

PRODUCTIVE LAND USE SYSTEMS  
HAITI

SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

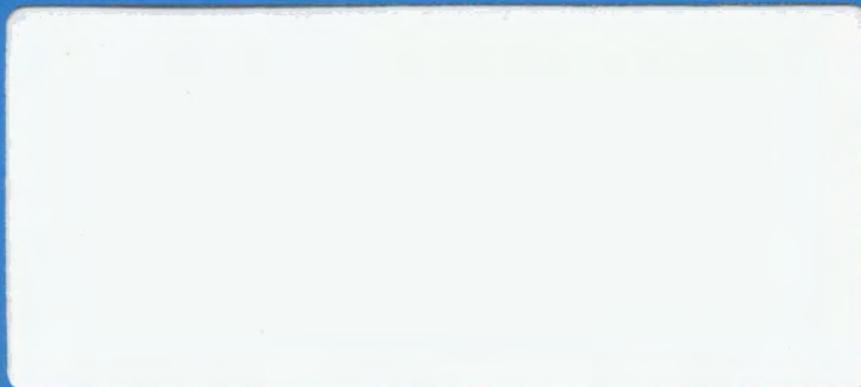
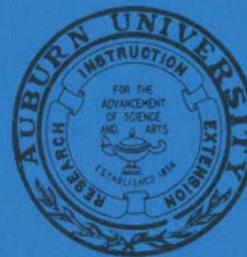
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SECID



**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 LES CAYES REGION 1**

**by**

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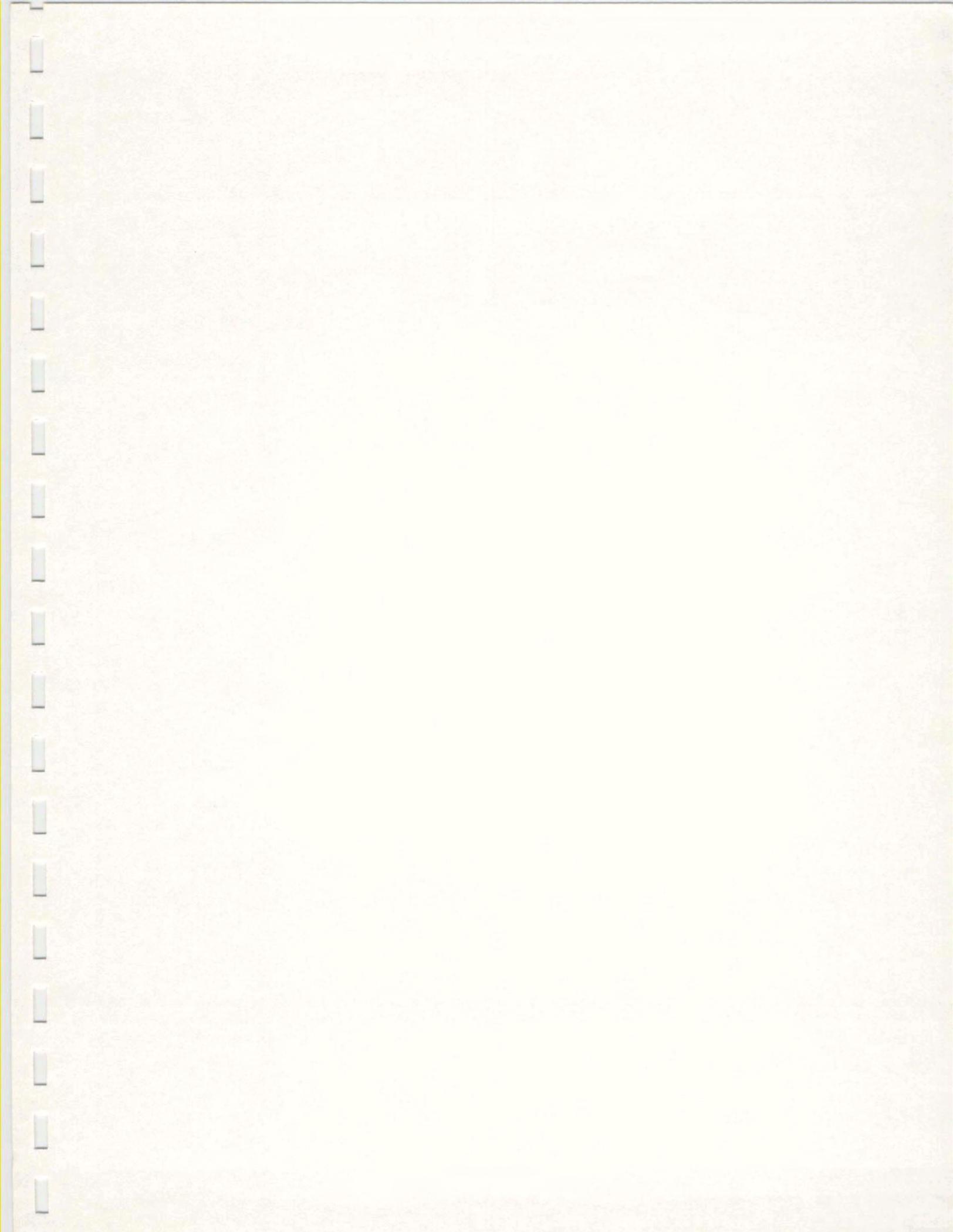
**SECID/Auburn PLUS Report No. 13**

**August 17-27, 1993**

**Gaita/Vachon**

**Picot/Raymond**

**Banatte**



## FORWARD

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

This survey was part of the on-going effort by SECID/Auburn University and its partners in PLUS, PADF and CARE, to implement a Monitoring and Evaluation System which orients the project towards activities that will bring about sustainable increases in farmer income and crop production, while conserving natural resources. As part of this effort, this survey provides baseline information on farming systems in three watersheds in the Les Cayes area of the Département du Sud, identifies constraints to production and opportunities for PLUS to achieve sustainable increases in production and farm income. The survey provides information on technologies promoted by PLUS as they are presently implemented in the survey areas. The authors have also elaborated a unifying theme for project interventions in this region.

This thought-provoking document represents an invaluable contribution to PLUS and our understanding of the farming systems in the survey areas and how they relate to interventions available to PLUS. It has raised issues to be addressed in our implementation program and widened our vision of socially acceptable ways to achieve sustainable increases in farmer income and improved conservation of the environment.

Because this report represents only one part of Dr. Swanson's job assignment, an executive summary was not included in this report. The executive summary is published as a separate volume, SECID/Auburn PLUS Report No. 7, which summarizes and integrates the findings of five separate surveys. The present volume contains the detailed findings from surveys in three watersheds in PADF's region 1 near Les Cayes in Southern Haiti.

Dennis A. Shannon  
Campus Coordinator  
Auburn University

## ACKNOWLEDGEMENTS

The Farmer Needs Assessment Team wishes to thank PADF field staff in this region for their assistance in making this a very productive time for us. We were met in Les Cayes by PADF M/E program leader, Gardy Fleurentin, who also spent the first day in the field with us in Gaita/Vachon. This was very helpful in communicating with the field personnel what we were trying to accomplish during our visit, and to make arrangements for including field staff in the field teams for the survey. PADF staff with whom we met and worked were:

Jean Roosevelt Mesidor, PADF team leader for field activities around Camp Perrin (Region 1 Team Leader, Gaspard Brice, was not able to be in region during time of our visit).

Jean Pradel Charles, M/E Assistant Technician  
Jean Rameau Gaspard, Technician  
Perrier, Paul Monfrell, Assistant Forester  
Fanfan Etzer, Technician  
Isaac Cherestol, Technician  
Mille Regine Louis, Trainee with PADF from University of Quisqueya  
Mille Edith Valiere, Trainee with PADF from University of Quisqueya

We also wish to thank SECID/Auburn University's Dennis Shannon for assistance in editing the documents written and Dr. Tom Westing, Director of International Agricultural Programs at the University of Arkansas at Fayetteville, for his support to the Chief of Party while in the field and during document preparation phases.

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

The PLUS project already had planned the acquisition of other significant survey information and some of this work was already in progress. This SECID survey work was scheduled at a time when PADF was itself in the process of initiating its work in its newly selected M/E 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 Rivière du Nord)
June 14,15,16	PADF Cap Haitien Region #4, Site 3 (Dondon)
June 17-22	Write up of PADF Cap 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, Site 2
July 22, 23, 24	PADF Jacmel Zone #2, Site 3
July 25-31	Write-up of Region #2
Aug.2,3,4	PADF Mirebalais Region #3, Site 1
Aug.5,6,7	PADF Mirebalais Region #3, Site 2
Aug.9,10	PADF Mirebalais Region #3, Site 3
Aug. 11-16	Write-up of Region #3 Site Visits
Aug. 17	To Les Cayes
Aug. 18,19,20	PADF Les Cayes Region #1, Gaita/Vachon, Site 1
Aug. 21,23,24	PADF Les Cayes Region #1, Picot/Raymond Site 2
Aug. 25,26	PADF Les Cayes Region #1, Banatte, Site 3
Aug. 27	AID Debriefing (Will provide copies of first 4 <u>draft</u> reports and Questionnaire Format Document used in field as survey instrument)
Aug. 28	Swanson Departure
Aug. 30-Sept.10 <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 Condé, Agricultural Economist (1/6 - 23/6)  
William Gustave, Animal Production (1/6 - 4/8)  
Yves Jean, Agronomist (1/6 - 4/8)  
Roosevelt Saint-Dic, Agricultural Economist (24/6 - 4/8)

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

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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.

Farmer contact with the team was voluntary and an effort was made not to significantly disrupt on-going farmer activities. All questions were asked in a free-style conversational manner with farmers regarding the major information needs outlined below. It was important that answers be followed up (Why? When? Specifics?). Field observations were particularly important and considerable

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

### **0.3.2 Questionnaire Formats**

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

- (1) General guideline questions, with leading questions expected to direct conversations in the directions needed. Team members kept their own notes on the responses to the information obtained. Leading questions led to further questions, as greater detail was sought on specific issues. Here, the inter-disciplinary nature of the team was important to provide a more complete technical understanding of the information obtained.
- (2) Prepared Questionnaire/Table Formats. Here, specific information on specific cropping patterns, prices/yields, land & livestock management were prepared and were filled out for several farmers and fields in each area. Purpose: to provide more specific objective data to complement the more qualitative information obtained in the other question formats.

### **0.3.3 Persons/Groups Interviewed**

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

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

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

(3) Meet with as many other individual farmers, as possible, who have had past experience with soil conservation interventions on their fields. 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 areas of about 2 km<sup>2</sup>, within a total of 5 zones of Haiti (4 for PADF, 1 for CARE) for M/E purposes. The Farmer Needs Assessment team was given 3 days for each micro-watershed. When possible, the first two days were spent on the watershed with farmers, and the third day used for team/project discussion and initial write-up of field notes into a more legible form.

At each field site, the team initially met with 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 be 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	Gaita/Vachon	Picot/Raymond	Banatte
Department	Sud	Sud	Sud
Arrondissement	Les Cayes	Les Cayes	Les Cayes
Commune	Camp Perrin	Camp Perrin	Les Cayes
Section Communale	1 <sup>ière</sup> Section Communale	2 <sup>ième</sup> Section Communale	4 <sup>ième</sup> Sec. Communale
Resident Households	NA	142 households	182 households
Elevation (meters)	150 - 280	250-350	60-70
Rainfall (X) (mm)	2,320 <sup>2</sup>	3,736 <sup>3</sup>	1800 mm (est.)
Soil Characteristics	Calcareous, gravelly, loose brown soils	Light brown, calcareous, some clay	Light brown, calcareous, gravelly, loose soils
Erosion	Severe	Low	Severe
Depth	Shallow (10-20 cm.)	Shallow	Very shallow
Cultivated Slopes	most 30%-70%	20% - 40%	most 30% - 70%
Land tenure	52% directly owned; 30% sharecropped; 7% rented, 11% undivided family land <sup>4</sup>	cf. Gaita	cf. Gaita
Land value (.32ha, 1/4cx)	\$34-\$100-\$320 <sup>5</sup>	\$200-\$800-\$1,600 (near road)	\$140
Land rent (.32ha, 1/4 cx)	\$10-\$25, renting rare	NA	\$20-\$60
Pressure on Hillside Land	Extreme - for both cultivation and grazing	Moderate	Very high, for both cultivation and grazing
Daily Labor Rate	5-10 gourdes	7-8 gourdes	5-7 gourdes
Important Infrastructure in Area	Camp Perrin near by with electricity; schools, good road	Camp Perrin near by, Saut Mathurine hydro-electric plant, good road	Good road to Les Cayes
Key Sources of Income	Sorghum, Manioc	Manioc, Cattle	Manioc
Key Consumption	Corn, Beans, Sorghum,	Corn, Beans, Sorghum	Corn, Beans, Sorghum
Key Animals	Cattle, rabbits, sheep	Cattle	Cattle, sheep

<sup>2</sup> Source: Service Meteorologique d'Haiti, 1962. Camp Perrin is located about 1 mile from site.

<sup>3</sup> Rainfall figures come from Saut Mathurine, about 2 miles away.

<sup>4</sup> Source: ADS-II data from Les Cayes Maniche mountain area, about 10 miles from this site (Summary Report, 1988). However, our impression was that sharecropping was even more important than the 30% of such figures, perhaps at least 40% (cf. Table 16).

<sup>5</sup> Low-Medium-High value land, cf. Table 16.

## 1.1 Gaita/Vachon Area

Gaita/Vachon is located 18 miles from Les Cayes over a good road, and only a couple miles beyond Camp Perrin.<sup>6</sup> The watershed is about 5 minutes drive from Camp Perrin. Perhaps for this reason, it has been the target of many development activities through the years. The watershed opens up towards the north, giving western, eastern and northern facing slopes. The low mountains form part of the ring around the Les Cayes plain to the south and are intensively cultivated (cf. Photos 1A,2A,2B). These largely bare mountains form very discrete and clearly observable watershed units and present striking vistas from their summits. Several small, shallow lakes have been formed on the Les Cayes side, with a number of productive rice areas created as well (cf. Photo 2A). Many households are found up along the ridge lines, where the trees are found; everyone else lives down in the valley, near the stream which passes through the area. PADF has worked directly on soil conservation activities since March 1993, though it has had a long involvement in the area through the previous USAID financed Agroforestry II project (AFII). Unlike many other PADF sites visited in other parts of the country, the team was able to observe some older project efforts with hedgerows, particularly leucaena. Some of the best examples of the potential for leucaena in hedgerows are to be seen in this region. Farmers can be found who are quite positive about its merits for increasing soil fertility and as an animal forage - though all the same problems exist too for its adoption.

The Camp Perrin area is known in Haiti as a source of some of the best cassava bread. The reasons for this were quickly evident. Contour ridges created specifically for cultivation of manioc were everywhere on the hillside slopes of this area (cf. Photo 3B,4C). They certainly contribute to protection of the slopes when they are present. It was in Gaita also that we encountered an innovative farmer who had, on his own initiative, planted castor bean along with the leucaena hedgerow PADF had helped him to establish near his homestead (cf. Photo 1B). Castor beans, he said, were an important cash crop to him, something that he could also harvest and sell several times during one year. In the valleys at the base of these mountains, farmers frequently grow small plots of forage grasses (napier, elephant, guinea) for their cattle (cf. Photo 4A). Farmers also leave scattered clumps of grasses for their animals in many of their cultivated fields in these valleys. Unfortunately, such grasses have not yet been successfully established here into the hedgerows or vegetative barriers on hillside fields, though at St. Helène, nearby, this has been done with PADF assistance (cf. Photo 7B).

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<sup>6</sup> PADF had, in April 1993, conducted a training seminar in this region with its field staff on methods of rural appraisal. Vachon was one of the three areas included in this seminar, and some information for this area was available from the resulting report (PADF, Rejyon I, Cayes, Rapo Sondaj, April 1993).

Gaita was also the first area in Haiti known to the survey team where farmers appear to have adopted rabbit raising for their own consumption needs. This is unusual. Rabbit raising has been attempted in many parts of the country, and as long as the project could help farmers sell the animals to Port-au-Prince or Cape Haitien markets, farmers would continue to raise them. But the animals were generally considered too similar to rodents and not 'fit to eat' by the farmers themselves. Here in Gaita, rabbit hutches, roughly nailed or tied together, could be found on the homesteads of many farmers, raised up high above the ground in protection from the ever hunger dogs of the area (cf. Photo 3A).

The Gaita watershed area has known much greater productivity and lush vegetation in long years past, receiving regular and good rainfall. An example of this can be seen in Photo 3C in which a dense stand of plantain/banana, breadfruit, avocado upon a steep slope is located immediately beside an area which has been cleared for corn, sorghum, and manioc cultivation. This is a region of great differences in rainfall over a short distance. While Gaita probably receives somewhat less rainfall than the 53 year Camp Perrin average of 2,300 mm./year, only 10 miles away into the higher mountains Saut Mathurine receives a long term average of 3,736 mm./year! It is at Saut Mathurine, that a small hydro-electric plant has been established to provide electricity to Camp Perrin, and also to Les Cayes.<sup>7</sup>

## 1.2 Picot Area

The Picot micro-watershed area is located about 15 minutes drive from the PADF office in Camp Perrin. This micro-watershed area is the least needy of soil conservation work of any we have visited yet (cf. Photo 8A). Elevation varies between 250 - 310 meters, and rainfall received is high (>3000 mm./year). The area is densely wooded along most parts of a series of low parallel hills which run through the area, with few of the bare, steeply cultivated slopes so characteristic of the Gaita and Banatte areas visited in this region. It is also located about 2 kilometers from the hydro-electric dam of Saut Mathurine. Posts have been put up for the area to get electricity (along the road) and coils of wire still stand in compound of one farmer along road. But since the political turmoil re-initiated in Sept. 1990, the project has been suspended.

Like Gaita, this area has been the recipient of a great number of past projects, as well as current projects, besides PADF. DCCH

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<sup>7</sup> This electricity was the most constant and reliable found in all the regions visited by the survey team - no blackouts or periods of current cut-off. At a time when an international fuel embargo was causing serious power shortages everywhere, Camp Perrin enjoyed power all day and all night during our visit. The major regional center of Les Cayes, at this same time, frequently did not have electricity at night, and only part of the day.

has worked in the region for many years (since 1990). The Ministry of Agriculture with USAID (Projet Sauvé Terre) had a major public works program for soil conservation in the nearby mountain area (paid labor - 13.5 gourdes/day). People seem to have a dependence mentality, expecting to be paid for any labor involved in soil conservation. PADF currently works with about 106 households in this area, having formed some 5 groups of between 18-20 farmers each. PADF local and regional agronomists have established, as elsewhere, a month by month program of activities which extensionists and technicians are expected to be following.

