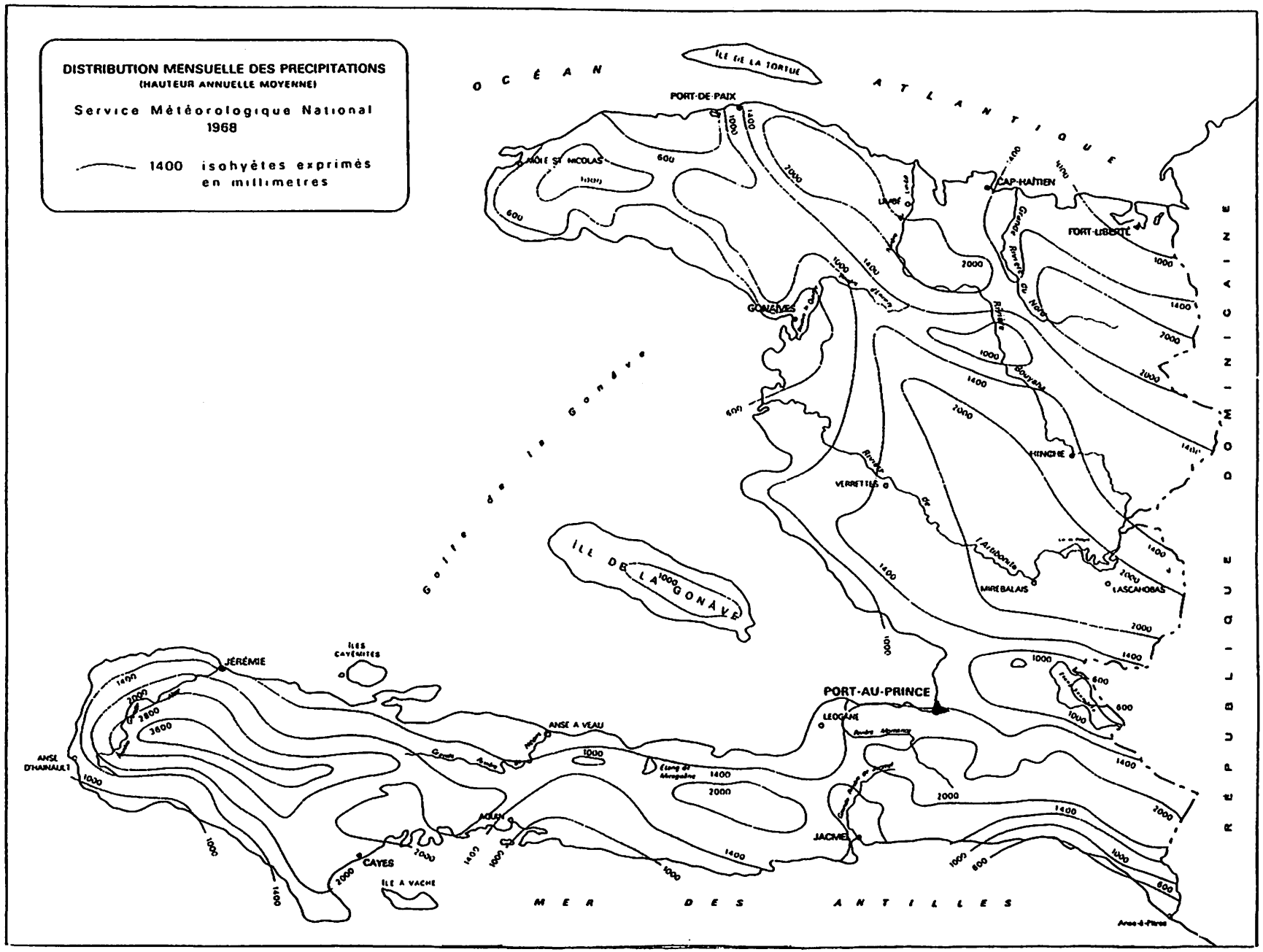
LEBLANC	yam	tet a neg	local	
		siguine	local	
		real	local	
	corn	panyol	Dominican rep	
	cow pea	pwa enkoni	local	
		pwa kouri	local	
		pwa neg	local	
	sugar cane	bwa pitimi	local	
		blanc	local	
		ananas	local	
		toro	local	
	pigeon pea	dizen	local	early maturing[11]
		mandalon	local	late maturing
	plantain			
		poban (Vincent)	local	best for slopes
		bougon	local	
		lougarou	local	market
		ti filo	local	
		jadinet	local	
		franc	local	market
		miske	local	market
	bean	melange	local	
		rouge	local	
		blanc	local	
		noir	local	
	sweet potato	———	local	

Peanuts are cultivated only in Castagne where soils are the most eroded, whereas, with the exception on cowpeas, manioc, and rice, all of the other crops are found in all three micro-watersheds.

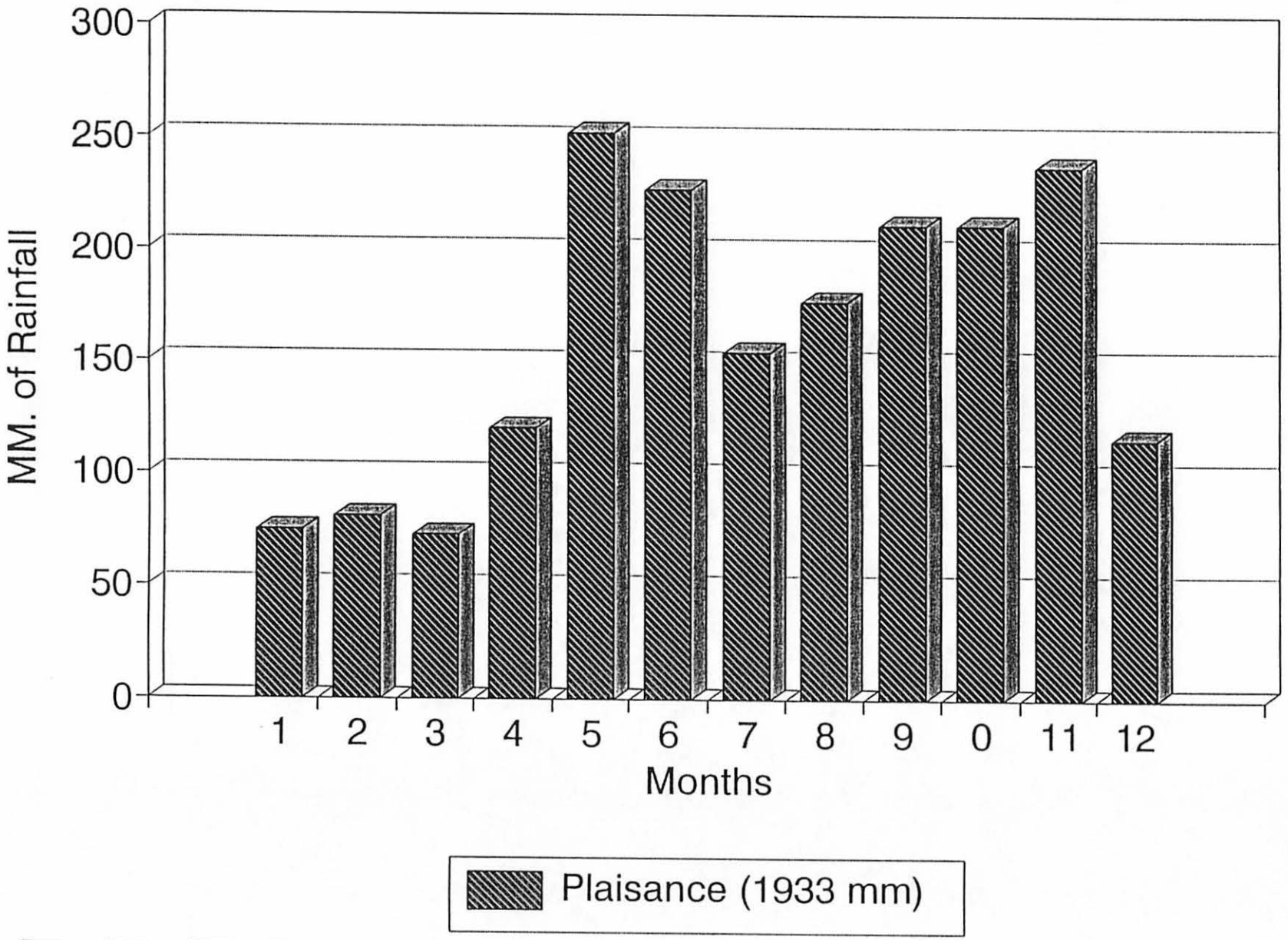
Crops which the farmers of these areas cultivate with the most interest vary within the watersheds. In Bedoret, this includes yams, beans, principally black beans which sell very quickly and well, and sugar cane. In Castagne, this includes peanuts, cowpeas and beans for the hillside crops and plantain in the gullies and lower areas of hills and valleys. In LeBlanc, plantain is the most important crop on hillside and valley fields.

Tables 4A, 4B, and 4C below provide information on cropping calendars. Planting periods range over a period of a couple months, as does harvesting. Rainfall data Figures 1-3 for this region are also provided here to compare with these cycles of planting and harvest. Though we were unable to locate rainfall data for the Dondon area, that of Plaisance should be considered more representative than Grande Riviere (Source: Haiti Meteorological Service, 1968 report).

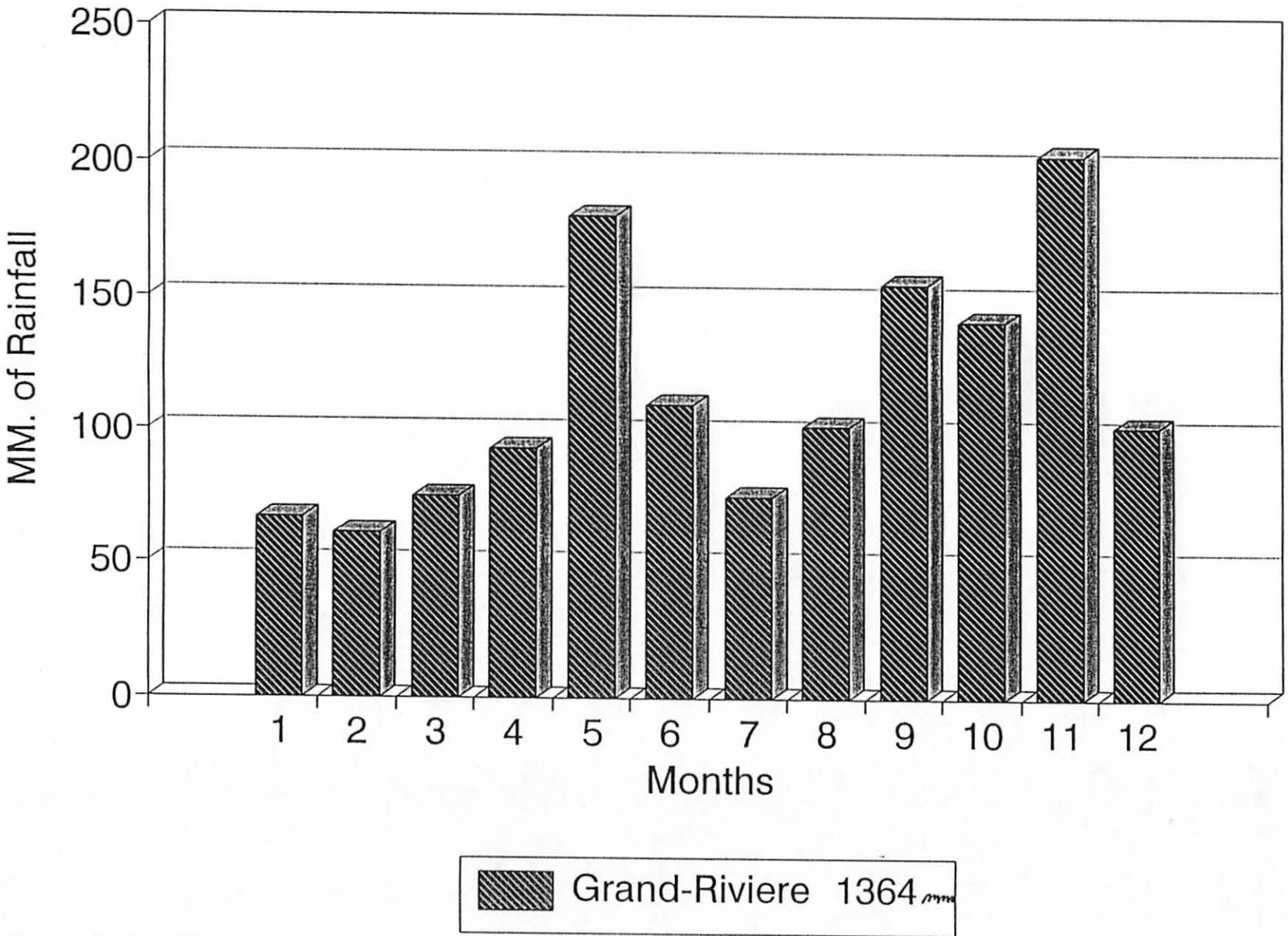
[11] Photo-sensitive.


DISTRIBUTION MENSUELLE DES PRECIPITATIONS
(HAUTEUR ANNUELLE MOYENNE)
Service Météorologique National
1968
1400 isohyètes exprimés en millimetres
OCÉAN ATLANTIQUE
ILE DE LA TORTUE
PORT-DE-PAIX
MOLE ST NICOLAS
CAP-HAITIEN
FORT-LIBERTE
GONAIVES
Golfe de la Gonâve
ILE DE LA GONAVE
HINCHE
VERRETTES
MIREBALAIS
LASCAHOBAS
JÉRÉMIE
ILES CAYEMITES
ANSE A VEAU
PORT-AU-PRINCE
LEOGANE
ANSE D'HAINAULT
JACMEL
CAYES
ILE A VACHE
MER DES ANTILLES
RÉPUBLIQUE DOMINICAINE

Plaisance


300
250
200
150
100
50
0
MM. of Rainfall
1
2
3
4
5
6
7
8
9
0
11
12
Months
Plaisance (1933 mm)

Grande-Riviere du Nord



Dondon

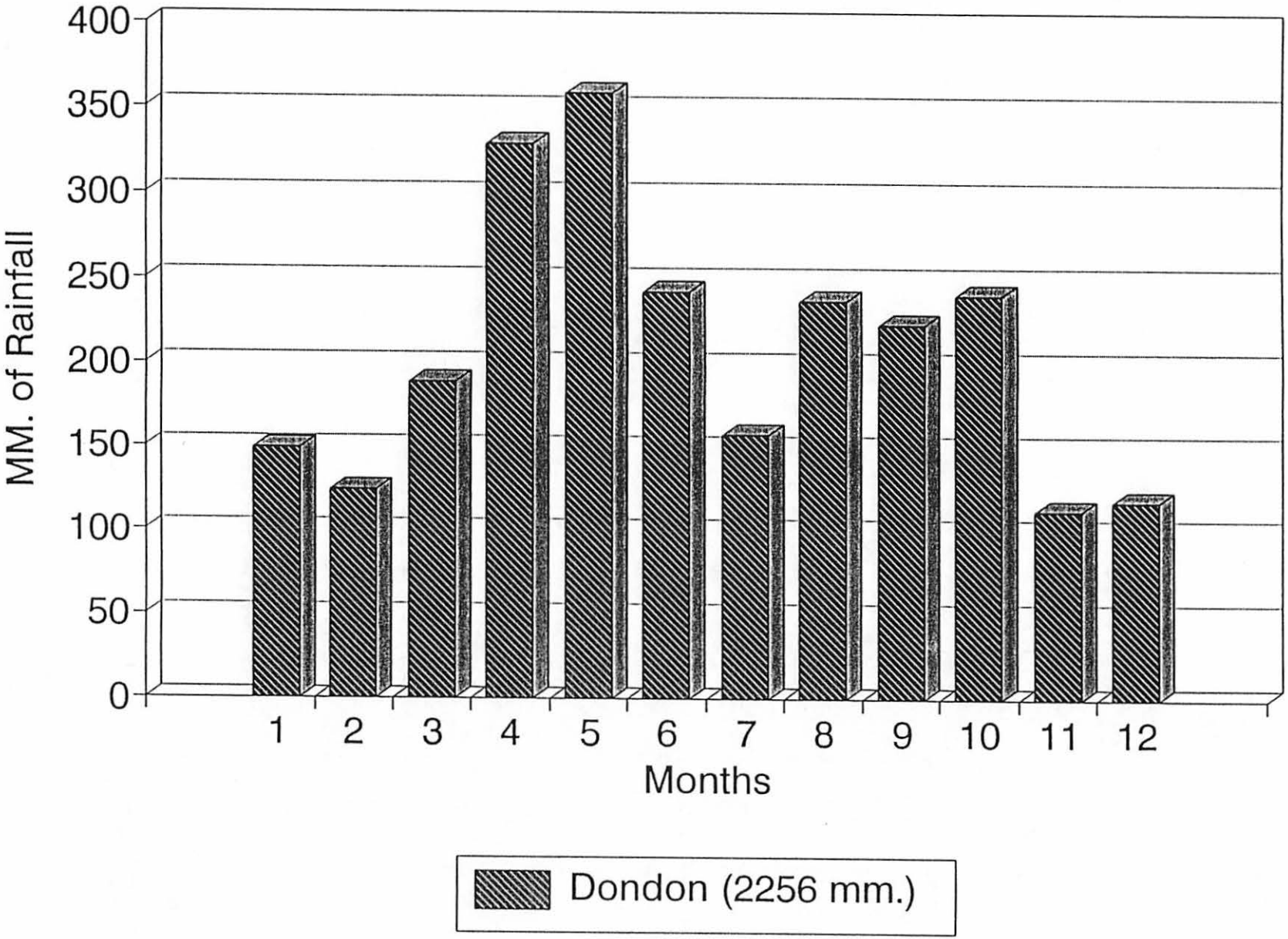

400
350
300
250
200
150
100
50
0
MM. of Rainfall
1
2
3
4
5
6
7
8
9
10
11
12
Months
Dondon (2256 mm.)

