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AN ASSESSMENT OF THE SECOND INTEGRATED RURAL DEVELOPMENT PROJECT

PART I:

THE IMPACT OF THE PROJECT UPON FARMERS

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CHAPTER I

INTRODUCTION

PURPOSE OF THE STUDY

Over the past two-and-a-half years, the Second Integrated Rural Development Project has made significant progress in promoting development activities within the Pindars River and Two Meetings watersheds. New components have been added, the effects of the project can be seen on every hillside, and "IRDP" has become a household acronym.

To date, however, there has not been an assessment of the impact of the project upon participating farmers. In this report, we present our findings of a study conducted to determine how far the IRDP has reached in attaining its goals of reducing the rate of soil erosion and promoting increased agricultural production.

Our focus on the objectives of soil conservation and agricultural production may be interpreted by some people as rather narrow. We fully recognize that there are many components to the IRDP, and thus many other criteria by which we could have assessed the impact of the project upon farmers.The decision to limit our scope of investigation, however, rested upon the fact that soil conservation and improved agricultural production remain at the core of the project's activities. Of the three main goals, or "purposes", presented in the Project Paper, the first two deal with these areas. (The third, that relating to the human resources of the Ministry of Agriculture, was not examined.) It is from the achievement of these two goals that many of the other anticipated benefits will flow; increased income, a greater standard of living, and reduced out-migration -- all will presumably result from more economically viable and ecologically stable farms.

METHODOLOGY

The study was conducted intermittently between January and April, 1981. The team consisted of two people -- an anthropologist and a senior soil conservation officer. The former collected data on labor utilization, land tenure, and attitudes toward the project. The latter member of the team was responsible for the more technical information -- assessing the construction and maintainance of soil conservation structures, appraising crop quality and care, and mapping the farm to determine post-implementation land use patterns.

Fifty-eight farmers were surveyed. Although it had been hoped to draw upon a larger sample, time limitations necessitated a reduced number. We do not feel that the smaller sample reduces the basic validity of our findings.

Although surveying farmers throughout the two watersheds would have minimized the importance of individual field officers as a variable affecting the farmers' progress, we decided to concentrate our efforts on four areas. In addition to the relative logistical simplicity, this was done to gain a more detailed knowledge of each area.

Within Pindars River, Kellits (P4) and British/Morant (P8/P9) were chosen. Kellits, because it is the administrative center of the watershed, presented a case where the visibility and the impact of the project should be the greatest. Further, as will be discussed in Chapter 3, 17 is undergoing a shift in its cropping patterns. British (which in the survey incorporates parts of British, Morant, Guava Ground, and Pindars Valley) is an area which experiences relative isolation (during rainy spells the valley is cut off by the raging Pindars River), little infrastructure, and few alternative employment opportunities to agriculture.

In Two Meetings, George North (T6) and the Yankee Valley area (T2/T3) were selected for the survey. In both areas farmers are engaged in mixed cultivation; the distinguishing feature here was land tenure. In 1961 George

North became a government land settlement; the Yankee area (comprised of Wild Cane (T3) and Silent Hill (T2) consists of districts in which freehold tenure has been the practice for a number of generations.

The number of farmers in each of the four areas is as follows: Kellits -- 15; British -- 14; George North -- 12; Yankee -- 17.

Within each of the areas, farmers were selected on the basis of their early participation in the project. All of the farmers surveyed had had their farm plans drawn up before mid-1979, thereby allowing sufficient time for the project to have made some impact. This, too, imposes a bias on the data; for example, the soil conservation treatments observed by us were constructed when many officers were still inexperienced. Throughout the paper, we will discuss where this bias may have influenced our findings. The relatively low number of farmers within each area who met this criterion prevented a further stratification of the sample on the basis of age, sex, farm size, etc. While these other types of stratification may have been desireable, we felt it more important that we concentrate on farmers who had had extended contact with the IRDP.

At this point, we wish to acknowledge the contributions made by the officers in the subwatersheds in which we worked. Their initiative in setting up appointments for us, as well as their sharing of their extensive knowledge of the community was a major factor in the success of this study.

OUTLINE OF THE REPORT

In Chapter 2 we focus on the soil conservation component. After discussing the criteria by which we assessed the impact of the soil conservation activities, we present out findings on the construction and maintainance of the established treatments.

Chapter 3 deals with land use patterns in the IRDP area. Although not an explicit goal of the Project Paper, there have been some significant changes in some parts of the watersheds.

In Chapter 4 we turn our attention to the agricultural production model which, according to the Project Paper, will increase production by 250 percent. Although detailed cost-return data were not collected, we base our analysis upon five indicators which are necessary for the attainment of the goal: intercropping, fertilizer use, use of spray materials, the use of continuous mounds on yams, and the mortality rate of permanent crop seedlings.

Although not an explicit focus of our study, we also collected data on other components of the project, and our findings on these -- home economics, livestock, and forestry -- are presented in Chapter 5.

In Chapter 6 we present a summary of our findings.

CHAPTER 2

SOIL CONSERVATION

The primary goal of the IRDP, as presented in the Project Paper, is the control of soil erosion in the two watersheds. The Project Paper envisaged that soil conservation activities would be carried out on 17,700 acres of land; mid-project changes, however, have reduced the total to 8586 acres, a reduction of 52 percent.

CRITERIA FOR EVALUATION

The Project Paper is fairly explicit about the measures to be used to evaluate the success of the soil conservation component.

> Success will be achieved ... if soil erosion is reduced from an average of 53 tons per acre per year in 1977 to 7 tons two years after the end of the project.
>
> The subgoal [soil conservation] will be achieved if 75% of the farmers in Pindars and Two Meetings are maintaining the treated land two years after the project's end....

Both indicators assume that an evaluation will take place two years after the completion of the project; no provision is made for a mid-project assessment.