For the past month, and this month (August), the activity is showing farmers how to create bio-intensive gardens (BIGs). We saw one group doing this.<sup>8</sup> In speaking with farmers about this activity, the survey team was told that many farmers had learned how to create BIGs from a past project, but using a different methodology. This project had in the recent past successfully introduced important vegetable cultivation. Much produce was sold in Camp Perrin, we were told. However, when the project ended in 1990, people stopped growing vegetables because the project had supplied all the seed, and farmers said they didn't know where to get more. PADF is again working with the same farmers and hopes to encourage farmers to obtain their own seed from Agri-supply in Les Cayes. Farmers in Picot seem to already know how to do most of the activities PADF is extending, such as BIGs, nurseries, soil conservation with rock walls or vegetative barriers, etc. However, they are not practicing them.

Most of the serious cultivation in this area seems to take place in the higher mountains above Saut Mathurine, outside the area in which the project works. During our visit, the team had difficulty finding farmers within the watershed site area during the day time as most were working in the mountains "planting beans". Furthermore, most of the land in this site seems to be owned by large landowners, with small farmers sharecropping or renting portions of land. A number of the manioc fields we visited were cultivated in this way, with farmers selling the standing crop to agents of people owning cassava processing operations in Camp Perrin.

Apart from the homesteads and their associated household gardens (mangos, plantain/banana, coconut, breadfruit, cocoa, etc.) there is very little else cultivated - with the exception of a number of manioc/sweet potato fields. The area is more of a

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<sup>8</sup> What PLUS/PADF calls BIGs here are somewhat different from what PLUS/CARE refers to as BIGs in the Northwest. In both, farmers will cover cut down branches with leaves and other organic matter with earth. This will be left to rot down for a few weeks before vegetables will be planted. CARE's gardens appeared to be more discrete units, with 3-4 bands about 2-3 meters long, 1 meter wide, constructed by the farmer him or herself. The PADF gardens being created in Picot were also located near a homestead, but were somewhat larger, were created by group activity, and were a series of parallel low ridges of covered branches/leaves into which would also be planted vegetables (cf. Photo 8B).

bedroom community for those living and working in the higher mountain areas. We were present during one very heavy rainfall one afternoon, and noted that little erosion was taking place as evidenced in the color of the run-off water in the streams.

### **1.3 Banatte Area**

This area strongly resembles the Gaita/Vachon watershed area and is located along the same rim of mountains/hills surrounding the Les Cayes plain, perhaps 6-7 miles away from Gaita. In this case, however the U shaped watershed area is very distinct and opens up towards the Les Cayes plains to the south, with east, west and southern facing slopes. The low mountains, largely bare of vegetation, are intensively cultivated. Below are small shallow lakes and fertile plains, with fine corn and some rice on the Les Cayes side of the mountains (cf. Photo 5A, 5B). Here too, farmers have been the focus of long term soil and agroforestry activities. Remnants of some of these activities can be seen, particularly the trees.

Like Gaita, the amount of manioc associated with sweet potato cultivated on ridges of the hillside slopes of Banatte is amazing and probably represents a successful cropping adaptation to farming in this region. The ridges certainly slow down soil/moisture loss from these fields, even after the tubers have been removed and a field left in fallow. These tubers, planted in association with corn and bean during the first part of the cycle, provide important ground cover. The cropping cycle itself can last as long as 2 years, sometimes longer. Soil conservation activities will need to build upon improving this system, perhaps by adding appropriate vegetative barriers in combination with these ridging activities.

PADF agronomists and extensionists have worked with farmers in this area for several years. Soil conservation efforts intensified in March 1993 as part of the PLUS program initiatives. Farmers in two communities have been helped by the project to form into 6 groups with about 20 members each. These groups were then helped to form into an association (Organisasyon Planté Banatte Fogé - OPBAF) through which PADF then channels its efforts (hiring extensionists, setting up meetings, etc.). Leaders of these groups are frequently the influential men of the community, live along the road and seem to have more than average land holdings.

### **1.4 Other Sites Visited in Area**

After finishing interviews in the Vachon area, two members of the team took a car and drove on down the road one evening for about one mile to an area in which one of our team members, Yves Jean, had worked many years ago. AFII had participated in the area with CARITAS (PVO) between 1988 and 1991, when project closed down

because of embargo. We drove up to the top of the ridge line over a very rough road. There, we were fortunate to meet several cooperative group leaders, and a former PADF extensionist who had been active in this area in years before. PADF is not actively engaged in this area at present, though it is within its range of activities for the region. We saw many young trees which had been planted through the efforts of the CARITAS program and supplied by PADF. There had been major soil conservation efforts leucaena hedgerows; patches of some of these were still evident in some areas. Other areas which had been completely covered, were today, three years later, as bare as before the project started. The local people said that this was the only land these farmers had and it was not possible to prevent animals being pastured on the fields when the crops were off, resulting in total loss of the hedgerows. People we spoke with were very receptive of continued efforts in this area. However, it was evident that past efforts have left little impact. One small spring which had gone dry was again producing some water. The trees immediately around the source of the spring were jealously guarded by the community. Higher up, though, above this spring, areas once protected with hedgerows of leucaena were once again bare, cultivated with some sorghum at the time of our visit.

#### **Fond-des Frères (Former ADS-II site)**

PADF is working in an area adjacent to the Fond-des-Frères site in an area called St. Helène, in collaboration with a PVO in this area (also found around Camp Perrin) called DCCH (a CARITAS supported community development organization). In the hills going up to the F-d-F watershed sites, we saw evidence of a lot of soil conservation work in progress (cf. Photo 7B), as well as the results of efforts of past years. What we saw in progress were small contour ditches into which were planted napier grass (and some guatemala); leucaena was also being used in some areas. This work extended up and overlapped into the areas in which ADS-II had worked. On one such field, DCCH extension agents had encouraged the farmer to dig a shallow ditch on the up-hill side of the still, mostly present, 6-7 year old leucaena hedgerow. The hedgerow had been repeatedly trimmed. Dirt from the ditch was thrown along the base where the leucaena were rooted, and into the top of the contour dirt ridge was planted cuttings of napier grass (cf. Photo 6B). The idea was to better protect the leucaena hedgerows which were breaking up from serious erosion coming down from between the rows of leucaena (slope of at least 70%). An interesting approach.

In the F-d-F area, were many vestiges of the project that had ended abruptly in 1987, when the US government terminated all foreign assistance to the government of Haiti. The soil conservation activities of ADS-II began in 1986 and extended through half of 1987. There remain many field with either complete or partial rows of leucaena, which have been clearly trimmed for animal feed (sheep and cattle), and directly grazed as well. In

other areas, the leucaena had completely disappeared.

In other areas, the cultivation practices (manioc and sweet potato, sorghum) on the very steep and highly erodible soils had led to extensive loss of the top soil, leaving ground rock surfaces exposed, or with lines of erosion down the slopes. In many such cases, the farmers have abandoned the fields to the leucaena. Small forests have developed in these areas (cf. Photo 7A). One farmer we spoke with told of the value of this land to him now for forage for his animals, for making a little charcoal each year!

The most visible impact of the project is the presence of a great many 20-30 foot tall trees with diameters of about 5 inches. These trees were about 6 years old. Many of these trees were spaced at 1.5 - 2 meter intervals along contour lines, with leucaena hedgerows between the trees (cf. Photo 6A). One farmer said he wanted the trees to become even thicker before he would harvest them for lumber (twice as thick)! Even though there was evidence of continued and serious erosion taking place, particularly through breaks in the leucaena hedgerows, it was also very obvious that the trees and leucaena, together, have prevented some soil loss. The farmer used the space on the up-hill side of each row of trees/leucaena to walk without great effort across his field - something one cannot do on any other part of the surface between these rows. This is made possible because of the raised soil terracing that has formed. While it is clear that additional protection must be given to this field, it is also evident that what is in place has been important and appreciated enough by farmers to keep and protect.

We asked three different farmers in the F-d-F area what they thought was the most valuable contribution of the ADS-II project to their area. The first in all three cases was the "bois" planted; bois blanc, bois capable, neem, cassia were mentioned. The bois blanc in particular were appreciated - tall, straight trees, with little shading and little competition to crops found in field below them. Farmers also mentioned the leucaena as a good thing for holding the soils and for feed for their animals.

One farmer said DCCH should not be planting napier grass in the contour ditches they were creating because it would not live longer than one year (ADS-II project had also planted this with little success). He said the soils are too shallow and that by the time the plant was about a year old it would die (could not support itself). Alternative grasses should be considered in these situations. When we asked why farmers were doing such planting in this case, he said "some projects plant trees, some plant grass" (in other words, this was what DCCH is extending through their extension agents in the area).

Lessons learned: future programs of this kind should pay particular attention in this kind of area (steep, calcareous,

shallow, gravelly, highly erodible soils) to planting trees (1.5 - 2 meters distance between) as a major part of the hedgerow, with the leucaena. Then 4-5 years later, there should be continued follow-up to encourage/help farmers to place new seedlings between the larger developing trees so that when harvest time comes the slopes are not once again completely bare (as will probably happen). These trees/leucaena hedgerows should also be better protected by planting other types of vegetation along the up-hill side of hill, creating a vegetative barrier (rather than just a row). Farmers should be encouraged to accumulate dead vegetative material (sorghum and pois congo stalks, etc.) along the up-hill side of slopes to create "rempe paille" capable of holding more soil/small rocks/stones in place.

Another lesson learned is that leucaena can indeed play an important role in areas like this one; but that they are not sufficient on their own to protect the hillsides. Considerable additional effort must be given to not only protecting the leucaena from total destruction by animals, but in increasing the economic value of the hedgerows. The leucaena hedgerow must be considered as only the first of a number of steps leading towards the creation of a multi-crop/species vegetative barrier. Table 29 in Appendix 3 is provided as a reference to some of the other options available for forage grasses and trees which provide forage for livestock which could be used, as appropriate, in such vegetative barriers.

## **2.0 General Description of the Farming System**

### **2.1 Crops**

#### **2.1.1 Principal and Secondary Crops**

The principal crops cultivated in all three watershed areas visited by the survey team are pigeon pea, corn, beans, sorghum and manioc. Secondary crops in both Gaeta/Vachon and Banatte include cowpeas, grass (elephant, guinea, napier), lima bean and sweet potato, while in Picot they are sweet potato, grass, and sugarcane. Farmers told us how important beans were as a cash crop cultivated in association with corn during the first planting season. These beans had already been harvested from the fields by the time of our visit (August), though some farmers in Picot were in process of planting beans in fields in the high mountains above Saut Mathurine. In the valleys and around homesteads, fields contained cover tree crops of plantain, banana, coffee, yams, coconut and royal palm, breadfruit, cocoa, and malanga.

Many hillside fields in both Gaeta and Banatte, particularly those close to homesteads, are planted with leeks. Some farmers indicated that leeks have been a "traditional" cultivated crop for farmers living along the ridge lines of these hills for a long time. Leeks are mainly planted and tended by women, and represent an important source of income for them. PADF in their efforts to improve vegetable gardening in the region might consider beginning with increasing productivity of leeks and related crops. Table 2, below, provides information on the crops the survey team observed in the fields visited in the three areas.

**TABLE 2: MOST OBSERVED CROPS IN FIELDS**

AREA	GAETA/VACHON	PICOT	BANATTE
CROP	NB OF FIELDS WHERE CROP WAS OBSERVED (among 40 seen)	NB OF FIELDS WHERE CROP WAS OBSERVED (among 46 seen)	NB OF FIELDS WHERE CROP WAS OBSERVED (among 37 seen)
corn	22	16	13
sorghum	23	7	10
manioc	11	26	13
sugar cane	0	2	1
banana	(9)	3 (9)	
coffee-tree	(9)	(9)	
malanga	(9)	(9)	
yam	(9)	(9)	
pigeon pea	22	27	15
sweet potato		7	5
bean	1 (10)	(10)	(10)
grass	3	4	1
cow pea	2		2
lima bean	3		8
leeks	(11)		(11)
rice		(12)	(12)

### 2.1.2 Crop Varieties and Preferences

Farmer discussions indicate that farmer preferences include:

- early maturing crop varieties
- crop varieties, especially pigeon pea, having a grouped harvest (not harvested over a period of time). Farmers want the crops off the field as quickly as possible because of the need for forage for animals.

<sup>9</sup> Plantain, banana, taro (malanga), coffee, breadfruit, coconut and royal palm, cocoa and yam were frequently observed under tree cover in some steep slopes, in gorges and in homestead (jardin la cour) fields.

<sup>10</sup> Beans are associated with corn and generally planted during the first season, beginning in February or March. A second period of planting can take place in August in the high mountains above Picot.

<sup>11</sup> In addition to the other fields seen, we visited 5 household gardens on top of hill ridge line where farmers are cultivating leeks. Such gardens frequently take up most of the household yard. One farmer we met had cultivated leeks since 1965.

<sup>12</sup> Rice is planted during the first season, associated with corn and beans. In Banatte it is cultivated on the plains at the foot of the mountains.

This argues strongly for grasses/leucaena as hedgerows for such farmers.

- crop varieties which can perform well under their cropping conditions.

Preferred crop varieties in the three areas are 'chicken corn' for corn, 'ti blanche', also called 'ti choucoune' for bitter manioc, black bean varieties for beans, 'crapeau' for pigeon pea, and the ORE's (Organization for Rehabilitation of the Environment) varieties for sweet potato. Table 3 below provides a listing of the common varieties farmers spoke to us of.

**TABLE 3A: CROP VARIETIES AND PREFERENCES (GAETA/VACHON)**

CROP	VARIETIES	ORIGIN	INTEREST
corn	chicken corn cornelie	Flat land local	early maturing and better yield less cultivated
sorghum	paré avan grand ané	local local	early maturing, less planted late maturing but preferred
pigeon pea	crapo sinistré ti novembre	local local local	preferred early maturing early maturing <sup>(13)</sup> late maturation, high production
manioc bitter  sweet <sup>(14)</sup>	ti blanche boulandrie matietas ti finfin	local local local local	preferred good yield less cultivated
bean	black red	local local	preferred, better selling less cultivated
malanga		local	cash crop
sweet potato	ti o cayes ti sinis neg sale viola crec coc	local Introduced " " " " " "	better yield good yield
bean	black red white suif	local local local local	cash crop
yam	bakala toro français pagnol guinin	local local local local local	preferred, seed available preferred, seed available seed unavailable seed unavailable

13 Fields are quickly cleared of crops for use for animals pasture.

14 Less cultivated.

banana	d'Haiti tonkin la reine	local local local	preferred cash crop
plantain	adelina franc toto miské	local local local local	preferred cash crop

**Table 3B: CROP VARIETIES AND PREFERENCES (PICOT)**

CROP	VARIETIES	ORIGIN	INTEREST
corn	chicken corn cornelie	local local	early maturing and better yield
sorghum	photosensitive	local	
plantain	franc poban	local local	cash crop
banana	tonkin d'Haiti	local local	rustic, more cultivated
manioc	sweet	local	less cultivated
	bitter ti choucoune boulandrie	else where local	rustic, more productive
sugarcane	zazin pelogi ananas toro	local local local local	zazin and pelogy are very good varieties but their seeds are not available
sweet potato	ka shown ti pestel zetoile ti palmiste	ORE local local local	"ka shown" is actually the most planted variety of sweet potato here
bean	black	local	cash crop
rice	tirezia	local	drought resistant
pigeon pea	lané tout le temps	local local	preferred no longer cultivated
yam	toro bakala guinin francé jaune	local local local local local	rustic Seeds of francé, guinin, and jaune are not available
malanga	kinston officie jamaïque wapintié	local local local local	cash crop sell better <sup>15)</sup> early maturing, seeds available

<sup>15</sup> used to make flour for baby feeding . Eat as Tomtom . Seeds are not very available.

**Table 3C: CROP VARIETIES AND PREFERENCES (BANATTE)**

CROP	VARIETIES	ORIGIN	INTEREST
corn	chicken corn	local	early maturing and better yield
sorghum	Ané Madan blanc non photosensitive	local local local	the most planted
plantain	franc poban	local local	cash crop
banana	tonkin d'Haiti	local local	rustic, more cultivated
manioc	sweet	local	less cultivated
	bitter ti choucoune boulandrie	introduced local	rustic, more productive
sweet potato	ka shown ti pestel zetoile ti palmiste	ORE local local local	"ka shown" is actually the most planted variety of sweet potato
bean	Sept semaine Thomazeau	local local	cash crop
rice	Boston Sica Ti jaune Madame Gougousse	local local local Artibonite	in this Area, rice is only cultivated in low land
pigeon pea	Crapeau ti graine	local local	preferred no longer cultivated
tobacco	pays	local	very cultivated
cowpea	black white pinte	local local local	better yield, cash crop
tomato	ti joceline kè bèf	imported local	preferred
lima bean	Ané Pois souche a tè	local local	preferred early maturing

### 2.1.3 Crop Associations

Common crop associations vary within each of the watershed areas visited. In both Picot and Banatte, rainfall had not yet been adequate enough this year to permit the sorghum planting which should have been well underway in August - so little sorghum was actually seen. Table 4, below, gives an indication of the most common crop associations in the three sites.

Cropping associations in the Les Cayes/Camp Perrin region are not as complex as those seen in some of the other areas visited by

the survey team. Crop associations observed in farmer's fields do not usually exceed more than 3 crops (Table 5). Given the generally short cropping cycles for most of the crops in these associations, hillside slopes are often exposed to erosion. The presence of manioc in many of these associations, combined with the common practice of planting manioc upon contour ridges, does help mitigate some of the soil loss one would expect with these associations.

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

AREA	CROP ASSOCIATIONS	GROWING CYCLE MONTHS	SLOPE (16)
GAETA-VACHON	corn, sorghum, pigeon pea	9-24	3-5
	pigeon pea, manioc	12-24	3-5
PICOT	corn, pigeon pea, manioc	12-24	2-4
	manioc, pigeon pea	12-24	3-4
BANATTE	corn, manioc, pigeon pea, lima bean	12-24	3-4

**TABLE 5: NUMBER OF CULTIVATED CROP IN ASSOCIATION AND NUMBER OF FIELDS**

CROP/POPULATION	GAETA/VACHON	PICOT	BANATTE
1	7	7	11
2	4	12	5
3	16 <sup>17</sup>	11	9
4	4	7	5
5	2		1
6			
Fallow	7	13	6
TOTAL	40	46	37

<sup>16</sup> We define slope into six classes: (1) Level: 0%-5%; (2) Gradual: 5%-20%; (3) Medium: 20%-40%; (4) Steep: 40%-60%; Very steep (5): 60%-80%; (6) extremely steep 80%-100%.

