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FINAL REPORT

Prepared for the
Division of Natural Resources of the Department of Agriculture
Government of Haiti

and the
United States Agency for International Development
(USAID/Haiti)

by

Michael D. Stapleton
Soil Conservationist

On USAID Personal Services
Contract (AID-521-77-22)

(This report has also been prepared in French)

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On the district level, the contractor appreciates the kindness and courtesies of the Staff of the Les Cayes District Office and thanks Max Mondesir (Agronome de District) and William Timmer in particular. In Jean Rabel, praise and thanks go to the various contractors (and their counterparts) who took the trouble to assist the author during his visits. John Johnson, Doug Lantagne, Matthew Anderson and David Grant (all with HACHO) were particularly helpful.

Most praise of all must go to the Technicians, Animators, and Agents, working in both areas (Les Cayes and Jean Rabel) of which Joseph Gaspard Brice stands out above the others as an individual of exceptional talent. His soft-spoken, yet firm approach to the motivation of the Acul Watershed inhabitants - and their warm response to him - has assisted the contractor more than any other factor in gaining understanding of the problems, setting up a training programme, and implementing a balanced work plan.

Finally, the author thanks the hundreds of watershed folk (in the Acul Watershed) for their many kindnesses and hospitality (to himself) and especially lauds their enthusiasm in their attempts to develop, and generally improve their lot.

INTRODUCTION

This was a Personal Services Contract of twenty-four (24) months to provide technical assistance to the Department of Agriculture in erosion control practices and procedures.

Twenty four months are hardly long enough to plan a Watershed protection programme (and without the assistance of a geologist, hydrologist and range management specialists; with only limited assistance from forestry and engineering specialists) and implement that programme in a "model" subcatchment of 400 hectares: let alone the Acul Watershed area of over 8400 hectares and the Jean Rabel Watershed (some 450 Km. away!) of 3000 hectares.

It is foolish to assume that the many acutely eroded hillsides of Haiti can be cured by paying peasants (cash payment or food) to construct hundreds of linear kilometers of rock walls, or to plant millions of trees. Whole hillsides, ridges, slopes and valleys bear witness to these crumbling monuments of stupidity and lack of foresight: walls which may have delayed the inevitable erosion for a while before being overwhelmed - for a new, and often more serious, threat of rilling and gullying; trees (with high mortality rates due to neglect) ill-planted and all too often assisting the erosion process.

The main result is that the PEOPLE who inhabit those hillsides - who scratch a living from small plots of land (to which they may or may not have title) - have had their cultivable area reduced, while the erosion continues. Maintenance of the physical structures is neglected, trees are "pruned" if not cut down altogether and the peasant continues to cultivate the steep slopes.

One should not express surprise to find, in areas where a Development Project (including land rehabilitation) has "operated and departed", whole stretches of accelerated erosion despite rows of neatly planted trees. Nor should one be shocked to find that physical structures have come tumbling down. For that is the reality of Haiti - a country riddled with failed projects, poorly planned and poorly executed programmes: failing to recognize the facts that only a balanced programme containing physical, vegetative and cultural treatments - balanced with a sound long-term programme of education, research and demonstration - involving the peasants' participation when they realize the project is for their own short and long term benefit.

People must come first! Watershed inhabitants see the effects of erosion, the loss of fertile topsoil and the decrease in yields. But they do not always see the connection between the three. They can be convinced by education and carefully selected extension programmes, combined with sound demonstrations based on research. Control of erosion may be only of secondary importance to him when he sees improved yields, due to deep-ploughing practices, composting and mulching, use of fertilizers and insecticides. But use of the correct physical and vegetative structures - when the peasant learns to manage his soil and water - will bring the lasting long term benefits to him and his family, his village, the watershed and to Haiti.

In spite of the brief period available, the author has adhered to the purpose of the Contract and to the Statement of Duties. Much time was necessarily given to the organizational work: demonstrations, evening meetings, formation and training of community councils and village priority projects (access tracks), as well as learning to understand the problems, and finding ways to solve them.

The Watershed Plan has not been finalized, the work achieved remains somewhat fragmented and uncoordinated.

The contractor terminates without a replacement, and leaves the burden on the shoulders of a few dedicated (but somewhat discouraged) animators and agents to build upon the shaky foundations established.

Worse, the Project is doomed to failure. Ex-Staff members of a certain entity* continue programmes in the same watersheds - poorly conceived programmes with many of the ingredients of failure as applied to other disastrous projects. This entity has already deceived some of the community Councils with their rash, ill-judged plans of work and strategies.

Thus the contractor terminates with mixed feelings: elated at the growth of the community groups and their response to the original programme; but disappointed at the thought of those same people being deceived by the short-term ambitions of the seemingly insincere, and most incompetent, agronomes who now work in these watersheds and press ahead with their ill-balanced programmes.

* The entity is PDAI - the Project de Développement Agricole Intégré, which operates as an independent authority in four (4) of the Agriculture Districts.

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SECTION 1: BACKGROUND

With a per capita income estimated at \$140 (and much less than the national average in rural areas), Haiti continues as the poorest country in the Western Hemisphere. A recent study indicates that the Haitian people consume an average of 1850 calories per day, one of the lowest caloric intakes in the world. Protein and fat consumption are equally deficient amounting to two-thirds (2/3) or less of the normal requirements. Nutritional deficiencies, thus, are a major factor affecting worker productivity in Haiti. They also constitute a serious health hazard and directly contribute to an infant mortality rate that is 33 times that of the developed countries. The annual population growth rate is slightly more than 2%, excluding net emigration. The 5 million estimated population results in one of the highest densities in the world, and only slightly less than that of India.

The land area of Haiti equals approximately 25 500 Km² (roughly one-third (1/3) the size of Ireland). Of the total land area of about 2 800 000 hectares, only 148 000 hectares are level or nearly so and, therefore, suitable for intensive cropping without special treatment. Actually, nearly, 1 600 000 hectares are cropped and signs of deterioration in the country's physical resources are evident everywhere. Erosion is not only evident, but is proceeding at an alarming rate.

The Haitian Government's Five Year Plan (in the agriculture sector) lists priorities as:

1. Improvement of the socio-economic position of the rural population and the reduction of urban migration.
2. Investments into activities which increase production and which increase the efficiency of the use of land and water.
3. Development of human resources and the creation of employment.
4. Promotion of economic growth in the rural sector and reduction in urban/rural disparities.

A. The Integrated Agricultural Development Project

The goal of the project is to increase the production, productivity and incomes of the small farm sector in Haiti. Per hectare yields in Haiti are presently among the lowest in the world, a fact attributable primarily to the primitive state of agricultural practices in Haiti's small farm sector. It is therefore anticipated that, in the Haiti context, relatively modest improvements in the agricultural technology applied by small farmers can provide significant improvements in crop yields.

The resources and services to be incorporated into the programme include the following functional areas:

Irrigation, Soil Conservation, Research and
Development, Agricultural Extension, Agricultural
Credit and Agricultural Training.

The project will provide financing for technical assistance, participant training and commodities to develop DARNDR's* capacity to carry out soil conservation programmes.

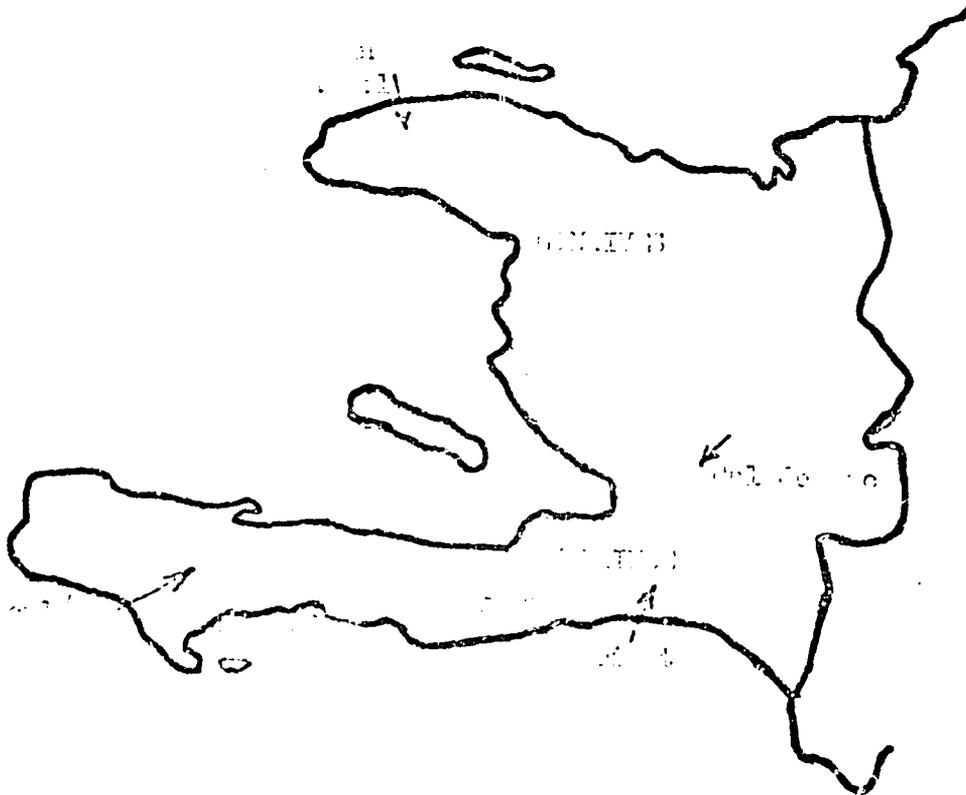
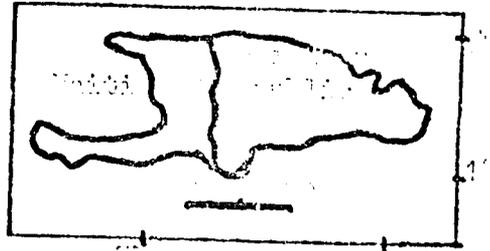
The geographic focus of the project is on irrigation systems and their (upland) watersheds located in four (4) regions in Haiti: Les Cayes (Dubreuil), the area East of Jacmel, (Marigot-Seguin), The Cul de Sac area (Thomazeau) and the North West (Jean-Rabel).

* The Haitian Department of Agriculture.

DARNDR- Département de l'Agriculture, des Ressources Naturelles
et du Développement Rural

HAITI

The 4 zones of the Integrated Project.
Les 4 zones du Projet Intégré (PII)



B. The Period July 1977 to April 1978

This was the period when the contractor, following the provisions of the Contract, moved to Les Cayes to set about his task. Having been briefed at length in Port-au-Prince and having obtained maps (aerial photographs were available, but were found to be unsuitable) the author prepared a personal timetable in order to produce a draft document "A Proposal for the Protection of the Acul Watershed".

The initial visits to the Acul Watershed were somewhat demanding! Apart from the work being done on the rehabilitation of the irrigated area by the J.G. White Corporation (with DARNDR) nobody had really ventured into the upper watershed to gather data. The Acul Watershed, above the Dubreuil Irrigation barrage, has an area of some 8400 hectares, mainly steep slopes with many creeks (ravins) and practically devoid of access except for pedestrians. Thus the author made most of his early reconnaissances on foot: into the sub-catchments of the Ravine aux Indes and into the hills of Bois Gerard, Bois Pagnol, Baron and Toro - and upwards to Daronceley; along the eastern bank of the Acul River to the Communal Forest above Madame Jacquot; along the western bank to Le Pretre and the source of the Acul - exploring at length the steep slopes of Tête a Boeuf, the erosion-plagued sub-catchment of the Ravine Caiman and up onto the plateau region of Les Platons.

It was a question of learning as much as possible about the Acul Watershed to acquire a good understanding of what had caused the environmental destruction. The long hikes were essential to understand the problems and the people of the region. It was deemed necessary to learn first hand all about the community groups functioning in the area, to attend their meetings and to seek the help of community development organizers. (it was at this stage that the contractor made contact with Gaspard Brice, who greatly assisted the author's acceptance by the community groups). Success or failure was to depend as much on the motivation of organization of the people as on the choice of technical approach.

Having reconnoitred the Project area, the author then proceeded to become familiar with soil conservation techniques employed in the Les Cayes area: to try to determine what had worked and why - also to consider alternative approaches.

The next steps were to review, evaluate and build upon the "avant-projet" paper of Agronome Joseph Wainwright - "Protection et Aménagement du Bassin Montagneux de l'Acul" -. There was no good reason to suggest changes in the "avant-projet" document: simply to elaborate upon it, and spell out the approaches.

During this period, the author became acquainted with another Personal Services' Contractor (Forester Kevin J. Mullally) who had spent almost nine months in Les Cayes; Agronomes Fritz Marcelin and Saurel Felix, who had both worked on the EDAPS (FAO and DARNDR) project in the soil conservation/reforestation discipline. The author gained much useful information from these persons and finally, prepared a comprehensive programme. This was submitted (in draft) to the ADO Office (Project Officer) USAID. The paper closely adhered to Agronome Wainwright's document, yet kept in mind USAID's basic concerns that (i) community groups be heavily involved, and (ii) the programme be identified with the Department of Agriculture, rather than USAID.

The draft document was submitted in October, but was not completed for several more months. New - often contradictory - information was gained from week to week. Issues - such as the diverse land tenure patterns in the Acul Watershed - required extra study. So the document began to develop into a really comprehensive project proposal.

Unfortunately, there was very little input-participation from the staff at the Department of Agriculture when the paper was being prepared, and being further built upon, at USAID Port-au-Prince. The author had followed Agronome Wainwright's paper, as - when originally briefed - he was informed that the provisions of the Integrated Agricultural Development Project paper (commonly referred to as the "Green Book") were only "loose guidelines" and required numerous modifications. Thus the author almost entirely ignored the "Green Book". The Project Proposal (for the Acul Watershed) stressed how this one region would be tried as a pilot watershed. As the project implementation was to get under way, and problems met and solved, were the other three PDAI zones to come into focus. A sound approach being applied in the Acul region could then be utilized, with a minimum amount of alterations to suit local conditions, as a model for those other regions.

In late 1977, the Department of Agriculture named Agronome Saurel Felix as Project Director. Having specialized in the field of soil conservation, Agronome Felix and the author then had the opportunity to co-operate closely, although there were no suggestions of having an expert-counterpart relationship. Agronome Fritz Marcelin and the other contractor worked together on the nursery programme.

In April 1978, the Integrated Agricultural Development Project (PDAI) began its activities, and from this point onwards confusion arose. The author, having spent so many months involved with developing proposal document for the Acoul Watershed - a document as yet not completed as so many issues had not been finalized - was naturally indignant, and shocked, to see a Project commence activities when the planning stages were not completed! The "Green Book" became the Project Document, and PDAI staff were appointed to the four Project zones. The Acoul Watershed was no longer to be a "Pilot area". All previous studies and issues (the payment issue in particular) were swept aside as the PDAI entity planned and budgeted. Worst of all, from the contractor's viewpoint, no constructive response came from the Project Office (ADO) in the USAID office; who presumably agreed to the PDAI set up.

C. The situation Since April 1978

The confusion continued.

Staff members of the PDAI institution, a separate entity within the Department of Agriculture (supposedly to strengthen the Districts) were appointed. In Les Cayes, the previously-nominated Project Director, Agronome Saurel Felix, now became "Chef d'Activites" for Soil Conservation, Agronome Fritz Marcellin was transferred to another PDAI zone, at Marigot. Other "Chefs d'Activites" were appointed for the other disciplines - irrigation, extension, research and community development.

Four technicians previously attached to the FAO project in Les Cayes, who had expected to form part of a watershed-based team under the supervision of Agronome Felix and the author, were "absorbed" into the local PDAI structure. One of these technicians had been on the payroll of the Forester, Kevin Mullally, and had supervised operations at the Levy Nursery. The other three technicians had had some experience with the construction of soil conservation structures. In the Project Proposal, a Training Course was planned for these technicians. The author requisitioned Motor-cycles for the technicians. Somehow both technicians and motor-cycles were "pirated" by PDAI after Agronome Felix became Chef d'Activites for Soil Conservation.

The lines of authority were never clear. The role of the Directeur des Operations for PDAI Les Cayes (Agronome Jean-Fritz Boutin) vis-a-vis the District Agronome, was not clarified. To the present date, distrust exists between several of the District Staff and the PDAI staff. The author, on contract to USAID to assist the Division of Natural Resources of the Department of Agriculture, found himself in a strange limbo situation: still awaiting the Project Proposal to be approved, with such delicate matters as payment (for the community council groupements' workers) unresolved - yet witnessing the Integrated Project's activities commence" with the decision to pay the groupements \$1.60 per day on the 3 - 1 - 1 system*.

* 3-1-1 System: a 5 days working week, of which 3 days salary paid directly, the 4th day salary paid into the Community Treasury. The 5th day to be worked voluntarily.

The hitherto good relations between Agronome Felix, Kevin Mullally and the author (as colleagues and "counterparts") disintegrated. Agronome Felix was requested to prepare a Plan of Work for the period 1 June to 30 September 1978 (although it was never made clear to either of the contractors who requested this Plan). The author had suggested the Toro area of the sub-catchment of the Ravine aux Indes as a good area to commence implementation, as there were active Community Councils in the area, whose groupement workers had been enthusiastic about constructing an access track 5 Km. from Dubreuil to the Chapel at La Rose.