Regarding the first measure -- that of soil loss -- there is at present no mechanism by which erosion can be measured. Since soil conservation is a major goal of the IRDP, it is imperative that such a monitoring system be established. Recent moves by the soil con component to set up a soil loss study should be given strong support so that it will be possible, after the project is completed, to measure quantitatively the effect of the project in this regard.

The Project Paper's second criterion of success -- maintainance -- was the focus of our study. For each of the treatments established by the project --

bench terraces, orchard terraces, hillside ditches, individual basins, and waterways -- we established indicators by which we could measure the quality of construction and maintainance on each of the farms we visited. Each of these indicators will be discussed under the relevant sections below; at this point, however, a word should be said about the system by which we rated each of the treatments.

Each indicator -- such as the condition of the risers on bench terraces, or the general maintainace of individual basins -- had a possible rating of 1, 2, or 3.

1 = Excellent. This is what we would demonstrate to farmers as the proper way of doing things.

2 = Average. What we saw was adequate, but some improvement is needed.

3 = Poor. We would show this to farmers as an example of how things should <u>not</u> be.

In the following section, we present our findings for each of the treatments.

SURVEY FINDINGS

Among the 58 farmers surveyed, we found 2 cases of bench terraces, 6 cases of orchard terraces, 53 cases of hillside ditches, 27 cases of individual basins, and 53 cases of waterways.

Bench Terraces -- 2 cases

A. Cropping -- In both cases, the crop planted was yam.

B. Quality of Construction -- Both cases were average.

C. Condition of Risers -- Both cases were average.

D. Clearing of Toe Drain -- One case was excellent, one case average.

E. Planting of Riser Grass -- One case was excellent, one case average.

F. General Maintainance -- One case was excellent, one case average.

Orchard Terraces -- 6 cases

A. Cropping -- 2 terraces with permanent crops; 1 terrace each of banana, pineapple, and ground provisions; one terrace with no crop at all.

B. Quality of Construction -- 2 cases were excellent, 2 cases were average, 2 cases were poor.

C. Clearing of Toe Drain -- 1 case was average, 4 cases were poor.

D. Distance between Crops and Terrace -- 2 cases were average, 2 cases were poor.

E. Front on 1:1 -- 1 case was average, 5 cases were poor.

F. General Maintainance -- 2 cases were average, 4 cases were poor.

Hillside Ditches -- 53 cases

A. Cropping -- 7 cases of permanent crops; 3 cases of semi-permanent crops and ground provisions; 3 cases of pineapple, coffee, and ground provisions; 2 cases of semi-permanent crops, permanent crops, and ground provisions; 18 cases of permanent crops and semi-permanent crops; 4 cases of semi-permanent crops alone; 1 case each of red peas, sugar cane, pineapple and pumpkin, cowpeas, and tomato; 5 cases where no crop was established.

B. Quality of Construction -- 7 cases were excellent, 38 were average, and 9 were poor.

C. Clearing of Toe Drains -- 4 were excellent, 26 were average, and 23 were poor.

D. Closeness of Crops to the Ditch -- 7 were excellent, 30 were average, 3 were too close to the ditch, and 3 were undecided.

E. Front on 1:1 -- 2 were excellent, 35 were average, and 16 were poor.

F. General Maintainance -- 6 were excellent, 29 were average, and 18 were poor.

Individual Basins -- 27 cases

A. Cropping -- 11 cases of bananas; 7 cases of citrus; 2 cases of coffee; 2 cases of plaintain; 1 case of citrus and banana; 1 case with dead citrus; and 3 cases of no crop at all.

B. Pattern of Establishment -- 10 cases were lined on the triangle, 11 cases were lined out on the square, 6 cases were lined out according to no pattern at all.

C. Basins Built Up After Planting -- 4 were excellent, 13 were average, 7 were poor, and 3 were not planted out.

D. Slope Angling Backwards -- 5 were excellent and not angling backwards, 15 were average, and 7 were poor.

E. General Maintainance -- 2 were excellent, 15 were average, and 10 were poor.

Waterways -- 53 cases

A. Of the 53 cases were waterways were required, 37 were not built, 12 were built, and 4 were not needed.

B. Type of waterway -- 2 were asbestos, 5 were prefab, 4 were ballasted, and 1 was both asbestos and prefab.

C. Quality of Construction -- 4 were excellent, 6 were average, and 2 were poor.

D. Connection of Waterway to To Drain -- 6 were excellent, 3 were average, and 3 were poor.

E. Outlet of Waterway -- 9 outlets were in an ideal place (culvert, channel, etc.), 1 was average, 1 was poor, and 1 incomplete.

F. General Maintainance -- 2 were excellent, 2 were average, 7 were poor, and 1 had just been constructed.

ANALYSIS OF SURVEY FINDINGS

From the preceding findings, several generalizations can be made in the areas of 1) construction, 2) maintainance, and 3) waterways.

Construction

In general, the quality of construction was good. Taking all of the treatments together, there were 18 cases of excellent construction, 63 cases of average construction, and 20 cases of poor construction.

As noted in Chapter 1, our survey was biased toward those farmers coming into the project early; as a result, many of the treatments were constructed under the supervision of inexperienced officers. There were some farms, therefore, where poor construction was found, and little can be done at this stage without a second cost being incurred.

In the cases where bench terraces, orchard terraces, or hillside ditches were poorly constructed, we found the following defects:

1) Uneven distribution of soil on the bench, resulting in a wavy bench.

2) A narrowing of the bench, especially on the steeper slopes.

3) Fronts of many treatments are at 90^{0}, not on a 1:1.

4) Risers are too steep, resulting in a caving under.

5) Benches are constructed with an inadequate reverse slope, resulting in the bench getting flat or causing the water to flow over the risers and breaking them.

6) Reverse slope is too steep, resulting in a trench forming at the toe drains.

7) Grades are too much or too little, causing the ends of the benches to go up or down.

