

HAITI PRODUCTIVE LAND USE SYSTEMS PROJECT

SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

AND

AUBURN UNIVERSITY

OCTOBER 1993

This work was performed under USAID Contract No. 521-0217-C-0004-00. The views expressed herein are the views of the contractor and not necessarily those of the U.S. Agency for International Development.

**FARMER NEEDS ASSESSMENT EXPLORATORY SURVEYS:
PADF MIREBALAIS REGION 3**

by

Richard A. Swanson

William Gustave

Yves Jean

Roosevelt Saint-Dic

SECID/Auburn PLUS Report No. 12

Seau d'Eau

Wanni

Lonsi

August 2-16, 1993

FORWARD

This report covers the fourth of five 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 Roosevelt St. Dic and 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 Plateau Central, 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 also 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 the survey areas 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 Plateau Central.

Dennis A. Shannon
Campus Coordinator
Auburn University

ACKNOWLEDGEMENTS

SECID/PLUS Project Team in PADF Region 3, Central Plateau
Joannas Gue, Agronomist and Central Plateau Team Leader
Sergot Labranche, M/E Technician for Region 3

St.Jean/Seau D'Eau
Jean Charles Joseph, PADF technician over extensionists
Carichon Emmanuel, PADF technician over local extensionists

Wanni
Dronette Louitesse, PADF technician over local extensionists

Lonsi/Lascahobas:
Charlot Bredy, Agronomist, Responsible for Lascahobas area
Elisea Luckner, PADF technician over local extensionists

In this region, only the M/E technician, Sergot Labranche, accompanied us to the field and joined one of the groups interviewing farmers. Local technicians and extensionists also accompanied us within the site.

TABLE OF CONTENTS

| | | |
|---------|---|----|
| 0.0 | Introduction | 1 |
| 0.1 | Objectives | 2 |
| 0.2 | Schedule and Multi-Disciplinary Survey Team | 3 |
| 0.3 | Methodology | 4 |
| 0.3.1 | PLUS Project Potential Interventions List | 4 |
| 0.3.2 | Questionnaire Formats | 5 |
| 0.3.3 | Persons/Groups Interviewed | 5 |
| 0.3.4 | Survey Team Information Sharing | 7 |
| | | |
| 1.0 | General Description of Micro-Watersheds | 8 |
| 1.1 | St. Jean/Seau d'Eau Area | 9 |
| 1.2 | Wanni Area | 11 |
| 1.3 | Lonsi/Lascahobas Area | 12 |
| | | |
| 2.0 | General Description of the Farming System | 14 |
| 2.1 | Crops | 14 |
| 2.1.1 | Crop Varieties and Preferences | 14 |
| 2.1.2 | Crop Associations | 17 |
| | | |
| 2.2 | Crop Management | 19 |
| 2.2.1 | Land preparation | 19 |
| 2.2.2 | Cropping calendar | 20 |
| 2.2.3 | Crop Rotation and Fallow | 25 |
| 2.2.4 | Yield of Principal Crop | 25 |
| 2.2.5 | Sources for Planting Seed | 26 |
| | | |
| 2.3 | Crop Management and Soil Conservation | 26 |
| 2.3.1 | Soil Conservation Activities Observed | 28 |
| | | |
| 2.4 | Crop Marketing and Transformation | 33 |
| 2.4.1 | Prices | 33 |
| 2.4.2 | Transformation: Sugarcane Agri-Business | 35 |
| 2.4.2.1 | Generalities | 37 |
| 2.4.2.2 | Marketing | 37 |
| 2.4.2.3 | Productivity and Utilization Rate | 38 |
| 2.4.2.4 | Prices | 39 |
| 2.4.2.5 | Major Constraints Impeding Expansion of Sugarcane Agribusiness | 39 |
| 2.4.2.6 | Financial Aspects | 40 |
| 2.4.3 | Marketing System: Profitability and Major Constraints | 42 |
| | | |
| 2.5 | Livestock Production | 45 |
| 2.5.1 | Types of animals owned, nature, reasons for ownership | 45 |
| 2.5.2 | Feed and seasonal availability | 45 |
| 2.5.3 | Health and Care | 47 |
| 2.5.4 | Reproduction | 47 |
| 2.5.5 | Animal Products | 48 |
| 2.5.6 | Markets and Consumption | 49 |

| | | |
|-------|--|----|
| 2.6 | The Land | 51 |
| 2.6.1 | Land Tenure | 51 |
| 2.6.2 | Land Values | 52 |
| 2.7 | Labor | 53 |
| 2.7.1 | Traditional Forms of Organizing Group Labor | 53 |
| 2.7.2 | Principal Activities for Group Labor . . . | 55 |
| 2.7.3 | Methods of Paying for Labor and Costs . . . | 55 |
| 3.0 | Already Existing Farmer Opportunities | 55 |
| 3.1 | The Cropping System | 55 |
| 3.2 | Livestock | 55 |
| 3.3 | Other Current Sources of Revenues | 56 |
| 4.0 | Major Constraints and Possibilities Solutions | 56 |
| 4.1 | Increased Production of Principal Crops | 56 |
| 4.2 | Farmer Strategies to Resolve these Constraints . . . | 57 |
| 4.3 | Animal Production Constraints | 58 |
| 5.0 | Recommendations for Program Interventions/Potential Technologies To Implement | 60 |
| 5.1 | For PLUS Project | 60 |
| 5.1.1 | Labor Organization to Accomplish Program Activities | 60 |
| 5.1.2 | Soil Conservation Work on ShareCropped and Rented Fields | 61 |
| 5.1.3 | On-Farm Research/Demonstration Fields . . . | 61 |
| 5.1.4 | Location of PADF Focus in Region M/E Watersheds | 62 |
| 5.1.5 | Farmers and PADF Interventions | 63 |
| 5.1.6 | Specific Actions Which Might be Taken . . . | 64 |
| 5.2 | Other Potential Programs (for Other Projects) . . . | 66 |
| 5.2.1 | Small Agri-business | 66 |
| 5.2.2 | Irrigation | 67 |
| 5.2.3 | Pest Control | 67 |
| 5.2.4 | Working Capital | 68 |
| 5.2.5 | Recommendations for Animal Production . . . | 68 |
| 5.3 | A Unifying Theme for PADF Watersheds in Mirebalais | 68 |

APPENDICES

| | | |
|-------------|---|----|
| Appendix 1: | Crop Associations and Frequencies | 73 |
| Appendix 2: | SECID/PADF On-Farm Trial | 75 |
| Appendix 3: | Photographic Overview of Survey Sites | 81 |

LIST OF TABLES

| | | |
|-----------|--|----|
| Table 1: | Comparative Indicators by Watershed | 8 |
| Table 2: | Most Observed Crop in Fields | 14 |
| Table 3A: | Crop Varieties and Preferences (Seau d'Eau) | 15 |
| Table 3B: | Crop Varieties and Preferences (Wanni) | 16 |
| Table 3C: | Crop Varieties and Preferences (Lonsi) | 17 |
| Table 4: | Cropping Associations & Time Land is Under Crop Cover, Where Frequently Found | 18 |
| Table 5: | Number of Cultivated Crops Associated and Number of Fields Seen | 19 |
| Table 6A: | Cropping Calendar, Seau D'Eau | 20 |
| Table 6B: | Cropping Calendar, Wanni | 21 |
| Table 6C: | Cropping Calendar, Lonsi | 21 |
| Table 7: | Crop Rotation and Fallow | 25 |
| Table 8: | Yield of Principal Crops | 26 |
| Table 9: | Hillside Conservation Measures, Crop Placement | 28 |
| Table 10: | Crop Prices | 33 |
| Table 11: | Prices Variations Rate: Classification of Crops | 35 |
| Table 12: | Numbers of Farmers and Area Serviced by Some Sugar Mills | 38 |
| Table 13: | Profitability of Cane Transformation | 41 |
| Table 14: | Profitability of Marketing Agricultural Products | 43 |
| Table 15: | Feed availability for Herbivorous at St-Jean, Wanni and Lonsi | 46 |
| Table 16: | Feed availability for pigs at St-Jean, Wanni and Lonsi | 46 |
| Table 17: | Reproduction parameters for livestock at St-Jean, Wanni and Lonsi | 48 |
| Table 18: | Animal Prices at Saint-Jean, Wanni and Lonsi | 50 |
| Table 19: | Conditions to Breed an animal at St-Jean, Wanni and Lonsi | 50 |
| Table 20: | Land Values | 53 |
| Table 21: | Major Constraints | 57 |
| Table 22: | Unifying Theme | 70 |
| Table A1: | Crop Associations and Frequencies | 71 |

LIST OF FIGURES

| | | |
|-----------|---|----|
| Figure 1: | Rainfall Map of Haiti | 23 |
| Figure 2: | Long Term Rainfall: Mirebalais and Lascahobas | 24 |

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 agroforestry activity directed to small-scale, hill-side farmers (Agroforestry Outreach Project and Agroforestry 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 had planned the acquisition of other significant survey information and some of this work was 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 2km² 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. A review by our team of initial reports completed by PADF staff for the Cap Haitien and Les Cayes area was found to provide a good introduction to the zone upon which we could build. The availability of this information enabled us to spend more of our time in in-depth discussions with selected farmers and groups concerning the opportunities and constraints for development in these areas. Without such information, we would have needed to obtain some of it ourselves 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 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 of the farmer needs assessment survey objectives 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 #2, Site 1 (Palmiste Avin) |
| June 7,8,9 | PADF Cap Haitien Region #4, Site 1 (Plaisance) |
| June 10,11,12 | PADF Cap Haitien Region #4, Site 2 (Grande Rivière du Nord) |
| June 14,15,16 | PADF Cap Haitien Region #4, 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 #2, Berry, Site 2 |
| July 22, 23, 24 | PADF Jacmel Zone #2, Tilier/Mondésir, Site 3 |
| July 25-31 | Write-up of Region #2 |
| Aug.2,3,4 | PADF Mirebelais Region #3, Seau d'Eau, Site 1 |
| Aug.5,6,7 | PADF Mirebelais Region #3, Wann, Site 2 |
| Aug.9,10 | PADF Mirebelais Region #3, Lonsi, 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 #1, Gaeta/Vachon, Site 1 |
| Aug. 21,23,24 | PADF Les Cayes Region #1, Picot/Raymond, Site 2 |
| Aug. 25,26 | PADF Les Cayes Region #1, Banatte, Site 3 |
| Aug. 27 | AID Debriefing (Will provide copies of first 4 <u>draft</u> 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 Region #1 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
University of Arkansas at Fayetteville, (26/5 - 4/8)
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/ Auburn University Campus Coordinator for two days during the initial week in Palmiste Avin.

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 being 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 focused "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) Hedgerows (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
- (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 a 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 and 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

Question 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 would 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 should be interviewed. 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) Meet with as many other individual farmers, on their fields, as possible, who have had past experience with soil conservation interventions. Go and 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 km², 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. In the field, the team, after an initial orientation, would split up into three or four teams, taking along an extensionist as guide, and a PADF technician or M/E person, if present.

At each field site, the team initially met with individual farmers pre-selected by PADF/CARE. Selection was based as much as possible on their being considered progressive farmers in the site area; farmers who are considered innovators, 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. It was considered preferable that these interviews held initially at the farmer's residence to permit the team to observe the "material" well-being of the farmer, in relationship to others in the area, and to permit some discussion with female members of the household. 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 was 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.

Farmers in the area of the field site who had experience with past program interventions (similar to those listed above), or who had on their own practiced any interventions of this nature were identified early on in the site visit. Plans were made to visit with them at the fields concerned during the survey visit 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 back 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 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 in each field site, a rough draft of the report for each zone was completed.

1.0 General Description of Micro-Watersheds

TABLE 1: COMPARATIVE INDICATORS BY WATERSHED

| ITEM \ AREA | St.Jean/Seau D'Eau | Wanni | Lonsi/Lascahobas |
|--|--|--|--|
| Department Arrondissement Commune Section Communale | Centre Mirebalais Seau d'Eau Seau d'Eau | Centre Mirebalais Mirebalais Sarazen, SC #6 | Centre Lascahobas Lascahobas Petit Fond, SC #1 |
| Resident Households | 211 ² | 166 | 343 |
| Persons/Household | 7-8 | 7-8 | Large families, 8-9 |
| Elevation (meters) | 200 - 250 | 140 - 410 | 170 - 330 |
| Rainfall (mm) | 2,624 ³ | 2,624 | 2,033 |
| Soil Characteristics | Heavy, black clay soils, with rocks on many fields. | Heavy, black clay soils, with rocks on many fields | Heavy, black clay soils, with rocks on many fields |
| Erosion | Moderate | Moderate, except NE exposure fields | Moderate, except NE exposure fields |
| Depth | Deep | Deep | Deep |
| Cultivated Slopes | most less than 40% | 40% - 50%, many 60% - 90% | 30%-40%; many 50%-70% |
| Land tenure | 70% directly owned; 12% sharecropping; 6% renting; 6% undivided family ⁴ | 67.6% private; 24.6% rented; 7.8% sharecropped ⁵ | Same as Wanni |
| Land value (.32ha, 1/4 cx) | \$800-\$1,400 (cane, plantain possible) ⁶ | \$120 -\$150 for undeveloped hillside land; \$600 for valley land | \$100, little slope; \$200 for level rice/plantain land. |
| Land rent (.32ha, 1/4 cx) | NA | \$40-\$50/year for valley rice land | Péligre Dam nearby, with electricity - Lascahobas |
| Pressure on Hillside Land | Strong, most land owned by large holders | Not bad, much fallow, but much land owned by large holders | Not bad, much fallow, considerable cultivated state land |

² PADF local field staff provided the numbers for these households, based on the census done on fields within the M/E area.

³ Source: Mission d'Assistance Technique Intégré, OEA, 1972. Figure here used is for Mirebalais, only 11 miles away.

⁴ Source: ADS-II Summary Report, 1988:20. Our survey shows even more sharecropping (up to 78% of cultivated land), much less directly owned fields (15%). PADF estimates for the region as a whole are 67.6 % owned land (including undivided inheritance), 7.8 % sharecropping, 24.6% renting. The renting seems high, and sharecropping much too low.

⁵ Source: PADF Regional office in Mirebalais.

⁶ Lower value for hillsides, higher value for flat areas with existing plantain, sugarcane, fruit trees.

| | | | |
|----------------------------------|---|--|----------------------------------|
| Daily Labor Rate ⁷ | 5-7 gourdes.All day:10 | 5 gourdes. All day 10 gde. | 6 - 11 gourdes |
| Important Infrastructure in Area | Major tourist town; road access to PAP | Road assess to PAP and Lascahobas, elementary school | Road access to PAP |
| Key Sources of Income | Sugarcane, Beans, Annual July festival, Livestock | Sugarcane, Taro, Plantain, Livestock, Beans | Taro, Plantain, Beans, Sugarcane |
| Key Consumption | Corn, sorghum, plantain | sorghum, plantain, taro | Plantain, sorghum, corn |
| Key Livestock | Cattle, Mules, Pigs | Cattle, Mules, Pigs | Cattle, Mules, Pigs |
| Handy craft | Nothing evident | Nothing evident | Nothing evident |

1.1 St. Jean/Seau d'Eau Area

Located over what is now a very rough road 11 miles from Mirebalais, Seau d'Eau is an important religious holiday center for many people in the region, many coming from as far away as Port-au-Prince during the month of July. Many wealthy Haitians have built beautiful villas in and around Seau d'Eau (locked up most of the year) and large tracks of land are owned by some of these families. One informant said 6 large families owned most of land in micro-watershed area, with much of sharecropping taking place⁸. Poorer members of these land-owning families tend the land as caretakers/managers. Seau d'Eau is located in a high rainfall area of Haiti, with long term rainfall of about 2,600 mm. year (cf. Figures 1,2). Many springs and streams run through this beautiful mountainous area, with many irrigation possibilities exploited in traditional ways by the local farmers. The St.Jean micro-watershed selected by PADF for M/E purposes includes part of the town of Seau d'Eau and covers much of watershed system just south of the town (slopes facing north, east, and south) (cf. Photos in Appendix 3). Most of the farmers exploiting the watershed appear to live in the town of Seau d'Eau.

Sugarcane is a very important crop cultivated in all the fairly flat basin areas, and on many hillsides, with some 5 sugarcane processing mills creating "rapadou" (raw sugar). The existence of such mills, requiring the use of a pair of bulls to drive the cane crusher, has resulted in the presence of many bulls in this region (also other two sites visited), something the survey

⁷ For 5-6 hours a day. Food is always provided (a breakfast with coffee/biscuits, and lunch (rice or corn and beans).

⁸ One lives in the United States, two in Port-au-Prince.

team has not seen in other areas visited⁹. Corn, rice, and sorghum are also important crops of the area. PADF activities in vegetable gardening and fruit tree grafting are certainly welcome activities. Many fields on the eastern facing slopes have numerous rocks scattered over their surface, while those with western and southern exposures have few if any. Both rock terraces and vegetative barriers are therefore major activities of the PLUS project in this region.

Much of the land within this zone, including the M/E site, is owned by large family groups, who have not permitted the land to be sub-divided into completely owned sub-parcels of family members. This means family members may use the land, sometimes over long periods of time, but they do not have permanent right to the land. Daily labor rates are almost double that in other areas visited, reflecting the difficulty of finding "cheap" labor. Because so much of the land is owned by large holders, sharecropping is very widespread, with some renting - cultivating all the major short season crops (corn, sorghum, rice, beans). Sharecroppers give the owner 2/5 of the produce of the field, keeping for themselves 3/5. We did not learn of any State land in this immediate area. Land owning farmers in the area make considerable use of day labor, using groups they call the "mera", which can vary in size from 10 to 30 people and more. They will receive the going daily rate of 7 gourdes plus 2 meals. The team did not meet many farmers here who collaborated through an "associé" relationship, whereby several farmers would band to work together, today on my field, tomorrow on his, etc., with the day's host providing some food for the days work to the others (no money).

Because of the land tenure constraints and land value appreciation in this area, PADF has had great difficulty in organizing groups of farmers to perform soil conservation measures on their fields. PADF works through a locally organized PVO called the Conseil pour le Développement Agricole Intégré de Sodo (CODAIS), and have hired 23 extensionists. Each extensionist is responsible for between 15 - 20 farmers, and to develop a tree nursery of 75 plants per farmer (which is often aggregated among farmers to making watering and care easier). Since March/April, these extensionists have achieved over 2000 meters of vegetative barriers and 3000 meters of rock terraces, besides their other activities¹⁰. The rock terrace work observed, in particular, seemed very well done, and represented enormous amounts of heavy

⁹ In other areas, bulls are sold off fairly quickly to the meat market, with only the female animals kept for producing young and milk for household needs.

