

**HAITI PRODUCTIVE LAND USE SYSTEMS PROJECT**

**SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT**

**AND**

**AUBURN UNIVERSITY**

**OCTOBER 1993**

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**FARMER NEEDS ASSESSMENT EXPLORATORY SURVEYS**

**PADF JACMEL REGION 2**

**by**

**Richard A. Swanson**

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**Roosevelt Saint-Dic**

**SECID/Auburn PLUS Report No. 11**

**June 2-4, 1993**

**July 19-31, 1993**

**Palmiste Avin (Léogane Area)**

**Berry (Marigot Area)**

**Tilier/MonDésir (Marigot Area)**

# Haiti Productive Land Use Systems Project

South-East Consortium for International Development

and

Auburn University

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**Report  
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2. *A Review of PDAI and ADS II Project Technologies.* by Marianito R. Villanueva. 1993. 31 pp.
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8. *Farmer Needs Assessment Exploratory Surveys: Field Information Acquisition Guide and Methodology.* by Richard A. Swanson. 1993. 28 pp.
9. *Farmer Needs Assessment Exploratory Surveys: PADF Cap Haitian Region 3.* by Richard A. Swanson, William Gustave, Yves Jean and Georges Condé. 1993. 75 pp.

10. *Farmer Needs Assessment Exploratory Surveys: CARE Northwest Regions 2, 3 & 4.* by Richard A. Swanson, William Gustave, Yves Jean and Roosevelt Saint-Dic. 1993. 76 pp.
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16. *Soil Profile Description for Selected Sites in Haiti.* by Richard L. Guthrie, Pierre M. Rosseau, Gene A. Hunter and Marie-Paule Enilorac. 1990. 72 pp.
- 17.<sup>1</sup> *Assessment of Hedgerow Performances in the Haitian Context.* by Pierre M. Rosseau, Arthur G. Hunter and Marie-Paule Enilorac. 1990. 41 pp.
- 18.<sup>1</sup> *Results of a Survey of Farmers in Selected CARE and PADF Intervention Areas.* By Marie-Paule Enilorac and Pierre M. Rosseau. 1990.
19. *Biological, Physical and Environmental Factors Affecting the Health of Trees Important to Haiti.* by G. Brett Runion and Walter D. Kelley. 1990. 101 pp.
20. *Storage Conditions and Pre-Germination Methods for Seed of Selected Tropical Tree Species.* by Joel C. Timyan. 1990. 23 pp.
21. *Factors Affecting Seedling Mortality in Haitian Agroforestry.* by Harry Elver. 1990. 36 pp.
22. *Agroforestry Research in Haiti: An Overview.* by Paul D. Starr, Donald R. Street, R. Kent Reid and Fritz Vaval. Contains 4 papers: The Social Foundations on Haiti Agroforestry; The Economics of Haiti Agroforestry; Forest Tree Nurseries in Haiti; and The Genetic Conservation of Native Tree Species. 1990.

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<sup>1</sup>Limited distribution only.

23. *A Geographical Information System (GIS) Approach to Locating Potential Planting Sites for Catalpa longissima Species (Chêne) in Haiti.* by Fritz Vaval and Douglas C. Brown. 1990. 37 pp.
24. *Effects of Seed Treatment Methods on Germination of Simarouba glauca var. Latifolia Cronq.* by Fritz Vaval and Joel C. Timyan. 1990.
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31. *Development of Stock Quality Criteria.* by R. Kent Reid. 1991. 30 pp.
- 33.<sup>1</sup> *Economic Indicators of Agroforestry II Strategy Implementation: Farm Income Analysis to Agricultural Project Analysis.* by Kent D. Flemming and G. Edward Karch. 1991.

Reports may be obtained by contacting the SECID/Auburn Office in Haiti or by contacting:

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Telephone: 202-628-4551  
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## FORWARD

This report covers the third of several surveys conducted by a multi-disciplinary team led by Anthropologist, Dr. Richard A. Swanson, of the University of Arkansas. Additional members of the team included Agronomist Yves Jean, Agricultural Economist 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 Southern Haiti, identifies constraints to production and opportunities for PLUS to achieve sustainable increases in production and farm income. The survey also provides information on technologies promoted by PLUS as they are presently implemented in the survey areas. The authors have 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 Southern Haiti and how they relate to interventions available to PLUS. It has raised issues to be addressed in our implementation program and widened our vision of socially acceptable ways to achieve sustainable increases in farmer income and improved conservation of the environment.

Because this report represents only one part of Dr. Swanson's job assignment, an executive summary was not included in this report. The executive summary is published as a separate volume, SECID/Auburn PLUS Report No. 7, which summarizes and integrates the findings of five separate surveys. The present volume contains the detailed findings from surveys in three watersheds in PADF's region ~~2~~ in Northern Haiti.

Dennis A. Shannon  
Campus Coordinator  
Auburn University

## ACKNOWLEDGEMENTS

We particularly appreciated the interest shown by the senior PADF agronomist in this area, Mr. Friedrich Nicolas, in going with the team, every day, to both the Berry and Tilier/MonDésir sites - permitting us to interact with him through the process of the survey, while learning much about the program objectives in the area in the process. We also appreciated the excellent collaboration of Duverge Vernus, in M/E, whom we found to be both very knowledgeable about the area and highly motivated.

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## 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 at small-scale, hill-side farmers (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 2km<sup>2</sup> 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 Riviere 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, Saut d'Eau, Site 1
Aug.5,6,7	PADF Mirebelais Region #3, Wann, Site 2
Aug.9,10	PADF Mirebelais Region #3, Lonci, 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, Gaita/Vachon, Site 1
Aug. 21,23,24	PADF Les Cayes Region #1, Picot, Site 2
Aug. 25,26	PADF Les Cayes Region #1, Banatte, Site 3
Aug. 27	AID Debriefing
Aug. 28	Swanson Departure
Aug. 30-Sept.10 <sup>1</sup>	Final Write-up of Les Cayes Zone #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 Conde, 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.

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<sup>1</sup> 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 (engrais 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. At Palmiste Avin, the PADF staff were occupied with their own survey and the Farmer Needs Assessment Team met with farmers directly. At Berry and Tilier/MonDésir, we were assisted by Friedrich Nicolas, Agronomist and Team Leader and by Duverge Vernus, Responsible for M/E at the Marigot Sites.

Farmer contact with the team was voluntary and an effort was made not to significantly disrupt on-going farmer activities. All

questions were asked in a free-style conversational manner with farmers regarding the major information needs outlined below. It was important that answers be followed up (Why? When? Specifics?). Field observations were particularly important. Considerable time was spent with farmers on their land, looking at crops, animals, etc. A list of topics and key questions was used to guide the survey team in the interviews, with notes usually taken in a personal notebook for later write-up in journal style on laptop PCs. Consideration of these notes formed the substance of this report.

### **0.3.2 Questionnaire Formats**

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 will be progressive farmers/innovators, half representing "typical" farmer (chosen by PADF/CARE). Main requirement is 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 km<sup>2</sup>, within a total of 5 zones of Haiti (4 for PDAF, 1 for CARE) for M/E purposes. The Farmer Needs Assessment team was given 3 days for each micro-watershed. When possible, the first two days were spent on the watershed with farmers, and the third day used for team/project discussion and initial write-up of field notes into a more legible form.

At each field site, the team initially met with 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 is important that it be understood that the meetings would be informal and small (4-5 farmers). One such group meeting would be held by each of the two field teams at each site. These meetings would not last longer than 1 hour, and usually led to contacts for further individual, more intensive interviews on field locations.

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	Palmiste Avin	Berry	Tilier/MonDésir
Department	Ouest	Sud-Est	Sud-Est
Arrondissement	Leogane	Jacmel	Jacmel
Commune	Leogane	Marigot	Marigot
Section Communale	Palmiste Avin (7ieme)	Macary (3ieme Section)	Macary (3ieme Section)
Resident Households	50	75	375 (PADF area)
Persons/Household	6-7	5	6
Elevation (meters)	380	800 - 1250	230 - 350
Rainfall (X) (mm)	2000 (est.)	1973 mm.	1973 mm.
Soil Characteristics	Reddish brown, high clay content; calcareous/basaltic	Black, high clay content with stones; red fersallitic	Black, high clay content
Erosion	Moderate to High	Very Low	Low
Depth	> 1 meter	50 cm. - over 1 meter	50 cm. to over 1 meter
Cultivated Slopes	Most > 30%, to 100%	Most < 20%	Most of slopes 20-40%
Land tenure	61% directly owned; 16% sharecropping; 12% undivided family; 6% rented <sup>2</sup>	59% directly owned; 23% undivided family; 13% rented; 5% sharecropped <sup>3</sup>	59% directly owned; 10% undivided family; 12% sharecropping; 19% rented
Land value, Purchase: (.32ha, 1/4cx)	\$1,500 - \$8,000 <sup>4</sup>	\$250 - \$700 <sup>5</sup>	\$1,000
Land rent (.32ha, 1/4 cx)	\$100/year \$12- \$27 (steep, poor)	\$100 yr. (for 6 years) \$20-\$40	\$20-\$60
Pressure on Hillside Land	Very difficult to find and costs rising fast	Not too bad, people say can find land to use	Land can be obtained, but cost is rising fast
Daily Labor Rate	10-12 gdes. + food; 15 gdes no food <sup>6</sup>	5-7 gdes. + food <sup>7</sup>	5-7 gdes. + food 10 gdes <sup>8</sup>

<sup>2</sup> Source: ADS-II report # 31, from statistics on the Department l'Ouest and Sud-Est, 1987:20. Our survey confirmed high ownership and much share-cropping.

<sup>3</sup> From ADS-II Jacmel mountain site socio-economic data, 1988:7), considered similar.

<sup>4</sup> Because of highly competitive land market here, farmers were reluctant to give us prices. Prices of land along the paved road are very high, "only affordable by someone from New York", one farmer told us. Actually, wealthy Port-au-Prince people seek land along this mountain road, with its dramatic views of distant mountains, valleys, and sea. The higher prices given here reflect land for such construction along the road; the lower prices represents steeply sloping land at some distance off the road, suitable for cultivation.

<sup>5</sup> Lowest price for exposed hillside land, highest price for wooded or fertile, less sloping land. Land growing plantain, banana, fruit trees considered most valuable.

<sup>6</sup> Farmers create contour ridges in this area, requiring considerable effort.

<sup>7</sup> Starts with coffee and "biscuits" in morning, ending with larger meal when finished (usually rice, oil, plantain, beans). Cost of meal (\$1 - \$1.50/person) usually equals cost of cash paid.

Important Infrastructure in Area	Paved Road, Elementary school, stores with supplies	Rough dirt road into area Macary coffee center	Near Marigot market
Key Sources of Income	Peanuts, Beans, Plantain, Manioc	Cabbage, Corn, Yam, Bean Potatoes, Livestock	Plantain, Beans
Key Consumption	Plantain, beans, taro	Plantain	Plantain
Key Animal	Cattle	Cattle, Mule	Mule, pig
Handy craft, Other	Several furniture shops; manioc & peanut transformation, Seed bank, handicraft store	Major women commerce	Major women commerce

### 1.1 Palmiste Avin Area

The Palmiste Avin M/E site is located along the spine of a spectacular mountain chain rising from the Léogane plain, on both sides (east/west) of the paved road from Port-au-Prince to Jacmel. It is just 10 minutes from the turn-off towards Jacmel off the road to Les Cayes (cf. Appendix 3, Photos 1A, 2C). Most homesteads are concentrated along or within a few hundred yards of the road, along the ridges of the mountains. Here, one finds fairly dense vegetation of mango, breadfruit, citrus trees, plantain and banana, cashew, avocado, several giant mapoo trees, etc. A small depression within the site was filled with standing water, with mazumbel (cocoyam) and large trees growing along the fringes. (Cf. Appendix 2 for a photographic overview of this and the other two micro-watersheds visited.)

Within Palmiste Avin, PADF has had a long standing working relationship providing tree seedlings to a Catholic religious order called Les Petits Frères de St. Therese. They have worked in this area since 1979 and have similar activities in other parts of Haiti. A number of "frères" living in the area since 1984 come work in community development and promotion of agricultural activities. This NGO had received a grant from a wealthy landowner in the Léogane plain of some 11 carreaux of land along the road, where they have built some important facilities, stores, residences, etc. They receive funding from a number of sources to run their various programs (UNICEF, PADF, Catholic Relief Service). Some 52 community groups have been created under their direction, with about 15 farmers/group. These groups have been organized into an Association (Association Groupements Paysans Palmiste Avin), with major efforts linked to soil conservation (deep contour

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<sup>8</sup> One farmer said he specifically selects farmers who he knows will work hard and pay them higher wages, and food he gives them is worth about 7 gdes/person. In this way, he is able to hire good work in a competitive labor market.

ditches) since 1988. They have also helped this Association develop a seed bank, where farmers can borrow 10 marmites of peanuts or beans (at time of planting or for sale) and return 12 marmites at harvest<sup>9</sup>. It is with Les Petites Frères<sup>10</sup> and these locally organized groups through which PADF has targeted its efforts here.

There are four small wood working shops in the immediate area, making hardwood furniture and house building parts. They get their Haitian oak (chêne) and mahogany (acajou) from trees in the area.

The most interesting aspect of the area is the extensive use of traditional contour ridges on the very steep slopes (40-65%) of the area (cf. Photo 2C). In spite of intensive cultivation of black beans, corn, manioc, peanuts, pois congo, and other crops on such slopes, the soils remain amazingly deep. The traditional structures are undoubtedly very effective in reducing soil erosion. The "Les Petits Freres" group has been engaged in funding major contour ditch construction in the area (1 meter deep, 1 meter wide) as an additional means of soil conservation - with farmers paid to do this work. We observed areas where trees and plantain had been supplied to improve these structures. It is not as yet clear that farmers themselves are convinced of the necessity of this work, nor do they seem to be maintaining them, since contour ditches are not 'cleaned out' and quickly fill up. However it is evident that the ditches have been used by farmers to extend plantain and banana cultivation to hillside slopes, a very positive development.

## 1.2 Berry Area

The Berry site is located over an extremely rough and, in some places, steep dirt road 10 miles (2.5 hours) from the town of

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<sup>9</sup> Peanuts, as a good cash crop, have been encouraged by this PVO, though it is probably not a good choice of crop, given its negative impact on the hillside fields. The team observed farmers carrying sacks of peanuts home from the cooperative depot for planting in July. Peanuts are planted on contour ridges, but unfortunately don't remain long in the soil.

<sup>10</sup> Les Petites Freres de St.Terrace expect that PDAF activities will help them better serve farmers. They have a mill for washing and processing manioc, with presses and stoves for baking the manioc cakes. Both these cakes and a manioc powder are created for sale to areas outside the region. Farmers also have access to make their own manioc flat cakes and powder at a nominal fee of \$1/sack of manioc. They also must supply charcoal and labor. It is used a great deal during the months of Dec- April.

Things they sell: taking cocoa and transforming it into a liquor. They also sell wine and a liquor (L'unitism) produced in centers elsewhere in Haiti. They sell handicraft made by farmers in the area as well. Manioc paddies cost 5 gourdes for a small pack (sold for 8 gourdes in PAP by merchants there). They purchase the manioc from farmers and produce about 700 of these packs each year. In processing, they purchase a sack of charcoal for \$12. It takes three sacks of charcoal to produce about 50 packs of manioc paddies, which are sold for a total of \$50. Add to this costs of transportation, and wages paid to those operating the mill and the profit margin is very small. The manioc powder is used for a number of food purposes, including a sauce for infants. Also sell glass jars of jam: tomato, papaya, cashew (from area) at \$3/jar. Not much is sold. Also sold is chalk for use on blackboards. Peanuts are also ground and made into a peanut butter. Manioc peelings are mixed with other products (rice bran, peanut shells, etc.) into a pig feed.

Marigot. Any large rainfall in this area would close down the road, making it very slippery or covered with large rocks and boulders falling down from the slopes above. The 2 km<sup>2</sup> site is largely located on a small plateau/basin with small hills/valleys, at 1000 meters, half way up the flanks of the highest mountain range in Haiti (Mount LaSelle) (Photo 4B). Because it is densely populated, with each homestead surrounded by a dense garden area of fruit trees, plantain and banana, the area looks heavily wooded from above. It is on the cultivated slopes above this plateau, where most of the people have 2-5 fields, that major soil conservation work is needed. The "site" selected by PADF for monitoring does not actually include these areas, some of which are at 1200 - 1600 meters elevation and higher.

The Farmer Needs Assessment team arrived at a time when this community was experiencing a major epidemic which we could not identify. Over the past two weeks, 28 young children had died (high fever, inside mouth turning black, death in 3-4 days). The entire two days of our presence was accented by wails and cries from various parts of the area. Everywhere we walked down paths we met groups of people either carrying small caskets, digging graves, or clustered around the stricken families. Needless to say, this was not the best time for us to try to meet with people and everyone was affected in one way or another and had obligations to the bereaved families. We did report this epidemic in Jacmel, hoping to initiate some help for these people - as the deaths were continuing during the time we were there. The Port-au-Prince Le Nouvelliste newspaper, dated August 8, gave a short notice of the medical visits to the area - with the deaths attributed to measles.<sup>11</sup> In spite of this, people were helpful and we were able to obtain much useful information about the area.

Perhaps the most striking aspect of the farming system was the presence of cabbage in almost all the major corn fields, whether on the plateau area, or the slopes above. Cabbage is planted in late September and transplanted into these fields in October, with harvests starting in January. Corn is then relay-cropped into these fields as cabbage harvests begin. Much of the corn is eaten green during the month of July. Harvest of the rest takes place in August and September.