8) Banana trees that could have been removed during construction were allowed to remain, thereby occupying parts of the benches as well as the toe drains.

9) The benches angle outwards.

In the case of individual basins, the following defects in construction were observed:

1) The bench is too small.

2) Inadequate reverse slope; in many cases the slope angles outwards or to the side.

3) Construction not done on the triangle, but rather on the square or according to no system whatsoever.

4) The basins are often too close to the hillside ditch; this often results in the broken risers of the hillside ditch blocking the toe drains of the individual basin.

5) Construction was done on steep slopes where they should not have been established in the first place.

Maintainance

The longevity of any structure depends on the maintainance work which is performed on it; soil conservations treatments are no exception to this rule. As the Project Paper notes, maintainance will be one of the key factors in evaluating the project objectives.

Findings from the survey show that it is on few farms that treatments are being properly maintained. Combining all of the treatments together, 11 had excellent maintaince, 49 had average maintainance, and 39 had poor maintainance.

We found the following manifestations of sub-optimal maintainance:

1) Breakages from the front are allowed to remain, thereby blocking the toe drain.

2) Debris from weeding are thrown on the treatments and are allowed to cover the benches and block the toe drains.

3) Silt is allowed to stay in the toe drain, causing a gradual build-up which causes treatments to get flat or have an outward slope; this results in water going over the risers and breaking them.

4) Animals are tied on the treatments, resulting in broken risers. Pigs, especially, make depressions in the benches which are not filled in.

5) Soil from land preparation activities run onto the treatments, thereby blocking the toe drain.

6) Silt and soil are not cleared from the toe drain and placed back on the bench; this should be done to help maintain the specified reverse slope.

7) Stones are placed on the bench and in the toe drain.

8) Risers are clean-weeded.

9) Individual basins are not reshaped after planting. In some cases, the basins have totally disappeared.

10) Some of the treatments are left in fallow and are not planted out.

Soil conservation treatments, no matter how much effort and skill was expended to construct them, cannot stand up for long under abuse and bad treatment. Continuation of poor maintainance practices can only result in the land getting worse than it would have been without treatments.

Waterways

Of the 53 farms surveyed where waterways were needed, 37 of them were not built at all. When asked why their waterways were not constructed, farmers responded either that they did not know, they were told by their officers that materials were not available, or they were advised to wait. In one case, we observed two unfinished waterways on one farm. In two cases, the waterways were excavated as far back as 1979, yet no construction was done; this has created severe erosion problems which get worse with each shower of rain.

In the following section, general problems of construction and maintainance will be commented on, followed by more specific problems associated with each type of waterway.

A. Construction

1. Excavations too narrow.

2. Steps of drop structures are not constructed to carry water to the proper outlet.

3. Toe drains are not linked directly with the waterway.

B. Maintainance

1. The flatter part of some waterways are blocked by silt and debris, causing the flooding of cropped areas.

2. Stilling basins are filled with silt.

C. Prefab Waterways

1. Wide and narrow prefabs are placed alternately in the same waterway.

2. Prefab waterway has many small curves and thus zigzag down the hill.

3. Structures are not laid firmly on the ground.

4. Structures are laid too deep, causing water to go under the side of the prefab.

D. Ballasted Waterways

1. Stones are shifted and not replaced.

2. The waterway is too narrow in relation to the slope and the amount of water that it has to carry.

3. Diameter of the stones is too small.

4. Stones are not properly sledged in and this results in unwanted shapes instead of the recommended trapezoidal or parabolic shapes.

5. Spaces between the slopes are too wide, enabling water to get underneath them and dig them out.

6. Waterways constructed on steep slopes are not cemented.

E. Asbestos Waterways

1. Excavation of waterways are done too wide and spaces are not filled in, causing water to go under them and dig them out.

2. The asbestos is not pegged in properly.

SUMMARY

1. Construction of the treatments was generally good.

2. Maintainance of the treatments is a problem. Many farmers are not caring the treatments in a manner which would ensure that they function over the years.

3. Many of the waterways have not been constructed. This is due primarily to the fact that many officers, under pressure to bring more and more farmers into the project, have little incentive to ensure the completion of implementation on farms. In addition, where new officers have replaced ones who have left the project, there is no system to ensure that the previous officers' farmers are attended to.

RECOMMENDATIONS

On the basis of the preceding analysis, we make the following recommendations:

1) Establishment of Run-off Studies - At present, the soil conservation component is considering methods for studying soil loss both before and after implementation. This type of measurement is vital if the impact of the component is to be evaluated. Careful studies should also be done to assess the relative effects of various kinds of treatments, especially those involving agronomic methods.

2) Greater Emphasis on Agronomic Soil Conservation Treatments -- Given the cost, maintainance requirements, and technical sophisitcation of the present methods of soil conservation, the project should place greater stress on the development of less costly and simpler agronomic treatments such as grass strips, strip cropping and mulching. We are pleased that 750 acres of such treatments have been budgeted for in this fiscal year. Careful monitoring should be done to assess the acceptance of these techniques, the level of maintainance, and the effect on soil loss.

3) Stress on Maintainance -- On the whole, the maintainance of the treatments has not been encouraging. The reasons for this are varied. First, a large number of farmers view the programme as a source of cash, and their interest in the project ceases when their money is issued. Second, many farmers are not encouraged by the field officer to maintain their treatments; one farmer even claimed that he was never told that he would have to perform any maintainance. Both aspects of the problem can be reduced to one statement: there has not been a concerted effort by project personnel to educate the farmers on the importance of caring for their treatments. Under the pressure of treating more and more acres of land, officers do not spend the time returning to those farms on which they had previously worked. Even at the cost of reducing the acreage to be accomplished, a systematic attempt must be made to encourage maintainance. It is time for officers to pull up their socks instead of allowing further deterioration of their work to continue.