<sup>17</sup> How to read this table: Here, in Gaita, out of 40 fields observed, 16 had (or have had) 3 different crops associated within this field.

#### 2.1.4 Seed and Planting Material Sources

Gaïta/Vachon, Picot, and Banatte farmers have three principal sources from which to obtain seed for planting: their own stock, the market place, and other farmers. Most farmers use seed saved from the previous year for a new season's planting. When loss occurs for some reason, either through drought, excess rainfall, or storage damage (corn, beans, sorghum), farmers will usually then get seed from a neighborhood market. At Gaïta/Vachon farmers spoke of often needing to purchase seed from their local Madame Sara, though they usually had enough of their own pigeon pea. At Picot, farmers spoke of a large landholder who generally is considered the best source for beans, corn, and sorghum seeds, if needed. At Banatte, a Madame Sara also sells beans and sorghum seed of good quality. PADF, more recently, has also become an important source for improved seed of Tamazulapa black beans in the area.

### 2.2 Crop Management

#### 2.2.1 Land Preparation

Traditionally, land preparation in the three watershed, for crops such as corn, sorghum, pigeon pea, and bean, consists of a simple weeding followed by a burning before planting. Following the counsel of PADF's technicians, many farmers have stopped burning their fields. Farmers will create contour ridges for the cultivation of manioc and sweet potato. The use of contour "rempe paille" strips (dead vegetative material held on slope by stakes), a traditional hillside soil conservation practice seen in other areas of the country, is not widely practiced in this area. Efforts should probably be made to build upon the practice of planting manioc on contour ridges. This is the crop with the longest growing cycle within most associations. One way of modifying the cropping system to more effectively conserve soil and increase moisture infiltration might be to include hedgerows of leucaena combined with castor bean or trees (such as Simarouba glauca) between manioc ridges. Soil fertility would be increased as well if the leucaena can be incorporated into the soils.

Farmers frequently group into small labor squads to help each other with initial land preparation activities, as well as later weeding. Sometimes they sell their group's labor to other farmers.

#### 2.2.2 Cropping Calendars

Discussions with farmers showed only slight variation in cropping calendars between the three areas. Timing of operations also depend on the specific crop varieties being used. Table 6 below shows the number of times within one year which specific

crops are cultivated in this area. The two principal planting seasons here are:

March through April  
August through September

Manioc and sweet potato fields can be started at any time of the year, only requiring enough soil moisture for planting.

**Table 6: Number of Planting Seasons/Crop per Area Visited**

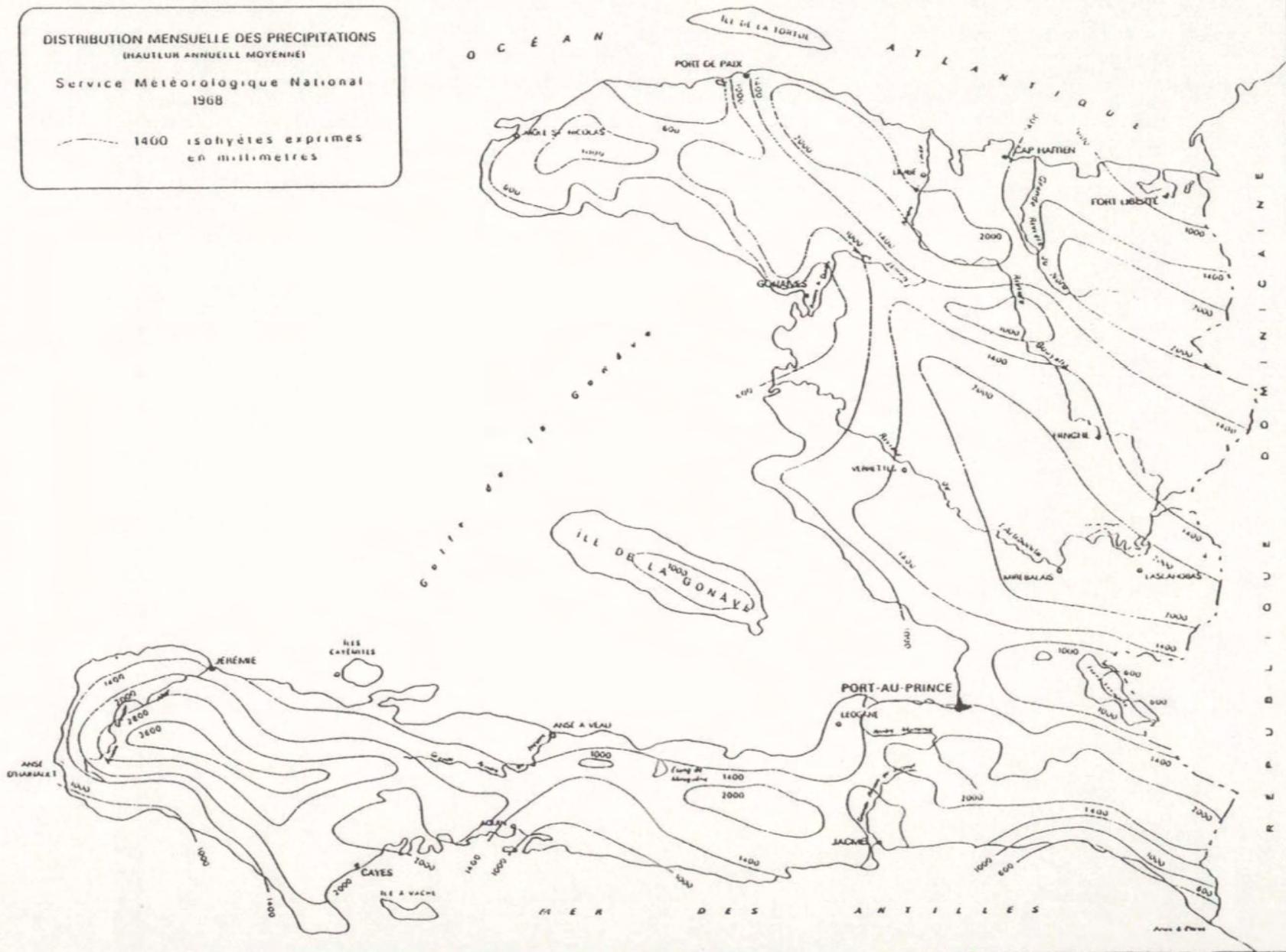
Crops/Areas	Gaeta/Vachon	Picot	Banatte
corn	1	1	2
sorghum	1	1	1
pigeon pea	1	1	1
Bean	2	2	1
Сompea	1	1	1

Tables 7A, 7B, and 7C provide the cropping calendars given to us through our discussions with various farmers. Figures 1 & 2 also provide rainfall information with which to compare planting sequences. The closest rainfall data we could find comes from Camp Perrin, located within only a few miles of both Gaeta/Vachon and Picot. Rainfall in Picot would be expected to be higher than in Camp Perrin (being nearer Saut Mathurine) while that in Banatte would be expected to be several hundred mm. less per year than at Camp Perrin. We have estimated 1800 mm (cf. Table 1).

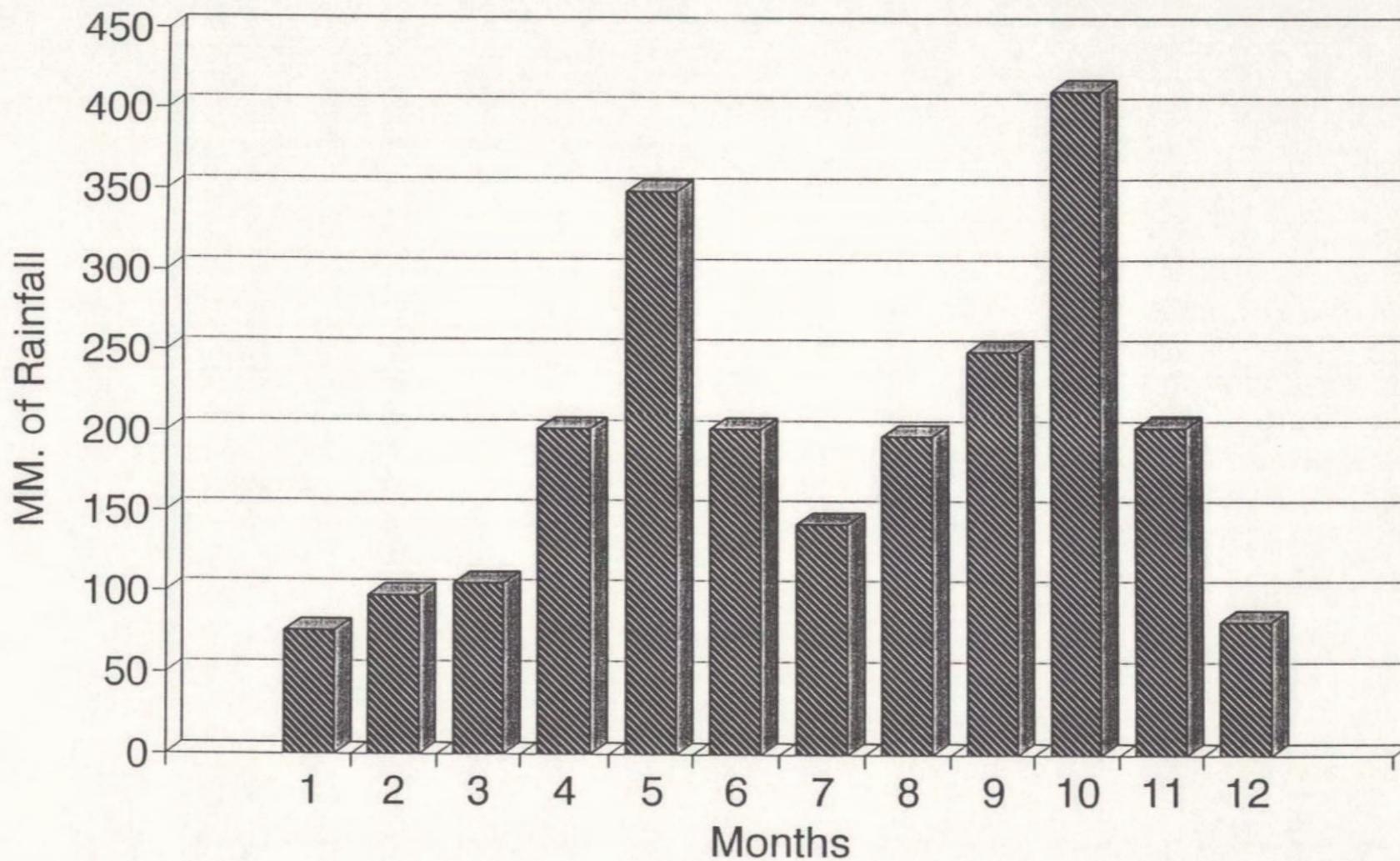
DISTRIBUTION MENSUELLE DES PRECIPITATIONS  
(HAUTEUR ANNUELLE MOYENNE)

Service Météorologique National  
1968

1400 isohyètes exprimés  
en millimètres



# CAMP PERRIN



■ Camp Perrin (2320 mm)

**Table 7A: CROPPING CALENDAR (GAETA VACHON)**

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		
pigeon pea	S-- H	_____ (18)	
sorghum	S----- H	-	
bean	S--          S-- H          H		
manioc (bitter)	S-----	H_____	---
(sweet )	S----- H_____	_____	
sweet potato	S----- H_____	_____	
Plantain/banana	S----- H_____	---	
malanga	S-----          S----- H_____	_____	
yam	S----- (19)----- H_____	---	

<sup>18</sup> Harvesting dates are not the same for the three varieties of pigeon pea cultivated: 'ti novembre' begins to be harvested in October; 'sinistré' harvesting begins in December and ends in February; 'pois crapeau' is all harvested at one time, in December.

<sup>19</sup> The varieties 'bakala', 'français', 'guinin', and 'toro' are planted between February and June. The 'pagnol' crop variety is planted throughout the year. 'Pagnol' and 'guinin' growing cycles can be as long as 6-7 years.

**Table 7B: CROPPING CALENDAR (PICOT)**

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__		
pigeon pea	S-- H	__	
sorghum	S----- H	-	
bean	S-- H__ S-- H__		
manioc (bitter)	S-----	H_____	__
(sweet)	S----- H_____	_____	
Sweet potato	S-- <sup>20</sup> H__	-	
banana	S----- H_____	__	
malanga	S----- S----- H_____	_____	
yam	S----- <sup>(21)</sup> ----- H_____	__	

<sup>20</sup> Sweet potato and manioc can be planted at almost any time of the year, depending on rains, but are most commonly planted in August and September.

<sup>21</sup> The varieties 'bakala', 'français', 'guinin', and 'toro' are planted between February and June. The 'pagnol' variety can be planted throughout the year. 'Pagnol' and 'guinin' have 6-7 year growing cycles.

**TABLE 7C: CROPPING CALENDAR (BANATTE)**

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_ S-- H_		
pigeon pea	S-- H_	(22)	
sorghum	S----- H	-	
bean	S--(23) H_		
manioc (bitter)	S-----	H_____	---
(sweet)	S----- H_____	_____	
sweet potato	S- H_ S-(24)	_____	
lima bean	S--- H_		
cowpea	S-- H_		
tomato		H_ -	

**2.2.3 Crop Rotation and Fallow**

Farmers usually fallow fields when production level has declined and become insignificant. For instance, in Banatte, after a harvest, farmers have two choices of what to do next on the field, depending on the yields last obtained on the land (cf. Table 7C below). The fields most frequently fallowed are those located on hillsides. These fields are very important grazing areas for

22 The crop variety 'crapeau' is harvested all at one time.

23 According to farmers, February is the best date for planting beans.

24 Sweet potato and manioc can be planted any time of the year, except for March, April, and May.





## 2.2.4 Yields of Principal Crops

Reported yields of the following principal crops, as observed in other areas visited, is very low. Sometimes, when rainfall is low, yields can be insignificant. The information provided in Table 8, below, was given by farmers in the watershed areas visited near Camp Perrin and represents the results of a "good" season.

**TABLE 9: YIELDS PRINCIPAL CROPS (marmites harvested per 1 marmite sown)**

CROP/YIELD	GAETA VACHON	PICOT	BANATTE
corn	40	40-50	NA
bean	15-25	5-10	NA
sorghum	50-80	110	NA
rice		30	NA

## 2.3 Crop Management and Soil Conservation

### 2.3.1 Soil Conservation Activities Observed

This region has been particularly favored with a number of development projects over the years targeting hillside conservation issues. Within the PLUS watershed areas visited, we did see the results of these activities, particularly the young trees growing upon the hillsides. Because of the general lack of adequate size stones, we did not observe rock terraces. Along some gullies, rocks were available, but had not been used. Hedgerows of leucaena and gliricidia seem to be the current extension theme of choice for hillside fields, though we did observe napier grass being established at another site not on our formal itinerary (St. Hélène, Photo 7B).

PADF has been fairly aggressive in extending leucaena to farmers over the years and we were able to visit a number of fields which possessed leucaena hedgerows older than 1 year. However, it must be said that much of this has come to no avail as grazing animals have, in most cases, removed much of these efforts. Sites usually shown to visitors at these sites, where old growth leucaena can be seen, are special cases. For example, one must be impressed by one field in Banatte which stands out from everything around it. The leucaena hedgerows are continuous (without breaks), they are continuously trimmed, providing green manures which permit this farmer to cultivate tomatoes in the field during part of the year. Some grasses have been included into the hedgerows, as are young trees. However one also learns that this is the PADF extension agent, and has been for many years, and that this field is

considered a "demonstration field". It can be seen across the valley in Photo 5A. To its right another farmer had also planted hedgerows which were much less well maintained, and in spots had disappeared entirely. One sees little other indication of hedgerows on other parts of this mountain side, even though there were other such fields in the past, according to farmers. PADF is again helping farmers establish new hedgerows on many of these fields, and a similar photograph of this site, a year from now, should show the results.

The question one must ask, however, is what is different this time from former attempts. The animals are still here, land tenure issues remain, the same crops are being grown. This example could be multiplied to other sites visited in this area. For the survey team, the major lesson is that leucaena hedgerows, though appropriate for some farmers on some fields in this region, can not be considered a solution of choice for the region. Further applied research and on-farm farmer managed trials need to be implemented more widely to develop combinations of vegetative materials upon vegetative barriers (not, hedgerows) on such fields. It will take many years of such support before appropriate changes can be made within the farming system which will in fact be sustainable.

Table 10 summarizes the hillside conservation measures observed in the three watershed sites visited by the survey team.

**TABLE 10: HILLSIDE CONSERVATION MEASURES, CROP PLACEMENT**

	Gaita/Vachon	Picot	Banatte
Dead Vegetative Barriers (Traditional)	no	yes, introduced by DCCH	no
Dead Vegetative Barriers (Modified - PADF)	yes	yes, and planted with leucaena	yes
Contour Ridging	yes, with manioc and sweet potato	yes, with manioc and sweet potatoes	yes, with manioc and sweet potato
Hills (for planting)	yes, for yams	yes - with yams	yes, for yams
Contour canals	no	no	no
Mulching	no	no	no
Gully Plugs: Rock Vegetative:	not observed	not yet	not observed
Fruit Tree crops, Plantain, Banana, etc.	no	no	no
Rice behind established terraces in Gullies	no	no	no
Hedgerows	yes, leucaena, gliricidia, also saw castor bean	leucaena/gliricidia <sup>28</sup> , saw some grasses, also castor bean	yes, leucaena, gliricidia, grasses
Shallow Contour Ridges <sup>29</sup>	yes, PADF extension for planting of leucaena along ridges	PADF extension for planting of leucaena along ridges	yes, PADF extension for planting of leucaena along ridges
Rock Terraces	no <sup>30</sup>	no	no
Livestock and Conservation	yes, leucaena and grasses used	pastures	yes, leucaena and grasses used

27. Since February/March, some 3000 meters of these hedgerows have been completed with PADF assistance, in between 10-15 fields.

29 Essentially the same as the PADF "modified rempe paille" structures, except these don't have the 'dead vegetative matter under the low contour ridges created.

30 Though we observed a number of fields where this could have been done, rather than the leucaena hedgerows which had been planted on shallow contour ridges.