Corn yields have reportedly been declining in recent years. We wonder if there may not be a link between the intensive cultivation of cabbage and corn on these fields without addition of fertilizers and without fallow. Cabbage cultivation has brought

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<sup>11</sup> LA ROUGEOLE FAIT 40 MORTS DANS LE SUD-EST; Le correspondant de Tropic FM, citant les responsables du district sanitaire du Sud-Est, a indiqué qu'au moins 40 personnes seraient mortes suite à une épidémie de rougeole à Béri, localité de la commune de Marigot. Selon M. Harry Policard, un des responsables de l'hôpital St-Michel de Jacmel, aucune campagne de vaccination contre certaines maladies infectieuses n'est possible faute de moyens de conservation des vaccins. Il est à souligner que le black-out dans le Sud-Est est lié à ce problème.

about a change in the cropping system. In the past, many of the fields of corn (then associated with beans) would have been placed into a long term cycle with yams, permitting some soil fertility regeneration. Because of many unforeseen problems with cabbage cultivation, farmers are beginning to think again about yams - but seed yam sources are difficult to find, or afford.

As in most areas within Haiti, it is remarkable how dispersed the fields of households are within the region. Some fields are around the actual community where people live. Others are at high elevation (1600-1800 meters or more) and 6 hours walking distance away, where a great deal of vegetable gardening takes place. Other fields are below the site at lower elevations (600 - 800 meters). The timing of crops and the nature of the associations vary in each area, providing farmers a means of reducing risk and having something coming off a field somewhere at most times of the year. PADF actually works in the area around 1000 m where the people actually live, although the impact could spread elsewhere.

### 1.3 Kaffé/Tilier/MonDésir Area

Located in a series of valleys just below the Berry site, between 230 - 350 meters, are a number of communities with which PADF has begun to work (cf. Photo 4A). The Tilier/MonDésir communities fall within the 2 km<sup>2</sup> area defined for the M/E activities and the focus of our own needs assessment efforts. PADF has only been active in the area since March this year. It has completed a short reconnaissance survey and initiated a number of training exercises in soil conservation, selection of extensionist farmers and nursery establishment activities. Grafting training is to be given very soon. PADF works principally through a number of large groups formed by prior projects in the area, principally Pristene, a European based NGO.

The valleys of this area are densely wooded, full of plantain and banana, breadfruit, some coffee, running streams - with a heavy concentration of homesteads hidden in the vegetation. The large regional market town of Perideau is located three miles down the one major dirt road into the area.

The area has benefited from substantial project assistance prior to the arrival of PADF. The two most important groups are InterAide and Pristene<sup>12</sup>. They have activities in soil conservation (rock terraces, vegetative barriers), cisterns, compost sites, vegetable gardening, nursery development and non-fruit tree distribution, pig distribution and community

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<sup>12</sup> Pristene seems to be largely sponsored by though religious groups, primarily Catholic. Father Dehoux, a French priest well known in Haiti for special efforts in rural and community development, creation of rural labor opportunities, etc. is an important sponsor of Pristene.

organization. Since 1989, both programs have been greatly reduced as a result of political/economic embargo, though efforts have been made to keep their presence in the areas by supporting some of their field extension staff. Certainly both will be back with important programs when political circumstances permit. The Kaffe area, in particular, has since 1984 received major Pristene soil conservation works, using organized community group labor (paid by linear meter) to construct rock terraces and rock wall in ravines<sup>13</sup>. These have been greatly appreciated and well maintained. Most are filled up level with tops of rock walls, with important cropping taking place behind and below the terraces. Plantain and banana are the principal crops benefiting from these structures, followed by corn and beans, whose yields have reportedly increased significantly. With few rocks, the Tilier/MonDésir communities have been the target of efforts in creating vegetative barriers. These have been accomplished mostly through PADF efforts, though a number of leucaena strips can still be found in the area from Pristene efforts. More vegetative barriers are found in the Kaffe area, nearby. Pristene apparently has given increased attention to vegetative barriers since 1991. While without technical personnel in the field during this time, it was possible for local extensionists with whom they worked to obtain leucaena seed by coming on their own to Port-au-Prince.

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<sup>13</sup> Though in principal people were paid 8 gourdes the linear meter, it appears that the project calculated that a man could complete 2 linear meters of rock terraces in one working day (8 am. to 1 pm.), or 16 gourdes/day. Groups were created with 18 members, working principally in August and September. Money was budgeted at this rate, so that even if only ten people showed up to work, those ten still actually received the entire amount of the full group. Apparently Pristene is willing to change its approach (when it comes back) to be more in line with PADF, placing more effort in farmers doing this work without such compensation (called "petite encouragement" by the farmers). The amount received is higher than that received for other comparable local labor. One of the principal extension organizers for Pristene estimated that Pristene spent about \$20,000 over a three month period for such 'encouragement'. Another farmer interviewed, who had worked constructing rock walls with one of these groups, said he received 15 gourdes/day for his work.

## 2.0 GENERAL DESCRIPTION OF THE FARMING SYSTEM

### 2.1 Crops

Field observations made by the survey team, concerning the major elements of the farming systems, are summarized in Table 2 below.

#### Palmiste Avin

Main crops observed were corn, beans (mainly black), pigeon pea, and peanuts. Secondary crops were cowpea, sweet potato, sorghum, and manioc. Manioc is allowed to grow for two years and is not weeded during the second year - permitting a form of fallow. It is also sometimes pruned back to permit a second crop of corn/beans (on heavy textured soils). Sorghum is relay cropped in the corn/bean fields in July/August. Many banana or plantain and fruit trees (coconut, mango, avocado, breadfruit, oranges, corosol (soursop) are found associated with corn/beans in fields near/around households in so-called "jardin la cour". Coffee, once cultivated in such areas, has almost died out<sup>14</sup>. Yams, usually planted in more wooded areas, are also found in association with corn and beans. Plantain is now being planted in accumulating soil found in contour ditches being created in many locations, which, if more densely placed, could become the basis for vegetative barriers. Malanga (taro) is associated with plantain, but plantain was sometimes absent from fields of poorer farmers. Sugarcane was also observed behind some contour canals (PADF activities).

On the less fertile, sandy soils, peanuts are planted as a sole crop or in association with pigeon peas. Such soils are usually associated with the category of soils referred to as "terre chaude" ('hot' soils) or "terre sec", referring to the exposure of the field to the sun (particularly during the winter season). Land found mainly in the shadow of mountains when the sun is lower during the winter months are classed with the "terres froid" ('cold' soils). Such soils often permit a third season of beans to be cultivated (during a period of lower rainfall).

As with other areas visited, farmers traditionally try to save their own seed, but more often than not are forced to consume all their production before planting, requiring seed repurchase at a high price from the market or better off farmers for planting needs.

All lands not in cultivation are used for grazing. Unfortunately, the poorer a section of land becomes (because of erosion, for instance), the more grazing one can expect to see - further worsening the situation. "Terre sec" land is intensively

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<sup>14</sup> We saw a small sack nursery to provide trees for local consumption.

grazed to the point that serious environmental degradation is occurring on the hillside slopes in terms of sheet and rill erosion and destruction of most plant vegetation.

### Berry

Principal crops observed in Berry were corn, cabbage, sweet potato, depal (type of yam), beans (various varieties), pigeon pea, yam, banana, plantain, sugarcane, papabon (taro variety). Banana, yam, plantain, coffee, and sugarcane are almost always cultivated around each household (jardin la cour). Secondary crops are manioc and potato. Table 2 below summarizes crop counts on a number of fields visited by the survey team.

The aspect of the farming system which seemed most unique in this area was that almost all the fields of corn and bean planted during the first season had earlier contained cabbage. While the cabbage heads had been harvested back in January/February, the shoots and roots had been left in the field and weeded around. The leaves were progressively harvested by the household for domestic consumption. We saw cabbage "harvested" in January still providing leaves in July!

### Tilye Mondesir

Principal crops observed in Tilier Mondésir were corn, banana, bean, sorghum, pigeon pea and sugarcane. Banana, plantain, yam, and coffee are cultivated around each household. Secondary crops are manioc, sweet potato, yam and cowpea (cf. Table 2 below).

TABLE 2: CROPS MOST OBSERVED IN FIELDS (cf. Appendix 1)

	PALMISTE AVIN	BERRY	TILIER MONDESIR
CROP	NB OF FIELDS IN WHICH CROP WAS OBSERVED	NB OF FIELDS IN WHICH CROP WAS OBSERVED	NB OF FIELDS IN WHICH CROP WAS OBSERVED
cabbage		21 <sup>(15)</sup>	
corn	16	43	19
bean	13	9	16
depal		17 <sup>16</sup>	
sweet potato	5	21	2
sugarcane		3	4 <sup>(17)</sup>
papabon		3	
yam	2	5	6 <sup>(5)</sup>
banana	2	3 <sup>(18)</sup>	17 <sup>(19)</sup>
coffee		3	(5)
sorgho	5		16
plantain	5 <sup>20</sup>	4	(5)
coupea	5		2
pigeon pea	10	9	12
peanut	6		
manioc (sweet,bitter)	4	1	8
taro (malanga)			1 <sup>(5)</sup>
Total Number of Fields	24	46	33

Berry, Tilier, and Palmiste farmers have three principal sources for planting seed: their own stock, the market place, and other farmers. The personal stock is always considered the main

<sup>15</sup> Beans and cabbage are the first crops planted in the cropping calendar.

<sup>16</sup> Depal is a variety of mazoumbel particular to this area.

<sup>17</sup> Most sugarcane is found near the river and in the gorges where more moisture is available.

<sup>18</sup> Banana and plantain are cultivated extensively in this area. They are associated with coffee, yam, sugarcane, papabon and various fruit trees and are the most important crop in household gardens. There are 75 households each with their own household gardens.

<sup>19</sup> Banana, plantain, yam, and coffee are principally cultivated in household gardens.

<sup>20</sup> Plantain and banana are found, together with fruit trees, in all household gardens. These are also planted in many of contour ditches.

source, while market seed is usually only used when a previous season's drought has led to major loss of harvest (usually beans). Yams, sometimes more scarce, are also purchased for seed in the market. At Berry, some farmers buy their cabbage seed directly from Port-au-Prince. It is also worth noting here that at Tilier/Mondésir, some farmers have specialized in the production of the seed yam of varieties "Réal", and "Gérard".

Two PVOs are also currently involved in supplying of seeds in this region: INTERAIDE for the cabbage and beans; and PADF for the beans. PADF also has plans to assist Berry and Tilier farmers with improved seed yam varieties.

## 2.2 Crop varieties and preferences

There is some variation between the three watershed zones of PADF Region 2 in terms of crop preferences. In Palmiste Avin, peanuts have become an important cash crop on poorer soils. Farmers prefer "large grain" varieties of pigeon pea rather than earlier maturing, but smaller grain, varieties. In Berry and Tilier Mondésir, farmers seem to prefer rustic, higher yielding, varieties which store better. Taste preferences are important in choosing the varieties of yams grown. The "Gera" yam variety has a better yield than "Réal", for instance, but farmers prefer "Réal" because it tastes better.

Farmers generally tend to look for adaptability, early maturation, and good commercialization potential in the varieties they cultivate (cf. Table 3).

TABLEAU 3A: CROP VARIETIES AND PREFERENCES ( PALMISTE AVIN)

CROP	VARIETIES	ORIGIN	INTEREST
corn	alizaine (4-5 months)	local	food
bean	black red	local	food, cash food, cash
pigeon pea	large grain small grain	local local	food early maturing
peanut	8 months	seed bank with PVO/Coop.	cash
sorghum	photo-sensitive	local	food
sweet potato	misère maléré (3-4 months) (red outside/white inside) Carl (red inside/outside)	local local	food food
yam	guinin réal	local local	open field open field
plantain banana	peau blanche cuyane barique	local local local	cash crop cash crop rusticity
manioc	bitter sweet	local local	cash food

**TABLE 3B: CROP VARIETIES AND PREFERENCES (Berry)**

CROP	VARIETIES	ORIGIN	INTEREST
corn	makina les anglais gros mais	BCA(makari)	rusticity
bean	noir red leta melange	local local local local	better yield
cabbage	kakacross raiana copernagen	Darbouco Kenskoff Seguin	cash stores better cash
potato (Irish)	dekama god nov	Seguin Seguin	bigger tuber cash
coffee	arabica catimore	local introduced	cash cash
sweet potato	makak(5to 6 months) ti grann(3 months) telzine fam pa fouye ra colet fam pa cale	local local local local local local	stores well early maturing
yam	a tout temps guinin real bochon'n	local local local local	dense shade open field open field open field
banana plantain	barique console miske	local local local	rusticity cash crop cash crop

**TABLE 3C: CROP VARIETIES AND PREFERENCES (TILIER MONDESIR)**

CROP	VARIETIES	ORIGIN	INTEREST
corn	makina (3 mois) bateau (3 mois)	MARNDR local	better yield
bean	black (3 mois) pois l'etat (2 mois 1/2) red	local MARNDR local	rusticity better yield
pigeon pea	alizaine (last season) gros pois (first season)	Jacmel local	precocity
manioc	ti tony ti pope	local local	rusticity
banana	console baril	local local	better sell
yam	gera real anglais <sup>21</sup> bouchon'n français	local local local local local	precocity tastes better disappeared disappeared disappeared
sugarcane	ananas petinou  cidaline cive	local Dominican Rep.  Dominican Rep. local	sells well sells well, better yield
sorghum	photosensitive	local	food
plantain	miske	local	food, cash

### 2.3 Crop Associations

Principal crop associations described by farmers in each watershed region visited are given in Table 4. With the exception of the household gardens (with trees, plantain, banana, yam, etc.), there do not appear to be any crop associations which cover a field for longer than one year. Hillside fields are exposed to constantly changing crop cycles, a factor in increasing soil loss in this region.

In Berry, the M/E watershed is under more extensive crop cover. Farmer's homesteads are scattered throughout the watershed area (some 75 of them), providing this vegetative cover. One must truly go much higher, out of the M/E area, to find the large and exposed slopes where many farmers in Berry cultivate. Farmers do plant a number of short cycle associations in some open fields, between household gardens.

<sup>21</sup> Crop varieties Anglais, Bouchon'n, and Français are no longer cultivated.

In Tilier Mondesir many crop associations of open fields have longer growing cycles than those of the other watersheds in the region visited. Field cover of such associations can last as long as 6 years! Household gardens offer hillside slopes the greatest natural vegetation cover possible. In Palmiste Avin, Berry and Tilier Mondesir they may last over 30 years; in fact never disappearing, as long as the homestead is lived in.

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

AREA	CROP ASSOCIATIONS	GROWING CYCLE MONTHS	SLOPE ( <sup>22</sup> )
PALMISTE AVIN	peanut, sweet potato	3 - 9	2
	plantain/banana, yam, mango, apricot, citrus, pine trees, cashew, breadfruit, cocoa	over 30 years and more	2
	pigeon pea, sorghum	12	3
	corn, bean, plantain (in contour canals)	3-36	3
	corn, bean, manioc, sweet potato	9 - 12	3
	corn, bean, peanut, pigeon pea	12	3
BERRY	plantain/banana, plantain, yam, papabon, depal, mirilton, coffee, avocado, sucrin, mango, orange, sugarcane	over 30 years and more	2
	corn, pigeon pea, sweet potato, depal	9 - 12	2
	bean, cabbage, depal	3 - 12	2
	corn, bean, plantain	3 - 36	2,3
	corn, bean	3	2
TILIER MONDESIR	banana, taro, yam, coffee, coco palm, breadfruit, soursop, royal palm, oak, mango, custard apple, orange, avocado, cocoa	over 30 years	1 and 2
	plantain/banana, yam	12 - 72	1
	corn, bean, sorghum, manioc, plantain/banana	12 - 72	2
	corn, bean, sorghum	6 - 9	2
	corn, pigeon pea, plantain, sorghum, manioc	12 - 72	2,3

It is evident from Table 4, above, that number of crops included in crop associations can vary from one area to another. Appendix 1 provides details of all the associations observed. The principal associations in Palmiste Avin do not include more than 4 crops. In Berry, crop association usually have no more than 2 or 3 crops. In Tilier Mondesir, principal associations have between 2 to 5 crops, as shown in Table 5 below.

<sup>22</sup> We define slope into four class: (1) Level: 0%-5%; (2) Gradual: 5%-20%; (3) Medium: 20%-40%; and (4) Steep: 40%-75%+.

**TABLE 5: NUMBER OF CULTIVATED CROPS ASSOCIATED AND NUMBER OF FIELDS (cf. Appendix 1)**

Number of Crops/Field	PALMISTE AVIN (fields)	BERRY (fields)	TILIER MONDESIR (fields)
1	2	8	1
2	5	17	7
3	5	10	7
4	5	4	10
5	1	4	8
6		3	
<b>TOTAL</b>	<b>18</b>	<b>46</b>	<b>33</b>

## 2.4 Land preparation

### Palmiste Avin

Farmers create contour ridges on which to plant all their field crops. This has become a traditional activity, practiced by everyone. Farmers can hire "squads" to perform such work, farmers organize into small groups to help each other with the work. This was the only area visited by the Farmer Needs Assessment Team where such contour ridging was practiced generally.<sup>23</sup> Farmers specifically state that the ridges are necessary to protect crops from washing away because of the steep slopes they cultivate<sup>24</sup>. After harvest, when fields are fallowed, they are used as pasture for household animals. At this time, animals break down ridges with their feet and increase the soil's exposure to erosion.

### Berry

Land preparation is most often done in groups, using either hired squads or small associated groups of farmers. Women are not part of this labor - though they are active in later planting and

<sup>23</sup> In other regions visited, such ridges were created for manioc/sweet potato cultivation (eg: Les Cayes).