4) Greater Education on Soil Conservation Treatments -- Some farmers do not do their own construction, relying on others to do it for them. These paid workers often use short-hand methods of construction, to the detriment of proper establishment. Thus, the farmer should be educated in the techniques of construction, as well as what can result from poor workmanship.

5) Subsidies - While farmers need some incentive to come into the project, the present system of 75 percent subsidy is seen by many farmers as a means of obtaining cash from the government. It is probably too late in this project to review the overall subsidy scheme; however, given the problem of maintainance, consideration should also be given to deferring some of the subsidy over time; this might create additional administrative complexity, but it would ensure that officers check back with farmers and that the treatments are maintained.

6) Staffing -- As is to be expected in a project such as this, officers are being moved from one subwatershed to another, while others simply leave the project. This creates a transition problem, as farmers are then exposed to officers with different ideas, techniques, and styles. It is hoped that this transitional period is smooth for both farmers and officers, but this does not always occur. Replacements should be given some form of guidance with regard to proper management from skilled staff within the IRDP. To the extent possible, replacements should overlap with the departing officer to promote continuity. Where this is not possible, a new officer should understudy good officers before he is left on his own. This would help the new officer to pick up the methods and orientation of the IRDP and thus reduce the adjustment period. In addition, a system should be established which ensures that implementation started by one officer is continued by his replacement; the problem of non-continuity is especially apparent in the case of waterways.

7) Field Checking -- Field officers should test the strength of treatments before making bills for payment. It should be re-emphasized to officers that bills should not be made for partially finished jobs. Senior officers should try to check more of the jobs for which bills have been submitted.

8) Training -- The recent (May, 1981) course provided necessary training for the soil con officers. Field assistants and senior labourers, however, are not adequately trained before they are sent out into the field. In some cases, senior labourers and casual labourers are sent to supervise construction. Most of them are capable of demonstrating the basics of construction, but they have not mastered the intricacies. In addition to more spot-checking of their work, some training for them should be provided. Better trained personnel at this level would improve the quality of construction and, if properly indoctrinated, could also provide a good means of encouraging maintainance.

9) <u>Greater Stress on Mini-Convertible Terraces and Intermittent Bench Terraces</u> - Although these two forms of soil con treatments were not mentioned in the Project Paper, they should be given more consideration. The use of IBTs would allow the farmer to phase in the establishment of terraces; this would allow greater time to adjust to the necessary management of terraces. Having either of these treatments would also allow the farmer to plant other crops between the terraces. Further, having fewer terraces would encourage the farmer to plant continuously on them; this would also enhacne the prospects for maintainance.

CHAPTER 3

LAND USE PATTERNS

Although changes in land use patterns is not a specific project goal, it is clear that the project is having an important impact on the ways in which farmers are using their land. In an earlier report, Blustain (1980) outlined projected changes in cropping patterns based on an analysis of agricultural development proposed in the farm plans. Our on-the-farm investigation in this study has confirmed that there have been significant changes in land use in some areas.

As part of the survey, we remapped each of the farms on which implementation had taken place. Where a farmer had two or more parcels, constraints of time did not always permit us to examine all of those parcels. We did, however, look at the parcel(s) upon which the farmer stated that he did the greatest amount of his cultivation.

In drawing up the farm plan maps in 1979, some of the officers were very explicit about the types of crops they saw growing on the farms. Others, however, utilized the conventional symbols (GP for ground provisions, PC for permanent crops, etc.), thus preventing a detailed comparison and analysis of the specific shifts in cropping. For the sake of clarity, most of the data will be presented in terms of major crop categories. These categories are:

1) Fallow -- This is not a well-defined category, as there is no common consensus on what constitutes the difference between ruinate, fallow, and unimproved pasture. Different officers, viewing the same piece of land, may label it differently. This proved to be a problem in our study, as what the farm plan

referred to as, say, a half acre of unimproved pasture was seen by us as a half acre of fallow land. What distinguishes this category from the others, however, is the fact that there are no cultivated crops on the land.

2) Permanent Crops -- Included in this category are coffee, cocoa, citrus, and such food trees as ackee, paw-paw, and avocado pear, among others.

3) Semi-permanent Crops -- Three main crops comprise this category: banana, plaintain, and sugar cane.

4) Ground Provisions -- This is the largest of the categories, consisting of the food crops grown by farmers: yam, coco, cassava, ginger, legumes, sweet potato, Irish potato, and others.

5) Forestry -- Here, we are specifically referring to trees planted under the supervision of the forestry component of the IRDP.

It is important to note that intercropping is a prevalent practice in both watersheds. In the case of ground provisions (e.g. yams and peas, or potato and pumpkin), this mixture of crops presents no problems in terms of "confounding the categories" in this analysis. Other forms of intercropping, however, cross the boundaries of the categories presented here -- for instance, banana (semi-permanent) and coffee (permanent). Where this occurred, either we noted this specially in the tables below (where we felt it was an important aspect of the areas's cropping system) <u>or</u> we subsumed both crops under the category of permanent crops.

In the sections and tables below, we present data on changes in cropping patterns in each of the four areas, starting with Pindars River.

Kellits -- 15 farms, 42.75 acres

TABLE 3.1

LAND USE -- KELLITS

Crop Category	%age of Land in Each Category 1979	1981
Fallow	36%	8%
Permanant Crops	15%	29%
Semi-permanent and Permanent Crops	20%	31%
Semi-permanent Crops	28%	9%
Ground Provisions	1%	6%
Forestry	-	6%
Land in Preparation	-	11%

Clearly, over the past two years a big shift has occurred. There is more land in production, with an increase in land devoted to permanent crops and food crops. Significant, too, is the decrease in the amount of land in pure-stand banana and sugar cane (semi-permanent alone). The category marked "Land in Preparation" resulted from an early bug in the survey; where farmers were in the process of preparing their land for cultivation, we did not always inquire as to the crop to be planted.