The Toro area (400 hectares) was reconnoitred. A lot of useful information was gathered together. Kevin Mullally provided a list of varieties (and numbers) of trees available for transplanting and it seemed a reasonable Work Plan could be drafted. Not only did he compile a paper which both differed, and omitted information, from the draft decided upon - Agronome Felix presented his Plan of Work* "signed" by Felix, Mullally and the contractor himself although the last two persons had not seen his final typed Plan; let alone signed it! Both Mullally and the author were naturally indignant when they received copies of the plan in mid-June. Agronome Felix had been in a hurry to present his work plan - it is interesting to note that the actual work realized, even after a few weeks, bore little relation to the Work Plan!

The works (Soil conservation structures) continued in the Toro area for several months - the groupement workers were awed by the inflated 8 gourdes per day ** (\$1.60) but were amazed that the payment for the Community Treasury had not come after some five months of work. The inhabitants of the other side of the same sub-catchment were even more surprised when they were informed that they would not be included in the treatment of the sub-catchment: part of the area was to be treated only. This was further reduced when PDAJ decided to treat "critical areas" only of the Toro area.

* Ref. 1 DOC 78/Les Cayes, 2 June 1978

** Agricultural workers (coumbites, etc.) are usually paid 2 gourdes per day in the Les Cayes region.

This was even further reduced when PDAI decided that all work done to date (to December 1978) was "demonstration" only! So, instead of a sub-catchment being treated, PDAI decided on certain areas only, further decided on the "critical" parts of these areas, and even further decided to limit the treatment of these "critical" zones to a few demonstrations! This fragmented approach, coupled with the decision to pay groupement workers * put the PDAI "conservation" plan on the sure road to failure.

The author returned from Home-Leave in July 1978 to find groupement workers - assisted by the three soil conservation technicians, and supervised by the Chefs d'Activites for Soil Conservation and Community Development - engaged on the construction of stone-walls. As confused as ever, the author decided to visit the Jean Rabel Watershed and attempt to start afresh. The situation in Jean Rabel was equally confusing!

In June 1978, PDAI** had visited the Project Offices (ADO-USAID) to explore the possibility of the contractor devote part of his time to the soil conservation activities of the Integrated Agricultural Development Project. The Project Officer replied that USAID was not opposed in principle so long as it did not detract from the successful accomplishment of the tasks set forth in his (the author's) contract. Furthermore, any assignments in districts other than Les Cayes and Jean Rabel would have to be for well-defined purposes and short periods.

Thus USAID still regarded the author's contract as being connected to the Department of Agriculture's programmes, and not the Integrated Agricultural Development Project! The Integrated Project was involved in the Acul Watershed - the Department of Agriculture (Les Cayes District Office) was not. The author had spent several months "participating" with the preparation of a Project proposal but, the Integrated Project was in action already! The author never understood why a meeting*** was held in June 1978, in Damien, to discuss a revised draft of the "Plan for Protection of the Acul Watershed". Nothing of value came from that meeting. In fact the "Plan" is all but shelved,

* Not all Community Council members were groupement workers. Many members were naturally annoyed that they were not chosen for the gangs. Non-Community Council members did not form part of work gangs.

** Agronome Yves Guery, National Soil Conservation expert.

*** In attendance Agronome Guery & Felix, Mr. Gaspari Brice, Messrs. William F. Sugrue (USAID) and Kevin Mullally, and the author.

having remained uncompleted for several months. By late 1978, the "Plan" still required a Budget - although several draft budgets were discussed and, presented during the year.

In August 1978, the Department of Agriculture (and PDAI) studied the author's contract for, as it seemed, the very first time. Having completed more than half of his contract, it was bizarre that the PDAI administration (and not the Division of Natural Resources, nor USAID) requested modifications to the author's duties. PDAI requested that both contractors assigned to Aux Cayes should be based in Port-au-Prince and should assist PDAI with planning. A draft letter, in English, was sent to Agronome Guery on 13 August 1978 and the necessity of a revised role for the contractor discussed. The contractor had never received a reply to that letter, nor has the matter ever been further discussed!

Fortunately, following several changes of personnel in the ADO office of USAID, the contractor was given verbal clearance to go ahead, ignore PDAI, and follow the Statement of Duties as laid out in the Contract 521-77-22. Further, the contractor "was to remain in Aux Cayes", the Jean Rabel zone being neither organized nor adequately staffed to set up a programme.

That is the "background", and that is why the contractor has operated virtually alone - (although alongside the PDAI agronomers!) - in the Acul Watershed during late 1978, up to mid-1979: following the provisions of his contracts.

If that "Background" seems disjointed and confusing - well, that is exactly how the contractor experienced it, something akin to a jigsaw puzzle without all its pieces.

SECTION 2: THE CONTRACTOR

The contractor (and author of this report) is Michael David Stapleton, a citizen of Ireland. He completed his schooling in Ireland, and his training (as a Soil Conservation Technician) with the Soil Conservation Service of the State Government of Western Australia.

The contractor gained further experience in Rhodesia and Botswana, and served as a volunteer in Lesotho for APSG */GORTA**/UN Volunteers on a FAO/Government of Lesotho integrated Agricultural Project. (APSO*, Agency for Personal Service Overseas; GORTA**, the Freedom from Hunger Council of Ireland).

This was the author's first "Personal Service" contract. He believes that one of his greatest assets is his willingness to operate "on the peoples' level" - in, or close to, the watershed itself; to motivate people and guide them "with their own enthusiasm" towards improved techniques rather than imposing "methodologies", "strategies" and "projects" upon largely illiterate mountain folk. The response given his plan was proof enough that his approach was both workable, and of value.

The author is aged 31 (and 10 months) and is married.

The Contract: A Personal Services Contract with the United States Agency for International Development (USAID), No. AID 521-77-22 for Agricultural Development support, an estimated Contract amount of \$ 54,000 over 2 years between 29 June 1977 and 28 June 1979. The purpose of the Contract was to provide assistance to the Department of Agriculture, Natural Resources and Rural Development (DARNDR), Government of Haiti, in erosion control practices and procedures.

Statement of Duties: The contractor was to work in the Acul, and Jean Rabel River Watersheds to:

1. Install the necessary physical and vegetative water control structures to reduce erosion and conserve soil in as far as possible.
2. To train and motivate farmers to install and maintain these structures.

3. To train farmers to adopt proper cultivation practices with present and introduced crops.
4. To cooperate with, and train Haitian agronomists to carry on this type of work.
5. To cooperate with the nursery supervisor in the overall watershed protection programme.

SECTION 3: THE ACUL WATERSHED

The Acul River is approximately 28 Km in length from its source, Tête l'Acul*, to where it enters the Caribbean Sea near to Carrefour Joute (on the Les Cayes-Port Salut Road).

The Acul flows irregularly during the dry season, and frequently "disappears" into its bed of limestone - to "re-appear" at intervals further downstream. During the rainy season, the river becomes a raging torrent: carrying huge volumes of water, vegetal matter, rocks, sediment and soil. Its two main tributaries, above the Dubreuil dam **, the Ravine Casse Cou and the Ravine Blanche, are dry for most of the year - but transport the greater part of the Acul's flood load during periods of intense precipitation.

The Watershed area, above the irrigation dam, covers an area of about 8 400 hectares: consisting of rugged, bare and deforested mountains, with narrow and steep valleys. At its highest point, the Watershed reaches an altitude of 1 900 meters above sea level.

The inhabitants (population approximately 12 000) of the Watershed are semi-subsistence*** farmers. Their plots of land range in size from "one thirty-second" (of a carreau) to as many as 10 carreaux.

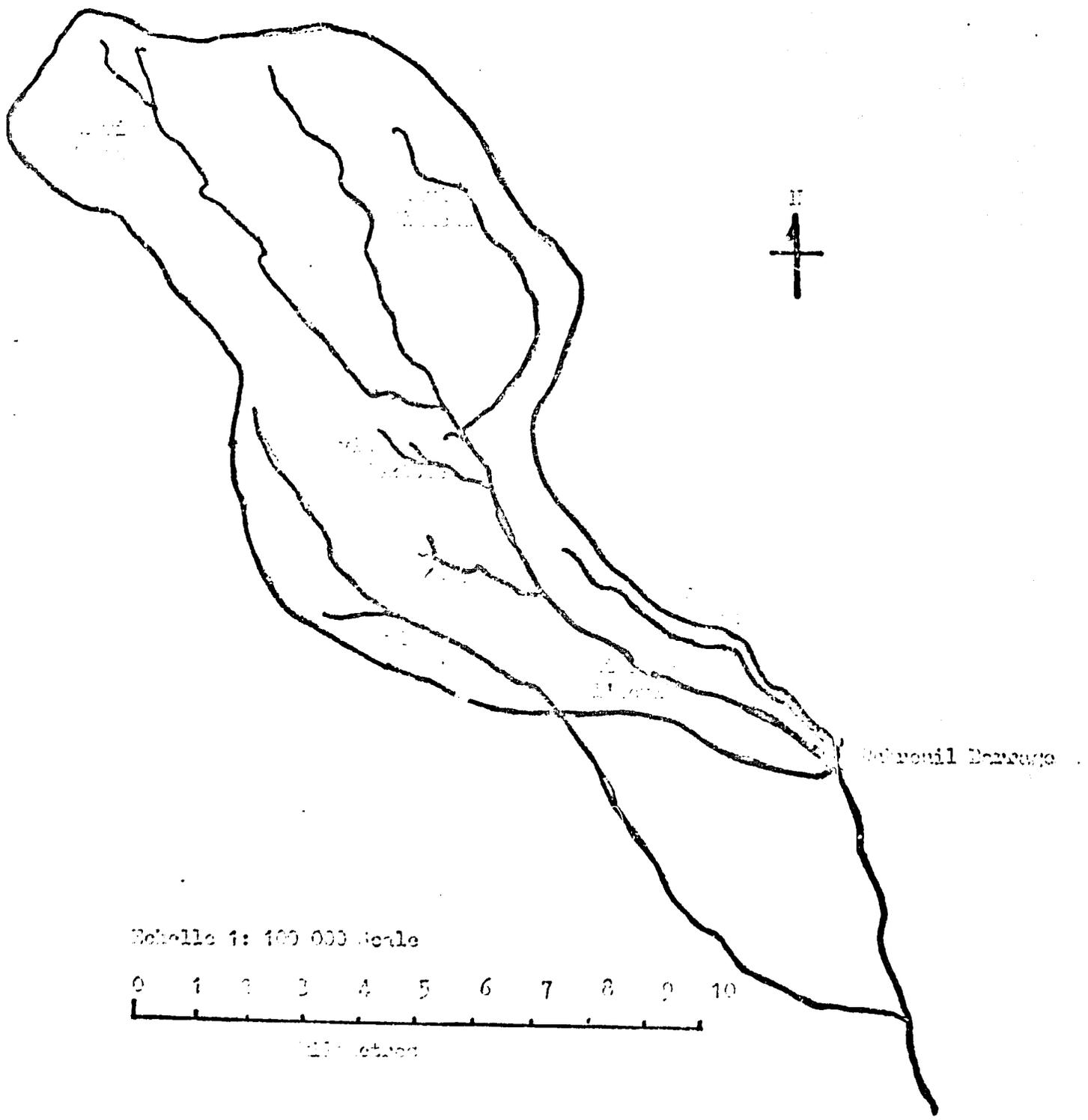
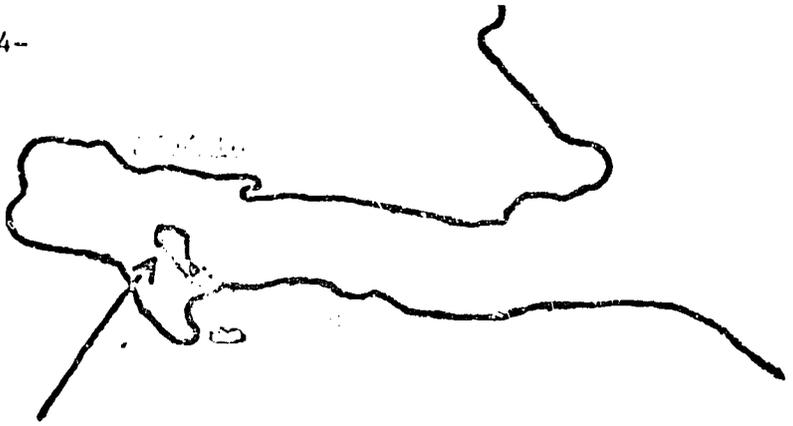
* Tête l'Acul: a spring, or "blue hole", some 4 Km north of Le Pretre; at an elevation of 300m above sea-level.

** Dubreuil Dam: the top of the irrigated area being rehabilitated. Now part of the PDAI project.

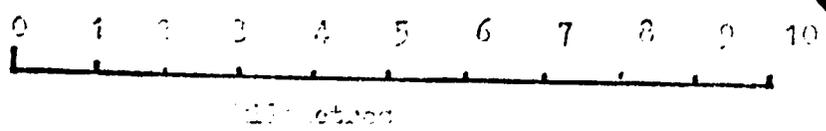
*** For various reasons, the farmers are only partly subsistent. A portion of most crops is sold at market in order to purchase other foodstuffs.

.....

Le Bassin Versant de l'Aoul
 The Aoul Watershed



Echelle 1: 100 000 Scale



An average farmer is likely to farm - but not necessarily own! - four or five plots, of a combined total of about 2 carreaux*. The majority of farming takes place on steep slopes - better suited for forest and range-pasture. The watershed is being deforested - (certainly not at the same rate of many other parts of Haiti) - particularly on the upper slopes of the Massif, below Pic Macaya. The hauling of freshly cut pine planks by mule is a familiar sight in the watershed: pine planks en route to the timber merchants in Les Cayes. Older watershed inhabitants can point out slopes being farmed as having had forest cover during their childhood.

A great deal of the sedimentation has been caused by stream bank erosion rather than serious soil erosion on the deforested slopes. Gullying has only been observed in a few critical pockets, in particular in the creeks which feed the Ravine Casse Cou in the upper catchment; and to a lesser extent in the Ravine Blanche and the subcatchment of the Ravine Caiman, above the village of Caiman itself. But sheet, and accompanying rill-erosion is all too evident: large areas of rocky waste and shallow soils almost down to bedrock. Most of the fertile topsoil has been long since deposited in the Caribbean Sea.

The soil erosion has important implications not only for the mountain/slope inhabitants but also for those farmers who live in those parts of the Plaine of Cayes served by the Dubreuil Irrigation System. The dam is being clogged by sedimentation. The Acul threatens to change its course. As long as the soil erosion continues in the watershed, the Irrigation System can operate at only a fraction of its potential and will require continuous rehabilitation.

*1 carreau = 1.29 hectares. A carreau is divided into sixteenths (1/16) or "seizieme" each seizieme being roughly 40 paces by 25 paces.

A. A Proposal for the Protection of the Acul Watershed.

The project proposed to provide resources and services to small farmers to enable them, and to induce them to modify their production methods to those which are conducive to soil conservation.

A general soil conservation plan would involve:

- formation of Community Councils among watershed families*
- construction of access tracks into the watershed
- construction of physical, erosion-control, structures
- tree planting
- provision of extension services to the Community Councils to create an awareness of the role of vegetative cover and the various structures in soil conservation efforts; to ensure (without forcing) that suitable trees and food crops were incorporated into the agriculture of the watershed area; to provide guidance in the proper construction and maintenance of soil conservation structures, and to guide and encourage community activities, and deepen farmers' understanding in order to ensure the continuity of Soil Conservation practices in the project area after the actual completion of the project.

It was estimated that 60%-70% of the Watershed area would require some Soil Conservation Work. - Most probably 70% of this area with a slope 30% or more would require structures of some sort to arrest, control or prevent erosion. Most basic to the soil conservation effort would be the formation of Community Councils: as all conservation activities would be channeled through these councils.

* in conjunction with local Community Development Officers - DARNDR, religious or private institutions.

The chronological order in which the Councils in the lower watershed area were to be established, would be reflected by the order in which access was provided to their respective localities by the access tracks activity of the project (see Map 3). This order proceeds from lower to higher elevations.

It was proposed to assign at least one trained technician to each Community Council zone. In turn, animators attached to each "sub-council" would be trained by the technicians.