TABLE 4A: CROPPING CALENDAR BEDORET (PLAISANCE)

YEARS		1992	1993	1994
Crop \ Month		J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
corn	P	———	12	
	H	.... — ...		
bean	P	— — —		
	H	... — .. —	---	
pigeon pea	P	———		
	H	.	-----	
rice	P	—		
	H	...		
sweet potato	P	———		
	H	....		
taro	P	— —		
	H	.	-- ---	
manioc	P	———		
	H	-	----------	----------
yam	P	—		
	H	...		
sugar cane	P	— —		
	H		--- --	--- --

P = Planting period; H=Harvest period.

It is unusual, in this region, to find fields with less than two or three crops associated on the same field. A field where only one crop is present means that a number of other crops have already been harvested from this field, and that the field is nearing the end of a crop association cycle. Three principal crop association cycles were observed:

(1) Associations of short duration (less than 6 months) that do not include crops such as manioc, pigeon pea, plantain, or sugar cane. Rarely seen.
(2) Associations with medium growing cycles (12-24 months) that include pigeon pea, manioc.
(3) Associations with long growing cycles that include plantain, taro, or sugar cane (3-10 years).

[12] Depending on the particular crop association practiced by a farmer on any one specific field, crops planted and harvested in 1992 may or may not be planted again on the same field in 1993. This table only shows times of the year various crops are most likely to be planted and harvested.

TABLE 4B: CROPPING CALENDAR CASTAGNE (GRANDE RIVIERE)

YEARS	1992	1993	1994
Month / Crop	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
cow pea			
pwa neg P	———	———	
H	----	---	
pwa kouri P	——		
H	-----		
pwa enkoni P	——		
H	-----		
corn P	———	—	
H	-------	---	
pigeon pea P	———		
H	--	-----	
taro P	———		
H			--------
manioc P	———		
H		----------	----------
plantain P	———		
H		----- --	-----
sugar cane			
yam P	——		
H	---		

TABLE 4C: CROPPING CALENDAR LEBLANC (DONDON)

YEARS	1992	1993	1994
Month / Crop	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
cow pea P	———		
H	-----		
corn P	——— —		
H	-------		
pigeon pea P	———		
H		------	
Plantain P	———		
H		-------	-------[13]
sugar cane P	———		
H		-----	------[14]
yam P	———		
H	------	----	

[13] Other harvests in 1995 and later.

[14] Other harvests in 1995 and later

Different crops give different planting time possibilities. Crops such as sweet potato, taro, manioc, yam, sugar cane can be planted at various stages of the cropping calendar. Others, like pigeon pea are always planted at the beginning of the cropping calendar. Corn can be planted at two different periods and beans at three different periods of the year - though on <u>different fields</u>.

2.2 Crop Management and Soil Conservation

TABLE 5: PRESENCE OF SPECIFIC HILLSIDE CONSERVATION MEASURES, CROP PLACEMENT, PROJECT INTERVENTIONS

	BEDORET/PLAISANCE	CASTAGNE/GRANDE RIVIERE	LEBLANC/DONDON
Dead Vegetative Barriers (Traditional)	Common [15]	Common	Less common
Dead Vegetative Barriers (Modified - PADF)[16]	Initiated	Initiated	Initiated
Contour Ridging	yes (for manioc)	no	no
Contour canals	no	no	no
Mulching [17]	no	yes	no
Gully Plugs: Rock Vegetative:	no yes	no yes	yes yes
Rock Terraces	no	no	no
Hedge Rows on Contour	proposed, leucaena, sugar cane, pineapple	proposed	proposed
Gully Plugs: Trash[18]	no	yes	no
Fruit Tree crops, Plantain, Banana, etc.	Found around homesteads	Heavily wooded in gullies	Heavily wooded in gullies
Rice behind established terraces in Gullies	yes	no	no
Bio-Intensive Gardens	no (but recommended)	no	no

[15] Vegetative material for these barriers ("rempe paille" in Creole) are gathered from the field (sorghum,corn, pigeon pea stalks, pruned tree branches, etc.). Most comes from off the field. The farmer also searches in other areas of his (and sometimes other person's) land to prune trees and bushes, carrying the material to the field. These strips are fixed to earth by either dried or green stakes, the latter being preferred as they may take root. The farmer will cover the field with as much material as he can find, or has time to look for.

[16] These barriers are modified in that dirt is removed from up-hill side of barriers, covering the dead vegetative barrier, and thus creating a type of contour mound with a shallow ditch (several inches deep and 1 foot wide). PADF is encouraging planting of a number of plant material to create longer lasting contour protection (sugar cane, pineapple, leucaena, benzolive).

[17] One farmer observed doing this on his own fields, on his own initiative. He was spreading the residue of past seasons crops over the field.

[18] One farmer was observed, on his own initiative, taking sorghum/corn/pois congo stalks, grass, or other pruned material, and tying these into bundles, placing them at strategic places (between trees) in the gully crossing his field to reduce soil loss.

	BEDORET/PLAISANCE	CASTAGNE/GRANDE RIVIERE	LEBLANC/DONDON
Livestock and Conservation[19]	Pigs rare, greatly needed	Need more adaptable pigs like 'gascon chinois' and other rustic breeds. Have many pigs.	Many rustic pigs observed.

2.2.1 Soil Conservation Structures Observed

Erosion barriers are sometimes constructed by farmers on slopes as part of their traditional methods for protecting water/soil movement down their fields. These are constructed by driving stakes into the ground along the contour, placing branches/stalks against these, and as being suggested by the PADF project, covering all this with soil taken from the up-slope side, leaving a furrow. The ridge so constructed is 20 cm. above bottom of furrow on up-slope side and 40 cm high on down-slope side. Barriers are about 4-5 meters apart. PADF is recommending planting sugarcane on ridge at about 1 meter intervals.

On one 1/4 cx. field, 50 man-days (20 x 2.5 days) were required to construct the modified barriers recommended by PADF. Up until now, all these activities have been done through "training exercises" which have included provision of a meal at a cost of $3 per person ($150 for this field).[20]

A major issue on both the traditional and modified dead vegetative barriers is how long will these really remain effective? And how will they be maintained? Many of the shallow ditches on the uphill side were already filled up with dirt from earlier rains! Farmers noted to us that their traditional dead vegetative barriers were not as effective in holding water and soil as these modified structures. Another major issue will be whether or not the planted vegetative matter (sugar cane, eventually leucaena) will take hold on these ridges before they disappear.

Fields were observed which had been two years in sugar cane (widely spaced) and grass, part of the usual practice for "fallow" (cf. table 2). Next year, the farmer will clear all this off, and

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[19] Above all other domestic animals, the pig has always been the best suited for Haitian mountain agriculture systems, particularly in areas below 800 meters. It is kept in lower, cooler areas, within the wooded fruit tree stands around farmers homesteads. It reproduces quickly and thus can provide the best and quickest source of emergency income for families (taking some pressure off farmers for "quick crops" like peanuts as money sources). Vegetative material grown upon the contours of hillsides can be extremely important sources of feed for pigs (particularly during the "soudure" months, leucaena for protein, sugar cane for energy. More pigs could mean less goats and cattle (which can be very damaging to hillsides). More pigs can mean more demand for forage and the fruit tree products for their fattening - leading to higher rates of reforestation.

[20] Farmers will usually do this work themselves, without outside labor. Using the modified barriers, which involves digging and moving earth, the labor is more than doubled, and would probably require the farmer hiring labor. We would question whether or not farmers would be willing to pay such added costs.

restart the cycle with corn and beans - followed by other associations culminating once again in the sugar cane or pigeon pea crops.

A field with 70% slope contained cassava and sweet potato planted on crude mounds. One "rempe paille" barrier, about halfway down the 30 meter slope had been made. Serious erosion was evident. Contour ridging, as practiced in Jacmel's Palmiste Avin area would be a major improvement.

We visited the pasture land of one farmer. He had planted cassia and eucalyptus (AgroForestry II) scattered over the area. After 9 years the cassia had been cut. Stumps were 18 cm. in diameter and were coppicing. Farmer says he is going to thin out coppice regrowth to one or two stems. He had used the timber to repair house and had agreement to sell rest. There was also evidence of outsiders coming into this field and cutting down some of the coppice growth for unknown purposes (creation of "rempe paille?). The farmer was not happy about this and said people did not respect each other's land. Another farmer nearby had planted over 300 trees into an open exposed part of the upper watershed, with very short grass cover. All were destroyed by other people's animals staked out on this "pasture". This farmer was not happy either about this.

From what farmers are doing on the fields of their slopes, it is very evident that the problem caused by uncontrolled water flowing over their fields is well understood and they are trying to do something about it. In Dondon one could see plantain becoming important on the contours of the slopes, as well as mango and other fruit tree. In Castagne, because of the sandy, gravelly soils, more drastic measures need to be taken to reduce soil loss, and increase lost soil fertility, through such measures as creating contour ditches (which could produce plantain and sugar cane, pineapple)[21]. In Bedoret, one would suggest introducing contour ridging over entire surface of field (as done in Palmiste Avin), and the establishment of vegetative barriers at appropriate intervals, into which plantain, taro, sugar cane and pineapple could be planted (cf. on-farm trial theme).

[21] Though the cost of establishing such structures may not make this possible without outside help. The alternative is to establish vegetative barriers with sugarcane, plantain which will eventually begin to hold dried vegetative material like a "rempe paille", eventually holding soil over a period of time.

2.2.2 What Drives the Project?

The PADF project in this region is under conflicting pressures. On the one hand it has done a good job to try to identify needs of farmers and, within the means it has available, to try to help farmers through the groups it works with. On the other hand, the project is fairly top down in directives because field staff are driven by target indicators of project "success" or progress. The more detrimental of these is certainly the need to report a certain number of "linear meters" of conservation structures created each month, of rock terraces, shallow contour canals, vegetative barriers, etc. These numbers are driving the project more than the more realistic need to identify procedures which might have long term impact and sustainability in the project areas.

For example, the project will report the number of meters of modified grass strips created during the month. Yet it is clear that many, if not most of these will not last the agricultural season, even if vegetative support is planted into them (like leucaena, sugar cane, pineapple). This is because in many cases such structures may only be on part of the field, so that the upper part will wash out what is below. In other cases, like Grande Riviere, where the soils are very loose and sandy, only a few rains will wash away the dirt put on top of the modified "rempe paille", with the "rempe paille" itself rotting down and washing down during the year.

Of more concern, perhaps, is the fact that much of the work done so far in this area to date has been achieved through "training extension" activity in which people are trained in soil conservation and other project activities. When this stops, the project must depend on the extensionists to encourage farmers to do this without assistance of any kind other than "technical guidance" and some vegetative material (sugar cane, pineapple, seeds, etc.). The numbers "achieved" towards the project indicators will probably drop considerably.

Some of the ravine plugs are impressive for the soil they have retained. In fact, several observed had filled up (3-4 feet!) in only 3 months, and now were not helping anything because everything washes over them (and this might even undercut the original structure). Or the spaces between the upright posts (many taking root) will open up as smaller branches rot out and soil will again be lost. Therefore counting these as "done" is misleading. The project may very well be in the position of counting these all over again next year.

Sugar cane and the modified "rempe paille" idea are well worth pursuing, but there is a need for a more research/demonstration

approach - not one where PADF is essentially extending a system without ever having tested to see if it works or not in this area. The current approach is very piece meal - contact the most farmers as possible, give the most farmers as much vegetative material as possible, because the "evaluators" need this to show progress in achieving the "indicators of project success". These indicators may need to be defined more realistically. Some suggestions are provided in the section on recommendations.

There is a clear issue with the approach surrounding the "training exercises" in which farmers or extensionists are provided 2-3 days or more of meals for work done. The location of the work done by squads of people can be anywhere, some doing gully plugs, some doing rock terraces, some doing modified rock terraces, some planting sugar cane, etc. Such work is often done on land in which the owner/exploiter is not even present during the work activity. This is a "training exercise". One farmer told us he didn't think people would be "willing" to do such work on their own fields without "project help" (ie. providing free meals) like that given during the training exercises. Farmers have heard of other projects in the area where food is given for such work too, and farmers will expect this of PADF - even though the extensionists feel optimistic that they can motivate farmers even without such help. This remains to be seen. We suspect that as the "training phase" ends in these areas, PADF field staff will find it very difficult to meet their projections of "number of____" to do.

2.2.3 Where Have Soil Conservation Techniques Worked in Haiti?

A study should be made in Haiti of areas which have managed to sustain production and to change farming systems because of some innovation that farmers were able to adopt. This would be particularly useful at this time since so many projects have shut down because of the embargo. An opportunity exists to visit sites without the "confusing noise" of project interests to mislead us. One PADF agronomist, for instance, said that he knew that vegetative barriers worked with small farmers. But when questioned further, it turned out that he had worked on a project where this was working with farmers. He did not know if, <u>after</u> the project left, the farmers continued to do the same thing. This is the key question which we find troubling. To the extent possible, the farmer needs assessment team will try to address this question.

2.3 Crop Marketing

Table 6 illustrates well one of the very serious constraints faced by Haitian farmers - the wide seasonal fluctuations in prices received for their products in the market place. Unfortunately for farmers, their need for cash forces them to sell much of their produce at the low end of the price range - and to frequently buy back seed for planting at the high range. Because farmers make every effort to sell surplus to "save" in the form of animals bought, this table should be compared with Table 8 for conversion rates (eg. at time of harvest, 5 marmites of beans will purchase one 3 month old pig - worth as much as 60 marmites a year later, 12 marmites of beans will purchase 1 adult goat, etc.)