¹⁰ Each PADF headquarters office shows a blackboard with planned target activities for area for each month of the 1993 year. Activities included construction of rock terraces, vegetative contour strips with leucaena, gliricidia, benzolive, cane, gully rock walls or vegetative barriers, nurseries (not fruit tree), grafting, creating compost structures, small gardening, some crop improved variety distribution (i.e. Tamazulapa black bean). Everywhere we went, fruit tree grafting training was being planned in July/August.

physical labor performed by these extensionists themselves. In this area, like that of Wanni, the local PVO's consider extensionists as employees who are to work for them (with the field users or owners) to accomplish the work needed. This work strategy has developed from the unique land tenure realities of these two sites.

PADF was active in this area, as well as in the other two areas discussed below, prior to PLUS Project through activities of the USAID Agroforestry Projects and many of the current extensionists are those of prior years. We observed a number of the trees and leucaena along the contours of some fields dating from this time.

1.2 Wanni Area

The Wanni watershed area is located 7 miles from Mirebalais on the road to Lascahobas. One side is delimited by a stream flowing on its southern border, the other side by a low ridge of hills, behind which rises a large mountain, Mountain Noir. On the other side of Mountain Noir is located the Lonsi/Lascahobas site. Like Seau d'Eau, Wanni is located in a high rainfall area of Haiti, with long term average annual rainfall of about 2,600 mm. (Figures 1 and 2). At least half of the M/E site defined as Wanni is located on completely flat, very fertile black clay soils, with high irrigation potential (already practiced). This area, largely owned by a number of very big land holders¹¹, is covered with sugarcane, rice fields, and corn, with a number of homesteads located within the dense vegetation. On this plain, many farmers use animal traction and a number of sugarcane processing mills have been created. The hills rising from this area are largely bare, with a great deal of cultivation and pasture for animals. The central plateau area is well known for its honey production. We met one farmer who had 130 active hollow log (palm tree) hives¹². Honey sells for \$6-\$8/gallon.¹³

¹¹ One farmer mentioned four major families and estimated their holdings as 160, 50, 20, and 20 cx. located on both the plain and mountain slopes. Local farmers sharecrop and rent from them. The most valuable bottom lands, good for rice, sugarcane and corn and taro are usually rented. Another landowner we met with had acquired his purchased land from one of the above large landowners. He told us that he was renting out 1 cx. of his land to another farmer.

¹² See Appendix for costs relating to a "combite" he held on a 3/4 cx. field using some 60 people during the course of 1 day.

¹³ The major honey flow begins in October and runs through June, with November/December being the best months. He usually takes honey twice during this period, and can get as much as 2 gallons from a single hive. He processes the beeswax which his wife sells in the market for \$9 for half a marmite (used locally for candles). Honey is this family's major cash crop, permitting him to invest in livestock and land. He purchased a 1 cx. piece of land in 1985 for \$669 and another 1 cx. in 1988 for \$600 (plus \$180 for land title/field boundary verification) - all fallow hillside land. When asked why he hadn't bought land on the flat plain

The farmer needs assessment team concentrated its activities with farmers exploiting the hillsides above this level plain, where the cropping systems were very different, with corn, pigeon pea, and sorghum intercropped with plantain, some sugarcane, and taro. Though we have encountered it elsewhere (Grande Rivière), it was in Wannì that the potential significance of castor beans as valuable crop for hillside vegetative barriers became evident. These plants grow into small trees, produce all year round, and the seeds can always be sold in the market for good prices ranging between \$3-\$5/marmite (comparable to beans, one of most important cash crops).¹⁴ Cultivated slopes ranged up to 95% in some areas.

PADF works with the Comité d'Evangelisation pour le Developpement Agricole (COEPDA) at this site, a locally organized religious PVO (Church of God), created to take advantage of development opportunities in this area, including agriculture. The 18 extensionists hired by PADF have, since March/April, undertaken considerable efforts in accomplishing over 14,000 meters of vegetative barriers and 3000 meters of rock terraces, working, as in Seau d'Eau, with and for the farmers of the area in these activities. Like Seau d'Eau, extensionists have had great difficulty encouraging farmers to group themselves together to do this work. As a result, their PVO has encouraged them, as employees, to do this work for the farmers.

1.3 Lonsi/Lascahobas Area

The Lonsi micro-watershed is located about ten minutes drive from the small town of Lascahobas, itself located an hour's drive from the town of Mirebalais. Portions of this road are very difficult to manoeuver over, particularly during this time, the beginning of second rainy season. Lascahobas links the important border town of Belladere, through which considerable goods pass from the Dominican border to Port-au-Prince. Currently it takes a good four wheel drive vehicle three hours to cover the 56 miles between Lascahobas and Port-au-Prince. Lonsi is located in a high rainfall area of Haiti, with average annual rainfall of about 2,033 mm (Figures 1 and 2).

The M/E watershed area is located between two mountain ridges. The lower one on the northern side, reaching 330 meters, forms the northern ridge of the watershed area selected. Members of the survey team met with farmers right up to the top of this side of the watershed - from which the Péligre Dam watershed system can be clearly viewed. The dam is clearly in serious danger of filling up

below, he said the hillsides were productive too and besides "it was much more expensive".

¹⁴ One farmer we spoke with had a number of these plants on the hillside near his homestead. He said he harvests 4-5 marmites each month, year round. Castor beans are processed for their oil, and used by household women as oil for their hair.

with silt. One sees a vast yellow plain of yellow clay/mud, with branches of streams making their way through this to a larger body of water nearer the dam itself. The very large mountain on the south rises to 1038 meters (Mt. Tonnaire) and was called "mountain noir" by farmers on the foothills on the opposite side, where the Wannu watershed is located. PADF has drawn an arbitrary line at about the 200 meter level up this mountain (where the densest vegetation ends) as the southern limit of the micro-watershed. The portion of the valley between the two mountain chains, defined by major gullies, is where most of the population of the watershed lives. The valley has running streams and springs and fairly flat fertile clay soils upon which farmers grow sugarcane, rice, taro, corn and sorghum, in addition to fruit trees (mango, breadfruit, citrus, avocado, plantain, banana, etc.).

There are many portions of the watershed hillside which were in fallow, some long term, with dense growth of delain (wild form of leucaena) in many areas. These fallow areas, which could be seen from the opposite side of the mountain, contained many cattle. The denser vegetation hid a great many pigs as well.

PADF works through the Central Baptist Convention (CBH) of Haiti in this zone, with 25 currently employed by PADF, through CBH, as extensionists. Of these, 3 work directly within the micro-watershed area. Most of these extensionists live within the areas in which they are working, and as such are already part of the communities. The team was impressed with the motivation and personal initiative some of these have taken. According to project records, zone extensionists have already helped farmers put into place over 5000 meters of rock terraces, among other things, since March/April 1993 when the new PLUS initiatives began to be realized and over 42,000 meters of vegetative barriers, That is more than three times that achieved in Seau D'Eau with the same number of extensionists.

2.0 GENERAL DESCRIPTION OF THE FARMING SYSTEM

2.1 Crops

Observations on hillside fields revealed that principal cultivated crops in fields, during the time of our survey, were almost the same in all three watersheds (with exception of taro (malanga) which was found most extensively in Wanni. These principal crops were:

corn - sorghum - plantain - pigeon pea - manioc

There is considerable variation in which secondary crops can be found in some kind of association with the above principal crops. Secondary crops were as follows:

Saut d'eau: sugarcane, sweet potato, rice, malanga

Wanni: sugarcane, sweet potato, yam

Lonsi: sugar cane, sweet potato, rice, malanga, yam.

Table 2: Crops Most Observed in Fields (Appendix 1)

| AREA | SAUT D'EAU | | WANNI | | LONSI | |
|--------------|--------------------------------------|--------------|--------------------------------------|--------------|--------------------------------------|--------------|
| | NB OF FIELDS WHERE CROP ARE OBSERVED | NB OF FIELDS | NB OF FIELDS WHERE CROP ARE OBSERVED | NB OF FIELDS | NB OF FIELDS WHERE CROP ARE OBSERVED | NB OF FIELDS |
| corn | 31 | 50 | 14 | 37 | 35 | 60 |
| sorghum | 31 | 50 | 15 | 37 | 27 | 60 |
| manioc | 19 | 50 | 20 | 37 | 28 | 60 |
| sugarcane | 10 | 50 | 4 | 37 | 13 | 60 |
| banana | 15 | 50 | 12 | 37 | 43 | 60 |
| pigeon pea | 16 | 50 | 11 | 37 | 18 | 60 |
| sweet potato | 8 | 50 | 8 | 37 | 13 | 60 |
| rice | 4 | 50 | | | 10 | 60 |
| malanga | | | 16 | 37 | 4 | 60 |
| yam | | | 3 | 37 | 1 | 60 |

2.1.1 Crop Varieties and Preferences

Interviews with farmers in the three watersheds revealed that farmers are looking for more early maturing varieties of their principal food grain crops, for good cash crops, or higher yielding varieties of their principal crops. These must be adapted to their

area. Preferred crop varieties are given in Table 2 below.

TABLE 3A: CROP VARIETIES AND PREFERENCES (Saut d'Eau)

| CROP | VARIETIES | ORIGIN | INTEREST |
|------------|---|---|--|
| corn | gros mais kamousik | local others areas | early maturing ⁽¹⁵⁾ |
| sorghum | pompon bouteille choual alisaine | local local local local | better yield early maturing |
| manioc | sweet chocho motelas bitter lasource trompe volè pistache | local local local local local | early maturing late maturing better yield |
| sugarcane | santa cruz ⁽¹⁶⁾ variété toro d'Haiti | Domin. Rep. Léogane local local | replaced by variety better yield |
| plantain | vincent ⁽¹⁷⁾ miské(3) lougarou | local local local | |
| banana | barique felicía rack | local local local | consumed both green and ripe consumed both green and ripe consumed ripe only |
| pigeon pea | alizaine dézè ti bôcô | local local local | early maturing better yield |
| cowpea | black liane porouge | léogane local local | better yield early maturing |
| bean | black red white | local local local | sells well in market |
| rice | toro sipa buffalo blemonique mansèta | local local local local | better yield better yield |
| yam | guinin rouge real | local local local | |

¹⁵ Traditional storage methods not sufficient.

¹⁶ Susceptible to "charbon" disease.

¹⁷ Vincent and miske are frequently attacked by "maroka" larvae.

TABLE 3B: CROP VARIETIES AND PREFERENCES (Wanni)

| CROP | VARIETIES | ORIGIN | INTEREST |
|--------------|---|---|---|
| corn | gros mais ¹⁸ kamousik ¹⁹ | local others areas | early maturing |
| bean | PICV black | PICV local | early maturing and better yield |
| sorghum | photo sensitive | local | |
| pigeon pea | alisaine ti pandié pois Novembre fem'ravagé ²⁰ | other areas fer a cheval local local | early maturing early maturing |
| plantain | miské cochon 220 franc vincent | local other areas local local | cash crop cash crop cash crop |
| banana | figue jacmel figue ti taille rack | local local local | cash crop |
| malanga | malanga | local | cash crop |
| manioc | sweet maria douce chocho contink bitter madan dieyè duvalcin ²¹ labègue ²¹ frè jan ⁴ | local local others areas local local local local | early maturing, rustic, better yielding, rustic |
| sweet potato | jano kalao payol demoimiro ti yam ti grisette sans refuse filiis | local others areas others areas local others areas local others areas | early maturing early maturing the most early maturing |

18 Very sensitive to both drought and excess moisture.

19 Stores very poorly using traditional methods.

20 Appears to have been lost to region and disappeared.

21 Sensitive to excess moisture.

TABLE 3C: CROP VARIETIES AND PREFERENCES (Lonsi)

| CROP | VARIETIES | ORIGIN | INTEREST |
|--------------|--|--|--|
| corn | ti bourik kamousik | local IDAI | early maturing and better yield |
| sorghum | pompon choual diri | local local local | better yield better yield |
| plantain | vincent miske | local local | cash crop |
| banana | figue | local | |
| manioc | sweet ti bok chocho matietas salcael contink maria douce kamenmis | Dom. Rep local local Dom. Rep Dom. Rep local local | early maturing, high yield early maturing, high yield |
| | bitter sô louise | local | |
| sugarcane | santa cruz ⁽²²⁾ toro 24 durici dacroune | local local local local local | gives a good rapadou |
| sweet potato | jano bale mache sauve nouris | local local others areas | better yielding good yield |
| bean | black red white suif | local local local local | cash crop |
| rice | matedoc lamea 3 mois fidel delin anglais nuffalo | local local local local local local local | drought resistant |

2.1.2 Crop Associations

The principal cropping associations on most hillside fields in all three micro-watershed areas visited are based upon very long term growing cycles (Table 4). Nowhere in our farmer needs assessment surveys in Haiti did the survey team meet farmers who specifically stated that they kept their crops in their fields for

²² Disappeared.

such extended periods of time as this.²³ Plantain/banana and sugarcane are associated with malanga as the key cash crops on such fields. Farmers are very interested in cultivating these crops on as many of their fields as possible. These cropping systems are excellent for the long term preservation of the soils on slopes, which in many cases, exceed 60%-70%! This system of long-term crop cover is a good way to slow down erosion on hillside land. Consequently, to avoid a major mistake in soil conservation methods proposed for these areas, it is critical that farmers' preferences be very seriously considered with regards to the material of choice to be included in vegetative barriers on slopes.

TABLE 4: CROPPING ASSOCIATIONS & TIME LAND IS UNDER CROP COVER, WHERE FREQUENTLY FOUND (Appendix 1)

| AREA | CROP ASSOCIATIONS | GROWING CYCLE MONTHS | SLOPE (²⁴) |
|------------|---|----------------------|-------------------------|
| SAUT D'EAU | corn, sorghum, pigeon pea, manioc | 9-24 | 2-3 |
| | corn, plantain, sorghum | over 96 | 1-2-3 |
| | corn, sorghum | 6-9 | 2-3 |
| | corn, pigeon pea, sorghum, sugarcane | over 36 | 1-2 |
| | corn, pigeon pea, sorghum | 6-9 | 1-3 |
| WANNI | malanga, plantain/banana, manioc | over 96 | 4-5 |
| | corn, sorghum | 6-9 | 1-3-4 |
| | corn, manioc, sorghum, | 24 | 4 |
| | malanga, manioc, pigeon pea, sweet potato | 9 - 24 | 2-3 |
| LONCI | corn, plantain(²⁵), sorghum | over 96 | 3-4 |
| | corn, plantain, manioc, pigeon pea, sorghum | over 96 | 3-4-5 |
| | corn, plantain, manioc, sorghum | over 96 | 3-4 |
| | corn, plantain/banana, manioc, sorghum, sugarcane | over 96 | 3 |
| | plantain/banana, rice | over 96 | 1-2 |

Farmer's crop associations are very complex. In the same field, farmers will always associate a number of crops, with up to seven different species not being uncommon. In such cases, most of the soils of these fields are under crop cover for most of the year. Table 5 below summarizes the number of different crops the

²³ Farmers in other regions spoke of leaving plantain/banana for periods of 3 - 4 years, before recycling them. Here farmers spoke of sometimes never removing these crops - with one middle aged man saying that his father had started the plantain clumps we observed on some very steep slopes.

²⁴ We define slope into six class:(1) Level:0%-5%;(2) Gradual:5%-20%;(3) Medium:20%-40%; (4) Steep:40%-60%;Very steep(5): 60%-80% ; (6) extremely steep 80%-100% .

²⁵ Plantain and banana are mixed. In all three areas, where ever one may be found, the other will most likely be present as well.

survey team observed during our visits to a number of fields in early August.

TABLE 5: NUMBER OF CULTIVATED CROPS ASSOCIATED AND NUMBER OF FIELDS SEEN (Appendix 1)

| CROP/POPULATION | SAUT D'EAU | WANNI | LONCI |
|-----------------|------------|-------|-------|
| 1 | 10 | 4 | 5 |
| 2 | 8 | 6 | 8 |
| 3 | 8 | 12 | 10 |
| 4 ²⁶ | 13 | 10 | 15 |
| 5 | 7 | 2 | 16 |
| 6 | | 1 | 1 |
| Fallow | 3 | 2 | 4 |
| rack (wooded) | 1 | | 1 |
| total | 50 | 37 | 60 |

2.2 CROP MANAGEMENT

2.2.1 Land preparation

The kind of land preparation done on a particular field for a new season's crop depends on crops previously cultivated in the field (some of which may remain), and on what crops are planned to be planted. Hired labor squads are frequently used for this work, particularly in the Seau d'Eau and Wannni areas, which have large numbers of well-off farmers controlling much of the land.

When a field was previously planted with sorghum or fallowed for a long time, most farmers will burn off the fields to destroy weeds and sorghum straw before planting again. Farmers also explained that this is a way to control (kill) some pests that eat planted seeds or otherwise harm developing plants. Rats are partially controlled in this manner. During our visit in August, we could see many hillside fields with stands of plantain/banana that were yellowed from recent burnings. Burning also helps to control delain (wild leucaena) weed growth which covers most fields in Seau d'Eau and Wannni, less so in Lonci. This burning, of course, proves a major problem for hedgerows of leucaena which have been established on many fields by the project. The survey team observed the charred remains of leucaena in a number such fields (Appendix 3, Photo 4B).

²⁶ In this example, 13 fields in Saut D'Eau were observed to have 4 different crops cultivated in it - at the time of our visit.

When farmers intend to plant rice, they will turn over the soil during weeding. Weeds and straw of previous cultivated crops will be mixed and arranged into a row across the contour of a slope, forming a dead vegetative barrier into which the project might encourage farmers to plant vegetative material that they want in order to improve the duration of this barrier as a soil conservation structure. Farmers in this region often create rock terraces on their own initiative, behind which they will plant taro (malanga).²⁷ Taro is considered a very important cash crop, often planted during the first planting season in March. Program efforts could assist such farmers to create better rock terraces for their taro.

2.2.2 Cropping calendar

There are two principal planting seasons in a year:

- March through May
- August through September

Harvest periods depend on crop varieties and date of planting. Most crops are grown only once during each year, with the exception of bean and rice which will often be planted twice in a year. Crops such as manioc, plantain/banana, and sugarcane can be planted almost any time of the year, depending on the yearly variability of water (rainfall, spring and streams). A recognized special traditional planting date for banana and plantain is June 24 (Table 6). Rainfall data are provided in Figures 1 and 2 for an understanding of the variability within the region.