<sup>24</sup> Certainly among the steepest anywhere visited, up to 100 %.

weeding. In this area as well, making ridges is a traditional method of soil preparation, used in areas where sweet potato will be planted. Farmers take advantage of the ridges to get a crop of cabbage as well, which is placed along top of ridges.

### **Tilye Mondesir**

Land preparation is characterized by often arduous weeding (particularly if field has been in fallow), using a long (digging) hoe or pruning-hook. Farmers will also frequently use a pick-axe to dig up the soil in some areas to permit better crop growth.

### **2.5 Cropping calendars**

Two principal planting seasons are identified in a year :

- February through May/June
- August through November/December.

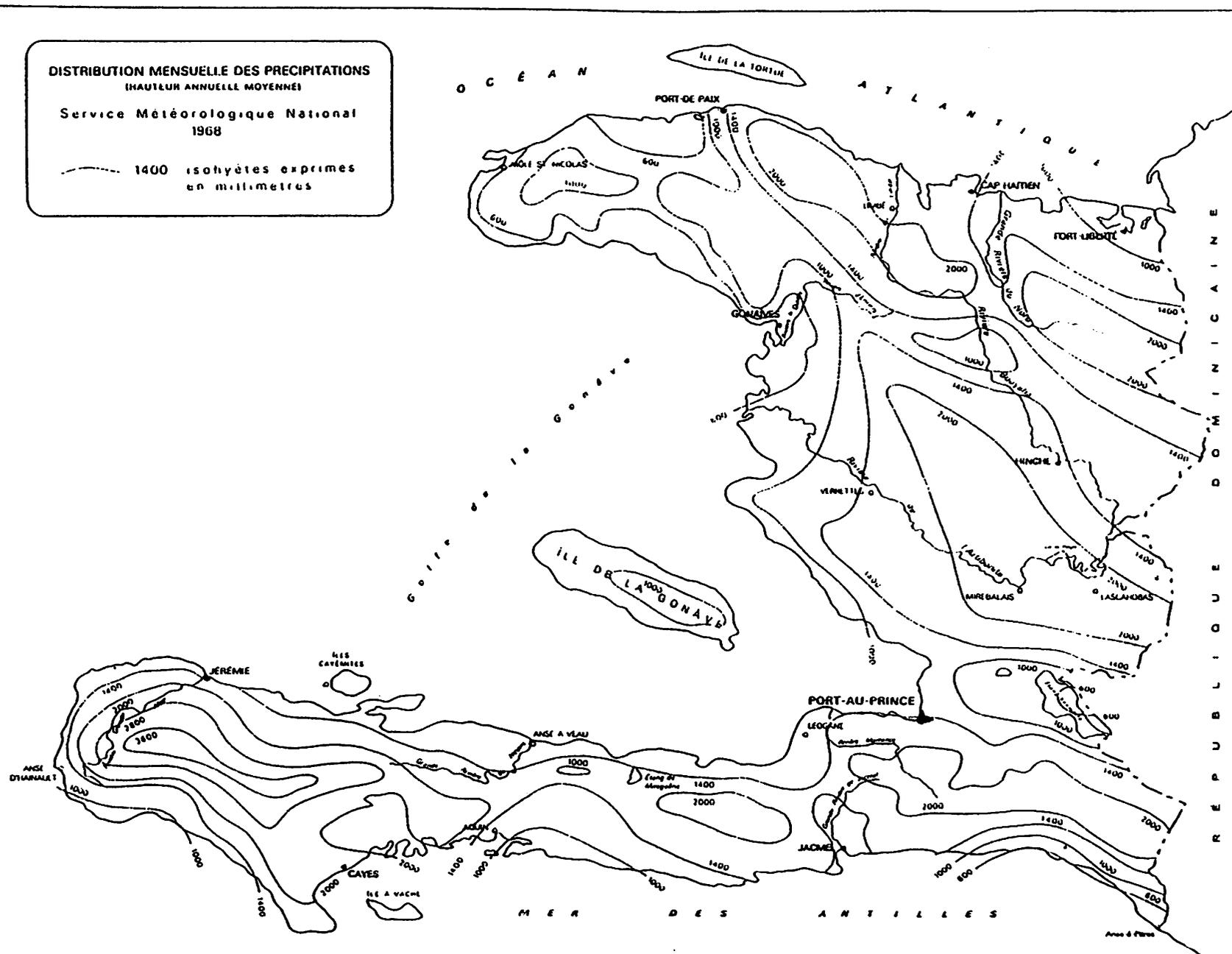
Rainfall Figures 1, 2, and 3 are provided to permit a better appreciation for how the cropping cycles, described below, fit into the cropping system and rainfall of the region. The end of June and the entire month of July usually characterized by a "dryer season" as are the months early December and February. October receives the most rain.

Harvest periods depend on crop varieties and date of planting. Corn has two sowing periods in Tilye Mondésir but only one in both Berry and Palmiste Avin. Cabbage, sorghum and peanuts have one sowing period in all three watershed areas. Pigeon pea in Tilier Mondesir can be planted during two periods of the year. Tables 6A, 6B, and 6C below illustrate cropping calendars for the three watershed areas.

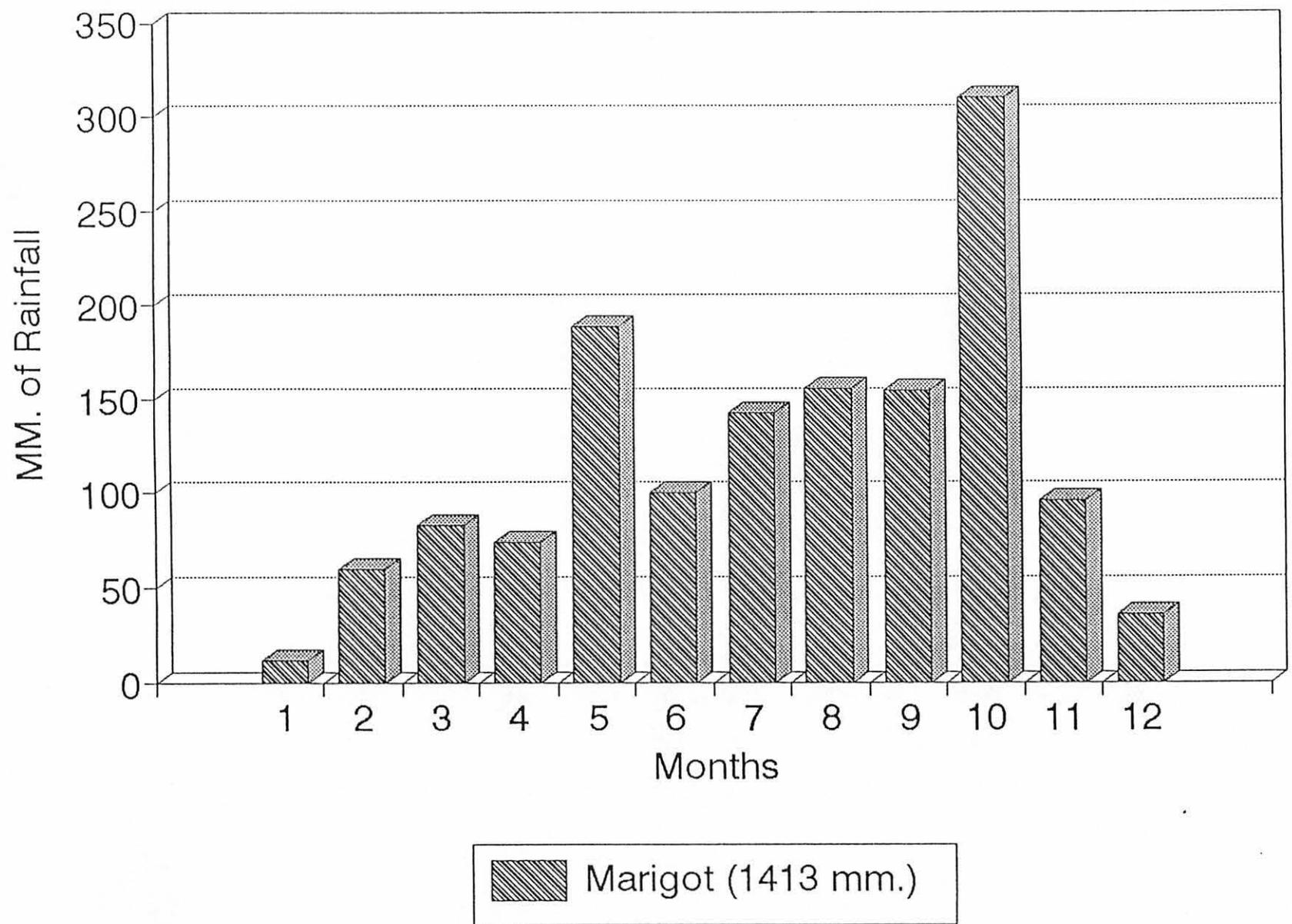
**DISTRIBUTION MENSUELLE DES PRECIPITATIONS**  
(HAUTEUR ANNUELLE MOYENNE)

Service Météorologique National  
1968

----- 1400 isohyètes exprimées  
en millimètres

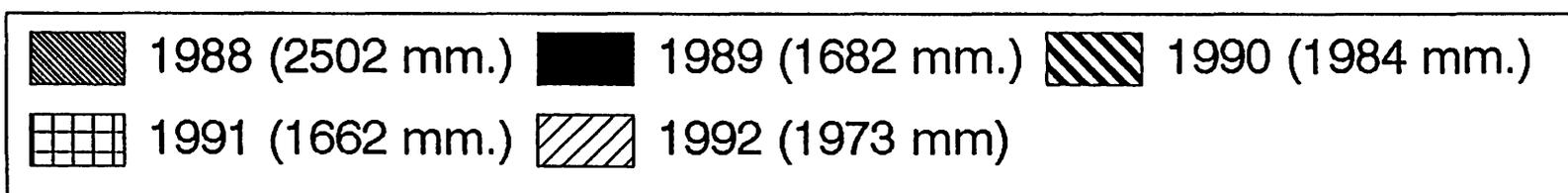
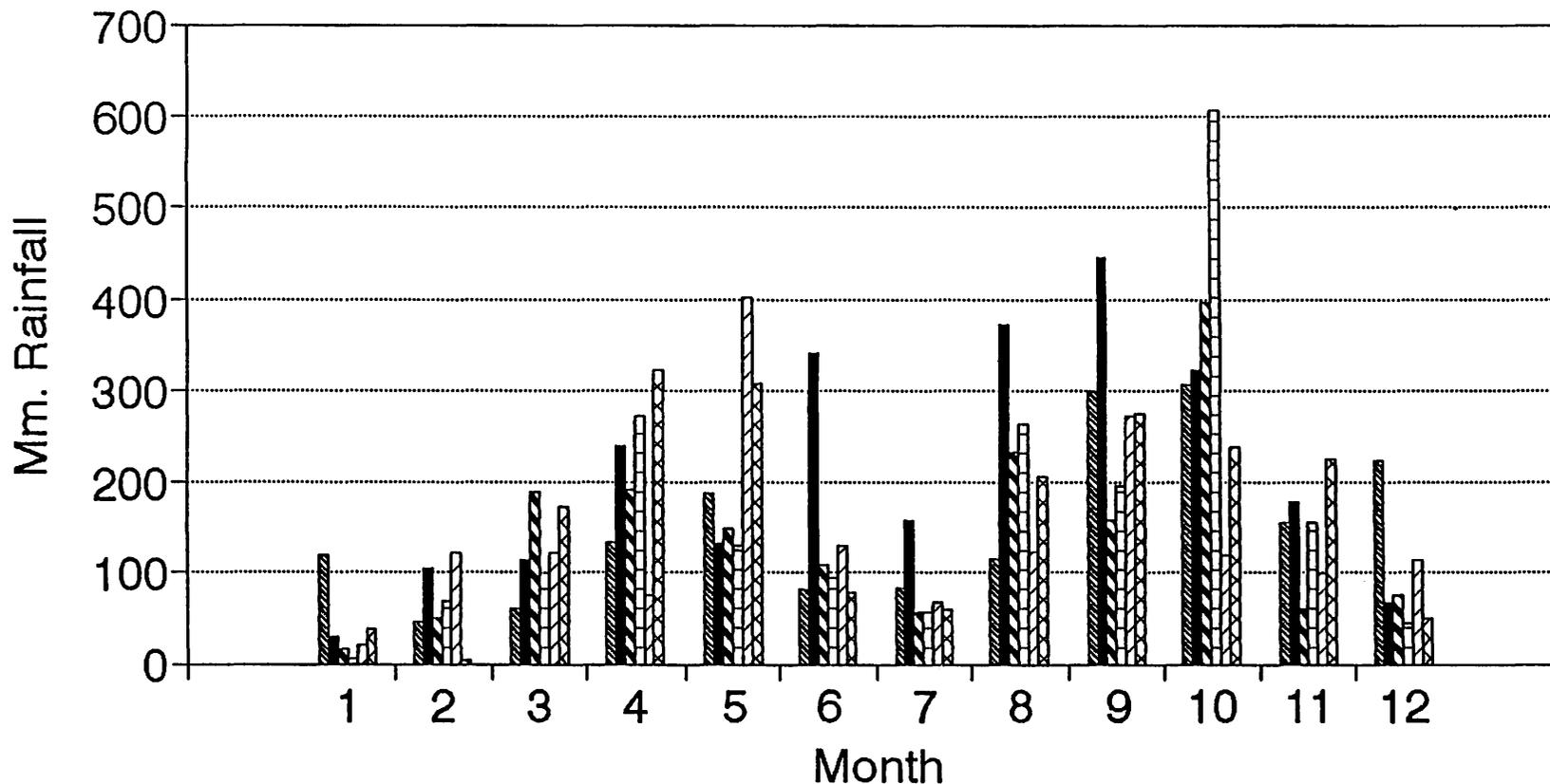


# Marigot (near Berry & Tilye MonDesir)



# Macary Rainfall (1988 - 1992)

(3 miles from PADF Berry Zone)



**TABLE 6A: CROPPING CALENDAR (PALMISTE AVIN)**

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___		
peanut	S----- H___	-	
bean	S---      S-- H___  H___		
pigeon pea	S---	H___	
sorghum	S---	H_	

**TABLE 6B: CROPPING CALENDAR (Berry)**

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___		
cabbage		S---- H___	
bean		S--      S---- H___  H___	-
potato	S--- H___		
sweet potato	S--	H_	

**TABLE 6C: CROPPING CALENDAR (TILIER MONDESIR)**

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--            S-- H_            H		
bean	S--            S-- H_            H_		
manioc	S--            S--	C-- <sup>25</sup>	H_
pigeon pea	S---            S-- <sup>26</sup>	H_            H_	_____
yam	S---                            27 H_H	_____	
sorghum	S---	H_	

**2.6 Crop Rotation and Fallow**

Fields in the three areas are not very often fallowed. Farmers cultivate the same set of crops during every cropping calendar. However crop rotations can vary between areas, and between farmers in the same watershed. One can find pigeon pea just being planted while other fields have pigeon pea of more than one year old. Because planting of a number of crops can take place over a period of months, standing crops also show great variation in the stage of development that each crop has reached.

Most fields are under crop associations of short duration (less than ten months). Consequently, hillside fields are very often exposed to erosion from wind and rain. The series of tables below show the nature of the rotations mentioned to us by farmers.

<sup>25</sup> Manioc is cut in order to avoid competition with associated corn and beans.

<sup>26</sup> This is a special variety, called "end of season pigeon pea" which can begin to be harvested already in July (eaten green).

<sup>27</sup> There are two varieties, one which can be harvested earlier than other.

**Table 7: Crop Rotations and Fallow**

**Palmiste Avin**

a) Sowing (March 92) ->	Harvest (June, July) -->	(July, August) -->	(Jan 93) -->	Sowing (March 93)
bean	bean			bean
corn		corn		corn
pigeon pea			pigeon pea	pigeon pea

b) Sowing (March 92) ->	Harvest (October) ->	(November) ->	(Jan 93) -->	(Jan 93) ->	Sowing (March 94)
peanut	peanut				peanut
sweet potato		sweet potato			sweet potato
pigeon pea			pigeon pea	fallow	pigeon pea

**Berry**

a) Sowing (Oct 92) ->	Harvest (Dec 92) ->	(Jan 93) ->	Sowing (Mar) ->	(July) ->	Harvest (August) ->	(Nov) ->	(Jan 94)
bean	bean	cabbage <sup>28</sup>	corn	bean	corn	bean	bean
cabbage							cabbage

b) Sowing (Oct 92) ->	Harvest (Dec 92) ->	(Jan 93) ->	Sowing (March) ->	Harvest (August) ->	(Nov) ->	(Dec)
bean	bean	cabbage	corn	corn	sweet potato	pigeon pea
cabbage			sweet potato		sweet potato	
			pigeon pea			

**Tilier Mondésir**

Sowing (Mar92) ->	Harvest (June) ->	(July) ->	Sowing (August)	Harvest (Oct)	(Dec)	(Jan93)	Apr	Jan94
bean	bean		bean	bean				
corn		corn	corn		corn			
			pigeon pea			p.pea		
			sweet potato				swpot.	
			Manioc					manioc

<sup>28</sup> Harvest of heads take place, for sale to Kenscoff. But the plant continues to provide leaves for domestic consumption through July.

## 2.7 YIELD RANGES OF PRINCIPAL CROPS

As observed in other regions visited by the survey team, crop yields on hillside fields often appear very low. Farmers further observe that these yields continue to decrease as the years go by. This is not surprising considering continuing cultivation of these fields, often without fallow, without use of fertilizers of any kind, and with continuing soil loss to water erosion. Table 8 below provides information given by farmers on how many marmites of harvest they have been obtaining per one marmite of the crop planted.