TABLE 6: RANGE OF CROP PRICES (Gourdes)

	BEDORET		CASTAGNE		LEBLANC	
	low	high	low	high	low	high
Corn marmite	3	7	7	8	7	7.80
beans marmite	20	30	25	35	14	18
yam sack	60	70		160	20	25
manioc basket			15 panier	20	40 cuvette	50
pigeon pea panier/marmite					10	15
plantain regime	10	25	35	40	10	12
taro basket	12	15	15	20	10	12
patate sack					20	45
peanut marmite			12	18		
breadfruit marmite	2.20	3	2.30	3.25		
cowpea marmite			8	10		
cashew marmite			10	15		
coffee bidon/lb	20	22			14	15
cocoa lb			1.40			
mangoes basket	20	25				
citrus sack	4	8			8 caisse	15
sweet manioc basket			15	20		

When asked about the proportion of crops used for household consumption or sale (and other purposes, like next year's seed needs), farmers generally will say that they sell "a little of everything", and consume most of everything else. When pressed however to clarify, certain crops do represent a higher percentage of household income from sales than other crops and certain crops are far more important for basic household consumption than others (cf. Table 1). Table 7 provides some information about perceived levels of consumption and sale of the major crops produced in the region.

TABLE 7: LEVEL OF CONSUMPTION AND SALE BY WATERSHED (%)

	BEDORET		CASTAGNE		LEBLANC	
	cons.	sale	cons.	sale	cons.	sale
corn	75	25	50	50	60	40
beans	80	20	25	75	50	50
cassava		100	100			100
pigeon pea					50	50
yams	25	75	70	30	50	50
plantain	70	30	40	60	40	60
citrus	30	70	25	75	40	60
breadfruit			50	50	40	60
mangoes	70	30	85	15	30	70
peanut			5	95		
sweet cassava	100		90	10	100	

2.4 LIVESTOCK PRODUCTION IN THE NORTH DEPARTMENT OF HAITI

Table 8 below summarizes information on livestock production and compares them between the three zones visited. Discussion of some of these data follow in text below.

TABLE 8: LIVESTOCK PRODUCTION DATA

	PLAISANCE	GRANDE RIVIERE DU NORD	DONDON
animals	cattle, goat	cattle, goat, pig	cattle, goat, pig
feed cattle goat pig	zeb a koss, fallow fallow, fruit tree leaves	zeb guinee, fallow fallow, fruit tree leaves fruit, corn, cassava	zeb a koss, fallow idem fruit, corn, sugar cane
season of low availability cattle goat pig	March, June	 Feb, March, April	 Feb, March, April
health & care pig		abortion	fever for piglets
period between farrowing cattle goat pig	over 16 months 1 year	over 16 months 1 year 8 to 9 months	over 16 months 1 year 6 to 9 months
separation age cattle goat pig	7 to 10 months over 4 months	7 months over 4 months 2 to 3 months	7 to 10 months over 4 months 1 1/2 to 3 months
starting to milk a cow (22)	2 at 4 months	2 at 3 months	1 1/2 at 3 months
milk production	2 to 4 l/day	3 to 4 l/day	4 l/day
size of litter goat pig	1 to 2	1 to 2 6 to 10	1 to 2 4 to 10
marketing cattle goat pig piglet(3mo) milk breeding pig	1000 - 2000 gdes 300 - 400 gdes 2,5 gdes/0,75l	1000 - 2000 gdes 400 gdes 1500 - 4000 gdes 175 - 250 gdes 2,5 gdes/0,75l 15 - 25 gdes	2000 - 3000 gdes 300 gdes 1500 - 2250 gdes 175 - 250 gdes 2,5 gdes/0,75 l 15 - 25 gdes

22 Lactation ended with separation from mother.

2.4.1 Types of animals owned, nature and reasons for ownership

Farmers in all three micro-watersheds visited owned animals. These included cattle, goats, horses, donkeys, pigs, chickens, some turkeys and ducks. Cattle and goat were present in all three sites. However in Bedoret, only one farmer was observed with one pig. The majority of farmers at Bedoret have not yet had the opportunity to obtain pigs. In many cases this is because they believe they can not afford to keep them - if they have to purchase feed for them. Yet it is the animal most desired. At Grande Riviere, many farmers had black, rustic type pigs. The majority were concentrated within the lower and more level terrain between the river and mountain, where many farmers have fruit trees and more opportunities to buy corn and sorghum bran than do the farmers who cultivate in higher areas. At Dondon, many farmers have pigs. Young farmers prefer to buy pigs than cattle, or even the seed needed for planting one of their most important crops, beans[23]. They have the opportunities to buy rustic pigs at EMAD (Ecole Moyenne d'Agriculture de Dondon), where a pig nursery is available.

The "gardiennage" (share-ownership) system is widely practiced in all three micro-watershed areas and is an important form of spreading the ownership of pigs (and other animals) among those who may not have the money to actually purchase them. The owner gives his animal to another farmer who may have some land where he can keep it and produce with which to feed it. They share the newborns. The first born animal, in case of a large animal like a cow, goes to the owner of the animal, the next to the person watching over the animal, and so on. Or with a pig, a choice of the best of each group of young produced.

This is an excellent way for the owner to keep his animal at low expense and the animal keeper to have a means of obtaining an animal without major initial cash investment. Such animals have great importance in the farming system, transportation (horse, mule, donkey), market (goat, cow, pig, chicken), consumption (milk, eggs, meat), and represent the most common way for small farmers to save money because bank credit is non-existent. When they need money for an exceptional occasion, the farmer can sell an animal. To buy land, a farmer may sell a cow or an adult pig (currently of equal value). Sale of a young pig can be an important source of money for school expenses, medical emergencies, purchasing seeds and labor, etc.

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[23] One farmer we interviewed indicated how the cost of a three month old pig at this time equals the cost of the 5 marmites of beans he needs to plant his field with on the hillside slope of one of his fields. He made it very clear that given the money, and the choice between the two options, the pig would be purchased. He said he could lose all his beans (rot or washout). With pigs the potential was greater for profit.

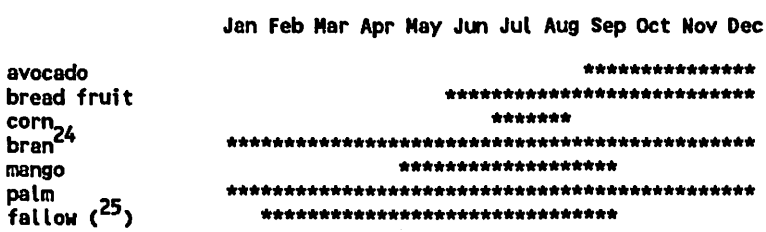
2.4.2 Feed and seasonal availability

For cattle and goats, farmers don't buy feed, they use only what they have on their fields or what they can pick up in their neighbor's fields. Cattle are always kept in the field during the day. The animal keeper changes the location of the animal once or twice a day. Farmers usually tie or stake out an adult goat in some pasture area, leaving the young untied (they stay with their mothers). Goats are usually kept out of cultivated areas. The goats are brought back to the house by the farmer at night and there receive tree leaves as a feed complement. Cattle and goats eat what they find on the fallows and can be very destructive to any conservation structures and vegetative barriers put into such fields.

At Plaisance, Grande Riviere and Dondon, farmers keep an area with grasses for their animals and use grasses when the dry season arrives. They cultivated "Zeb a Kos" at Plaisance, and Dondon, Guinee grass (Panicum maximum) at Grande Riviere. At Plaisance and Grande Riviere, they use the grass reserve at the end of the dry season in March and at little dry season in June or July. At Dondon, the rainfall is higher and they have grass easily available during all the year. But sometimes in March or June at Dondon they can use their reserve when the rain is late.

At Grande Riviere and Dondon, the pigs stay at the farmer's home and receive fruits, corn, corn and sorghum bran, cassava, sweet potato. At Dondon, some farmers go with adult pigs to their fields where they're working during land clearing activities before a new corn/bean and other associated crop cycle and the pigs can find roots, bulbs, and grasses to eat.

TABLE 9: Feed and seasonal availability for pigs at Grande Riviere and Dondon



The fattening period for pigs is usually October to December during the avocado production period. After January, availability of fruit becomes a problem until the appearance of mangoes in March and the farmer often must purchase more bran than his own household

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[24] Mostly coming from household processing of corn, sorghum. But these can also be purchased from the market, including rice and wheat bran.

[25] Used at Dondon during the crop season.

can produce and use fallow, if available, to feed these pigs. This can also be supplemented by feeding the pigs other food crops, such as manioc (which brings little at the market but is important for household food), or taro, or sugar cane (if available) (cf. Table 4 for when available).

2.4.3 Health and care

The animals in the three areas are well adapted, the pigs are mixed races, nor are there important diseases in the region. For chickens, however, Newcastle disease can be a very serious problem between December to March, killing off most of the chickens in an area. Some diarrhea can occur in cattle and goats at the beginning of the wet season when the grass is too young, but the negative impact for the animal is low.

Ticks are present but the parasitism is under control because the animals are resistant. Sometimes the farmer puts insecticide on cattle when the number of ticks is too high. Deworming of pigs is sometimes practiced by some farmers, but this is not a common practice.

There is a high risk of mammitis due to the way cows are milked. Milking takes place in the open field and begins 2 to 3 months after the farrowing. Usually, goats don't receive drinking water and cattle are watered when it isn't raining. Pigs are led by cord once a day, often early afternoon, to a watering place where they may cool off and drink.

At Grande Riviere and Dondon, farmers can sometimes find the help of a veterinary technician.

2.4.4 Reproduction

Animals are bred by natural methods. Farmers recognize the signs when their female animals are ready to breed and (when they don't themselves own a male) will take them to a friend or neighbor who has a male and will stake it near the male for a day or two. Production of young for every category of animal is very low. For cattle the interval between two farrows is 16 months or more for the three areas. The goats present a seasonality in their reproduction. The ovulation period is usually in spring and the farrowing occur in summer. The goats have only one litter in a year. The interval between farrowing for a sow is 8 to 9 months at Grande Riviere and 6 to 9 months at Dondon. The lack of availability of feed is largely responsible of the long periods between farrowing for the female.

From a purely technical point of view, farmers in all three areas wait too long to separate the young from their mothers. For cows, it is 7 to 10 months. For goats, weaning is done naturally

by the mother and occurs beginning at 4 months. At Grande Riviere du Nord weaning of piglets from their mother occurs at 2 to 3 months and at Dondon at 1 1/2 to 3 months. Keeping animals with their mothers somewhat longer than usually recommended has the advantage, under Haitian farming circumstances, of allowing the newborn to receive good nutrition for a long time, thus maximizing its potential of survival. At the same time, however, the mother is weakened and the time until the next farrowing will be long.

Sows can have two litters in one year with 4 to 10 piglets. To breed a sow cost 15 gdes to 25 gdes in two areas, but the breeding is free for cattle and goat. The choice of the male depends on the proximity of the animal. Some problem of low prolificity for pigs can come from the male, due to in-breeding.

The importance of the pig in the small farmer economy became very clear on many different occasions. Certainly goats and cattle have a negative effect on the slopes in that they are often fed on these slopes, breaking down structures put in, eating up any grass hedges put in, pushing soil down the slopes, etc. On the other hand, the pig is an animal kept in the shade areas lower down. Farmers traditionally depended on the excess fruit of the area (mango, avocado, breadfruit, etc), which cannot be sold or even given away at certain times of the year, to feed and even fatten pigs for the market, particularly during the Aug-Dec. period. When farmers lost their pigs, they lost a major justification for the many excess fruit trees they had maintained for their pig populations. The pig was clearly the linchpin of the Haitian small farmer economy. They were small, hardy, reproduced quickly and often, ate almost anything. There is no doubt that its departure had an important role in the accelerated deforestation of the Haitian hillsides over the past decade. The pig was the most important source of funds for family emergencies. With its departure, farmers sought other ways to meet this need - resulting in more goats and cattle for example by some people. Others depended on charcoal for this money need, or greater reliance of a cash crop such as peanuts which is very destructive to the hillsides. Sale of farm produce of corn, beans, and plantain could not be depended on to meet such need, nor was it always available when needed.

Therefore, any attempt to improve the numbers of pigs in the hands of small farmers is certain to have an important impact on the hillsides. Because many farmers have lost the tree crops which would have fed these animals during certain periods of the year, they have become more dependent of "purchasing" feed. This has proved a problem and disincentive for many small farmers getting back into pig raising. On the other hand, this also presents an opportunity to help small farmers on the hillside raise some of the tree crops and forage necessary to get back into this economy. For instance leucaena is a very important source of protein for pigs and in some areas of the country has already become of great demand

for this purpose (as well as for other animals). PADF should perhaps consider the farming system as a whole, and tie the creation of vegetative barriers (sugar cane and leucaena, etc.) to pig production. This would certainly get farmers attention as it is what they want most to be able to do again. It is extremely important for them. With this can also come mango and other fruit trees placed upon these plots.

2.4.5 Production

In all three areas there is some production of milk for domestic consumption and limited sales. But the lactation time is very short. The animal keeper starts to milk a cow at 2 to 4 months after the birth of the calf at Plaisance and will stop when the calf reaches 7 to 10 months. At Grande Riviere and Dondon, the same procedure is followed, with milking lasting between 5 and 8 months. To milk a cow, the presence of the calf is needed and lactation stops with separation from the mother. The quantity of milk that the farmer will take from a cow varies from 2 to 4 liters a day. The quantity obtained from the cow increases with the age of the calf. In the 'gardiennage' system, when a farmer is taking care of a cow for someone else (the owner), there is sometimes conflict between the owner and farmer about whether or not the calf is receiving enough milk (farmer is taking for personal use). In reality, milking of the cow can begin at the birth of the calf and stop at 10 months or more. It is possible to know experimentally what quantity of milk the farmer can take from a rustic cow without detrimentally affecting the calf.

Usually goat milk is used exclusively for the newborn. Between 1 and 2 kids are born each year to each female in all three areas. Such production is low, as a female can have two sets of 2 kids a year.

Between 6 to 10 piglets are born to each sow at Grande Riviere and 4 to 10 at Dondon. The period of time between the birth of one set of piglets and the next is 8 to 9 months at Grande Riviere and 6 to 9 months at Dondon. This interval is long. This is because the farmer forces separation between 2 or 3 months after birth (rather than 6 weeks). The farmer may often wait two months before breeding the sow again. This unproductive time is due to the long period of lactation of the sow and the poor nutrients available to the sow during alimentation. Unless better nutrition can be provided to the sow during this period of time, it will not be possible to separate the young any earlier - to do so would risk the loss of the yet poorly developed piglets.

The fattening of a castrated pig begins at 1 year of age at Grande Riviere and Dondon, preferably during the production period of avocado (October - December).

2.4.6 Markets and consumption

Milk is sold in the area of Plaisance, while part of the production is reserved for family consumption. Because the M/E sites visited are near the towns of Grande Riviere and Dondon, it is easy to sell fresh milk. In the 'gardiennage' system, the owner of a cow will usually allow the farmer keeping the cow to use milk production in excess of the calf's needs. There is not enough milk production to allow for such transformations as cheese production.

Table 10 below presents the range of prices currently received for different animals or animal products.

Table 10: Prices for Animal or Animal Products

Animal/Product Price in Gourdes	PLAISANCE		GRANDE RIVIERE DU NORD		DONDON	
	low	high	low	high	low	high
Cattle	1 000	2 000	1 000	2 000	2 000	3 000
Goat	300	400		400	300	
Pig			1 500	4 000	1 500	2 250
Piglet			175	250	175	250
Milk 0.75 liter	2.5		2.5		2.5	

2.4.7 Animal/soil conservation interaction

Pigs are almost always kept tied under a tree near the farmer's homestead, and fed from forage material and excess fruit gathered by the farmer for this purpose. Pig manures and rootings in these household garden areas are important for the fertility of these soils.

