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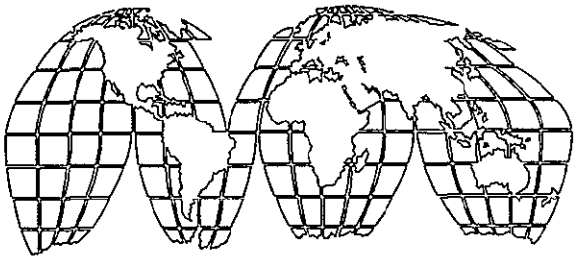

Sustainable Agriculture and the Environment:
Jamaica Case Study

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SUSTAINABLE AGRICULTURE AND THE ENVIRONMENT:

Jamaica Case Study

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PREFACE

USAID's Center for Development Information and Evaluation (CDIE) is conducting a worldwide assessment of its environmental programs. Initially, the assessment is focusing on the environmental impact of USAID-supported programs in three areas: biodiversity, forestry, and sustainable agriculture. Other environmental areas, such as coastal resources and urban and industrial pollution, may be covered in subsequent assessments.

This assessment on sustainable agriculture in Jamaica is one of five country case studies. Similar studies have been completed for the Philippines, Nepal, Mali, and The Gambia. The results of the five case studies, all of which follow a similar analytical framework, will be synthesized into an overall assessment that summarizes key lessons learned from a worldwide perspective and that highlights important program and management implications for USAID.

* * *

The team received excellent support from numerous individuals in Jamaica and from USAID/Kingston. The team is particularly grateful for the assistance provided by former (and current) sub-project managers of the Hillside Agriculture project who helped identify farmers who had participated in USAID-supported activities that, in some cases, had terminated over ten years ago.

SUMMARY

Jamaica's single most important environmental problem -- the one that affects the largest number of people -- is the degradation of watersheds. Watershed degradation leads to topsoil loss which, in turn, leads to:

-- reduced agricultural productivity and the use of more chemical fertilizers; and

-- reduced retention of rainwater by the soil, faster runoff, and more flooding.

Jamaica is particularly susceptible to watershed degradation because about 80 percent of the land surface is hilly or mountainous. Of Jamaica's 33 watersheds, 19 were badly eroded in 1993. About half of Jamaica's land area is used for agriculture, and, in the absence of soil conservation measures, agriculture is the principal cause of watershed degradation.

USAID has supported soil conservation measures in Jamaica since the late 1970s -- primarily under two projects. The seven year, $22.2 million Integrated Rural Development project (1977-1984), of which USAID contributed $11.4 million; and the ten year, $10 million Hillside Agriculture project (1987-1997), of which USAID is contributing all $10 million.

In May/June 1994, 17 years after the first of these two projects was initiated, a three person team visited Jamaica to assess the impact of USAID's support of sustainable agriculture activities. The team based its findings on a careful review of existing documentation, especially past evaluations; structured interviews with persons and organizations in Jamaica knowledgeable about A.I.D.-supported programs in sustainable agriculture; and perhaps most important, visits with 28 farmers at 11 sub-project sites in Jamaica to assess impact from the perspective of the intended beneficiaries.

The two USAID-supported projects (IRDP and HAP) used dramatically different approaches to address environmental concerns and soil and water conservation problems -- and they had dramatically different results. The assessment, therefore, represents a study of contrasts, and these contrasts are highlighted in the report.

IRDP used heavy earth moving equipment to construct terraces, ditches, and waterways (often made of concrete) in order to control soil erosion on steeply sloping terrain. The land that had undergone conservation treatment was then planted with crops. In contrast, HAP provided tree crops (primarily coffee and cocoa seedlings) which, when planted on steep hillsides, not only helped to control soil erosion but also provided farmers with a

source of income. HAP also introduced improved agricultural practices and conservation measures associated with the production of tree crops, including resuscitating existing trees, constructing ditches, and planting vegetative barriers.

Thus, the conservation technologies introduced under the two projects were quite different. IRDP promoted the construction of bench terraces using heavy equipment, while HAP promoted the planting of trees using manual labor. The former was expensive; the latter was not. The former was complex; the latter was simple. The former was clearly inappropriate, as some farmers actually lost productive land; the latter was familiar to most farmers and was consistent with existing cropping patterns.