## 2.4 Crop Marketing and Transformation

### 2.4.1 High and Low Prices

Prices vary strongly between harvest periods and planting, with variations in magnitude depending on particular areas and products. Table 11, below, presents the range of prices in Haitian gourdes for major agricultural commodities. Farmers usually sell when prices are at their low range, and buying from the Madam Sara when prices are high. These Madam Sara are frequently the wives of farmers.

**Table 11: Crop Prices (in Gourdes)**

Zone/ Product	Gaïta/Vachon		Picot		Banatte	
	Low	High	Low	High	Low	High
Pineapple/ unit	-	-	0.40	1	-	-
Beans/m	15	25	20 - 21	25- 30	20	25
Pigeon peas/m	6	12	5	8 - 12	6-7	12
Leeks/ packet	0.75	1	-	-	-	-
Tomato/ bucket	-	-	-	-	30	50
Corn/m	5	6 - 8	3.5 -4	7 - 10	3.5	10
Rice/m	-	-	-	-	7	15
Sorghum/m	3 - 4	7 - 8	4	7	3.5	10
Sweet potato/unit	-	-	-	-	0.15	0.45
Plantain Gosbot/ bunch	4	8	-	-	-	-
Banana Laren/ bunch	-	-	35	60	-	-
Banana d'Haïti/bunch	10	15	-	-	20	35
Plantain Fran/ bunch	-	-	35	60	-	-
Plantain Miske/ bunch	-	-	-	-	10 - 15	15 - 20
Coffee/m	-	-	4 - 7	15 - 20	-	-
Cocoa/m	-	-	4	12	-	-
Yam France/ basket	-	-	75	125	-	-

Yam Toro/ unit	-	-	10	15	4.5	6
Breadfruit/ dz.	-	-	1	20	4	15
Dry coconut/unit	3	3	-	-	-	-
Avocado/unit	0.20 0.25	0.60 1	0.40	0.75	0.20	0.75
Manioc/basket	30 (big)	40 (big)	10 (small)	15 (small)	20 - 25 (big)	30 - 35
Tobacco/ tèt	-	-	-	-	30 - 40	125 - 130
Boards 6 feet, 12 planks (frène)	50	60	-	-	-	-
Boards 6 feet, 12 planks (redwood)	50	60	-	-	-	-
Board 6 feet, 12 planks(Breadfruit)	45	55	-	-	-	-

The units of measure are the common "marmite" (m), a metal bowl containing about a quart, containing four "godets" (cups), unless otherwise indicated. The highest prices for most grains are received between February and March when seed is needed for planting, long before new grain is available from new harvests. Lowest prices are received when most farmers are harvesting a particular crop (eg. April/May for the beans) and are needing money urgently. In many ways, farmers feel "forced" to sell low because of their economic needs of this time, with many debts to pay off, etc. Survey respondents seemed to indicate that most of a household's production tends to be sold at the low range. Those merchants able to store grains are able to benefit from the high prices later.

The principal wood used for making boards at the three sites is "frène/bwa blan" (Simarouba glauca). It should be noted that trees cut down for this purpose are usually not systematically replaced.

As noted, price variations rates can be very high. We have classified such variation into four classes, to better appreciate the problem of particular crops. Table 12, below, presents data for the different sites.

**Table 12: Price Fluctuations Classified by Products**

Variation Rate in %	Gaïta/Vachon	Picot	Banatte
Greater than 200%	Avocado	Coffee, Cocoa, Breadfruit	Avocado, Breadfruit, Sweet potatoes
Between 100% and 200%	Sorghum	Pineapple, Corn	Corn, Rice, Sorghum, Tobacco
Between 50% and 100%	Beans, Pigeon peas, Banana Tonken	Avocado, Pigeon peas, Sorghum, Banana Larenn, Yam France, Plantain Musqué	Banana d'Haïti, Pigeon peas, Tomato
Between 20% and 50%	Leeks, Corn, Banana d'Haïti, Cassava, Board	Beans, Yam Toro, Cassava	Plantain musqué, Cassava, Beans

Differences in price can sometimes reach more than 300% to 1,000% for some crops (avocado, coffee, breadfruit). In the three sites, price fluctuations for beans are more moderate because of the many different harvest periods for beans in the surrounding region (Les Cayes plain, and higher mountain regions).

#### 2.4.2 Marketing Information

Within the three sites, one finds a fairly large number of market intermediaries, or Madam Sara (about 10 to 30 for each site), who participate in marketing crops, particularly food grains (corn, sorghum, and beans). There are two types of merchants, those that buy and sell immediately (1 to 2 days after purchase), and those that buy, and store until prices rise some months later.

##### 2.4.2.1 Rapid Purchase and Resale

These are the Madam Sara that travel around the various markets of the area, to Camp-Perrin, Dominique, Kans, Duchity, etc. Their working capital is low, estimated at between 50 to 600 gdes. They travel by foot, or by animal (donkey or mule), frequently over long distances (more than 10 hours travel to and from markets). They finance themselves through three sources: personal capital, loans from friends, usurious loans from speculators (about 10% a month). Some of these speculators are pig breeders, who will receive their money in kind through corn and/or sorghum bran. Risks are always high, and profits not always assured. Table 13, below, presents some data on merchants of this kind.

**Table 13: Profitability of Grain Marketing (Gourdes)**

Item	CASE 1/ Gaïta-Vachon <sup>31</sup>		CASE 2 Picot <sup>32</sup>	CASE 3 Picot	CASE 4 Banatte
	Corn	Sorghum	Corn	Sorghum	Corn
Quantity Purchased in Marmites:	50 m	45 m	10 m	8 m	10 m
Unit Price	5 gdes	5.5 gdes	4 gdes	4 gdes	4.5 G
Total Cost:	250 "	247.5 "	40 "	32 "	45 "
Milling Costs:	37.5 "	22.5 "	5 "	4 "	7.5 "
Total Costs:	287.5 "	270 "	45 "	36 "	52.5 "
Sale					
Main Product	221 "	266 "	40.5 "	42 "	52 "
Flour	20 "	-	6 "	-	7.85 "
Bran	30 "	62.5 "	1.5 "	6 "	3 "
Total Sales:	301 "	328.5	48 "	48 "	62.85
Benefit	13.5 "	58.5 "	3 "	12 "	10.35
Work Days	3		2	2	2
Day's Profits	24 gourdes		1.5 gourdes	6 gourdes	5.15 gourdes

Benefits vary with the size of the operation, and with the product. It is usually higher for a merchant having greater working capital, including a mule, or a donkey. Profits are also higher when dealing with sorghum. It is interesting to compare this with the daily labor fee of men who "sell their day" - which is around 6-7 gourdes/day. Rapid purchase and resale can be profitable for some, but the margins for gain are certainly low.

<sup>31</sup> Case 1: A Madam Sara has purchased 50 "marmites" of corn, and 45 "marmites" of sorghum. At the mill she paid 0.75 gdes/marmite for the corn to be ground, and 0.50 gdes for the sorghum. After grinding, she obtained: 34 marmites of ground corn, 10 marmites of corn bran, 10 marmites of flour corn; 30 marmites of sorghum, 25 marmites sorghum bran. The sale prices for each of these: ground corn, 6.5 gdes; corn bran, 2 gdes; corn flour, 3 gdes; sorghum, 7 gdes; sorghum bran, 2.5 gdes.

<sup>32</sup> Case 2: After grinding, this merchant obtained 6 marmites of ground corn sold at 6.75 gdes, 3 marmites of corn flour sold at 2 gdes, and 2 marmites of bran sold at 0.75.

Case 3: After decorticating, this merchant obtains 6 marmites of sorghum flour sold at 7 gdes, 6 marmites of bran sold at 1 gourde.

Case 4: After grinding, this merchant obtains 8 marmites of ground corn sold at 6.5 gdes, 3 marmites of corn flour sold 2.60 gdes, and 3 marmites of bran sold at 1 gourde.

#### **2.4.2.2 Purchase and Storage**

Merchants who stock food grains may be either men or women. Their working capital is greater than the Madam Sara who only deal in purchase and rapid sales. Profitability is almost always assured, and sometimes very high. They can earn as much as 6 gourdes for each marmite of grain marketed.

At Picot, there is one merchant who controls the entire system of grain marketing. He has two or three centers for stocking his initial purchases (Picot, Duchity), and each has between 2000 and 3000 marmites of storage capacity. He apparently buys from more than fifty Madam Sara, and resells to them as well. During a year, he can sell between 6000 to 10,000 marmites. He is also an important supplier of seed grain to farmers.

At Banatte, we heard of a number of smaller merchants who deal in about 1000 marmites each year, and who also supply seed grain to farmers.

#### **2.4.3 Transformation of Manioc into Cassava Bread**

##### **2.4.3.1 Generalities**

The farmer needs assessment team came to see manioc as a potentially important crop in improving soil conservation systems in the region. It is extensively cultivated on very steep hillside slopes. The contour ridges farmers are willing to create for its cultivation are significant physical structures which reduce soil loss on steep slopes. Such crops can provide long term vegetative cover to these slopes if left sufficiently long upon these fields. Farmers profit economically from leaving manioc to grow into larger tubers for periods of up to two years. However, harvests often take place as early as 9 months after planting because of urgent cash needs of farmers. It will be important that the cultivation of this important cash crop be integrated appropriately into any successful soil conservation system for hillside fields of this region.

Following corn grinding, and sorghum decortication, transformation of manioc into cassava bread is a very important agribusiness in the three sites. Camp Perrin has two centers of some importance which serve two of the three watershed areas visited (Gaïta, and Picot), as well as other areas. Each center has no less than 10 small processing units.

Farmers also transform manioc themselves on their homesteads for direct consumption. In general, transformation of manioc tubers into cassava flour and bread is a family activity involving husband, wife, and even children. Some household women, after scraping off the outside skins, take their production of manioc to

a mill where it is ground and pressed, to remove most of the moisture. Returning home with the ground cassava, they spread it out to dry further and then bake cassava bread for their families and for sale.

Our conversations with the operators of some of these manioc processing mills provided the following observations:

(1) Most mill operators purchase their supplies of manioc through middle men who buy the manioc directly from farmers, either within the immediate area, or from further away. Manioc is often purchased "in the ground", with the agent bargaining with the farmer for the field. Sometimes this is done well before harvest. The dealer will pay for digging up the manioc, or the farmer will assist, if the price includes such assistance.

(2) There is no supply problem for manioc. The product seems to be available when one has need it - since the owners of the crop can leave the crop in the ground until it is sold. In fact, tubers will continue to grow well for up to two years, giving farmers a better profit if they can wait. However, need for quick cash often forces farmers to sell off their tuber crops beginning at about 9 months of age, bringing them less return for the amount of work they have put into establishing this field (construction of contour ridges being a high labor intensive activity). At Banatte, some farmers told us that prices they were receiving for their manioc were much too low.

(3) Cassava bread is easily sold, without problem, at the location where it is prepared. People will come on a daily basis to buy their bread, much like one would do at a bread store in a city or larger town. Because of the demand, payment is frequently required in advance, except during the mango and breadfruit production periods.

(4) During the last few years, cassava bread production has been increasing thanks to installation of efficient new mills. This has permitted more people to become involved in baking cassava bread "pancakes" as well. The Camp Perrin region has always been well known for the quality of their cassava bread, and this is an expanding business. Innovative bakers include sugar and ground coconut in some of their cassava, creating a product which sells for more than double the price of plain cassava. Though most of the production is still sold locally and to Les Cayes, outlets have been established by some Madam Sara in Port-au-Prince supermarkets.

(5) There are many constraints that impede development of manioc transformation into cassava bread:

(a) Farmers, who produce the manioc themselves, and whose wives would like to get into the business of selling their own products often have difficulty finding the baking trays (platine) upon which the cassava flour is placed for baking. This is

frequently nothing more than a steel drum which has been pounded out flat to create such a surface - but even this is hard to obtain.

(b) Transportation of manioc from distant hillsides upon which it is grown to the grinding mills is a constraint;

(c) The marketing system for cassava bread and the manioc tubers themselves could be much improved. It is insufficiently developed.

(d) Scraping off the poisonous outer skin from bitter manioc is a difficult process and simple improvements need to be made to increase the efficiency of this labor intensive activity.

(e) There is a shortage of wood for cooking the cassava ("cassave") bread.

#### 2.4.3.2 Profitability

From the information we could obtain, manioc transformation and cassava bread production did not appear to be very profitable. This could either be a problem with the information we were able to obtain during such a quick visit, or there may, indeed, be problems which need to be studied further. Because of the importance of manioc and the cassava products generated in this area, and because of the importance of this crop to hillside farmers in particular, we believe efforts should be made by PADF or others to study this issue at greater depth, to determine how this agro-industry might be supported and improved. A decline in manioc production on hillside slopes, along with the use of the contour ridges that come with them, could have a serious impact of increasing the soil erosion problems of this zone<sup>33</sup>. Increase in manioc production, and specifically leaving manioc in the field longer to obtain larger tubers could have an economically beneficial effect for farmers and for the hillside slopes where manioc is cultivated. Table 14, below, provides some data we were able to obtain concerning the economics of manioc transformation into cassava bread.

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<sup>33</sup> This is because farmers would probably choose to cultivate short cycle crops like beans or peanuts in its place, which would accelerate erosion.

**Table 14: Profitability of Cassava Transformation**

Item	CASE 1/Gaita <sup>34</sup>	CASE 2/Picot	CASE 3/Banatte
Purchase of manioc	45 gdes	500 gdes	25 gdes
Digging out tubers	-	50 "	-
Peeling tubers	4 "	40 "	-
Rasping	10 "	80 "	-
Pounding	2 "	50 "	7 "
Renting Materials <sup>35</sup>	20 "	-	2 "
Salt	0.5 "	1.5 "	0.5 "
Wood for baking	5 "	50 "	10 "
Hiring of Cook	-	80 "	-
Total Cost:	86.5	851.5	44.5
Sale	100	950 "	60 "
Net Profit:	13.5	98.5 "	15.5
Work days	2	10	4
Earning by day	6.75 gdes	10 gdes <sup>36</sup>	3.85 gdes

Daily profit of operating this business seems small, considering the investment, about the same as the daily cost of an agricultural worker or a grain merchant. Further study should look more closely at the economics of this business, and for ways to improve profitability.

## 2.5 Livestock Production

### 2.5.1 Types of animals owned, nature, reasons for ownership

At Gaita/Vachon, Picot and Banatte, farmers keep cattle, goats, sheep, and pigs. At Vachon, more than 10 farmers raise rabbits for local consumption. Efforts of past development programs have been effective in encouraging farmers to cultivate

<sup>34</sup>) Case 1: This processing center transforms 3 baskets of cassava during a production cycle of 2 days, using one man.

Case 2: This processing center was fairly large. Information presented here concerned a production cycle of 10 days; it uses a lot of locally paid labor. Such mills provide important employment in rural areas.

Case 3: This small processing center operated during a production cycle of two days, employing 2 persons.

<sup>35</sup>) Tools for cooking, and winnowing.

<sup>36</sup>) Before amortization of some materials.

forage grasses for their animals. Napier grass, for instance, frequently is planted along field borders, in gullies, and in grazing areas. Some farmers possess fields which they keep as pastures and rent out for brief periods. The renter will let his or her animals eat all the grass in the field, and then move the animals elsewhere. It will be two or three months again before the land owner will be able to rent out this land once again to another person for pasture.

At Picot, farmers raise their sheep and goats mainly outside the watershed area, in the higher mountain areas above Saut Mathurine where pasture is most available. Some farmers go with their cattle into these mountains, usually between March and June, when local fallows and crop residues are insufficient to feed animals. From June to July, corn residues are usually available within the Picot area and cattle are kept closer to home. After pigeon pea harvesting in mountain areas in September, many farmers return there once again with their cattle. Sorghum residue is available within the Picot area between December and January and constitutes an important feed source at that time.

At Raymond near Picot, DCCH introduced rustic pigs in 1991 through created community groups. In spite of DCCH departure in late 1991, two of the sows provided are still kept under group management. Most of the pigs, however, are currently under individual ownership and care. Farmers can purchase both improved and rustic pigs Vachon and Banatte.

#### **2.5.2 Feed and seasonal availability**

Main feed sources for herbivores are chiendent, napier grass, fallow fields and crop residues. Leucaena, introduced in recent years as hedgerows for soil conservation on many hillside fields of the region is also used for cattle, goats, sheep, and pigs. July is considered the period with lowest feed availability. This is a time when farmers are preparing their fields for a second cropping season, and fallow fields are scarce. Napier grass has become an important source of forage during this period of the year for some farmers. The survey team considers that improvement could be made in farmer's use of their patches of cultivated grasses, whose management causes considerable waste. Farmers do not cut grasses and give to their animals, but allow direct grazing.<sup>37</sup> Table 15 shows seasonality of feed availability for herbivorous in the three watershed areas visited.

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<sup>37</sup> One farmer seen at Raymond said he had more than 4 carreaux of land which he leaves as permanent pasture. He says that, each year, he spends thousands of gourdes to repair the pasture. In spite of this continuing loss, he continues to put cattle directly on the napier grass and a lot of grass is wasted (trampled).

**Table 15: Feed and seasonal availability for herbivorous livestock**

	J	F	M	A	M	J	J	A	S	O	N	D
<b>Residues:</b>												
-rice <sup>38</sup>								*****				
-corn								*****				
-sorghum			***									*
<b>Grass:</b>												
-napier								*****				
-chiendent								*****				
Fallow								*****				
<b>Leaves:</b>												
-leucaena								*****				

Farmers who cultivate napier grass bring their cattle to feed upon it directly four times a year. Cattle are able to forage on wild grasses during the rainy season months of March to May, and August through November. During this time, farmers clean their pastures to allow napier grass to grow again. When crop residues and fallow are available, farmers always use these up before reverting to their napier grass holdings. It is only the better off farmers, with land holdings, who are able to leave land uncultivated for napier grass animal forage. PADF can help smaller farmers establish this in vegetative barriers either around or within the few personal fields they may own. Doing this on land which is sharecropped or rented poses serious risk of wasted efforts, as animals will be permitted to completely eat and destroy this.

Table 16, below, provides periods of the year when different kinds of feed are available for pigs.

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<sup>38</sup> Available at Banatte.

**Table 16: 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	***											*
-rice								*****				
<b>Bran:</b>												
-rice bran	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-wheat bran	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-corn bran	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-sorghum bran	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
<b>Other:</b>												
residue												
of manioc	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
leucaena	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
napier	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

Farmers purchase mainly corn and sorghum bran for their pigs. Wheat bran is more expensive. Between March and November, excess fruit (mango, avocado, breadfruit) can be given to pigs, and is considered an important feed at this time. Lack of sufficient fruit trees has been one reason why many small farmers have not been able to get back into profitable pig raising. Many of their trees have been cut down for charcoal or planks, in order to raise a little money.