In all three watershed areas visited, cattle and goats are tied to stakes in fallow fields. Usually goats and their kids are tied outside of area cultivated. At Plaisance and Dondon, free pasture is permitted on the fallow fields of neighbors; however at Grande Riviere the landowner do not allow neighbors use of their fallow fields. Such free pasturing, leading to over-grazing, has a bad effect on the soils of such fields, often leading to erosion problems. Such pasturing also discourages farmers from growing special forage materials (grasses, leucaena, etc.) on fields which will be in fallow in a year or two.

The presence of animals on a fallow field can improve the fertility of the soil from the manures dropped. However the actual value of these manures is limited because they are exposed to sun and rain before much benefit can accrue to the soil. In the case

of soil conservation structures (rock terraces, vegetative barriers), cattle, horses, donkeys and goats can cause very significant destruction to established structures. Farmers must be shown the need to reserve a place for the animals off their fallow fields and improve their method of cultivating forage grasses for cut-and-carry forage management.

2.5 The Land

Table 1 provided some basic information on land values within the three micro-watershed areas, as well as land costs for sale (rare), rent and share-cropping. Farmers did not like to talk about the value of their own land, but would offer opinions about the value of adjacent land.

Information gained about land use presented a basic contradiction. On one hand, available statistics and the farmers themselves will say that most of their exploited land is under their control. Yet, when on the hillsides, one finds that there are a great number of rented and share-cropped fields - and "undivided inheritance" land. Land mostly under a farmer's control may be either directly owned, or more frequently, land inherited from the family or land of the family which had not been "officially divided". Farmers, of course, prefer the first two classes of land. The latter kind of land (undivided inheritance), which is very extensive, causes considerable problems in that farmers do not have <u>complete</u> control of the land. Therefore they can't refuse a family member pasturing their animals on the land when not in use some year (even if farmer put in hedge rows). Since the extended family will use it in this way, the farmer is motivated to put his own animals directly on the field and at least gain a short term advantage. If he didn't, someone else would use it.

A number of families, particularly in the Castagne and LeBlanc areas, own one or more large sections of land. Much of this land is rented or share-cropped by poorer farmers, many of whom are related in one way or another to the actual land-holders. Much of this land is also located in the mountains and represents an important portion of the hillside agriculture of the area. Some of this land is actually former State land which was acquired in past years through rents or other agreements and which today pass as the property of these people.

2.6 Organization of Labor

Labor is a major constraint during peak labor periods. Farmers have all kinds of strategies whereby they seek to acquire the benefits of these to maximize their own benefits. How they do this varies a great deal, depending on whether the farmer is a large landowner (and "rich") or a poor farmer or young, often unmarried man just getting started, with little resources. We were

told about three different forms of labor organization which farmers use in the three micro-watersheds when major activities on the fields need to take place (as in field clearing and construction of "rempe paille" to prepare for planting). These are: the 'ramponeau' or 'escouade', the 'combite', and the 'job'.

2.6.1 The Ramponeau

A 'ramponeau' (sometimes also called "escouade") is made up of usually a small group of men with common interests who perform work together. For big jobs, it is more effective to work as a group than individually. Members of a 'ramponeau' are more likely to be the poor farmers of the region. Such farmers may not have money to purchase the bean seed they need for planting. Or they need help in clearing a field and preparing it for planting or for some other activities (eg. building a house). The actual number in such a group can vary from as few as 5 men to as many as 15 and more. The fee paid in such cases depends on the area. In BEDORET, the current fee is 4-4.5 gourdes/person per day (US$.33/person!). In CASTAGNE, the daily rate is 5 gourdes.

Five men may therefore, for example, get together to form a 'ramponeau'. In some cases, they may appoint a 'leader' who will seek to represent the group to a large landowner who needs labor for various field activities, from field clearing, planting, weeding, to harvest. The landowner will 'verbally contract' with the group, usually well before the time the labor is needed, for a certain number of days of work. Day one money will go to farmer 1 for his needs, day 2 to farmer #2 for his needs, etc. This money may be used by these farmers to buy their seed, put towards purchase of a pig, pay for a combite on his own land, etc. In Castagne, one 'ramponeau' team leader described this process. A need has come up to be sure that everyone does his fair share of the work. A rope measure is provided to measure out 36m^2 areas, each of which is assigned to an individual person. For each land unit completed, the individual earns for the group 2 gourdes, and recently "with the embargo", this has gone up to 4 gourdes. Every day, the total pay of that day is assigned to one of the members of the 'ramponeau'. In this specific case, the field owner/cultivator has to also provide a meal of rice and beans (no grog[26]). Though such feeding is not always the case, it is a good way to assure getting a 'ramponeau' these days when everyone is competing for the limited available labor force in the area. One farmer told us that for a 1/4 cx. piece of land he had to provide 3 marmites of rice (16 gourdes X 3= 48 gourdes), and 3 godets of beans (18 gourdes X 3 =54 gourdes) or a total of 102 gourdes.

In another form of the 'ramponeau', the group may each agree to have the use of the 5-Man-Labor-Group for 1 day (or 2 days)

[26] Alcoholic beverage

during the next 5 days (10 days). When your day(s) comes up, you can use it in any way you wish. Sometimes a "rich person" will become a member of a 'ramponeau' in order to have access to such labor (which he may have a hard time to get in any other manner). He benefits by the labor of the men on his fields, and when **he** is supposed to work on the other 4 days, he will **pay for the privilege** of not working. So he will give the 5 gourdes to each of the other men when he doesn't show up on their day. They may use this money to help pay for the food they give that day to the working group.

Some of the farmers we interviewed in Castagne and the Dondon area mentioned that there were aspects of the 'ramponeau' they didn't like - particularly the fact that the people coming would "help themselves" to anything they found eatable in or around the field (digging up a few sweet potatoes, taking mangoes or sugar cane, etc.). This is more clearly the problem of the land owner who invites the labor force to his field, and less of a problem when the owner is with the group on his own field!

The duration of this form of labor is about 5 hours of work/person (from about 7 am to 12), with people leaving for their own work in the afternoon.

2.6.2 The Combite

This is an invitation to someone's field to perform some specified labor, like field clearing or creating contour ridges, etc. Farmers using this are generally better off than the average small farmer. Such a farmer announces the day for the work. People coming to work this day are provided a meal and usually 'grog' alcohol. No one knows in advance how many people will actually turn up, or when they will actually come, though the numbers rise as they get closer to the time when the meal will be served. People may come and go during the day, some staying for a few hours, some staying longer. The meal must be a good one or the person will not be able to attract future combites to his land. A good meal is defined as one where plenty of rice is provided, with oil (taking the place of meat we were told), with beans, fried plantain, and plenty of grog throughout the working day. We were told that if rice and beans (which are considered expensive) are not provided, people won't come!

2.6.3 The "Job"

A 'job' is essentially an oral agreement to pay someone so much money to do a particular task on so much land. We frequently were told of this practice used in the specific fields we looked at. The field owner, usually a better off farmer, would agree to pay another (poorer) farmer so much to weed his entire "jardin" field (of which most farm households have at least 5-6 and more, sometimes scattered all over the different watersheds of the area). The job might be expected to take three or four days. The person

cultivating the land might give half the money when the job is half done, and the rest when it is over. One farmer we met gave such payout over three payments.

2.6.4 Implications

Labor at key periods of the agricultural cycle is clearly a limiting factor for many farmers, though the large number of farmers looking for work still keep prices low. All three of these labor strategies may be used by any one farmer, sometimes even two of them the same day on the same field. One farmer told us of having a 'ramponeau' in the morning, and a 'combite' in the afternoon, as a way of keeping the 'ramponeau' group together throughout the entire day (with promise of food in the late afternoon).

The 'ramponeau' in particular would seem to be the ideal 'informal traditional group' within the area for PADF to work with. By definition, working with local NGO's or cooperatives, as the conduit for PADF activities in an area will certainly exclude those who are non-members (even if these groups **say** that they will include others as beneficiaries in the project's activities). The survey team observed cases in which this was not the case in Castagne and LeBlanc, where PADF channels activities through cocoa and coffee cooperative structures. The project would be advised to reconsider its approach within the communities with whom they work. One might consider (as is being done) finding out who owns **and** works the target watershed slopes on which the program is trying to make an impact. Those actually cultivating this land will have friends and neighbors with whom they are from time to time associated in the 'ramponeau' activities. For soil conservation activities (however this becomes interpreted in the area) to be sustainable, the program needs to link it to a sustainable labor force activity of this kind.

For instance, Bedoret and LeBlanc farmers would do well to begin creating contour ridges on their slopes as **traditionally** practiced in the Jacmel Palmiste Avin area. This will require a labor force of the 'ramponeau', as done in Jacmel. If vegetative barriers are to become important, individual farmers must first realize their importance to some tangible aspects of their lives (either in form of increased cereal grain or other vegetative production from the land, or as cycled through a pig (discussed below).

2.7 Irrigation

Except for several small terraced plots along a small stream coming down from the principal ravine of the Bedoret micro-watershed, we did not see any evidence of irrigation. There might be a potential for water catchments and cisterns which could serve as a reservoir for vegetable crops, should such activity ever

become important in the area (all three sites have good potential for this).

3.0 Already Existing Farmer Opportunities

In Bedoret/Plaisance area, it was particularly difficult to elicit from farmers their own views on opportunities they had to improve their well-being. Our general impression of the area was that, when compared to Jacmel's "Palmiste Tavin", there is considerable land available for exploitation, that there are many pasture areas of many hectares, that there were still a large number of trees in the middle to lower sections of the watersheds, where people live (many of the communities have located along the paved road). Farmers seem to have a great deal more production options from which to choose, with tuber crops (yams, taro, and manioc in particular) being extremely important as major food sources. With fairly good soils and lands to cultivate available, with good rainfall (between 1500 - 2000 mm), a wide selection of crops, farmers seem to be orientated towards extensive production. They have not had to work as hard to maintain a subsistence level of living as most other areas of the country. This can perhaps partly explain their seeming lack of enthusiasm for labor intensive activities needed for good field/soil/crop management.

When asked which crops or activities brought the most household income, we were usually told that "all our crops" produce income, or when pressed further, that yams and red beans were particularly important. Households in the watershed appeared largely self-sufficient, though purchases for such items as rice, oil, and vegetables (coming from outside the area) were important household expenses. We observed several fields of what we considered very healthy stands of mountain rice, associated with between 4-5 varieties of yams (in one field), taro (mazumbel), manioc, corn, red beans, and pigeon pea.

Farmers did express a desire for help in obtaining seed for small vegetable gardening (cabbage, lettuce, carrots, Irish potatoes, etc.) which could certainly be very productive in this area. When asked why they didn't already grow these crops, we were told that no one had any seed or experience with these crops.

Though outside the immediate area of the major FAO interventions of past years (massive hired labor contour ditch construction, and tree planting) on the region's hillsides, many of the men in this area had been hired by FAO agents as part of the work gangs that dug these ditches in the Limbe area. Many gained experience in the use of the A-frame levels for contour tracing, and knew how to create the contour ditches. None had brought home the technique to their own land, nor, as is very evident in the Limbe area, have the farmers who had their land "protected for them" maintained any of the ditches or vegetative barriers created.

It is difficult to assess the negative impact of this experience. It is clear that neither the farmers upon whose land was worked, nor the laborers who did the work, had any particular personal interest in the work done outside of the immediate income it provided - in form of food for work corn meal, oil and sardines. On the positive side, there are many farmers today with unused skills which, under the proper circumstances, with relevant demonstration of the long term results of such activity, might be encouraged to adopt some modification of these activities.

4.0 Major Constraints and Possible Solutions

4.1 Increased Production of Principal Crops

Farmers are losing a great deal of top soil from their fields, many of which have slopes between 40 and 50 %. This situation will become increasingly serious as increased population pressure leads to decline in crop productivity. Farmers already attest to such a decline. What has saved them so far is their ability to often abandon fields to fallow for a few years after a few years of cultivation (or even 1 year of cultivation). This extensive orientation had not permitted local development of good land intensive management practices - as seen in Jacmel. Techniques which are now considered "traditional" (ie. done by everyone for a long time) as the contour ridging in Jacmel's "Palmiste Avin" area are unknown here. That farmers in this area are aware of the problems of cultivating steep slopes is evident from the "traditional" activity of creating dead vegetative strips along the contour, held in place by stakes every 2 meters or so. This activity seems to focus more on protecting the crops of the field from being washed out by water and moving gravel/stones from higher up during rain storms - and less on a perceived need to actually protect the resource represented by the soils themselves. This is an area which needs investigation and awareness building.

Another important problem is the whole tenure issue. Are the farmers with whom they are working through the cooperatives (coffee, cocoa), and whom by implication have land for such crops, those who are actually farming the problem slopes the project wishes to target? If the project wishes to target "Production" increases it should be looking at this issue.

Slope agriculture may not be sustainable. The farmer may only be able to slow down the process of degradation. The real issue, therefore, is to raise the farmer resources in a manner which will

take pressure off such land. Peanuts are raised, as is much corn, beans, manioc, etc., because money is needed to survive. If funds can be obtained in another manner, or on the slopes in a manner which raises productivity (garden crops), then this is achieving the same objective.

4.2 Climatic Constraints

By this, we mean the lack of rainfall during critical periods of growing season (either short or long), during which time crops suffer poor yields are obtained. For example, a farmer in the BEDORET watershed noted that during a good season for beans, on 3/4 of carreau, with 10 marmites of seeds, he got 60 marmites. During bad seasons, he got only 30 marmites, half of the good season.

Sometimes, depending on the year, he harvested only 1 godet (cup)(equal to 1/7 or 1/6 of a marmite). Another farmer, on 1/4 of carreau, with one marmite of corn, harvested 80 marmites during good years and half of this during bad seasons. Clearly rainfed agriculture, under the variable rainfall conditions of this region, is a risky venture.

4.3 Technical constraints

The lack of technical assistance is a constraint to increasing the productivity of the farming systems of this region. There exists virtually no extension system for farmers, much less advice concerning acquiring improved seed varieties, commercialization possibilities, availability of appropriate insecticides, etc.

4.4 Institutional constraints

The lack of seeds for farmers, the lack of extension service, all of this constitutes a vacuum at the institutional level. To the extent possible, NGO's like PADF are trying to provide some assistance in this regard. In terms of marketing, there is no official information on market prices, though farmers in Castagne told us that they are aware of the prices before going to the local market. However farmers are rarely informed about prices in the larger regional markets where the products they sell locally end up. However it is not clear that such knowledge could be effectively used by farmers (eg. they take what the Madame Sara merchants will give them).

There are no policies concerning standardized unit measures and market organization. Farmers have been slow in realizing the considerable loss in value of their money during the past year or the implications of this when they seek to repurchase durable goods. There is no policy for agricultural credit for inputs, marketing.

4.5 Cropping System Constraints

(1) Those crops of short growing cycles, found on lands with significant slopes, leave land too often exposed to wind and rain erosion.

(2) There seems to be a serious lack of understanding of those anti-erosion methods which can be realistically applied by farmers within the context of what their actual needs/ability/means are. Methods being recommended are sometimes ineffective. Leucaena hedgerows, for example, are often lost causes, representing more the perspective of the project (what the farmer supposedly should do) than the needs of the farmer (what he wants to do with his land).

(3) The traditional method of "dead vegetative barriers" is an effective method to control some of the effects of erosion in the short term; however it is a very precarious system which is too fragile and porous to retain much soil and significantly hinder flow of water down a field when the earth is exposed. At best, "dead vegetative barriers" do not last more than a few months as they quickly rot down. However, <u>their existence imply the farmer's desire to provide protection for his land</u> and their application do cost the farmers who put them in considerable effort and time, even outlays of money when group labor is frequently sought for their creation.

(4) Fields located on steep slopes very often correspond to lands which have been given out, by larger land holders, in a share-cropping arrangement to poorer farmers who don't have better land to use and so are forced to use what they can get or rent. The large land owners are very clearly more interested in the cultivation of their lands in the lower hills, valleys, and flat areas. In fact, one of the attributes given by many of the landless farmers met were that "well-off people" were people with woodlands. Such woodlands permit greater diversification, they permit intensive production of a wide range of valuable food grain and fruit tree crops. Share-croppers are less able to benefit from cultivating such crops as plantain, sugar cane, yams, taro; all

important crops usually associated with the more shaded and moist (cool) woodlands. They are obliged to practice a cropping system which includes peanuts and beans, all important and "quick" cash crops, and manioc, a food security crop. These crops are often destructive of the soils on the steep slopes.