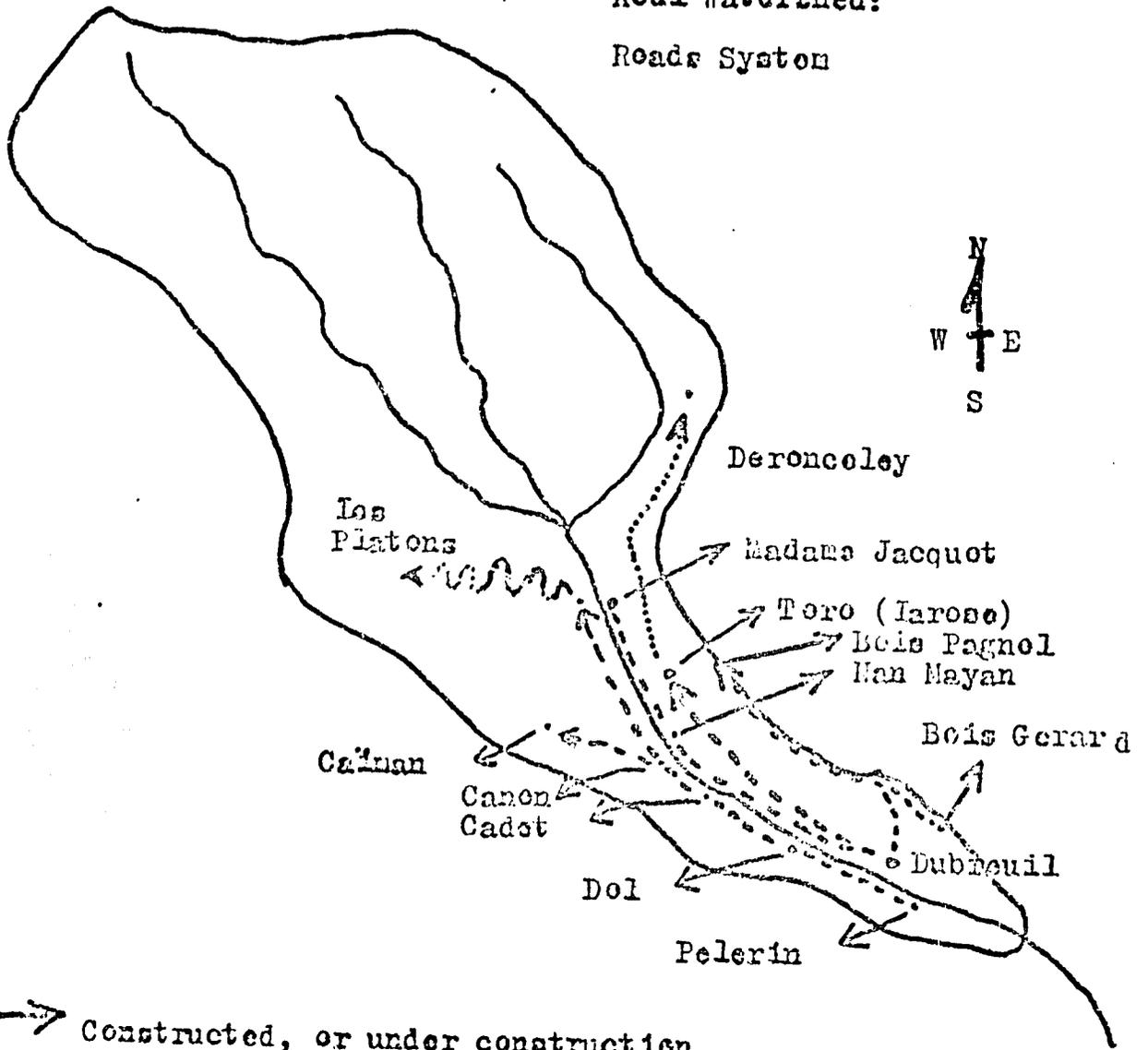
The Toro Community Council area (with five sub-councils) was chosen as a model zone for training technicians and establishing a base in the lower watershed. It seemed the ideal model to follow and a proper focus of attention, in a formalized way, of other residents of the watershed to be organized into Councils in their own Communities.

Theoretically soil conservation efforts should begin in the higher reaches of a watershed and proceed downward to the lower elevations rather than the reverse. The theoretically negative result of proceeding from bottom to top rests in the likelihood that soil conservation structures and practices in the lower regions will be undone, will be overwhelmed by soil eroded and washed down from unprotected areas further up. Nevertheless there is good reason for following an ostensibly opposite approach in the case of the Acul River watershed: which can be viewed most accurately as a series of sub-catchment basins, roughly parallel to each other along their long borders and arranged perpendicularly to the Acul River, throughout the length of the watershed. Each sub-catchment basin, in effect, is a small self-contained watershed area and can be approached as such in mounting a soil conservation effort. Viewed in this way, the soil conservation effort in the Acul River watershed area would actually proceed according to orthodox theory in soil erosion control. Although the impact of the project would be felt first in the lower sub-catchment basins, the soil conservation work within each sub-catchment would proceed from top to bottom. Thus, soil conservation work would proceed from the lower to higher sub-catchment basins in the overall project area but from top to bottom within each sub-catchment basin. This approach would allow soil erosion control efforts to proceed as accessibility was expanded - without unnecessarily delaying initiation of complete accessibility to the entire project area is achieved - and, at the same time, would permit utilization of the technically most sound approach to hillside soil conservation.

HAITI

Map No.3

Acul Watershed:
Roads System



—> Constructed, or under construction

.....> To be constructed

Echelle 1: 100 000

B. Implementation Approach of the Soil Conservation Effort

Almost none of the land area of the watershed is really "suitable" for agriculture by conventional definitions of agricultural land. Nevertheless, facing facts, one must admit that farm families are on the slopes of the watershed to stay. Eliminating agriculture from the area is not a viable alternative; allowing it to continue as it is presently practiced would guarantee the rapid depletion and eventual elimination of the soil resources. Due to socio-political factors operating in Haiti, it is unreasonable to expect any major changes in land settlement patterns; the best that can be done in the project area is to minimize the ecological damage to the watershed by introducing soil conservation practices (and rational land use) into its agriculture.

Several basic soil conservation structures or treatments were utilized in the soil erosion control effort in the watershed. Among these Bench Terraces and Contour Cropping were the most successful measures.

On the less steep slopes, standard bench terraces (with reverse slope on ditch; open-ended with stone spillways or grassed water ways) could have been employed. On the steeper slopes, contour cropping*, with trees or grasses could be utilized. These structures were established in order to modify agriculture in the watershed with as little disruption as possible to present patterns of cultivation but with the aim of increasing yields and of introducing promising new crops.

Ravine or gullying has been treated with checkdams and a number of treatments employing gabions and rip-rip (rocks-and-wire) were planned for riverbank erosion.

* using Hillside Ditches or Mini-Terraces, especially when there is a shortage of rocks.

SECTION 4: THE ASSIGNMENT

- A. INSTALL THE NECESSARY PHYSICAL AND VEGETATIVE WATER CONTROL STRUCTURES TO REDUCE EROSION AND CONSERVE SOIL, IN AS FAR AS POSSIBLE

The first of five duties in the Contractor's assignment was something of a challenge! The choice of physical and vegetative water control structures as isolated treatments - and not part of an overall Watershed Management Plan which would have included such data as a Soils Map, Hydrological and Meteorological information, Land Use and Land Capability classification, and Economic studies.

No data was available - nor was there a hydrologist, geologist, botanist, or range/pasture conservationist on hand to assist with the preparation of a Watershed Management Plan. So the contractor decided to confine his planning of structures on what limited information could be obtained on Land Use and Land Classification, as well as what would be most socially acceptable.

The Land Capabilities in the Acul Watershed range between III and VIII (US Department of Agriculture Classification) - lands normally suited to limited, or very limited cultivation; better suited to permanent vegetation, range/pasture or forestry uses.

For Land Classification, a knowledge of these factors is a pre-requisite:

SOIL (profile, depth, texture and structure);
TOPOGRAPHY (elevation, and degree (or %) of slope;
LAND CONDITION (erosion);

The contractor decided on temporary classifications based on soil depth, degree of slope and erosion-type; but felt that even had all the above factors been known, the principles and procedures of the USDA Land Capability Classification System was not altogether applicable in watersheds as that of Acul. Specific criteria regarding classification should be modified according to the total resources available, physical conditions of the land, land-use patterns as well as some socio-economic factors. As there are tremendous population pressures on the land in Haiti, more emphasis should be put on sub-classing the present "limited to cultivation" classes in order to manage those land-types (V, VI, VII and VIII) already under cultivation. See also under "Conclusions and Recommendations"

At this stage it was clear that the type of structural treatment required would be confined to terracing: (i) where rocks were available, standard Bench Terraces, and (ii) when rocks were not abundant - Mini Terraces, Hillside Ditches and a variation of the standard Bench Terrace.

Bench Terracing is one of the oldest treatments on sloping lands for erosion control and cultivation in many countries. In South-East Asia, South America and Southern Europe, bench terraces have been cultivated continuously for more than a thousand years. Although the type of terrace or the material used for supporting terrace risers may vary from place to place they are essentially level (or nearly level with a reverse inward slope of about 0.5%) strips running across the slope. The strips are supported by steep risers and the whole system looks like a series of steps.

The broad benefits of bench terracing include protection of land from erosion, minimization of sedimentation and water pollution, reduction of runoff water and flood damage, intensification of land use, stimulation of improved farming practices (and increased production), improved drainage, conservation of moisture, build up soil fertility, encourage permanent farming and reduce shifting cultivation and forest fires.

Standard bench terraces were introduced in the Ravine Aux Indes Sub-Catchment at Diaty, Valentin, Lan Marre and La Rose (Toro).

Side-hill beds (reverse sloped) were constructed in Les Platons (Ravine Senette Sub-Catchment) at Ca Michel, Fortresse and Titon. These could be modified later as Mini Terraces.

Throughout Haiti, a system of erosion-control is in use. Using rocks as "barriers" and constructed along contour lines, these structures could be considered useful by arresting soil run-off and, given time, forming "natural" terraces. The majority of these Rock Barriers have done neither. Poorly constructed, not always following the contour, and not spaced correctly as per the Vertical Interval for a particular slope, the barriers are regularly overwhelmed by run-off, and come tumbling down. Maintenance hardly exists, as so many of these Rock Barriers were constructed as a "Food for Work" activity. When the food allocation was finished, so too did the barrier-building activity come to a halt. Many have been constructed, many have fallen down due to lack of maintenance. Nowhere can Rock Barriers compare with Bench Terracing for long term benefits. For these reasons, the contractor did not recommend the construction of Rock Barriers.

Gully erosion control: Gullies are not as numerous in the Acul Watershed as in the Jean Rabel Watershed. But intermittent streams (creeks) which transport a great deal of soil, sediment and rocks are gullying in many places. A programme of gully/creek control is been carried out in the two sub-catchments Ravine Aux Indes, and Ravine Caiman at Dubreuil, Diaty, Dol, Cadet, Canon and Nan Mayan.

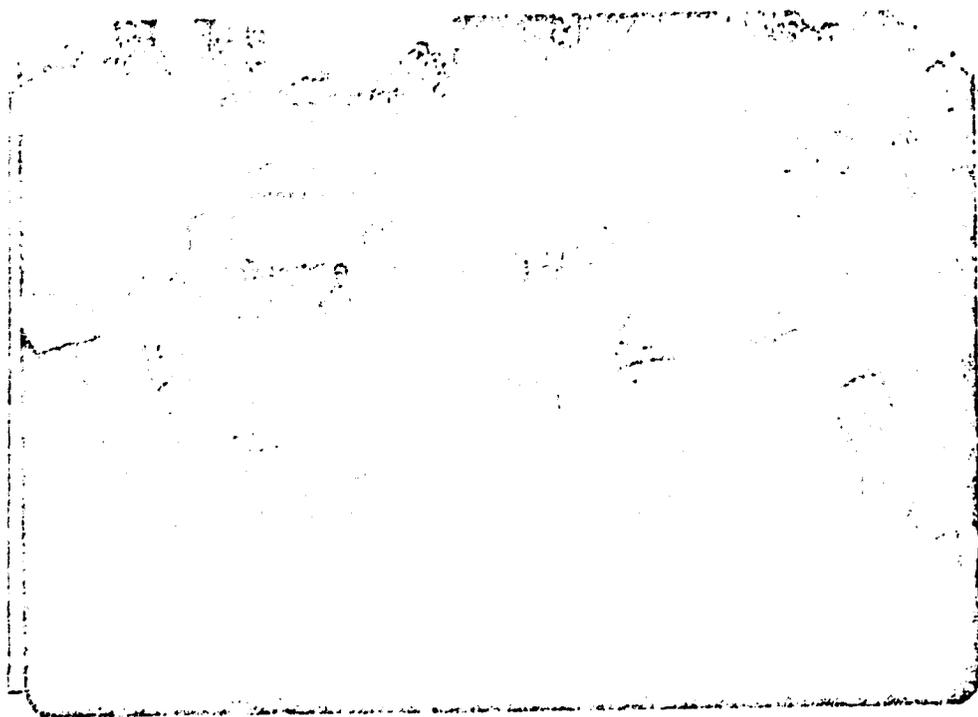
With regard to vegetative controls: a programme of leguminous grasses (Guinea, Napier Guatemala grasses) got under way in conjunction with the tree-planting activities in the Ravine Aux Indes sub-catchment, adjacent to the Acul River at Dol, Cadet and Canon and around Dubreuil.

Bamboo was planted in the silt trapped by the check-dams - notably around Dubreuil, and in the Ravine Caiman sub-catchment.

More use could have been made of grasses as outlets for the Bench Terrace drains (pick-up ditches at the back of the actual bench). So far the drainage system of the terraces has not been put to a severe test. The outlets could be rock-paved, or grass-waterways.

To conclude this sub-section, some statistics regarding the construction of bench-terraces. The first lot of ten (10) terraces at Valentin . (Toro area) were completed in 720 mandays (40 workers). These terraces averaged 30 meters in length, are $3\frac{1}{2}$ meters wide (including ditch) with risers of $1\frac{1}{2}$ meter. Breakdown of activities: hauling rocks, breaking rocks, surveying contour-lines (A-level), cutting and filling to shape terraces, shifting top-soil, construction of ditches, construction of risers (retaining walls). The outlets (incomplete) are additional.

Some 6 000 linear meters (6 kilometers) of Rock Barriers could have been constructed with the same amount of Man-Days - but the Rock Barriers cannot compare to the longterm successes of terracing.



Standard Bench Terraces at Valentin (Toro)



Rock Barriers at Diaty



Rock Barriers at Ca Marie



Rock Barriers near Dubreuil
(note the sheet-erosion)



Checkdams at Dubreuil

B. TO TRAIN AND MOTIVATE FARMERS TO INSTALL AND MAINTAIN THESE STRUCTURES
(as referred to in -A-)

The training was incomplete, and - in the Toro area - unsatisfactory. The response was better in Les Platons. The training programme ran, necessarily, parallel to the PDAI "extension" activities in Toro and Dubreuil: PDAI "by day" the training "by night"

PDAI had decided to motivate farmers by cash payments. Their anti-erosion structures (physical and vegetal) were built by groupement workers, guided by three technicians and supervised by the Chef d'Activités, Soil Conservation. Many community council members did not manage to participate (as they were not included in the work gangs) and so were at a loss to understand the significance of the construction works. Not that the actual workers were aware of the programme either!

A series of discussions were held - tied in to the regular evening meetings of the sub-councils - where farmers (and their wives) had the opportunity to discuss as well as learn about the short-term advantages of a balanced soil conservation plan.

Each sub-council decided to go ahead with a "community work day" - without payment - and this was how Bench Terracing was begun, as a small demonstration plot on a steep slope with a poor shallow sandy-clay soil.

The demonstration was hardly convincing: but the response on the part of the farmers was encouraging. By providing technical assistance, and following-up by providing seeds (tomatoes, carrots, cabbages, etc) and insecticides: the author had no difficulty whatsoever with finding farmers keen to build terraces: WITHOUT PAYMENT! And so the "balanced conservation plan" in Toro (five sub-councils) and later in Dubreuil (seven sub-councils) and Les Platons (1 sub-council, but with as many as nine "Core-groups") got under way.

The author attended as many meetings as was physically possible, and -with the assistance of the very capable Gaspard Brice, the "Chief Motivator," - set up demonstrations of terrace construction and maintenance, composting, seeding and mulching as well as training local animators to continue the works. The response was even better in the isolated plateau zone of Les Platons.

Unfortunately, much of the works done came too late, as the author's contract expired at the time of the first vegetable harvest. Several keen animators were only "half-trained" and not ready to take over as envisaged local Extensionists. Worse, PDAI wanted to take the credit for the partial successes and to continue the programme!