British - 14 farms, 76 acres

TABLE 3.2

LAND USE -- BRITISH

Crop Category	%age of Land in Each Category 1979	1981
Fallow	60%	39%
Permanent Crops	21%	42%
-(citrus)	(10%)	(33%)
-(other)	(11%)	(9%)
Semi-permanent Crops	7%	6%
Ground Provisions	12%	10%
Forestry	-	3%

The main shift in this area has been a decrease in uncultivated land and a concommitant increase in permanent tree crops, especially citrus. This rise in citrus, while desireable in terms of its productive potential, may lead to problems later on. At the March, 1981 meeting of the Development Committee Council, there was a spirited argument between some members over the ability of the Citrus Growers' Association to provide a marketing outlet for fruit currently being produced in that area. With a new surge of production anticipated in a few years, marketing problems may be encountered.

GEORGE NORTH -- 12 farms, 39 acres

TABLE 3.3

LAND USE -- GEORGE NORTH

Crop Category	%age of Land in Each Category 1979	1981
Fallow	35%	29%
Improved Pasture	3%	10%
Permanent Crops	19%	16%
Banana	9%	8%
Ground Provisions	33%	34%
Forestry	1%	3%

The only significant change here involves less fallow land and more improved pasture, although once again it should be noted that these two categories are not always easy to distinguish on the ground.

YANKEE VALLEY -- 17 farms, 43.9 acres

TABLE 3.4

LAND USE -- YANKEE VALLEY

Crop Category	%age of Land in Each Category 1979	1981
Fallow	49%	40%
Permanent Crops	9%	10%
Semi-permanent Crops	26%	26%
Ground Provisions	16%	27%
Forestry	-	1%

The primary change in the Yankee area has been a decrease in fallow land and a corresponding increase in the land devoted to ground provisions. The increase in this sample of food crops, however, represents a growth from 7 to 11 acres.

It is evident from these data that the impact of the project on land use has been greater in Pindars than in Two Meetings. The change in Pindars is characterized by an increase in the area devoted to permanent tree crops, especially citrus and coffee. The shift, while facilitated by the project, has been a response by farmers to what had become unfavorable market conditions for their traditional crops. Fewer trucks and higher prices for transport, along with rising wage rates, had made cane an unprofitable crop for small farmers. Bananas, too, which had at one time (the 1920's and 1930's) been the mainstay of the Kellits economy, were no longer a viable crop due to the distance to the nearest boxing plant (17 miles) and the high rejection rate. Many farmers expressed the view that they had continued to grow these crops over the years because it was "what they knew" and, further, that it was through the IRDP that they were able to get into more profitable crops.

In the British area, farmers had been in even more of a rut. With a dry climate, poor infrastructure, and few marketing outlets, farmers in that area had had few opportunities and little incentive for increasing their area of cultivation; the IRDP has unquestionably given those farmers a boost.

In Two Meetings, on the other hand, farmers had long benfitted from better marketing outlets and better roads. The Christiana Area Land Authority, as well, had provided opportunities for farmers to benefit from concentrated extension and the more readily-available inputs. Permanent crops have not increased much in this area because farmers have had neither the experience nor tradition of growing such crops. In the case of food crops, acreage is not significantly being expanded for two reasons. First, catch crops are labour-intensive, and with the high price that labour currently gets, farmers are keeping their acreage within their management capabilities. Second, the current unstable marketing conditions provide farmers with no incentive for expanding their acreage of these crops.

In this chapter we have focused on the acreage in cultivation. In the next, we will concentrate on a more central goal of the IRDO -- increasing the productivity of those acres.

CHAPTER 4

THE AGRICULTURAL MODEL

One of the three major goals of the IRDP is the adoption by farmers of an agricultural model which would increase farmers' production by 250 percent.

CRITERIA FOR EVALUATION

As was the case with soil conservation, the measurement of success in this area is dependent upon an evaluation being conducted two years after the completion of the project; there is no provision for a mid-course assessment.

> The goal of increased agricultural productivity will be achieved if 75% of the farmers in Pindars and Two Meetings are maintaining the treated land two years after the project's end and are practicing multiple cropping, intensified farming techniques using higher-value crops appropriate to their own circumstances.

Ideally, changes in agricultural pproductivity would be best measured by detailed cost/return data from a sample of "real" farms. Given our constraints of time and resources, the collection of that kind of data did not prove practical; any figures we could have come up with would have been estimates of dubious accuracy.

In the absence of these data, we felt that the best means for assessing changes would be to measure the rate of adoption by farmers of those practices which are associated with the projected increase in productivity. We assumed that if farmers have adopted the recommended practices, then, regardless of their actual present yield, they were "on their way" to achieving the desired results; where farmers have <u>not</u> adopted the necessary practices, the assumption was made that they are not likely to achieve the desired increase in productivity and income.

Five indicators of the improved cropping model were chosen: intercropping, fertilizer use, use of spray materials to control disease and pests, continuous mounds in yam cultivation, and the mortality rate of seedlings supplied by the project. The fifth aspect is not a cultural practice per se, but the survival of the planting material is an important factor in assessing the future production and income of farmers.

It should be pointed out at this time that in regard to the first three indicators -- intercropping, fertilizer use, and spray use -- there have been no clearly established and definitive guidelines established by the project. The officers are, of course, trained technicians, and most of them are aware of the correct cultural practices for the cultivation of various crops. Yet the work done on the demonstration farms has not been disseminated to the extension component, and field officers have received no standardized list of practices which they should encourage farmers to adopt. Thus, in assessing the adoption of correct practices, we had to establish our own measures of what constituted "correctness"; where appropriate, and for purposes of verification, we have indicated the standards we have used.