Table 6A: Cropping Calendar, Seau D'Eau

| YEAR | 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 | S---- H | | |
| rice | S S H H | | |
| bean | S-- S-- H H | | |
| pigeon pea | S---- | H | |
| manioc | S----- H | | |
| yam | S-- | H | H |

²⁷ Rice is also being planted behind many structures realized through PADF project efforts.

| | | | |
|-----------------|------------------|----|---|
| sugarcane | S----- | H | H |
| plantain/banana | S-----S(Jun 24)- | H | H |
| sorghum | S--- | H_ | |

Table 6B: Cropping Calendar, Wannu

| YEAR | 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 | S---- H | | |
| rice | S S H H | | |
| bean | S-- S-- H H | | |
| pigeon pea | S---- | H | |
| manioc | S----- H | | |
| yam | S-- | H | H |
| sugarcane | S----- | H | H |
| plantain/banana | S-----S(Jun 24)- | H | H |
| malanga ⁽²⁸⁾ | S-- H | | |
| sorghum | S--- | H_ | |

²⁸ Xanthosoma spp.

Table 6C: Cropping Calendar, Lonsi

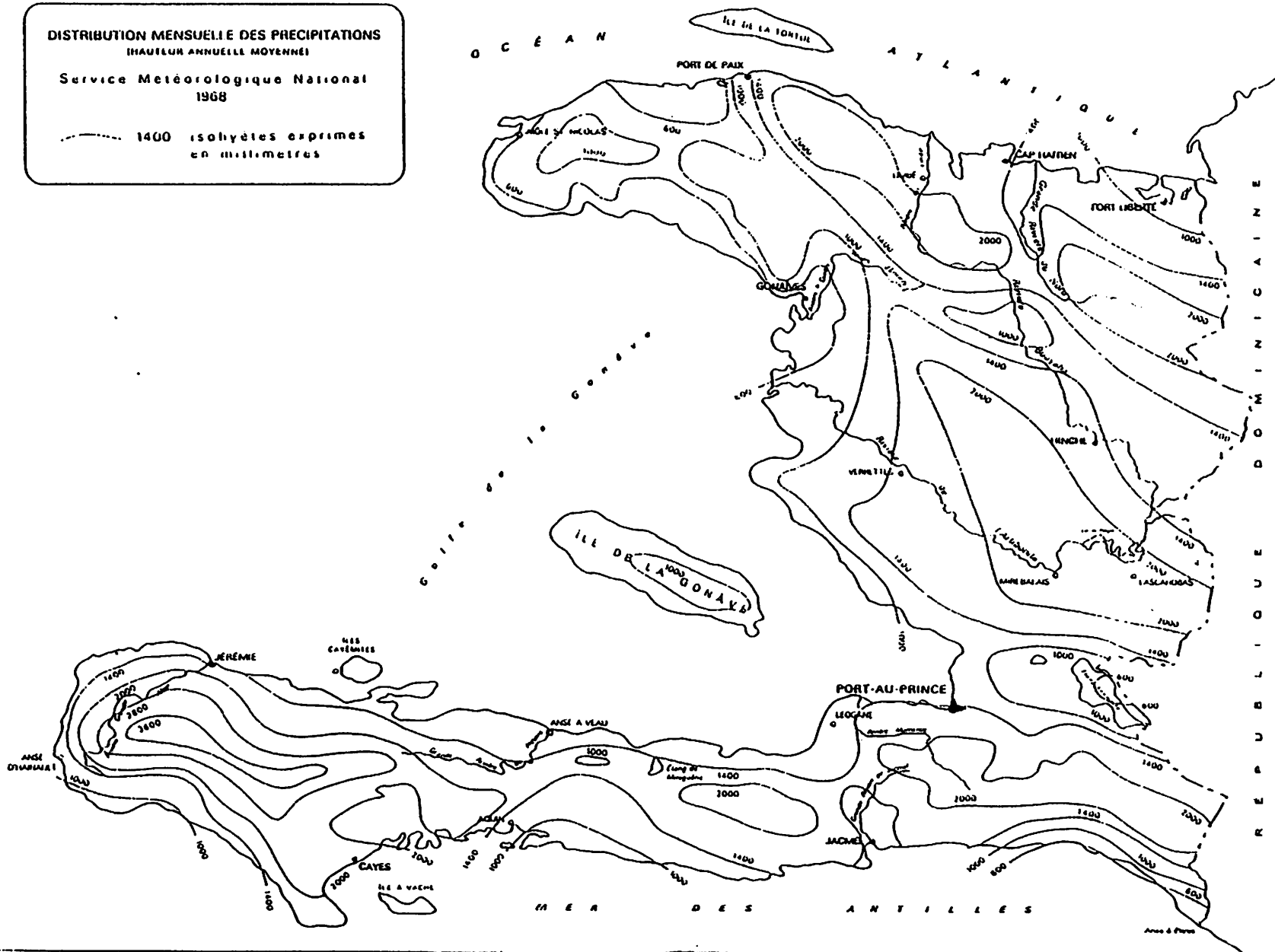
| YEAR | 1992 | 1993 | 1994 |
|-----------------|--------------------------------|-------------------------|-------------------------|
| CROP/MONTH | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D |
| corn | S---- H | | |
| rice | S S H H | | |
| bean | S-- S-- H H | | |
| pigeon pea | S---- | H | |
| manioc | S----- H | | |
| yam | S-- | H | H |
| sugarcane | S----- | H | H |
| plantain/banana | S-----S(Jun 24)- ²⁹ | H | H |
| malanga | S-- S H | H | |
| sorghum | S---- | H | |

²⁹ Farmers cite this date as special date for planting banana and plantain.

DISTRIBUTION MENSUELIE DES PRECIPITATIONS
(HAUTEUR ANNUELLE MOYENNE)

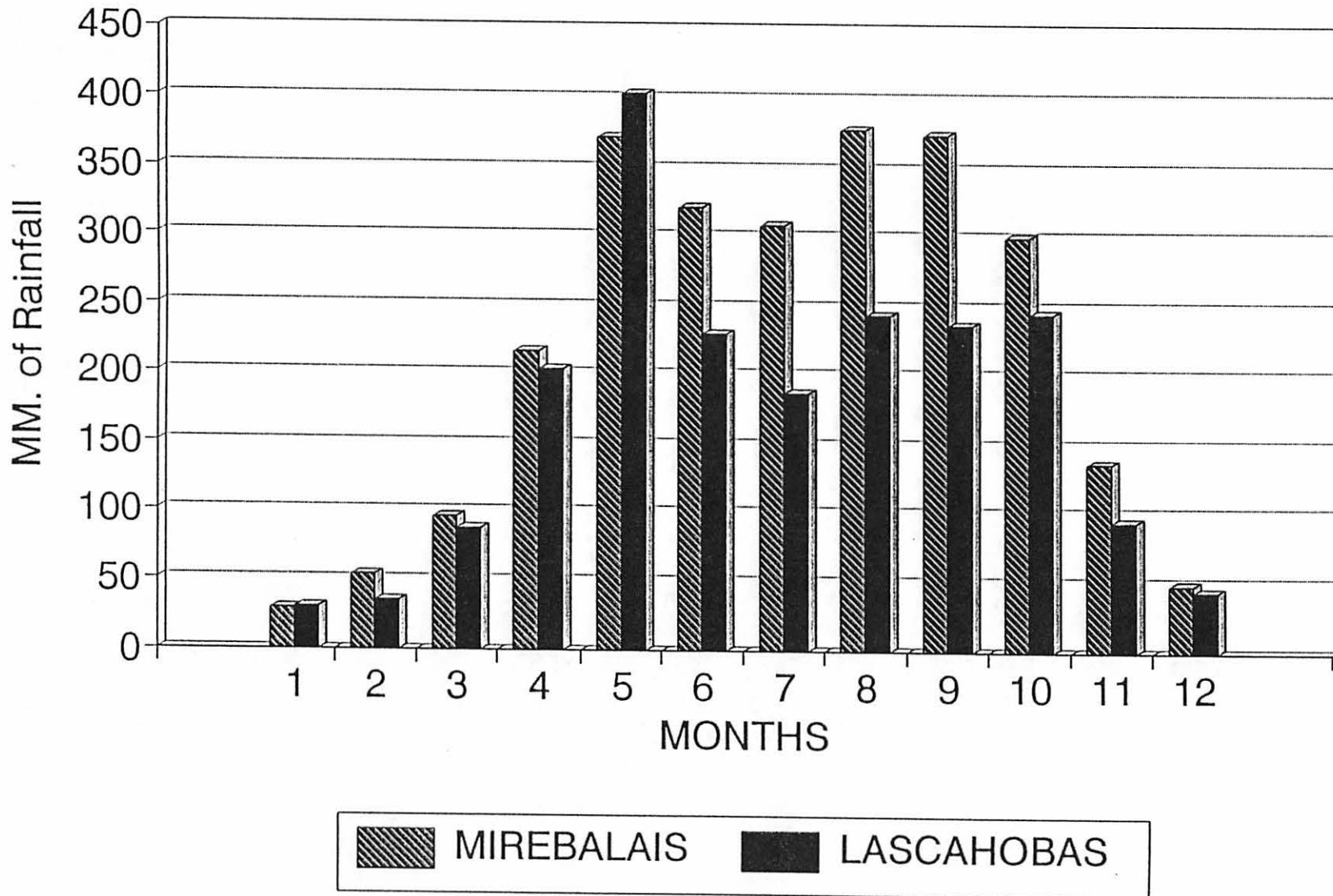
Service Météorologique National
1968

----- 1400 isohyètes exprimées
en millimètres



LONG TERM RAINFALL

MIREBALAIS & LASCAHOBAS



2.2.3 Crop Rotation and Fallow

Wanni and Lonsi farmers fallow their fields after many years of cultivation (7-8+ years). During such "fallow", the fields will actually contain many clumps of plantain/banana, with rest of field gone to grass/weeds. Then, frequently, banana, plantain and/or sugarcane will be progressively installed into the fields, until the fields become predominantly plantain/banana or sugarcane fields. (cf. Table 7 below).

Table 7: Crop Rotation and Fallow

1) Seau d'Eau

| | | | |
|-------------------|------------------|-----------------|-------------|
| a) Sowing | Harvest | | |
| (August 93)-----> | (Apr-May 94) --> | (August 94) --> | (August 95) |
| sweet potato | sweet potato | sugarcane | sugarcane |
| sugarcane | | | |

| | | | |
|----------------|--------------|-----------------|----------|
| b) Sowing | Harvest | | |
| (Apr 92) ----> | (Sept 92)--> | (Jan-Feb 93)--> | (Apr 95) |
| corn | corn | pigeon pea | |
| pigeon pea | | manioc | banana |
| manioc | | | |
| banana 30 | | | |

2) Wanni

| | | | |
|-------------------|-----------------|------------------|----------|
| Fallow | Sowing | Harvest | |
| (over 3 years) -> | (Apr 92) -----> | (Dec-Jan 93) --> | (Apr 93) |
| | malanga | malanga | |
| | bitter manioc | bitter manioc | banana |
| | banana | | |

3) Lonsi

| | | | | |
|---------------|--------------|------------|--------------|-------------|
| Fallow | Sowing | Harvest | | Sowing |
| (2 years) --> | (Mar 88) --> | (July) --> | (Jan 89) --> | (Mar 89)--> |
| | corn | corn | sorghum | corn |
| | sorghum | | | sorghum |
| | banana | | banana | |

2.2.4 Yield of Principal Crop

As already observed in the other watersheds, yields of cultivated crop are very low. Yields of beans, in particular, vary a great deal in Seau d'Eau and Wanni (Table 8).

³⁰ Banana and plantain are mixed.

TABLE 8: YIELD OF PRINCIPAL CROPS (number of marmites per 1 marmite sown)

| CROP/YIELD | SEAU D'EAU | WANNI | LONSI |
|------------|------------|-------|-------|
| corn | 20 | 40 | 40 |
| bean | 6-20 | 10-20 | 10-12 |
| sorghum | 60 | 40 | 80 |
| rice | 10-16 | | |

2.2.5 Sources for Planting Seed

Farmers have three important seeds sources: their own stock, other farmers, and the market place. Where any one farmer actually gets his seed depends on a number of factors, including the time of the year, the size of the farm, and the crop. To obtain seed of food grain crops (corn, beans, sorghum, cowpeas), the smallest farmers (less than .5 cx.) principally use the market place; medium size farmers (.5 - 5 cx.) will use their own stock as well as the market place; while large farmers (+ 5 cx.) will principally use their own stocks.

At Lonci, farmers clearly explained to us the problems associated with obtaining seed from the market place: small grains, mix of various varieties, presence of pests. For tubers, (manioc, sweet potatoes, taro, mazoubel, yam), farmers mainly use their own stock, or get it through purchase or gift from other farmers.

PADF, since about March 1993, has been a source for sugarcane cuttings for some farmers in the area for soil conservation hedgerows in all three watershed sites visited by the survey team.

It is important to underline the high cost of seed at time of planting (cf Table 10 below and compare with Table 6). This is a significant burden to the majority of small farmers.

2.3 Crop Management and Soil Conservation

Corn, pigeon pea, sugarcane, sorghum, plantain are common crops found in association within individual fields within this area. Each particular crop possesses a particular niche within the planting calendars (Table 6), with opportunities changing depending on field location (eg. on "terre froid or chaud" (warm or cool soils), usually a factor of field orientation and yearly sun exposure, or high or low on a mountainside, or near spring or stream, etc.). There is much relay cropping (corn-sorghum, sugarcane-corn/sorghum). Some crops remain on a field for only a few months (corn and beans), some for a year (manioc, sweet

potato), some for much longer (pigeon pea, plantain, castor bean, banana, fruit trees). The more of the latter type of crop, generally, the greater the value of the land and the greater the implied security of the farmer on this land.

As mentioned above, field burning is a common practice in all three watershed sites visited. This is done for one of several reasons. In areas where sugarcane has become mature, and become the dominant crop in the field for a number of years (7-10 years), a farmer may wish to return the land to other crop production such as corn/sorghum for 2-3 years before restarting the cycle again (inter-cropping sugarcane into corn/sorghum fields until cane begins to re-dominate the field). He will cut the cane and burn the field to kill the stalks. In many other fields, "delain", a wild variety of leucaena, is a major weed and removing it from the fields appears to be almost impossible in some areas. Before planting of corn in the spring, or sorghum or beans in the fall, fields are cleared (cut back at ground level) and burned in an attempt to reduce and kill some of this growth. Physically removing the extensive root systems appears to require more time than farmers are prepared to give in these areas. By the time corn in such fields is head tall, the delain is already growing well in small bushes over the entire surface of many of these fields. These will again be cut/weeded back during a weeding, providing good (though perhaps not intended) nutrients to the soil. Indeed, the corn crops on most of these fields were among the best we saw anywhere, clearly benefiting from this "weed" growth³⁰. Farmers will also burn pastures in the upper portions of the watersheds and mountains to permit regeneration of new grass growth for their animals, getting rid of the coarse, less nutritious dried material covering such areas³¹.

³⁰ The project might consider taking yield plot measurements in a sample of these fields to gain a perspective on just how important this wild growth of leucaena might be for these fields. Farmers don't like the plant, even fight it, but it would appear to have, nevertheless, a positive impact too.

³¹ This same process is used by cattle herders in the West African sahel to get rid of the tall, coarse grasses, which, when burned, permit fresh new grass to develop from the crowns of the old grass clumps.

2.3.1 Soil Conservation Activities Observed

The farmer needs assessment team was impressed by the productive potential that this region is capable of providing to the country. Besides being blessed with good rainfall, many running streams and springs, good vegetative cover along the lower mountain basins and plateaus, the hillsides within the areas visited, in spite of evident erosion, still (amazingly) retain rich, deep soils with high productivity. Fields of plantain and taro, mixed with corn and pigeon pea, sweet potato and sorghum, depending on the season, can be found on the steepest slopes. One obviously productive field of taro and plantain was observed in Wanni on a 95% slope with deep, black clay soils. That such productivity will not continue for long without appropriate soil conservation measures is also obvious. Hillside conservation measures observed by the survey team are presented in Table 9, below, some of which are being supported through PADF.

TABLE 9: HILLSIDE CONSERVATION MEASURES, CROP PLACEMENT

| | Seau D'Eau | Wanni | Lonsi/Lascahobas |
|---|------------------------------|---------------------------|--|
| Dead Vegetative Barriers (Traditional) | yes | yes | yes |
| Dead Vegetative Barriers (Modified - PADF) | yes | yes | yes |
| Contour Ridging | no | no | no |
| Hills (for planting) | yes, for sweet potato | some, for sweet potato | not observed |
| Contour canals | no | no | no |
| Mulching | no | no | no |
| Gully Plugs: Rock Vegetative | yes yes | yes yes | yes yes |
| Rock Terraces | yes | yes | yes |
| Hedge Rows on Contour | yes, leucaena, gliricidia | yes, leucaena, gliricidia | yes, leucaena, gliricidia, sugarcane |
| Fruit tree crops, plantain, banana, etc. | not on contours | not on contour | some on contour, holding "rempe paille" |
| Bio-Intensive Gardens | not yet | not yet | not yet |
| Rice, taro behind established terraces in gullies | yes | no | yes |

As in other areas visited by the farmer needs assessment survey team, farmers in all three micro-watershed areas visited have at one time or another used the traditional soil conservation

technique of "rempe paille" (dead vegetative matter) along the contour of their hillside fields, to slow down soil loss. These strips of vegetative matter are held in place by stakes driven into the ground along the contour. Such strips quickly accumulate soil and rot down, so that by the end of a cropping season of 4-5 months, they have completely disappeared. PADF, since AOP days in 1989, have used this traditional technique and created what they call "modified rempe paille". The dead vegetative strip is covered with dirt, creating a small contour ridge and shallow ditch on up-hill side of strip, into which farmers will plant corn. Leucaena is then planted on (or near bottom of up-hill side of furrow) the small contour mounds, in hopes that this will in time provide a permanent vegetative strip against which soil and other debris will accumulate. This was the soil conservation technique most frequently encountered in the sites visited and represents what PADF in this area call "rempe vivan". Farmers in the region, particularly in Wanni and Lonsi, learned to place rocks along the contour through experience of prior projects in the region (ODBFA, Foundation CARE - work to protect Péligre dam watersheds), and with PADF. Some continue to create such structures in places. This is particularly true in locations where presence of many rocks and increased soil moisture possibilities coincide (eg. gullies, below springs, etc.) can be used to enhance taro/plantain cultivation.