**TABLE 8: YIELD OF PRINCIPAL CROP (Harvested quantity per unit planted)**

CROP/YIELD	PALMISTE AVIN (Harvested)	BERRY (Harvested)	TILYE MONDESIR (Harvested)
bean	5 - 6 Marmites	8 - 10 Marmites	3 - 4 Marmites
corn		15 - 25 Marmites	20 - 50 Marmites
peanut	4 - 25 Marmites		
cowpea			
cabbage		40 doz / 25grams	
yam	6 tubers <sup>29</sup>	6 tubers	
potato		2 - 6 boxes	
pigeon pea			15 - 36 Marmites

<sup>29</sup> Possible after two years in the ground.

## 2.8 Crop Management and Soil Conservation

**TABLE 9: HILLSIDE CONSERVATION MEASURES, CROP PLACEMENT**

	Palmiste Avin	Berry	Tilier/MonDésir
Dead Vegetative Barriers (Traditional)	yes	no	no
Dead Vegetative Barriers (Modified - PADF)	no	no	no
Contour Ridging	yes (traditional, all crops)	some (for sweet potato)	some
Hills (for planting)	yes	yes (for sweet potato)	no
Contour canals	yes	no	no
Mulching	in household field	in household field	in household field
Gully Plugs: Rock	yes	yes	yes
Vegetative:	yes	yes	yes
Fruit Tree crops, Taro, Plantain, Banana, etc.	yes (in contour ditches)	yes (behind rock walls or veg. barriers in gullies)	no
Rice behind established terraces in Gullies	no (but possible in contour ditches)	no	no
Rock Walls/Terraces	no	yes	yes
Vegetative Barriers	yes (leucaena)	yes (leucaena, glericidia)	yes
Bio-Intensive Gardens	no	no (but greatly needed)	no
Livestock and Conservation	Livestock a major problem	Livestock not a major problem	Livestock not a major problem

### 2.8.1 Palmiste Avin

Farmers at Palmiste Avin have learned to grow crops and raise livestock on extremely steep slopes. By American standards, 99% of all cropped land would be classed as agriculturally unsuitable due to excessively steep slopes. Nevertheless, farmers have developed a management system that permits them to be productive on these lands. Farmers are already practicing good soil conservation practices on their better soils in that virtually all crops are planted on contour ridges. Such ridges do not eliminate all soil erosion, but they certainly reduce it to a manageable level. Furthermore, crop residues are often incorporated into these ridges at time of preparation. Creation of these contour ridges is part of the local work group activities. The fact that daily wage rates for such labor is about twice (10-12 gourdes) that of other regions of Haiti visited during this survey reflect the increased labor required for such work. More significantly, that farmers have

adopted such increased labor to prepare such structures, gives hope for other regions of the country where farmers do not yet practice such measures. We believe the key to this practice here is the high productivity of the soils and the high value of the land.

The local cooperative, organized by the Catholic order of "Les Petits Frères", has been very active recently in promoting construction of major contour ditches on fields, as an added measure for soil conservation. They virtually stop all soil loss and greatly increased water infiltration. The trapped soil in these ditches have been quickly used for planting of taro, plantain and banana, thus greatly increasing the value of the field.<sup>30</sup> Widespread adoption, unfortunately, has been limited by high labor costs. This has prompted the program to assist many farmers in constructing such contour canals by providing cooperative farmers an "encouragement" of 5 gourdes/linear meter. However, cooperative groups are also constructing such canals at no additional cost to field user/owner - as a community service! Farmers with whom we spoke are enthusiastic about the benefits of these canals (about 1 meter deep and 1 meter wide, along contour). We did observe that plantain planted in these ditches did less well than those planted just below the ditches, probably receiving too much water! Rice would be an option for some of these ditches. An additional problem is that in a couple years these ditches will fill up, leaving behind only the crops growing in them. One farmer said they would then create new contour ditches above and below the old canal.

Vegetative strips in this area, as promoted by PADF, are leucaena strips along the contour. Some farmers are aware of the benefit of such hedgerows to hold soil (they remember what extensionists said about them), but few are adopting this on a wide scale, although this is what PADF is extending here. One farmer, who had leucaena hedgerows from AFII times, explained how he cuts the leucaena and incorporates it into the soil, and also feeds his animals with it. His leucaena rows were not very effective however in stopping soil erosion on his 60% field. His contour ridges were far more important in this respect.

Some farmers were practicing other means of controlling soil erosion from their steep slopes. One farmer was observed using the manioc planted along the contour ridge as "living stakes" on the on-hill side of field to hold in place dead vegetative material he had placed against the base of the manioc - to "hold the soil", he said. Another farmer, having seen the way contour ditches captured soil and water in one of his fields, dug a very deep (1.5 meters deep, 1.5 m. wide) ditch canal on his own just below a

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<sup>30</sup> A PVO leader recounted to us their experience this last March when they brought in a truck load of over 1000 plantain plants (from Jacmel) for planting in these contour ditches. Farmers literally mobbed the truck to get their share.

descending path above his land in a ravine-like area. The path was channeling water over his land, beginning to create what would eventually become a ravine. His deep contour canal, strategically placed to catch this water, now holds water for days after a big rain. The plantain, corn, beans below the canal are some of best seen anywhere. Yet another farmer has modified the contour ditch idea by placing several such ditches, though not quite so deep or wide, across the field where he plants peanuts each year (in addition to the contour ridges across his field onto which he actually plants the peanuts). He says because of this, he is getting about 50% more production.

The lack of rock/stones in this area eliminates construction of rock terraces from consideration.

No special crop management was seen in the valley bottoms of ravines. The steep slopes of the ravines leave little area for cropping, though some grazing was observed. A small stream was seen at the base of the ravine, with no evident irrigation. Apart from the ridging activities of cultivated fields in slopes above, no other ravine control measures were observed. We understand that PADF plans to encourage creation of vegetative barriers across some of these ravines - starting at the top.

### 2.8.2 Berry

Programs in soil conservation taking place lower down in the Marigot watershed have not reached this area. Most of the M/E basin represented by Berry is not in any great danger, being mostly covered in household garden vegetation. Berry farmers do cultivate fields much higher up in the mountains below Seguin. These areas, which can be clearly seen from Berry, are bare of all trees, yet extensively cultivated. The project does not work in these higher regions. However, techniques learned by farmers in creating rock terraces and planting hedgerows on the few Berry slopes which are exposed could, in principal, be extended to these areas as well.

PADF is extending vegetative strips of leucaena on modified "rempe paille" structures or on simple shallow contour ditches/mounds (when dried vegetation is not available for "rempe"). Often the same field will have both. Rock terraces and rock walls in ravines have also been constructed through groups formed in the area. These groups, remnants of a past program in region, had little or no function before PADF brought them back into operation. Local, traditional work groups are not specifically worked with.

### 2.8.3 Tilier/MonDésir

Located below Berry on slopes of the Marigot watershed, this area is also heavily wooded, with numerous fruit trees, plantain and banana, and other trees. There are also many exposed fields with considerable slopes (20%-40%) which are in need of soil conservation structures. The entire watershed area has been the focus of past programs (Pristene) and the Department of Agriculture, with paid labor (by linear meter) for construction of rock terraces and planting of vegetative barriers. Little of the latter remain. Local, traditional work groups are not specifically worked with, though many of their members belong to one or other of the larger community groups worked with by the project.

## 2.9 Crop Marketing

### 2.9.1 High and Low Prices

Prices show great variability between those weeks and months during which a particular crop is being harvested and when this same crop is being planted some 5-7 months later. The actual range in prices varies depending on the specific crop concerned and zone, as illustrated in Table 10 below.

**Table 10: RANGE OF CROP PRICES (in gourdes)**

Product\Watershed	Palmiste Avin		Berry		Tilier/MonDésir	
	Low	High	Low	High	Low	High
<u>Cabbage/dz</u>						
Cacacos	-	-	8	10	-	-
Openagen	-	-	6.5	15	-	-
Riana	-	-	18	25		
Beans/m	12	25	12	20		
Pigeon peas/m	7 - 8	10 -14				
Green peas/basket	10 -12	20				
Corn/m	4	10	2.5 -4.5	6 - 10	4 - 5	7 - 10
Sorghum/m	5	8 -10	-	-	3 - 7	10
Peanut/m	3 - 4.5	10 -12	-	-	-	-
Sweet potato/unit	-	-	0.37, 0.07	0.5, 0.1		
Mazoubel (cocoyam) /unit	-	-	-	-	0.5 - 3	0.75- 5

Taro/unit	2	5	-	-	0.5 - 0.75	3 - 5
Banana Barik/ stalk	10- 12	17	2.5	4.5	-	-
Banana Console/ stalk	-	-	-	-	2.5 - 20	4 - 35
Plantain Musqué/ stalk	-	60	-	35 - 40	20 - 30	30 - 40
Coffee/lb			1.5	4.5		
Cocoa/unit	-	-	-	-	1	1.25
Yam/unit			6.5	10	2 - 3	4 - 6
			3	5.5		
Sugar cane (stalk) Pineapple/Petinou, Cive, Sidalin	-	-	-	-	1.25 0.25 0.50	1.7 0.50 0.75
Sweet Orange/unit	-	-	-	-	0.50	0.75
Nugget Fruit/m	-	-	-	-	2.1	3.5
Breadfruit/dz	-	-	-	-	2 - 4	12 - 15
Mango/unit	-	-	-	-	0.01	0.1 -0.16
Coconut/unit	-	-	-	-	0.5 - 0.83	1 - 1.7
Citrus/m	-	-	-	-	3	-
Grenadia/dz	-	-	-	-	1 - 1.5	2.5
Mililton/unit	-	-	0.15	0.4	-	-
Cassava/basket	-	-	20	40	20 - 30	30 - 50
Wood Plank/dz	-	-	-	-	450	700

### Remarks

1. Unit of measure the common "marmite", containing 7 "godets" (cups), unless otherwise indicated.

2. Highest prices for most crops (between February and April, at Tilier/Mondésir for example) are when seed is needed for planting and before harvests have come in. Lowest prices are received when most farmers are harvesting a particular crop (eg. June/July at Tilier/Mondésir) and needing money urgently, are "forced" to sell low. Survey respondents seemed to indicate that most of a household's production tends to be sold towards the low range, while it is the market women selling back the produce (principally grains) who receive most of the profit of grain sold at the high end of the range.

3. The sugar cane "ananas" and "petinou" are cultivated in soils with good fertility and sufficient quantity of moisture, while the "cive" and "sidalin" varieties are cultivated in different soils

types. With 16 to 20 stalks per clump "petinou" is a highly productive variety; the "cive" variety is used for sweetening household coffee, with small amounts pressed at the house.

4. The principal wood used for making boards at Tilier is Haitian oak or "chêne" (Catalpa longissima).

5. The cabbage "riana" is newly introduced to Berry. However its development has met with some constraints, particularly the high cost of seed. This variety transports on mule back to distant markets better than another popular variety of cabbage: "cacacos"; it remains longer in the field and is more heavy to transport than "cacacos".

6. The banana "console" is the preferred variety for the market, considered superior in quality to the "barik" variety, but also requires better soils and more water. The preferred plantain variety cited was 'musqué'.

As seen above, prices variation rates can be very high. We have classified this variation into four major groupings, expressed as a percentage in Table 11 below.

**Table 11: Variations Rate: Classification of Products**

Rate in %	Palmiste Avin	Berry	Tilier/Mondésir
Greater than 200%	Peanut	-	Sorghum, Taro, Breadfruit, Mango
Between 100% and 200%	Corn, Beans	Taro, Coffee, Mirliton, Cabbage Openagen, Corn	Grenadia, Coconut
Between 50% and 100%	Sorghum, Green Peppers, peas, Peas, Banana barik	Banana barik, Yam, Beans	Corn, Mazoumbel, Banana console, Yam, Manioc
Between 20% and 50%	-	Cabbage Cacacos and Riana, Sweet Potato	Plantain musqué, Cocoa, Sugarcane, Pineapple/petinou, and sidalin, Orange

Remarks

1. The variations in rates can reach 500% to more than 1000% for some crops: taro, breadfruit, mango.

2. At Tilier/Mondésir, price variations for corn are relatively moderated because it is possible to obtain two harvests a year.

## 2.9.2 Markets and Consumption

Only some indication of the relative proportions of produce consumed and sold for various households was obtained.

### At Berry

- "mazoumbel" (a tuber), depal variety, is totally consumed; farmers also frequently use it for fattening pigs;
- most sweet potatoes are consumed at the household level;
- Small avocado are not sold but are used for fattening pigs;

### At Tilier/Mondésir

- the banana, variety "barik", is more often consumed than sold, while the variety "console" is more often sold;
- The 'réal' and 'gérard' yam varieties are generally consumed at the household level.

## 2.9.3 Marketing Information

### Berry

At Berry, all farmers speak of their commercialization problems: transportation, difficulty of selling certain products, unadaptability of some products to the market. In order to obtain a better perspective on some of these problems, we were able to meet with a "Madam Sara" market woman who provided the following information:

- A trip Berry - Port-au-Prince - Berry takes 48 hours (by mule), across mountain trails, in order to sell five (5) bags of cabbage;
- There are not many "Madam Sara" at Berry. It appears that people of this locality don't like to attempt the trip by truck; the road conditions are too bad and they fear accidents;
- The Madam Sara rarely buy at Berry because of the bad conditions of transportation between Berry-Peredo (near Marigot). These market women either purchase Berry products in Peredo, requiring farmers (wives) to deliver products at Peredo by foot or mule (more than 3 hours walk), or by purchasing the same products at some half-way point between Berry and Port-au-Prince.
- Often the Madam Sara record high losses in marketing cabbage. Because of the heat during the trip, the product rots (the cacacos

variety in particular), thus losing a portion of their working capital;

- The 'cacacos' cabbage variety is not liked by some of the buyers of Port-au-Prince;

- During some periods of the year, the "Sara" can wait several days before arrival of a truck which will take their produce to market (Port-au-Prince);

- Some Sara buy at Berry or at Peredo, and depend on the Madam Sara of other areas closer to Port-au-Prince to sell the produce there. This brings with it increased risk as the original buyers are at the mercy of the sellers, who can say anything they want about the condition of the product when finally reaching the market.

- In April 1993, five bags (15 dz) of cabbage, purchased at Peredo and sold at Port-au-Prince, gave a Madam Sara a net profit of 14 gourdes.

- In spite of the problems listed, cabbage remains one of the most important cash crops for farmers in Berry and its cultivation will continue. Some diversification might be sought.

#### Tilier/Mondésir

Here, as in Berry, a meeting with a Sara was organized and information obtained, as presented below:

- The trip Tilier/Mondésir-Port-au-Prince-Tilier/Mondésir takes 72 hours for selling 2 dozen stalks of banana/plantain, 10 bags of charcoal;

- Unlike Berry, there are many Sara at Tilier/Mondésir;

- Tilier Madam Sara sell the cabbage produced at Berry, but generally do not buy at Berry; farmers are expected to deliver products at Peredo;

- The Sara don't like "cacacos" because of its fragility in transport; they prefer the "riana" variety, more easy to transport, though more heavy;

- There is no problem to sell banana and plantain. In general these products are rapidly sold;

- The low sale period for cabbage is February/March; the good seasons are December/January, and April/May;

- The Sara sell at Frères/Pétionville, and not in Croix-des-Bossales/Port-au-Prince because various difficulties exist in the latter market;

- Madam Sara state that they run great risk of theft of the cash earned from their sales in Port-au-Prince because of thieves (the "zenglendo" problem);

- For their return to Peredo and Tilier, many Sara buy industrial and imported products (sugar, rice, oil, fish) for resale in their home regions;

- In July 1993, 2 dozen plantain and banana stalks, 10 bags of charcoal purchased at Tilier/Mondésir and sold at Port-au-Prince, and two bags of sugar, one bag of rice, seven gallons of oil, one package of fish, would permit a Sara to earn a net profit of about 500 gdes, after about 80 hours of work; this represents 6.25 gourdes an hour.

## **2.10 Livestock**

### **2.10.1 Types of animals owned, nature, reasons for ownership**

At Palmiste Avin the number of animals is fewer than at Berry and Tilier-Mondésir. Horses are less important at Palmiste Avin because of the proximity of the national paved road. Mules, donkeys, and horses, are necessary at Berry and Tilier-Mondésir to sell farm products at Seguin and Peredo markets. In the three micro-watersheds, goats have diminished with the increase of land cultivated in the mountains. Cattle are found in all three sites and remain an important source of saving, while their potential for milk is poorly exploited.

Pig raising is very important at Tilier-Mondesir, mainly because of the presence of a large number of fruit trees (mango, breadfruit, avocado, etc.). Some 'rustic pigs' can be found in Berry while pigs are scarce at Palmiste Avin. Pigs bring a high price in all markets of the region and are considered more prolific than other animals one might raise.

In all three areas, share ownership (gardienage) is common. At Tilier-Mondésir, farmers readily give their cattle in share ownership to farmers living in the higher mountains above (near Seguin), where pasture is most available.

At Tilier-Mondésir there are beekeepers. One old man interviewed by the survey team had more than 50 traditional hives. Three other farmers in the immediate area were said to have bees, but with fewer hives.

## 2.10.2 Feed and seasonal availability

Farmers in all three areas feed their cattle using fallow fields, crop residues, tree leaves, and some cultivated grass, the first two being of principal importance. "Zèb a koss" grass is present mainly at Palmiste Avin. Guinea grass is cultivated at Berry and Tilier-Mondésir in special locations reserved for this purpose (not associated in fields of food crops). Table 12 below shows the periods of the year when certain kinds of feed are available for cattle and goats in the three areas.