(5) Fruit Production and Charcoal Production

There are no commercial outlets anywhere near these watershed areas for the principal fruit tree products (mango, oranges, avocado). With no pigs to consume the unwanted and unsalable excess, and with urgent needs for some source of money, farmers in these area turned to cutting down many of the now seemingly "worthless trees" for firewood and charcoal - one sure way of making some quick short term money to meet urgent family needs. Help in increasing the pig population and in creating commercial outlets for potentially valuable fruit production is essential to reversing the loss of vegetative cover on the hillsides of this region.

(6) Animal Production

At Plaisance, farmers need pigs but do not have access to the rustic pigs they want. Lack of capital is the significant constraint hindering farmers from buying pigs. At Castagne, farmers with pigs have fruit trees and money to buy feed. At Dondon rustic pigs are available and many young farmers try hard to buy pigs. Farmers consider pigs as a very important way of making money because of their prolificacy and the good price received on the local markets.

Cattle and goat are raised in all three areas. Feed availability during certain times of the year are the main constraints to improved production. Farmers show little interest in raising forage crops on their cultivated fields at the expense of their own food crops. Better demonstrations are needed, linking the productivity of both cropping and livestock systems. Dogs are frequently mentioned as an important constraint to animal raising, as many of the young goats are eaten when pastured far from the homestead; farmers therefore bring the goats near their houses every afternoon before nightfall. To improve the productivity of their ruminants, farmers will have to diversify feed and better manage their pasture.

5.0 Recommendations for Program Interventions & Potential Technologies to Implement

5.1 For PLUS Project

The survey team was impressed by the quality of the agronomists and field staff available to PADF. We believe that very good work is being done in each of the three watershed areas visited. But what is being attempted may be very well beyond the human, financial, and time resources available to the field team. **There is so much that needs to be done, among so many people, in what are really very large areas.** Some focusing and concentration of efforts may help the field team become more efficient and accomplish more with the resources available. The following recommendations are provided as a suggestion to PADF leadership on how some such focusing might be accomplished in the field.

5.1.1 Labor

It would seem that if PADF wishes to promote new or improved soil conservation methods, it must look at the entire field as a unit and be sure that if work is to be done on it, that it is done completely. Otherwise, as in the case of one field visited, traditional dried vegetative matter strips in the upper part of a field were not enough to stop the flow of water down the field onto the areas which had been "improved", resulting in sections of this being washed out (sugar cane cutting, pineapple, and all). And such a field is only part of the entire farming system of the farm household which must be seen as a whole.

Major field work often requires the assistance of organized labor groups, particularly for the initial preparation of fields for planting. This includes breaking of soil, forming random small mounds for planting yams, manioc, sweet potatoes, looking for and cutting stakes to hold in place dried vegetative matter (cut down branches of trees/bushes near field, last season's sorghum and maize stalks, etc.) and forming this dried vegetative matter into rows on the contour. This activity is often performed through the use of the local version of the "ramponeau" (cf. 2.6.1), where a farmer will invite a group of neighbor men (as many as 15 sometimes) to help him over a period of 1-3 days. The farmer's expense consists of a daily fee sometimes paid to each worker and the meal which he must provide. This may be the principal meal these people will eat that day. The preferred food is rice and beans, with oil, which represents a considerable expense to the

farmer. The farmer is expected to reciprocate when participants call for similar assistance.

It is very important that the PADF project activities which call for important labor expenditures (like creation of soil conservation structures) be worked into the range of activities considered appropriate tasks for "ramponeau" and other locally recognized categories of group labor. These groups exist locally for the purpose of this kind of work. There may be a danger that PADF, in focusing on working exclusively through groups formed by other projects for other purposes[27], or on creation of community groups, or groups of contiguous farmers, that project activities introduced will not be sustainable beyond the life of the project. On the other hand, most farmers in Haiti perform major farm activities together. Either a group of friends organize to work together on each other's fields (the same group may decide to 'sell' their time to a third party to raise some money), or groups are organized for specifically selling their labor to the community. The more prosperous people of a community are used to dealing with such groups for labor on their fields. Many of these groups, while not formalized in the sense of having a 'president and secretary', are nevertheless stable across a number of years. The PADF project might make more effort to better identify such groups in all sites and work more closely with them, in addition to the more formal groups currently worked with.

5.1.2 Inter-Regional Visitations

One very important, and often unused, tool for communicating new ideas and management techniques to farmers is the use of farmers who have either traditional activities of potential relevance or mastered new techniques/crops, to communicate to other farmers. Farmers will speak to and observe other farmers, and learn from them, much more effectively than from "professional extension staff" whom many farmers would consider to be unable to actually manage a farm themselves, if they had to (ie. their advice is "theoretical"). And they are often correct in this assessment.

Because farmers in the Plaisance/Bedoret and the Dondon/LeBlanc areas do not practice contour ridging, which has become "traditional" in the Jacmel "Palmiste Avin" area, and because such a technique would be a very significant improvement into this local farming system, it is recommended that the PLUS

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[27] These groups tend to cease functioning with the departure of project activities. Then when a "new project" shows up in the area, local people are quick to say that they have organized groups within the area with which the new project can work.

project give immediate priority to taking a group of about 12 cooperating farmers from Plaisance area, particularly the M/E area, to visit for 1-2 days the farmers in Palmiste Avin. The trip should be timed to occur when pre-identified farmers are planning a "group labor activity" upon personal fields to create these contour ridge structures[28]. The key would be for farmers to observe and talk with actual farmers (like themselves - not the local PADF extension agents) in process of creating these ridges. Perhaps they should even be encouraged to lend a hand in the work. Because this will be certainly disruptive to the Jacmel farmer's maximizing the labor of the labor group on his fields, and those doing the labor have their own time schedules, it is important to divide the visiting farmers into several groups to visit several work sites, and to also perhaps assist the target farmers with the cost of that day's meals, perhaps even part of the 10 gourde fee given to the labor contributing farmers.

This same visitation technique should also be used when (and if) assistance is given to vegetable gardening, ie. taking a group of farmers from Plaisance to the Fermathe area of Kenscoff. Farmers from Fermathe participating in such an exercise should be encouraged to talk to farmers from Plaisance, explaining to them the entire cycle of activities they follow. It would also be good to subsequently invite some of these same Fermathe farmers to Plaisance during the beginning of the appropriate season to provide some "technical assistance". PADF agents participating in the exercise should pay great attention to listening to what farmers are saying "to each other", and making a real effort not to add their own commentaries. Much can be learned to help programs in both areas by listening to the farmers discussing their crops, their activities, demonstrating work, etc.

5.1.3 Demonstration Plots

We are concerned that PADF is depending too much on extending techniques which have not been shown to necessarily work anywhere else. One lesson we should learn from the numerous projects which have attacked soil conservation problems in Haiti is that, when a project departs, the work often disappears. It was not sustainable. Farmers often will follow recommendations as long as they are able to earn some much needed money or other perceived

[28] It could also be useful to have some of the Palmist Avin farmers visit some of the visiting farmers in their own area who might wish some follow-up assistance on their own land - trying to use same type of work groups used in the Jacmel region.

benefit in doing what program technicians tell[29] them to do. The project, can be viewed by farmers as a pragmatic way to earn something in the short term. But once gone, people go back to what they were doing before. This project may be no exception.

Ideally, it would seem that farmers in this area should be provided with applied research & demonstration sites under the technical leadership of SECID researchers (currently there are none anywhere). Even though many of the anticipated results of recommended interventions may not be realized within the (current) 18 months remaining with the project, a base line should be established for what will be expected to be long lasting benefits but which need to be objectively documented. This will be important to future M/E whether or not the project continues. It is important that such demonstrations be done on only one of the fields of individual farmer volunteers. The farmer should be the one who actually arranges for the labor and other activities to be done on the field - with guidance from PADF and SECID technical staff and extension people. We do not encourage promotion of such activities through "group activities" on a "group field", as this again is an artificial situation and probably will not be sustainable. Group fields tend to not receive the same attention, focused care, or timeliness of activities, as personal fields.

As an example, we observed an extension agent in a cooperating farmer's field bend down and trim off the branches from a small citrus plant to permit it to develop better. Though the technique was right, and the need justified, the agent's doing this (without even pointing out the problem to the farmer or asking his permission to do so), the action shows a certain "proprietary air" over the farmer. The farmer should have been shown the "offending plant", asked why it wasn't trimmed, and if the farmer might not want to trim it himself. If the farmer is felt to be obliged to do so, then nothing is learned by the farmer or agent, and the time wasted. Actions of field agents often speak louder than words and farmers are observant. There is no point telling a farmer, as we heard, that he must not cultivate manioc and sweet potatoes (for example) on a 45% slope when it is quite evident that the farmer has already done this, and will probably continue to do so unless some very compelling economic justification can be proven to him to do otherwise. The real question is whether or not this farmer can be helped, on this field, to continue (for short term at least) to cultivate what he has, but by using a management system which will at least retain most, if not all, his soil resources intact. We

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[29] Unfortunately, in spite of the best of intentions of project leaders and field agronomists, the technicians and extensionists (who actually meet the farmers) often tend to be fairly aggressive in telling farmers what is best or should be done, as understood from their own training from their program directors. This is one reason the survey team believes it is important for PADF to perhaps modify their approach and specifically work more closely with farmers. While the old approach may have been appropriate for distribution of tree seedlings, it is not appropriate for farming systems rural development type approaches.

know this is possible, but the cost of the proper structures may very well be beyond the means of the farmer's ability to maintain in the long run.

5.1.4 Modifications to Local Soil Conservation Practices

PADF, at the moment, is encouraging a slight modification of the local custom of placing dried material on the contour. Though there are occasional exceptions, farmers don't do a bad job of running these dried vegetative strips along the contour - perhaps, as in the case of Bedoret/Plaisance, reflecting the experience gained in use of A-frames in the FAO Limbe work groups. However, these dried vegetative strips only slow down the flow of water and stop the movement of some clumps of dirt or small stones from moving down the hill. PADF is encouraging farmers to build up small dirt mounds upon these dried vegetative strips (which then result in a sort of compost), and creating a very shallow contour depression in front of the low dirt mound, upon which farmers are encouraged to plant sugar cane, pineapple, grasses (leucaena), and trees.

The choice of sugar cane is very good because this is already an important component of many fields in this area, though currently only planted randomly in field.

The choice of leucaena is perhaps not such a good idea in this region, in spite of great intentions for this leguminous crop in this area. Leucaena has been an almost spectacular failure in most areas where it has been attempted as a vegetative barrier - particularly in higher rainfall areas (over 2000 mm.)[30] - though it is true that exceptional farmers are found here or there who have managed to 'protect' their leucaena from the predation of their neighbor's (or their own) animals. While perhaps more appropriate in low rainfall areas, such as the Northwest, the survey team has come to believe that the importance of vegetative barriers as a <u>means of soil conservation</u> is too important to leave to the probable ultimate rejection of leucaena by farmers on their hillside fields. There <u>must</u> be greater emphasis placed on those crops which can cover the fields for the longest periods of time, which provide very important sources of revenue for the farmer. Such crops, in vegetative barriers, would have the greatest potential of becoming a part of the permanent farming system of hillside fields - while still permitting the farmer to grow the corn, sorghum, beans, and manioc on the more open areas of these fields. Our recommendations along these lines appear below in

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[30] This statement is based on the farmer needs assessment team's visits to the sites of many past projects within Haiti. The problem is not technical in nature but one of human adoption - given a number of socio-economic realities farmers face on their land.

section 5.6.

It is questionable in our minds that the shallow dirt strips created for the leucaena, sugar cane, and pineapple currently being planted as hedge rows, will last more than 1 season - particularly if the farmer, when left to his own immediate reactions, cannot resist the temptation to plant sweet potatoes and manioc on these convenient ridges. One might perhaps consider introducing a more long-lasting structure, like the contour "ditches"[31] promoted by the Petits Freres in Jacmel, with the spaces in-between created into contour ridges for planting the traditional crops the farmer wishes. This would give a 4-5 year time span in which to establish the vegetative barriers of sugar cane, pineapple, leucaena, etc. on the larger contour ridges created by the ditches, with banana and possible rice planted within the ditches by the second year. However, the survey team would recommend something other than this, to be discussed in 5.6 below.

In spite of the seeming attractiveness to the farmer needs assessment survey team of suggesting that PADF attempt some contour ditch support for this area, we continue to have serious doubts about the appropriateness of this technology - as it does not appear sustainable. Such contour ditches require significant labor to create, which even the farmers in the Jacmel Palmiste Avin area rarely do without outside subsidies to cover the extra labor. As such ditches begin to fill from year to year with layers of silt from the slopes above, farmers (significantly) will want to plant banana, taro, and maize in these very fertile strips of land. It could even be expected that rice would also do well in some of these ditches, which could potentially provide the economic encouragement to maintain them. However, it is more likely that over a 4-5 year period, the ditches will fill up and become important production strips for a of couple years. They will eventually go the way of the rest of the slope unless they are either cleaned out, or another similar ditch is created above/below them. It seems unlikely that the farmer will have realized enough yield increase to pay for the costs (himself) of repeated major labor expenditure which would be needed. Leucaena certainly would not be profitable enough. However, one could foresee the possibility that, were such "ditches" again created above and below the former "filled in ditch", that the farmer's field could potentially become stabilized over a number of years and the land become very much more productive.

A key question is who should be expected to pay for the cost of the major labor costs needed for contour ditches. And if the farmer cannot do so with the income he may be getting from even the

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[31] This is a costly undertaking for farmers and unlikely to be adopted without continued outside assistance. A less labor-intensive approach should be tried, to be discussed for on-farm trials.

greater production realized, does this mean one must be content with the inevitable continuing degradation of the slopes? The team measured significant depth in some of the slopes. The parent material seems to break down fairly quickly into useable soil for cultivation. The team has proposed below an on-farm trial, as an alternative to contour ditches and the methods currently being extended, using vegetative materials which the farmer already cultivates on his hillside fields, which have high economic value, to create the vegetative barriers needed.

5.1.5 Animal production

It would be important to help farmers at Bedoret/Plaisance to have access to rustic pigs. Increased interest in planting fruit trees and establishing vegetative barriers on hillside fields must be linked to pig production in the area. The pig represents the best way to use the excess produce of fruit trees, particularly during the fattening periods at the end of the year. A fat pig represents an important source of income for a farmer.

At Castagne/Grande Riviere, young farmers cultivating hillside fields must be given a vital reason for maintaining vegetative barriers. With overt linkage of vegetative barriers to pig production, the need for animal forage during specific times of the year can provide these farmers with the incentive to take the interest and commit the time needed to invest in soil conservation measures, and to maintain them. However, the selection of <u>what goes into those vegetative barriers</u> is critical, and must have the farmer's real objectives and likely actions in mind.

Rustic pigs are available at Dondon and young farmers seek to obtain pigs. Such farmers, often the ones cultivating the hillside slopes as sharecroppers and renters (they can't yet afford their own land lower down, or it isn't to be found), need to see how their management of vegetative barriers can directly help them reach their objective of having pigs, and having the feed needed to feed them. Hedgerows with plantain, banana, sugarcane and pineapple can furnish money to buy piglets, they can also provide significant sources of feed for pigs, once obtained.

Hedgerows with different grasses (elephant & guinea grass) and tree forage (e.g., leucaena) could furnish important feed for herbivorous livestock. However, it might be more appropriate to place these non-food crops into other locations of the productive region, in the ravines and very steep slopes, or as sole crops for forage on small plots near the homestead. It would be necessary to provide demonstration plots for farmers to show them how to use such plots.