Many of the hillsides in the three sites, though certainly not all, are covered with rocks or smaller stones which can be used in creating rock terraces. There have been programs in the past, through the Ministry of Agriculture, in creating rock terraces and vegetative barriers on the hillsides in the region - particularly on the slopes of the mountains draining into the Péligre Dam watershed. Some of the farmers interviewed in Wanni, and many in Lonsi, had participated in these public works programs - and know how to create such structures. In Wanni, for instance, at the highest reaches of the PADF watershed (410 meters), we met a "mera" group of 17 farmers who had created a working association, which they called "Groupe Admiration Tete Ensemble"³². This group works every day except Sunday in all the major activities of field work (land preparation, planting, weeding). They create rock terraces (in March) on those fields where they intend to plant taro and plantain. We saw a number of rock walls (on 65-75% slopes), very well built, some as high as 4 feet and massive in width, behind which soil had accumulated permitting impressive taro, plantain, and corn. We were told that there were many such groups in the hillside regions above Wanni. PADF is not working with these

³² It is certain that the members of such a group are all small farmers, there would not be any large landowners among them. The large landowners hire such groups, if they can, to work on their fields. This group said that no member had, as yet, ever sold a "day", though this would be possible. This would happen if, for example, on the day the 16 members of the "mera" were to work on the 17th members field, he would sell the labor of all 17 of them to another farmer, thus earning (17 X 5) 85 gourdes for himself, which he could use for some special need. They would also be fed by the farmer hiring them. Of course, the farmer selling "his day" would lose out on all that labor for his own field activity - which could also be a major disadvantage. It would not be something he would do lightly.

groups³³, though in this case, most of the work performed by this group is located outside and higher than the watershed area selected.

To achieve its objectives of creating rock terraces and vegetative barriers on hillside fields of farmers within the region, PADF has used a rather unusual approach³⁴. This approach was apparently proposed by the extensionists themselves. In both Seau d'Eau and Wannu areas, PADF extensionists have banded together to form working groups (a modification of the traditional *associée* idea³⁵) to work on farmer fields. An extensionist will identify a hillside farmer whose field can benefit from rock terraces. Three or four extensionists (sometimes as many as 9!) sharing a particular area will work together, with this farmer, to build the rock terraces needed. In some cases this work may take 6 days. In one case such work was done over a period of 6 weeks on a number of fields of one farmer³⁶! One extensionist explained that when doing this, a neighboring farmer would see this work, realize that his field would also benefit from this too, and "invite" the extensionists to work on his field next - and so on. Though in principal, the extensionists are only to work on one field of a farmer, expecting him to do any other fields he might have with his own efforts, this is not what actually happens. We met one farmer who had four of his fields improved with rock terraces.

When there are no rocks to use, the extensionists create shallow contour ditches and plant leucaena along the resulting ridge. In some cases we saw leucaena planted in fields which actually had rocks which could have been used for terraces. Leucaena and shallow ditches were used to "demonstrate" a different technique. Though PADF technicians and extensionists claim that the farmer "asked" for this, it is clear that in most cases the farmer "agreed to let the extensionists" place these structures or vegetative material on their fields.

As an approach to achieve soil conservation structures, this approach is very effective in getting work done fairly quickly - though the long term quality/value of the work, particularly in

³³ Having only begun intensive work in this micro-watershed since March/April of this year, work has not yet reached into the upper reaches of the watershed, being concentrated in the lower areas.

³⁴ The approach used in Seau d'Eau and Wannu is obviously at odds with PADF's general philosophy of working with farmers, or through local groups of farmers and can be understood, when constraints are taken into consideration.

³⁵ An "associée" grouping is formed, in this area, when 4-5 men, usually friends and neighbors, often farming in the same general area, agree to work together; today on my field, tomorrow on yours, etc. to do the weeding, or field preparation. It is possible for a person who is to receive the group's work on a particular day, to decide to "sell" his day to a larger landowner who has made his need known. We would encourage PADF to make major efforts to work with existing groups of this kind.

³⁶ We figured out that this farmer essentially received a gift from the project of 900 gourdes in free labor (3 extensionists X 5 workdays/week = 15 x 6 weeks = 90 workdays X 10 gourdes).

case of vegetative barriers (leucaena) might be questioned. Most of the Seau d'Eau farmers seem to fall within the category of farmers who would prefer to hire labor for major activities, and do not widely practice selling their labor or forming associations to perform major activities. This is a good indication of the relatively higher socio-economic status of the farmers with whom PADF works in this area. While farmers based mostly on the plain of the Wanni area also largely fit this category, it is possible to find many farmers in the upper portions of the watershed who are poorer and who must depend on their own labor to increase the productivity of their lands. These latter farmers are more often motivated to "get their own hands dirty," so to speak, in land improvement and in being part of groups for this purpose.

Technically speaking, the rock terraces created were well done, had accumulated a great deal of soil in the few months they had been in place, were growing highly productive crops like taro, plantain, rice, and corn, and were very much appreciated by the farmers benefiting from such work. PADF will clearly be able to demonstrate increased productivity on these fields, when measured - no question about it! This will probably not be the case with the vegetative barriers established with leucaena, however, which we understand, under the best conditions, does not show significant effects on soils until 4 or 5 years after establishment³⁷. Given the dynamic cropping systems on these hillside fields, few farmers will wait this long to be convinced.

Extensionists need to get as much work done as possible, to meet PADF/AID indicators of progress³⁸. In many cases, extensionists are also the ones who care for the nurseries (for the farmers for whom they are working), planting the seed, weeding, watering, etc. We were told that farmers often don't take good care of the seedlings, which die, so it is necessary that they care for them. From one perspective, the approach used for the extensionists makes sense³⁹. Extensionists are essentially working as a form of local soil conservation labor squad, providing days of free labor (while "demonstrating to the farmer how to do the work correctly"), then moving on to the next farmer. Farmers we met were eager to call upon these extensionists next year (when such work can again be done) to help them do the same on other fields. "They need to complete the work they have begun", one farmer told us, concerning his other fields on which rock terraces could be

³⁷Editorial comment: This does not reflect the view of SECID/Auburn University.

³⁸ PADF has set up target amounts which each area should accomplish during each season - a good thing to do. In Wanni, for example, the target has been set to establish during the first season of 1993 (Nov. '92 through April '93) 36,000 meters of 'dead vegetative strips', 1800 meters of ravine rock walls, 950 meters of rock terraces, 18,000 trees (at 50 per household - we were told 75 by extensionists); 360 compost piles; 18 fruit tree grafting (5 per household); 15 model gardens).

³⁹ This approach is clearly supported by the technicians and agronomists who monitor their work.

constructed. Extensionists are paid 300 gourdes/month for 5 days work/week, for about 6 hours/day of work. The local wage for hired labor (achet journe) is 5-7 gourdes/day for 5-6 hours of work, with 2 meals. Working a full day, a person would expect 10 gourdes with 3 meals (3 mange). Put into this context, extensionists are receiving almost exactly this pay for their work, without the meals⁴⁰. This is a wonderful deal for the concerned farmers.

When we asked PADF field technicians and extensionists why they thought PADF was promoting such a method of working with farmers, the extensionists pointed out that they had found out that working with these rock walls (and gully plugs, etc.) was really hard work, and that just one extensionist working with one farmer took too long; that some rocks were too hard for just one person to move; that this kind of work went better when there were a number of people present working at the job. (Unlike Seau d'Eau technicians, no one specifically mentioned that the project and AID in particular, was expecting a certain output from them and that they had to produce a certain number of structures/month to meet target goals - yet it clear that this is a major driving factor here as well).

In Seau d'Eau, Wanni, and Lonsi watersheds, most farmers with whom we discussed this subject, considered leucaena a weed, comparing it to 'delain", a wild form of leucaena which grows in abundance in the higher hills throughout this region, though no where so densely as in Seau d'Eau⁴¹. In all areas, fields are commonly burned to clear them of brush for the beginning of the cropping year. Apparently plantain and sugar cane found in these fields are not destroyed by such burning, though they do lose the leaves exposed at this time. We saw many fields along hillsides where such burning had taken place within the past few months, with plantain all yellow in color. We also saw, in some of these fields, the remains of the charred leucaena which had been planted on shallow contour ridges.

⁴⁰ Considering the free labor they are receiving, it is really surprising that most farmers are taking this direct assistance without even giving a meal to the working extensionists. The extensionists have indeed been working very hard, doing good work. One wonders if the farmers lack of providing meals could be an indication as to just how important he really considers the work to be - at the time. Once done, and crops are planted, the farmer appreciates just what a good deal he has received - in case of rock terraces.

⁴¹ Delain, like the leucaena being promoted for hedge rows, was found in dense concentrations in fallow and cultivated fields in Seau d'Eau, being very difficult to totally remove from the fields. Fields are frequently burned in an attempt to destroy the delain. Both delain and the PADF leucaena can become trees if permitted to grow. One of most distinguishing differences between them in the smaller size of the pods and seeds produced by delain. Delain is also shorter.

2.4 Crop Marketing and Transformation

2.4.1 Prices

Great price variations were reported by farmers for all major crops - between harvest and planting periods. At harvest, most farmers sell rapidly because of serious cash flow problems. It is not that farmers do not know that they could realize considerable saving by storing their crops and selling when prices are higher. Their economic positions do not permit them this opportunity.

Table 10: Crop Prices

| Zone/ Crop | SAINT-JEAN | | WANNTI | | LONCI | |
|----------------------|---------------|------|---------------------|------------|---------------|--------------|
| | Low | High | Low | High | Low | High |
| Corn/m | 4 | 8 | 4 | 15 | 3 | 10 |
| Sorghum/m | 3 | 8 | 3 | 6 | 2 | 5 |
| beans/m | 15 | 25 | 20 | 28 | - | - |
| Rice/m | 10 | 13d | 10nd | 15 | 10nd 13 | 15 17d |
| Cowpeas/m | 6 | 18 | 7-8 | 20 | - | - |
| Sesame/m | - | - | - | - | 21 | 30 |
| Dry coconut/ unit | - | - | 1 | 1 | 1.5 | 2 |
| Tobacco/krèy ** | - | - | 60 100 | 175 300 | 50 | 300 |
| Sweet potato | 1/lo | 2 | 12/ basket | 20 | 25 chaj | 50 |
| Manioc | - | - | 7-8 basket | 10-15 | 100 chaj | 200 |
| Taro | - | - | 35/basket 75/bag | 75 125 | - 100/bag | - 200 |
| Breadfruit/ unit | 0.75 | 1.5 | 0.3 | 1 | 1.5 | 2 |
| Avocado | 0.15/ unit | 0.7 | 0.25/ unit | 0.5 | 40/ chaj | 60 |
| Citrus | - | - | 3-4 unit | - | 3/bidon | 6 |
| Mango musca | - | - | - | - | 0.03/ unit | 0.1/ unit |
| Mango francis | - | - | 250/ root | 350 | - | - |

| | | | | | | |
|--------------------------------|---------------|-----|------------------|-------|-----------------|-------|
| Mango blan | 0.2/ unit | 0.6 | 150/ root | 250 | 0.04/ unit | 0.20 |
| Mango janmari | - | - | 250/ root | 350 | - | - |
| Mango fil | 1/ basket | 4 | - | - | - | - |
| mango jès | - | - | 150/ root | 200 | - | - |
| Mango batis | - | - | - | - | 0.04/ unit | 0.5 |
| Sweet Orange | - | - | - | - | 30/ chaj | 50 |
| Chadeque | - | - | - | - | 25/ chaj | 40 |
| Plantain vensan | 10/ rejim | 18 | 15 | 25 | 10-12 | 20-25 |
| Plantain miske | - | - | 20-25 | 50 | 25 | 40 |
| Miske 220 | - | - | 75 | 100 | 60 | 75 |
| Banana Lavièj | - | - | 4-5 | 10-15 | - | - |
| Banana Jaknèl | - | - | - | - | 20 | 30 |
| Coconut Seed/ unit | - | - | - | - | 5 | 5 |
| Malanga seed | - | - | 0.2-0.4/ unit | - | - | - |
| Cassava Bread ⁴² | 0.25/ unit | 0.5 | - | - | - | - |
| Rapadou/unit | 5 | 15 | 8 | 20 | 8 ⁴³ | 15 |
| | | | | | 4 ⁴⁴ | 7 |
| Syrup/ drum | 300 | 600 | - | - | - | - |
| Rum/ gallon | 6 | 10 | | | | |

Note: m= marmite, common market unit of measure (small metal bowl).

In many cases, the "high prices" for the food grains are not farm gate prices, but intermediate prices charged by merchants in the market.

⁴² Cassava bread, rapadou (amorphous sugar), syrup, rum are transformed products.

⁴³ Clear Color: Better Quality

⁴⁴ Dark Brown Color: Bad Quality

Table 11: Prices Variations Rate: Classification of Crops

| Rate in Percentage | SAINT-JEAN | WANNI | LONCI |
|-----------------------|--|---|---|
| > 200% | avocado, mango fil | corn, breadfruit | corn, tobacco, mango musca, mango blan, mango batis |
| Between 101% and 200% | sorghum, cowpeas, malanga, mango blan, banana lavièj, cassava bread, rapadou | cowpeas, tobacco, rapadou | sorghum |
| Between 51% and 100% | beans, corn, sweet potatoes, breadfruit, plantain vensan, syrup, rum | sorghum, sweet potatoes, cassava, malanga, avocado, mango blan, plantain vensan, malanga seed | sweet potatoes, cassava, citrus, sweet orange, shaddock, plantain vensan, rapadou |
| Between 20% and 50% | rice, plantain miske | beans, rice, mango francis, mango janmari, mango jès, plantain miske, miske 220 | rice, sesame, dry coconut, breadfruit, avocado, miske 220, banana jakmèl |

The high price variations observed for corn, sorghum, cowpeas, tobacco, rapadou, and some mango varieties are common to all three sites visited. Plantain, banana, rice, and some mango varieties (francis variety is exported) have relatively moderate variations in prices.

2.4.2 Transformation: Sugarcane Agri-Business

2.4.2.1 Generalities

In all three watershed areas visited by the survey team, sugarcane transformation represents an important, though small, agri-business venture in which cane syrup is transformed into rapadou (amorphous sugar).

The Saint-Jean site has 10 sugar syrup and rapadou "factories"; Wannì has nine, of which one only produces syrup, and eight produce principally rapadou. At Lonci, seven sites produce rapadou exclusively.

Cane transformation is a local industry which appears to be expanding in importance within the region in recent years. Many factories visited have only been in business for two to three years. Some processing sites, abandoned by parents in the past, have been brought back into production by the children. A number of farmers were encountered who have plans of building new facilities - in both plain and mountain sites. According to some farmer cane producers and factory owners, sugarcane cultivation has

replaced pig raising as a cash crop. A major reason for past decline in the importance of the sugarcane industry in the region was extensive cane loss through the charbon disease in varieties like "Santa Cruz". New varieties have been introduced which appear to successfully resist this disease. Because cane is frequently cultivated on hillside slopes, this development has potentially important implications for soil conservation measures in this region.

With few exceptions, these sugarcane transformation factories are operated with animal traction. In Wannì, we did see one facility which was operated using a diesel motor. The source of power is used to drive a cane crushing implement, producing the cane syrup which may itself be sold, or is boiled down into raw sugar. Both the left-over cane stalks and large amounts of wood are used for the fuel in this boiling down process. This process uses large amounts of wood and certainly contributes to deforestation in the region. Both improved processing systems as well as more fuel-efficient heat sources should be considered to help diminish this problem as well as hopefully make it more economically efficient.

The main parts of these factories are:

- the crushing mill itself, made up of three pieces (in metal or wood), which serve to crush the cane (Photo 5B);
- the frame "cadre" into which this mill is placed;
- the yoke "jouk" to which a bull or two are attached;
- the pushing bar "zèl", which serves to transmit the animal power to the mill;
- a small, thatch house for cooking where one finds a large copper kettle into which the cane syrup is placed for boiling down.

All cane transformation sites do not have a mill. At Wannì six of the eight sites did not have one, but only take syrup crushed elsewhere and boil it down into rapadou raw sugar. At Lonci, only one does not have a mill. A large cane producer can rent the services of a mill to crush his cane, and then take care of the transformation process himself. One such mill can serve many syrup transformation sites.

The production operation (rapadou or syrup) requires five (metal mill) to six (wood mill) kinds of workers:

- the "tailleur" who cuts the cane;
- the "brotteur" who transports the cane from the field to the factory;
- the "piqueur" (one or two) who feeds the cane into the mill;
- the "pousseur" that walks after the bulls (keeping them moving);
- the "sucrier" who manages the cooking of the syrup.

The owner of the transformation mill, his wife, as well as the cane owner, are usually also present to control the different phases of the operations, and especially for preparing the food for the hired workers. These local sugar mills are therefore important sources of local employment.

2.4.2.2 Marketing

Syrup is produced for direct consumption (sugar coffee, AK-100, and some alcoholic beverages, in cookies, etc). It is also used as the major ingredient in rum distilleries (guildives). At Saint-Jean, there is one distillery which serves the entire zone, and delivers a product of very poor quality. According to farmers, there used to be four such distilleries in the area. At Wannitself, there is not a distillery, though there were reported to be about 10 in the local area.

Syrup from the sugar mills is orientated towards two particular markets:

- the distilleries, and farmers located in the mountains who use it in coffee, cookies, AK-100, and beverage alcohol (mabi).
- the creation of rapadou.

The market for rapadou is much larger and the product is sold everywhere, from the smallest to the largest markets (in Port-au-Prince, for example)⁴⁵. Rapadou is used for the same purposes as syrup, yet, because it is dried, has a much longer shelf-life. It is often eaten raw by farmers working in the field as a source of energy. Those selling the syrup usually use intermediaries who will buy at credit. Containers used for the syrup usually come from other imported goods, and are relatively expensive to obtain (metal or plastic drums, generally, but also plastic pails and gallon jugs). Rapadou, on the other hand, is made by the producer or his wife and is sold for cash - wholesale. It is stored in locally-created tube-like containers, made from the leaves of the royal palm tree (several feet long, 3-4 inches wide). During our visit to the region, we would frequently see women rolling up smaller cylinder-looking tubes (diameter of \$1 coin and about one food long) on the steps of their homes - with scores of these cylinders out drying on the cement porch in front of the home.⁴⁶ Such containers are fragile and, if subject to rain, can deteriorate quickly.

Rapadou production gives a sure cash flow to the household

⁴⁵ Rapadou of good quality is sold in the Dominican Republic.

⁴⁶ These women usually bought from those who created the rapadou - wholesalers. Then they will work the raw sugar into these smaller containers for re-sale in the market place.

during the operation. This is not the case with syrup, which can only be stored for 2-3 months. Rapadou can be easily stored, if kept dry, for at least six months. The selling of the rapadou gives rise to many employment opportunities for women in the region and represents an important part of the income for many families.

2.4.2.3 Productivity, and Utilization Rate

Both metal and wooden mills are characterized by very low productivity. It takes about one month to transform cane coming from a field of 0.25 cx. (0.32 ha) to 0.75 cx. (about 1 ha). The number of farmers, and the area which each mill can serve is therefore small (cf Table 12).