There is little evidence that attempts to create greater awareness among the rural population about the long-term negative effects of watershed degradation had any effect, one way or the other, on the rate of adoption of the technologies introduced under either activity. Farmers adopted the conservation technologies not because of the potential long-term benefits resulting from less soil erosion, but because of the short-term benefits that were promised to those who participated. IRDP paid farmers cash to construct terraces; HAP gave farmers free seedlings, free fertilizer, and free technical advice as long as they agreed to plant the seedlings, use the fertilizer, and take the advice. The short-term benefits (whether in cash or in kind) -- not awareness about watershed degradation -- induced farmers to adopt the conservation technologies.

Both projects sought to strengthen national and local level institutions to help assure the sustainability of the conservation and production activities. IRDP focused at the national level by providing technical assistance and training for extension officers in the Ministry of Agriculture (MOA) and by strengthening agricultural institutions that provided marketing and credit services. In contrast, HAP assumed that there was already an established capability at existing institutions, including the Coffee Board, the Cocoa Board, and the MOA's extension service, the Rural Agricultural Development Authority (RADA) to deliver agricultural inputs, market outputs, and provide technical advice. Although IRDP established local level Development Committees, these did not emphasize farmer involvement and were short-lived. In contrast, HAP required farmer involvement through Local Management Committees (LMCs) which selected the beneficiary farmers and provided regular management. However, as with IRDP, local level participation was a weak component, and as a result, LMCs generally became non-functional after each sub-project ended.

One criterion LMCs used to select farmer beneficiaries was whether or not they owned the land on which the perennial tree seedlings would be planted. Since perennial trees represent a

long-term investment, secure land tenure was necessary to ensure that the benefits of the project would accrue to participating farmers and not be claimed by other family members (as might occur in the case of family land). Land tenure considerations were also important under IRDP, since it would be inefficient to construct a bench terrace for one farmer but not his neighbor; in spite of this, no mechanism was implemented to assure such cooperation.

It seems quite clear that during much of the 1977-1984 period, when IRDP was implemented, the political environment was geared more toward assuring jobs for members of the party in power than in protecting the environment. Although an expensive bureaucracy was established to implement IRDP, the bureaucrats cared more about political patronage than about watershed development. In contrast, the political environment during the 1986-1994 period has been much more conducive to supporting environmental programs and other development activities. Especially since the early 1990s, the Government of Jamaica has begun to give environmental issues the attention they deserve, for example, by elevating environmental concerns to cabinet status, by creating the Natural Resources Conservation Authority, and by publishing its National Environmental Action Plan. Finally, policies designed to promote economic liberalization and deregulation that were initiated in the mid-1980s, when HAP was implemented, have helped create an environment in which farmers are better able to increase their financial returns to the production of traditional export crops.

The results of HAP are quite positive, partly because farmers were already aware of the technologies that were introduced and partly because adoption of the technologies did not require a major change in farmers' cropping patterns. The most widely adopted technological interventions were resuscitating existing coffee and cocoa trees and increasing the density of perennial tree crops. But various other soil conservation practices were adopted as well. For example, plant material was left on the soil surface to reduce sheet erosion, increase water infiltration, and improve soil fertility; ditches and wooden barriers were constructed and contour ridges were reinforced to do the same thing; and gully plugs were used to reduce water velocity in the vertical channels that drain water from the fields and off the roads.

HAP has affected nearly 7,000 acres of hillside land on which: 2 million coffee and cocoa trees have been resuscitated; 1 million seedlings have been planted; and more than 10,000 direct erosion control measures have been carried out. However, the emphasis has been primarily on land already in perennial crop production rather than on land characterized by the most severe erosion problems. IRDP, on the other hand, which attempted to introduce an inappropriate conservation technology, had a short-term detrimental effect on soil fertility in at least some fields

where bench terraces were built; in other cases, the effect was, at best, neutral because the terraces and waterways were abandoned or neglected by the farmers. One successful element of IRDP was the reforestation of land on steep slopes; there are still extensive pine stands in the IRDP area, and the timber is now being used for commercial purposes.