Table 12: Feed availability for cattle and goats at Palmiste Avin, Berry and Tilier-Mondésir

	J	F	M	A	M	J	J	A	S	O	N	D
<u>residues:</u>												
-corn							*****					
-peanut <sup>(31)</sup>									*****			
-bean							*					
-sorghum <sup>(32)</sup>	*										***	
-sugar cane	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-cabbage <sup>(33)</sup>	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
fallow	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
<u>grass:</u>												
-guinea			***								*	
-zeb a koss			***								*	
-elephant			***								*	
<u>leaves:</u>												
-avocado			***									
-mango			***									
-bois d'orme			***									
-plantain	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

In the dry season, between February and March, farmers give tree leaves to cattle and goat, and cultivated grasses, if available. The best grasses are reserved for the horses because they are more sensitive.

At Tilier-Mondésir some farmers improve bean straw taste with urine. This method improves straw quality for cattle with urea present in urine. At Tilier-Mondésir and Berry, farmers take their cattle and goats up to the higher mountain pastures mainly between December and June. This period also corresponds to the planting period and farmers take their animals along with them to where they are working (staking them out in pastures or fallow fields). Farmers will bring their cattle back home, from time to time, to feed on plantain/banana and tree leaves around the homestead. Between June and December, cattle will frequently be found in household fields feeding on crop residues (bean vines, corn stalks,

<sup>31</sup>- Present at Palmiste Avin

<sup>32</sup>- present at Palmiste Avin and Tilier-Mondésir

<sup>33</sup>- Present at Berry

sweet potato vines, etc.).

Pigs receive fruit, cereals, tubers and leaves. During lactation and fattening periods, some farmers also purchase cereal bran as a supplemental feed. Tilier-Mondésir has the greatest potential for fattening pigs of the three sites visited. While farmers will raise piglets in Berry, for instance, these are usually sold off to other farmers below in Tilier-Mondésir, who, because of greater feed availability (fruit tree produce), will raise them to adulthood and sale. Table 13 shows feed availability for pigs throughout the year.

Table 13: Seasonal feed availability for pigs.

	J	F	M	A	M	J	J	A	S	O	N	D
<b>Fruit:</b>												
-avocado										*****		
-breadfruit										*****		
-mango				*****								
-palm seed	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
<b>Cereals:</b>												
-corn										*****		
-sorghum	*****											
<b>Leaves:</b>												
-corn										***		
-banana	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
<b>Tubers:</b>												
-potato												
-colocasia	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
<b>Bran:</b>												
-corn	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-sorghum	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-wheat	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

At Berry and Tilier-Mondésir, the feed available for pigs contain too much fiber, and the protein level is low. Farmers have the habit of mixing corn, grain and leaves together, thus diminishing the nutrient value of the corn.

The most important period for fattening pigs begins in August, with avocado, and lasts until December at Tilier-Mondésir. The period of low availability of feed extends from January through April, so farmers will sell off their fat pigs before this period. Some farmers are able to get their pigs fattened up earlier by feeding their pigs with mango beginning in April, thus being the first on the market with large pigs.

### 2.10.3 Health and care

Some cases of Anthrax are reported with cattle and goats at Palmiste Avin and Tilier-Mondésir. Farmers at Palmiste Avin recognize mammitis problems on their cows. To avoid this, they thoroughly rub udders with medicinal leaves immediately after

calving. Farmers will provide drinking water for their cattle and pigs, but never for goats. Farmers water their cattle 3 or 4 times in a week. However, during the dry season or when cattle receive dried grass, farmers give water more often.

Significant losses of piglet are experienced before separation from the mother takes place, between 8-12 weeks after birth. Some farmers told us about cases of abortion and dead birth.

In March-April every year, important losses occur among household chickens because of New Castle disease. Farmers do not have access to vaccinations to avoid this recurrent problem.

Dogs attacks on goats is a significant problem at Palmiste Avin. In an attempt to reduce this problem, farmers will bring in their goats near the homestead during the late afternoon and evenings to avoid this problem.

#### 2.10.4 Reproduction

There are few differences in the range of reproduction parameters between the three sites. Table 14 provides information on these parameters.

Table 14: Reproduction parameters for livestock at Palmiste Avin, Berry and Tilier-Mondésir

	Palmiste Avin	Berry	Tilier-Mondésir
Period between births			
cattle	12 months or more	12 - 15 mth	12 - 15 mth
goat	7 - 12 months	7 - 12 mth	7 - 12 mth
pig	-	7 - 9 mth	7 - 9 mth
Separation age			
cattle	7 - 9 mth	6 - 10 mth	6 - 10 mth
goat	4 - 6 mth	4 - 6 mth	4 - 6 mth
pig	-	3 - 5 mth	3 - 5 mth
Litter size			
cattle	1	1	1
goat	1 - 2	1 - 2	1 - 2
pig	-	4 - 12	4 - 8

The period between births for pigs is too long because the separation age from the mother arrives too late. Sows are often too weak because of poor feed to have another litter right away. The productivity of sows would be increased if farmers separated piglets from their mother earlier. However, if poorly fed, a higher mortality of piglets could then result. More and better feed availability would solve both problems.

The separation age for cattle and goat does not pose the same problem as with pigs because these animals can be pregnant while they suckle their kids, and they benefit more from available

grasses. Farmers should time the breeding of their animals so that births will occur in periods of high feed availability.

#### **2.10.5 Production**

Farmers start to milk cows 2 to 3 months after birth. Lactation time lasts until the separation from the mother (6 to 10 months) because rustic cows need calf presence to produce milk. The quantity of milk that the farmers take decreases until the end of the production. At the beginning, farmers take about 4 liters per day. Four months after birth farmers may not be getting more than about 2 liters per day. If the cow is pregnant 3 months after birth, milk production decreases rapidly and at 6 months milk production will be about 1.5 liter/day. In order to obtain more milk, farmers will tie calf far from the mother for a period of 24 hours. The next morning the farmer can have 3 to 4 liters. Farmers can extend milk production for as long as 10 months but by this time production is low, and milking is not taking place every day.

Some farmers obtain one calf each year for every cow, while others can wait for 15 months before a next calf. In the three sites visited, farmers considered this interval as a good range.

Sows in Berry and Tilier/Mondésir produce between 4 to 8 piglets at each birth, and the period between births is around 7 to 9 months. The sow productivity is lower unless farmers buy feed for their pigs.

The peak production of honey is in March-April. This period corresponds with the nectar flow from mango and many wild tree flowers at this time. Beekeeper extract both honey and beeswax from hollow log hives. Beekeeping is a traditional activity in the process of disappearing at Tilier-Mondésir because younger farmers do not want to invest the time necessary in bee management - though from all indications, it is a highly profitable business. Lack of appropriate equipment (eg. removable frame hives), fear of bees, or lack of knowledge about them, and lack of specialized management knowledge needed for beekeeping hinder development of beekeeping in the site.

#### **2.10.6 Markets and Consumption**

Household consumption of animal products concerns primarily milk and eggs. Rarely do households kill their own animals for their own consumption - though they may purchase a piece of meat from time to time in a market. Animals represent the most important source of savings (banking) a household will have. Cattle and goats are sold in the market to obtain money for critical household needs (eg. planting seed, payment of field

labor, school fees and supplies, medicines). Piglets, for example, will be sold quickly after separation from the mother, as farmers do not have enough feed capacity to maintain numerous pigs on their homestead.

At Berry and Tilier-Mondésir one bottle of milk (0.75 l) can be sold for 1 gourde and 2.50 gourdes at Palmiste Avin. At Palmiste Avin, milk is sold to merchants who prepare Ak-100 for quarry workers near by the road. This reason explains the higher price for milk in this site. Table 15 provides animal unit prices in the three sites.<sup>34</sup>

**Table 15: Animal Prices at Palmiste Avin, Berry and Tilier-Mondésir**

	Palmiste Avin		Berry		Tilier-Mondésir	
	low price gourdes	high price gourdes	lw pr gdes	hgh pr gdes	lw pr gdes	hg pr gdes
Goat reproductive castrate 18 mth young	75	100	250 150	300 155	250 150	300 155
Pig adult piglet			1500 150	2000 155	1100 150	1500 155
Cattle cow bull young female milk 0.75 l	1250 750 2.50	1000	1500 1	3000 2500	1500 1	
Horse Mule Donkey (etion) <sup>35</sup>			1550 1000	1550 2000 1200	1100 1550 1000	1150 2000 1200

Animal prices have gone up considerably during the past couple of years. This is partly because of the current political situation, growing problems with public transportation, and the need to get produce to markets.

Stud services can be an important source of income for the owner of male animals. Different conditions exist for each category of animals. Table 16, below, provides some of the fees associated with breeding services in the three areas.

<sup>34</sup> Because of lack of means of food preservation (dehydration, salting, etc.), once killed, meat must be quickly sold. This explains why, on a unit by unit level, goat or pig meat will be more expensive than beef. It is difficult to sell all a cow's meat at higher rates because people know the price will have to come down as the meat ages. If there were appropriate means of conserving slaughtered meat, higher prices could be maintained within the market.

<sup>35</sup> Special male donkey (larger) to breed horse for purpose of obtaining a mule.

**Table 16: Conditions to Breed an Animal at Palmiste Avin, Berry and Tilier-Mondésir**

	Palmiste Avin	Berry	Tilier-Mondésir
Cattle	10 - 15 gdes	a rope or 4 - 5 gdes	a rope or 4 - 5 gdes
Pig	na	a piglet after birth	a piglet after birth
Horse	na	50 gdes in advance and 50 gdes after birth	30 gdes in advance and 30 gdes after birth
Goat	free	free	free

At Palmiste Avin, the price to breed a cow is higher than the other sites because bulls are scarce in the area. Some farmers have to go many miles from their home to find a male. At Berry and Tilier-Mondésir, bulls are available and sometimes the service is almost free, with the farmer only giving a rope to the bull owner.

At Berry and Tilier-Mondésir farmers depend on mules for transportation. Only a specially trained (and larger size) male donkey ("etion") can breed a horse to produce such mules. Berry farmers will pay 50 gourdes in advance and 50 gdes after birth for the use of such an animal's services. At Berry, only one such special male is available; during the past year this male has successfully bred with sixteen horses.

At Berry and Tilier-Mondésir, pig owners follow traditional practice in regard to breeding. To breed a sow, the owner of the boar will demand one piglet after separation from the mother. Although the payment is made 7 months after the breeding service, the price is high, because a piglet costs around 150 gdes at this time.

One bottle (0.75 l) of honey costs 12 gdes at Tilier-Mondésir. An equivalent bottle of honey is sold for 20 gdes by "Les Petit Frère de St. Thérèse" at Palmiste Avin.

## 2.11 The Land

Land values are related to the kinds of land under consideration - whether the topography is steep or level, what the actual soil fertility of the land is, what is currently growing on the land (wooded, fruit trees or pasture), or location (distance from a road or stream). Land values can be greatly increased, particularly when lands which have been abandoned as too poor for cultivation are brought back into production of high value crops. This is a process that needs to increasingly take place on many mountain hillside locations in Haiti - but it is labor intensive and takes time. But the end results are worth the expense.

For example, in Palmiste Avin, there are two major land classes, one of which has considerable productive potential (in spite of very steep slopes). The other is coarse textured and of low fertility, and therefore of rather low potential for intensive cultivation of row crops but has potential for other uses. Some farmers have both types of land. Poorer farmers may only own low potential land - of their own.<sup>36</sup> Whether a farmer has one or both types of soil does not matter, because land use must be viewed from the perspective of the whole community. What happens to good land affects what happens on the poor land. This is because livestock will not be grazed on cropped land. They will be grazed on any land not presently cropped, regardless (in most cases) of the owners wishes on this. With increasing population pressure and increasing pressure on the land, there is less and less true fallow land to be found<sup>37</sup>. Consequently, the land with poor agricultural potential that is not in peanut production, is intensively grazed. Any intervention which would increase farmer income would result in purchase of more animals (as savings), and increased use of the poorer lands for grazing. Unless, therefore, use of the less productive lands is addressed at the same time, the results could be catastrophic from an environmental point of view (ie. erosion of topsoil down to bedrock and complete loss of productivity). Some hillsides visible from the Jacmel road have already reached this point.

Low potential for row crops on contour ridges does not necessarily mean low potential for agriculture. We met with one farmer who showed us his household garden on a slope of more of about 50-55 degrees (more than 100%). He explained to us that before 1980 nothing could grow there; the soils were too poor. However in 1980 he constructed 5 deep contour canals and in 1981 planted fruit trees in the accumulating soils at the bottom of these canals. Today, the canals have long since disappeared, but one sees a small wooded area, at the top of a hill, completely surrounded by almost barren infertile soil with light brown color, indicating little organic matter. Within this wooded area one finds oranges, mango, corosol, kenep, plantain, banana, breadfruit, with an dense understory of maize and cowpeas. Trees looked excellent, and the dense cowpea understorey was vigorous and green and during our visit was fruiting. This farmer, and others in the community, want to construct more canals but say they cannot pay for the labor. He belongs to a group currently constructing canals on other farmer's land, but has not been able to get them to work for him yet. This farmer's experience could be replicated throughout Haiti. Program interventions need to focus on long term results, not quick fixes.

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<sup>36</sup> They may obtain better land through sharecropping and renting arrangements.

<sup>37</sup> In the sense that the land actually rests for at least one full year or more. What one increasingly finds is land 'resting' between cropping seasons - of which there are two a year, and in some cases, three (for beans).

### 2.11.1 Land Tenure

Within all three watershed regions visited, farms are very small: 12/100 to 1.3 carreaux for the majority of farmers<sup>38</sup>. These are divided into many different parcels located in many different areas. Large landholders are not common in Tilier/Mondésir and people own or have permanent control over most of the land they cultivate. This is not the case in Berry. Someone with between 4 to 5 cx. is considered a large landholder. Table 1, at the beginning of this report, provides some data on land tenure distribution from secondary sources. At Tilier/Mondésir, we were told of farmers having eight carreaux of land. According to these farmers, there is no "state land" within these three watershed areas; however, in the mountains above Berry near Seguin, large quantities of such land are to be found.

Of the lands under direct control of farmers at Tilier/Mondésir, the most common, representing about 60%, are those inherited from one's parents through division, usually before the death of one's parents. Less than 20% are actually purchased directly by the farmer concerned. Between 10%-20% of the lands used are "undivided inheritance" - family land - but land over which the farmer cannot be certain he will inherit. Both sharecropping and renting are also important means for poorer farmers to have access to enough land to meet their household needs. At Tilier/Mondésir we encountered farmers who rented (potèk) fields of plantain/banana over a period of many years.

Land tenure rights over specific fields very significantly influence a farmer's motivation to adopting effective long term soil conservation measures of hillside fields. These rights also often determine the degree to which a farmer can "protect" his field from use by other farmers or relatives during the short fallow period between seasons.

Individual households exploit a great many fields, located in different parts of the watershed, sometimes many miles apart, some at high elevation, others lower down. Households interviewed had between 3 and 8 such fields.

The land market is not very active at either Berry or Tilier/Mondésir. It is difficult to find land for purchase, except land obtained by a land-surveyor as fee, a common practice in these zones. At Palmiste Avin, the market is more active, but land for purchase is equally rare. The Haïtian diaspora actively seek land to buy on Amitié mountain along the beautiful Jacmel paved road.

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<sup>38</sup> One carreaux is equal to 1.29 hectares.

## 2.11.2 Land Value

Land value is a function of four principal variables: location, slope, presence and kind of trees on the land, and potentially cultivatable crops. Table 1 (page 8) provides some comparative data on land values and rents within the three watershed areas, with the variability in values determined by one or more of the variables mentioned.

## 2.12 Labor

### 2.12.1 Traditional Forms of Organizing Group Labor

#### Berry

The terms various people use to describe the 'groups' which perform labor can be confusing at times. It appeared that farmers themselves were not always sure what to call them. The basic distinction seems to relate to how the actual labor is to be performed: (1) either as a mutual-help type of association or (2) or hiring of a group for field labor. The farmer hiring either individual or group labor may refer to the group as a "corvée" or "coumbite". Members of a mutual-help association, whose members principally work to help each other on their own fields, may also, at times, sell their labor as a group to a third party. At Berry farmers used a number of terms to describe these different arrangements of group labor.

One farmer, a merchant, spoke of frequently 'buying a corvée' to prepare his land for planting, and then to weed it, paying 10 men 5 gourdes/day for this work, with a breakfast served (coffee and biscuits) plus a noon meal (rice or corn meal and oil) following completion of work (about 1 pm.). He shared the cost of this labor (and the food required) with his adult daughter who worked this field with him. This farmer spoke of his neighbor, in the field next to him, who had hired a 'corvée' of this kind to create rock terraces across the slopes of his field. Where do the 10 men referred to here come from? They can either be members of a mutual-help "escouad" association, selling their day's labor, or be individual community members needing a day or two of work, or a combination of both.

A second farmer spoke of being a member of an "escouad" of 8 persons, a group formed three years earlier. This was a work association of friends, of similar social levels, where each day a member benefits from the work of all members during the first half of the day, between about 7 am. and 1 pm. (5-6 hours). Today they group works on my field, tomorrow we all work on yours, the next day we all work on a third member's fields, and so on. It usually works best to have less than 7 members, to permit a weekly cycle

among all farmers of the association. Sometimes the group may work only for two or three days each week, creating a working cycle of 2-3 weeks. Such groups do not work in the afternoons, as members pursue their own work on other fields or with other activities during this time. The principal types of labor performed by this group is field preparation (for planting), weeding, and creating contour ridges (for sweet potato/manioc). Members of such "escouads" vary between 4-8 persons. This farmer noted that the Berry community contained 6 other "escouad" associations such as his own. This farmer, the leader of his "escouad", had actually managed to encourage his group to construct rock terraces on his field during a recent days work on his own land.<sup>39</sup> When working on each other's fields in this way, there is no cash payment - only provision of meals as agreed upon by the group.