Our survey of 58 farmers included an assessment of 90 fields on which crops were established. By "field", we do not means "parcels" of land, but rather distinct sections of a farm which are devoted to specific crops. One parcel, for example, may have a field in banana, another in yam and peas, and yet another in cane. These 90 fields were planted out with 13 main crops, as shown in the following table.

TABLE 4.1

NUMBER OF FIELDS IN CROPS

Crop	NUMBER OF FIELDS				
	Kellits	British	George North	Yankee	Total
New Coffee	10	6	-	2	18
Citrus	2	6	1	-	9
Plaintain/Banana	6	1	6	2	15
Yam	4	-	8	10	22
Irish Potato	-	-	4	4	8
Sweet Potato	1	1	1	-	3
Coco	-	-	1	-	1
Red Peas	-	-	-	3	3
Gungo Peas	3	3	-	-	6
Corn	-	-	1	-	1
Cabbage	-	-	1	-	1
Tomato	-	1	-	-	1
Pineapple	-	-	-	2	2
TOTAL	26	18	23	23	90

INTERCROPPING

The Project Paper (page 20) anticipates the establishment of an agricultural model based on "continuous multiple-cropping techniques". Thus far, no specifications or guidelines have been issued on the correct practices farmers should use for intercropping. In the absence of such a model, our analysis is based upon our own knowledge of correct agronomic practices.

In Table 4.2 we organize our data on the basis of the number of fields in which the main crop 1) had no intercrop, 2) was intercropped properly, or 3) was intercropped improperly.

TABLE 4.2

INTERCROPPING

Main Crop	No Intercrop	Properly Intercropped	Improperly Intercropped
New Coffee	3	10	5
Citrus	7	1	1
Plaintain/Banana	3	5	7
Yam	15	0	7
Irish Potato	4	1	3
Sweet Potato	0	2	1
Coco	1	0	0
Red Peas	3	0	0
Gungo Peas	3	1	2
Corn	0	1	0
Cabbage	1	0	0
Tomato	1	0	0
Pineapple	2	0	0
TOTAL	43	21	26

Only 21 of the 90 fields we observed (23 percent) were properly intercropped; almost half (10) of these involved new coffee, where the seedlings were lined out by project officers.

The symptons of improper intercropping were varied. In some cases, over-population of too many kinds of plants created unhealhty competition; for example, one farmer planted corn and Irish potato in the same hole at the same time. In one area (Wild Cane), the officer had instructed the farmer to plant the coffee seedlings on the individual basins and the banana suckers on the mounds, a reversal of accepted practice.

The major reason for incorrect intercropping had to do with spacing. In some cases the spacing was too close, in most cases (particularly with peas) the spacing was too far, and in all cases the spacing was not done systematically.

From these data, it seems that farmers are not adopting a farming system based on practices of intensive intercropping. If such a system is a precondition for the attainment of the desired increase in production, then the project -- and the farmers -- have a long way to go to meet this goal.

FERTILIZER USE

The issue of fertilizer use comprises several distinct questions: Is the farmer buying any fertilizer at all? If so, is he using the right type? At the right times? In the right quantities? Using the right method?

The Use of Fertilizer

In Table 4.3 we present data on the number of fields on which fertilizer was used, broken down by district and by specific crop. The column marked "Yes" indicates the number of fields on which fertilizer was used, regardless of the type, quantity, or timing of application. The column marked "No" shows the number of cropped fields on which no fertilizer at all was used.

TABLE 4.3

FERTILIZER USE

	NUMBER OF FIELDS							
	Kellits		British		George North		Yankee Valley	
Main Crop	Yes	No	Yes	No	Yes	No	Yes	No
New Coffee	7	3	1	5	-	-	-	2
Citrus	1	1	1	5	1	-	-	-
Plaintain/Banana	4	2	-	1	3	3	1	1
Yam	4	-	-	-	7	1	9	1
Irish Potato	-	-	-	-	4	-	4	-
Sweet Potato	-	1	-	1	-	1	-	-
Coco	-	-	-	-	1	-	-	-
Red Peas	-	-	-	-	-	-	3	-
Gungo Peas	2	1	1	2	-	-	-	-
Corn	-	-	-	-	1	-	-	-
Cabbage	-	-	-	-	1	-	-	-
Tomato	-	-	1	-	-	-	-	-
Pineapple	-	-	-	-	-	-	2	-

Fifty-nine of the 90 fields -- or about two-thirds -- had had some amount of fertilizer applied to them. Analysis of fertilizer use reveals significant differences along two dimensions -- area and crop.

In terms of area, it is clear that the farmers in the British area of Pindars do no use much fertilizer on any of their crops. This is primarily because there are no supply stores in the area, transportation is scarce and expensive, and farmers in that district are among the poorest in the two watersheds. In the other three areas, on the other hand, fertilizer -- and the means to transport it -- are more readily available.

Although the number of observations for some crops is small, there also appears to be a variation in the types of crops for which farmers use fertilizer. Yam , for example, is one crop for which farmers go to the trouble and the expense of using fertilizer; 20 of 22 fields had had some amount applied. Similarly, all eight fields of Irish potato had been given some fertilizer, probably because of the education provided by the Christiana Potato Growers' Cooperative. Other crops are generally neglected when it comes to adding nutrients to the soil. We were surprised that new coffee (except in the Kellits area) was not a crop which was widely given fertilizer.

Type of Fertilizer

In this section we deal with the question of the types of fertilizer which farmers are using on various crops. For some crops, more than one application was made, often with different formulas; thus, our unit of analysis is each application itself. In all cases, we will indicate the type of fertilizer which is correct for that crop, and then indicate the number of applications which entailed the use of the right or the wrong fertilizer.

Coffee -- Soil additive at time of planting; 6-18-27.