Table 12: Numbers of Farmers and Area Serviced by Some Sugar Mills

| Processing Mill Visited # | NUMBERS OF FARMERS | | | AREA IN Carreaux (1 cx. = 1.29 ha.) | | |
|---------------------------|--------------------|-------|-------|-------------------------------------|-------|-------|
| | SAINT-JEAN | WANNI | LONCI | SAINT-JEAN | WANNI | LONCI |
| SJ | 4 | - | - | 2.5 | - | - |
| W | - | 2 | - | - | 3.75 | - |
| L1 | - | - | 11 | - | - | 9.5 |
| L2 | - | - | 8 | - | - | 4.5 |
| L3 | - | - | 5 | - | - | 2 |

It is worth noting that the mean area in sugarcane cultivated by a farmer is low: 0.4 cx. to 1.87 cx, and in general, the sugar mill's owner does not have more than two to three carreaux. This has important implications for using sugarcane as major components on hillside fields for soil conservation vegetative barriers because even small farmers should be able to benefit if an economically feasible means could be found to crush their cane. The farmers can take care of the syrup themselves. PADF might link aggressive inclusion of firewood tree species within the vegetative barriers also expressly for these farmers who will need it for transforming their syrup.

It was difficult to estimate just how long these sugar mills remain in operation throughout the year. One can say, however, that these factories do appear to remain open year-round. This does constitute a serious problem in that it is known that the yield in sugar is lower during the rain months (more dilute). It takes more energy to boil the excess water off. At Saint-Jean (Seau d'Eau) this problem is more serious. Here, with extensive and uncontrolled irrigation practiced, and without adequate

drainage systems, cane fields are frequently wet even during months of major harvest during dry periods.

2.4.2.4 Prices

There are considerable annual fluctuations in prices for rapadou and syrup products as well:

- At Saint-Jean: 200% for the rapadou, 100% for the syrup;
- At Wann: 150% for the rapadou;
- At Lonci: 75 to 90% for the rapadou.

Such fluctuations are influenced by many factors: price of sugar, quality of product, purchasing power of farmers, supply v.s. demand. For example, during the rainy season, farmers in mountainous areas are frequently cut off from markets in lower valleys by rising rivers/streams, so prices for them increase. When roads open up again, prices fall.

2.4.2.5 Major Constraints Impeding Expansion of Sugarcane Agribusiness

- lack of bulls as a source of power for driving mill; this results in high renting fees for their services. A bull is rented for 10 gourdes⁴⁷ a day or 50 gourdes a week (6 days). A trained bull could cost between 3.500 to 4.000 gourdes;
- lack of mules for transporting sugarcane from fields to processing mill. Renting of a mule for this purpose is about 50 gourdes a week⁴⁸. Many farmers point out that this is a principal constraint which impedes sugarcane cultivation in mountainous areas where no crushing mills are to be found;
- lack of sugarcane cuttings for planting during ideal planting season months (rainy season months of April, May, and June). When cuttings are abundant (eg. during best harvest months between December and February), there is insufficient rain to establish new fields.
- lack of working capital. For the production of 3.800 gourdes of rapadou, a farmer or a factory's owner needs about 500 to 600 gdes; for the same value in syrup, the working capital

⁴⁷ At this time of writing, one US Dollar was worth about 12 Haitian gourdes.

⁴⁸ Merchants in this region use mules in their business of transporting goods between Haiti and the Dominican Republic and pay as much as 250 gourdes a day for their use.

necessary would be about 2.400 gdes;

- quality of products. Often the rapadou has a dark brown color which consumers do not like, nor is the raw sugar sufficiently dry (hard). This quality problem has many causes. This can be because the cane was processed during the humid rainy season months. Sometimes mature cane is harvested too late, perhaps because of the lack of bulls, mules, cash, or mill. Such delay can permit rats and birds to cause damage to stalks, permitting water to seep into the stalk. Nor is there any kind of quality control on the preparation of the rapadou in terms of cooking temperature, duration, etc.
- lack of wood. The cane, once crushed for the juice, is dried and used as an important source of fuel during later heating of the cane syrup. However, during the rainy season, farmers have problems both drying and keeping dried fuel from being rained upon. This leads to increased need for wood, which is harder to get and costs about 10 gourdes a day. Even in a drought period rapadou processors are often obliged to use wood because the crushed and dried cane stalks burn much more quickly than wood, requiring additional labor to keep feeding the fire continually - and this extra labor is considered expensive.
- Finally, the operators of a small sugar mill may not have the bulls needed to run his crusher, or a person may have the bulls necessary, but not have a mill close enough for use in crushing his cane.

It is important to note, however, that in spite of these many constraints, sugarcane as a rural agri-business does seem to be expanding.

2.4.2.6 Financial Aspects

Investments

Information supplied by sugar mill owners and potential owners indicate that an investor would need between 20,000 and 25,000 gourdes to set up a mill with a metal crusher. A wooden crusher would cost between 6,000 and 10,000 gourdes, depending on whether or not the equipment was new or used. The crushing mill, when metal, and the bulls represent between 50% to 70% of one's investment; a mill constructed out of wood represents between 15% to 20%, with the bulls representing more than 50% of this.

Profitability

Discussions with farmers have provided some indication of the profitability of sugarcane mills in this region (Table 13). In the

calculations for the sugar mill operators, we were not able to take into account the value of fixed costs (eg. cases 2, 3, 5). Sugarcane would appear to be profitable for both those who can raise the cane as well as the mill owners.

Table 13: Profitability of Cane Transformation

| Item | CASE 1 ⁴⁹ | CASE 2 | CASE 3 | CASE 4 | CASE 5 | CASE 6 |
|----------------------------|----------------------|------------|-------------|----------|-------------|-------------|
| Rent Mill | 50 | 250 | 0 | - | 0 | 480 |
| Rent Bulls | 100 | 330 | 900 | - | 800 | 240 |
| Rent Copper Cooking Kettle | 0 | 0 | 0 | 0 | 0 | 240 |
| Rent Mules | 0 | 0 | 0 | - | 200 | 816 |
| Workers | 130 | 437 | 3,060 | - | 800 | 600 |
| Food | 100 | 300 | 1,800 | - | 720 | - |
| Container | 0 | 75 | 1,500 | - | 515 | 0 |
| Wood | 0 | 0 | 0 | - | 180 | 0 |
| Variable Total Costs | 380 | 1,392 | 7,260 | - | 3,215 | 2,376 |
| Production | 2 drums | 200 brik | 1,600 brik | - | 1,280 brik | 384 gallons |
| Unit Price | 350 gdes | 8 gdes | 8 gdes | - | 11 gdes | 10 gdes |
| Sale Value | 700 gdes | 1,600 gdes | 12,800 gdes | - | 13,200 gdes | 3,840 |
| Profit Margin | 350 gdes | 208 gdes | 5,540 gdes | 500 gdes | 9,985 gdes | 1,464 gdes |
| # Work Days | 2 | 15 | 72 | 2 | 24 | 24 |
| Net Profit/Day | 17.5 gdes | 14 | 77 | 250 | 416 | 61 |

Remarks

Table 13 shows great variations for daily profit margin; the variation in profitability does not come so much from whether a person is a mill owner or a mill user, as from other factors. These would include yield in sugarcane, harvest period and sale prices during this time, and quality of the products produced. It is important to stress that sugarcane mill owners who principally use metal cane crushers have high costs of operation and

⁴⁹ Cases 1 and 6: Small (one woman) producers of syrup at Saint-Jean. Case 2: A sugar mill owner, renting out his mill (metal cane crusher) at Saint-Jean, and producing rapadou. Case 3: A sugar mill owner (with metal cane crusher), producing rapadou. Case 4: A small producer of rapadou at Lonci. For information, he only gave an idea of his profit margin, and number of days worked. Case 5: A sugar mill owner (wood crushing mill) producing rapadou.

maintenance. One can expend as much as 1,000 gourdes/year for repairs. There is a need for better engineered mills for cane crushing. The survey team, while in Les Cayes, learned that the Ateliers of Camp Perrin are working on plans for a well-built steel unit which will have less maintenance costs and operate more efficiently.

2.4.3 Marketing System: Profitability and Major Constraints

The marketing system is very developed in all three sites. The Madam Sara are numerous, well-organized, and often specialized. There are those who market sugarcane syrup, others who market raw sugar (rapadou), yet others who market food grain and other agricultural products (plantain, banana, avocado, orange, shaddock, etc.) to Port-Au-Prince, others who market food grain only within local markets, and those who only warehouse food grain (beans, sorghum, corn, peanuts) for other merchants.

At Saint-Jean/Seau d'Eau, 11 Madam Sara stock most of the corn and sorghum for the town of Saut d'Eau. One reported an annual stock of as much as 2,000 marmites for grain. Smaller Sara may not stock more than about 20 marmites each year, purchased when prices are low, sold when prices are high.

Table 14 below summarizes some of the information received from various Madam Sara interviewed by the survey team.

Table 14: Profitability of Marketing Agricultural Products

| Item | CASE 1 ⁵⁰ | CASE 2 | CASE 3 | CASE 4 | | | CASE 5 |
|--------------------|----------------------|--------------------------|---------|------------------|---------------------------------|------------------|------------------------------------|
| Product | Syrup | Beans Corn Sorghum | Sorghum | C o r n | S o r g h u m | B e a n | Banana/Plantain Avocado Corn |
| Quantity Purchased | 54 gal | 120 m 80 m 80 m | 160 | 75 m | 5 b | 36 m | 3 dz 20 bags 700 m |
| Unit Price/gdes | 12.95 | 21 5.1 5.6 | 4 | 4 | 100 | 11 | 167/dz 7.5/bag 5/m |
| Purchased Value | 700 | 3,376 | 640 | 300 | 500 | 400 | 4,150 |
| Ship Cost | - | 30 | - | - | - | - | 49 |
| Transport | - | 225 | - | - | - | - | 1,205 |
| Transport Sara | - | 25 | - | - | - | - | 30 |
| Storage Cost | - | 30 | - | - | - | - | 67 |
| Other Misc. Costs | - | 60 | 16 | 21 | 45 | 19 | 120 |
| Total Costs | 700 | 3,746 | 656 | 321 | 545 | 419 | 5,626 |
| Sale Gdes | 810 | 3,360 466 513 | 936 | 675 | 2.00 0 | 630 | 810 700 5,200 |
| Total Sales | 810 | 4,339 | 936 | 675 | 2.00 0 | 630 | 6,710 |
| Benefit | 110 | 593 | 280 | 354 | 1.45 5 | 211 | 1.084 |
| Work Days | 5 | 5 | 4 | 3 | 9 | 3 | 3 |
| Benefit/Day | 22 | 118 | 70 | 118 | 160 | 70 | 360 |

⁵⁰ CASE 1: Madam Sara of Saint-Jean selling syrup in the mountains. CASE 2: Madam Sara of Wanní selling food grain to Port-au-Prince. Case 3: Madam Sara of Wanní storing food grain locally for sale. Case 4: Madam Sara of Lonci storing food grain locally for sale; Case 5: Madam Sara selling various products to Port-au-Prince.

⁵¹ Various marketing costs include: loss during manipulation of products, food of the merchant when on trip to sell products (his per diem), cost for containers for transport, "taxes" paid to small hoodlums of Croix-des-Bossales, etc. Of particular importance are those losses caused by the "officials" who take weight measures for corn buyers of Croix-des-Bossales. Rural sellers are given considerably less than the true weights of their products, and their activity is seen by the Madam Sara as simply official theft. The officials taking these measures categorically refuse to permit the Madam Sara to participate in taking these measures.

Remarks

These figures are only indicative, and do not give a holistic view of what is taking place during these market transactions, of course. However, it can be said that the Madam Sara still do manage to turn a good profit. Even sugarcane syrup merchants earn a better daily wage (about double) than the daily going rate for wage labor. It should also be pointed out that profit is linked to the scale of the enterprises, and that economies of scale are important.

Storage of food grain by the Madam Sara varies, depending on the crop: a month for corn, two to four months for sorghum, five months for beans. Merchants control pests like bruchids through using insecticides such as Sevin.

While profit can be high for these Madam Sara, their risks are also high. Robbery by ruffians in Port-au-Prince can take all the money earned on a trip; price fluctuations are such that a merchant can find a commodity selling for less in Port-au-Prince than in her zone of purchase; many products are perishable and significant loss can be experienced when problems and delays are encountered in transport to distant markets).

Credit is scarce resulting in the need for different approaches to raising capital. Personal savings (sangle system) may be used, or livestock sold. Local credit, though available, runs to between 15% and 25% a month at Lascahobas. Working capital is frequently used for urgent household needs (school fees and supplies, funeral expenses, medical expenses, etc.), resulting in lost opportunities for making new money.

Plantain and banana are products that Madam Sara particularly like to market in Port-au-Prince, and all trucks leaving the region for this city can be seen stacked high with them. Risk of product spoilage is low, sales are rapid, and profits good (more than 20% return on money invested). Marketing, of course, is not always profitable. During the time of our survey visit in Lonci, for example, some Madam Sara reported having problems selling some of their products - frequently related to quality issues. Lonci/Lascahobas raw sugar (rapadou) is not sold at Port-au-Prince for this reason. One merchant, after five trips to local markets, could not sell her stock of rapadou valued at 300 gdes (30 units).

There is a fairly active market in the sale of wooden planks, most originating in the area, and hand sawn. A "mombin" tree (wood of inferior quality) gives the farmer who harvested it about 12.5 gdes/dozen planks, a Haitian oak ("chêne") tree (Catalpa longissima, tree of superior quality) about 166 gdes/dozen, and a mango tree about 89 gdes/dozen. Because of this range of prices, and in order to "increase" the price of "mombin", and "mango" boards, sellers will mix these with "chêne" boards with the

buyer's agreement. These merchants will in turn sell these "mixed" boards at 450 gdes. to 500 gdes/dozen, a good profit for them.

2.5 Livestock Production

2.5.1 Types of animals owned, nature, reasons for ownership

Animals are very important to the farming systems of all three micro-watershed sites visited. In none of the other regions visited by the farmer needs assessment survey team did we see so many bulls as in this Mirebelais region.⁵² This is principally because there are so many more uses for them. Bulls are important as sources of power to run sugarcane mills and for animal traction equipment (plows). An owner of a bull can associate himself with an owner of a mill, running operation as a joint venture, or he may simply rent his bull to run the sugarcane mill. Bulls are also used in transportation, like mules.

Farmers keep goats and pigs too. Many farmers buy piglets from the market for the sole purpose of fattening them for resale to the Port-au-Prince market some 9 to 12 months later. Goats are kept in the three micro-watersheds and children often tend these animals. Horses, mules and donkeys are also particularly important in all three areas for transportation. Roads are very poor, especially during the rainy season months between May and November. At Lonci, some farmers rent their mule to merchants who transport produce to the Dominican Republic, and return with manufactured goods for sale. This was particularly true during recent international embargo. At Saint-Jean/Seau d'Eau, a number of farmers raise tilapia fish in pool near their homesteads - a positive innovation of a recent FAO project. At Wann, we met a farmer with over 200 bee hives. His sales of honey and beeswax represent important sources of income for him.

2.5.2 Feed and seasonal availability

Table 15 below shows the periods of the year when different kinds of feed are available to livestock.

⁵² There are often many cattle in other regions, but they are predominantly cows kept for their milk and producing young - with only a few bulls in the region to serve in breeding. The rest of the males are castrated and raised for the meat markets of Port-au-Prince and other urban areas.

Table 15. Feed availability for herbivorous at St-Jean, Wanni and Lonsi

| | J | F | M | A | M | J | J | A | S | O | N | D |
|----------------------|---|---|-------|---|---|---|---|---|-------|---|-----|---|
| Residues: | | | | | | | | | | | | |
| -corn | | | | | | | | | ***** | | | |
| -sorghum | | | *** | | | | | | | | | * |
| -sugar cane | | | ***** | | | | | | | | | |
| -rice | | | | | | | | | | | *** | |
| Grass: | | | | | | | | | | | | |
| -koss | | | *** | | | | | | ***** | | | |
| -guinea | | | *** | | | | | | ***** | | | |
| -corde a grain | | | ***** | | | | | | | | | |
| -michel | | | *** | | | | | | | | | |
| Leaves: | | | | | | | | | | | | |
| -plantain | | | ***** | | | | | | | | | |
| -delin ⁵³ | | | ***** | | | | | | | | | |

Sugarcane and plantain/banana residues, corde-a-graine grass and delin (local leucaena) are available year round for herbivores in all three sites and in what appears like sufficient quantities. For this reason, raising grasses/leguminous plants as a animal forage in hedgerows of productive farmer fields is not particularly interesting to most farmers. In March, pasture and fallow field forage grasses are dried. In mountainous areas of this region, as in the African sahel, farmers will burn these dried grasses (Madan Michel, corde-a-graine, delin) to permit regrowth of fresh, young grasses from old root systems for their animals. In none of the three areas do farmers cultivate grass for their livestock. Abundant rainfall in this zone permits year-round availability of grasses for forage.

Table 16 below gives seasons for specific feed availability for pigs in the three micro-watersheds.

Table 16: Feed availability for pigs at St-Jean, Wanni and Lonsi

| | J | F | M | A | M | J | J | A | S | O | N | D |
|----------------------|---|---|-------|---|---|---|---|---|-------|---|----|---|
| Fruit: | | | | | | | | | | | | |
| -avocado | | | | | | | | | ***** | | | |
| -breadfruit | | | | | | | | | ***** | | | |
| -mango | | | *** | | | | | | | | | |
| -palm seed | | | ***** | | | | | | | | | |
| Cereals: | | | | | | | | | | | | |
| -corn | | | | | | | | | ***** | | | |
| -sorghum | | | *** | | | | | | | | | * |
| Roots/tubers: | | | | | | | | | | | | |
| -malanga | | | | | | | | | *** | | | |
| -sweet potato | | | | | | | | | | | | |
| Leaves: | | | | | | | | | | | | |
| -delin | | | ***** | | | | | | | | | |
| Other: | | | | | | | | | | | | |
| -cane syrup | | | ** | | | | | | | | ** | |
| Bran: | | | | | | | | | | | | |
| -sorghum | | | ***** | | | | | | | | | |
| -corn | | | ***** | | | | | | | | | |
| -wheat | | | | | | | | | | | | |

⁵³ Plant closely resembling leucaena, and a member of its family.

Avocado, mango, palm seed, breadfruit are available for pigs in the three areas. But at Lonci, breadfruit trees are fewer than at St-Jean and Wannii. Corn and sorghum grain are given to pigs between July and February. Corn and sorghum bran are available all year through the market and farmers will buy this mainly during gestation or when fattening animals for the market (usually castrated).

2.5.3 Health and care

Livestock are generally in good condition. Epidemic diseases appear only in chickens. In all three sites, some cows have the bizarre habit of sucking at their own udders. Farmers noted that this behavior results in cow not reproducing normally. Mineral deficiencies could be responsible for this condition. Farmers do not supply vitamins or minerals for their animals during gestation. Nor is drinking water provided every day for cattle and goats, though it is provided more frequently during the dry season. Goats are never given water directly. Animals are not de-wormed regularly. If attacked by external parasites, agricultural insecticides will be used (eg. ticks for cattle, mange for pigs). There is no particular dosage followed.