At Vachon, rabbits receive only wild grasses and tree leaves. Farmers were not aware that one could feed them food grains. During feeding, they do mix several different kinds of plant vegetation, but concentrate feed, if available, would certainly improve nutrition. It is uncertain that farmers would purchase feed for these animals, however.

**2.5.3 Health and care**

Many veterinary agents trained through the USAID financed project ((Projè Sovè Tè) continue to care for animals in the area. They buy medicines and farmers pay them for care received. Two such agents told us that they find many cases of mammitis, parasites in all kind of animals, and pneumonia in goats and sheep. Antibiotics and anti-parasite medicines are expensive and difficult to find in the market. PADF might be able to assist these agents in identifying more reliable sources for these medicines, or helping them to find some group who can help them.

One indication of past development project efforts in this area are that farmers of all three areas have become accustomed to calling veterinary agents to help them care for their animals. One farmer told us that between January 1993 until July 1993, he spent

70 gourdes in care for a pig, 150 gourdes for a bull, and 100 gourdes for a horse. Vaccinations against anthrax are made every year for cattle, goats and sheep.

Farmers furnish drinking water every day for cattle and pigs. Goat and sheep don't receive drinking water. Rabbit eats grass only and do not receive any water - perhaps one reason for low reproduction rates.

#### 2.5.4      **Reproduction**

We spoke to a number of farmers who had become accustomed to raising rabbits at Gaita/Vachon. One farmer explained that one male rabbit currently is bred about 65 times between April and August 1993. Females succeed in producing 3 or 4 litters a year, though some, under good conditions, are reported giving as many as 5 or 6 litters a year. Survival rates, however, are very low, primarily because of the nature of the hutches used and because of sanitation.

As mentioned elsewhere, farmers have great difficulty finding males with which to breed their female animals. Farmers have to go far from their home to find a stallion with which to breed their horses. Since March 1993, a large imported male donkey has been made available at Camp-Perrin with which to breed horses and donkeys. Mr. Jean Spumon, manager of the Camp Perrin Ateliers, who owns this animal, allows farmers to use it at no cost, in the hopes of helping farmers improve the quality of their mules and donkeys in the region.

At Picot, only two boars are available for breeding. One is a rustic but it seems that it has a fertility problem. Sows bred with it obtain no more than 4 piglets. Further data concerning animal reproduction issues are provided in Table 17 below.

**Table 17: Reproduction Parameters for Livestock**

	Vachon	Picot	Banatte
Period Between Births			
cattle	18 - 20 months	12 - 28 months	12 - 18 months
goat	6 - 9	7 - 9	7 - 8
sheep	6 - 9	6 - 8	6 - 9
pig	6 - 12	6 - 8	6 - 8
Age at Separation			
cattle	10 - 12 months	7 - 12 months	6 - 12 months
goat	3 - 5	3 - 4	3 - 4
sheep	2 - 4	1 - 3	2 - 3
pig	2 - 3	2	2 - 3
Litter size			
cattle	1	1	1
goat	1 - 2	1 - 3	1 - 2
sheep	1 - 2	1 - 2	1 - 2
pig	6 - 11	3 - 8	6 - 11

Reproduction parameters for goats and sheep are considered good for the three areas. For cattle, the interval between births is too long. The ideal period would be about 12 months, permitting both production of a calf as well as milk production every year.

### 2.5.5 Production

Some farmers consider 2 liter bottles of milk/day to be sufficient to continue milking a cow, and will therefore avoid separating the calf from its mother until the calf reaches 8-10 months of age. Rustic cows need the presence of the calf to produce milk. According to farmers, milking sometimes keeps the cow from coming into heat. A more likely reason for this would seem to be the lack of sufficient feed for the cow during lactation.

Pig production is important primarily in Gaita/Vachon and Banatte. A sow here produces between 3 to 11 piglets at birth. At Picot, where only one male is widely used for breeding, sows had much lower numbers of live births of piglets (about 4). Farmers also frequently only end up breeding their sow once before fattening and sale in the market place - thus losing out on the higher number of young the sow is likely to give in later reproduction.

Goats and sheep produce young twice each year in all three areas. The growth of young sheep is faster than goat, permitting more rapid sale of young.

### 2.5.6 Markets and consumption

As in most parts of the developing world, animals are a household's primary means of saving money and also represent its primary source of capital when this is needed. At Gaita/Vachon, rabbits are widely used locally in household consumption and production is not sufficient to arrive in the local markets. All males are consumed, so that it can be very difficult to find a breeding male. Only one male was reported to be available for reproduction during the time of our visit - and we saw few young rabbits within the hutches (cf Photo 3A).

Farmers informed us that in September animal prices are lower. This is because of the sales taking place at this time to meet everyone's financial needs as a new school season opens up (eg. school fees, uniforms, cost of materials). One is most likely to find young animals for sale in the markets between February and April. Farmers also sell animals in order to raise money for household emergencies or special needs (eg. illness or land purchase). Table 18, below, provides the range in animal prices for various categories and ages of animals.

**Table 18: Animal Prices (in Haitian Gourdes)**

Areas	Vachon		Picot		Banatte	
	low price	high price	low price	high price	low price	high price
Sheep						
reproductive	200	300	250	350	250	350
young (5 months)	125	150	100		100	
Goat						
reproductive	250	350	250	300	250	350
young	100	150	100	150	125	
Pig						
adult	2000	2500	1500	2000	2000	3000
piglet	200	225	200	250	200	250
Cattle						
cow	2000	2500	2000	3000	2300	4000
bull	2500	3000			3000	3500
young female	1000	1500	800	1000	1500	1800
milk 0.75 liter	1.25	1.5	1.25	1.5	1.25	1.5

Because of the embargo, animal prices have been increasing. Though good for some farmers, this has been very hard on the poor, small farmers who frequently have sold off their only goat or sheep or cow to meet some emergency, hoping to buy a young one later in the market - only to find that the price has gone up so much that they can no longer afford it. The team definitely noticed what seemed to be a depopulation of many hillside regions of both small and larger animals. Though this may be temporarily good for the

hillsides, in that mountain vegetation is under less pressure, the economic implications for thousands of small farmers are serious. An important animal market exists at Ducis near Chantal. Animal dealers purchase cattle from local markets and keep them sometimes as long as six months before selling them again - making a good profit from rising prices.

Farmers frequently must pay for breeding their cattle, pigs and horses. Prices for pig breeding resembles that found in other region of Haiti. For cattle the price is higher for larger animals. No one in any of the three watershed possessed a donkey large enough to breed a horse, producing the much desired and sought after mules. The imported donkey located in Camp Perrin mentioned above is therefore a valuable contribution to the community. Table 19 provides breeding fees for animals in this region.

**Table 19: Stud Breeding Fees/Conditions**

cattle	pig	horse	rabbit <sup>39</sup>	goat	sheep
15 gdes up to 25 gdes	25 gdes <sup>40</sup>	40 gdes advance and 40 gdes after birth	free	free	3 gdes

#### 2.5.7 Animal/Soil Conservation Interaction

After harvest, farmers always put their animals into the fields to feed them with crop residues. During fallow periods, farmers stake their animals in the field, to prevent them from wandering into a neighbor's field which may still have crops upon it. Soils are enriched with manures by such grazing. Animals are important in the farming system and fallows are important feed source for cattle, goat and sheep. Cultivated grasses, usually found in the valleys, are not enough to feed all the animals of the household. Such pastures are only used during planting periods and during dry periods.

In recent years, farmers in the region have been encouraged by projects such as PADF to include hedgerows within their cultivated hillside fields. But farmers continue to attach animals in these fields during fallow periods, as they have always done, with the result that these hedgerows are usually destroyed. Farmers say that the space between two hedgerows isn't wide enough to permit

<sup>39</sup> Available at Vachon.

<sup>40</sup> One farmer demanded a 50 gourdes fee for use his boar.

their animals to browse the field without reaching the hedgerows. Many farmers have rejected leucaena hedgerows in this region for this reason, and many of the hedgerows currently being established will not remain long on these fields. Increased feed availability apparently was not considered solved by the installation of these hedgerows and seems to conflict with what is considered to be valuable forage left on these fields after a crop is removed from the field. The survey team has developed an on-farm farmer managed trial theme which we believe may help to resolve some of this perceived conflict and competition for limited space. We believe farmers must be permitted to continue to graze their animals upon these fields, that the added manures are important at this time to soil fertility, but that there must be some reorganization of crops upon these fields which will permit multiple uses over time.

## 2.6 Land Tenure

### 2.6.1 Types of Land Tenure

Six land tenure patterns are encountered:

- purchased
- rented
- inherited
- undivided family land (before death of parents)
- sharecropped
- usufruct.

In general, the land exploited by most farmers is small. For the three sites, Gaïta, Picot and Banatte, farmers averaged about 1.92 cx, 0.5 cx and 1.17 cx., respectively. This land is divided into a large number of fields or plots which are often located at considerable distance from each other, some in the high mountains, some on the slopes closer home, some in the valley. Farmers frequently used between seven to nine such fields (cf. Tables 1 and 15 for more detail).

Purchased land is, of course, the most secure, and farmers are most ready to create the necessary structures for soil conservation and to maintain them. The reality is quite different, however, for other kinds of land. A farmer in Gaita spoke to us of the fact that there just isn't enough land for everyone. Families with undivided family land have a particular problem in that they don't divide because they can't give everyone enough to be worth using. So, it is shared by everyone. When the land is in pasture the problems are less, but once put into crops, many problems develop as relatives permit their animals to graze on the fields of their kinsmen. One young man in Picot, with a wife and three children, told us of his problems. One of his larger fields (corn, sorghum, beans) is land his father obtained after he had married another

women. The grown children of his father, with this other women, consider this land to "be theirs" once the father dies. However, as long as the father lives, this young man can use it too. Apparently, he has caught his kinsmen grazing their cattle on his corn, and he took us to this field to show the damage. PADF had recently encouraged him to plant leucaena hedgerows on this field, which he has done with project assistance, but he is certain that they will not last long. He pointed out that it would have been better to put these hedgerows on a piece of land he will inherit through his own mother (received from his father as a gift to his mother to support her). This man has no incentive to either improve or give good management to the land of his father which will not have any chance of passing to him at his father's death. If farmers have such problems with land which is ostensibly "undivided inherited land", their incentives with respect to sharecropped and rented land are even less.

There is a great deal of sharecropping in all three watershed areas and little renting. Large landowners, frequently living elsewhere in Camp Perrin or Les Cayes, even Port-au-Prince, find that they make more money sharecropping their land than by renting. The usual division is a third for the land owner, and two thirds for the working farmer. At Picot, we were told of many large landholders having between 15 cx. and 20 cx. of land, some given in renting and sharecropping, but much left for pasturing of their animals. These landowners live in Camp-Perrin. Gaita has a number of equally large landholders, also living at Camp-Perrin, who give their lands in renting and sharecropping. With the exception of two absentee landowners, most of Banatte land is controlled by resident farmers. The absentee landowners have sharecropping arrangements for their land.

There is not an active land market. It is very difficult to find land to buy and it was difficult for us to find farmers who would tell us of prices for land. We saw one old man at the top of one hillside ridge in Gaita who was supervising a neighbor who was going to sharecrop his land. They had just cut down a large number of trees for the purpose of planting sorghum and some beans. The old man said he needed some money (from lumber, and crops), but was too old to work the land himself. According to farmers, it is relatively easy to find land to rent, or sharecrop. At Banatte, it is easier to rent in October, when schools are re-opening after the summer vacations, and farmers need money for fees, than in February when major planting takes place for the first (and primary) growing season of corn and beans. It is important to note that fees for land measuring are very high: between 20% to 40% of the land value or about 250 gourdes for an area between 0.1 cx. to 0.30 cx. in size.

**Table 20: Patterns of Tenure**

Item	Gaïta/Vachon	Picot	Banatte
Average Area Cultivated	1.90 cx. (41)	0.50 cx.	1.15 cx.
# Of Parcels	5 - 9	3 - 6	4 - 6
"Purchased" lands	16.4%	20%	10%
Renting	25%	14% (42)	24%
Divided Inheritance	39.4%	20%	35%
Family land, before division	3.2%	0	17%
Sharecropping	11%	46%	14%
Usufruct	5%	0	0

**2.6.2 Land Value**

Land value is a function of three principal variables: location, presence or absence of trees, particularly fruit trees, and the kind of crops which can be cultivated on the land (eg. rice, plantain, corn or beans). Using these variables, farmers can think of the following three kinds of land categories: high value, medium value and low value.

Table 21 below provides some indication of the range in land values, within these categories (cf. also Table 1).

**Table 21: Land Value (Gourdes/0.25 Cx.)**

Zone	Gaïta/Vachon	Picot	Banatte
<b>LAND FOR SALE:</b>			
High value	1,200 - 1,600	8,000/near road	-
Medium Value	400	4,000/near road	-
Low Value	170	1,000	-
<b>LAND FOR RENT:</b>			
High Value	100 - 120	-	300
Medium Value	60 - 90	-	200
Low Value	40	-	100
Sharecropping	33%	33% - 40%	33%

41 One carreaux (cx.) is 1.29 hectares.

42) This is State land, from another area, and for which no rent has actually been paid since 1991, with departure of Duvalier.

Land located near the road to Camp Perrin has a very high value, having access also to electricity. At least one out of every three fields are sharecropped in all three areas. This reality underlines the difficulty programs such as PADF will have in creating sustainable hedgerows on hillside fields, where farmers will not necessarily be interested in the long-term conservation of the soils, only their own short term benefits from short cycle crops. Such farmers need to be assisted to obtain more rights to land, or at least more long term security for use of these lands under such arrangements.

## **2.7 Labor**

### **2.7.1 Traditional Forms of Organizing Group Labor**

The general form of organizing group labor found in the three sites is called the "escouade". It is an association between friends of usually similar social level. Each day the group works, one member will benefit from the work of all the members upon one of his fields. The day's work usually lasts for 4-6 hours, from about 7 am until 1 pm.; during peak labor periods the "escouade" can also work in the afternoon hours. The number of people associated with such groups can vary greatly, from three to twelve. When a member doesn't need the escouade's services during the day reserved for him, he can "sell his day" to another group member or anyone else. He then earns the day's wage for each member of the group working for this third party during that day.<sup>43</sup> In general, an "escouade" is directed by a "governor", and a "secretary", and has its own name. The governor gives orders for when work should begin, when it should stop, and handles any contracts (oral) which may be made with other farmers "buying the day's work" of its members. The secretary collects and disburses the money, if any, and often keeps written records and all transactions.

Any one man may be a member of more than one such group at one time, working for the first three days of the week with one group, and the next three days for another group - with only one full day for his own activities, plus the afternoons of the other days. One farmer we spoke with in Gaita said that he worked with a group called 'Code Famille' (family honor) on Mondays and Tuesdays, and had been with this group for 5 years. On Wednesdays and Thursdays he worked with a group called 'Kaka Poul' (chicken shit). They cleared fields, planted, created contour ridges for sweet potatoes and manioc, and weeded. He believed their hardest work was weeding and digging up sweet potato and manioc. In his groups, he usually

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<sup>43</sup> So if there were 10 members of this group, as much as 60 gourdes could be earned for the farmer who "sells his day" (10 \* 6 gourdes/person).

expected to receive clairin or food, preferring the former which he said cost about 10 gourdes/person. When labor was sold by the groups, they expected to receive at least 6 gourdes/person.<sup>44</sup> Another farmer in Gaita spoke of being a member of a group of 8 people (7 men, one woman) who called themselves 'Cherché la Vie' (look for life). He spoke of one member of their group who had recently used his group day's work to create soil conservation structures on one of his fields. The survey team finds this kind of development particularly exciting as this is the kind of adoption which needs to take place if soil conservation activities are to become institutionalized into the farming systems of this area. In fact, we believe it is precisely with these kinds of groups which PADF must work if long term sustainability of their efforts is to be realized.

In Picot, one farmer explained to us that he himself did not work in "escouade" groups, though he hires them to work on his land, paying them 7 gourdes/person/day (7 am. to 1 pm.). Though he had not done so himself, he told us that he had heard of other landowners in the higher mountains above Picot using "escouade" groups to create soil conservation structures (rock terraces, vegetative barriers) on their land. One has to plan ahead to contact such groups to work upon one's land, or they won't be available when one needs them. This farmer, himself, knows of two "escouade" groups in the Picot area with whom he deals. When he needs work done on his fields, he will either go to the leader of one of these "escouade" to hire the entire group, or will ask to hire several members only from the group (not needing the entire group). He also knows individuals who "sell their day" apart from such groups. People who "sell their days", whether individually or as members of groups, are people who cannot find enough food for their families, or are facing sickness in the family for which quick money is needed, or a member of the family needs cash for some other special need.

One finds three variations of the "escouade" in this region:

(1) The "acolad". Here, two or three friends will group to perform principal field activities together. They will alternate among each other's fields, during three days of the week. No money is exchanged; nor is food always provided. The purpose is to work together, not alone, doing one's field work;

(2) The "bonmaten". Here, during those periods of the year when there may not be much work to do on one's own fields, several friends or neighbors may organize together and seek out, usually larger, farmers, who may be able to hire them as a group for a day or more for cash.

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<sup>44</sup> Though it is only the person who was "selling his day" who would actually take the money home.

(3) The "avanjou", also called "jounen sòkò". Here, during periods of the year when labor demands are high, five to seven or more friends and neighbors may organize to sell their group's labor to larger farmers.;

(4) The "jounen pèp", also called "antrepriz". Also seen during the very busy periods of the year, this group will be willing to work for credit. A part of the fees (about 25%) are used for buying food, and/or beverages; the other part is kept as savings by the group's secretary for buying a cow at the end of the year for a "New Year's Feast". At this time, the animal is killed, divided between members of the "escouade", and consumed. The number of members of such groups can reach to 15 and more. In another modification of such a group, some groups plan on working four days of each week for each other, on each other's fields, alternating around. Then they will take two days of the week and work as a group selling their labor and keeping the wages in a common treasury for a feast at the end of the year, or for some other special activity.

One young man in Gaita told us of his 7 man "escouad". Most of the members have been working together for several years, though members sometimes drop out to be replaced by someone else. Though most of their work is done on each other's fields, it does happen that a member may "sell-his-day". If someone within the group wants to buy the day, the fee is 5-6 gourdes/day/person, depending on the time of the year; if it is someone outside the group, the fee goes up to 6-7 gourdes/day/person. He usually expects to receive "something to drink" (ie. clairin) during these days which are sold. Furthermore, in his group, they work for two days "for the group", where money is saved for the special "New Year's Party" mentioned above, in which they buy a "beuf" to slaughter, with drinks too.