C. TO TRAIN FARMERS TO ADOPT PROPER CULTIVATION PRACTICES WITH PRESENT AND INTRODUCED CROPS

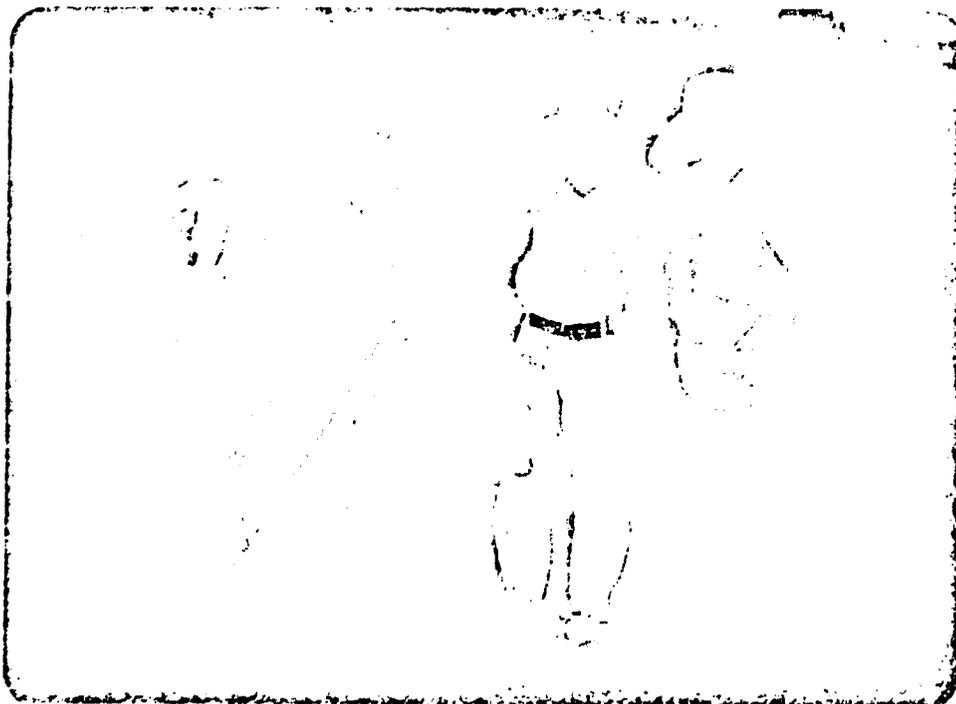
Physical structures only for soil erosion control are not interesting, from the point of view of the majority of Acul farmers. This is probably true for Haiti in general. They take up cropping space. They require continuous maintenance. Newly planted trees too, are often annoying. They require watering and weeding, and necessitate constant care from marauding cattle and goats. Physical and vegetal structures are regarded as necessary evils. The average farmer is content to build such structures and be paid for his labour: but does not see it as an investment.

The most real and rewarding benefit of soil conservation structures is increased production, and "visible" returns in the short term. (The "short term" having obviously priority above the "long term" in the minds of subsistence farmers). The use of bench terraces, for example, can easily increase food production by 20% - 30% on moderately depleted soil as a result of such factors as increased moisture conservation, fertility preservation, soil fertility and structure improvement over several years of reduced erosion, and improved cultivation practices generally adopted with soil conservation techniques.

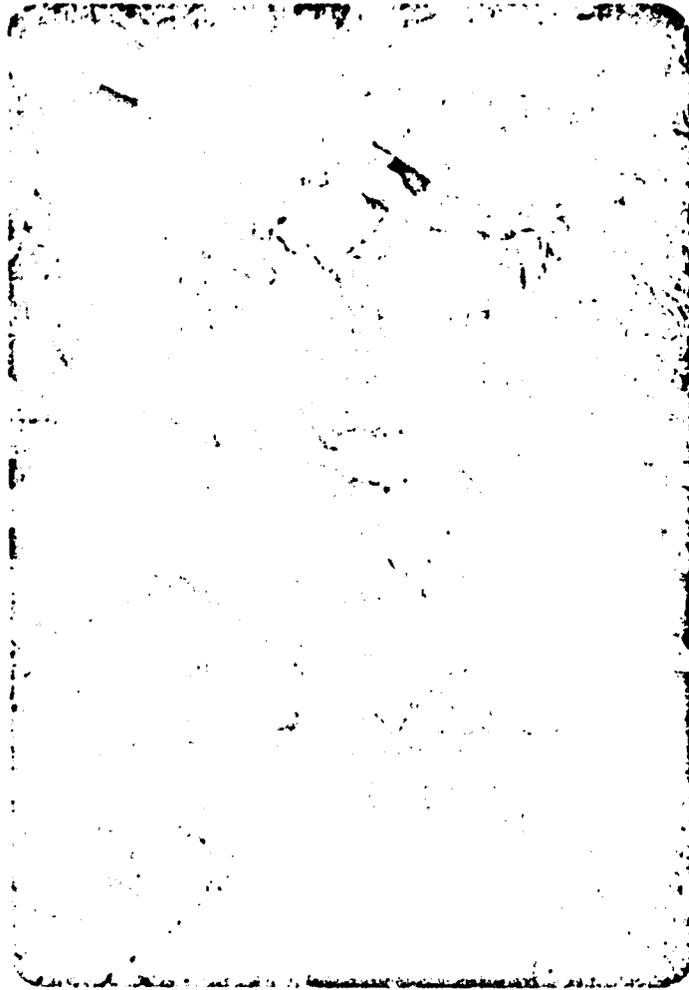
It is of course, common knowledge among those with experience in agricultural extension work that traditional subsistence farmers, on discovering that certain innovations actually can increase yields, are generally more likely to attempt other improvements such as composting, mulching, improved storage, pest control and other management techniques. The farmers of the Toro, Dubreuil and Les Platons zones were found to be no different in this regard.

Vegetable growing (without hindering the traditional cropping patterns of manioc and sweet-potatoes, maize, millet, pois-congo, pois rouge, plantains etc) activities introduced in these areas combined with soil conservation techniques were simple, easily understood and have proven after only several months to be very effective. The balanced conservation approach, as regards cropping, is straightforward.

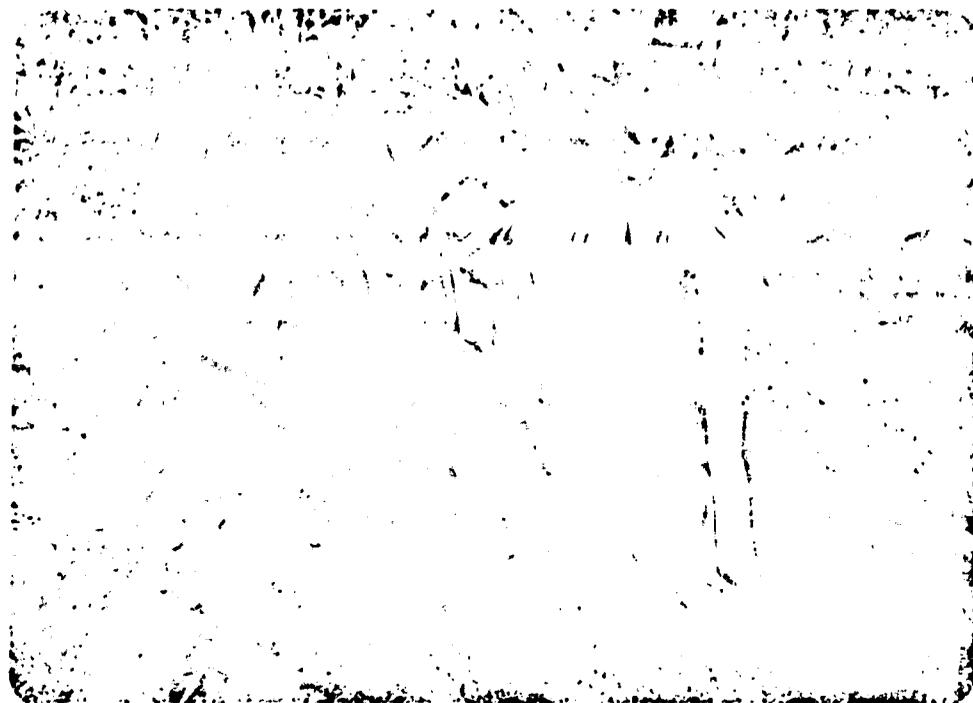
It incorporates physical, vegetal and CULTURAL practices. Hopefully the approach can be continued- as it has in some other parts of Haiti - and became a permanent feature of Acul Water-shed agriculture.



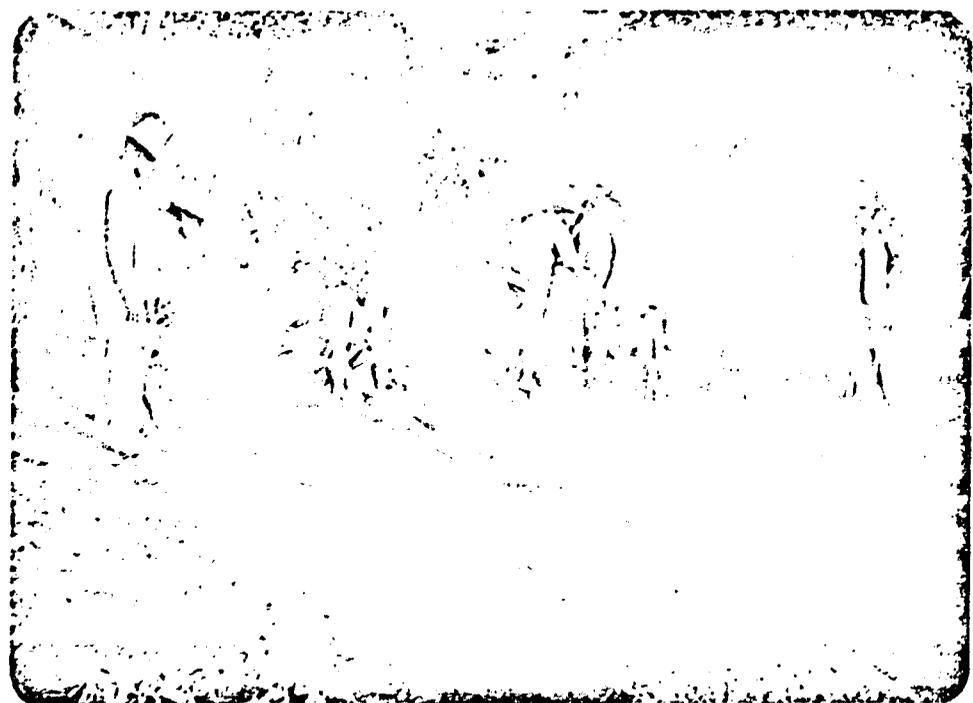
Surveying a contour-line with an "A" level



The furrowed seed-beds follow the contour line surveying by the "A" - level.



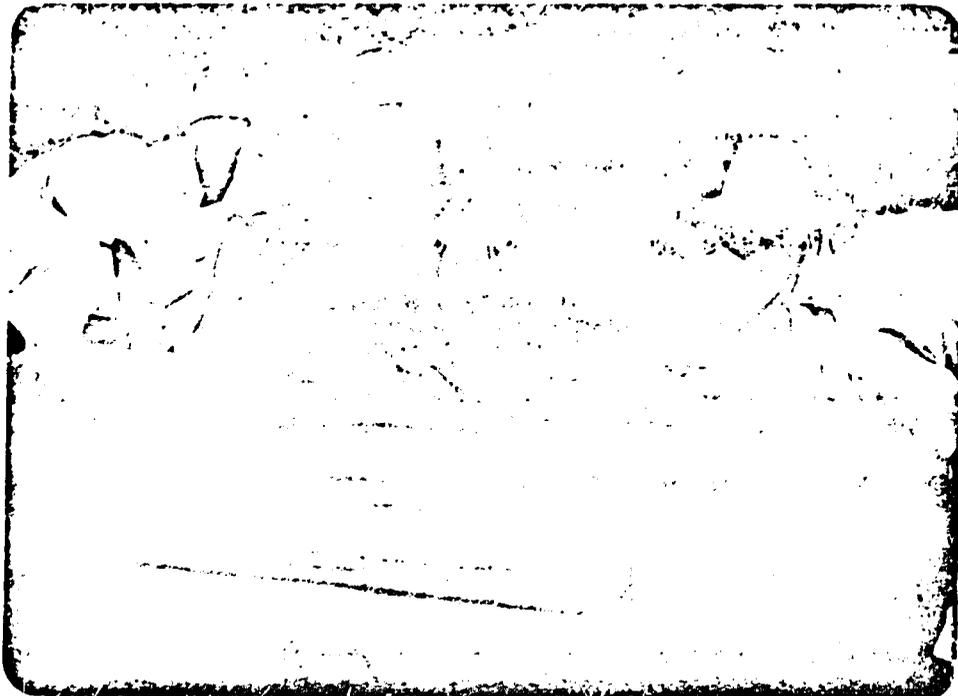
Seeding



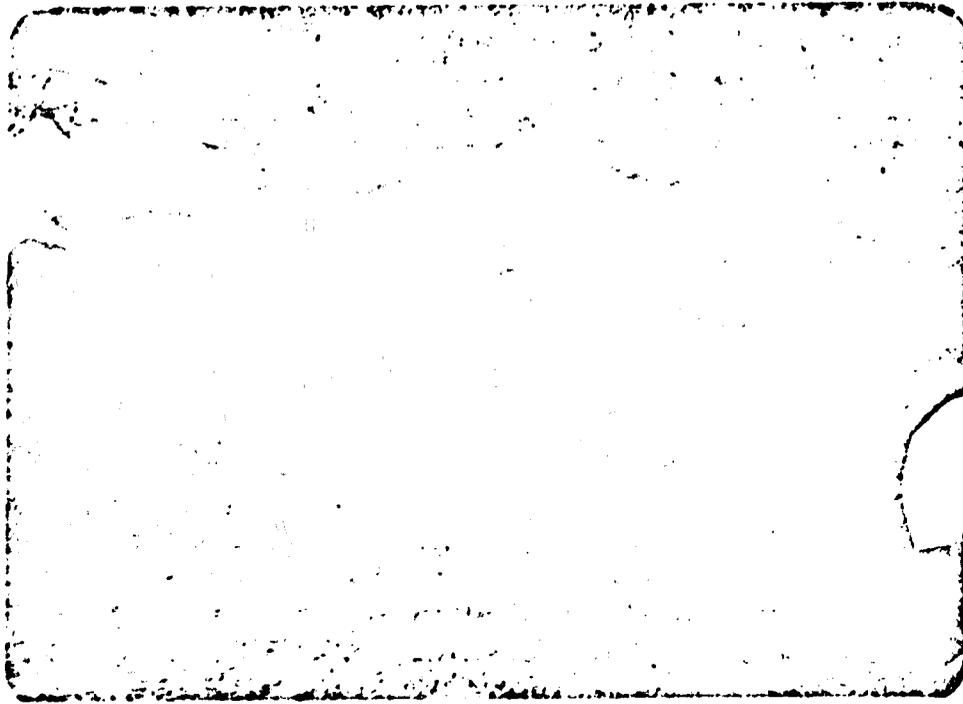
Demonstration Mini-Terraces/Bedding (with reverse slope) being prepared for seeding. Pick-up ditches are graded to safely dispose run-off water into the scrub.



Preparing seed - drills



Another method of preparing seed - drills



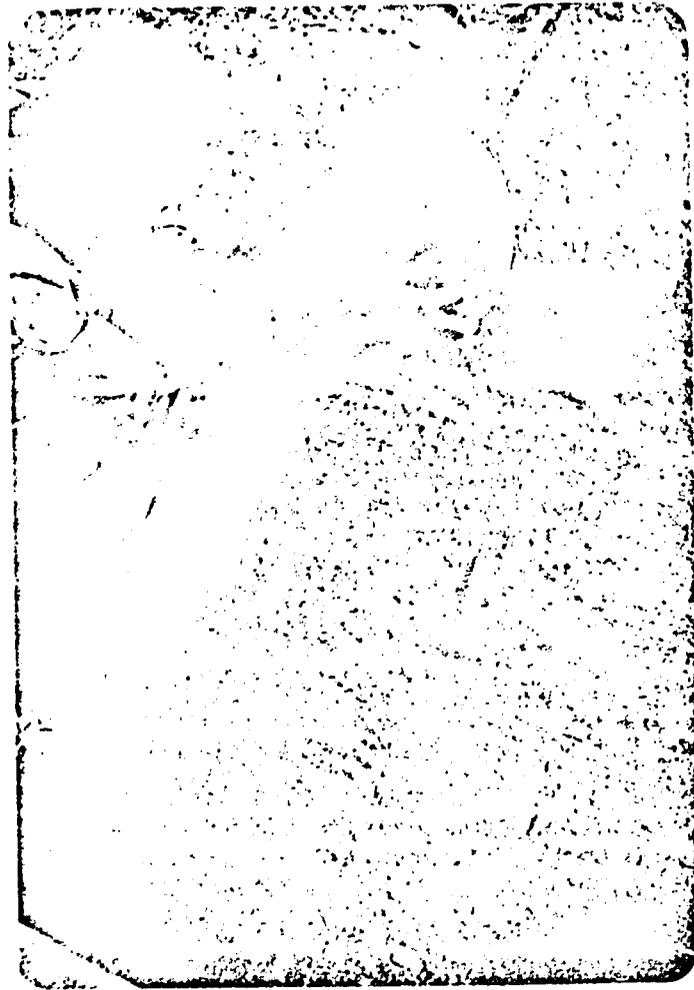
Seeding (tomatoes)



Seeding (beetroots)



These women at Titon have prepared and seeded several extra terraces. (beds)