When a member of an "escouad" does not need his group to work on his field on a particular day, he can "sell his day" (ie. vanjou) to another member of the group or to another farmer at the going daily rates. The farmer hiring this labor may think of this group as a kind of 'corvée' which he is hiring. He may need to hire more than one group like this if more people are needed for the job being performed - or he may simply pick up other individuals who may not in fact belong to any particular "escouad" work group.

Two other farmers in this area referred to the "escouad" as an "associé". On the days they would work in each others fields, they would all begin at the same time, end work at the same time. There is no 'cash payment' for this work, and meals may or may not be provided, as agreed upon among these friends. Upon occasion, a member may "sell his day" - in which case the daily wage of all members goes to one selling the day - and all benefit from a breakfast and lunch.

Within this area, PADF does not work with these traditional work groups for its soil conservation and other activities. Instead it works with 6 groups of farmers organized by an agronomist (Cantave) some years ago to facilitate development aid into this area.<sup>40</sup> These groups are larger, and are currently led by a PADF extensionist. Group #3 in Berry, for example, has 10 members and is working one day a week (as a group) to construct rock terraces and vegetative barriers under the guidance of the extensionist. There is no 'payment' for such work, and food is

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<sup>39</sup> When asked why more local self-help work associations of this kind did not perform soil conservation work as part of their labor, he noted that it all depends on the group's leader and how he motivates his friends. The farmer pointed out that if an extension agent or agronomist told them to do this, they wouldn't do it!

<sup>40</sup> The groups had ceased to function when the Ministry of Agriculture project on which this agronomist worked ended in this area. When PADF arrived late last year, looking for 'groups' with which to work, the leaders of these groups reformed.

generally not provided. We learned that most of the members of one "escouad" worked within this group. It was the son of this "escouad" leader who had been named by PADF as extensionist leader of this Group #3.

### Tilier/Mondésir

Most of the same traditional labor associations found in Berry also were found here - though sometimes called by different names. One farmer, who participated in Pristene soil conservation activities in past, described his own 4-man 'escouad'. They work each others fields every week (7 am. to 1 pm.), and are given coffee and biscuits for breakfast, and a noon meal when finished. He noted that one member of their group is always 'selling his day' (vanjou). When they are to work his field, they end up working on someone else's fields. They are each paid 10 gourdes/day, which means this man takes home 40 gourdes (\$8) to use for other needs. Their 4-man work group had not yet thought to perform soil conservation work (rock terraces, planting hedgerows, etc.) as part of their 'escouad' work day - but said it would certainly be possible if they wished to do so.

Yet another farmer noted that he was a member of a PADF group. However, he noted that he prefers to work with his own small (4 man) 'escouad' group because 'they are more serious'. When one works with the large (PADF) group, there are always people who are lazy or poor workers. Some people don't show up on time, some don't come at all. His own 'escouad' group always show up when they have work to do. He even proudly showed me a A-frame level he had constructed himself for marking contour lines on his field. His 'escouad' have already created rock terraces on member fields. He also pointed out that 'his four' could show other such groups how to do soil conservation work for themselves. This would be a model worth testing.

One farmer spoke to us of often using 'escouad' labor for land preparation and weeding, paying them 5 gourdes/person for about 4 hours of work (this would be a 'vanjou' situation). This same farmer also pointed out that sometimes he specifically selects a number of good workers to do his work and pays them at a higher rate (see Table 1 footnote) - noting that they perform better work than the 'escouad'.

Another farmer described to us his use of a 'combite', the description of which fitted what Berry farmers were calling "vanjou". Rather than providing a meal, he provided "grog" alcohol. Farmers also use a 'corvée', which is essentially a combination of smaller groups 'selling their day' "vanjou", and working all day. A 'corvée' may have between 20 and 25 members, and more, and as a group, only exists for the day.

PADF does not work with any of the traditional work groups of the area, though members of these groups are to be found within other project formed groups. For example, the Pristene project has worked a great deal in this region in past years in soil conservation, initially constructing rock terraces/walls in fields and ravines beginning in 1984, and more recently ('91) working with leucaena/gliricidia hedgerows.<sup>41</sup> It currently closed down because of political embargo. Such work, usually done in August and September involved project-formed groups of 18 or more people, working about 5-6 hours/day and receiving 8 gourdes/linear meter from the project. PADF worked through this PVO during AFII days and continues to work through extensionists employed by Pristene-formed groups, but paid for by PADF. PADF has been able to encourage Pristene to stop such payments for soil conservation labor and to redirect moneys to community related activities, like a store which can purchase and resell agricultural products of its members, provide seed, and other agricultural products needed by farmers. PADF hopes to encourage the Pristene farmer groups to continue soil conservation labor without pay - organizing currently to work one day a week, for 3 hours each Wednesday. The groups are large and numbers of people actually showing up on any one day varies greatly - which will be a problem for motivation as time goes on. During our visit, PADF technicians had used one of these Wednesday group days to instruct farmers on the creation of vegetable gardens.

Within Tilier/Mondésir, there used to exist another traditional form of organizing group labor called the 'société', with 50 to 60 members, that essentially sold their labor for major public works. This has practically disappeared.

#### **Palmiste Avin**

Here, one finds the "couadi/associé", and the "corvée". These are the same basic kind of group organizations found at Tilier and Berry. Because contour ridging is used for all crops, and because such work is much more labor intensive than land preparations in other regions where this is not done, the costs associated with such labor are much higher. Formal groups were created by the PVO in this area, Les Petites Frères, and each person in these groups often receive 5 gourdes/meter for the work done in conjunction with the constructing of contour canals in members fields. When an "associé" group works in selling its labor to another farmer to construct contour ridges, they will expect between 10 - 12 gourdes plus 2 meals (breakfast and lunch). When a lunch is not provided, they expect to receive 15 gourdes/day/person. Men also work under contract in this zone, with a fixed price attached to a certain measured unit of land to be worked.

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<sup>41</sup> Very little of this work remains today, though patches of left-over hedgerows could be seen on a number of fields.

## **2.12.2 Principal Activities for Group Labor**

In the three zones, principal labor accomplished by these traditional labor groups include land clearing and preparation for planting (particularly hard after a fallow period), deep tillage, planting, weeding, creation of ridges, particularly important in Palmiste Avin.

Each watershed area has its peak period for such activities:

- Palmiste Avin: March to June, July to October;
- Berry: March, November;
- Tilier/Mondésir: February - March; August.

At Palmiste Avin, during peak periods, the "couadi" will frequently work two shifts (morning and afternoon). At Tilier/Mondésir, farmers speak of a serious problem of finding labor during these peak periods, as many of the younger men have left for Port-au-Prince and the Dominican Republic. Therefore, it is not uncommon to find that, during these peak periods, women will participate in some field work: sowing, and first weeding. During these periods the women will even organize their own "couadi" at Tilier/Mondésir, selling their days as do the men. They are only paid about 50% of what men will get for the same work, however! Women also frequently join together to help each other in planting beans. At Palmiste Avin, women were said to work under contract performing paid labor on fields.

## **3.0 Already Existing Farmer Opportunities**

### **3.1 The Cropping System**

At Berry, cabbage is considered the principal cash crop by farmers, and beans are in second position, though they say that the beans are high risk crop which easily can be lost if rains are inadequate. Most farmers in Berry have land at higher and cooler elevations, below Seguin, excellent for extensive vegetable cultivation. Help to farmers growing vegetables on these lands in the form of appropriate varieties, seed sources, and marketing could make a major impact on household budgets.

At Tilier/Mondésir, beans and plantain/banana are the two important cash crops. Beans are seen here also as being a high risk crop.

At Palmiste Avin, peanuts and beans are the main cash crops according to farmers, though it appears that manioc and pigeon pea

are also very important. The cassava processing mill has been a major stimulus in the area.

Each of the above crops represent significant resources that farmers exploit on their land, to increase their income and household financial security. When money is earned, farmers will try to save as much of it as possible through some kind of animal, starting with smaller animals like goats or piglets. We have seen earlier (2.10) that there are many opportunities to help improve the quality and profitability of livestock production.

### **3.2 Other Current Sources of Revenues**

Farmers have few sources of revenue other than that coming from agricultural activities and animal production. Tilièr/Mondésir seems to offer some other possibilities: charcoal production (mango, mombin, figuier), though the quality is not very high, and production of wood planks from Haitian oak, mango, etc.. Many farmers also find seasonal work in the Dominican Republic, and some in Port-au-Prince.

In these different zones, sale of one's labor force is a very important source of revenue for many farmers.

### **4.0 Major Constraints and Possible Solutions**

The key constraint for small mountain farmers is the lack of working capital: cash. How to obtain this, how to invest the little farmers get from sales of portions of their crops, or from money earned through work is a concern that preoccupies most such farmers. Because of their general poverty, it takes very little misfortune to force farmers to mortgage their possessions and long term futures for short term capital availability. Planting seed is eaten because the family comes to a point where they have no other food, and no cash to buy it in the market. When the farmer finally must have the seed for planting, he will hire himself out to a better off neighbor for several days in order to get cash with which to purchase the seed which is now at its most expensive. Or, in some cases, he will not be able to plant certain crops at all (or in the quantity he might have) that year. This frequently happens in case of beans. There is a local credit market, but interest rates exceed 200%. Large mango, avocado and other fruit and non-fruit trees may be cut for quick infusions of cash through sale of charcoal<sup>42</sup> or wood planks. However, the household loses an important source of recurrent food and potential income from

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<sup>42</sup> And even here, the household concerned only get a portion of the money represented by this charcoal, as frequently help must be employed to perform these tasks correctly.

feeding pigs on excess fruit, not to speak of resulting soil erosion problems. This lack of basic working/living capital is the real constraint which must be resolved if any long term improvement of the Haitian small farm economy is to ever take place.

#### 4.1 Increased Production of Principal Crops

Farmers in each of the three watershed areas visited face major constraints to increasing agricultural production on the hillside slopes they are cultivating. Palmiste Avin is different from the other two sites, and presents unique challenges. A first major challenge in all three sites, however, is to identify a cropping system for the hillside fields which will at least prevent further soil loss during periods of rainfall and water run-off. Following this one may begin to attempt to improve existing soil fertility. In spite years of attempts to promote leucaena and gliricidia as hedgerows in these areas, it is a major problem that farmers generally have not been convinced that this is the appropriate and effective means of preventing soil loss or in improving soil fertility of fields in which these leguminous plants have been placed. Maintenance of such vegetative structures as well as spontaneous adoption of the technique has been lacking. This reality suggests the need for adaptive on-farm research of this problem and looking for other possible solutions. That farmers are clearly aware of the problem and are seeking (and in some cases have found) solutions is evident in their use of dead vegetative barriers along the contour of new fields (rempe paille) and contour ridging, as practiced extensively in Palmiste Avin.

As seen elsewhere in Haiti, the farmer's long term access to his land is a root constraint which prevents his incentive to provide the appropriate (and more costly) care the land requires in conservation. The steeper the cultivated slopes, the more likely it is that these farmers are among the poorest, with the least resources to commit to long term land management. Short term gains are sought with long-term negative impact on the land, such as loss of tree cover to produce charcoal and planting of short duration crops, such as peanut and bean. These crops have a high cash potential but cover the soil for only a short period. The fruit tree crops, as well as plantain and banana, which would provide greater land/soil cover and long term food security take time to grow and are more costly to establish - something not done on land to which one does not have firm tenure. Share-cropping, fields with undivided and unclear inheritance, state land and rented land (on hillsides), are tenure constraints which often seem difficult, if not impossible, to solve. Certainly land tenure issues need to be resolved at a much higher political level - to the benefit of those who will actually use the land.

In an attempt to increase soil fertility on their hillside fields, farmers purposely move their pastured animals around on

different parts of the land during fallow, benefiting from both the manures and organic remains from feed they are given. Farmers also practice a form of manual deep tillage to work the soil. When possible, they will also purchase chemical fertilizers for their crops.

Farmers were observed to plant windbreaks in Palmiste Avin and Tilier/Mondésir to protect their plantain/banana on hillsides. Trees are also planted (or left) in fields to provide climbing stakes for yams.

Some farmers will purchase rat poisons as a means of trying to control against attack on maturing corn and bean crops. One problem with this is that not enough farmers do it to effectively control the problem.

Transportation of agricultural commodities to markets and the high cost of both obtaining and transporting needed inputs were constraints frequently mentioned by Berry farmers.<sup>43</sup> The highest value crops that farmers can grow in this area (vegetables) are also the most fragile to transport.

At Tilier/Mondésir and Palmiste Avin, farmers most frequently cited the problem of lack of sufficient rainfall and decreasing soil fertility. The Tilier/Mondésir area is located within a rain-shadow, with considerable rainfall experienced higher up in Berry and even more yet higher up still. As a result, there is considerable water flowing in streams in the lower valley regions (cf. Photo 4A), and irrigation is an important option. USAID has already invested in major irrigation canals in the Peredo and Marigot areas, just downstream from Tilier/Mondésir. Access to irrigation could help many farmers here too. Table 17 below gives major constraints for each crop as cited by farmers.

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<sup>43</sup> It took the survey team 2 1/2 hours by 4-wheel drive vehicle to cover the distance from Marigot (a sea-coast town with good road access to Jacmel) to Berry - 10 miles!

**Table 17: Major Constraints by Crop**

CROP	CONSTRAINTS		
	Palmiste Avin	Berry	Tilier/Mondésir
Banana/ Plantain	Wind, Schaffer/mucuna larvae on Vincent variety)	Fertility, Schaffer/mucuna larvae	Drought, fertility
Beans	Drought, fertility, bruchids, too much rain <sup>44</sup>	Water, bruchids, input costs, fertility	Drought, water, fertility, snails
Cabbage	- <sup>45</sup>	Transportation, inputs cost (seeds, fertilizer), competition with other zones <sup>46</sup>	-
Manioc	Fertility	-	Drought
Coffee	Had cut down most of trees because of coffee prices	Weakness of prices, rat, rain in harvest period, fertility, fertilizer cost	Had cut down most of trees because of low coffee prices
Corn	-	Fertility, birds at harvest, quality of seeds, rat	Drought, wind, fertility, rat, larvae
Peanuts	No major problems	-	-
Pigeon peas	No expressed constraints	-	-
Potato	-	Inputs cost (pesticides, seeds, fertilizer), transportation,	-
Reed-pipe	-	Transportation, market	-
Sorghum	Short season varieties	-	Drought, fertility
Sweet potato	-	Rat, Schaffer/mucuna larvae	-
Cowpea	Bruchids in mature grain		
Yam	Mucuna larvae causes yam to rot in ground	Unavailability of seeds, cost of seeds, fertility, Schaffer/mucuna larvae with rotting problem <sup>47</sup>	Schaffer/mucuna larvae (Real & Gerar varieties), brûlure des tubercules

<sup>44</sup> Excessive rainfall, running down steep slopes, frequently washes out the beans (when just planted), or they rot on the pod before they can be harvested. Too much rain can also result in low pot set.

<sup>45</sup> Unavailable information or crops are not cultivated in this area.

<sup>46</sup> Farmers must be helped to diversify into other kinds of vegetable crops.

<sup>47</sup> Yams used to be an important crop in Berry but in recent years had been replaced by cabbage as a cash crop. Cabbage is becoming less profitable because of strong competition from other zones, decrease in purchasing power of the consumer this year, and the high cost of inputs. This is pushing some farmers back to yams with two major constraints - availability of good varieties and seed sources, and cost of seed yams. Yam presents some advantages over cabbage in that it transports better, can be stored for several months (after harvest), and farmers can grow their own seed.

#### 4.2 Major constraints to improve animal production

As in other regions of the country visited by the survey team, we had the clear impression, after talking with farmers, and from our own experience and observations, that there are clearly less (small) animals around than in previous years. Economic conditions of farmers have been increasingly difficult in recent years, and animals have been sold off to meet critical household needs. Many households have not been able to replace these animals 6-9 months later (after a harvest) as costs have been rapidly increasing for such animals as well. There are less pigs in many areas than there should be, given the number of years that have passed since pigs were re-introduced into the countryside. Reasons given were inadaptability of pigs introduced.<sup>48</sup>

At Palmiste Avin, feed availability is an important constraint to animal production. With increasing pressure for cultivated land, there is less and less long term fallow available. This has clearly resulted in declining numbers of livestock. While farmers increasingly leave part of their land in grass for livestock feed, the quantity is not sufficient to feed animals year round.

At Berry, cattle and goats are very important. However fruit production (mango, avocado) isn't enough to permit pig fattening, as traditionally practiced towards the end of each year (trees have been cut for fire-wood). Some farmers buy cereal bran for their pigs and, to cover these expenses, have to produce more pig and sell off the young quickly.

Tilier-Mondésir farmers have greater numbers of fruit trees remaining, and can more easily raise pigs to maturity for sale. Piglet production at Tilier-Mondésir is low, however, because farmers separate piglets from their mother too late, thus weakening the sow (from lactation). She cannot reproduce again for several months.

Animals are only sold in response for special household cash needs (health, education, money to pay for labor on fields). Following such sale, many farmers have difficulty earning enough money to re-invest in these animals.

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<sup>48</sup> Pigs initially brought in were given the same sanitary conditions and feed they had been raised on and so died off quickly. Because they are bigger, they require more feed, and people, not being used to buying feed for such animals, did not feel they could afford this. These animals have subsequently adapted to Haitian rural conditions, and more farmers are buying feed because pigs bring such good money. No-one uses pig houses -all pigs seen were attached by cord to trees/stakes or wandering freely.