In general, the person benefiting from a hired group's labor is not obliged to provide food or beverages (clairin). However, doing so will not only assure him of better work being performed, but will also make it more likely that he will find future help during a time when labor is scarce. The group is certainly more likely to accept work with a farmer who provides food and drink, than one who doesn't (when given a choice). We have seen elsewhere that the cost of such food per worker can easily be at least as much as the daily wage given.

One can find "avanjou", and "bonmaten" groups formed exclusively of women ("awoyo" groups). However, women have responsibility for cooking the food, and seeking water for any of the groups that work, and as such, are also frequent participants in the labor group. On the day that a person's escouade group comes to work on his fields, that person's family will host the group as necessary.

In all three sites, those who sell their group labor work under contract. That is, the person hiring will clearly lay out the work-task for each person - with prices fixed based on the size and number of these units completed.

In each of the three watershed areas visited, PADF works principally through NGOs (non-government organizations) or groups which they, themselves, have helped to create. In Picot, for instance, their five extensionists work with a 'confederation' of groups from four communities called OPINAREG (Organization des Paysans de Picot, Naze, Raymond, et Guillaume). In Banatte, PADF works with confederation of six groups called OPBAF (Organization Planté Banatte Forgé). The PADF regional agronomist was instrumental initially in creating the groups, and then in helping them to band together into these confederations, each with their president, secretary, and treasurer.

### **2.7.2 Principal Activities for Group Labor**

Group labor is used to accomplish the most difficult of the field operations faced by farmers: field clearing and preparation for planting, creation of contour ridges for manioc and sweet potato, deep tillage, and planting.

Peak periods of labor begin in December for field preparation for corn and bean planting in the spring, and continues in intensity through until March. There is a brief labor surge around August when fields are being prepared for planting sorghum, and for the coffee harvest of Picot; and in June for bean planting in the highlands. During these peak periods, women participate in some of the field activities, i.e. planting, first weedings, rice harvest (Banatte) and coffee harvest (Picot). It is during these periods that women organize their own "escouade".

### **2.7.3 Methods of Paying for Labor and Costs**

When labor is being sold, farmers expect to receive a cash payment immediately upon completion of their day's work. Credit is sometimes practiced in the cases of the "jounen pèp" work groups, though it may cost 7 rather than 6 gourdes/day/person for work done in August but paid for in December. The cost of labor is somewhat variable depending of the zone and the time of year. Table 22, below, provides some information on this for the three sites visited.

**Table 22: Labor Cost in Gourdes**

Item	Gaïta/Vachon	Picot	Banatte
# Hours	4 - 5	5 - 6	5
Cost/Man	6: August 10: February	7 - 8	2.5 - 3/low period 6-7
Cost/Woman	5 - 7	3 - 4 vs 5 flat land	6 - 7

Women generally receive 50% to 80% of the wages given to men for their work, which is usually considered by the men to be "easier". Women do not perform the heavy digging work of their menfolk.

### **3.0 Already Existing Farmer Opportunities**

#### **3.1 The Cropping System**

In the three sites, beans are considered by farmers as the main cash crop, corn and sorghum are in second position, and manioc is in third position. At Gaïta/Vachon, leeks grown near homesteads at the top of mountain ridge lines and tomato are considered by some farmers as cash crops. Coffee and yam are cash crops for mid-size to large farmers with lands in the valleys.

#### **3.2 Livestock**

There were not as many animals in this region as some of the others visited by the survey team, though many households attempt to raise a head or two of cattle for income and investment purposes.

#### **3.3 Other Current Sources of Revenue**

Farmers have few opportunities to make money other than agricultural or livestock pursuits. As noted earlier, many farmer wives try to become involved as Madam Sara merchants, selling a little produce along the roadways or in local markets. Some make a little money processing manioc into cassava. Trees, when available on one's lands, are cut down for construction wood (frêne-white wood particularly) and provide an important source of revenue for some farmers. Large mango and breadfruit trees are sometimes sacrificed for the cash they can provide during some critical moment. Certainly, the sale of one's own labor provides income for many small households, particularly during peak labor months between January and March.

Other opportunities open to some farmers include animal breeding and food grain storage. At Gaïta, farmers stressed the opportunities available in cattle and sheep breeding, and food grain storage. At Picot, sheep breeding, in particular, was mentioned. At Banatte, farmers spoke of cattle breeding and food grain storage as good ways to make money, if the opportunity existed for a person to get into this business. A number of other activities also exist for innovative farmers to make money, including the purchase of land for renting in forage crops, fattening of pigs, trade of food grain for immediate sales, and goat breeding. When we asked farmers to rank these in terms of priority, they could not do so, saying it depended on the person and the circumstances. Farmers think rather in terms of diversification when and where ever possible. They will try two things at once, given the chance, simply hoping one of them will work out.

## 4.0 Major Constraints and Possible Solutions

### 4.1 Increased Production of Principal Crops

Principal constraints to agricultural production for selected crops in the three watershed areas are presented in Table 23. Needless to say, farmers will always mention the lack of capital as their first and most serious constraint in realizing their objectives. Closely following this will be the serious lack of sufficient grazing lands for their animals - a fact that should increase farmer interest in hedgerows and vegetative barriers on their hillside fields if approached in an appropriate manner.

**Table 23: Major Constraints**

CROP	CONSTRAINTS		
	Gaïta/Vachon	Picot	Banatte
Banana/ Plantain	Water deficit, Larvae attack to root systems of local variety (Vincent, plantain thick and tall), Wind	-	Wind, drought, larvae attack
Beans	Water deficit, Water excess, crickets, snails	Water deficit, Excess water, Snails (rare)	Water deficit, excess water, mosaic virus, cricket, snails
Manioc (Bitter)	Fertility	-	Lack of moisture, rats
Coffee	-	Lack of land, price variations	-
Corn	Water deficit, rodents attack stalks, Birds, Wind, Water excess	Fertility, Water deficit, birds at harvest, rats	Water deficit, erosion/fertility, birds, wind
Leeks	Water deficit, Lack of time to manage	-	-
Pigeon peas	Wind, Water excess (flowering period), Rats, Mosaic virus	-	Wind, and excess rain (period of flowering), mosaic virus attacking terminal shoots)
Sorghum	Water deficit, Water excess (harvest period)	-	Erosion/fertility, water deficit, poor quality seeds
Sweet Potato	-	Rat, Schaffer larvae	
Yam	-	-	Water deficit, wind, "galle"

In spite of the fairly high annual rainfall received in this region, farmers still cite lack of enough rainfall at certain periods of the year as a constraint. Rainfall figures presented earlier do not show enough detail to pick up the possibility of problems of timing between rains, which could be one reason for farmers citing this problem. At the same time, the same farmers will also say that too much rainfall at other times also causes

damage to their crops, particularly beans around harvest time. Low soil fertility, and the low moisture retaining capacity of the soils are equally important constraints.

Plantain and banana are attacked below ground by a larvae farmers call "ver" (with a black head, and a white body). We were not able to obtain a sample to make a more helpful identification, but this appears to be the same larva which causes similar problems in other parts of the country - something we have also called a "Schaffer larvae".

Farmers have a number of strategies to minimize the impact of these problems. To increase the fertility of their soils, farmers of all three areas (particularly Gaïta and Picot) place their livestock on the fields during fallow periods, which may vary from a few months to a couple years. Animal manures are expected to increase the soil's fertility during this time. At Banatte, many farmers purchase chemical fertilizers which they put onto their fields. For some crops such as manioc, for example, deep tillage in the preparation of the contour ridges is believed to also improve the soil.

To prevent being blown down by wind, plantain and banana trees on hillside slopes are frequently propped up by support posts. Farmers facing serious attack of rodents in their corn and bean fields will sometimes purchase rat poisons in the local market, though this solution does not help for long when neighboring fields are not treated.

Chemical pesticides, such as Sevin, Chlordane, and Nuvacon are used by some farmers against a number of the insect pests they face in their fields. Pigeon peas under attack by mosaic virus are pulled up and destroyed; farmers will do the same thing when banana or plantain are attacked by the "ver" larvae mentioned above. Banatte farmers told us of using castor bean oil-cake and ash around the roots of these plants as another way to try to control this larvae attack.

Against the snails that attack beans, farmers of all three sites have a very efficient biological method of control. In the evening, farmers will place small piles of the leaves of plantain and banana, sweet potato, etc. (plants the snails apparently really like) in different places throughout their fields which has come under attack. The snails will concentrate in these places, and will also seek shelter in the foliage as day comes to escape the sunlight. In the morning, the farmer will turn these piles of leaves over and be able to easily kill (crush) concentrations of these snail pests.

## **4.2 Adopting New Crops**

The experience of past projects in this region clearly demonstrates that it is often not easy for farmers to adopt the new crop varieties introduced into the region. There are frequently very good reasons for this, which such program do not learn about until their departure. If something new is to be introduced, a program must to consider all the various components from seed source to final marketing, for a major constraint at any one point can result in ultimate failure in adoption and in wasted efforts for the entire venture. For example, Picot farmers did not go on cultivating the vegetables they had been shown how to grow and sell successfully as part of the DCCH project which terminated in September 1991. Yet farmers in the area will say how profitable this activity had been. They say that they never learned where they could get their own seed, even though this can be easily obtained in Les Cayes from Agri-Supply. Projects need to be careful when introducing new varieties that farmers not become dependant on them for the supplies, without any effort on their own part to either keep seed for future seasons or to obtain the seed from local suppliers. In some cases, it will be necessary to help set up local distributors for such seed supplies. PADF is once again re-introducing vegetable gardening into Picot!

Another reason for lack of adoption can be the lack of some technical information about the crop on the part of farmers. Or, the new crop may not actually fit well into long established cropping systems, with rotations and fallows, and the presence of animals in these fields at various points of time. Lack of credit sources can also be another factor for not being able to initiate some new ventures.

## **4.3 Major Constraints to Improve Animal Production.**

According to farmers, feed availability is an important constraint to improved animal production in the three areas. At Banatte, draught bulls have priority for available cultivated grass. After a bull has had access to the grass (direct feeding - not cut and carry), other cows, horses, or donkeys, sometimes even goats and sheep, are permitted to feed on the napier grass. Because of the severe lack of forage, pasture renting has become common-place in all three watershed areas. Pasture management currently practiced does not allow for the best grass productivity. Animals are permitted to browse on the rented napier grasses of a pasture for 8-15 days until all grasses disappear in the field. It can take at least another three months for the pasture owner to be able to bring this field back into forage again.

Following adequate forage constraints, poor reproduction, mainly among cattle and pigs, constitute additional constraints to increased animal productivity in the region. The interval between

giving births is too long for most cows. Following the birth of a calf, a farmer may have to wait from 18 to 30 months until the next birth. Should the cow not reproduce in this period, she will be considered infertile, and sold as beef.

Many pigs in the three areas have very low reproduction levels. At Picot, the rustic male available could be the cause of the problem. Many farmers do not breed their sows more than once, before selling them as well, even though one might expect higher numbers of piglets with the second and third litters.

At Gaita/Vachon, rabbit hutches are a major problem for increased rabbit production. Rabbits are raised in this area for local consumption and sale. The hutches farmers make themselves are not appropriate for effective rabbit raising. The wood materials used give rise to hygiene problems. New born rabbits are often lost by falling through the slats of wood of their hutch. Farmers also limit themselves to two reproductive females because they do not have the space to care for more young than this. Given the fact that rabbit raising has actually been accepted in this area, efforts could be made to help interested farmers improve their rabbit raising - perhaps by introducing the fibro-cement hutches developed in Salagnac by the FAC project.

Males of many of the common livestock species are often very difficult to find when breeding is required. The males are always the first to be fattened up and sold. One result of this reality, common throughout Haiti, is that in-breeding becomes a problem when a majority of farmers in an area use the same male for breeding. Reproduction problems will increase unless new blood lines can be introduced into the area. Efforts in artificial insemination might be appropriate from time to time in many such areas of the country, if means could be found to obtain the proper supplies and to preserve these until their use.

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

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

## 5.1 For the PLUS Project

### 5.1.1 Labor Organizations to Accomplish Program Activities

The survey team found that in all areas in which the PLUS project works, much greater effort could be made to take advantage of traditional work groups. This recommendation is no less true in the Les Cayes region. PADF works through community groups and organizations in this region which it, itself, helped to create and motivate. This has been a good effort, which has greatly facilitated communication of ideas and distribution of tree seedlings (through AFII) in parts of the communities in which they work. Members of these groups also organize to perform group labor on each other's fields, sometimes in much the same way as the traditional work groups organize their activities.

The survey team met with hillside farmers in all three watershed areas who were members of traditional labor squads ("escouade"). Many of these individuals were not members of the large "formal" groups with whom PADF officially interacts in the area. Yet these are the very groups who are organized locally for the purpose of accomplishing major agricultural activities on the hillside fields. These are the kinds of farmers (see below) who are most likely to destroy or manage poorly soil conservation structures and vegetation on fields they are renting or sharecropping for short term gain. Unlike other areas of the country we visited, some members of these traditional work squads have begun to include soil conservation activities among the activities considered acceptable for a member to ask squad members to assist him with. We heard of rock terraces being built using such labor in areas outside the project area (above Saut Mathurine). We also met farmers in the surveyed watersheds who, using squad labor, dug shallow contour canals, creating low ridges into which they could plant leucaena or gliricidia.

PADF needs to focus their efforts to not only identify all the different labor squads within their areas of intervention, but must seek ways in which to include them in their activities. One way to accomplish this would be for an extensionist to accompany such groups to the fields on which members are working at different times of the year and evaluate their need for soil conservation structures and vegetation. This need can be discussed with the members who may decide to work together to protect their hillside fields (particularly the ones which they own). Extensionist should not ask these groups to come to a meeting of the local extension organization where they "can learn" what needs to be done.

Members of these work squads may or may not be members of the formal "groupements" with which PADF works. We have found that more often than not, they are not. At some risk of over-generalization, members of such squads are characterized by (1) living in the mountains (as opposed to the plains and valleys);

(2) being poor; (3) having little land of their own; (4) sharecropping much of their cultivated land; (5) having little or no land in the valley bottoms and plains; (6) working for the 'better off' landowners of the valley/plains - when they 'sell their days', and (7) 'selling their day's labor' and being the sharecropper to members of the groupements that PADF, in particular, works with.

Squad members interviewed in Banatte, for instance, told us that they "didn't know they could work 'directly' with PADF" or "they thought they would have to dissolve their squad and become part of the 'formal group' created by PADF in the area". Others said they thought they "would have to pay a fee" to become a member of the 'formal groupement'; or "they thought they would have to 'change their squad name' and join the larger 'formal groupement'". It is important to realize that these groups are formed because these are people who can work together, people who are friends and neighbors. They are often very proud and do not want to be told by others, whom they may either not like for one reason or another, what they must do. They do not want to be led by such people. They have their own group. This must be respected by PADF and efforts made to work more directly with them.<sup>45</sup>

#### **5.1.2 Soil Conservation Work on Sharecropped and Rented Fields**

We strongly recommend that where rented or sharecropped fields are being "improved" with soil conservation structures, the extensionists be certain that the farmers have a clear understanding (verbal contract) with the landowner about the farmer's right to the plants (grasses, leucaena, trees) being put into the field. This particularly applies to the short fallow which follows harvest of sorghum and start of a new season of corn and beans in the spring. The same kind of clear understanding is necessary before such work is done on land classed as an "undivided inheritance". Helping farmers meet with landowners and discuss these issues before soil conservation work is performed should help improve the farmer's incentive to better manage and care for the hedgerows or vegetative barriers put in. Unless such agreements can be made, however, there is no point of putting in such efforts - the effort will be wasted.

#### **5.1.3 On-Farm Research/Demonstration Fields**

This region is fortunate to have benefitted from many years of development interventions aimed at agroforestry and soil conservation. Farmers can be found in the area who have maintained hedgerows and who clearly have benefitted from their presence. At

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<sup>45</sup> This is not to say that some of the squad members may not also be members of the formal groupements of the area - because some are.

the same time, it must be said that one does not see the amount of hedgerows on hillsides as would be expected from the efforts expended by these past projects. There remain serious constraints to adoption, some of which we have outlined in earlier sections. The survey team believes it is essential that the PLUS project establish a number of its own on-farm trials to better understand the dynamics of the farming systems of each area. Though leucaena has been a good choice for some farmers, it must not be seen as the only alternative for hedgerows or only component for such hedgerows. We recommend that the program field test the on-farm trial themes developed by the survey team for this area. One of these trials (Unifying Theme #1, below) is orientated to the major hillside field, with an attempt to establish vegetative barriers (rather than hedgerows), using a combination of material the farmer already grows on these fields, but with some spatial rearrangements. A trial protocol has been developed in Appendix 4, summarizing the various steps which could be followed in implementing this trial. The second theme (Unifying Theme #2) is orientated towards vegetable gardening, which holds much promise for some hillside farmers.

#### **5.1.4 Tamazulapa Bean Extension**

Farmers have appreciated the extension of this mosaic virus resistant variety of black beans, which appears to have raised yields obtained by farmers. We would point out, however, that increased bean production on hillside slopes is not necessarily a desirable objective unless it is combined with the necessary soil conservation measures (hedgerows or vegetative barriers) protecting the field from soil loss. Bean cycles are short in duration. When grown in some locations without more long term crops like corn or sorghum, beans actually increase the soil's exposure to wind and rain. Bean crops are also risky to grow, being sensitive to both too much and too little rainfall. We recommend that farmers who receive beans as part of PADF assistance plant them in fields with already established contour hedgerows or vegetative barriers.

We also suggest that consideration be given to increased focus on seed yams, which many farmers here also desire. Though perhaps more costly to provide initially, yams present fewer risks to farmers, provide high income, have a long growing cycle (thus better protecting hillside slopes). Such an effort could also be combined with a tree seedling program (eg. through nurseries) which would provide the supports for these yams.