2.5.4 Reproduction

Reproduction characteristics for livestock in the three areas are similar. Many farmers want to breed their cow 3 months after calving, giving them one calf per year. In reality, farmers are not able to achieve this objective because, not being able to predict when the animal will come in to heat, breeding animals are not available on time. Almost all farmers can recognize when their animals come into heat, but they do not understand the ovulation cycle of their animals. Sometimes females are in poor health conditions and heat cannot appear.

Sows will come into heat a few days after separation from piglets. Farmers appear to wait too long to wean, leading to considerable weakness in the sow from feeding. As a result, some farmers will wait 2 months after separation to again be able to successfully breed their sow. Table 17 below illustrates reproduction parameters in the three sites.

Table 17: Reproduction parameters for livestock at St-Jean, Wannii and Lonci

| | St-Jean/Seau d'Eau | Wanni | Lonsi |
|--|--|--|--|
| Period between dropping cattle goat pig | 12 month or up 9 - 12 month 7 - 12 | 12 - 18 month 12 month 7 - 11 month | 12 - 24 month 8 - 12 month 7 - 11 month |
| Separation age cattle goat pig | 6 - 10 month 6 - 8 month - | 6 - 12 month 3 - 6 month 1 1/2-2 1/2 m | 6 - 10 month 4 - 8 month 1 1/2 - 3 month |
| Litter size cattle goat pig | 1 1 - 3 - | 1 1 - 3 4 - 10 | 1 1 - 3 4 - 8 |

Children usually care for the household's goats and see that reproduction takes place. Separation of young from mother occurs naturally when milk supply diminishes. In rare cases, a goat may have 3 kids, but 2 is the norm.

2.5.5 Animal Products

Household income derived from animals includes milk, eggs, young animals (piglets, goats, calves, chickens), fat pigs, sale of bulls and mule renting. Farmers prefer that their pigs and goats give birth during November/December. This is a period when they have a little more disposable income and food grain from harvested crops which they can use to support these animals. Then in March/April they can sell the young to obtain the money needed for a new agricultural season's activities (hiring labor for land clearing, planting, purchasing seed, etc.).

Milk production starts 1 to 2 months after calving. Some farmers will start as soon as 15 - 22 days after birth of the calf. At first, a farmer can expect to take about one gallon of milk at each milking, with the quantity decreasing to less than .5 gallons 6-8 months after the birth of the calf.

Pig fattening is also an important activity and source of income for many households in this region. The demand for piglets for these purposes greatly exceeds the supply. Farmers will go searching in various markets of their region to find piglets to buy. One merchant told us that some of these piglets are brought in from the Dominican Republic. We met several animal traders who regularly purchase 10-20 pigs in the area for transport to Croix-des-Bouquet, for the Port-au-Prince market.

Animal power and locomotion are highly important throughout

the region because of poor and un-maintained road infrastructure. We have already discussed the importance of bulls as a source of power to run the many sugar mills of the region, draw plows, and for simple transportation, much like mules. To run a sugarcane mill, an operator needs 6 bulls to work comfortably. Those with access to less than 3 bulls will overwork these animals. Therefore, mill operators frequently will resort to working agreements with cane farmers in their area to either rent them or to process their cane at better rates, sometimes even as part owner of the mill proceeds.

2.5.6 Markets and Consumption

In all three watershed sites surveyed, animal sales are significant. At Saint-Jean/Seau d'Eau, farmers make much money selling animals and meat to people coming for the Seau d'Eau annual religious festival in July. Demand for meat is particularly high between July 10 and August 1st. Many pilgrims buy animals when they leave the area, to take home.

Important local markets for live animals (Cana near Wann, Kass near Lascahobas) exist. At Lonsi, 11 full-time livestock merchants were identified. They sell to the Croix-des-Bouquets, one of the largest animal markets in Haiti - serving the Port-au-Prince market and region. Cattle, pigs and goats are the main animals sold. One merchant explained to us how he spends the week collecting animals from farmers and local markets. Then, on Fridays, he will go by truck to Croix-des-Bouquets to sell, for example, some 15 pigs he may have purchased. He also deals in cattle. Here, the animals he has been able to purchase during the week will be given to the care of two or three trusted men, hired to lead/drove as many as 40 animals overland, along the road, to Croix-des-Bouquets.

Milk sales are important in the region. The majority of cow owners sell milk, though this is not a daily practice, nor is this well developed. Some farmers, for instance, will only milk a cow on day market, being able to sell it the same day. The region is highly favored for livestock production, particularly cattle, and much could be done to develop the services and market possibilities for animals and their products.

Renting of large animals for transportation is a well-developed business for some farmers in all three watersheds. Bulls are rented to sugarcane operators to run their mill; they are rented for use in plowing fields. At Lonsi, farmers rent mules for as much as 250 gourdes/day to merchants going to the Dominican Republic. Such renting usually takes place during the rainy season months between May and November when roads are impracticable by trucks. Table 18 gives animal price in the three areas of this Low Plateau region.

Table 18: Animal Prices at Saint-Jean, Wanni and Lonsi

| | Saint-Jean/Seau d'Eau | | Wanni | | Lonsi | |
|-------------------|-----------------------|-----------------|----------------|-----------------|----------------|-----------------|
| | low price gdes | high price gdes | low price gdes | high price gdes | low price gdes | high price gdes |
| Goat | | | | | | |
| reproductive | 300 | 400 | 250 | 400 | 300 | 400 |
| castrate 18 month | 300 | 400 | 250 | 400 | 300 | 500 |
| young | 125 | 200 | 100 | 200 | 175 | 200 |
| Pig | | | | | | |
| adult | 1500 | 2000 | 1500 | 1500 | 1500 | 2000 |
| piglet | 150 | 200 | 200 | 250 | 175 | 250 |
| large adult | 1200 | 2000 | 1000 | 2000 | 1500 | 3000 |
| Cattle | | | | | | |
| cow | 2000 | 3000 | 2000 | 3500 | 2400 | 2500 |
| bull | 2000 | 4000 | 2000 | 3000 | 1700 | 5000 |
| young female | 800 | | | 1000 | 700 | 1000 |
| milk 0.75 l | 1.5 | 1.75 | 1.5 | 1.5 | 1.2 | 1.5 |
| Equine | | | | | | |
| horse | 1250 | | 1250 | | 800 | 1000 |
| mule | 2000 | | 1500 | | 2500 | 3000 |
| donkey (étion) | - | | - | | | 1000 |

Important sales of young animals occurs in March during the planting period and in September when money is needed for school expenses. This is the best time to find young animals at a low price. At Saut-d'Eau, many animals are sold in July. Farmers come from all over region to sell their animals there for the annual festival.

Table 19 below give information about breeding expenses in the three areas visited.

Table 19: Conditions for Breeding an Animal at St-Jean, Wanni and Lonsi

| | Saint-Jean/Seau d'Eau | Wanni | Lonsi |
|---------------|--|--|--|
| Cattle | free | free | free |
| Pig | a piglet after birth or 50 gdes | a piglet after birth | 25 gdes |
| Horse | 5 gdes in advance and 100 gdes after birth | 75 gdes in advance and 75 gdes after birth | 50 gdes in advance and 75 gdes after birth |
| Goat | free | free | free |

Breeding a cow or goat is considered a courtesy service one should be willing to provide at no cost. For pigs, conditions will vary. At Saint-Jean and Wanni, boar owners will demand a piglet for the services of their male. At Lonsi, we learned that only one good male was available for breeding purposes. Another boar had

been available, until recently, when its owner castrated it for fattening. Frequently, a farmer only has so much feed for these animals, and after a few months of breeding services, he will have a supply of new piglets coming to him as payment for his boar's services. He will want to make even more money from his boar, so will castrate it, and start the cycle over again with new piglets. For this reason, it is not uncommon to find areas with a serious deficit of good breeding males of all the major animals, which are the first sold off to the market to raise household money.

2.6 The Land

2.6.1 Land tenure

Saint-Jean

Farmers with whom we met spoke of three principal tenure patterns: "tè achete" or land which they had purchased, representing about 15% of the area, "heritage" or land inherited from one's parents, representing about 6% of the land area, and sharecropping, said to represent as much as 78% of the cultivated land (cf. Table 1). Indeed, according to PADF technicians and many farmers, six landholders living in Saut-d'Eau, Port-au-Prince, and a foreign country own almost all the land of the Saint-Jean/Seau d'Eau site. This helps to explain why it is so difficult to motivate farmers to create soil conservation structures on the fields they are using - most of the land does not belong to them and their period of occupancy of the land is uncertain. At the same time, there is a very strong land market. Many well-off Haitians own plots of land in and around Seau d'Eau upon which they have built beautiful villas. We saw a number of new homes of this kind being built during the time of our visit. It is difficult to buy and to rent land. Cultivated fields and farms are small, with about 0.10 to 0.6 cx. for the former and 1.6 cx. for the latter.⁵⁴

Wanni

Farmers in Wanni spoke to us of four kinds of land tenure practiced in this locality. Land purchased and controlled by the farmers using the land represented about 39%, land renting about 14.5%, sharecropping 14.5%, and inherited land about 32%. Our estimates are different from those reported by PADF (Table 1), particularly with renting (lower) and sharecropping (higher). The mean farm size was said to be about 1 cx. which may be divided into at least 5 different fields, located at considerable distance from each other. Land here is also controlled, for the most part, by about seven large families, each having between 7-10 cx. Land

⁵⁴ 1 carreaux (cx.) of land = 1.29 hectares.

tenure clearly has an impact on farmer motivation to installing and maintaining soil conservation structures, as well as in what crops will be cultivated. Sharecroppers tell us that they will not grow taro (malanga), sugarcane, plantain/banana on such parcels unless they have been able to arrange a special contract with the land owner concerning rights to these crops and how long the sharecropper will be able to exploit these fields. As these are the very crops which provide the most security and best economic returns to farmers, besides being important for soil conservation, these constraints to sharecroppers should give cause for concern. They are the ones cultivating much of the most "at risk" land which could benefit from just these crops. Clearly, sharecropping as a tenure system is detrimental to the objectives of protecting hillside fields. The solution is not to "outlaw" sharecropping (which would never work), but to find ways for these farmers to gain better rights to the production of these fields, as well as some possibility for eventual purchase.

Lonsi

Lonsi farmers spoke to us of three kind of land tenure patterns for their area. Unlike the other two sites, sharecropping appears to be greatly reduced, even negligible. Land owned through direct purchase is about 70% of area; rented land represents about 10%, and inherited land about 20%. Many Lonsi farmers cultivate in the Péligre dam watershed basin, with the dam waters themselves located just over a large hill ridge line from Lonsi. The survey team interviewed Lonsi farmers on the slope of these ridges, with a full view of the heavily silted dam watershed. However, much of the land of this watershed has been state land which farmers had been renting up to the time of Duvalier's departure. Since then, the status of this land is uncertain, with many farmers saying it is "their" land (they are certainly no longer paying a rent). A few years ago they would have said it was rented state land - or even sharecropped from those large landowners who had received rental rights to tracts of land. Farmers told us that it was not difficult to buy or rent a parcel of land in this area.

2.6.2 Land Values

Land values are function of five principal variables: location, slope, presence of trees, kind of crops one could cultivate on the soils, and irrigation potential. Given these variables, we have created the following three categories:

- . high value
- . medium value
- . low value

Table 20 below presents the range in prices found in the three

watershed areas according to these categories for a .25 cx. piece of land - a unit people readily could relate to (also see Table 1).

Table 20: Land Values (Gourdes/0.25 Cx.)

| Zone | Saint-Jean/Seau d'Eau | Wanni | Lonsi |
|-----------------------------|-----------------------|---------------|-----------|
| Sale: High value | 2,500 | 3,000 | 1,333 |
| Sale: Medium Value | 1,000 | 2,000 | - |
| Sale: Low Value | - | 1,000 - 1,200 | - |
| Renting: High Value | 300 | 300 | 250 |
| Renting: Med. Value | 150 | 200 | 60 |
| Renting: Low Value | 90 to 100 | 80 to 150 | 50 |
| Sharecropping ⁵⁵ | 33 to 40% | 35 to 50% | 37 to 50% |

We are not certain why land at Wanni should be more expensive than that at Saint-Jean as the reverse would be anticipated. The arrangements between sharecropper and land owner are essentially the same in the three areas. At Lonsi, we encountered a new variation in sharecropping relationships: a sugarcane field owner can give his parcel to a sharecropper who will have total responsibility for financing and working the land and crop, as well as in transforming the cane into syrup. Once all the work is done, and crop sold off, 40% of the receipts will go to the land owner, and 60% to the sharecropper. This is a system used by many large absent land owners.

2.7 Labor

2.7.1 Traditional Forms of Organizing Group Labor

The traditional form of organizing group labor that one finds at Saint-Jean is the "mera". The "mera" is also called "associé", when the labor being performed is not done for money (an exchange). Though a mera usually only works from about 7 am. to 1 pm., when the group works all day, it will be referred to as "jounen". A "mera" is an association between friends of usually similar social level. Each day a member benefits from the work of all the members of the group, working about six hours. Number of members is variable, ranging from 3-4 for the small group to 10- 15 and more

⁵⁵ Share received by land owner.

in large groups. One, and sometimes two meals are provided during the work period; though sometimes members agree among themselves that they will not provide meals. Should any particular member, on the day scheduled by the group to work his field, not need "mera" for his own work (or, more frequently, needs the cash), he can sell his "day" to another member or farmer in the community. He then earns the day's wage of each man working. Someone who "buys" such a group must provide at least two meals (a breakfast and end-of-day dinner).

The "mera" is particularly active between March and May, when field preparation work is being done by everyone. Mera groups are usually found in the higher mountain areas, and less so in the productive valleys and areas like Seau d'Eau and Wanni. These groups will frequently be hired by farmers in the valleys and plains at the foot of these mountain areas. Women from these mountainous areas also form their own mera, principally working on field planting and weeding. They too have been known to "sell their day", but only earn about half of a man's wage for each woman working.

The mera in the Wanni area are similar, though with a few differences. The "associé" work only for about three hours permitting a "mera" to work two to three shifts during the same day, in peak periods. This is principally because of the serious labor shortage present at this time of the year and is a means of sharing around more equally the labor that can be done within the groups. During these peak period, a special women "mera" can have as many as 50 members for sowing beans.

At Lonsi, one finds the "mera/associé", and the "combite". The mera are the same basic type of organization found at Saint-Jean and at Wanni. In the "combite", no money is exchanged. Here a farmer will invite other farmers with whom he has good relations to come and work in his field for a day. This farmer offers food to his guests. The numbers of people who show up is variable, depending of the financial capacity of the farmer and the amount of work to be done. In the morning a breakfast is served to workers, and at the end of day a dinner is offered. This particular form of work group seems to be becoming more rare, as demand for labor increases; many men also go off to the Dominican Republic in search for seasonal work.

Work is also frequently done individually, and men will often work under contract for a farmer to do a specified amount of work for an agreed upon price. At Lonsi, an employer may divide a field into sections, called "gol"); a "gol" measures about 200 square meters. Each worker will be assigned one such section for the day's work, paid at the going rate (cf. Table 1).

2.7.2 Principal Activities for Group Labor

In the three zones, group labor is used for the most difficult kind of field labor (land clearing/preparation for planting, weeding, deep tillage, sometimes planting). In peak periods, women work groups may participate in planting and first weeding.

2.7.3 Methods of Paying for Labor and Costs

In the three zones, payment of workers is made by cash and food. Workers will not work for credit. In fact, an employer is sometimes even obliged to give an advance. In these cases, there is no risk to the worker that the employer will try to get out of paying or delay payment - which apparently has been enough of a problem to give rise to this practice. The cost of labor is variable, depending of the zone. Table 1 (page 8) provides a summary of this information. Higher rates represent peak periods. In general, women receive 50% - 75% less than men when they work in such groups.

3.0 Already Existing Farmer Opportunities

Most inhabitants of this region depend on agriculture as their primary source of income and livelihood, while many are also engaged in complementary livestock activities.

3.1 The Cropping System

At Saint-Jean/Seau d'Eau, sugarcane is considered the principal cash crop by farmers, with beans in second position. Some farmers do very well with rice as well. At Wanni, sugarcane is largely cultivated in the low/flat lands between the foot of the mountain and the river (cf. Appendix 4, Photo 3A). Taro is a second valuable crop for both mountain and valley farmers. Plantain and beans are also important cash crops for many farmers. At Lonsi, sugarcane and plantain are the primary cash crops according to farmers, with taro, corn, and sorghum also providing significant revenues.

3.2 Livestock

Cattle and pig raising are considered particularly important by farmers for greatly increasing household financial security. Forage for these animals is widely available, and the animals seen appeared to generally be in very good shape indeed. Cattle breeding at Saint-Jean and Lonsi provide opportunities for some farmers, while trade in livestock is important too, with goats and chickens at Wanni, and cattle out of Lonsi. Animal fattening,

particularly of pigs, is a widely used strategy of many households in all three areas for supplemental income. Piglets are purchased in the market, are fed until full grown, and immediately sold, with cycle starting over again. Many don't bother raising a sow to produce their own piglets. Bulls are raised in the same way by some. Though disappearing among younger farmers, we did meet with several farmers who raised bees and received significant income from sale of honey and beeswax (cf. discussion in 1.2 above).

3.3 Other Current Sources of Revenues

Beside agricultural activities and animal production, farmers in these regions do not have many other opportunities to earn a living. Most other activities involve some kind of processing or transformation of agriculturally based commodities. In Seau d'Eau for instance, production of syrup, and rapadou raw sugar are important; as is the sale of milk (but not milk products) and sale of labor. Besides these possibilities, Wanni and Lonsi farmers are also engaged in charcoal production, tree cutting, and lumber sales to Mirebalais and Port-au-Prince. Planks produced from different tree species (mombin, mango, chêne), are also frequently exported to the Dominican Republic, particularly from Lonsi.

The wives of many farmers are Madame Sara, some stocking grain (corn, sorghum, beans) in the three sites, and peanut and tobacco at Lonci, for sale to both local and regional markets. Some are middle women for larger merchants for sales to Port-au-Prince and the Dominican Republic.

For someone with the sufficient means, purchasing of the equipment for a sugar mill is also considered a good investment. The demand for such mills exceeds the supply.

We found it very difficult to have farmers rank these opportunities in order of priority. Farmers think constantly of diversification of risk and opportunities and will themselves try to have a number of options going at the same time - hoping that one will work out for them. From our conversations, however, it was clear that animal production represented important investment opportunities with fattening and trade being essentially profitable activities. The breeding of cattle should probably take priority over that of goats and pigs, should a choice have to be made between them.