Correct -- 2
Incorrect -- 10

Citrus -- Soil additive at time of planting; 6-18-27

Correct -- 1
Incorrect -- 1

Plaintain/Banana -- Sulphate of Ammonia at time of planting; 12-4-28

Correct -- 3
Incorrect -- 12

Yam -- 6-18-28 or 12-24-12

Correct -- 13
Incorrect -- 16

Irish Potato -- 6-12-28 or 12-24-12

Correct -- 6
Incorrect -- 2

Red Peas -- 12-24-12

Correct -- 1
Incorrect -- 3

Gungo Peas -- 12-24-12

Correct -- 1
Incorrect -- 1

Corn -- 16-9-18

Correct -- 0
Incorrect -- 1

Cabbage -- 12-24-12 or 7-14-14

Correct -- 2
Incorrect -- 0

Tomato -- 7-7-14

Correct -- 1
Incorrect -- 0

Of the 26 applications of fertilizer used on all of the crops, 26 of them -- or one-third --entailed the use of the correct type; 50 involved the use of the wrong type of fertilizer. Two caveats are in order. First, not all types of fertilizer are always available to the farmer in all areas; a few farmers stated that they had had to buy other types of fertilizer even if they were not the best ones. Second, we do not imply that the 50 incorrect applications represented a total waste of the farmers' reosurces; some nutrients were derived from even the incorrect fertilizer. However, if the aim is a maximized farming system, then these incorrect fertilizers were suboptimal.

Timing of Applications

Analysis of our data reveals that most farmers are aware of the correct times of apply fertilizer. Of 86 applications made on ten crops, 65 were made at the correct intervals after planting. The one crop for which the timing of applications presented a problem was coffee, where 8 of 12 applications were made at the wrong intervals. On citrus, one of two applications were correctly timed; on yams, 22 of 29; on bananas, 9 of 15. The total of 19 applications on Irish potato (8), red peas (4), gungo peas (3), corn (1), cabbage (2) and toma

tomato (1) were all made at the right times and intervals.

Amount of Fertilizer

Given the fact that farmers will spread a bag of fertilizer on several different crops, it was not possible to determine the exact amount of fertilizer used on each crop. Thus, our analysis is more impressionistic than quantitative.

Many farmers apparently do not know the amount of fertilizer to be used on crops. Often, farmers use too much fertilizer. Some complain that it causes their yams to "burst", a sign of over-fertilization.

Method of Application

Farmers also need to be educated on the correct method of applying fertilizer. Some broadcast it through their crop, others build small mounds at the base of the stem. In many cases, particularly on vegetables, incorrect application causes a burning of the leaves.

USE OF SPRAY MATERIAL

Our survey revealed that not many farmers -- especially in Pindars -- use spray to controlpests and diseases. Table 4.4 presents data on the number of fields of each crop for which spray had been used.

TABLE 4.4

USE OF SPRAY MATERIALS

Crop	Number of Fields	Number of Fields Sprayed	Percentage of Fields Sprayed
New Coffee	18	0	-
Citrus	9	0	-
Plaintain/Banana*	15	5	33%
Irish Potato	7	6	86%
Sweet Potato	3	0	-
Red Peas	3	2	66%
Gungo Peas	6	1	17%
Cabbage	1	1	100%

*In all cases, spraying was done by the Banana Company

Although the nonavailability and cost of spray are two factors accounting for the low use of spray material, it is not the full story. Many farmers were ignorant of which sprays cured which problems; some farmers were using fungicides where insects were the problem, and vice versa. In addition, farmers have a tendency to use the same type of spray three or four times in succession, instead of mixing them or rotating them; in such cases, the insects had developed an immunity to that type of spray. Finally, few farmers use sticker in their spraying formula.

CONTINUOUS MOUNDS

Of the 22 yam fields we checked, only two were planted on continuous mounds; the majority were planted on individual hills.

The low rate of adoption of this practice can be explained in several ways. First, some extension officers do not push the practice strongly; it may be

suggested to farmers, but many that we talked to claimed that they had never been given practical instruction in the construction of the mounds.

Second, although mounds have been packaged by some officers as a labor-saving device, farmers view it as more labor-intensive. And with high labor rates, this is not seen as an advantage.

Third, farmers claim that because the yams are planted closer, the vines become entangled and, in high winds, this causes the vines to pull from the roots. This problem became more apparent last year with Hurricane Allen.

Fourth, recent experience at Allsides indicates that the yield per yam head on continuous mounds is less than that derived from planting on individual hills. Because the yam heads are planted closer together (with four vines to a pole), the weight of each mature yam is less. The total yield from both methods are the same, but continuous mounds require twice as much planting material.

Fifth, last year's drought may have reduced the yield of all yams, regardless of how they were planted. Yet because this was the first year farmers had tried the continuous mounds, they may have blamed their poor yields on the new practice.

Whether all, some, or none of these explanations are correct, it is clear that the farmers are not adopting one of the key practices of the improved cropping system. More research needs to be done <u>on real farms</u> to determine whether continuous mounds are in fact appropriate for small farmers.

SEEDLING MORTALITY

The survival rate of seedlings is an important indicator of future production. In our survey, we concentrated on finding the mortality rate of coffee and citrus seedlings supplied by the IRDP. The rates presented below are based upon farmers' own estimates and our own field checking.

Coffee -- On the 14 fields for which mortality data weregathered, approximately 4875 coffee seedlings had been planted. Of these, an estimated 1535 had died,. This translates into a 31 percent mortality rate.

Citrus -- On the 9 fields for which such data were gathered, 365 of 1000 seedling had died, for a 39 percent mortality rate.

While some mortality is expected, the rates for both coffee and citrus are high. As with most things, there are multiple reasons for this, including poor material from the nursery, long waits for distribution to farmers, and poor attention from the farmers.

SUMMARY

The five indicators chosen to assess the progress of the agricultural production model indicate that farmers -- at least those who have been in the project for two years - have not adopted the practices necessary for the desired goal in production to be met.

1. Twenty-one of the 90 fields we surveyed (23 percent) were properly intercropped. Twenty-six fields were improperly intercropped, and 43 fields (48 percent) were not intercropped at all.