#### **5.1.5 Hedgerows and Vegetative Barriers**

Leucaena should only be used as vegetative material in the hedgerows of farmers who really want this. Alternatives should be proposed from which the farmer may choose. Establishing actual

vegetative barriers, rather than simple hedgerows, should be encouraged and demonstrated. Napier grass should be an option, followed by elephant and guinea grass. Any number of tree species could become components in a vegetative barrier, planted directly as seeds or as seedlings. Trees of special interest to farmers in this area include "bois d'orme" (utilization: fodder, and fabrication of chairs), "bois blanc and bois capable", and cassia. Sugarcane, pineapple, plantain and banana are other appropriate alternatives for some kinds of fields. In all cases, the project needs to have its agronomists and technicians (not just extensionists) spend time with farmers discussing these issues with an open mind. It is the survey teams' view that the more diversity that can be established into a vegetative barrier, the more likely farmers are to maintain and protect what should become valuable strips across their fields. To be valuable, and therefore preserved, these vegetative barriers need to be not only productive, but a source of some kind of short term income (food or cash). Castor beans, plantain and banana, and some fruit tree products could fill this role. They also need to include vegetation that the farmer already knows how to manage, or which fit specific needs (eg. napier grass and leucaena). The vegetation must compete successfully with the crops farmers will establish between each contour barrier, the subsistence corn, beans, and sorghum crops and hopefully production of the latter will be increased because of the presence of the former. This needs to be monitored over time through on-farm trials.

Though more appropriate in some other regions of Haiti visited, we nevertheless believe that plantain and banana should be included as components of vegetative barriers in some parts of a field, particularly in Picot, and on certain slopes in Gaita/Vachon, near wooded gullies.

When establishing leucaena or gliricidia hedgerows, these should never be placed across fallow or soon-to-be fallowed fields, as they are likely to be destroyed by grazing animals. Rather, hedgerows should be established at the beginning of a 9 month minimum cropping cycle of corn/beans with sorghum, thus permitting the young plants to become better rooted before they are exposed to direct feeding, during fallows, by animals. One way to extend the time for establishment would be to plant the hedgerows between newly established contour ridges of manioc and sweet potato - which will protect the leucaena for at least 9 months, and in some cases, as long as two years. Here farmers need to become involved in trimming and use of the cutting for either animal forage or as a green manure.

Manioc cultivation should be encouraged in any way possible, because manioc forms, in effect, multiple hedgerows across hillside fields and provide good protection to the slopes during their time in the soil. Even after harvest, the general shapes of these contour mounds remain and provide some protection for run-off and

increased water infiltration. Manioc intensification can not take place without assistance at the transformation and marketing stages of cassava bread, however. Furthermore, manioc processing uses large quantities of fire wood, and such wood is difficult to obtain in all three watersheds. Therefore, manioc intensification, with assistance to the agri-business side, would require a corresponding effort to increase firewood availability. Farmers interested in tree products should consciously plan for their inclusion on portions of their fields (along borders for wind breaks, as supports for plantain, as future lumber sources, and for firewood for a household level cassava bread business). Marketing efforts should also focus on helping farmers or groups of farmers establish commercial outlets in Port-au-Prince, for example.

#### **5.1.6 Leek Production and Vegetable Gardening**

PADF must continue its program to establish vegetable gardens, and must, as outlined in the unifying theme #2 below, also concern itself with seed supply and product marketing issues of the vegetable commodities with which it works. Farmers should be helped to diversify as much as possible. At the same time, however, it is important that PADF not neglect a long established vegetable crop found in both Gaita/Vachon and Banatte - leeks. We met farmers who have worked with mono-crop leek gardens for over 30 years. This is an important and profitable cash crop for many hillside farmers<sup>46</sup>. Farmers are able to make as much as 50 to 65 gdes/day from this activity (cf. Appendix 2 for details). Because of the success of this crop on these soils, there may be other, similar crops, which could be cultivated here as well - onions for instance, or garlic.

#### **5.1.7 Monitoring and Evaluation**

The PLUS project should be certain that a sample of farmers are selected from which the following data can be monitored:

(a) Identify farmers who have completed soil conservation activities (hedgerows, vegetative barriers, rock terraces, gully plugs) on their own initiative, without direct project extensionist encouragement or participation. Learn why farmers have done this work, how they achieved the work, who actually did the work, and then monitor how it is maintained. Find out what the land tenure situation was on such fields and how farmers may have used their own initiative to modify procedures recommended by the project.

(b) Monitor the prices of crops of particular interest to the project in the watershed, particularly manioc, in this region. Determine the cost of inputs needed for improved production. How

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<sup>46</sup> The leeks are not grown in the valleys or plains; they are grown at the very top of the hillside ridges.

do project interventions actually affect these crops?

(c) With farmers who have had soil conservation improvements made upon their land, a random sample should be selected from the records of extensionist activities and visits made to these field a year later to assess objectively what remains of the activities undertaken earlier. What has disappeared and why? What has been maintained?

(d) A sample of farmers who have resisted placing soil conservation structures on their fields should also be taken. A short, qualitative, interview should be held with them to assess the reasons for their actions and what project or other changes would need to take place in order for them to be interested in some form of conservation activity on their fields.

## **5.2 Other Potential Programs (for Other Projects)**

It has become clear to the survey team, in the course of our discussions with farmers, that a number of interventions were needed in the area to improve the chances of success of many PLUS project activities. Activities do not exist in a vacuum, even as the farming systems of these farmers are, in fact, complicated systems of inter-acting variables. Support to the activities discussed below would provide complementary support to PLUS project objectives of increasing the productivity of the hillside farmers of this region. The primary objectives of these proposed programs are to minimize the effects of the constraints recorded and to permit farmers to better exploit their investment opportunities.

### **5.2.1 Small Agri-business: Manioc Transformation into Cassava Bread**

The demand for cassava bread apparently exceeds the supply, both in large towns like Camp Perrin and Les Cayes, as well as in the rural areas from which the manioc come. A small manioc processing center in each of the three watershed areas would give a boost to the local economies as well as giving many rural households the possibility of starting small business outlets for baking the cassava bread. One mill could serve a large number of such households. A program would be needed to advance the credit necessary to enable some enterprising person of each area to set up the mill. Equipment and initial training can be obtained from the Camp Perrin Ateliers which produce the equipment needed (the manioc grinders, presses to squeeze out water). Though many mills run with small gasoline motors, hand driven models also exist which should be of particular interest in the rural areas. Assistance is needed to enable rural households to obtain the metal cooking sheets. More efficient wood burning ovens need to be introduced. Sources of wood need to be assured among the participating household. This should lead to increased agroforestry interests

among these farmers. Finally, farmers need to be helped in marketing the products in distant, more profitable markets. Households engaged in baking the cassava pancakes could also be assisted to develop new products for the market, using other locally available products as components (coconut, sugar). Increased marketing and markets for manioc products within rural communities like these should also have a positive impact on soil conservation efforts if the entire business is seen as inter-related and inter-dependent among farmers.

### **5.2.2 Castor Bean Oil Transformation**

Another small agri-business venture with some potential is the exploitation of castor bean oil for the export market, where it brings a good price (the in-country market is limited). The survey team found castor bean on many hillsides fields in this region, as well as in other areas surveyed (eg. Cap Haïtien and Mirebalais), and came to realize that this crop could also be an ideal component for inclusion in vegetative barriers. We were therefore interested to find that castor bean was considered an important cash crop in the Camp Perrin area and were impressed to find some farmers in the area (Gaita) who had actually planted this, on their own initiative, along with leucaena hedgerows, without any problem of competition. Castor beans produce quickly and year round, and will continue bearing for several years, eventually growing into a small tree which can be occasionally pruned for firewood.

Before major expansion of castor beans could take place in this region however, it would be necessary to identify a way to collect and process the beans for their oil, initially at smaller, rural processing centers, and later collected for bulking and refining for export. The Camp Perrin Ateliers has a manual press which can be used for extracting the oil, but it is expensive. The entire marketing issue needs to be examined more closely, with attention given to how farmers can most benefit from a farm-gate price which will encourage significant expansion of this as a cash crop. If this could happen, castor beans could become highly significant components of hedgerows and vegetative barriers. Their quick growing trunks would provide ideal supports against which dead vegetative material could accumulate along the contour, helping to build small terraces on the up-hill side of the barrier.

### **5.2.3 Processing and Transformation of Milk and Meat Products**

Because of the importance of cattle in this region, and because their presence has stimulated increased interest among farmers in establishing forage grasses, particularly napier grass, on their fields, increased efforts to increase the profitability of cattle to rural farmers could promote soil conservation on hillside fields. Efforts should be made to find ways to stimulate a dairy

venture in this region. Les Cayes and Camp Perrin are large enough to represent important markets for dairy products, and Port-au-Prince is not too far away over a paved road. Electricity is readily available in the Picot and Gaita areas and could be used to support a small agri-business venture for pasteurization and processing of milk products.

The value of meat products from cattle could also be significantly increased if technologies for preserving meat, for creating sausages, etc., could be introduced into the region. This is one tradition that does not exist anywhere in Haiti, yet whose introduction and adoption could have a profound impact on a country where refrigeration is so rare.

#### 5.2.4 Pest Control

This program would aim at combating the major pests that attack the main crops of the three zones. These crops are principally plantain, banana, sorghum, and pigeon peas. The pests are mainly Schaeffer larvae, mosaic virus, rats, and birds.

- A first approach would be for PADF, with its field agents, to help farmers to procure the materials (pump, pesticides) they need to effectively meet the problem. Simply helping to have the material available for farmers to purchase would be helpful.
- A second approach, supporting the first, would be for PADF or some other organization to help establish marketing channels within the three zones for such equipment and supplies. This might include extending credit to small merchants to get them into business, helping them to find suppliers and products, etc.

A pest control program in the region would require the means to get information out to farmers on methods, risks, and options they have for dealing with their specific problems. Merchants would also need to be helped in this regard. The region has a large number of mature neem trees and the seeds of neem have been shown to contain a high level of azadiractin, a biological insecticide which has proven effective for many kinds of pest treatments. PADF could show farmers how to collect and process the seeds, obtaining the oil themselves and using it for their needs. This could also stimulate increased interest in this fast growing tree as a component of vegetative barriers on many hillside fields, or on field borders.

### 5.2.5 Working Capital

We discussed earlier in the section under farmer opportunities that many farmers would like to undertake new activities, such as animal production and grain storage (for commercialization). Many of these activities, among the most profitable in rural areas, cannot be realized because interested farmers do not have the financial means to get into business. A credit fund could permit many such farmers to profit from these ventures, and help farmers escape the usurious credit schemes currently available (over 100% annually).

### 5.2.6 Possible Solutions to Increase Animal Production

Animal productivity could be considerably increased if efforts were focused on improved forage and reproduction practices for the key animals kept by Haitian farmers in this area. These efforts should be combined with the efforts being made to find appropriate vegetative material to use in contour barriers upon cultivated fields. Napier grass has been proven to be a much appreciated forage grass in the region. Better management of pastures should be encouraged and greater attention paid to including this grass within the vegetative barriers of soil conservation programs. Instead of bringing animals to the pasture for direct grazing, cut and carry practices need to be developed. This change of behavior will take time<sup>47</sup>. Though this is a supplementary effort for farmers, we believe they will do this if they can benefit through some kind of increased production (milk for example). By practicing cut and carry, farmers can regulate feed quantity and supply more animals. Appendix 3 provides further information on forage grasses available to animals in Haiti.

Though the survey team is not certain that this is feasible, improved reproduction through means of artificial insemination could have a dramatic effect on the quality of animal populations. This is particularly true if feed supplies could be improved and made more regular for reproducing females, and if farmers could be assisted in better predicting when their animals will come into heat, rather than reacting once they perceive this to have already happened. In all three areas, farmers noted a need for larger size cattle. One reason for this is the need for bulls as draft animals. A program in artificial insemination could help develop improved breeds of this kind.

At Gaita, rabbit hutches could be greatly improved through use of fibro-cement hutches developed in the Madian Salinac region.

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<sup>47</sup> One farmer we met at Fond des Frères, near Banatte, has developed the habit of cutting napier grass and bringing it to his two cattle every day. This grass constitute a supplemental feed for the animals (cf. also Photo 6C).

This would improve the sanitary conditions under which the rabbits are kept. It is also necessary to bring in new blood lines, because of the in-breeding which has been taking place over the past few years. Improved feed management, using cereal bran for example, particularly for reproducing females and young animals, would also greatly increase productivity.

#### **5.2.7 Land Tenure Issues**

Land tenure issues pose serious constraints to the motivation of many farmers to construct and maintain soil conservation structures on the fields they cultivate and manage. The issues are extremely complex and in many cases require some fundamental changes in land tenure policy at the national level. Planners have known for decades that land policy reforms are urgently needed but the political will for change has not yet developed. We would recommend that should the government of Haiti be able to begin to deal with some of these issues, that USAID and other donors should be willing to provide the support requested to help this difficult process along. One objective should be to provide the Haitian small farmer, who actually works and lives from the land, with greater security and rights to this land. This is particularly important for the hillside slopes, whose destruction through over-cutting of trees, over-cultivation and over-grazing place at risk so many other resources in the valleys and plains of the country.

#### **5.2.8 Innovation Incentives**

The survey team recommend that PADF initiate an annual or semi-annual competition among farmers in each of the three watershed areas. Rewards of cash, or some kind of agricultural implement, perhaps an animal, could be given to those farmers who, in the past year, have done the most to improve soil conservation on their hillside fields - preferably using vegetative barriers as recommended by the project. Prizes would go to those who have shown the greatest innovation and creativity in addressing problems faced by other farmers in creating such structures. Prizes would be given with under conditions of great publicity, where these fields would be visited by area farmers and discussions held with the concerned farmers about what they have done, and why. This could prove to be an effective means of both extending new ideas and for discovering new approaches with farmers as colleagues in the process.

### 5.3 A Unifying Theme for PADF Watersheds in the Camp Perrin Region

The farmer needs assessment team believes it is important for program efforts to be more focused within the watersheds in which it works in each region. A greater focus should be provided for the work of extension staff and technicians. They need to be shown how all the different things they are doing (in PLUS, not just PADF) are all actually linked to some over-arching objective and purpose. This is also important for farmers, as they observe program efforts in the area. This can be achieved by consciously linking program efforts to reach such common objectives. Such an approach is important in that it will also show to program leaders which efforts are not contributing to these objectives and which, perhaps should either be dropped, or better integrated into overall objectives.

The survey team has therefore proposed what we have termed "unifying themes" to tie together the different threads of PLUS project efforts. This region is the only one in which the survey team is proposing two sets of such unifying themes. This is because, after developing work on activities dealing with the major soil conservation possibilities in the region, we believed that a modification of the unifying theme developed for CARE in the Northwest for vegetable gardening would also be appropriate for many farmers in Gaita, Picot, and Banatte. Vegetable gardening also provide particularly important benefits to farmers. As in the Northwest, water for such gardens is frequently insufficient if one depends uniquely on rains. There is therefore a need for below ground cisterns.

In the first "unifying theme, presented in Table 24 below, we consider there to be seven components necessary for achievement of the soil conservation efforts which would be both sustainable and increase farmer productivity on hillside fields. Failure to address any of these components would, we believe, place at risk the success of the overall objectives towards which PLUS is working in this area. We wish to also stress that we do not expect these efforts to require additional project resources. Rather, current resources should become better focused, some of the monitoring efforts currently planned should be modified towards these efforts. Nor should data collection around these efforts be permitted to become excessive. Some of the extensionists, the monitoring personnel and the technician and agronomists should contribute time in support these efforts. And finally, research support and field supervision should be divided among the SECID Port-au-Prince staff.

The theme itself, "Leucaena/Napier Grass, Combined with Trees, as Principal Component of Vegetative Barriers with Long Term Manioc/Sweet Potato Ridges as Formal Components of Association" was built around the best soil conservation work local farmers do already (large, contour ridges on which are cultivated sweet potato

and manioc, the later in fields for a minimum of 1 year to 3 years). This is combined with a rotation of these kind of fields in a vegetative band configuration, separated by the leucaena hedgerows intercropped with other tree and plant species (eg. napier grass). Included in this theme would be an attempt to provide agro-industry assistance for transformation of bitter manioc into cassava bread, and castor bean (planted in rows with leucaena) transformation into oil.

Our recommendations for the establishment of vegetative barriers should provide farmer choice, and include plantain and sugarcane where possible, downplay leucaena but increase emphasis on grasses, and greatly increase help to farmers in obtaining bois blanc and other fast growing tree species as components of choice in the barriers. Farmers should also be encouraged to include a number of coconut and royal palm trees at various points along these barriers (which implies that these trees need to be included in the nursery programs, if farmers wish).

The second "unifying theme", presented in Table 25 below, concerns vegetable gardening. It has ten components which would need to be addressed by the project. Again, we believe that these components must be considered if efforts to establish vegetable gardens are to prove sustainable.

**TABLE 24: UNIFYING THEME: Leucaena/Napier Grass, Combined with Trees, as Principal Components of Vegetative Barrier, with Long Term Manioc/Sweet Potato Ridges as Formal Component of Association.**

UNIFYING THEME	COMPONENT	CONSTRAINTS RESOLVED BY ACTIONS	PROJECT ACTIONS TO BE TAKEN
<p>Hillside Cropping Associations: Crop Rotations Between: (1) Corn/Sorghum/Bean Pigeon Pea; (2) Short Fallow; (3) Manioc/Sweet Potato</p> <p>with Vegetative Bands of: Leucaena <u>and</u> Napier Grass (close parallel rows) with Bois blanc tree seedlings (every 2 meters) and Some Castor Bean Some Gliricidia Some Coconut Trees Some Other Trees</p>	1. Household Food Consumption	Need for food. Produce from area between vegetative barriers reserved for most important food crops.	Establish at least 20 on-farm, farmer managed, research/ demonstration trials with this unifying theme. Assist other farmers in area to establish these, if interested.
	2. Soil Conservation	Lack of vegetative cover on hillside fields. Soil erosion, decreased water infiltration, decreased productivity of hillside fields.	Establish shallow contour ditches along contour, creating small soil ridges, into which are planted both one row of leucaena and one row of napier, or other grass (on up-hill side).
	3. Agro-Forestry	Increased vegetative cover and long term productivity of hill-side fields.	Encourage farmers to select a number of both fast growing trees (bois blanc, bois capable), coconut tree seedlings (project supplied), castor bean, and other tree species to include scattered along the vegetative barriers. In furrow, plant every 2 meters tree seedling. Include castor beans (plant seed every 2 meters. Initially supply farmers of 20 trials the seed/plant material; initiate seedling development in nurseries for extended adoption.
	4. Animal Production and Forage	Need for forage material for increased animal production, higher quality feed for animals is particularly high in these regions; space is limited for animal pasturing	Forage material coming from the vegetative strips can become an important new source of feed, using cut-and-carry. No direct field pasturing.
	5. Marketing	Low productivity of hillside fields will be modified with higher production from protected soils; vegetative barriers will produce new crops (castor bean, lumber, fire-wood); increased manioc cultivation will generate new revenues.	Establish alternating crop production zones between the vegetative barriers; Band One with corn/bean/sorghum/pigeon pea; Band Two with sweet potato/manioc on contour ridges; every other band should always be in a field of manioc/sweet potato - providing long term vegetative cover and some protection from direct grazing by animals on part of each vegetative barrier. Provide assistance, where needed, in marketing key crops, seed banks, improved varieties, etc.