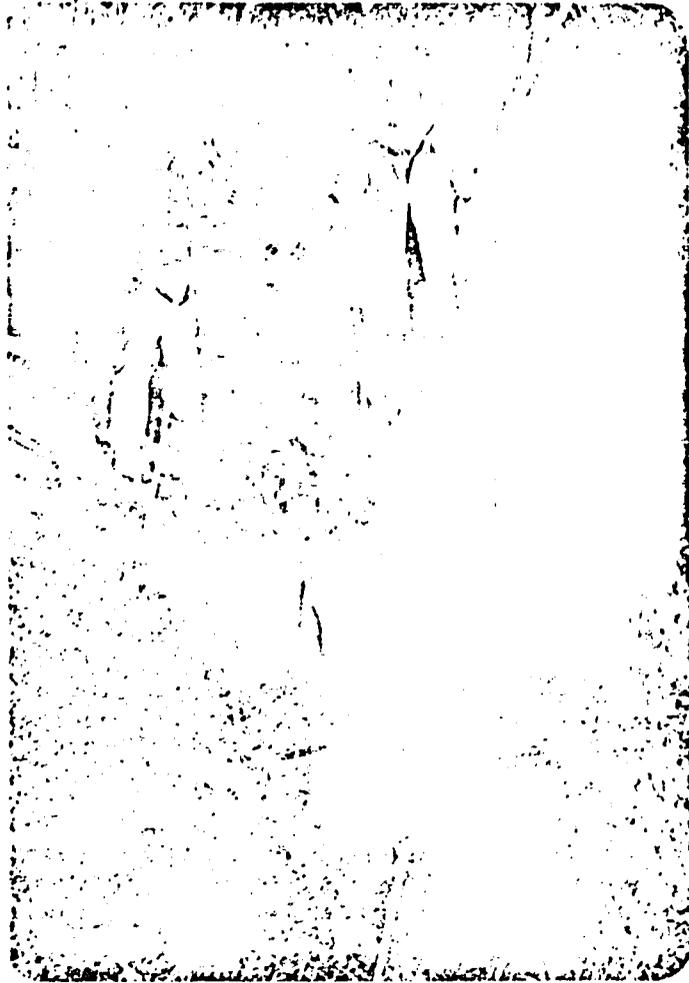
Watering

(Notice the calabash "watering-can")



Mulching

(Plantain and other leaves)



Composting

D. CO-OPERATE WITH AND TRAIN HAITIAN AGRONOMISTS TO CARRY ON THIS TYPE OF WORK (as outlined in -A,B,C,)

This was a problem, even since early-1978, when there were obvious misunderstanding regarding the roles of the two contractors. As mentioned previously, the author's purpose (of contract) was to provide assistance to the Department of Agriculture. However he was never officially assigned a national counterpart! Nor was it clear at what level the contractor would provide assistance. Agronome Joseph Wainwright made it clear, verbally to the author that he should plan the watershed management of the upper Acul River: to map, if possible, the various Land Uses, Land Capabilities and Vegetal Cover. This was being undertaken when the Protection Plan was being developed.

When Agronome Saurel Felix was appointed "Chef d'Activites/Soil Conservation" he assumed total charge. He planned without (hardly) ever consulting with the author. He went ahead with a programme of Rock Barriers, admitting freely (in the presence of Agronome Yves Guery and USAID Consultant Michael D. Bengé) that the barriers would probably fall down in 2 or 3 years! He planned a gabion-placement programme on the Acul River near Dubreuil without first having treated the slopes, creeks (ravins) and upper reaches of the Acul River System! The author was regularly disgusted, as were some ADO/USAID staff members, at Agronome Felix's arrogance and incompetence.

Later, when an overall plan (for Fiscal Year 1979) was produced -omitting almost everything the author had proposed (see Appendix A) - it was plain that not only Agronome Felix was incompetent, but virtually the whole PDAI staff at Les Cayes.

The author regrets the lost opportunities to teach, and learn from, a willing young agronomist - some of whom are available and who recently graduated from Damien. Although the Contractor had some success at the farmer, animator and technicians' level, the absence of a DARNDR counterpart with whom mutual trust and respect (as experienced by the author in Africa) might have made for better all-round cooperation for the success of the project.

E. CO-OPERATE WITH THE NURSERY SUPERVISOR IN THE OVERALL WATERSHED TRAINING PROGRAMME

The Nursery Supervisor (up to, and including) September 1978 was another USAID contractor, Kevin J. Mullally.

Mr. Mullally had been in Les Cayes since November 1976 (some eight months before the author arrived) when the Acul Project Proposal had hardly got onto the drawing board!

Co-operation, on the whole, was good. Mr. Mullally made some inspection tours in the Acul Watershed (and the Jean Rabel watershed) and reported on forest cover, forest inventory etc. Unfortunately, a forest inventory (for a Watershed Management Plan) was never compiled.

However, the author had some rather strong reservations about Mr. Mullally's adherence to a one nursery (The Levy Nursery) approach - especially when that nursery was many kilometers away (over 30 Km by good road) from the Acul Watershed. Tree production is all very well (101 723 trees, forest and fruit were on inventory in August 1978, Levy Nursery) but not of any use to a watershed

- (i) without a finalized soil conservation plan, because
- (ii) the project proposal (in which Mr. Mullally had participated) had not been finalized, nor approaches spelt out.

Mr. Mullally was only an occasional visitor to the Acul Watershed, and rarely attended Community Council meetings. So he had hardly the "feel" for the problems of the watershed farmers, nor the understanding of their needs, priorities etc.

What happened to those 101 723 trees? To my knowledge, not even half of them survived - let alone were transplanted in the Acul Watershed. Village nurseries were set up in Toro, but not by Mr. Mullally. The author was most keen to co-operate with research trials (400m., 800m., elevations) and actually acquired some plots for demonstrations at La Rose and Tête à Boeuf. But the trees never arrived!

A demonstration nursery of over 3000 avacadoes (Lan Marre) became a "wilted monument" because the local farmers were not interested to take trees and transplant them. Why not? Because almost everyone in the area has an avocado tree. Three thousand (3 000) avocado trees meant approximately thirty (30) trees for each family: What would any of those families have done with 30 avocado trees, notwithstanding the generous gift?

The community council members at Toro NEVER requested trees. They would (Yes!) accept trees (fruit and forest) and plant them if provided with Food for Work as they had done previously for the catholic priest's programme. However, the farmers DID ASK about the possibility of grafting sweet oranges to the sour orange trees abundant in the area; also expressed interest in certain varieties of mango normally not found in the area. Forest trees (Bois Blanc, Bois Pele etc) needed replacing, but nobody seemed keen to plant them on his own plot where they would compete for cropping space.

As a forester, Mr. Mullally was competent and thoroughly professional. It is not for the contractor to give judgment but as a colleague, the author must criticize Mr. Mullally's "lack of social conscience" - to seemingly disregard the watershed's inhabitants in planning the watershed. To produce, and go on producing trees, at Levy Farm when it was never decided how many trees (if any)* would be required was folly.

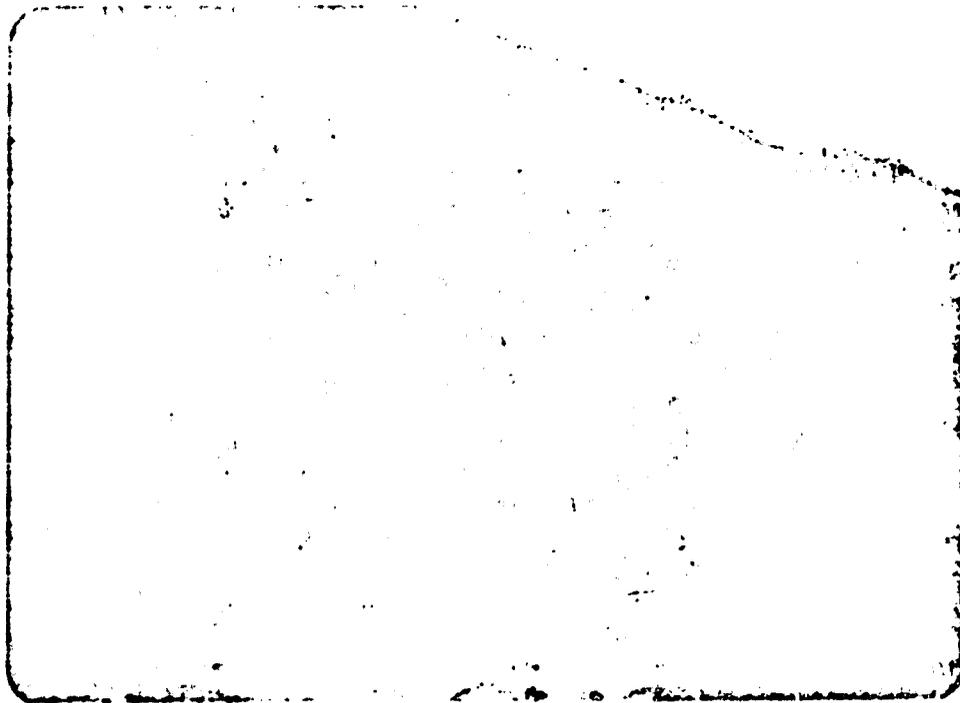
Nevertheless, Mr. Mullally was most sincere - if intense - and it was a pity that he was not (as in the author's case) part of a Watershed Management Team, where his expertise could have been better exploited in a combined effort.

Kevin Mullally terminated his contract, and departed in September 1978. PDAI nominated Agronome Saurel FELIX as Nursery Supervisor. As the author was not involved with tree - planting activities, there was no need to "co-operate" further with the Nursery Supervisor. However, the author must praise Agronome Felix for setting up another nursery - more central to the watershed - at Dubreuil and several village nurseries.

* Fruit trees could have been included as "introducing proper cultivation practices" as Pilot Orchards, etc.

SECTION 5: THE JEAN RABEL WATERSHED

The Jean Rabel River is approximately 19 Km. in length from it's source near La Montagne (elevation 800 m.) to where it enters the Atlantic Ocean at Bord de Mer. The river has cut a deep valley into the soft limestone bed, leaving some sheer cliff/escarpment banks. Many of these cliff faces support little vegetation, and are eroding rapidly.



Eroding-banks of the Jean Rabel River

(Note the deposit of sediment)

The river has perennial flow and it is the only river that reaches the sea west of the Trois Rivières at Port de Paix.

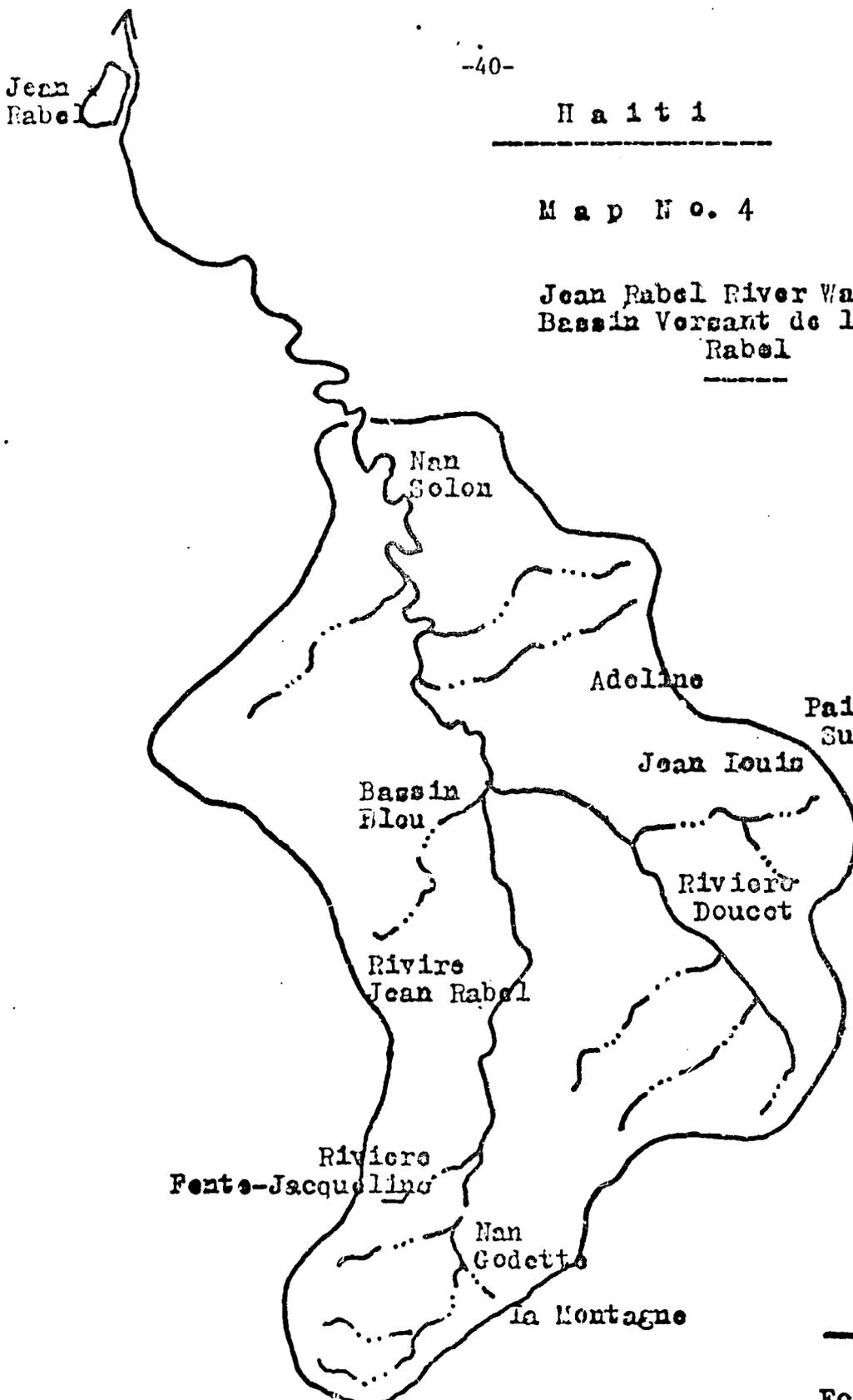
Two tributaries join the Jean Rabel River in the valley. These are the Rivière Coicou* and Rivière Price (the latter is often referred to as the Rivière Prien and Ravine Prunier). These tributaries drain watersheds to the west of the Jean Rabel River but neither has perennial flow. Drainage from the east and west portions of the Jean Rabel valley is through gullies that flow only during heavy rains. Except for the irrigated areas near the river, and some springs, the valley is extremely dry and suffers heavy soil erosion. Vegetal cover is sparse. Sheet erosion, rilling, gullying, tunnelling, land-slipping and stream-bank erosion are all evident.

* Not part of the watershed to be treated.

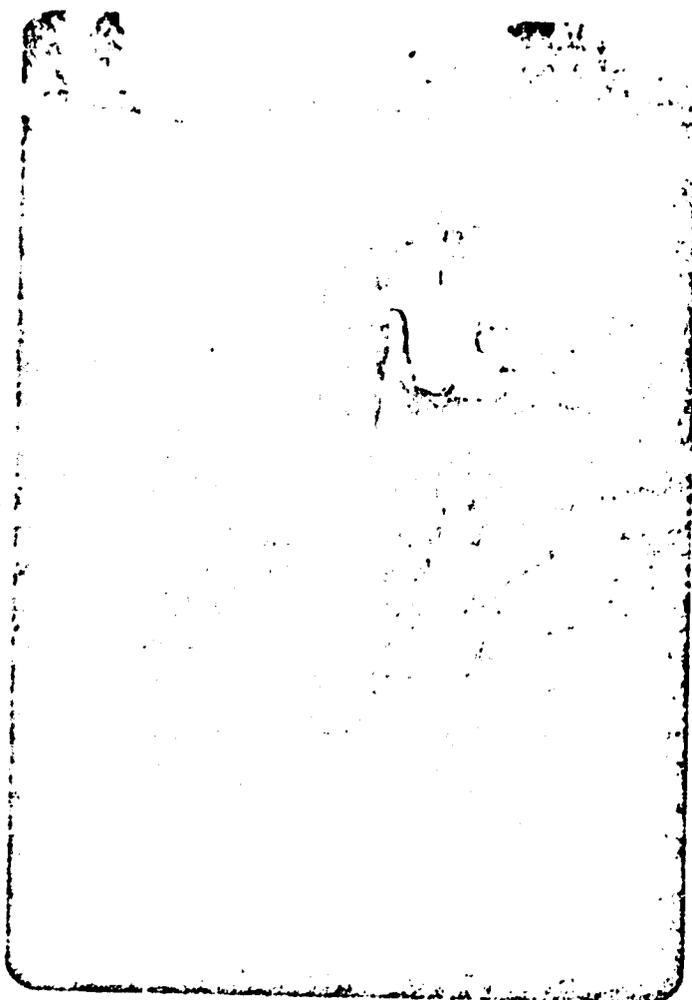
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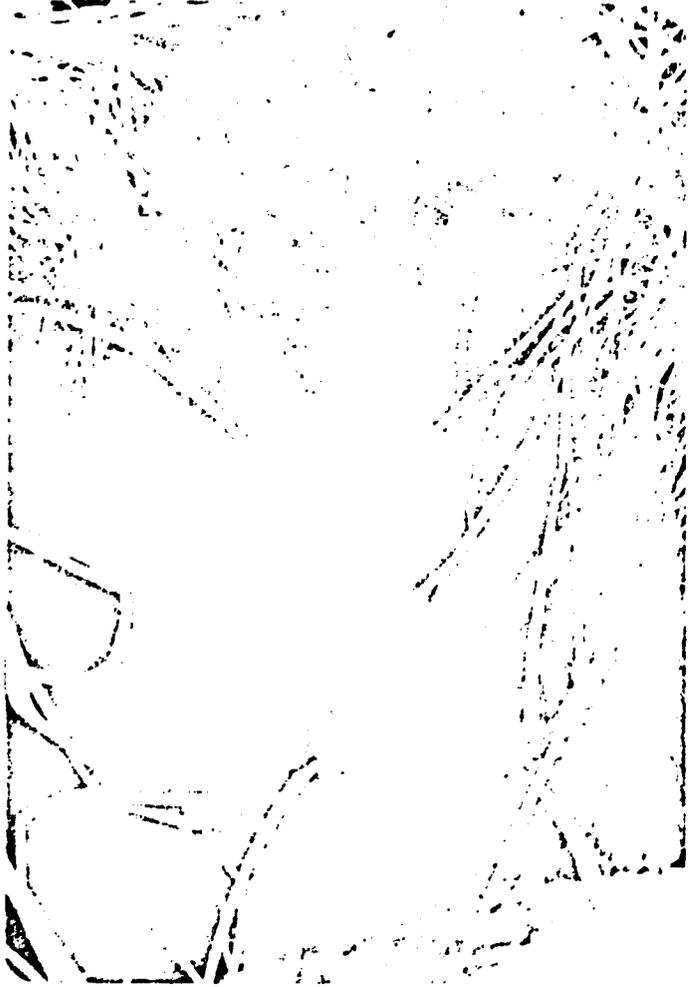
Jean Rabel River Watershed
Bassin Versant de la Riviere Jean Rabel



Echelle 1:50 000



Rills



Tunnelling

Gully erosion

Sheet, rill and gully erosion

The situation in July 1977.