2. Two-thirds of the crops observed had had fertilizer applied to them. In most (two-thirds) of these cases, however, the incorrect type of fertilizer had been used. Most farmers are knowledgeable about the times at which the nutrients should be applied.

3. Many farmers do not use spray material; nor do they have the knowledge about the types of and differences between various sprays.

4. Very few farmers are planting their yams on continuous mounds.

5. The mortality rate for project-supplied seedlings is in the order of 35 percent.

RECOMMENDATIONS

1. As noted earlier, there are no standardized specifications regarding agronomic practices. Spacing of crops, types of fertilizer or spray, amounts of inputs -- all of these need to be determined by the agronomy unit and disseminated to officers and farmers.

2. More vigorous extension is needed to convince farmers of the advantages and yields to be derived from improved cultural practices.

3. More coordination is needed between the agronomy and extension components. This point has been raised several times in previous evaluation reports (Curtis et. al 1980; Armor et. al. 1981), but it has not yet been instituted.

4. Variety trials and other forms of agronomic research need to be done on real farms and under actual farm conditions. Rather than a technology being developed on government farms (where labor and money are not major constraints) and handed down to the farmers, farmers must participate in the development of practices which are appropriate for them.

5. Subcenters would be an appropriate place for such trials, although the free inputs provided by the project would remove some of the "real-life" constraints experienced by farmers; the free input policy should be re-evaluated. Although having many farmers involved in this process would be advantageous, practical considerations might lower the number of participating farmers to less than the fity scheduled subcenters.

6. More training sessions are needed for farmers. Of particular value would be courses on the mixing of fertilizer components (thus lessening the farmers' dependence on whatever type of fertilizer is currently available in his area) and the mixing and rotation of sprays.

7. More field assistants should be trained in the techniques and substance of extension. At present, most of the field assistants are assigned to soil conservation work. The project has reached the stage where more effort should be devoted to extension.

8. The project should encourage the establishment of a private-sector supply store in Pindars. Two Meetings is well-served by at least two well-stocked stores, while farmers in Pindars must travel to May Pen or, in some cases, to Spaldings. The current distribution of tools was a needed boost, but the sustainability of improved practices depends upon a reliable source of inputs.

CHAPTER 5

HOME ECONOMICS, LIVESTOCK, AND FORESTRY

While our primary emphasis was on the goals of soil conservation and agricultural production, we also collected data on the impact of other components. In this chapter, we present our findings on three additional components -- home economics, livestock, and forestry.

HOME ECONOMICS

Our survey was limited to only one of the home economics component's many activities -- kitchen gardens. Of the 58 farmers surveyed, we came across only four such gardens. The conditions of these gardens ranged from poor to excellent, but the limited sample precludes any substantive analysis.

At present, the home ec component is undertaking its own evaluation to assess the impact of the programme on nutrition, family planning, and income. We support the thrust and design of this study and urge that the project make available the resources and support necessary for its completion.

As a recent report suggests (Armor et. al. 1981), the home ec officers are in the best position to evaluate the impact of the project on standards of living. We recommend that such an evaluation instrument be designed, as it would expand and complement the formal criteria established by the Data Bank and Evaluation Unit of the Ministry of Agriculture.

LIVESTOCK

Of the farmers surveyed, 44 maintained one or more of the following types of livestock -- pigs, cows, goats, rabbits, or donkeys. None of these 44 farmers had obtained their animals with the assistance of the project.

Pigs -- 35 farmers were maintaining a total of 165 pigs. Six farmers had only one pig, while one had 23 of them.

Cows -- 30 farmers had a total of 54 cows and bulls.

Goats -- 27 farmers were rearing a total of 80 goats.

Rabbits -- Two farmers were keeping five rabbits.

Donkeys -- 22 farmers had a total of 30 donkeys.

The poor condition of most of these animals attests to the fact that much extension work needs to be done on the care of livestock.

The major problems cited by farmers in the rearing of livestock concerned feed. Most expressed their inability to purchase feed, either because it was unavailable or because they did not have the cash to purchase it. Other problems encountered were market conditions (in the case of pigs), theft, poor pens, worms, and itch.

Recommendations

1. Field offciers need more training on the care of pigs and cows. With a greater understanding of simple ailments and remedies, they could instruct the farmers during the course of routine visits to the farm.

2. A small pamphlet should be issued to farmers on the feeding of various animals. With feed scarce and/or expensive, instructions in optimal mixes of farm products for feed would help the nutritional status of the livestock.

FORESTRY

In our survey we encountered 9 fields planted out in forestry. Mortality ranged from 2 percent to 100 percent, with 7 fields experiencing a rate of 20 percent or below. There was an even distribution of plantations in excellent, average, and poor condition. In all fields, the spacing of trees was according to recommended specifications (8 feet by 8 feet).

CHAPTER 6

CONCLUSIONS

In this report we have looked at the impact of the IRDP in terms of its impact on farmers in two key areas -- soil conservation and the adoption of an agricultural production model. In both areas, it was found that the project is still along way from meeting the goals established in the Project Paper.

In the case of soil conservation, we found that while the field officers were doing a good job in terms of supervising the construction of the treatments, the farmers were not putting in the effort and energy toward maintaining the structures so that they would have a lasting effect in controlling soil erosion.

The goal of establishing a production system which would raise the production level of farmers by 250 percent was also seen to be falling short of its fulfillment. While detailed input/yield studies have yet to be conducted on real farms, an analysis of five indicators which are basic to the accomplishment of that goal -- intercropping, fertilizer use. spray use, continuous mounds for yam cultivation, and seedling mortality -- reveals that farmers are not adopting the technology which would help them realize that increased production.

We have purposefully left out an analysis of <u>why</u> the project's goals are not being achieved. This analysis will be presented in the second part of the report.

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