Organized seminars can be an important activity for the project in the three areas. Seminar themes would include animal reproduction, feed, and livestock management.

5.2 Key Indicators

For program monitoring and evaluation purposes, key indicators are required to effectively measure progress towards the objectives of productivity increases and sustainability. Though the survey team is acquainted with the indicators of success selected for M/E purposes in this project, we only wish to mention a few points here which are relevant to the discussions in this document.

Construction of rock terraces and rock walls and vegetative barriers in ravines and gullies are key activities of the project with clear and long lasting productivity returns for farmers located in such areas. It is important to objectively measure the yield increases gained behind such structures. Because of their significance, the number of fields benefiting from such structures, their length (meters), the rate of filling up, the yields/value of newly cultivated crops in these locations, and whether or not construction was done with some form of compensation "encouragement" are important indicators of solid accomplishments.

Measuring the same factors for hillside slopes containing vegetative barriers of "rempe paille" and leucaena in these areas is more problematic. We doubt that the limited resources of the project should be used for this purpose, though perhaps a very simple survey among the scores of farmers who were "extended" this technique could be justified (ie. without yield measurements) as a means of seeing "what happened afterwards". We recommend this because the effective life of many of the structures that would be measured/evaluated will be very limited indeed, some not lasting the season, many not lasting the year. Many will have to be replanted. All this complicates measurement. It would be better to set up a number of well-designed farmer managed, on-farm demonstration trials where these factors could be measured accurately, and farmers in the area have the chance of seeing what results could be expected if specific procedures were consistently followed over time.

Measuring more substantial efforts to create more productive (in the farmer's eyes) vegetative barriers such as strips of well-organized plantain/banana, sugarcane, pineapple, and other farmer choices (pigeon pea, taro and yam, dense line of sorghum), on the other hand, **would** be worth measuring and monitoring closely - in both research/demonstration plots as well as in the fields of other farmers showing interest.

5.3 The Time Factor

It is clear that PLUS cannot work in this area without a long term perspective. This conflicts with the current project cycle with 18 months remaining, where everyone is trying to show "short term" improvement at, perhaps, the expense of real long term

impact. PLUS must look at the problem as a system where the animals and commercialization aspects are critical for success. It may not be necessary to prove yield increase of corn/beans/manioc on the slopes with conservation structures (though there is reason to believe there could be long term gain in this area). If vegetative barriers like plantain, banana, sugarcane, pineapple, (even leucaena), produce a marketable cash crop, household food, and a crop of forage for pigs which increase household income (while also at least reducing, if not stopping all erosion), then this must be considered a major advance. Pigs produce manure which can be used for production increases. They dig up the soils which is beneficial for the chickens looking for feed at their feet and for keeping the soils loose for water penetration.

5.4 Specific Actions PADF Can Take

(1) Introduce vegetable seeds (tomatoes, cabbage, okra, spices, spinach) and information about vegetable gardening. Diversify as much as possible the vegetable crops introduced. Farmers in Bedoret/Plaisance area specifically expressed interest in this kind of gardening, which could potentially modify the cropping system. Experience in the CARE Northwest Region shows that vegetable gardening can be a very high value to labor activity - to such an extent that some farmers abandon one or more of their less productive hillside fields in order to place more time in increasing the size and output of their vegetable gardens. Cap Haitien gets its vegetables from St. Raphael and Port au Prince, why not from Bedoret? A farmer could grow a small plot of 1/16 ha or 625 m2. A rough estimate of net income for tomatoes is 72 gourdes. Value added by work day is 13 gourdes. Other vegetable crops could be even more profitable.

This means that project technicians should help local farmers/groups find a market through the traditional "Madame Sarah" to distant markets - or better yet, reach these markets themselves. The project can also inform farmers about prices being received for various vegetable and other crops in the main regional centers.

(2) Introduce Francisque mango seedlings for income in the long term for local market and export. One such mango tree can provide, within five years, 80 Haitian dollars/year to the farmer. Four producing trees could provide $320, representing an eight-fold of his estimated present earnings. Such seedlings could be encouraged for favored parts of the vegetative barriers on hillside farmer fields, or as grafts on existing trees on these fields.

(3) Introduce pigs in the watersheds to give more income to farmers. This will have a direct impact on greater interest in vegetative cover for forage and for fruit tree produce. An arrangement with the EMADE in Dondon could assist in this regard.

(4) Technical support and advice from project technicians is very important to farmers and appreciated. Their presence in each area, visiting farmer fields, cannot be underestimated, particularly with soil conservation works which often require extra effort without immediately visible returns to such effort.

(5) Collect more information on the labor force groupings (eg. ramponeau) in each micro-watershed area to see how soil conservation activities might be organized through them. Locate participating farmers who would use their own 'ramponeau' network to meet such needs. This would be a good way to locate the hillside fields to be used for the 15 - 20 demonstration plots of an important on-farm farmer managed trial theme.

(6) Any actions which will help reduce the insecurity of farmers exploiting their land (more secure contracts between owners and share-croppers[32], between owners and renters), which will guarantee long term rights and better protection of the land, should be actively encouraged by the project.

Such measures could be followed by actions which would encourage the practice, on hillside fields, of focusing on growing crop associations characterized by long term growing cycles such as plantain, taro, sugar cane - even pigeon pea, all of which help realize an optimal covering of these fragile soils and sustain their presence on these slopes. To the extent that farmers can be shown the economic incentive of including forage crops such as leucaena, this will also be significant. Fruit tree and other valuable tree species should continue to be encouraged on these slopes - something which can be best aided through finding expanded uses for the products of such trees (eg. commercialization of more sought for varieties, product transformation, accelerated return to rustic pig availability) which will give a returned demand for excess fruit available on the household's land.

(7) The system of using mulch by some farmers in the Castagne area could potentially be an effective means of soil protection for some farmers. This practice might be both encouraged and shown to other farmers.

(8) **Adopting New Crops**

Tamazulapa black beans, with mosaic virus resistance, would be an important crop to introduce into all three regions. A red bean variety introduced in the Salagnac area might also be adaptable in

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[32] Share-croppers do not have any interest in planting tree crops or in improving the value of the land they are working - unless they, in their agreements with the landowner, they believe they have a reasonable possibility of purchasing this land someday, and that their improvements do not add to this cost. Perhaps special agreements could be created which would provide share-croppers greater incentive, such as long term contracts for land use, payments to share-croppers by the landowner for any improvements made, etc. This is already happening in some regions visited by the team. In many such cases, the landowner can't afford to pay the share-cropper for the improvements, so the share-cropper in fact "earns" the land.

this area as well.

(9) Finally, and perhaps most importantly, the extension of any soil conservation program should be preceded by a phase of on-farm control/experimentation of the method, on the scale to which one would expect/hope it might be practiced. This would permit better evaluation of the effectiveness of the methods under consideration for extension as well as the economic value of the concerned crops in the potential associations for the farmer household farming system. For instance, the use of sugar cane and pineapple as vegetative barriers for contour ridges (even the shallow modified "rempe paille" version as being worked with in this region by PADF) are worth looking at more closely. Will farmers really maintain contour strips with such crops over all the contour ridges of their field, are these effective in stopping soil erosion, what happens when the sugar cane or pineapple have been in the strips for several years? What would be the economic impact of this system? How could leucaena be introduced into this as part of the vegetative barrier association to give greater diversity? These and many other questions on just this one system can only be answered with structured and long term (more than one year) applied on-farm research and monitoring procedures.

Aid in the development of pig raising can provide the justification for farmers to plant such plants as leucaena, sugar cane and pineapple on the hedge rows of hillside fields. The manure produced could be used in more intensive gardening activities (vegetables), which would further leverage the value of these slope hedgerows, helping to pay for the added labor for their maintenance. Any acceptable system of hedge rows or vegetative barriers on such slopes will have the long term value of protecting the soil base these farmers depend upon for continued food crop production on these slopes. The added moisture infiltration and added organic material added to the soils will almost certainly more than cover any loss in production realized from the "lost space" of which farmers are very conscious for their corn, beans, sweet potato and manioc. The latter two should never be planted as part of vegetative barriers, though this could be done in the areas just above the hedgerows.

(10) PADF, in each of its project regions, should identify one or more unifying themes around which to organize their activities in order to have the greatest impact. This should provide the basis for an on-farm, farmer managed trial program (at least 15-20 repetitions per region). An example of such a unifying theme is given below which might be considered for implementation during the remaining 18 months of the project, and hopefully into the time beyond. To be unifying, the theme must combine the efforts of the entire PLUS team in the area: PADF and SECID researchers, looking at the farming system AS A SYSTEM and not as a number of unrelated parts. To have an impact on soil conservation, a key element of the production system must be identified which will permit the

economic justification for more long term improvements, like soil conservation. The farmer needs assessment team are convinced that, in many cases, animals MUST be considered in a total systems approach. Commercialization issues MUST be addressed carefully and thoughtfully, and real help provided to see appropriate mechanisms put into place. Project M/E activities should be particularly concerned with components of the unifying theme, activities for socio-economic data collection should be focused around this theme, project indicators for success should be primarily focused on the measured success of the components of this theme.

5.5 A Unifying Theme for the Three Micro-Watersheds of Region 3

TABLE 11: UNIFYING THEME FOR PADF REGION 3

UNIFYING THEME	COMPONENT	CONSTRAINTS RESOLVED BY ACTIONS	PROJECT ACTIONS TO BE TAKEN
Hillside Cropping Associations: Corn/Sorghum/Bean Pigeon Pea/Manioc with Vegetative Bands of: Plantain Banana Sugarcane Pineapple Some Castor Bean Some Yam Some Fruit Trees Some Gliricidia Some Coconut Trees Some Other Trees	Household Food Consumption	Produce from both vegetative barriers and space between them reserved for most important food crops.	Establish at least 20 on-farm, farmer managed, research/ demonstration trials with this unifying theme. Assist other farmers in area to establish these, if interested.
	Soil Conservation	Increased vegetative cover of hillside fields, reduced soil erosion, increased water infiltration, increased productivity of hillside fields.	Establish "rempe paille" along contour, using living stakes of preferably Gliricidia, limited leucaena, creating small soil ridges. Establish vegetative barriers along these ridges, using plantain, banana, sugarcane, pineapple, sorghum.
	Agro-Forestry	Increased vegetative cover and long term productivity of hill-side fields.	Encourage farmers to select a number of both (grafted) fruit, coconut tree seedlings (project supplied), castor bean, and other tree species to include scattered along the vegetative barriers. Create a wind break of fast growing trees along at least one side of field.
	Animal Production and Forage	Need for forage material for increased animal production, higher quality feed for animals.	Forage material coming from the vegetative strips can become an important new source of feed, using cut-and-carry. No direct field pasturing.
	Marketing	Low productivity of hillside fields will be modified with high value crops like plantain, banana, fruit trees, improved corn and bean production.	Establish full range of crops during the 1993 season with at least 20 participating farmers in region.
	Project Information Needs for Monitoring and Evaluation	Lack of objective data on soil conservation measures which will significantly both raise hillside farming productivity and result in soil conservation and farmer sustainability.	Obtain detailed data on the 20 participating farmer fields concerning all activities undertaken, timing, costs, and production. Use of forage for animals. Value of animals benefiting.

We have already discussed elements of our proposal for a unifying theme for the concerned watersheds. This does not mean that the project will not continue to be involved in other activities in the area, or collect information about other aspects of their work. But it does mean that the unifying theme components will take priority over other field activities (when time and personnel and financial resources pose a constraint).

The on-farm, farmer managed research/demonstration trial we would propose for all three watersheds would include the following critical steps (cf Appendix 2 for a trial protocol).[33]

(1) Identify 15 - 20 local work group associations (ramponeau for example), with between 3-7 members, within the region (equally distributed among 3 M/E watersheds) and find out if they would be interested to participate, as a group, with program activities. This will require them being willing to use their own labor group to effect all activities, without monetary compensation, though they will initially receive vegetative material assistance and technical support. Members of the group will need to agree, between them, to continue program activities for a period of 4-5 years, whether or not the project is present - so as to permit all participants to equally benefit from assistance provided.

(2) One farmer, perhaps the leader of each work group association, will be selected, upon whose principal hillside field will be placed the unifying theme activity described below[34]. This should be a field of about 12/100 cx. or 1548 square meters, a common size field in these areas. If possible select a field which can be seen from an opposite slope for photographic monitoring.

(3) The work group association will prepare "rempe paille" from dead vegetative material along the contour of each field, spaced as appropriate depending on slope, and with assistance of field technician. The stakes to be used must be from live Gliricidia or local material which will take root this season and branch. In creating these, a shallow ditch, with a low mound of soil forming a contour ridge just above the "rempe paille" will be created.

(4) The project will furnish enough plantain (preferably of Vincent or Musquée varieties) or of farmer's choice, to plant one

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[33] This is not a "trial" in the sense that a researcher is going to be able to "control" for each experimental factor being tested; this is going to be done, by the farmer, who will be given choice about what combination of vegetative material he will actually use. How the farmer may chose to plant this spatially will probably vary; some may put in more sugarcane than others, some may prefer more plantain, and few banana, etc. One of the objectives of the trial is to see just what farmers actually decide to do, within the context of creating these vegetative barriers.

[34] This will give a total of 20 research/demonstration trials per region, which should be enough to draw statistically valid conclusions from quantitative data results. The variability we would expect to take place between farmers, different parts of the same watershed area, different watersheds, etc. should not hinder quantitative evaluation if this number of the same trials are implemented.

plant every 2 meters along each of the contour ridges. The farmer, with the help of his work group, will dig the holes, place organic material in them (project may need to help locate enough organic manures, etc.), and plant the plantain. Some banana may be substituted for plantain, as desired by farmer.[35] Within a year, the project may propose placing some yam along upper portions of these vegetative bands, where enough soil has accumulated and where a tree or plantain may serve as a climbing post.

(5) Following planting of the plantain/banana on entire hillside field, PADF will help these farmers obtain enough sugarcane to fill in the spaces between the plantain/banana plants, planted into the low contour dirt mounds.

(6) Farmers of these research/demonstration fields should be encouraged to plant any other long growing crop they wish along this vegetative barrier (integrated with sugarcane). Key plants we would recommend include coconut tree seedlings, castor beans - material which the project should supply initially for the trial treatment side of each of these demonstration fields. The coconut tree seedlings should become part of the nursery effort - but destined uniquely for these vegetative bands on the hillside fields - not elsewhere[36].

(7) Following planting of the sugarcane, the farmer should plant a row of sorghum along entire length of contour ridge, just below the sugar cane. This is easy to plant, is often planted anyway in some of these fields during the second season, and the farmer already uses this, at times, for forage[37]. The purpose of this sorghum will be principally for forage for the household animals, to cut-and-carry, and will be cut off at knee level when needed. It will not be uprooted, thus helping in establishing an initial live vegetative strip, running along side the plantain/sugarcane. As plantain and sugarcane grower larger, competition for sun/nutrients will diminish the need for the sorghum.

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[35] We have estimated that a field of this size (12/100 cx, or 1548 m^2, about 39 meters by 39 meters, if square), would require about 8 vegetative barriers along the contour (every 5 meters). This field would therefore require about 160 plantain/banana (20 per strip). Thirteen dozen banana plants would cost about 156 gourdes (cost is 12 gourdes/dozen), for preferred 'musquée' variety. PADF would have to invest about $32 for each of the 20 farmers for the cost of the plantain/banana. It is realistic to assume at least one bunch per year. At a low selling cost of 15 gourdes each (can often get more than double this), the farmer could potentially realize a return of as much as 2,400 gourdes the first year, and for several years after. Even half this amount would be a very significant increase in income for the farmers, which will have to be monitored carefully - probably put into livestock. Each year, each plant will produce new plants, which will be given, at no cost, to other member of the work group for their own fields, the following year.

[36] Coconut trees are found on many slopes up to an elevation of up to 600 meters. In areas like the Northwest, latanier palm can also serve the same purpose. The survey team has observed farmers actually using palm trees as living structures to hold in place 'rempe paille'.