The author's first visit coincided with the visit of the DARNDR Director General to Jean Rabel. This was in conjunction with the final selection of a dam-site for the proposed irrigation. The author made the acquaintance of DARNDR personnel, as well as the J.G. White Corporation team (who had worked on the Dubreuil system on the Acul River) and some members of HACHO.

The author was able to get a clearer picture of what had been happening in Jean Rabel, and how a soil conservation plan could be tackled. Firstly, there were organized community councils. Secondly, there was a forester* who had set up several nurseries with the assistance of some keen young DARNDR agronomists.

* John R. Johnson, Virginia Polytechnic Institute and State University (VPI) who worked with HACHO.

And thirdly, some work had already been done in the Watershed area.

The author did not visit the Jean Rabel for several months, as he had concentrated on the Acul protection proposal. In the meantime, the J.G. White team had terminated their contract - although the dam had not been constructed. They had had many problems in selecting a suitable site for the dam due to the geological conditions. It would be better to treat the watershed area - and attempt to arrest the run-off soil and water before constructing the dam, which would surely have sedimentation problems before it were more than a few months old.

PDAI began its activities with a Survey. Agronome Michel William was named as Directeur d'Operations and Agronome Antoine Fleurant as Chef d'Activites for Soil Conservation.* The author visited the Watershed area with the latter, and began preparation of a map for a soil conservation plan. John Johnson had left, and had been replaced by another VPI graduate forester, Douglas Lantagne.

Mr. Lantagne continued the tree-production programme at the Nan Vincent Nursery - later to become the PDAI central nursery. By the end of July 1978, some 102 839 seedlings were on inventory at Nan Vincent (92 315 forest and 10 622 fruit trees).

The outplanting programme was active. Several community nurseries had been established: one in the watershed area at Nan Solon. This had been established because of the interest shown by the community council there. All work undertaken was accomplished by voluntary labour. The nurseries were provided with materials, equipment and technical aid, and were supervised by a paid "Guardian". Most of the 2000 seedlings at Nan Solon were coffee. Some 25 336 assorted forest and fruit species were planted in the Jean Rabel Watershed during early 1978, with up to 65 000 seedlings ready for outplanting. Transport problems delayed planting before the end of the wet season.

Although there was no problem with regard to planting trees, the "motivated community council members" did not show the same enthusiasm when the Food-for-Work programme was temporarily suspended. Mr. Lantagne had observed the same "lack of enthusiasm" and had serious doubts about the survival of trees, and yet-to-be undertaken soil conservation measures.

*There was some misunderstanding about this appointment as Agronome Fleurant had been attached to the HACHO project, and had requested to remain with that project.

The author found it difficult to fault the works carried out in the Jean Rabel River Watershed - only regretted the precedent (of payment) had been set, and the fact that so many trees had been planted on various slopes as "isolated treatments" and not part of an overall Watershed Management Plan which would have included reforestation as part of a balanced treatment programme.

Douglas Lantagne left Haiti in August 1978 and not long afterwards, PDAI took over the supervision of the Nan Vincent nursery. The author visited the Jean Rabel area only once in 1979, but found the situation unchanged. Some community councils were functioning but the author did not witness any tree-planting or other activities. PDAI had no person responsible for Soil Conservation and, since the author had begun the Bench Terracing programme in the South-West during 1979, could not really spare the time to visit the Northwest regularly.

The situation in Jean Rabel remain frustrating. The District Agronome is based in Port-de-Paix 45 Km. away. Neither the District (DARNDR) nor PDAI could provide a Soil Conservation agronome. Given the "go-ahead" to tackle a Watershed Management Plan - the author (as part of a team of complementary specialists and counterparts) could have produced something worthwhile. However, to have done so, considering the fate of the Acul Protection proposal would have been a sheer waste of time and energy.

No conservation plan - based on sound Watershed Management including a balanced approach as tried and tested in parts of the Acul Watershed - exists.

Work has commenced on the irrigation dam. Mr. Rimpel Charles is doing some good work with community councils; but on the whole, the effort is fragmented and riddled with problems.

SECTION 6: RECOMMENDATIONS AND CONCLUSIONS

A. For the Department of Agriculture (DARNDR)

1. The Need for a National Erosion Survey and Control Programme to Protect and Improve Haiti's Production Base:

Most assuredly, good resource conservation and management are basic to any country's rural development and permanent agriculture and silviculture. All will agree that better production techniques such as improved crop and the varieties, fertilization, insect and disease control, better harvesting methods, improved breeding and livestock management are desirable. But their benefits are only temporary if the country is losing its topsoil, as is Haiti, or mismanaging its plant and water resources. Likewise, any favourable prices obtained for farm or other commodities will not mean much in a country whose production is insufficient to meet its own needs because of deterioration in its soil and water resources. An adequately planned and properly applied EROSION CONTROL PROGRAMME which is based on a NATION-WIDE SURVEY will help prevent these things from happening.

It is recommended that a NATIONAL EROSION SURVEY be undertaken which would identify, symbolize and/or delineate the seven (7) external water-erosion forms.* The external forms include the following:

- a. Sheet erosion - detachment of soil particles by raindrop impact and removal by overland flow;
- b. Rill erosion - removal of surface and subsoil material in narrow perpendicular channels, like a series of incisions across a field;
- c. Gully erosion - removal of upland soil and material and formation of channels (often from rills) by concentrated flow of water;
- d. Streambank erosion - removal of streambank channel banks caused by the force of flowing water and caving of streambanks;

* There are five other forms, considered "internal", consisting mainly of mass movements: which would require special studies as to their origins and effects. Their occurrences could be noted in the survey.

- e. Stream channel degradation - removal of channel bed materials and downcutting of natural stream channels;
- f. Floodplain scour - erosion of the floodplain surface by flood flows;
- g. Valley trenching - formation and enlargement of a well-defined channel in a flood plain or other alluvial deposit.

The five (5) internal forms are:

- Land slips
- Land slides
- Mud flows
- Soil creep
- Underground erosion

AERIAL PHOTOGRAPHY will be quite useful in making this survey by providing base maps upon which many of the erosion forms could be identified and delineated subject later to field annotation/"ground truth checks". Gullies and streambank erosion can be identified easily on aerial photographs. The Field Annotation work will be necessary and must be accurate for the interpretation of soil erosion: to include a description of the appearance of the different erosion forms and their geomorphological relationships.

It would seem logical to use the thirty six (36) agro-ecological zones established by DARNDR (See page 294 of "Agricultural Development in Haiti" an assessment of sector problems, policies, and prospects under conditions of severe soil erosion, USAID Washington, Clarence Zuvekas Jr. 1978). From these zones, a breakdown of land resource areas, and further breakdown of land systems/land resource units can be made. These latter units would be the bases for making the survey.

The benefits to be rendered from the survey? Haiti will, for the first time, have qualitative and quantitative analyses of her erosion problems - what kind, where and how much along with physical damages caused by the various erosion forms; it will be a valuable teaching tool and aid in conservation education at secondary, college and university levels; it will be quite useful in adult education; and the survey will form a basis for establishing erosion control programmes for the land systems/watersheds within the respective agro-ecological zones.

2. Development of a National Erosion Control Programme

This is vital, because current erosion-control projects in Haiti are far too fragmented and uncoordinated albeit, their objectives and intentions are good. Once the erosion survey is well underway, the development of the NATIONAL EROSION CONTROL can begin.

This is a matter of selecting the practices to bring under effective control the respective erosion forms indicated by the survey in the various land systems or land resource units. These practices are CULTURAL, VEGETATIVE and STRUCTURAL, and total over sixty (60) in number which gives a wide latitude in selection. They should be at least physically feasible and preferably economically justifiable - e.g. Bench Terraces, with interplanted traditional crops and vegetables, with fruit trees, and accompanying compost-heaps - as well for the control effort.

The eight (8) LAND USES on which an erosion control need occurs include cropland, pasture, rangeland, woodland, engineering, watercourse, wildlife and recreation. After all of the practices have been decided upon in the control programme, they will need to be placed in a "Schedule of Operation" which will indicate the times and places for their application or installation. MAINTENANCE of the practices is as important as their application and must be scheduled as well.

It is, unfortunately, still not widely appreciated that piece-meal or "band-aid" approaches to resources problems - however good their intentions - can be disastrous by raising expectations, and providing "temporary employment" (as witnessed by the PDAI approach in the Acul Watershed). For this reason it is essential that any technical assistance activities, from whatever the source, be tied into a well-conceived and structured programme of high-technical quality: such as this one propose to be, and with sufficient magnitude ("National-level") to stand some chance of continuing impact.

EROSION CONTROL is the heart of the entire programme and an aspect of nearly all practices. In this, a basic distinction must be made between practices aimed at controlling surface erosion in connection with the various land uses, and those designated to halt deep erosion in gullies and streambanks, for example. The management of soil for cropping, centres on improved terracing (bench terracing, mini-terracing, hillside ditching), contour farming and better use of plant residues (composting and mulching).

The management and conservation of water involves those practices which will store water in the soil and thereby reduce the amount of surface run-off and thus slow down the rate of erosion. These involve conceptually simple practices by farms individually and with their neighbours, with little change in lifestyle - on in farming and grazing techniques, and should have relatively rapid visible benefits.

The dimensions and goals of the National Erosion Control Programme are such that it must be viewed as a long-term effort with many and varied inputs.

It is believed that this programme will provide a unique approach in Haiti to integrated resources management and conservation by being a multi-objective peoples' programme which will have been developed on a multi-resource basis involving all of the land uses, and using the multiplier effect through MASS COMMUNICATION. This approach is based on the philosophy of service through the cooperation of all concerned. The problems affecting soil, plant and water resources are field problems, and as such, they require servicing in the field by and through people. Reaching people by means of a programme requires the involvement of agencies, groups and individuals. The NATIONAL EROSION CONTROL PROGRAMME therefore will rely on the cooperation of national, international and regional agencies, religious groups, cooperatives, rural teachers and private individuals. People in these bodies will need to perform the technical functions and educational roles necessary in helping the land users to apply and maintain the programmes management and conservation practices throughout Haiti.

3. Implementation of the National Erosion Control Programme:

It is believed that EDUCATION, APPLIED RESEARCH and DEMONSTRATION are the best possible means to learn and appreciate the causes and effects of the erosion problem in its many forms. Also to understand and use the management and conservation practices necessary for its control. These means of implementing the CONTROL PROGRAMMES are described as:

a. EDUCATIONAL MEANS:

The Agricultural College at Damien (DARNDR) is in an unique position to help establish and maintain the educational means by virtue of the fact of its entry and growing experience in the field of conservation education.

It is recommended that the College conduct workshops for teachers of agricultural subjects in the country's school system. Each workshop can deal with a specific aspect of the overall erosion problem. Workshops and seminars can also be organized for technicians from other conservation agencies and organizations within and without the governmental structure.

The educational programmes - at College level - can be based upon a new improved curriculum which will deal with the theory and practice of resource conservation: theoretical subjects ranging from the changing definitions of conservation to a suggested framework of national legislation; exercises in conservation practice cover the identification of erosion types and forms to determination of run-off values for structural design.

Handbooks (several handbooks on gully control, river-bank stabilization etc. are available) should be provided, and a series of technical papers on various aspects of erosion*.

It is recommended to establish a visual-aid programme utilizing battery-run projectors and film strips to depict erosion problems and solutions. This programme will be carried out in cooperation with existing extension services. Also included in the programme will be the distribution of "comic-book" style pamphlets which vividly portray the problems and solutions. These will have a particular appeal for the young students in the secondary schools.

The educational programme at the secondary school level could be spread over six years: (a typical)

1 st Year	"Looking at the Environment"
2 nd Year	"Change in the Natural World"
3 rd Year	"How Environments Differ"
4 th Year	"Taking Care of Natural Resources"
5 th Year	"Use of Natural Resources"
6 th Year	"Responsibility for Environmental Conservation"

A publication entitled "Teaching Conservation in Developing Nations" (Action Pamphlet No. 4200.23 (9/77)) is recommended as a teaching manual.

b. RESEARCH MEANS:

Closely allied with the educational means should be an applied conservation research programme. It should consist of the following component:

- Determination of soil and water losses;
- Determination of infiltration velocities of various soils;
- Measurement of the effects of conservation and management practices;
- Studies of useful plants for soil conservation and management;
- Erosion studies using a rainfall simulator;
- Studies of the physical properties of soils which cause erosion;
- Experiments for the improvement of soil structure and infiltration capacities of representative soils;
- Comparative studies of two small pilot demonstration watersheds or sub-catchments.

*The author of this report has produced a handbook, in Creole, for soil conservation technicians. Another, in English and French, for a national Bench Terracing Programme, is being prepared.

The College at Damien would be a suitable site for that portion of the programme requiring more or less permanent installations because of the facilities it enjoys in terms of trained personnel, laboratory and field space.

c. DEMONSTRATION MEANS:

The old adage "seeing is believing" certainly has an application in demonstration areas. These are the means for showing the various practices which have been programmed to control the erosion forms found in a given unit or system.

Therefore they can be sited on any of the land uses and for whatever form.

In order to be fully effective, the demonstration area must be visible, accessible and representative of the soil and erosion conditions at a given location.

The definition, purposes, applicabilities and specifications for the practices in a given area should be explained, preferably in Creole, by means of diagrams, filmstrips, photos or other kinds of visual aids.

Benefits and costs pertaining to the practices should also be available, if possible. Whatever the information, it should be presented in a simple but forthright manner.

There is no maximum or minimum size for a demonstration area. It will depend on the erosion form and how many and what kinds of practices it will take to control it and where they need to be applied. There is no set number of areas that will need to be established. The more there are, the greater number of people are reached and the more the conservation and management practices are applied. In the end the country will be "saturated" with areas and practices to do the total job of protecting Haiti's soil resource from further destruction.

A local person should take charge of a demonstration area. He (or she) could be a Conservation Technician, an extensionist or one interested in erosion control. That person could be reimbursed in some manner for the time spent in operating the area.

d. PROGRAMME FOLLOW-UP:

Too often projects and programmes suddenly cease to exist, or fade away simply because no one cared to see what success or failure they were having, or in other words, there was no "follow-up".

Resource programmes, especially those having to do with soils, are many times ever-continuing in their existence by their very nature. Erosion, for example, will not be under control by any specific date. In fact, it is always in danger of going out of control unless the practices in the programme are properly applied and adequately maintained for longer periods than the scheduled life of the programme/project. So the line between

soil-depleted farming and soil-conservation farming is very thin indeed. Thus follow-up is vital to maintain contact with the land-users to see if the programme is being successfully carried out on a more or less permanent basis, or why it has failed. This means a staff of technicians or animators with an ample budget.

4. Preparation of Watershed Programmes:

It is recommended that detailed investigations, studies and surveys be made in the four watersheds already chosen for the Integrated Agricultural Project: Acul, Thomazeau, Marigot and Jean Rabel; and in other areas where watershed problems (water erosion, run-off and flood control, water conservation, sedimentation, surface and subsurface drainage and soil productivity) are common and acute, e.g. Kenseoff and Fermathe. These activities will supply such information as is pertinent to, and essential for the planning and application of management and conservation plans in these four pilot watershed areas; development of recommendations for watershed protection; flood prevention and the economic utilization of watershed lands as essential parts of watershed programmes. They will provide inventories of PHYSICAL and ECONOMIC watershed conditions, including EROSION, PLANT COVER, SOIL, HYDROLOGIC CONDITIONS and EXISTING PRACTICES. They will also determine the effects of various combinations of watershed conditions on the Hydrologic, erosion and sedimentation characteristics and the economic significance of each.