4.0 Major Constraints and Possibilities Solutions

4.1 Increased Production of Principal Crops

Principal production constraints vary with the zone. In the three zones, water (too little at times, too much at other times),

and soil fertility are major constraints cited by farmers. This was particularly true in the northern segment of the Seau d'Eau/Saint Jean site, where excess water proves a major problem for sugarcane during periods when harvest should be taking place. The Shaffer larvae was an often mentioned problems for a number of crops in the region, and PADF may wish to look more closely at this problem, particularly in light of the on-farm trial themes we have recommended (which include plantain). Table 21 below summarizes major constraints mentioned by farmers for each major crop of these watershed areas visited.

Table 21: Major Constraints

| CROP | CONSTRAINTS | | |
|---------------------|---|---|---|
| | Saint-Jean/ Seau d'Eau | Wanni | Lonsi |
| Banana/ Plantain | Schaffer larvae (Vincent variety) | Lack of water (March), wind (May-July), Schaffer Larvae (Vincent & Miske varieties), fire in high lands | Shaffer larvae (Vincent & Miske varieties), fertility, wind |
| Beans | Insects, rats, drought/water excess, fertility, | Drought, insect larvae, bruchids, fertility | - |
| Cassava | Excess water, Shaffer larvae | Excess water, rats, free livestock in high lands | Water excess, fertility |
| Corn | Fertility, drought/water excess, worm/rat/mouse (cut the seedlings), quality of seeds | Drought, rat&birds (harvest period), crickets&/mice (eat stalks), early varieties | Drought, soil fertility, rat/ crickets (eat stalks), birds (harvest period) |
| Taro (Malanga) | - | Water deficit, fertility, lack of seeds | Fertility, quality of seeds |
| Pigeon peas | Bug, worm | Water excess (flowering period), insects, rat/cricket (eat stalks), wind (flowering period) | Excess water, insects |
| Rice | Competition with "miami rice" | Water deficit | Quality of seeds, birds (harvest period), insects |
| Sorghum | Fertility, drought (earring period), rat/mouse/bird (harvest period) | Water deficit, or water excess in harvest period, crickets/mice (eat stalks) | Fertility |
| Sugarcane | Lack of bulls, and mill for the transformation, rats, lack of land | Fire in high lands | Lack of seeds, birds/rat (attack the stalks) |
| Sweet potato | - | Shaffer larvae, and other soils pests | Shaffer larvae, fertility |
| Yam | Shaffer Larvae | - | - |

4.2 Farmer Strategies to Resolve these Constraints

In order to improve soil fertility of some fields, some Saint-Jean's farmers say that it helps to practice a deep tillage of the soil. Lonsi farmers say they leave their fields in fallow for one or two years.

To resolve the wind problem for plantain and banana on windward facing field on steep slopes, farmers set in wooden supports, sometimes using nearby trees. This would be why inclusion of certain fast growing trees along down-hill side of vegetative barriers with plantain/banana would be useful on certain slopes. Farmers will know which slopes particularly need this support.

For some crops (beans, corn), where rats and mice eat stalks, some farmers use ratsbane poison. This is only a partial solution, because, since not everyone uses it, it is not long before neighbor rats find their way into the newly de-ratted field.

Against the Shaffer larvae, which particularly attack plantain and banana, farmers are forced to destroy the attacked plants. Less drastic methods of saving the clump would be a very valuable intervention for this important cash crop. Some varieties might be introduced which are less susceptible to such attack.

At Saint-Jean, insects in field beans are killed with Sevin insecticide, while at Wannu, attempts to control field insects in pigeon peas by using smoke (old tires, or other material, producing acrid smoke).

4.3 Animal Production Constraints

In none of the three areas is feed availability or quantity a constraint for cattle, or goat production. Bran (corn, sorghum, wheat) prices are a constraint for fattening a reproductive pig. Major constraints identified for herbivorous and pigs were management, reproduction, and the productivity of the animals. Many farmers do not know how to manage their animals to yield best results. Farmers with cattle should be able to obtain one calf/year per cow, but do not. Although farmers know that the best time to breed their cows is three months after birth of young, few actually can achieve this. The main reason is that they miss the heat. In a cow, this period occurs rapidly, and only lasts eighteen hours. For this reason, it is important that farmers be helped in predicting the correct date in order to be ready with a bull at the right time. This is particularly true since availability of bull (and this is true for obtaining mules as well) is an important constraint for farmers. Bull are quickly sold for meat or are used for other means of labor, so few are kept by the

farmers producing them. And because of both strong meat and animal power markets, sales are very strong for both purposes. There is a resulting competition between meat and work markets which drives up prices for these animals. Increasing calf production would therefore be a means of raising incomes in the region.

Some cows have the bizarre problem of sucking their own udders. While the reason for this is not known, it may be attributed to some form of mineral deficiency.

To produce mules, important for mountain transportation throughout the region, it is important to have an "étion" (special kind of large male donkey). In the three areas visited, there was not a "étion" to be found. Farmers are forced to go long distances, to other regions, in search of an appropriate breeding male - which considerably increases the cost as well.

Because of the strong demand for piglets for fattening and sales to the Port-au-Prince market, there is a need to improve the reproductive capacity of sows. Piglets born in all three areas are frequently sold in advance of their birth. Many sows seen in the three areas have low productivity. The period between births is too long because separation age occurs at 3 months. And litter size is too small in many cases. Farmers breed sows only once, while it would be better if this were done twice to assure better results.

In none of the areas do farmers give their animals a deworming - though this is a problem at times. Pigs, in particular, are most in need of this. Agricultural pesticides are sometimes used on animals against external parasites, with no particular dosage being respected.

Farmers provide very little care for their goats, considering them almost like a marginal animal - expected to fare on its own. Yet, within the market place, goat meat is in great demand. This is primarily because butchers prefer to kill and sell goat meat as the animal is small, and there is less risk that it won't all sell. Larger animals, like cattle, produce so much more meat. People know that the butcher is under pressure to sell, for fear of wastage since he can't conserve it, so they wait until prices fall. On a unit by unit basis, goat meat sells more than beef for this reason.

All farmers will always say that cash is the number one constraint they face.

5.0 Recommendations for Program Interventions/Potential Technologies To Implement

It is important to understand that these recommendations are drawn from what we learned from farmers about their attitudes and thoughts concerning PADF interventions in the area. Generally speaking, farmers with whom we met were positive about the efforts that were being made in their midst through the PLUS project. Our recommendations below take two forms, those specifically for the PLUS project, and those which may be beyond the scope of the project, but if implemented, would have a positive impact on the success of the project. For this reason, at the very least, the PLUS project might actively seek other partners so that these other recommendations might be considered and possibly implemented.

5.1 For PLUS Project

5.1.1 Labor Organization to Accomplish Program Activities

Rather than the current system of using extensionists to perform labor on cooperating farmers' fields to create some kind of soil conservation structure, PADF might consider a number of alternative approaches, which may be more culturally appropriate, and which may have greater potential for long term impact in the area. One alternative approach would be for extensionists to locate farmers with a need for similar soil conservation structures (rock terraces or vegetative bands), and to encourage them to form into small groups of 4-5 farmers. These groups would work under guidance of one extensionist to create the appropriate structures on their fields. Such farmers could either be farmers with fields adjacent to each other, or be neighbors with fields (someplace) with similar needs. These farmers should all have similar land tenure situations on the fields they will work (all owned, or all rented, etc.), to avoid problems of motivation. One potential problem with this approach, however, is that many of the farmers with whom PADF is currently working are large landowners, or are fairly prosperous. These farmers are the kind who hire labor for their field work. They don't really do much of it themselves.

A second, and we believe preferred complementary approach, would help in the situations where farmers hire labor for field work. PADF should give priority to identifying the "associée" and "méra" work groups working in each area, and have an extensionist join such a group as an 'animateur' towards activities which would include soil conservation, nurseries, etc.⁵⁶ The team was

⁵⁶ A Baptist Convention PVO local leader and his son, an extensionist, in Lanssi, have on their own initiative, built upon this traditional concept by forming four small groups of motivated farmers, each led by an extensionist, to work their fields. Their names tell the story: Tete Ensemble ("Heads Together") with 5 members, Na We ("We Will Succeed") with 6 members, Union Fait La Force ("Through Union We Are Strong") with 4-6 members; Espoire ("Hope") with 8 members. Members work like the traditional "associée" in that no money

impressed to find that the PVO in Lanssi has encouraged extensionists to be innovative, themselves creating what are in effect "associée" work groups whose major mission is establishing soil conservation structures on member fields.

5.1.2 Soil Conservation Work on ShareCropped and Rented Fields

Where rented or sharecropped is being "improved" with soil conservation structures, it is important that PADF extensionists be very certain the farmer have a clear understanding (contract?) with the landowner about the farmer's rights to vegetative material being put onto the field. Sharecropping farmers will never put crops like plantain, banana, manioc, sugarcane (and especially trees) on such land, unless the owner specifically agrees to the rights of the farmer over a number of years to make this worthwhile. Helping sharecroppers and renters obtain clear agreements of this kind should help improve the farmer's incentive to (1) place vegetative barriers which truly interest him on these fields and (2) to maintain them. Because so much of the hillside fields in all three watersheds are sharecropped or rented, this would appear to be very important.

5.1.3 On-Farm Research/Demonstration Fields

PADF extensionists and technicians in this region informed us that they had been told (by PADF agronomists/leadership) that whereas leucaena was a proven vegetative barrier and therefore appropriate for extension, other types of vegetative material were "experimental". Under the circumstances, however, it seems evident that leucaena is the crop which is experimental in this and many other areas, and the vegetative material which the farmer might be using on such barriers, though new in the sense of their placement on the fields in bands, are already widely used on the hillsides. While it is not certain that farmers will in fact modify their hillside farming system to the extent of changing the placement of already cultivated crops on such fields, an attempt to test this possibility through an on-farm research/development program would certainly seem appropriate. We cannot emphasize strongly enough

exchanges hands and the member getting the group's activities on his field provides something to eat. The group Espoire, the extensionist son who initiated this group, only does this for soil conservation activities. The other two groups will work in this same way when working under the "flag" so to speak of their group name - but the same individuals are also (and were previously) grouped as an "associée" (without a 'name'), in which they do other farm activities, and sometimes sell their "days" like a "mera". A potential problem with this evolving system is that the extensionist, who heads each group, wants the group to continue to grow. Too many members (even over 5-6) begins to cause problems for field activities which can not wait longer than a week for the group to "return" to one's own field. These groups should probably remain small. One extensionist said that if the group got too big, and this became a problem, he would split the group into sub-groups (under same group name). This might work. The team's recommendation would be for PADF to look more closely at this uniquely evolving system and perhaps suggest to those extensionists involved that they simply identify the existing "mera" or "associée" work groups already in the area, help them find a name if necessary, and then simply help them to perform like the "Espoire" group is performing - but remaining independent.

how important it is that farmers, once accepting the idea of having some kind of vegetative barrier on their field, be expected to think carefully about just what they might place in this barrier. A range of choices should be provided, and a sample of these monitored.

The farmer needs assessment team has developed an on-farm trial based on what we have learned from farmers about their priorities and cropping systems. We believe this trial should be used as a research/demonstration trail in all PADF watershed M/E zones. The basic orientation of the trial 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. This trail protocol is summarized through Table 21 below, under the discussion of "unifying themes" for the PLUS project, and is further described in detail in Appendix 2. Essentially, sugarcane and plantain/banana (with possibly other intermixed crops, such as castor bean, fruit trees, some gliricidia, palm trees, etc.) are proposed as a means of creating "rempe paille" dead vegetative barriers (held in place by living material) to hold back soil loss; field plantain will be relocated to these barriers, further freeing land in-between barriers for other crops of the farmer's choice.

5.1.4 Location of PADF Focus in Region M/E Watersheds

PADF might consider concentrating more of its effort in the higher reaches of the Wannu watershed, and much less in the lower portions, particularly the flat plain. In fact, the vast and treeless mountain areas above the Wannu watershed itself (Mountain Noir area) would appear to present much greater challenges. People There would be more likely to be motivated to work in groups for purposes of soil conservation, which is a major problem in the lower reaches of this watershed.

PADF may wish to more closely define who they consider their primary clients to be, and what kind of land they should be focusing on "improving": those exploiting the hillside fields or those exploiting the perhaps somewhat more productive valley bottoms and level regions at the foothills of mountains, etc. Many farmers have a number of fields in both mountains and valleys. It is difficult for a project to successfully consider development options for both areas because the production systems of the two areas are so different, calling for a completely different range of development options (eg. irrigation improvements, animal traction programs, sugarcane processing improvements, etc. for the valleys). The survey team would suggest that in both Seau d'Eau and Lonsi, as well as Wannu, the project not lose its focus on the very

productive hillsides, where effective soil conservation will be so important to maintaining the continued well-being of these people.

5.1.5 Farmers and PADF Interventions

At Saint-Jean/Seau d'Eau, farmers demonstrated a very positive orientation towards the soil conservation program - though this would be expected given the approach being applied (cf. section 2.3.1). Some farmers made the observation that they would prefer hedgerows using different plant material (from leucaena), specifically mentioning lumber trees (chêne, frêne/bois blanc, acajou). To support this, they provided these figures: after five to six years one "chêne" seedling can have (at present prices) a value of 50 gdes, and between 250 to 300 gdes after 10 to 15 years; a "frêne" is worth 35 to 40 gdes after 5-6 years. Farmers were clear in their preference for rock walls "murs secs". They also had a very negative opinion about the leucaena being extended by the project. According to them, there already was too much local leucaena (delain) in their fields, which they were struggling to get rid of. For them, leucaena is a plant to destroy as a "weed". Hedgerow leucaena and the common delain are both frequently burned off fields during field preparation, in an attempt to destroy it.⁵⁷ However, farmers will readily admit the utilitarian character of this tree: good fodder and green fertilizer for soils. In spite of the clearly negative opinion toward leucaena/delain, it was quite obvious to the team that the corn in these fields very much benefitted from soil enrichment of principally this "wild" leucaena.

At both Wanni and Lonsi, we found considerable interest in promoting sugarcane in hedgerows and in vegetable gardens. Extensionists have initiated small nurseries near water in a number of locations throughout the region, using innovative ways of placing planted seed into containers formed from plantain/banana stalks (cf. Appendix 3, Photo 9C). However, it appeared that they were doing most of the management for those who would eventually plant the seedlings out into their fields. This will not become a sustainable activity unless farmers become more directly involved in management of the nurseries. Lonsi farmers also noted a preference for Haitian oak (chêne), acajou (mahogany), cèdre (cedar), and eucalyptus.

⁵⁷ Once well established, even cutting down and burning will not totally destroy the plants. Some will continue to grow from root system (unless actually dug out).

5.1.6 Specific Actions Which Might be Taken

(1) **Sugarcane:** PADF may wish to consider placing much higher priority on supporting the entire range of activities linked to hillside soil conservation and in a more consciously focused effort by the field team. Greater efforts would be justified in the use of sugarcane for vegetative barriers. Farmers really want this, it entails less risk for them, and can generate good income. Its long cycle also provides better protection to hillside soils. Project help is needed in resolving issues which reduce the economic profitability of this crop for hillside farmers, as discussed earlier. There is much more to establishing sugarcane as hillside conservation vegetation than simply providing farmers with some cuttings. Issues of cane processing, marketing, disease resistant varieties, animal feed all become important.

(2) **Nurseries:** The seedling nursery ("pépinière lakou") program is potentially very important. It could become an important means of propagating diverse plants for the vegetative barriers recommended in this team's report. More attention must be given to (a) being sure that farmers themselves are managing these - and not project paid extensionists; (b) that a wide range of plants (fruit trees - for grafting, farmer requested non-fruit trees, coconut, royal palm, bamboo, etc.) be established in these nurseries and that farmers be helped to obtain sufficient quantities of difficult to obtain plants; (3) that there be an extension plan in place for where the seedlings from these nurseries might best go. We recommend that these plants be included specifically as components of the vegetative barriers rather than simply being planted haphazardly in a field. Such trees, if properly placed, can easily serve more than one objective on hillside fields.

(3) **Care in Bean Extension:** When one considers the fact that bean crop cultivation on hillside fields actually promotes soil loss,⁵⁸ and that it is also a crop with considerable risk, being very sensitive to drought and excess water, PADF might reconsider the wisdom of active extension of this crop until actual soil conservation measures are in place on the fields of farmers receiving this assistance. The Tamazulapa black bean variety being extended is an excellent choice, being resistant to the mosaic virus, a problem in local varieties. However its extension should be more seriously linked to placement within the cropping areas between vegetative barriers of hillside fields. Beans do provide a good source of income, but their increased cultivation (in 3 month cycles) on slopes can be counter-productive to long term soil conservation.

⁵⁸ This is equally true of peanuts as well. Corn and sorghum are in the field much longer and so present somewhat less problems. Pigeon pea, manioc, and sweet potato provide even longer soil cover, while the latter, frequently placed on contour ridges, actually provide real protection. Plantain, banana, and tree crops provide the best long term soil cover protection.

(4) **Leucaena:** Extensionists must be more aware of farmer's real concern with regard to leucaena as material planted for hedgerows in their fields. If farmers express reluctance to use this, it should not be used. Extensionists, furthermore, should not be made to feel that PADF expects them to promote it (which they do). There are other alternatives. Other plants can be proposed, such as the sugarcane already being encouraged in some areas. This report has suggested other alternatives (plantain, banana, grasses, etc.). Extensionists must not be pressured to plant leucaena simply because it is the seed most readily and easily available, and will best help them to meet their short term goals of satisfying USAID short term project indicators (# of linear meters of X planted). In all cases, a good training program is necessary for farmers, in which soil conservation management issues are discussed, with consideration of rock terraces, hedgerows, vegetative barriers, etc.

(5) **Need for Other Information:** The farmer needs assessment team only spent two days speaking with farmers in each watershed area, and as such, our impressions are qualitative. Much more could have been learned with more concentrated attention on specific types of farmers with whom the PLUS project is working. We would encourage the project, in its monitoring of program impact efforts, to be certain that the following types of information are obtained:

(a) Survey the costs (money, labor time) and possible increases in income resulting from soil conservation efforts established by farmers themselves;

(b) Keep records, over time, of the prices of inputs and crops of particular interest to the program, which might indicate an impact of interventions within the region;

(c) Survey farmers that adopt different soil conservation structures (gully plugs, vegetative barriers, hedgerows, rock terraces) to know the (real) reasons for their decisions.⁵⁹ This should be with farmers with established structures of at least two years of age;

(d) Survey a sample of farmer who have not adopted (i.e. not maintained) soil conservation structures on their fields. There are enough AFII farmers in this region who had previously established hedgerows to be able to do this. Learn reasons for failure and learn more about constraints.