[37] Guinea or guatemala grass would be alternatives to use, if the farmer really wishes to use it, and adequate supplies could be made available, by the project, to plant along all the areas needed.

(8) PADF should help farmers of each of these field obtain the rapid growth tree seedlings they need to plant a closely spaced wind barrier on that side of the field which farmers say most of the wind during the year can be expected to come. It is important that this windbreak be established soon after the completion of planting activities on the field, or before such activities start. Depending on the orientation of a field, wind may pose some problems initially. Short variety plantain/banana would be better in these locations.

(9) Farmer should be encouraged to create contour ridges between the vegetative barriers, and perhaps should be taken to Palmiste Avin to give a good example of traditional farmers creating such structures using their own labor work groups. The farmer will plant the crops they want between the vegetative barriers. They should be encouraged to plant pigeon pea, and to never completely remove the pigeon pea roots when final harvest is completed a year or more later (leaving cut stalks). Farmers should be encouraged to continually put brush, plant stalks, etc. against the developing vegetative barrier - on uphill side of plantain/banana/sugarcane, sorghum).

(10) Over the year, the farmer should be encouraged to plant some special trees into the vegetative barrier developing, like grafted fruit trees, or a few other valuable, slow growing trees like chêne or acajou. These vegetative barriers should come to be seen as semi-permanent structures on his field, both for soil conservation and for productivity increases. Within three or four years, the farmer may have to relocate his plantain/banana/sugar cane vegetative barrier halfway up and down his field, recycling this productive area into a production area for corn, beans, and manioc. (Where rock terraces are present, the vegetative material discussed here can be planted on the up-hill side of the rock walls. Where soils are sandy/gravelly, this should be done below the rock wall to prevent under-cutting.)

(11) It is not possible to foresee how farmers will adapt or modify these vegetative bands over time, therefore careful monitoring is important. It is difficult to foresee just how effective a soil conservation structure this will result in. It seems fairly certain that farmers will accord high importance to these vegetative bands and will provide some measure of protection to them. Because of the experimental nature of these recommendations (though actually no less experimental than what PADF is currently 'extending' in the region), it is important that the project monitor these fields, both for total inputs used (labor, other costs), and production (amounts and values, how used).

(12) In a program like this, it is certain that farmers outside the immediate group assisted will want to benefit too. We would recommend that PADF assist by encouraging farmers to use their own plantain/banana/sugarcane on as much of their fields as possible,

creating at least a few vegetative bands. PADF assistance should be limited to technical advice and help in obtaining tree seedlings and grafting. Project costs for the 20 demonstration fields would be below $1000/region ($680 for plantain and banana). Depending on resources, additional farmers could be assisted. A waiting period of a year is recommended, however, to evaluate impact of this theme on the production systems of the participating farmers.

(13) It is essential that the project **not** permit a massive data collection exercise to take place around this trial. It would be tempting to do so, but the project could never afford this. The whole purpose is to observe what the farmer actually does over time, on these plots. Once the trials are established, by the farmer, we would see two or three visits by technicians, each season, to the site, to observe and record what has happened. The farmer will be asked about only certain limited key information, including if any forage materials are being used from the vegetative bands for household pigs and cattle. The farmers will also be told that the project will need to know exactly how many bunches of plantain/banana come from the trial treatments, and about any other economic gain from materials from the vegetative barriers. Some socio-economic benchmark data should be obtained about these farmers, at the beginning, to monitor if any change can be attributed to trial themes (eg. # of animals, means of feeding them, use of hired labor, etc.). The survey team did not have the time to develop this part of the trial, but stress that data collection, though important and essential, must not become a burden.

APPENDIX 1: SPECIFIC FIELD INFORMATION

1.0 Bedoret/ Plaisance Area

Crop arrangement and spacing:
- maize planted at 80 x 80 cm. with 4 plants per hill (up to 10 seeds planted)
- bean density: 10 plants/m2
- pigeon pea: 1 plant every few maize hills

Yield Ratios:
- maize: 1:40-80 marmites
- beans: 1: 5 marmites
- pigeon pea: 1:60 godet (small metal cup)

Planting Rates for 1/4 cx. field (.32 ha.)
- maize: 1 marmite
- red beans: 7 marmites
- black beans: 2 marmites
- taro: 100 crowns

APPENDIX 2: SECID/PADF ON-FARM TRIAL PROTOCOL

0.0 Introduction

In spite of decades of attempts and millions of dollars spent on soil conservation efforts in Haiti by many different organizations, travel through regions of past efforts are usually very disappointing. Except for rock walls and terraces, which by their very nature are more permanent, very little remains; vegetative barriers have been removed (weeded out, burned, eaten up by animals). Even rock terraces have been knocked down by animals (and not repaired), or been completely taken away (for house construction material), or have filled up with sediment and no longer stop continuing soil loss over their tops. "Don't farmers care about what is happening or see the results?" one wonders. Why don't they do more to help themselves (at **least** taking care of structures which have been created "for them" - if they won't do it themselves? The reasons for this situation are very complex, with land tenure issues, labor availability (at key times), implementing program approach to farmers, and the farmer's production system organization all being key factors. Hillside farming systems are dynamic systems, always changing, and soil conservation measures must fit into this reality if they are to endure.

Soil conservation practices being extended by many programs in Haiti, including PADF and CARE, are not taking into consideration carefully enough existing farming systems or preferences of farmers on their hillside fields. Surveys are often performed but what is learned from farmers about their systems is frequently not applied to establishing program priorities. Land values to farmers depends on what that land is capable of growing. The kind of land which possesses the greatest value is land possessing productive long term vegetative potential (fruit trees, plantain, banana, etc.), or capable of growing high value crops (rice, taro). The greater the soil erosion problem, the less value this land will have (in purchase, renting, share-cropping). So farmers **clearly are interested in increasing the value of their land** - particularly if it is theirs.

1.0 A Unifying Theme

The SECID farmer needs assessment survey team has developed a series of recommendations for applied, on-farm, research/ demonstration trials for hillside fields with soil conservation as major objective linked to increasing agricultural productivity along the lines farmer most desire, with greatest potential for sustainability. The applied research trial in each region is developed around the concept of a theme which will unify/integrate a number of PLUS project key program interventions which the farmer needs assessment team have learned to be particularly significant

to farmers in the areas concerned[38]. We believe the basic outline of the following trial can be used in each of the three micro-watershed areas of all four of the PADF regions visited.

The basic orientation of the trials is that the vegetative barriers created, on farmers fields, must be made with crops the farmer already knows about, with crops of high economic and household consumption importance, and already cultivated on local hillside fields. Techniques proposed must be such as to be quickly grasped and understood by the farmer, something he can continue on his own without the "technical" help of project employees. Essentially, sugarcane and plantain/banana (with, at farmer's discretion, possibly other intermixed crops, such as castor bean, fruit trees, some gliricidia, palm trees, bamboo, etc.) are proposed as a means of creating contour vegetative bands against which "rempe paille" dead vegetative barriers will develop (with farmer's help) to stop soil loss and increase water infiltration; field plantain will be relocated to these barriers, further freeing land in-between barriers for other crops of the farmer's choice.

2.0 Time Frame

This trial should begin to be initiated during the month of August 1993 in all areas, if possible, or as soon after as possible, in order to provide the maximum time as possible to monitor and evaluate results. August is also one of months when farmers normally plant plantain and sugarcane. It will probably not be possible to immediately put all the elements of the trial into place, on all fields. This will depend on the particular cropping cycle in which a specific field will be in at the time of trial initiation. However, it should be possible to move most of the trial elements into place in the next couple months. Otherwise, vegetative barrier creation activities could not begin until March/April when good rains resume.

3.0 Who Will Implement this Trial

It is proposed that trail efforts be led by one SECID researcher assigned to one of each of the four PADF regions, who will work in collaboration with PADF local agronomists, field technicians, extensionists, and M/E personnel to implement the field activity[39]. This will help develop a PLUS project team approach to an important unifying theme in each region.

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[38] And which, under current program implementation, are not being approached in any systematic, unified approach.

[39] The CARE Northwest Region, would be require the leadership of a fifth SECID staff member to lead the research/demonstration trial program in that area - around the theme of the Bio-Intensive Gardens. The five SECID researchers who could lead such programs are: Dr. Frank Brockman, Dr. Zach Lea, Agronomist Yves Jean, Agro-economist Roosevelt St. Dic, and Animal Production Technician William Gustave.

4.0 Approach

This will be an on-farm, farmer managed trial (not researcher managed - in that project technicians do the work). Project field extensionists will identify at least 20 farmers who have fields within the micro-watershed area on slopes of **at least 30% slope.** The greater the slope, the better. The fields should be at least 12/100 cx. in size[40]. The fields should preferably be outright owned by the farmer, or, if sharecropped, with a clear agreement between sharecropper and owner about the type of crops to be placed on the field, if rented, likewise a clear agreement on number of years the renter has access to this field (at least 3-4 years).

The field could be a new one in which, this August, the farmer has recently completely cleared, and is in process of placing plantain in different parts of the field, planning to plant corn, beans, or sorghum. Or the field can be an already long-established one, in which may be located (by not necessarily) clumps of plantain on different parts of the field.

Extensionists and program technicians should visit these fields to verify their size and appropriateness before going into any details with the concerned farmer. These fields may very well have benefitted from some soil conservation measure with PADF (rock terraces, modified "rempe paille" with possible leucaena and/or some sugar cane. If appropriate, the field agronomist and/or SECID trial leader should meet with the farmers and verify their willingness to collaborate with the project on these special sites over a period of possibly several years, particularly being willing to provide information on the off-take and use of all products from this particular field (amounts, use for household and animal consumption and sale, etc.). The farmer will be willing to rearrange the crop placement (ie. plantain) of part of his field (actually doing this is part of what is being tested), and implement recommendations from the program technicians, as a applied research trial. The farmer must be willing to use his own plant material in the field trial, to extent that it is available. If not available, the project will furnish the material[41]. The farmer **must realize that the project wants to learn with him** the results of this effort. The trial theme is not being extended in this region, it is being tested as an approach for farmer evaluation. If the farmer likes the results, he is free to extend it to other parts of his field, other fields, as he wishes.

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[40] A 12/100 cx field equals 0.15 hectare or 1548 square meters. A square field of this size would measure about 40 meters/side. Hillside fields tend to be longer (top to bottom) than they are wide (left to right). Fields of at least this size are very easy to find. For calculation purposes, half this size field should be used for estimating plant material needed for the proposed treatment side of the field.

[41] However, it is considered very important that the farmer's own plant material be used, either from the field itself, or from one of his 4-7 other fields located elsewhere in the area. The farmer must be permitted to put the varieties he believe would grow best on this field.

5.0 Steps

(1) The left side of every field will be used for the trial theme treatment to be tested. This treatment will be about 400 m^2 [42] with the right side of the field used as the control treatment. However, it is important that the vegetative barriers start at the top of the field and extend to the bottom[43]. It should be at least 10 meters wide, but not cover more than 1/2 of the field. The farmer must be permitted to do <u>whatever</u> he wishes to do on the control side - even if he decides to eventually extend the trial theme to this side at some future time. It is important to describe the state of the control side of each farmer's field, once the trial theme has been established. The trial theme area should extend from top to bottom on this left side.

(2) This trial is not looking at leucaena as a hedgerow, so if the field already has significant growth of leucaena, it should <u>not</u> be used for this trial[44]. However, if modified "rempe paille" or just "rempe paille" already exist, or rock terraces, this is acceptable. If they do not exist, they will not be purposely created for this trial. In those fields where farmers have created contour ridges, as part of their traditional activities (eg. Palmiste Avin), these ridges will be important for this trial.

(3) Unless "rempe paille" or contour canals already exist in the field, extensionists should help farmers place stakes across the contour, as being currently practiced, within <u>only the part of field to be used for trial.</u>[45] We would encourage use of "bois repousse" (stakes which will take root) exclusively for such stakes, using preferably gliricidia or manioc[46].

(4) The farmer will now be asked to plant one plantain every two meters across the trial plot area, with at least 6 meters between vegetative barriers[47]. It is important that the entire area be

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[42] No effort should be made to make it square (20X20) or rectangular (10X40), but to simply follow the natural shape of the field, beginning at the top, and extending down as appropriate to the vegetative material available (for at least 400 m2). We would estimate, for this, a minimum of 30 plantain plants and the cane to go between them.

[43] If in some cases this would make the trial area too large, then start at the top and move down.

[44] It may be used for a trial where the effects of leucaena on soil conservation are being tested.

[45] If the farmer wishes to complete this work across the rest of his field himself, he should do this with his own efforts, but not with extension agent assistance.

[46] We have seen farmers using manioc to hold up "rempe paille" in just this way. Furthermore, we expect that by the time the manioc is harvested, it will have served its purpose.

[47] Many farmers will believe this is too close, not being used to this arrangement. Based on observations in the field, we do not think this is too close, or that there will be any problem with the sugarcane. We have observed many instances of sugarcane/plantain, on steep slopes, closely associated. Clearly the sugarcane, over time, may be dominated by the more slow growing plantain. This will not harm the essential purpose of the

established during the same time in August/September. This plantain should come from young plants growing within the clumps of already existing plantain in the garden, or elsewhere.

One innovative approach of this trial will be to eventually remove all plantain clumps which may exist in areas other than along the vegetative barriers being created. The way plantain is currently planted (scattered clumps) will be rearranged into rows, much in the same way that farmers, who had rocks piled up in their fields were asked to rearrange these into rows[48]. The larger, already existing, plantain plants will eventually produce their crop and be cut down. The clump should be destroyed over a 6-9 month period, leaving the entire area between vegetative bands for cultivation of whatever the farmer wants (corn, sorghum, sweet potato, taro, pigeon pea, etc.). Because plantain on hillside fields is often left in the field for 7-10 years, and longer, this crop has the potential to provide a long lasting barrier against soil loss, while contributing to the continuing productivity within this field, a goal as important as increasing productivity, which is also expected to take place where soil accumulation takes place[49].

(5) Following planting of the plantain, sugarcane should be planted along the same row (if not already planted into a modified "rempe paille" by earlier project efforts), so that a solid line of cane will develop between the plantain plants.

(6) The project should also encourage the farmer, at this point, to also plant any young fruit tree seedlings he may have or castor bean seed or pineapple (project supplied), or any other long cycle plant (eg. bamboo, young palm tree seedlings, etc.) at whatever interval he wishes along this same line between the young plantain plants.

(7) Farmer should, from the very beginning, be encouraged to place dead vegetative material on the up-hill side of the plantain and (soon to develop) sugarcane line. Such material will become more abundant as the plantain become bigger and are eventually cut and laid along side the strip, as sorghum and corn stalks are

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vegetative barrier which is to create the barrier itself with productive material. Other trials may consider use of sugarcane alone as a potential vegetative barrier. However we believe the plantain in this association (with malanga above eventually in some places), will be the most economically interesting to farmers. Farmers, themselves, will ultimately select/reject the material they want for such barriers, if they accept them at all over the long term.

[48] This is also one of techniques we recommend for establishing vegetative barriers in the CARE Northwest Region, where many farmers already grow clumps of guinea grass in their fields for livestock forage.

[49] According to farmers, the best variety to use on slopes, and one which is left in field for long periods of time is the Vincent (Matintin) variety of plantain. It can be seriously damaged from marocha. The Mustique variety of plantain brings a higher price, is less susceptible to marocha attack, but does not stay in field as long, and requires better soils, and better preparation of the hole (with organic fertilizer) at time of planting.

harvested, etc. This dried vegetative material will be held in place by the living 'stakes' of plantain, sugarcane (castor bean), which will actually hold soil on the slopes. Over time, terraces will develop in front of them. This same system can be used in the case where rock terraces exist, with plantain/cane on the up-hill side of the rock walls[50].

(8) Farmers should be encouraged to plant taro on the up-hill side of the plantain/cane barrier, but not as part of the barrier itself.