Following are the recommended steps in the implementation of the method:

- (a) Review of available data;
- (b) Collection and inventorying of physical and economic data for watershed programming;
- (c) Analysis and interpretation of data;
- (d) Preparation of watershed programmes.
- (e) Planning, application and maintenance of management/conservation plans in these pilot areas.
- (f) Organization of local soil and water management and conservation or watershed conservancy districts.

The emphasis should be on the TRAINING OF LOCAL TECHNICIANS (animators) in the various techniques to provide a nucleus for the establishment of a National Soil and Water Management and Conservation Agency which, in time, could furnish continuing and material assistance to an expanding programme.

Necessary items for the Training Programme:

- Study of existing watershed maps, aerial photos and available data;
- Field inspection trips;
- Staff and equipment;
- Soil surveys and geologic investigations;
- Hydrological and meteorological investigations;

- Flood damage surveys;
- Agricultural economic studies;
- Agronomic studies;
- Forest, range and idle land surveys;
- Classification of watershed lands* in accordance with their capability-in-use.
- Appropriate practices: Agronomic, forest, range/pasture for demonstration areas;

The following format indicates the minimum detail which will be included in the programmes:

- (a) Summary of the programme;
- (b) Description of the watershed
 - physical data
 - economic data
- (c) Watershed problems
 - erosion damage
 - sediment damage
 - flood water damage
 - problems related to soil/water management;
- (d) Projects of other agencies /organizations;
- (e) Works for improvement recommended for installation
 - soil management practices;
 - plant management practices;
 - water management practices;
- (f) Effects of works on damages, and benefits;
- (g) Comparison of benefits and costs;
- (h) Review the progress of demonstration areas
 - Status of management and conservation plan;
 - Group projects: local participation and interests;
 - Technical Assistance: Types and amounts;
 - Material assistance: Types and amounts;
 - Financial assistance: Types and amounts;
- (i) Investigations and analyses
- (j) Tables, charts, drawings and maps;

The Watershed areas will demonstrate, but not be limited to the following management and conservation practices:

- (1) Soil management
 - Composting
 - Strip-cropping on contour
 - Mulching
 - Crop rotation

* As mentioned elsewhere in this report: the Land Capability Classification System (US Dept of Agriculture) utilized - occasionally - in Haiti requires re- and sub-classing to suit the many diverse land types. It is recommended that the Jamaican system (as developed by FAO Officer T.C. Sheng) be adopted. See Appendix "B"

(ii) Plant management

- Pasture/range management
- Proper grazing use
- Tree planting

(iii) Water management/Conservation practices:

- Bench terraces
- Hillside ditches
- Mini terraces
- Orchard terraces
- Waterways
- Contour furrowing
- Irrigation water management;

Organization of local Soil and Water Management and Conservation Districts:

The most effective way to establish and maintain a management and conservation programme is by incorporating local interest and organized support. Community councils, cooperatives etc. are the key - ably supported by animators, National Technicians and Agronomers and the District office of the Department of Agriculture (DARNDR).

The programmes prepared for the selected watersheds and plans developed for the demonstration areas can be applied to other watershed areas where similar environmental conditions exist. The method will have Nationwide Applicability. A National Soil and Water Management and Conservation Programme will thus eventually evolve.

B. For the Agency for International Development (USAID)

USAID's greatest weakness* is that it is a HIRING AGENCY and SUPPORT OUTFIT rather than an implementing organization (it does not pretend otherwise). It does not seem to "feel" or grasp the project flows and operation especially at the provincial - district - field level.

Large sums of financial aid is earmarked for soil conservation/reforestation/irrigation projects. The greater part of this financial assistance is wasted. The Improvement of the lot of the "small farmer" should be the priority consideration. Financial assistance and/or Food-for-Work over "Project-duration-periods" is NOT the answer.

Nor is pumping large sums to supplement salaries for National Technicians/Agronomers "to motivate them" the answer.

* as observed in Haiti.

Too many projects have failed. Why? for a number of reasons - a combination of the following factors:

1. Lack of understanding of resources problems (soil resources, plant resources, water resources) by the people involved.
2. People involved?
 - cultivators
 - programme implementers
 - government officials
 - public in general
3. Programmes lacking "balanced treatments"
 - cultural, structural and vegetative;
4. No provision for follow-up in terms of maintenance;
5. Bad extension methods;
6. Structural or vegetative treatments as separate programmes.
 - unsound structures and practices;
7. No determination of social benefits;
8. Ill trained agronomists and technicians;
9. No security of land tenure;
10. No organization, at local level, to carry on maintenance of planned and applied treatment practices;
11. No economic evaluation of project benefits and costs;
12. Payment (cash, food etc.) for conservation works;
13. Institutional weaknesses of implementing agencies.

It is therefore recommended that USAID, in financing Soil Conservation/ Reforestation projects, CAREFULLY EXAMINE the thirteen above-mentioned factors before committing large sums of money to projects, such as the Integrated Agricultural Development Project:* mentioned several times in the report.

*

In the case of the Acul Watershed, Points No. 1,2,3,5,6,7,8,9,12 and 13 are all obviously evident! Unless remedied, the project is bound to become one more failure in Haiti's trail of disasters.

The author therefore recommends that USAID:

Support the Department of Agriculture (DARNDR) with the above-mentioned NATIONAL EROSION SURVEY and the NATIONAL EROSION CONTROL PROGRAMME, the latter in all three approaches: educational, research and demonstrational - and a follow-up programme.

Such a NATIONAL PROGRAMME would be, at this point in time, a massive undertaking for DARNDR. This body requires considerable strengthening in terms of technical and financial support in order to accomplish such a programme - all the way down to the grass-roots level.

Technical support: is required in both the College of Agriculture at Damien, and in all the District Offices (Agronomats). Watershed Specialists will need to be "imported" for one phase of the technical Training. This will include a team made up of soil conservationists,* range management and pasture specialists, agronomists, agro-meteorologists, hydrologists, extensionists, irrigation engineers, livestock and fish-culture specialists.

The teams, especially at District level, should preferably be young (25 - 40) men or women - and fairly dynamic. So much the better if they be resourceful, though they should given good support. A University degree is not a pre-requisite: a practical background with previous overseas experience is more important. (Some of the very best agronomists the author has known were practical, pragmatic technicians from the Republic of China - their successes on small, but well-run vegetable growing/irrigation projects, are clear: long after those agronomists have returning to their homeland.)

This will provide part of the training ("On the Job Training") for the DARNDR National Technicians/Agronomists, as well as local technicians and animators, extension agents etc. However, participation in better-developed training programmes overseas would also be desirable for the National Technicians and locally-trained** technicians. Short visits, or participation in other projects, training courses etc. is recommended for periods of 3 months to 1 year.

* Although this team is likely to be recruited in the U.S.A., it is imperative that the candidates have overseas experience (in other developing countries) - preferably ex-Volunteers, many of whom have the correct approach for grass-roots level development.

** Locally trained technicians: as distinct from DARNDR technicians/ agronomists; trained by religious groups, volunteer organization etc...

Choice of country is most important: Some Central American countries (Guatemala, Costa Rica and Mexico) South America (Peru, Colombia), Asia (Taiwan, Philippines, Korea), Africa (Several states) and, nearer to home, the Caribbean (Jamaica, the Dominican Republic and Cuba) have made progressive strides in developing along the grass-roots level. (Israel, Yugoslavia and Southern Italy may be mentioned too). Haitian agronomers and technicians need to see sound demonstrations if they are to "see and believe" (and apply the knowledge at home) - visits to similar type developing countries, especially with mountain/hillside agriculture, will be of better use to Haiti than 2, - 3, - and 4- year scholarships to North American or European Universities. Indeed there are too many DANIDA agronomists "marking time" in Haiti awaiting scholarships and fellowships, and the possibility of "defection" abroad.

The author urges USAID to AVOID SMALL FRAGMENTED-TYPE PROJECTS: . of immediate short-term benefit to certain individuals, but of little long-term value to a region, district or watershed area.

Certain issues should be investigated further (such as Land Tenure and Community councils) and some other issues (Food-for-Work) scrapped altogether.

The misplaced belief in the peasants' "lack of motivation" has led to the excessive use of surplus food in Food-for-Work projects in order to activate people to work on community projects. If these projects are supposedly in the self-interests of the peasant: why should he be "paid" in food to participate?

The fact that he has to be paid suggests two things:

- either he does not see the project as benefitting him;
- or he does not see the project as his but rather that of the sponsoring agency or institution.

(This was evident when PDAI operated in the Acul Watershed although the payment was cash, not food.)

Food for work programmes create a dependence on payments which there is no reason to believe will be maintained. Too many agricultural projects exist where peasants "were motivated" to participate through payment in food. Once the food supply runs out, so does the work stop leaving a half-done project. Alternatively, the peasants SLOW DOWN to make a job LAST LONGER (as in the Dubreuil Irrigation Project). Either way, the peasants do not see it as THEIR project but rather that of the sponsoring agency.

This dependency has been aggravated by the large presence of foreigners in various developmental activities in Haiti. These "Blancs" are usually well-received because the peasant knows that, in many cases, the foreigners are bringing something. The fact that basic services are minimal in the rural areas has made it possible for private voluntary organizations, (particularly religious) to come in and build schools, clinics, roads, etc., and often these groups have had access to FFW. With the result that now, in any development project with a highly visible foreign element, the peasant has to expect some payment for working on some project which is supposed to be of direct benefit to HIM. But such payment can be self-defeating; if the peasant does not see the project as his own.

Surveys made of projects utilizing the 3 - 1 - 1 system (as described in an earlier section) indicated that

- many workers did not understand why they were being paid for only 3 days, and some were afraid to ask;
- representatives of communities which would benefit directly from the projects were chosen, and TOLD to form groupement work gangs;
- as with community councils*, indicators are that groupement gangs tend to be made up of only certain families;
- "real" local peasant leaders are not always involved, and a high percentage of the workforce is composed of landless labourers, also some of whom have come from outside the project areas.

Cash payments, as well as FOOD for WORK, are commonplace on Agricultural Projects. The justification is "motivation" - PDAI officers explained to the author that the cash payments paid to groupement workers in Toro (Acul Watershed) were adequate to motivate the locals to perform all sorts of works in the future WITHOUT PAYMENT. The money-in-pocket approach (: bribe?) led to "development" insofar as many community council members now have corrugated-iron roofs (rather than thatch roofs) on their houses.

* The author has always supported the "Heads together" (Tet ansam) approach for the community to work together for the common good, rather than individuals. Regrettably, too many Community Councils are falsely set up as "Fronts" in order work on projects for payment. The food is regularly sold, and the "project" becomes a profitable "sideline" for project organizers, and community leaders. Some non-community council members said they were not wanted in the work gangs, now council committees because they were not sufficiently politically conscious.

The local folk are happy with their new roofs. But they are no further along the road to resource conservation education now than they were two years ago before the project was initiated. A programme of rural employment is highly desirable: especially for road-works, clinics, schools, and such services to make up rural infrastructure. And the Department of Agriculture should press ahead with such a programme.

But conservation of soil, water management and the urgent task of preserving depleting natural resources is not MERELY RURAL EMPLOYMENT! USAID must understand this when they allot money for such programmes, whether grants or loans.

Finally, the author recommends that USAID get more involved - as part of Rural Development/Soil Conservation/Watershed Management programmes - in FISH CULTURE. The demand for fresh fish is so great that, in the case of saltwater fish, the catch is sold almost before a boat docks. The greater part of the fish is sold to the consumers within a few hours of the time it comes off the boat. Chiefly because of the position of the landings, but also because of the greater purchasing power centered there, almost all sea food is consumed within a few kilometers of the coast. In the larger centres of population, some sort of small market exists, but the demand is so keen that little fish ever gets there.

Successful (fish) culture methods have been applied to almost every type of water: from completely fresh to completely salt: from permanent ponds to those which can be maintained for only part of the year. They have been successfully combined with agriculture, and used as steps in reclamation and soil/water conservation. Successful pond culture has the merit of putting to profitable use areas otherwise useless and unproductive. It supplies much fish where it is most needed - in the midst of the rural population: and it can often be so regulated as to even out supply, avoid gluts and meet exceptionally heavy seasonal demands.

CONCLUSIONS: In spite of many frustrating periods the author was pleased to provide service to the Government of Haiti: Department of Agriculture. It seems a pity the contractor's skills, at the "lowest" level, were not better exploited - in particular on a large training programme/demonstration for animators and technicians, in conjunction with community councils in both the Acul and Jean Rabel Watersheds. There is a great potential for development in Haiti : but ACTION is required, and less reports and recommendations. The contractor can boast that he "produced" in both cases.

Michael D. Stapleton

36 Rockfield Avenue
Perrystown
Dublin 12, Ireland

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APPENDIX "A"

Les Cayes, October 10, 1978

To: Agronome Jean Fritz BOUTIN
Directeur des Operations
PDAI Aux Cayes

From: Michael Stapleton
Soil Conservationist
PSC-AJD. 521-77-22

Subject: Annual Work-Plan (draft) for Fiscal Year 1979: Soil Conservation Section.

1. INTRODUCTION: The Draft Plan is divided into two parts:
 - (i) Routine Soil Conservation planning with regard to it's own programme, and
 - (ii) a separate programme, of no less importance, requiring liaison and co-operation with the other PDAI sections to achieve the Integrated Objectives.
2. ROUTINE SOIL CONSERVATION PLAN: The Routine plan involves Soil Conservation staff-members and covers the normal planning of sub-catchment ("sous-bassin") areas, zone by zone. The zones are determined by the "intensity" of local interest: by which motivation encourages the formation of Community Councils. Each and every community council already formed has demonstrated its enthusiasm by having embarked on Road Works: on a One-Day-Per-Week voluntary basis. The sub-catchments to be tackled are then studied: and recommendations made as to what conservation/anti-erosion structures/reforestation be applied. At least one (1) Technician is assigned to the zone, and is required to reside in that zone. The Technician works closely with the Work Teams, and assists with the construction of walls, setting up of nurseries etc.

Focus on the Routine Plan for 1979 are three areas:

- (a) The Sub-Catchment of the Ravine Aux Indes: Toro region. (west).
- (b) The Sub-Catchment of the Ravine Aux Indes: eastern side, which includes Baron, Bois Gerard and Bois Pagnol.
- (c) The Sub-Catchment, and environs, of the Ravine Caiman.

The first-mentioned (a), is the largest section of the Sub-catchment. It includes the Toro Grand-Conseil area, where five (5) sub-councils are active. Three (3) Technicians reside in the area. Works have been in progress since June 1978, and will continue during 1979: rock cordons, gradins forestiers and tree-planting.

In addition, two village nurseries will be set up. Bench-terraces have been limited, to date, to one small demonstration area (as the technique is still relatively unknown in these regions) however more areas will see the construction of bench-terraces: a longer lasting conservation measure requiring the minimum of maintenance.

As the Work Teams become more experienced, it will be possible to choose reliable council members to take over the role of the Technicians: thereby enabling two (2) of the Technicians to be withdrawn from the area, and transferred to the next zones requiring Conservation works.

Tree Planting: some 5,600 trees have been planted in conjunction with the Rock Barriers. Planting will continue during October until the end of the current rainy season, and will resume at the beginning of the next rainy season (April).

Research : A recently acquired plot at Larose will be used for the first of four (4) Trials in which several species of trees (fruit and forest) will be planted together. The elevation at Larose is 400 m. It is proposed to plant:

Teak	Ipil-Ipil	Saman
Sucrein	Nime	Haitian Mahogany
Bois Blanc	Eucalypt	Casuarina
Pine (several varieties)		

Other sites will be sought at elevations of 800m, 1200m and 1600m. In addition to the leguminous grasses being planted above the rock-barriers, several other species of grasses will be put on trial: kikuyu and Blue Panic in particular.

(b) the eastern side of the sub-catchment of the Ravine aux Indes: where, to date, community organization is still in it's early stages. The plan for this zone would entail the construction of an access road from Dubreuil to Bois Pagnol (and possibly a link-road to Toro), also an inspection of the topography of the area: closely examining land-use patterns, land-capabilities, denudation and erosion etc., and recommending a plan of action which would include conservation structures. As soon as the "motivation/awareness" reaches a satisfactory peak (perhaps when a conseil with a large work gang completes a section of access track?) it will be possible to transfer one (1) of the technicians to the area, and conservation structural work can commence.

One of the most important features of the conservation plan will be the treatment of the two (2) main ravines in this sub-catchment; the Ravine Aux Indes and the Ravine Delmont. It will be necessary to examine the water courses of these two intermittent streams, and plan for their protection.

- (c) The Sub-Catchment, and environs, of the Ravine Caiman: A large block of somewhat more than 1000 hectares, or 10 km², ranging from steep well-wooded slopes above Le Prêtre and Canon to another series of forested slopes below Tete-à-Boeuf. The upper reaches of the Ravine Caiman are in places very steep, in others steep and undulating. The extent of deforestation is conspicuous: here, if anywhere, can be termed as "critical"...