6. Agro-Industry	Farmers do not achieve what they might from the production of key crops. Incomes remain low and motivation to increase production thus limited.	Search for means to transform key crops grown in vegetative barriers. consider improved means of processing castor beans; consider assistance in establishing cassava processing cooperatives.
7. Project Information Needs for Monitoring and Evaluation	Lack of objective data on soil conservation measures which will significantly both raise hillside farming productivity <u>and</u> result in soil conservation and farmer sustainability.	Obtain detailed data on the 20 participating farmer fields concerning all activities undertaken, timing, costs, and production. Use of forage for animals. Value of animals benefiting.

**Table 25: UNIFYING PRINCIPAL THEME: BIO-INTENSIVE GARDENS (BIGS)**

UNIFYING THEME	COMPONENT	CONSTRAINTS TO BE RESOLVED	PROJECT ACTIONS TO BE TAKEN
<b>BIO-INTENSIVE GARDENS (BIGS)</b>  Spinach Cabbage Lettuce Tomatoes Eggplant Carrots Pois Souche Cantaloupe Melons Watermelon	1. Household Food Consumption	Need for food. Critical Food Supplement, Especially between major crop harvest periods.	Promote wide-spread adoption
	2. Seeds: Commercialization	Lack of Seed; Greater diversity of seed available; Seed source stabilized and Employment Generated; Area not dependent on project source of seed.	Set up several small enterprises (women) merchants to sell seed; Possible provide loan to start-up; Help develop contacts with outside seed sources; Help BIG households learn how to preserve their own seed.
	3. BIG Production: Commercialization (Key Constraint)	Reduce Risk of Over-supply in Local Markets; Diversify locations where produce may be sold.	Obtain wide range of vegetable varieties and dates of maturing; Help BIG farmers
	4. Basket Making: Commercialization	Poor Quality of Produce arriving at distant market (papaya, Francisque mango, eventual melons, etc.)	Help develop cottage industry in making appropriate containers from latannier leaves for long distance transport.
	5. Water: (Key Constraint)	BIGs often located at considerable distance from water, which is transported by children or a donkey; Few farmers have close access to streams; Insufficient water given to BIGs; Water a problem for livestock too.	Promote construction of very simple, below ground cisterns (low cost - without cement) to catch run-off from household yard; Train in more efficient means of BIG water use (evening watering; soil cover).
	6. Manure	Low soil fertility resulting in lower yields.	Demonstrating, through trials, importance of using animal manures; Advise BIG farmers on animal enclosures and staking for gathering manure; Improve manure quality through means of protection from sun/rain.
	7. Forage Crops	Farmers have critical need for animal forage for sheep and cattle; Money from BIGs will be used to purchase additional sheep = greater need for forage.	Farmers with BIGs should create vegetative barriers on hillside fields using guinea grass, tree seedlings (eg. bois blanc, neem), leucaena, & other herbaceous legumes <sup>1</sup> on contours on at least ONE of their major OWNED fields (with project help). Farmer will take measures to protect forage strips when fields are not in use.
	8. Pest Management	Extensive insect larval damage to vegetables; Reduced quality of product resulting in lower prices.	Instruct in methods to use neem kernel extract as an insecticide on BIGs; Collect neem seeds in area, if available, with BIG farmers; Encourage BIG farmers to plant neem trees on contour vegetative barriers.

<sup>1</sup> Eg. siratro, glycine, teramnis.

<p>BIO-INTENSIVE GARDENS (CONTINUED)</p>	<p>9. Agroforestry</p>	<p>Hillside soil conservation for serious erosion, need for cover crops; forage for livestock; increased water infiltration; increased food for consumption.</p>	<p>Availability of neem, napier grass, leucaena, castor and lumber trees for contour strips on hillside fields of BIG farmers. Establish nurseries with tree seedlings for these hillside fields.</p>
<p>BIO-INTENSIVE GARDENS (CONTINUED)</p>	<p>10. Project Information Needs for Monitoring and Evaluation</p>	<p>Data Collection on the 10 components of the BIG unifying theme for M/E purposes; objective to quantify benefits of system.</p>	<p>Data on BIG farmer use of time, water, and amount of produce sold and consumed; Data on costs of constructing simple cistern; Simple manual on preparation of neem kernel extract for application to BIGs and method of application; If small business set up for sale of BIG seeds, then collect data on numbers of farmers requesting seed, where they are from (extension), periods sought, varieties requested and purchased, and economics of business; Data on timing and quantity of forage obtained from BIG farmer fields, and monitor BIG livestock, destination of all manures; Select 10 Cooperating BIG Farmers per Micro-Watershed for this M/E Data Collection.</p>

APPENDIX 1 - CROP ASSOCIATIONS AND FREQUENCIES

Table 26A. Crop Associations and Frequency - Gaeta/Vachon (40 Fields Observed)

Associations	Observed Frequency	Slope <sup>1</sup>
sorghum	5	3-6
manioc (usually bitter)	1	5
grass (elephant, guinea, napier)	1	5
manioc,pigeon pea	2	3-5
manioc,corn	1	3
manioc,sorghum	1	3
corn, bean,sorghum	1	3
corn,pigeon pea,sorghum	12	3-5
corn,pigeon pea,manioc	1	5
corn,pigeon pea,grass	1	4
corn,pigeon pea,cowpea	1	3
corn,sorghum,pigeon pea,grass	1	5
corn,pigeon pea,manioc,lima bean	1	2
corn,pigeon pea,manioc,cowpea	1	3
manioc,sorghum,sweet potato,lima bean,banana <sup>(2)</sup>	1	3

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

<sup>2</sup> Banana and plantain are mixed in the same field.

**Table 26B. Crop Associations and Frequency - PICOT (46 Fields Observed)**

Associations	Observed Frequency	Slope <sup>1</sup>
manioc (usually bitter)	4	3-4
pigeon pea	2	3-4
grass (elephant, guinea, napier)	1	3
manioc, pigeon pea	6	3-4
manioc, sweet potato	2	2-3
pigeon pea, sorghum	1	5
manioc, grass	1	2
corn, sorghum	1	1
corn, pigeon pea	1	4
corn, pigeon pea, manioc	6	2-3
corn, pigeon pea, sorghum	2	2-3
corn, sorghum, pigeon pea, sweet potato	1	1
corn, pigeon pea, sorghum, manioc	1	1
corn, pigeon pea, manioc, sweet potato	2	2-3
manioc, pigeon pea, sweet potato	1	4
manioc, pigeon pea, grass	1	2
corn, pigeon pea, plantain, sugarcane	1	3
pigeon pea, plantain, sugarcane	1	2
corn, manioc, pigeon pea, grass	1	3
manioc, sweet potato, sorghum, squash	1	

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

**Table 26C. Crop Association and Frequency - BANATTE (37 Fields Observed)**

Associations	Observed Frequency	Slope <sup>1</sup>
sorghum	3	3-4
banana,plantain	1	4
manioc	5	3-4
grass	1	3
sweet potato	2	3
corn,sorghum	1	4
manioc,pigeon pea	1	2
sorghum,cowpea	1	3
pigeon pea,sorghum	1	4
manioc,sweet potato	1	4
corn,pigeon pea,sweet potato	1	3
corn,pigeon pea,lima bean	1	3
corn,pigeon pea,manioc <sup>2</sup>	1	3
corn,sorghum,cowpea	1	3
manioc, sweet potato,castor bean	1	2
manioc,pigeon pea, lima bean	1	3
corn ,pigeon pea, manioc,lima bean	2	3-4
manioc,pigeon pea,sorghum,lima bean	1	4
corn,pigeon pea,manioc,sorghum,lima bean	1	2
corn,pigeon pea,sorghum,lima bean	1	2-3

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

<sup>2</sup> Manioc is planted in a portion of the field only.

## APPENDIX 2 - LEEK GARDENS

Leeks are a cash crop cultivated near farm homesteads at the top of the low mountains of areas like Gaïta and Banatte, on limestone. Many women manage these fields as their only source of income. The survey team believes that better strategies could be developed for obtaining the needed seed each season, or better varieties. According to farmers, this crop which requires a great deal of attention and care. This crop has two main constraints according to farmers: lack of enough land near the residence, and lack of water. The cisterns proposed for unifying theme #2 could be one solution for the latter problem.

Leeks are cultivated without manure or chemical fertilizers, and without pesticides. Farmers have no problem selling all that they can produce, except during the parts of the rainy season, when leek production from other high land areas come on to the local markets (September-October, and February-March).

### Profitability

Table 27 below gives some data obtained from farmers interviewed concerning the economic costs and benefits of growing leeks in this area.

**Table 27. Leek Gardens.**

Item	Garden A	Garden B <sup>1</sup>	Garden C
Area/square meters	110	80	200
Age/months	18	22	5
Interval between harvests/month	4 - 5	3 - 5	not yet
<b>Budget/Cost and Sale</b>			
<u>Work time</u>			
Seeds/gdes	0	80	0
Soil preparation/hours	6	10	26
Planting/hours	6	10	28
Weedings before first harvest/hours	16	8	10 gdes (not yet harvest)
# work days (8 hours)	3.5	3.5	-
Sale/gdes (first harvest)	190	300	-
Margin	190	220	-
Margin by work day/gdes	54	63	-

<sup>1</sup> Gardens B, and C have same owner. This farmer believes that more people do not grow this crop because they don't know how.

APPENDIX 3. LIVESTOCK: ALTERNATIVE SOURCES OF FORAGE WITHIN HAITI.

Table 28: Grasses occurring spontaneously on fallows in Haiti

Latin name	Creole name	Animal
<i>Axonopus compressus</i>	Zeb si	Cattle-equine
<i>Anatherum</i> spp.	Jonc	Goat & Sheep
<i>Brachiaria reptans</i>	Zeb si	Cattle-Equine
<i>Chloris</i> spp.	Zeb pie poul Corde a graine	Cattle-Equine-Goat-Sheep
<i>Cynodon dactylon</i>	Chiendent	Cattle
<i>Dichantum eschaenum</i>	Zeb si	Cattle-Equine
<i>Digitaria</i> spp.	Zeb fine	Cattle-Equine
<i>Eleusine indicata</i>	Pied poule	Cattle-Equine
<i>Paspalum</i> spp.		Goat-Sheep-Cattle-Equine
<i>Setaria</i> spp.	Jonk madidak	Cattle-Equine-Goat-Sheep
<i>Schizachyrium</i>		Goat
<i>Sporolobus indicus</i>	Zeb fin	Cattle-Equine-Goat-Sheep
<i>Themeda quadrivalvis</i>	Madan Michel	

SOURCE: Manuel d'agronomie tropicale appliquee a l'agriculture haitienne. GRET/FAMV, 1990

**Table 29: Tree forages used in Haiti**

Latin name	Creole name	Animal
Acacia	Acacia	Cattle-Equine
Centrosema virginipanum	Campeche	Cattle-Equine-Goat-Sheep
Prosopis	Bayaonde	Cattle-Equine-Goat-Sheep
Calotropis procera	Coton soie	Goat-Donkey
Capparis spp.	moutade	Goat
Crescentia	Calebassier	Goat
Eupatorium odoratum	Langui-chatte	Goat
Guazuma ulmifolia	Bois d'orme	Cattle
Lantana spp.	Ti chic-chi	Goat
Mangifera	Manguier	Goat-Sheep-Cattle
Ocimum nimanthum	Basilic marron	Goat
Persea americana	Avocatier	Goat
Pisonia spp.	Case zo, croc chien	Goat
Ruellia tuberosa	pet pet	Goat
Spondias purpurea	Sirouel	Cattle
Tournefortia	Chic Chic marron	Goat-Sheep-Cattle

SOURCE: Manuel d'agronomie tropicale appliquee a l'agriculture haitienne. GRET/FAMV, 1990

**Table 30: Other Herbaceous Plants on fallows in Haiti**

Latin name	Creole name	Animal
Desmodium spp.	Cole-Cole	Cattle-Equine-Goat-Sheep
Rhynchosia minima	Pistache marron	Cattle-Equine
Bidens pilosa	Pied poule-Zegui	Cattle-Equine
Boreria laevis	Koupe kolon	Cattle-Equine
Brassica spp.	Moutade jaune	Cattle-Equine
Callisia rotundus	Zeb dio	Cattle-Equine-Goat-Sheep
Cyperus rotundus	Zeb si - Afio	Cattle-Equine-Goat-Sheep
Euphorbia spp.	Boua let	Cattle-Equine
Malvastrum americanum	Zeb bale	Cattle-Equine
Sida acuta	Balai	Cattle-Equine

SOURCE: Manuel d'agronomie tropicale appliquee a l'agriculture haitienne. GRET/FAMV, 1990

APPENDIX 4: PHOTOGRAPHIC OVERVIEW OF SITES VISITED

# 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.
2. *A Review of PDAI and ADS II Project Technologies.* by Marianito R. Villanueva. 1993. 31 pp.
3. *Monitoring and Evaluation System for PLUS.* by Angelos Pagoulatos. 1993. 53 pp.
4. *Rapport sur les Recherches d'Opportunités de Commercialisation pour les Produits Agricoles dans les Aires d'Intervention du Projet PLUS.* by Henry Jude Bélizaire and John Dale (Zach) Lea. 1993. 61 pp
5. *Guide to the Literature and Organizations involved in Agribusiness Research and Agribusiness Development in Haiti.* by Henry Jude Bélizaire and John Dale (Zach) Lea. 1993. 46 pp.
6. *Evaluation of Tree Species Adaptation for Alley Cropping in Four Environments in Haiti. A. Establishment Phase.* by Dennis A. Shannon and Lionel Isaac. 1993. 90 pp.
7. *Farmer Needs Assessment Exploratory Surveys: Executive Summary and Recommendations.* by Richard A. Swanson, William Gustave, Yves Jean and Roosevelt Saint-Dic. 1993. 53 pp.
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.
11. *Farmer Needs Assessment Exploratory Surveys: PADF Jacmel Region 2.* by Richard A. Swanson, William Gustave, Yves Jean and Roosevelt Saint-Dic. 1993. 84 pp.
12. *Farmer Needs Assessment Exploratory Surveys: PADF Mirebalais Region 3.* by Richard A. Swanson, William Gustave, Yves Jean and Roosevelt Saint-Dic. 1993. 91 pp.
13. *Farmer Needs Assessment Exploratory Surveys: PADF Les Cayes Region 1.* by Richard A. Swanson, William Gustave, Yves Jean and Roosevelt Saint-Dic. 1993. 84 pp.
14. *Food Marketing in Northwest Haiti: CARE Regions I-IV.* by Curtis M. Jolly and Melta Jean-Louis. 1993.

**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.

**SECID/Auburn Agroforestry Reports**

Report  
No.

1. *Tree Planting in Haiti: A Socio-Economic Appraisal.* By Donald R. Street. 1989. 48 pp.
2. *An Interim Report on Influences of Inoculation with Nitrogen-Fixing Symbionts on Reforestation Efforts in Haiti.* by R. Kent Reid. 1989. 13 pp.
3. *Short-Term Seedling Field Survival and Growth as Influenced by Container Types and Potting Mix.* By R. Kent Reid. 1989. 46 pp.
4. *Seedling Growth and Development in Different Container Types and Potting Mixes.* By R. Kent Reid. 1989. 15 pp.
5. *Microsymbiont Colonization and Seedling Development as Influenced by Inoculation Method: Rhizobium and Frankia.* by R. Kent Reid. 1989. 15 pp.
6. *The Charcoal Market in Haiti: Northwest to Port-au-Prince.* by Donald R. Street. 1989. 26 pp.

7. *Haiti Regional Tree Nursery Cost Study.* by R. Kent Reid and Donald R. Street. 1989. 19 pp.
8. *The Pole Market in Haiti: Southwest to Port-au-Prince.* by Donald R. Street and Philippe A. Bellerive. 1989. 21 pp.
9. *Socio-Cultural Factors in Haitian Agroforestry: Research Results from Four Regions.* by Paul D. Starr. 1989. 61 pp.
10. *Impact des Haies Vives sur la Production Agricole.* by Pierre M. Rosseau, Gene A. Hunter and Marie-Paule Enilorac. 1989. 14 pp.
11. *Outline of Techniques for Use in Studying Agroforestry Hedgerows and Alley Cropping Systems in Haiti.* by A.G. Hunter, Pierre M. Rosseau and Marie-Paule Enilorac.
12. *Pathology of Nursery Seedlings in Haiti: Diseases, their Etiology and Control.* by G.B. Runion, R. Kent Reid and Walt D. Kelley. 1990. 29 pp.
13. *Technical Constraints in Haitian Agroforestry: Research on Tool Use and Need in Two Regions.* by Paul D. Starr. 1989. 51 pp.
14. *Financial Analysis of Selected Tree Operations in Haiti's Northwest and Central Plateau.* by Donald R. Street, Arthur Gene Hunter and Philippe A. Bellerive. 1990. 36 pp.
15. *An Explorative Approach for assessing Soil Movement in Hillside: Applications for Hedgerow Performance.* by Marie-Paule Enilorac, Pierre M. Rosseau and Arthur G. Hunter. 1990. 20 pp.
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.
24. *Effects of Seed Treatment Methods on Germination of Simarouba glauca var. Latifolia Cronq.* by Fritz Vaval and Joel C. Timyan. 1990.
25. *Time Rate of Discounting and Decisions of Haitian Tree Planters.* by Donald R. Street. 1990. 17 pp.
26. *First-Year Seedling Field Survival and Growth as Influenced by Planting Stock Type.* by R. Kent Reid. 1991. 65 pp.
27. *A Financial Analysis of Selected Hedgerow Operations in Haiti's Southern and Northwestern Regions.* by Philippe Bellerive. 1991. 31 pp.
28. *Alternative Techniques for Propagating Planting Stock: II. Small Plastic Bags.* by R. Kent Reid. 1991. 15 pp.
29. *Agroforestry Knowledge, Attitudes and Practices in Northwest Haiti.* by Paul D. Starr, Sigrid d'Aquin and Kathleen L. Rorison. 1991. 75 pp.
30. *The Effects of Alley Cropping and Fertilizer Application on Continuously-Cropped Maize.* by Dennis A. Shannon, Wolfgang O. Vogel and Kapinga N. Kabaluapa. 1991. 24 pp.
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  
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