#### **4.3 Other Endeavors**

When asked about other opportunities they believed they had for improving their production systems, farmers mentioned the following:

- Other crops: yam, and potato at Berry, and yam at Tilier/Mondésir;
- Animal production: breeding of chickens at Berry, of goats, pigs and cattle at Tilier; of chickens and turkeys at Palmiste Avin;
- Trade of livestock: goat, pig and cattle at Berry, and goats at Tilier;
- Animal fattening: pigs at Berry and at Tilier; cattle at Tilier.

Farmers found it very difficult to give any particular ranking to these opportunities - saying that they were all important - depending on the person concerned. Farmers think in terms of diversification and will seek several options at the same time, if possible. It is important to underline the importance of animals as a source of household investment opportunity - where other forms of investment are simply not available to farmers. Chicken and turkey raising (sale at the end December), fattening, and animal commerce are almost always profitable activities. Having a few cows is a goal of most mountain farmers, with raising of goats and pigs being intermediate steps in this direction.

#### **5.0 Recommendations for Program Interventions/Potential Technologies To Implement**

The survey team was impressed by the quality of the agronomists and field staff available to PADF, and particularly appreciated the extent to which the Marigot field team took time to accompany us to the field and work with us. We believe that, as at other sites visited, this field team is over-extended. They are trying to do far more than is possible to do well in so large a region. As observed elsewhere, there needs to be greater focusing of the team's efforts on a number of realizable objectives with long term potential benefits to the farmers of the area. The field team itself is not completely convinced (justifiably) of all the extension messages they are being asked to extend - and measure. The following recommendations are provided as a suggestion to PADF leadership on how such focusing might be accomplished in the field.

## 5.1 Farmers and PADF Interventions

PADF must work more closely with farmer households, listening more to them, and being more directly involved in the activities being extended through associated PVO extensionists. Viewing farmers simply as the recipients of extension activities, which appears to be the general approach, completely misses the point that many of the messages being extended may not be appropriate; or if appropriate, may require a set of other supporting activities on the part of PADF or some related organization to assure success and sustainability (what we are recommending as 'integrating themes').

Farmers are generally enthusiastic about the PADF actions of providing new seed material to farmers (Tamazulapa beans, yams, corn). While at Berry, which is new to soil conservation measures, farmers seemed positively orientated to encouraging soil conservation in the area (hedgerows with leucaena, rock terraces, rock walls in gullies), in Tilier/Mondésir, the situation is much more complicated. Here, farmers already have had recent past experience with rock terraces and vegetative barriers (leucaena, gliricidia). While the rock terraces have been created, in many places, impressive deep soils behind the walls where crop productivity is high (plantain, banana, corn), hedgerows have almost completely disappeared or are in very bad condition (often destroyed by animals). Farmers clearly indicate their preference for the rock terraces and rock walls in gullies, while they are much more reluctant, sometimes openly hostile, to re-establishing hedgerows of leucaena.

PADF might consider giving higher priority to helping farmers re-establish yams through a seed yam program, and less priority to distribution of beans. While the latter can be an important cash crop, its cultivation is associated with much greater risk of failure as well as being a short season crop which continually exposes the hillsides upon which they are cultivated to erosion. Yams, on the other hand, are also important sources of income, provide long term cover and protection to the hillside fields where they are cultivated, and also require living structures upon which to climb - further encouraging planting of various kinds of trees within such fields. Haitian oak (chêne), cedar and mango were frequently mentioned tree species much appreciated in agroforestry efforts in the area. Bamboo, an important house construction material and also known in area, could be much more exploited in ravine areas, and also serve as yam growing structures.

## 5.2 Labor

PADF might find that a greater effort to identify and work with traditional work groups found within all three micro-watershed areas would provide a more effective means of institutionalizing within the farming systems of farmers ideas concerning soil conservation management, creation of rock terraces, hedgerows,

establishment of private tree nurseries, etc. Existing groups, largely in place at the request of outside efforts, should not be the only means of extending new management methods and ideas to farmers.

### 5.3 Vegetable Cultivation

Farmers in Berry have, on their own initiative, focused in on cabbage as an important cash crop - to the extent that it is associated on most major fields and has had an impact on the cropping system. PADF should consider focusing some of its efforts in bio-intensive gardening in helping farmers resolve the many problems they are experiencing related to this specific crop. This includes help in terms of inputs (seed source, variety [riana] and availability, fertilizers, pesticides). Farmers need help in diversifying their vegetable cultivation as well. Of particular importance, perhaps, is the fact that most Berry farmers, and many Tilier/Mondésir farmers, have land in the uplands below Seguin, at very high elevation. This cool and humid area is almost completely bare of trees and because of steep slopes, subject to substantial erosion. It is also an ideal area for vegetable production, similar to the Kenscoff area, and many of the Berry and Tilier farmers are growing vegetables in this area for the Kenscoff market. PADF, in considering the farming system of the Berry and Tilier/Mondésir farmers in a holistic sense, must consider if efforts with BIGs might not be more productive in those areas where their farmers are actually growing vegetables (below Seguin), and perhaps concentrate less on trying to grow similar vegetables at the lower elevations.

### 5.4 Inter-Regional Visitations

Farmers in the Palmiste Avin area in particular, with their intensive and traditional approach to contour ridge cultivation, have much to offer to a number of other areas in Haiti which do not currently use such ridges for anything except sweet potato and manioc. PADF has a unique opportunity to foster inter-regional visitation among farmers as a means of helping farmers communicate among themselves concerning improved means of cultivating steep hillsides. This could help to better understand the constraints which hinder farmers in other areas from adopting systems which appear to work so well elsewhere. Berry farmers, with their growing interest in vegetable cultivation, and Palmiste Avin, with similar potential, might be helped by visiting with Kenscoff vegetable farmers as a means of promoting new ideas. Marketing issues will certainly be dominant concerns that the program must not neglect in seeking solutions.

## 5.5 Modifications to Local Soil Conservation Practices

The three micro-watershed areas in which PADF by work in Region 2, vary greatly in terms of the experience local populations have had with past soil conservation/agroforestry programs, and in terms of the traditional farming systems which have developed in each area. While rock terraces can be built in some locations in the Marigot area, particularly in gullies and ravines, most farmers will need some form of earthen or vegetative barrier as a soil conservation measure. At Palmiste Avin, contour canals seem to provide an important additional and new method (though expensive) which farmers can use to protect and improve their very valuable and often productive soils, already well cared for through traditional means of contour ridging. Contour canals can also help rehabilitate areas which have suffered degradation and soil fertility loss through over-cultivation and erosion. In all cases of contour canals, they must be associated with the creation of vegetative barriers of mixed long-cycle tree and other crops.

At Tilier/Mondésir, experience with hedgerows of leucaena and gliricidia have not been particularly positive. PADF is encouraged to look to other means of providing vegetative barriers. Work begun with sugarcane and pineapple is a move in this direction. The survey team recommends that PADF look more seriously at some of the other crops (plantain, banana, bamboo) currently grown on these slopes as well, but rearranging them to create true barriers along the contour. A specific recommendation is made below for an on-farm applied demonstration series of trials with participating farmers.

Caution should be given to the use of the modified "rempe paille" structures which are being promoted through the extensionists. In some cases, this practice is increasing soil loss from slopes, as loose earth is thrown upon the dried strips of vegetation and easily washed away with the first rains.

Extensionists must clearly permit farmers the freedom of not planting leucaena as a hedgerow on these modified "rempe paille", should they not want this. In many cases, this is what is used simply because the leucaena seed is available, and other material not sufficiently available (eg. sugarcane or pineapple). Extensionists might also consider something like "bois d'orme" (use: forage, and making of chairs).

The major point to make is that what is really appropriate to extend for vegetative barriers for farmers on these hillsides is really not known. Therefore approaching such activity as a form of extension is not appropriate. PADF, with SECID technical leadership and assistance, must initiate the appropriate applied, on-farm research to test different options under farmer management conditions (not researcher management). The survey team has provided SECID and PADF a recommendation of the kind of trial

unifying theme which might be appropriate - based on high value crops farmers already cultivate but requiring spatial re-arrangement of their placement and density in the field.

PADF might consider establishing some sort of local competition, with public awarding of prizes (animal, food, cash, farm implement, etc.), to farmers who, over the past year, have been able to establish significant vegetative barriers and/or rock terrace structures on their own fields. Awards would go to those who have been the most innovative in this regard, who have used their own resources to perform the work, and who can show some objective evidence of benefits of this effort. Farmers wishing to compete may wish program technicians to measure pre-existing situations on a site before work is initiated.

### 5.6 Demonstration Plots

For vegetative barriers to be sustainable, it would appear that farmers must have the following:

- they need to clearly see the economic benefit of the vegetative material growing on their field - either in terms of food to themselves or animals, or as a cash crop.
- must be based on something they already use or know how to manage.
- must be seen to have a high value in relation to the other crops which farmer will be growing between the vegetative barriers.
- must permit development of a true vegetative barrier, and not simply a hedgerow, by which we mean one simple row of a crop, like leucaena or gliricidia, across a contour. We would go so far as to question the usefulness at all of the simple hedgerow on significant slopes.<sup>49</sup>

PADF will need to establish demonstration plots, under farmer management, to validate themes they wish to extend. The principals outlined above may be useful in considering how to set these up.

### 5.7 Credit

In speaking to farmers about their priority needs, one quickly realizes that the PLUS project, as it is currently organized, can not possibly respond to the full range of actions needed to give their current activities the greatest likelihood of success. One

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<sup>49</sup> All cases of leucaena and gliricidia viewed across Haiti, whether promoted by CARE or PADF, or some other project, were planted as a row of seeds down one furrow, with the spacing of these furrows up or down the slope being more a function of the extensionists judgment than any real science. The fact that there appears to be "soil retention" because of these rows seems to be more the result of farmers digging below the rows (eventually resulting in leucaena hedgerow being 'higher up' than the level of the field immediately below), and not due to any particular soil that these rows have "held" in place, or retained.

speaks of farming systems because they are systems, not just one element that can be attacked, thinking we have therefore solved the problem. In many ways, PLUS project activities are too narrowly focused in the field, with many activities executed separately. The survey team recommends that key activities be identified and that program resources and monitoring, etc. focus around the various components necessary to permit these activities to succeed - what we call establishing unifying themes.

Some of the most promising and profitable activities which farmers could undertake in all three areas visited require some form of financial assistance or credit. Such activities include developing yam and potato cultivation, animal fattening, animal production (particularly pig raising). A credit fund would permit farmers to regain some of the working capital lost during the past years, where the embargo has had direct impact on the most poor. A credit program would help these farmers also escape the usurious forms of credit currently found in these areas (+200%). The survey team is not certain that the PLUS program can help directly with this issue, but its resolution will certainly affect the program's ability to succeed in other efforts.<sup>50</sup>

## 5.8 Animal production

At Palmiste Avin, it should be possible to introduce the cultivation of grasses (like elephant grass [Pennisetum purpureum]) as part of vegetative barriers on hillside fields. This is because animal forage is becoming increasingly difficult to find. Some farmers already have the habit of cultivating such grasses on some of their fields during fallow periods, and using it specifically for the dry season in February - March or July, when forage can be scarce to find. It will be necessary to show farmers how to better manage such grass with regular cutting in order to have more production in a year. Other plants, like plantain and banana might also be associated with such grasses within these barriers in order to increase the interest of these farmers in maintaining these barriers.

At Berry and Tilier-Mondésir, feed availability for pigs is a particular problem for farmers. At Tilier-Mondésir, farmers told us that pigs represent their best opportunities in animal production. They have to buy cereal bran for their pigs mainly during lactation of the sows and for fattening pigs for the market. There are also management techniques which could be taught which could increase productivity of these animals as well. Farmers need

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<sup>50</sup> Farmers cut trees for charcoal because of need for quick capital - an action with many system repercussions. Because of capital needs, farmers often grow short cycle crops (beans, peanuts, even cereals) in areas they would not otherwise do so, even though these same areas could support the establishment of long cycle crops (fruit trees, plantain, banana).

to separate piglets from their mother at two months at the latest. They also need to be shown how to better select the timing of breeding sows to coincide with household feed availability. To achieve better results in fattening pigs, farmers might be shown how to mix several feed sources together, at the same time, in order to provide a better balance of nutrients. Farmers might also be shown that pigs should be fattened and sold at one year of age, and that increasing age and fat of the pig increases maintenance cost of these animals. Increased pig populations are seen by the survey team as a positive development within hillside communities. The presence of these animals stimulates increased interest among farmers in fruit tree crops on hillsides, and reduces interest in cutting down large fruit trees for firewood. Support to increasing pig populations, particularly where they are rare, as in Berry and Palmiste Avin, will provide complementary support to PADF efforts in including fruit trees as elements of hillside vegetative barriers.

At Berry, because of current year around feed supply constraints, there is less possibility for farmers to realize the profits of those farmers who can raise their pigs to adulthood and the market. As a result, support might in the short term be given to current efforts in raising piglets for sale to farmers in the valley below, as at Tilier/Mondésir, where farmers extensively purchase piglets and raise them to maturity. Berry farmers might also be encouraged to fatten their pigs through establishing share ownership relationships with farmers in the valley who have fruit availability.

## 5.9 Land Rehabilitation

As the name Productive Land Use Systems implies, the program team needs to be concerned with the use of the various different types of land available to farmers. We have already pointed out, for instance, that farmers have fields located in many different watersheds, at various elevations, close to and far from the homestead. It is also important to view land uses on various types of land as related components of the farming systems of the farmers concerned. This has important policy implications for the PLUS project.

Farmer experience at Palmiste Avin, of bringing very poor land back into high production, is proof that tree crops and multi-story gardens will do well on even low potential land provided that efforts are made to create contour canals to harvest run-off water, trap topsoil, reduce erosion, and plant long cycle tree and high value crops. The survey team recommends that PADF support this process, even to the extent of providing limited funding to the cost of meals of bringing people together to do such work, if this will make the difference. Because of the intensive labor involved, and the poverty of the farmers on such land, some assistance of

this kind will probably be necessary.<sup>51</sup> Perhaps one reason why the farmer experience cited at Palmiste Avin was so successful was because he was improving land upon which he intended to create a household garden, near his home, under his family's constant watch. PADF efforts in this regard, should they be attempted, should pay particular attention to where these 'to-be-improved' fields are located, and the farmer's ability to provide the care needed for its long-term rehabilitation. Fields located miles from farmer residence, or fields often share-cropped or rented, or fields where land tenure rights are unclear, are poor candidates for intensive (and expensive) improvement.

Livestock probably are the most important product of many of the low fertility, low crop production potential, lands of the region. Farmers frequently express interest in obtaining forage crops for their livestock - a problem during certain times of the year. In the past, they have planted guinea grass. Remnant plants of *Stylosanthes*, a forage legume sometimes referred to as tropical alfalfa, was observed on several farms at Palmiste Avin. Planting of *leucaena* and forage grasses in feed parcels and as erosion control structures would be of tremendous economic benefit to farmers, while contributing to the rehabilitating of these slopes. It is important to find the appropriate means of integrating such material into the farming system of farmers in a more widespread way, possibly as one component of vegetative barriers on hillside fields.

It is very possible that a more visible impact would be had by rehabilitating the "terres sec" dry (poorer) lands of Palmiste Avin, for example, than by interventions placed on the better soils, simply because the latter soils are already reasonably fertile and are managed fairly well by farmers through their contour ridging. In regions where contour ridging is not extensively practiced, efforts should be made to determine if there are any technical reasons why this should not be done (eg. soils too sandy/gravelly), and if not, seek to help farmers find the motivation needed to do so, perhaps through more high value crops. Berry farmers might be encouraged to practice contour ridging on their more valuable fields - such as those where they are cultivating their cabbage. A portfolio of strategies should be developed to address the problems on each category of soils. On more productive soil classes, emphasis should be on increased yields of contour row crops (on ridges if possible) through soil and water conservation practices - and using some form of vegetative barrier to prevent soil/water loss. Introduction of better crop varieties and crop protection should be a secondary component contributing to higher yields. On the poorer soil

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<sup>51</sup> We do not consider this to be the same as a project "paying" people, by the day or by linear meter, to do such work. If directed through the local work group structure, or 'escouad', of 5-6 men, then helping the farmer provide a meal during the days when this kind of work is being done could represent the encouragement needed to perform such work.

classes, emphasis should be placed on land rehabilitation with contour canals combined with vegetative barriers (within, just above and below canals), followed by introduction of fruit trees, forages, and multi-purpose trees on these developing vegetative barriers. Erection of gully plugs in the lower class lands will also open more land to higher value crops. The objective would be to raise land values through greater productivity. All farmers want this! The unifying elements on all lands will be soil and water conservation through erosion control and soil fertility enhancement and by improved crop cover.

#### 5.10 A Unifying Theme for PADF Watersheds in Jacmel Region 2

The following theme recommendation (Table 18) for on-farm farmer managed applied research and demonstration work, led by SECID, with PADF field support, has also been made for the PADF Mirebalais and Cape Haitian regions, where the survey team believes they will be equally valid and effective. Some minor modifications have been made based on crop preferences of farmers in this region and based on different field management practices. We call this a "unifying theme" because it is essential that a number of related components be addressed at the same time if overall success and sustainability of the efforts is to be realized. It also provides a framework within which a number of PADF activities can be inter-linked toward a common goal, understood by farmers and researchers/extensionists alike.

Appendix # 2 provides a step by step indication of how PADF/SECID might initiate this activity in this Region. We believe this should be initiated this September, 1993, and that both the motivation of PADF field workers, SECID staff, and farmers will be supportive to the process.