(6) **Soil Conservation Incentives:** In general, the costs (labor and cash) for implementing soil conservation are high, and difficult. A system is needed to encourage farmers themselves to

⁵⁹ It was very clear to the survey team that farmers having "accepted" placement by, or with the help of extensionists, of soil conservation measures in their fields have not necessarily "adopted" these. Future maintenance of these structures quickly shows the difference.

get involved in putting in the needed structures on their land. The team would suggest that PADF initiate a public award system of prizes based on individual initiatives in this regard. Awards could be in cash, food, animals, going to farmers who have done outstanding work in creating the structures needed to preserve their soils, and to even increase its fertility. Awards would be given during special field demonstration days, when these farmer's fields would be visited by people in the community.

5.2 Other Potential Programs (for Other Projects)

It became clear to the survey team, in the course of our speaking with farmers, that a number of interventions were needed in the area to improve the chances of success of many PLUS project activities. Activities do not exist in a vacuum, even as the farming systems of these farmers are, in fact, complicated systems of inter-acting variables. Support to the activities discussed below would provide complementary support to PLUS project objectives of increasing the productivity of the hillside farmers in this region.

5.2.1 Small Agri-business

(1) Sugarcane Processing/Transformation Mills

It is absolutely essential to further develop sugarcane cultivation on the hill and mountain slopes of the three watershed areas. Such cultivation, ideal in this region, is a very effective means of soil conservation, and, if planted as cane barriers, would also be a means of expanding sugarcane production while still permitting important food grain production. One of the best ways to promote increases in sugarcane production would be through the establishment of more and more efficient small sugarcane transformation/processing mills. Improved manual and motor run sugar mills of the kind needed in many parts of Haiti are being developed in the Camp Perrin Ateliers at this time, and should be ready for extension within the year. Financing is needed for establishing such small enterprises. Such a program would concern many aspects: mills, bulls, improvements in quality of raw products, working capital for the farmers to increase production, transportation of cane, etc. Such a program would equally be of interest in the valleys and plain areas at the foot of these mountains. Further development of sugarcane industries in the region would provide much needed generation of employment.

(2) Processing and Transformation of Milk and Meat Products

Because of the high importance of cattle in this region, and the possibility of increased production, efforts should be considered to look at a dairy venture, with support to farmers to make this possible. Port-au-Prince is close enough to be a good market for such products, though roads will need to be improved to

make this a realistic possibility. During our visits, electricity from the Péligre dam was available in both Mirebalais and Lascahobas more regularly than in Port-au-Prince.⁶⁰ Increasing the importance and value of cattle and milk in the hillsides could encourage farmers to leave more land in pasture - a very appropriate alternative use for the hillsides. The value of cattle could also be increased if processing technologies for preserving meat could be introduced into the region.

5.2.2 Irrigation

Agricultural production in this region could be greatly intensified in the fertile and productive flat lands at the foot of the mountains. This could increase employment opportunities and reduce pressure on mountain agriculture (as people seek to make a living). One option for such intensification would be through support to irrigation ventures in both Saint-Jean/Seau d'Eau and at Wann, where numerous streams and spring flow down hillsides with little or no management. While at Saint-Jean, farmers already use water to some extent, there is a serious management problem. Sugarcane fields are often submerged, even during harvest periods, thus resulting in an inferior cane for transformation. Household fish farming has been successfully introduced into the area, using small retaining ponds fed by springs for fish production. This activity could be further expanded.

5.2.3 Pest Control

This program would aim to fight against the major pests that attack the main crops of three zones. These crops are principally sugarcane, rice, banana, plantain, sweet potatoes, and pigeon peas. The pests are mainly rats, miscellaneous caterpillar larvae, Schaffer larvae, and insects (principally bruchids). Programs which might be envisioned would have two approaches:

- a first approach where PADF, with its field agents, would help farmers obtain the kind of equipment they need (pumps, insecticides);
- a second approach where PADF or some other organization would help to establish marketing channels within the three zones, for such equipment and supplies. This might include some credit extended to small merchants to get into business, helping them to find suppliers and products, etc..

A pest control program in the region would require means of getting information out to farmers on methods, risks, and options they have

⁶⁰ This was true in Camp Perrin, in Les Cayes, as well, another area with great potential for cattle and their products.

of dealing with their specific problems. Merchants would also need to be helped in this regard.

5.2.4 Working Capital

We have discussed earlier how many farmers would like undertake new activities such as animal fattening, trade in livestock, animal production, and food grain storage (for commercialization). Many of these activities, among the most profitable in rural areas, cannot be realized because interested farmers do not have the money to get into business. A credit fund could permit many such farmers to profit from these ventures, and to escape from usurious credit schemes currently available (at Lascahobas, near Lonsi, for example, some small businessmen pay 25%/month for loans).

5.2.5 Recommendations for Animal Production

In the three areas, it is important to work on animal management and reproduction to increase productivity of females and quantity of bulls and mules. A program could be developed to show farmers how to manage their livestock better. Farmers would learn ovulation cycles of their female animals, best times to breed them, and be given basic instruction on animal feeding and care. It would be desirable to have available in the three sites those products most necessary for such care (eg. vermifuge, antibiotics).

In order to partially resolve the reproduction constraint for sows mentioned earlier, it would be possible to introduce rustic boars such as the Gascon-chinois-créole. Rustic animals reproduce at a light body weight and the cost of maintenance is much less. Farmers would, in this way, also have greater genetic variability. An animal of such mixed race will reproduce better than the "improved races" currently available, would cost less to raise, and would, with fattening, produce a larger animal than a rustic pig.

5.3 A Unifying Theme for PADF Watersheds in Mirebalais Region⁶¹

The farmer needs assessment team believes it is important for program efforts to be more focused in each region, within each watershed area worked in. Extension staff and technicians need to be provided a greater focus for their work, showing how all the different things they are doing (in PLUS, not just PADF) are all actually linked to some over arching objective and purpose. This is also important for farmers, as they observe program efforts in

⁶¹ This same theme has been proposed for the PADF Jacmel and Cape Haitian regions as well, with modifications depending on the specific plant materials which would be most appropriate for each area.

the area. This can be achieved by consciously linking program efforts to reach such common objectives. Such an approach is important in that it will also show to program leaders which efforts are not contributing to such objectives and which perhaps should either be dropped, or be better integrated into overall objectives. The survey team has therefore proposed what we have termed "unifying themes" to tie together the different threads of PLUS project efforts. We consider there to be six components necessary for achievement of the soil conservation efforts which would be both sustainable and increase farmer productivity on hillside fields. Table 22 below also indicates which constraints would be addressed within each component, as well as which specific activities should be undertaken by the project to implement this. We do not think that implementing the activities suggested in the on-farm, farmer managed trial, and related activities should increase the work load or costs of the PLUS project. Rather, there should be a reorganization of activities to permit this. We have made some suggestions concerning how this might be done using some of the extensionist and monitoring and evaluation personnel.

TABLE 22: UNIFYING THEME: Plantain/Sugarcane as Principal Components of Vegetative Barrier

| UNIFYING THEME | COMPONENT | CONSTRAINTS RESOLVED BY ACTIONS | PROJECT ACTIONS TO BE TAKEN |
|---|--|--|--|
| <p>Hillside Cropping Associations: Corn/Sorghum/Bean Pigeon Pea/Manioc</p> <p>with Vegetative Bands of:</p> <p>Plantain Banana Sugarcane Pineapple Some Castor Bean Some Yam Some Fruit Trees Some Gliricidia Some Coconut Trees Some Other Trees</p> | 1. Household Food Consumption | Need for food. 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. |
| | 2. Soil Conservation | Soil Erosion. 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. |
| | 3. Agroforestry | Deforestation leading to erosion, wind damage. 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. |
| | 3. 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. |
| | 4. 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. Provide assistance, where needed, in marketing key crops, seed banks, etc. |
| | 5. Agro-Industry | Farmers are not realizing what they might from the production of key crops. Incomes remain low and motivation to increase production thus limited. | Search for means of product transformation of key crops grown in vegetative barriers. Consider assistance to sugarcane processing mills and new manual means of extracting juice; consider improved means of processing castor beans; consider associating hillside plantain crops with varieties for flour processing; consider assistance in establishing cassava processing cooperatives. |
| | 6. Project Information Needs for Monitoring and Evaluation | Lack of objective data on soil conservation measures which will significantly both raise hillside farming productivity <u>and</u> 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. |

APPENDIX 1: CROP ASSOCIATIONS AND FREQUENCY

TABLE A1a. CROP ASSOCIATIONS AND FREQUENCY (SEAU D'EAU)

| Associations | Frequency | Fields Numbers | Slope ⁶² |
|---|-----------|----------------|---------------------|
| sweet potato | 2 | 50 | 1 |
| rice | 4 | 50 | 1-2 |
| sugarcane | 3 | 50 | 1-2 |
| sorghum | 1 | 50 | 3 |
| manioc, sorghum | 1 | 50 | 3 |
| corn,manioc | 1 | 50 | 2 |
| sugarcane, plantain ⁶³) | 2 | 50 | 1 |
| corn, plantain, sorghum | 3 | 50 | 1-3-4 |
| corn, pigeon pea, sorghum | 3 | 50 | 1-3 |
| corn, manioc, sorghum | 1 | 50 | 3 |
| sugarcane, plantain, sorghum | 1 | 50 | 1 |
| corn, sorghum, pigeon pea, manioc | 4 | 50 | 2-3 |
| corn, pigeon pea, sorghum, plantain, manioc | 2 | 50 | 3 |
| corn, pigeon pea, sorghum, manioc, sugarcane | 1 | 50 | 3 |
| corn, manioc, sorghum, sweet potato | 3 | 50 | 1-3 |
| corn, sorghum, manioc, plantain | 2 | 50 | 2-3 |
| corn, pigeon pea, sorghum, sugarcane | 2 | 50 | 1-2 |
| corn, pigeon pea,manioc, plantain, sweet potato | 1 | 50 | 3 |
| corn, sorghum, manioc, plantain, squash | 1 | 50 | 4 |
| corn, pigeon pea, manioc, sugarcane, sweet potato | 1 | 50 | 1 |
| pigeon pea, sorghum, plantain, sugarcane,sweet potato | 1 | 50 | 1 |
| corn, manioc, sugarcane, plantain | 1 | 50 | 2 |

⁶² We define slope into six classes: (1) Level: 0%-5%; (2) Gradual: 5%-20%; (3) Medium: 20%-40%; (4) Steep: 40%-60%; (5) Very steep: 60%-80%; (6) Extremely steep: 80%-100%

⁶³ Banana and plantain are mixed.

TABLE A1b. CROP ASSOCIATION AND FREQUENCY (WANNI)

| ASSOCIATIONS | FREQUENCY | FIELDS numbers | SLOPE (14) |
|--|-----------|----------------|------------|
| sorghum | 1 | 37 | 2 |
| sugarcane | 1 | 37 | 2 |
| pigeon pea, sorghum | 1 | 37 | 1-3 |
| corn, sorghum | 3 | 37 | 1-3-4 |
| plantain, sugar cane | 1 | 37 | 6 |
| pigeon pea, sorghum, sweet potato | 1 | 37 | 1 |
| pigeon pea, manioc, sweet potato | 1 | 37 | 4 |
| corn, manioc, plantain | 1 | 37 | 2 |
| corn, manioc, sorghum | 2 | 37 | 4 |
| corn, pigeon pea, sorghum | 1 | 37 | 2 |
| malanga, manioc, plantain | 4 | 37 | 4-5 |
| corn, plantain, sorghum | 1 | 37 | 6 |
| malanga, plantain, sorghum | 1 | 37 | 4 |
| corn, malanga, sorghum, squash | 1 | 37 | 3 |
| corn, manioc, sorghum, plantain | 1 | 37 | 4 |
| corn, manioc, sorghum, pigeon pea | 1 | 37 | 2 |
| malanga, manioc, pigeon pea, sweet potato | 2 | 37 | 2-3 |
| corn, manioc, malanga, pigeon pea | 1 | 37 | 4 |
| malanga, manioc, sorghum, sugarcane | 1 | 37 | 5 |
| malanga, manioc, plantain, bean, sweet potato | 2 | 37 | 2 |
| corn, manioc, malanga, plantain, pigeon pea | 1 | 37 | 2 |
| corn, malanga, plantain, yam | 1 | 37 | 3 |
| manioc, plantain, malanga, yam, pigeon pea, squash | 1 | 37 | 4 |
| malanga, manioc, yam, sweet potato, sugarcane | 1 | 37 | 1 |

TABLE A1c. CROP ASSOCIATION AND FREQUENCY (LONSI)

| ASSOCIATIONS | FREQUENCY | FIELD Numbers | SLOPE (14) |
|---|-----------|---------------|------------|
| sugarcane | 1 | 60 | 2 |
| plantain ⁶⁴ | 4 | 60 | 3-4-5 |
| manioc, plantain | 1 | 60 | 3 |
| sugarcane ,sorghum | 1 | 60 | 1 |
| plantain, sorghum | 1 | 60 | 2 |
| plantain, rice | 2 | 60 | 1-2 |
| corn, rice | 1 | 60 | 3 |
| sugarcane, manioc, sweet potato | 1 | 60 | 3 |
| corn, malanga, sorghum | 1 | 60 | 2 |
| corn, plantain, sorghum | 3 | 60 | 4-5 |
| corn, manioc, sorghum | 1 | 60 | 2 |
| corn, plantain, sugarcane | 1 | 60 | 3 |
| plantain, rice, sugarcane | 1 | 60 | 1 |
| corn, plantain, manioc, sugarcane | 1 | 60 | 4 |
| corn, plantain, manioc, sorghum | 3 | 60 | 4-5 |
| corn, manioc, sweet potato, sugarcane | 1 | 60 | 2 |
| corn, plantain, sorghum, sugarcane | 1 | 60 | 3 |
| plantain, manioc, sorghum, sweet potato | 2 | 60 | 3 |
| corn, plantain, sorghum, pigeon pea | 1 | 60 | 2 |
| corn, plantain, manioc, pigeon pea | 2 | 60 | 1-3 |
| corn, rice, sugarcane, pigeon pea | 1 | 60 | 3 |
| corn, rice, manioc | 1 | 60 | 3 |
| corn, plantain, sugar cane, pigeon pea | 1 | 60 | 1 |
| corn, plantain, sugarcane, manioc, malanga | 1 | 60 | 3 |
| corn, plantain, manioc, pigeon pea, sorghum | 1 | 60 | 3-4-5 |
| corn, manioc, plantain, sweet potato, sorghum | 2 | 60 | 1-3 |
| corn, manioc, plantain, sweet potato | 1 | 60 | 5 |
| plantain, manioc, pigeon pea, sweet potato, sorghum | 1 | 60 | 4 |
| corn, plantain, manioc, pigeon pea, sweet potato | 1 | 60 | 5 |
| corn, manioc, pigeon pea, sweet potato, sorghum | 1 | 60 | 2 |

⁶⁴ Plantain and banana are mixed. Where one is present, other is likely to be there too.

| | | | |
|---|---|----|---|
| plantain, manioc, pigeon pea, sweet potato, sorghum | 1 | 60 | 3 |
| corn, plantain, pigeon pea, rice, malanga | 1 | 60 | 3 |
| plantain, rice, sweet potato, malanga, sorghum | 1 | 60 | 3 |
| corn, plantain, rice, pigeon pea | 1 | 60 | 1 |
| corn, plantain, pigeon pea, yam, sorghum | 1 | 60 | 4 |
| corn, plantain, pigeon pea, manioc, sorghum | 1 | 60 | 3 |
| corn, rice, pigeon pea | 1 | 60 | 3 |
| corn, plantain, sugarcane, manioc, sorghum | 2 | 60 | 3 |

Appendix 2: SECID/PADF ON-FARM TRIAL

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, do not take 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. To farmers, land values depend on what that land is capable of growing. The kind of land which possesses the greatest value is land possessing long term productive 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. Soil conservation is the major objective, which is linked to increasing agricultural productivity along the lines farmer most desire. This has the 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 key PLUS project program interventions which the farmer needs assessment team have learned

to be particularly significant to farmers in the area⁶⁵. 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, 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 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 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

⁶⁵ And which, under current program implementation, are not being approached in any systematic, unified approach.

field activity⁶⁶. This will help develop a PLUS project team approach to an important unifying theme in each region.

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 size⁶⁷. 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 (but 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 (i.e. plantain) of part of his field (actually doing this is part of what is being tested), along recommendations from the program technicians, as a applied research trial. The farmer must be willing to use his own plant material, to the extent that it is available, to put on this field trial. If

⁶⁶ 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.

⁶⁷ A 12/100 cx field equals .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.

not available, the project will furnish the material⁶⁸. 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.

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 m²⁶⁹ 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 bottom⁷⁰. 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 whatever 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 hedge row, so if the field already has significant growth of leucaena, it should not be used for this trial⁷¹. 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. Palmist Tavin), these ridges will be important for this trial.

(3) Unless already done (i.e. from already existing "rempe paille" or contour canals), extensionists should help farmer place stakes across the contour, as being currently practiced, within only the part of field to be used for trial.⁷² We would encourage use of "bois repousse" stakes (stakes which will take root) exclusively,

⁶⁸ 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.

⁶⁹ 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.

⁷⁰ If in some cases this would make the trial area too large, then start at the top and move down.

⁷¹ It may be used for a trail where the effects of leucaena on soil conservation are being tested.

⁷² If the farmer wishes to himself complete this work across the rest of his field, he should do this with his own efforts, but not with extensionist agent assistance.

preferably gliricidia or manioc.

(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 barriers⁷³. It is important that the entire area be 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 rows⁷⁴. 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 as long as 7-10 years, and longer, this crop can provide a long lasting barrier against soil loss, ensuring continued productivity within this field. This goal is as important as increasing productivity on such land, which is also expected to take place where soil accumulation occurs⁷⁵.

(5) Following the planting of 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 the line between the young plantain

⁷³ 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 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.

⁷⁴ 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.

⁷⁵ 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.

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, are eventually cut (and laid along side the strip), as sorghum and corn stalks are harvested, etc. This dried plant material will be held in place by the living 'stakes' of plantain, sugarcane (castor bean), etc. and will actually hold soil on the slopes, developing, over time, physical terraces 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.

(8) Farmer 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 planting materials, if possible, and if farmer really wants it, provide disease resistant plant material (i.e. against charbon for cane, against marocha for plantain). 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 barrier⁷⁶. 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

⁷⁶ 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.

the years of accumulated organic material of the newly built terrace area for production of corn, beans, manioc, sorghum, pigeon pea.

APPENDIX 3: PHOTOGRAPHIC OVERVIEW OF SURVEY SITES VISITED