Although there are, as yet, no Community Councils organized with the assistance of PDAI in this block: there is strong community spirit and a previous history of organized work teams. During the last few months, a road has been repaired -and extended- to link Dubreuil to Caiman. Within a short period, Le Prêtre will have a road connection to Dubreuil. It will not take much more "motivating" in order to interest the inhabitants of the region in a programme of protection of their natural resources. Especially as coffee is the main cash crop of the greater part of the region.

Several reconnaissance tours of the block have been undertaken, and it is proposed to give this block much attention during 1979: especially as work in the first sub-catchment (Aux Indes) nears completion.

3. INTEGRATED WORK PROGRAMME: Moving parallel to, and ranking as important with the Routine Plan, is an Integrated Plan whereby the Soil Conservation section will liaise with the other sections of the PDAI on a broader-based long-term programme.

For 1979, it is proposed that the Soil Conservation section tackle the following (in liaison with one, or all the other sections):

- (i) A full scale Nursery programme, with a (new) Main Nursery at Dubreuil and numerous village nurseries within the Project Area.
- (ii) A Fishponds programme.
- (iii) A Livestock programme.
- (iv) A Meteorological/hydrological programme.
- (v) A Soil Conservation education programme.
- (vi) Continuation of the access tracks programme.
- (vii) A Research programme, in conjunction with the Research Section, covering items which are not included as separate programmes.

3.(i) Nursery Programme:

To date the trees produced for the reforestation of the areas treated have come from the nursery at the Government-owned Levy Farm. The Farm (and of course, the Nursery) is ideally situated in the northern part of the Cayes Plain for serving any projects in the foot-hills surrounding that area. Camp Perrin, Maniche etc. However, for the special needs of the Acul Watershed area, the Levy Nursery is not only at a distance -connected by a seldom-used track which is in poor condition - but limited too in the species of trees required for a greater part of the Acul Basin. (The elevations of the Project area range from 200m to 2,000m in altitude, whereas Levy Farm is at an elevation of 170m.)

It is therefore recommended that the reforestation effort be decentralized, so that:

- (a) trees planned to be planted in any given zone be grown by a village-nursery in that particular zone;
- (b) that the trees grown in village-nurseries be limited in number as required for reforestation;
- (c) that those trees be species of local (social) acceptance, as requested by the inhabitants of an area. Any introduction of exotic species should only be treated as "Research Trials", again, with popular approval.

A Project Nursery can be set up nearby the PDAI Office at Dubreuil (elevation is the same as that of Levy) but preferably for either Research, or Training purposes.

Village Nurseries will be set up in each zone. Two (2) are planned for the Toro area, and will serve the five (5) Sub-Councils in that area. One nursery may be adequate for the Bois Pagnol section of the same sub-catchment, and probably five (5) or six (6) for the block comprising Le Prêtre/Caiman/Tête-à-Boeuf. One of the four Conservation Technicians is presently based at Levy. The plan envisages his being transferred to Dubreuil to assist with setting up the Project Nursery. The same Technicians should also participate with the setting-up and organization (record keeping, etc.) of village nurseries.

3. (ii) Fishpond Programme:

It is recommended that a Pilot Fishpond scheme be set up at Dubreuil, adjacent to the Nursery (where some 1½ ha. are available). The Pilot scheme would probably be limited to one (1) pond, approximately 10m x 7m and containing 100 fish: Tilapia Mossambica, if available. It will be necessary to liaise closely with the Fisheries Section at Damien as to supplying fingerlings, support system (acquiring manure, fertilizer and food), local acceptance, markets etc. The pond itself could probably be constructed by the community council at Dubreuil, and the responsibility

given to a Work Team selected from with the Council. Stocking of the pond (with fish) would initially be the responsibility of the Fisheries' Section at Damien: hopefully the same section could supply a Technician, even on a temporary basis, until a local technician (or members of a work team from the Community Council) gain sufficient experience.

During the reconnaissance of zones by the Soil Conservation section, notes can be made of possible future fishpond sites: should the Pilot Scheme be successful.

3. (iii) Livestock Programme

This programme can be divided into three (3) separate units:

- (a) "Large" livestock;
- (b) "Small" livestock;
- (c) De-limitation of pasture lands;

Although the setting-up of Livestock programmes might not be considered the role of the Soil Conservation section, both (a) and (c) are necessary parts of any regional soil conservation and watershed management plan. When assessing Land Use and Land Capabilities, a decision must be taken on zoning of pasture lands as separate from agricultural lands. In the Acul Watershed, it is often very difficult to see the distinction between the two types. In the Ravine Aux Indes Sub-Catchment, livestock population is as follows:

Cattle (bulls, cows, heifers, etc.)	68
Goats	48
Sheep	38
Pigs	89
Equines (horses, donkeys and mules)	10
Chickens	307

(Small numbers of Ducks and Turkeys are also kept). Pasture is limited, and animals are usually not confined. One solution would be, as envisaged in the "Large" livestock programme: to confine cattle to stall feeding lots. The same solution could be applied to sheep and goats, and possibly pigs.

Therefore it is recommended (that, based upon a positive report from a USAID livestock consultant - due to visit the Acul Project in January or February 1979) that a Pilot Feedlot Scheme be set up in the Toro zone for a Pilot area), availability of feed, and market outlets.

With regard to (b) the "Small" livestock proposal: another USAID consultant is due to visit the Acul Project in November 1978 with a view to examining the possibility of setting up Rabbit Raising schemes. The Government's Bureau of Nutrition has already embarked on a medium-scale rabbit-raising programme. The same consultant has had experience with Poultry, and may recommend a Pilot Poultry and Rabbit-raising

scheme. A bee-keeping study can also be undertaken.

Concerning (c): it is recommended that a survey be made of all pasture lands, and to make recommendations on all Idle Lands, as well as Under-Utilized Lands.

3. (iv) Meteorological Programme:

It is proposed to set up at least one (1) Meteorological station in the Acul Basin. A request will be made to the Meteorological Service at Damien to assist the Project with choosing a logical site (possibly at Les Platons, at about 900m elevation) for such a station. Some equipment has been acquired, but there are several outstanding instruments required.

It is recommended (a) to set up about 10 Rainfall Stations (maximum) to cover the whole watershed. During 1979, two (2) or three (3) stations can be set up: most likely at Toro and Caiman, and (b) to set up a maximum of three (3) hydrological measuring gauges: the first in the River Acul above the Dubreuil Dam (probably at Del) and one each in the Ravine Blanche and the Rivière Casse Cou above their confluence with the Acul (near "Tête l'Acul"). These gauges will record river flow (vital for planning purposes) and research can be made on the silt/sedimentation content of river flow following each storm or period of intense rain. This would hopefully be reduced after the construction of Soil Conservation structures.

3. (v) Education Programme

This would actually be a part of the proposed programme of the Extension Service: to hold a weekly "school" for animateurs, probably at Canon. The Conservation education programme would probably consist of lectures, audio-visual aids (photos, slides, films) as well as Field Tours.

3. (vi) Access Tracks Programme

One of the earlier successes of this Project has been the opening up of zones with penetration tracks. Even from the earliest studies made, Roads were the Number One priority of the vast majority of the watershed's inhabitants. Many of the lower zones of the Acul Watershed are now connected to Dubreuil by roads. The standard of road-building has not been high: but the motivation (one day per week roadworks, on voluntary basis) has been excellent.

For the 1979 Plan: It is proposed to continue to co-operate with the Community Development Section with repairing, extending or constructing roads into the watershed. Priority will be given to three (3) areas:

- (a) Northwards from Toro towards Der-ncele;
- (b) Upwards from Le Prêtre to Les Platons, and onwards towards Fernon; also (same block) from the Dubreuil Dam to Tête à Boeuf.
- (c) From Dubreuil, via Baron and Bois Gerard, to Bois Pangnol;

It is recommended that (1) better tools be sought for these road construction gangs, and (2) consideration be given to introducing a Food-for-Work system.

3. (vii) Research Programme

Although the Soil Conservation Section will initially have its own research programmes: some liaison will be necessary for over-lapping research activities. A run-off studies trial will probably be set up on various slopes (treated and non-treated) in the Toro zone. Other trials involving Soil Fertility increases (due to more moisture being retained because of less runoff) and Better Land Use and Improved Farming Practices can possibly be set up by the two sections.

4. BUDGET:

A budget has yet to be drawn up for the Soil Conservation programmes to cover:

(a) Routine Plan: Cost in Man Days for the completion of the Toro Section of the Ravine aux Indes sub-catchment; for the whole of both the remainder of the same sub-catchment (and environs) block; costs for construction activities, tree-planting, ravine control and research activities. Also Levy Nursery.

(b) Integrated Programme:

Costs involved in setting up, supervision and maintenance of the Dubreuil Nursery and village nurseries, Dubreuil Pilot Fishponds Scheme, Livestock Scheme, Meteorological and Hydrological programmes, Education programme, Access Tracks and Research programmes.

In addition, it will be necessary to compile a new list of requisitions to include:

Maps (enlargements of zones to 1:10.000 scale), aerial photos, tools for conservation work teams, tools for road gangs, tools for nursery workers, survey instruments, drawing office equipment, meteorological equipment, hydrological equipment, petrol etc. for vehicles and for Technicians' Motor-cycles.

This Budget can probably be compiled to include the budget in the Work Plan as prepared for 1 June - 30 September, (No 1 DOC 78), by Agr. Saurel Felix.

5. PROPOSED TARGETS: Fiscal Year 1979.

Month	Routine Programme	Integrated Programme	On-going works
October 1978	<p>Reconnaissance of Caiman Sub-catchment & environs.</p> <p>Demonstration: bench-terraces at Toro.</p> <p>Trials: various Tree species 400 m. (Toro)</p> <p>Various grasses.</p>	<p>Contact Fisheries Service; Meteorological Service.</p> <p>Setting out traces for new roads: Le Prêtre - Platon</p> <p>Dubreuil - Bois Pagnol</p> <p>Leroux - Tête à Boeuf</p> <p>Toro - Deroncele</p>	<p>Conservation structure: Toro</p> <p>Roadworks: Canon-Prêtre</p> <p>2 village nurseries: Toro</p>
November 1978	<p>Reconnaissance of both Caiman & Ravine Aux Indes Sub-catchments.</p> <p>Inspection of ravines. (Aux Indes & Dalmont).</p> <p>Initiate Dubreuil Nursery</p>	<p>Visit of USAID Consultant: Small Livestock (Rabbits & Poultry).</p> <p>Visits from officers: - fisheries (Damien)</p> <p>- Meteorological Service (Damien)</p> <p>Extension Education programmes initiated</p>	<p>Conservation works: Toro</p> <p>Roadworks: Prêtre-Canon</p> <p>Prêtre-Titon</p> <p>Dubreuil-Baron</p> <p>Leroux-T'Boeuf</p> <p>Toro-Deroncele</p> <p>Village nurseries active</p>
December 1978	<p>Reconnaissance trips.</p> <p>Plan (Conservation) for Caiman sub-catchment & environs.</p>	<p>Extension Education programme continues.</p> <p>Various trials initiated.</p> <p>Recommendations of Rabbit/Poultry consultant studied.</p>	<p>Same as November</p> <p>Dubreuil nursery in operation.</p>
January 1979	<p>One (1) Technician to be transferred to reside in Caiman.</p> <p>Conservation structures commence: Caiman block</p>	<p>Extension Education programme continues.</p> <p>Visit of USAID Livestock consultant to study feasibility of feedlots.</p> <p>Survey of Pasture Lands and Idle Lands.</p> <p>Initiation of Pilot Fishpond Scheme</p>	<p>Same as December</p> <p>Road to Prêtre completed: gabions placed at crossings.</p>

TARGETS (continued)

February 1979	Reconnaissance trips. Conservation plan for Bois Pangnol zone. Plan for ravine control Ravines Aux Indes Sub-catchment	Study recommendations of Livestock consultant. Extension Programme (ed.) Train Meteorological observer Train Hydrological observer Train Fishpond staff.	same as January.
March 1979	As conservation works near completion at Toro: a study of costs to be undertaken. One (1) Technician to be transferred to Bois Pangnol;	Initiate Livestock Programme Begin construction of Fishpond. Set up Meteorological Station: also two (2) Rainfall gauges. Set up three (3) river-flow gauges. Extension Education programme;	Conservation works continue. Roadworks continue. Various research trials continue.
April 1979	Conservation works commence: Bois Pangnol Evaluation of conservation plan: Toro. Inspection of structures, trees, etc. Co-operate with Community Development Section and Community councils with formation of Maintenance Groups.	Extension Education programme Fishpond Construction continues. Livestock Programme continues.	Conservation Works continue: Toro and Caiman. Roadworks continue. Tree-planting commences with opening rains.
May 1979	Roadworks: Completion of Dubreuil to Baron/Bois Gerard Section; Lerou - T'Boeuf. Reconnaissance trips: Deroncele and Platon. Commence Ravine Control works below Toro zone Initiate village nurseries Caiman, Prêtre and T'Boeuf	Possible visits from USAID consultants: Botanist and Soil Scientist. Fishpond completed. Fisheries' Technician required to assist with stocking pond with fingerlings. Livestock programmes. Extension education programmes.	Conservation works completed: Toro Roadworks continue. Tree-planting continues. Various research trials continue.

June
1979
to
During this period, an Evaluation should be made of all Soil Conservation activities for the period 1 June 1978 to 31 May 1979. Targets should be reviewed: those items which might well be ahead of schedule, other items behind schedule. Targets can be revised.

September
1979
The Toro zone of the Ravine Aux Indes sub-catchment should be completed and the ravine-controls close to completion. It will then be possible to withdraw the last remaining Technician, and transfer him to the large Caïman & Environs block. Works in the Bois Pagnol zone will well under way: probably nearing completion. The plan for controls on the Ravine Aux Indes can commence. The Dubreuil Nursery will be functioning, and as many as six (6) or seven (7) village nurseries.

The Fishpond Pilot Scheme will commence production, and also the Livestock Programmes. A meteorological station will be providing data: also the rainfall stations, and river gauges. Numerous trials (research) will have been initiated: but as most are long-term, data will probably not be available. Changes to the PDAI structure are likely to take place: when a firm contracted to implement the Soil Conservation/Irrigation programme arrives during 1979. The writer of this draft will probably spend less and less time in the Acul region as he assists the Jean Rabel (PDAI) region with their conservation activities. The writer's contract with USAID is due to expire in June 1979.

6. MAPS : Attached to this Draft Plan is one (1) set of maps for the FY 1979 Target areas. These are at scale 1:10.000.

Michael STAPLETON
Soil Conservationist
USAID / PSC. AID.521.77.22

10 October 1978

Copies: Agronomes Saurel FELIX, Chef d'Activites: Conservation
du Sol PDAI Aux Cayes
Project Officer, ADO Office, USAID/Port-au-Prince
Rural Development Officer, ADO Office, USAID/Port-au-Prince
File.

APPENDIX "B"

III. PRESENT LAND CAPABILITY CLASSIFICATION CRITERIA IN JAMAICA

Jamaica has completed its island-wide soil survey. In the soil survey report of each parish, lands have been divided into seven capability classes and sixteen sub-classes as follows:

- I Level land with a deep fertile soil with no factors limiting the use for agriculture.
- IIe Land suitable for cultivation with moderate limitations. The risk of erosion is the chief factor limiting its use.
- IIw Land suitable for cultivation with moderate limitations. Naturally wet land on which drainage is the main factor limiting to its use.
- IIs Land suitable for cultivation with moderate limitations. Soil fertility or some other soil factor is the main limitation to its use.
- IIIe Land suitable for cultivation with strong limitations. Must be cultivated carefully to prevent erosion of the soil. Rotational strip cropping is advised for this land.
- IIIw Land suitable for cultivation with strong limitations. Naturally wet land needing much attention to drainage. Drains are necessary to remove water and prevent erosion of the soil.
- IIIs Land suitable for cultivation with strong limitations imposed by adverse soil factors.
- IIIc Land suitable for cultivation with strong limitations imposed by climatic factors (especially low rainfall).
- IVc Land marginal for cultivation due to extreme danger of erosion. Improved grassland, or tree crops should be established on this land. Some cultivation with extreme precautions.
- IVs Land marginal for cultivation due to soil factors. Economic tree crops or grass should be established on this land. Some cultivation with extreme precautions.
- Ve Land not suitable for cultivation, steep sloping with extreme danger of erosion. Tree crops, food or forest trees should be established on this land.
- Vs Land not suitable for cultivation due to adverse factors. Usually steep land that should be used for forest or food trees.

- VIc** Land not suitable for cultivation. Very steeply sloping land that should never be cleared of its natural vegetation.
- VIb** Land not suitable for cultivation. Thin rocky soils on steep sloping land that should never be cleared of its natural vegetation.
- VIc** Land not suitable for cultivation due to a combination of adverse factors usually dominated by dry climate. Should never be cleared of its natural vegetation.
- VII** Miscellaneous and not suitable for cultivation. Should be left to wild life.