The following on-farm trials, and related component activities, should be initiated in Palmiste Avin, Berry, and Tilier/Mondésir - representing a total of some 60 trials. We do not believe 20 per watershed area to be excessive because most of the work will be done by the farmer - with periodic monitoring by SECID or PADF trained technicians. These are farmer managed and executed trials, not researcher managed and executed ones (which would require more project effort than can be expected.

**TABLE 18: UNIFYING THEME: Plantain/Sugarcane as Principal Components**

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 Yam Some Fruit Trees Some Gliricidia Some Coconut Trees Some Other Trees</p>	Household Food Consumption	Produce from both vegetative barriers and space between them reserved for most important food crops.	Establish at least 20 on-farm, farmer managed, research/ demonstration trials with this unifying theme. Assist other farmers in area to establish these, if interested.
	Soil Conservation	Increased vegetative cover of hillside fields, reduced soil erosion, increased water infiltration, increased productivity of hillside fields.	Establish "rempe paille" along contour, using living stakes of preferably Gliricidia, limited leucaena, creating small soil ridges. In Palmiste Avin, superimpose trial by selecting contour ridges at appropriate distances upon which to create veg.barriers. Establish vegetative barriers along these ridges, using plantain, banana, sugarcane, pineapple, sorghum.
	Agroforestry	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), cashew, and other tree species to include scattered along the vegetative barriers. Create a wind break of fast growing trees along at least one windward side of field (Palmiste).
	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 unless on short lines at center, between barriers, during short fallow.
	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.
	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 means of using cashew nut and fruit more effectively; consider associating hillside plantain crops with varieties for flour processing; consider assistance in establishing cassava processing cooperatives for manioc grown between barriers.

<p><b>Project Information Needs for Monitoring and Evaluation</b></p>	<p>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.</p>	<p>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. Management of household animals.</p>
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**APPENDIX 1: CROP ASSOCIATION AND FREQUENCY (PALMISTE AVIN)  
(24 Fields)**

ASSOCIATIONS	FREQUENCY
sweet potato	3
pigeon pea, manioc	1
bean, corn	1
pigeon pea, sorghum	2
bean, corn, pigeon pea	2
bean, corn, manioc, sweet potato	1
bean, corn, banana	1
bean, corn, peanut	1
bean, corn, cowpea, sorghum	1
bean, corn, cowpea, pigeon pea, sorghum	1
corn, cowpea, manioc, sw.potato	1
corn, cowpea, pigeon pea, manioc	1
peanut	1
corn, bean, plantain	3
corn, manioc	1
corn, bean, plantain, pigeon pea, yam, banana	2
corn, sorghum, pigeon pea, plantain	1
cowpea	1

**CROP ASSOCIATION AND FREQUENCY (BERRY)  
(46 Fields)**

ASSOCIATIONS	FREQUENCY
corn, depal, pigeon pea, sugarcane	1
corn, depal, yam, sugarcane, banana/plantain	1
banana, sugarcane, sweet potato, papabon, yam	1
corn, pigeon pea, depal, yam	1
corn, sweet potato, pigeon pea, depal, yam	1
corn, niko bean, squash, pigeon pea, depal	1
corn, sweet potato, depal, papabon, sugarcane, plantain/banana	1
corn, sweet potato, papabon, depal	1
corn, depal, yam	1

corn, sweet potato, depal	1
corn, pigeon pea, manioc	1
bean, corn, pigeon pea	1
corn, depal	1
plantain/banana, papabon	1
corn, depal	3
corn, pigeon pea	1
corn, pigeon pea, sweet potato	2
bean, sweet potato	2
sweet potato	2
corn, sweet potato	3
bean, corn	8
bean	2
mazoubel	1
corn	9

**CROP ASSOCIATION AND FREQUENCY (TILYE MONDESIR)**  
(33 Fields)

ASSOCIATIONS	FREQUENCY
bean, corn, pigeon pea, sorghum	1
bean, corn, manioc, sorghum	1
bean, corn, pigeon pea, sorghum, banana <sup>52</sup>	1
bean, corn, pigeon pea, sorghum, banana	1
bean, corn, pigeon pea, sorghum, sweet potato	1
bean, corn, sorghum	2
corn, sorghum, banana	2
bean, corn, pigeon pea, sorghum, manioc	1
bean, corn, pigeon pea, sorghum, sweet potato	1
bean, corn, pigeon pea, manioc	1
bean, corn, banana, grass	1
bean, corn, cowpea, manioc	1
bean, corn, cowpea	1
bean, corn, sorghum, manioc, banana	3

<sup>52</sup> Where ever "banana" appear, read this as meaning either plantain or banana - as both appear in all the same fields.

corn, pigeon pea, sorghum	1
sugarcane, sweet potato, banana	1
banana, yam, malanga	1
banana, yam	4
corn, pigeon pea, manioc, sorghum	3
banana, sugarcane	1
sorghum, sugarcane	1
pigeon pea, banana	1
coffee, pigeon pea, banana	1
pigeon pea	1

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

### 1.0 A Unifying Theme

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

to farmers in the areas concerned<sup>53</sup>. We believe the basic outline of the following trial can be used in each of the three micro-watershed areas of three of the PADF regions visited (Cape Haitian, Mirebelais, Jacmel).

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

## **2.0 Time Frame**

This trial should begin to be initiated during the month of August/September 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

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<sup>53</sup> And which, under current program implementation, are not being approached in any systematic, unified approach.

field activity<sup>54</sup>. 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 size<sup>55</sup>. The fields should preferably be outright owned by the farmer, or, if sharecropped, with a clear agreement between sharecropper and owner about the type of crops to be placed on the field, if rented, likewise a clear agreement on number of years the renter has access to this field (at least 3-4 years).

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

Extensionists and program technicians should visit these fields to verify their size and appropriateness before going into any details with the concerned farmer. These fields may very well have benefited 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. It is particularly that they be willing to provide information on the off-take and use of all products from this particular field (amounts, use for household and animal consumption and sale, etc.). The farmer will be willing to rearrange the crop placement (ie. plantain) of part of his field (actually doing this is part of what is being tested), along recommendations from the program technicians, as a applied research trial. The farmer must be willing to use his own plant material, to extent that it is available, to put on this field trial. If not

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<sup>54</sup> 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.

<sup>55</sup> 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.

available, the project will furnish the material<sup>56</sup>. 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 m<sup>2</sup><sup>57</sup> with the right side of the field used as the control treatment. However, it is important that the vegetative barriers start at the top of the field and extend to the bottom<sup>58</sup>. 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 trial<sup>59</sup>. However, if modified "rempe paille" or just "rempe paille" already exist, or rock terraces, this is acceptable. If they do not exist, they will not be purposely created for this trial. In those fields where farmers have created contour ridges, as part of their traditional activities (eg. Palmiste Avin), these ridges will be important for this trial.

(3) Unless already done (ie. 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.<sup>60</sup> We would encourage use of "bois repousse" stakes (stakes which will take root) exclusively

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<sup>56</sup> 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.

<sup>57</sup> 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 m<sup>2</sup>). We would estimate, for this, a minimum of 30 plantain plants and the cane to go between them.

<sup>58</sup> If in some cases this would make the trial area too large, then start at the top and move down.

<sup>59</sup> It may be used for a trail where the effects of leucaena on soil conservation are being tested.

<sup>60</sup> 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.

for such stakes, using preferably gliricidia or manioc. This activity will not be necessary where contour ridges already exist upon the field.

(4) The farmer will now be asked to plant one plantain every two meters across the trial plot area, following the line delineated by the stakes or existing "rempe paille", with at least 6 meters between what will become eventually vegetative barriers<sup>61</sup>. Where contour ridges already exist, the plantain will be planted along the up-hill side of the appropriate ridges, spaced as appropriate down the field.<sup>62</sup> 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 rows<sup>63</sup>. The larger, already existing, plantain plants will eventually produce their crop and be cut down. The clump should be destroyed over a 6-9 month period, leaving the entire area between vegetative bands for cultivation of whatever the farmer wants (corn, sorghum, sweet potato, taro, pigeon pea, etc.). Because plantain, on hillside fields, is often left in such fields for as long as 7-10 years, and longer, this crop can potentially provide a long lasting barrier against soil loss, assisting in the continuing productivity within this field, a goal as important as increasing productivity on such land, which is also expected to take place where soil accumulation takes place<sup>64</sup>. In those cases where the farmer has left clumps of

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<sup>61</sup> 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.

<sup>62</sup> The farmer must understand that these particular ridges must not be broken down during future land preparation of the field - though he can do as he wishes with other ridges between these vegetative barrier sites.

<sup>63</sup> 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.

<sup>64</sup> 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.

forage grasses in this field, these clumps should also be moved to become part of one or more of the vegetative barriers of this field - spaced as the farmer desires.

(5) Following the planting of the plantain, sugarcane should be planted along the same row (if not already planted into a modified "rempe paille" by earlier project efforts), so that a solid line of cane will develop between the plantain plants. Preferably, two closely spaced rows should be planted. Clumps of forage grass could be placed at different locations as well.

(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, coco or royal palm tree seedlings, etc.) at whatever interval he wishes along this same row between the young plantain plants.

(7) Farmer should, from the very beginning, be encouraged to begin to place dead vegetative material on the up-hill side of the plantain and (soon to develop) sugarcane rows. Both the plantain and sugarcane (and forage grass) will in the months ahead grow into clumps, spreading out and forming, not a row but meter-wide or more vegetative barriers. The dead vegetative material placed on the up-hill side will become more abundant as the plantain become bigger, are eventually cut (and laid along side the strip), as cane, sorghum and corn stalks are harvested, etc. This dried vegetative material will be the material, held in place by the living 'stakes' of plantain, sugarcane (castor bean), fruit trees, etc., which 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. In time farmers will be creating vegetative bands across their fields which in some respects will resemble their household garden fields.

(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 plant materials, if possible, and if farmer really wants it, provide disease resistant plant material as possible (ie. 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. Judging from the density of plantain/banana and fruit trees on many steep cultivated slopes visited, we do not believe shading of cereal crops between vegetative barriers will pose a problem - but this will need to be monitored through good yield data for all crops coming from these fields - over time. These costs, however, will be worthwhile, if the ultimate result is a field cropping system which will at the same time produce high value crops and provide the barriers needed to reduce soil erosion and increase water infiltration into the hillside soils.

(11) Finally, it must be recognized that the biological systems on these fields are dynamic ones and that farmers are going to, at one point or another, want to remove this barrier<sup>65</sup>. From the very beginning, farmers must be encouraged to be thinking about moving this vegetative barrier half way up or down their field, and using the years of accumulated organic material of the newly built terrace area for production of corn, beans, manioc, sorghum, pigeon pea.

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<sup>65</sup> If the barrier were uniquely sugarcane, this would be necessary after 6-7 years to maintain any kind of production capacity. While less essential perhaps for the plantain (Vincent), such movement permits other crops to take advantage of the increased fertility of these soils - while permitting other areas of the field to, in their turn, also be upgraded.

**APPENDIX 3: PHOTOGRAPHIC OVERVIEW OF REGION 2 SITES VISITED**



1A: Palmiste Avin/Jacmel. July. The mountain slopes of this region are intensively cultivated. In the foreground, above, can be seen contour ditches, with contour ridges between them planted with peanuts.



1B. Palmiste Avin. Traditional ridges, like these, are prepared for planting virtually all crops - and are fairly effective in reducing soil erosion.

1C. Palmiste Avin. Close-up of contour ridges, with two rows of peanuts planted along the top. Similar ridges may provide the structure upon which future vegetative barriers may be created.



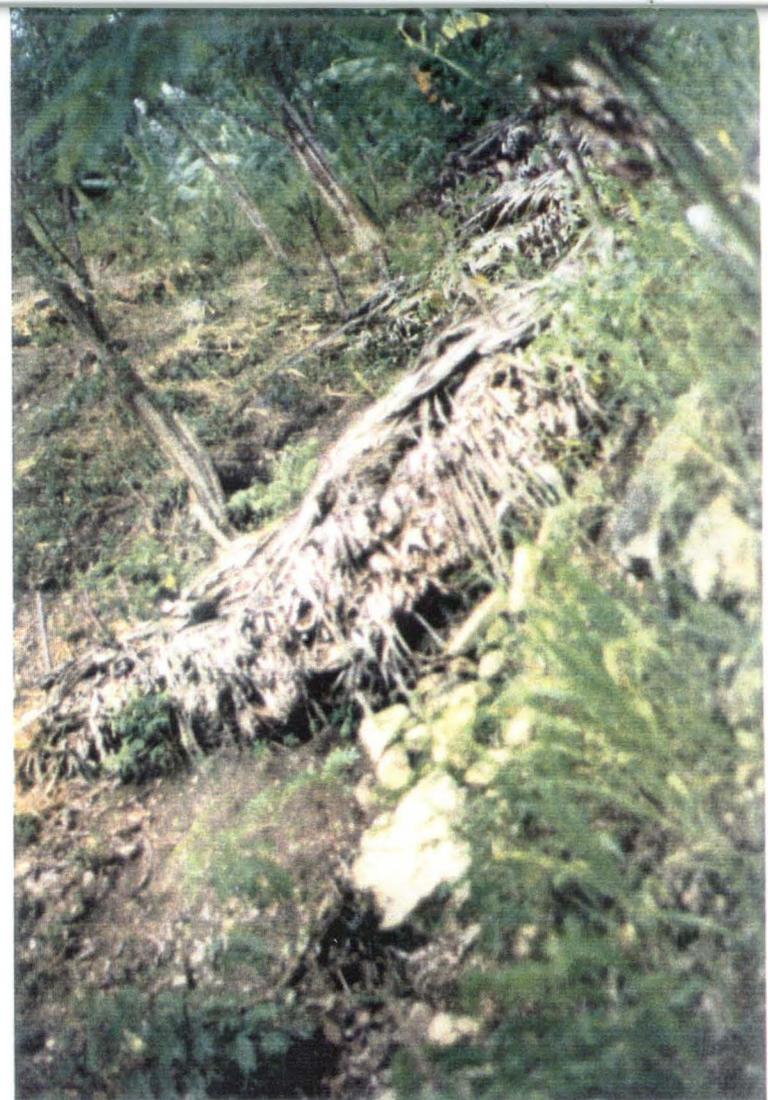
2A. Palmiste Avin. Peanuts along contour ridges.

2B. Palmiste Avin. Interviewing in farmer field.

2C. Palmiste Avin. Panoramic view of part of micro-watershed. Boundaries of individual fields are clearly evident, as are extensive nature of contour ridging practiced. Crops are peanuts, beans, sweet potato, manioc.



3A: Palmiste Avin/Jacmel. July. Plantain are common on many of the steep slopes. In this field, located near a homestead, it was associated with corn, sweet potato, and beans, with contour ridges running through the field.



3B. Palmiste Avin. July. Leucaena has been established as a hedgerow on a number of fields in the watershed - here shown with sweet potato. This farmer claimed he did cut the leucaena to incorporate it into soil.

3C. Tilier/MonDésir. Dead vegetative material was used to create this barrier along a ravine. These quickly fill up with soil, even with the top, into which farmers plant banana and plantain.



4A: Tilier/MonDésir, July. This PADF zone is located in the hills found between the two mountain ridges seen above (to left). The top of the ridge in the foreground contains part of the Berry site. Peredo is located in the valley below.



4B. Berry. View on the upper portion of the Berry plateau. This drops off sharply to the right into a valley leading to Marigot. To the left there is a shallow depression forming the plateau area of Berry. The mountain rises sharply in the foreground, above plantain and corn seen.

4C. Tilier/MonDésir. Sugarcane is being planted as a strip crop in place of leucaena in some fields here. This field also contained a number of plantain. Sorghum and sweet potato were also in this field.

# Haiti Productive Land Use Systems Project

South-East Consortium for International Development

and

Auburn University

## SECID/Auburn PLUS Reports

Report  
No.

1. *Status of Seed Orchards and Tree Improvement Trials in Haiti and Plan of Activities 1993-1994.* by Joel C. Timyan. 1993. 72 pp.
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#### PLUS Special Report

*Intervention Success Stories: Productive Land Use Systems Project.* by J.D. (Zach) Lea, Roosevelt Saint-Dic and Frank Brockman. 1993. 39 pp.

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16. *Soil Profile Description for Selected Sites in Haiti.* by Richard L. Guthrie, Pierre M. Rosseau, Gene A. Hunter and Marie-Paule Enilorac. 1990. 72 pp.
- 17.<sup>1</sup> *Assessment of Hedgerow Performances in the Haitian Context.* by Pierre M. Rosseau, Arthur G. Hunter and Marie-Paule Enilorac. 1990. 41 pp.
- 18.<sup>1</sup> *Results of a Survey of Farmers in Selected CARE and PADF Intervention Areas.* By Marie-Paule Enilorac and Pierre M. Rosseau. 1990.
19. *Biological, Physical and Environmental Factors Affecting the Health of Trees Important to Haiti.* by G. Brett Runion and Walter D. Kelley. 1990. 101 pp.

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<sup>1</sup>Limited distribution only.

20. *Storage Conditions and Pre-Germination Methods for Seed of Selected Tropical Tree Species.* by Joel C. Timyan. 1990. 23 pp.
21. *Factors Affecting Seedling Mortality in Haitian Agroforestry.* by Harry Elver. 1990. 36 pp.
22. *Agroforestry Research in Haiti: An Overview.* by Paul D. Starr, Donald R. Street, R. Kent Reid and Fritz Vaval. Contains 4 papers: The Social Foundations on Haiti Agroforestry; The Economics of Haiti Agroforestry; Forest Tree Nurseries in Haiti; and The Genetic Conservation of Native Tree Species. 1990.
23. *A Geographical Information System (GIS) Approach to Locating Potential Planting Sites for Catalpa longissima Species (Chêne) in Haiti.* by Fritz Vaval and Douglas C. Brown. 1990. 37 pp.
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