(9) For project supplied plant materials, disease resistant plant material (ie. against charbon for cane, against marocha for plantain) should be used if possible, and if farmer really wants it. The project must be prepared to help farmers respond to disease problems on these fields, if they should appear, with the proper products.

(10) Because this is a research/demonstration trial, the project cannot foresee all possible consequences of this activity on farmer fields. It must be closely monitored. Unforeseen problems will most certainly come up, to which the program must respond appropriately in finding a solution, if technically possible. For instance, plantain planted in a vegetative strip like this will eventually (in 1-2 years) grow together. While the vegetative barrier must be maintained, farmers must be encouraged to remove plants expanding up and down into the food grain production areas of the field. Also marocha disease problems could spread much more quickly under these conditions, so it is important to help farmers be prepared for controlling this, at first appearance. These costs, however, will be worthwhile, if the ultimate result is a field cropping system which will at the same time produce high value crops and provide the barriers needed to reduce soil erosion and increase water infiltration into the hillside soils.

(11) Finally, it must be recognized that the biological systems on these fields are dynamic ones and that farmers are going to, at one point or another, want to remove this barrier[51]. From the very beginning, farmers must be encouraged to be thinking about moving this vegetative barrier half way up or down their field, and using the years of accumulated organic material of the newly built terrace area for production of corn, beans, manioc, sorghum, pigeon pea.

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[50] In some cases observed by the team, rock terraces which have been created on steep slopes are in danger of being undercut from the water flowing through them from slopes above (these terraces did not have any vegetative barrier, as we are proposing). In these cases, besides establishing the vegetative barrier proposed, it would be wise to plant some cane along bottom of rocks to help provide support.

[51] If the barrier were uniquely sugarcane, this would be necessary after 6-7 years to maintain any kind of production capacity. While less essential perhaps for the plantain (Vincent), such movement permits other crops to take advantage of the increased fertility of these soils - while permitting other areas of the field to, in their turn, also be upgraded.

APPENDIX 3: PHOTOGRAPHIC OVERVIEW OF SITES VISITED

1A: Bedoret/Plaisance. June. Modified 'rempe paille' across this field of corn and beans. Dead vegetative matter is held in place by short stakes and covered with dirt.

1B. Bedoret. Close-up of modified 'rempe paille'.

1C. Bedoret. Mountain rice in association with taro yam, plantain, corn, and beans - on slope.

1A: Bedoret/Plaisance. June. Mountain rice, in association with corn, located at summit of mountain, surrounded by sugarcane. Note bare top of mountain in background, used for pasture this season.

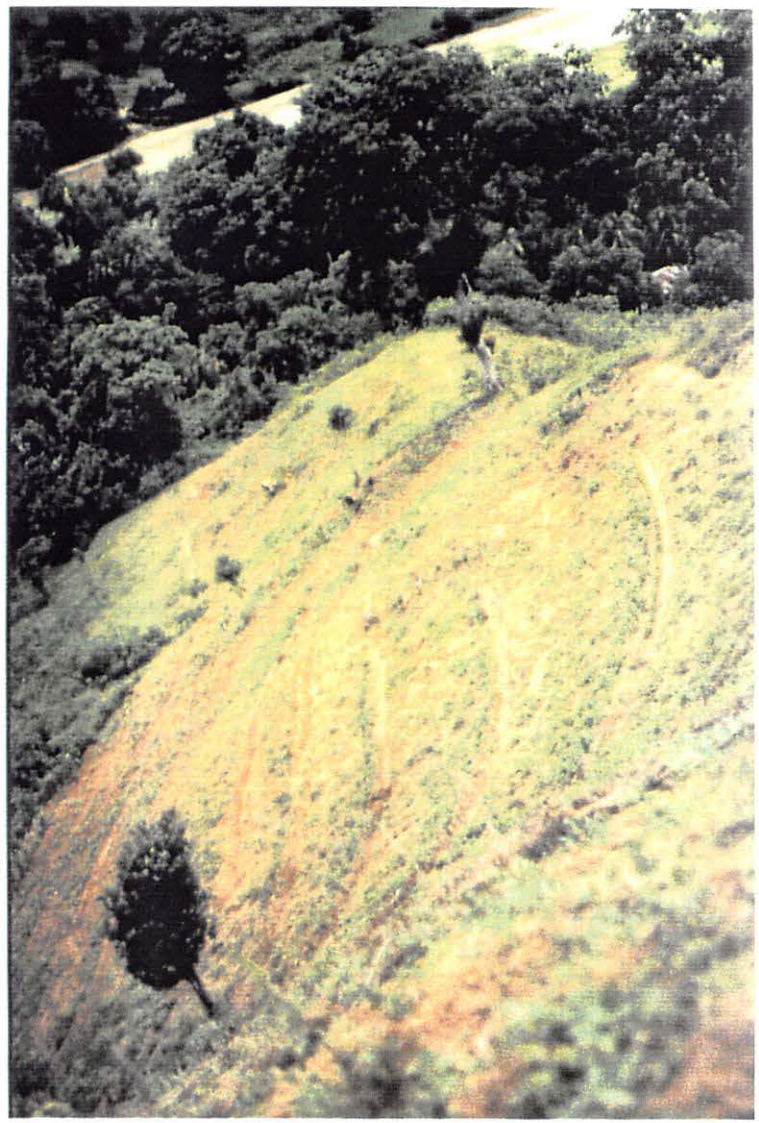
1B. Bedoret. Dead vegetative barrier in gully, held in place by large stakes. Usually stakes with ability to resprout are used in such locations. Taro, yam, plantain are growing both above and below this structure.

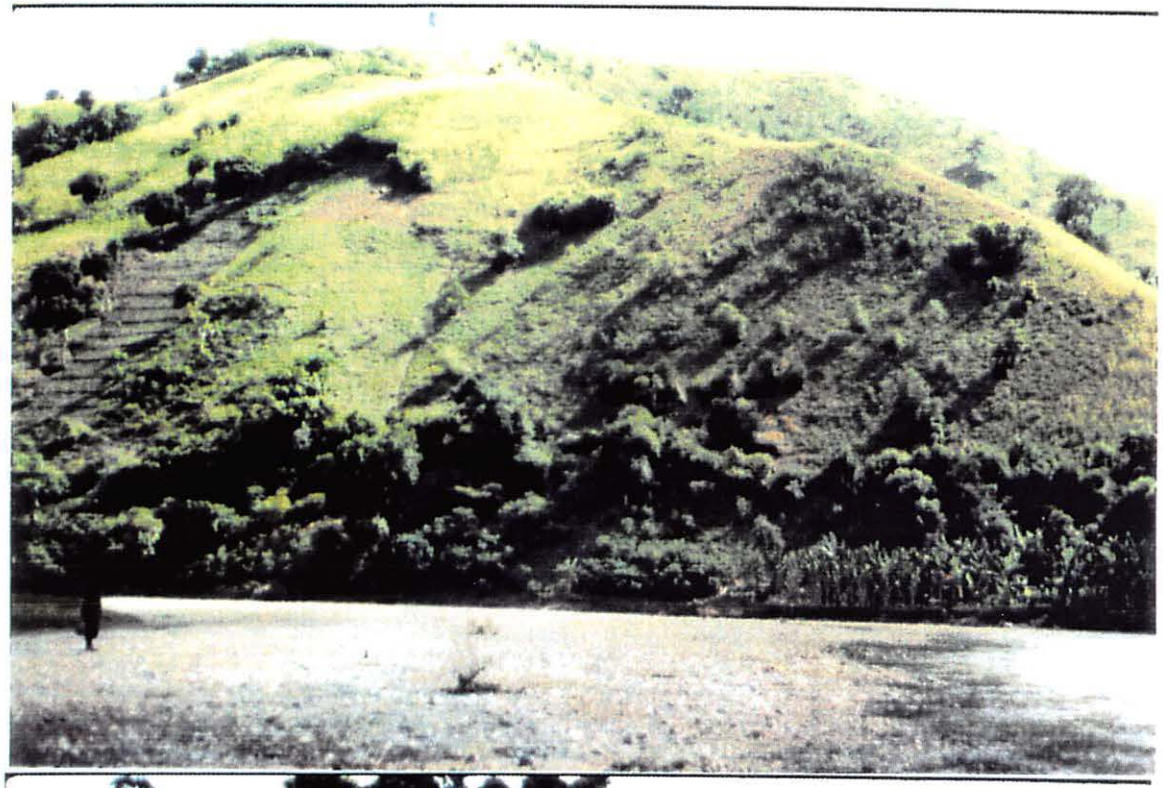
1C. Bedoret. Basket making with fronds on royal palm. Structure behind chair is wall of this man's house, not yet covered with mud finish.

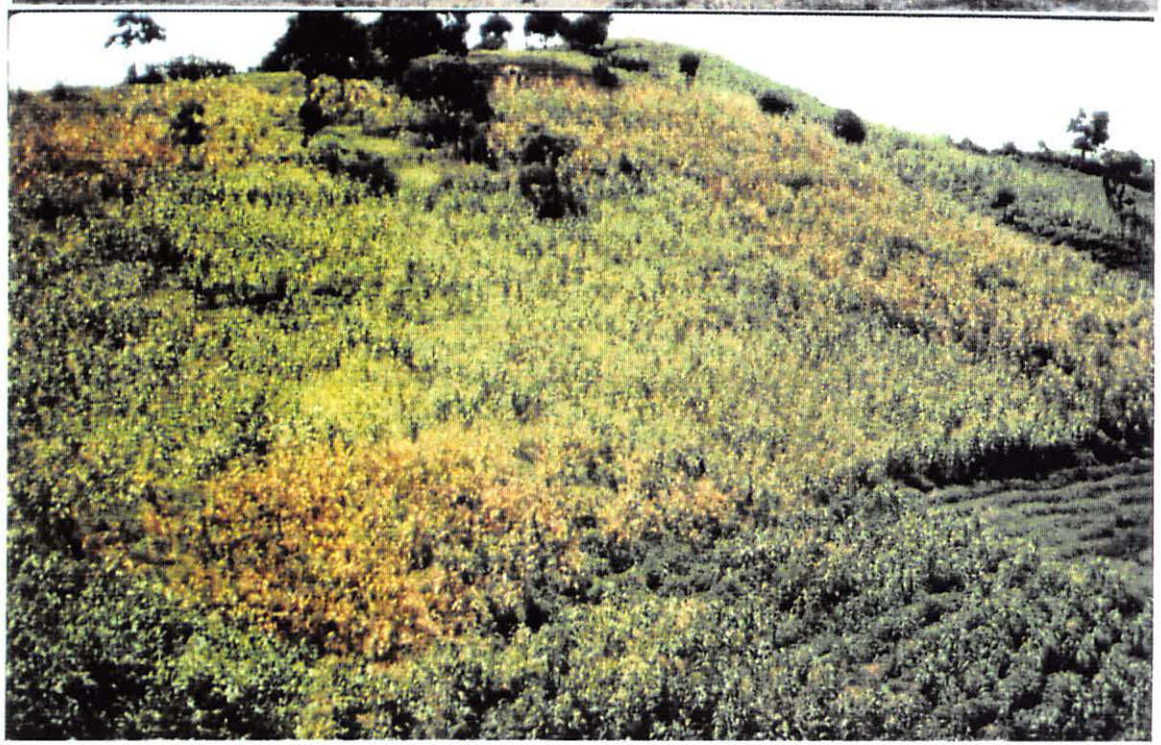
3A: Grande-Riviere, June 1993. View of one portion of the micro-watershed. Homesteads are located in lower parts of the watershed, among trees. The entire mountain side has been under cultivation. PADF assisted leucaena hedgerows can be seen upon distant slopes.

3B: Gully plugs, made by weaving branches of vegetation together, and held in place by driving stakes into the ground. We observed many such structures which had been entirely filled with soil after only a few rains, with future soils/water continuing to flow over these structures. As seen here, plantain are often quickly planted into such spots, which will eventually help to provide some additional protection to the slope.

3C: This steep slope in Grande-Riviere has recently received shallow contour ditches into which has been planted leucaena. The slope here exceeds 70%. In the background can be seen the Grande-Riviere itself, a river which is crossed by foot most of the year to reach the main road leading to Cape Haitian. People live in the denser vegetation between the foot of the mountain and the river.



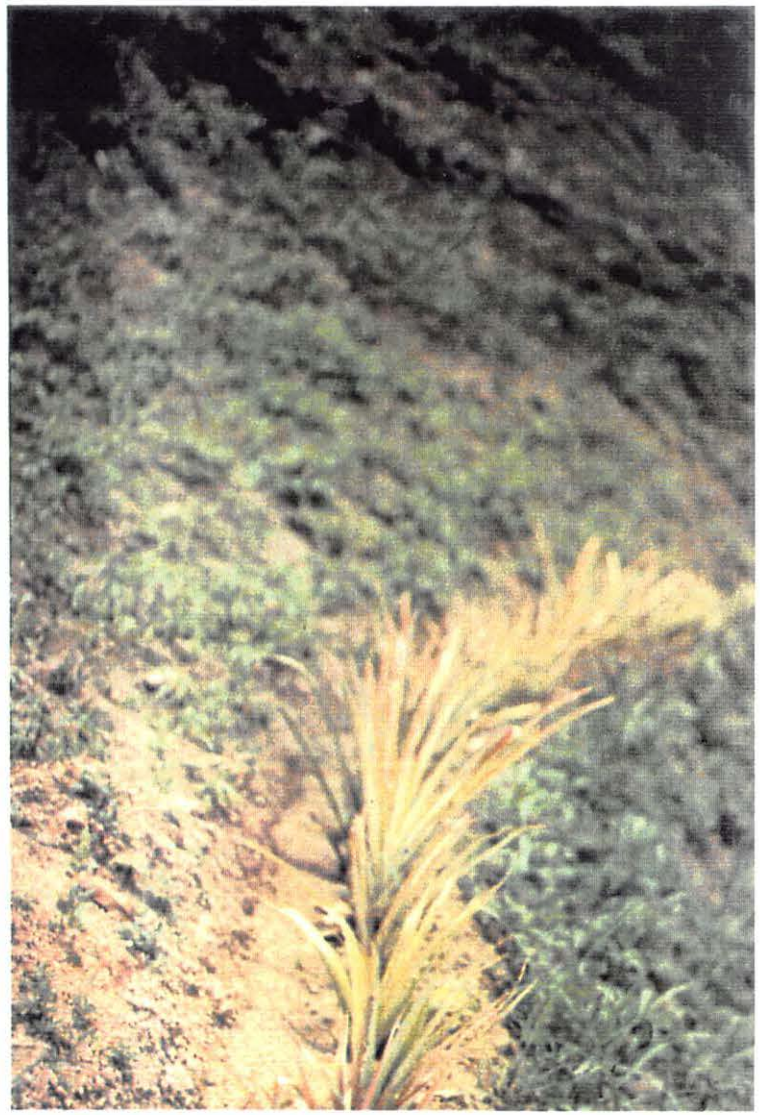




4A: Grande-Riviere, June 1993. View of one portion of the micro-watershed, seen from the riverbed which delineates the southern border. To the lower right a small plain broadens between the river and foot of mountain, dense with plantain, banana, coffee and mango trees, breadfruit, etc.

4B: Dondon, June 1993. This densely cultivated area (corn, beans, sweet potato, some intercropped sorghum, has high agricultural potential. Sugarcane is grown in many locations and may become an important component for hedgerows on such hillsides. Contour ridges of sweet potato may be seen at lower right. In upper portions of the watershed, trees are almost entirely absent - having been chopped down for charcoal and the cash it represents.

4C: PADF has introduced pineapple as an alternative choice for the establishment of a hedgerows for some farmers in this region. Shallow contour ditches (sometimes with modified "rempe paille" dead vegetative material, are constructed, with the pineapple planted in shallow ditch on up-hill side. This shallow ditch quickly fills up with sediment from the upper slope.



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