HAP has clearly had an impact on agricultural production. According to the farmers interviewed by the evaluation team, coffee production nearly doubled from less than the national average (which is about 20 boxes per acre) to almost 30 boxes per acre. Likewise, cocoa production increased from about 8-10 boxes per acre to about 30 boxes per acre. The increase in production was due to higher yields achieved from existing trees (which was the result of resuscitation, the application of fertilizer, and the use of improved practices) as well as to planting additional seedlings more densely per acre. The extent to which the increased production translated into increased income was dependent on, among other things, world market prices for coffee and cocoa.

HAP's impact on the environment is less clear, partly because before-and-after data have not been collected and partly because HAP was implemented on land that was <u>not</u> the most susceptible to erosion; thus, it served mainly to prevent future erosion problems rather than to solve existing erosion problems.

HAP may have had a positive impact on the short-term food security of participating farmers (since they could use their increased income to purchase food); it also improved their long-term social security (since perennial trees provide an annual source of income to the owner for 15-20 years).

In contrast, IRDP could claim none of these economic, environmental, or social benefits; it did not contribute to increased agricultural production, increased income, or increased social security, and with a few exceptions, it did not contribute to environmental stability.

As of January 1994, HAP had reached 9,550 beneficiaries farming 6,789 acres, or about 2/3 of an acre per beneficiary, on average. Although the majority of hillside farms in Jamaica are small (70 percent are under two hectares and 95 percent are under four hectares), HAP did not deliberately attempt to reach the smallest, or the poorest, farmers. To the contrary, it attempted to reach those who had secure land tenure, those who were dedicated farmers, and those who were young; (the average age of Jamaican farmers is relatively high, 55 years.) As a result, the more marginal farmers (including widows and other women) were often not selected. All participants, regardless of farm size or income level, received the same benefits: enough seedlings and fertilizer to cover not more than one acre of land and valued at

not more than J$3,500 per beneficiary (later reduced to J$2,500 per beneficiary). When the sale of the incremental coffee or cocoa production generated additional income, there is no evidence that the husband benefited more than the wife or visa versa; instead, the additional income was treated as family income and was shared between the two.

As indicated above, IRDP was, for all intents and purposes, ineffective; it did not contribute to increased agricultural production nor did it reduce soil erosion or enhance the environment. From an economic point of view, the costs of the program ($22.2 million) were greater than the benefits. HAP was judged economically feasible in 1987 when it was designed; the estimated internal rate of return (IRR) ranged from 9 percent to 22 percent, depending on a number of assumptions concerning rates of adoption, commodity prices (of coffee and cocoa), wage rates, and yield increases.

However, the economic analysis overestimated yield increases for the coffee component of the project, which was the single most important component, by a factor of at least two or three; that is, it assumed coffee yields would increase to 144 boxes per acre by the end of year 7 and 192 boxes per acre by the end of year 9 -- compared to an actual yield of about 30 boxes per acre at the end of year 7 and a potential yield of only 120 to 150 boxes per acre. Other things being equal, this suggests that the IRRs were also overestimated. (The estimated IRRs range from 6 percent to 18 percent under the assumption that coffee yields are one-half those assumed in the 1987 analysis; and under the most optimistic scenario, the benefits of the project are cut almost in half.)

The absence of institutions to provide agricultural inputs, markets, and technical advice seriously threatens the long-term sustainability of HAP. To the extent these needs can be met by national institutions (such as the Coffee Board, the Cocoa Board, and/or RADA) or by local institutions (such as the church, other NGOs, cooperatives, or common interest groups), long-term program sustainability will be enhanced. Moreover, to the extent the farmers receive attractive financial returns (in part dependent on the international market), they are likely to work aggressively to obtain the inputs and services they need.

To the extent that HAP is sustainable, both institutionally and financially, it is also replicable. That is, the production and conservation technologies introduced under HAP can be replicated by neighboring farmers who were not HAP participants as long as the neighboring farmers have access to seedlings and fertilizer, markets, and a price that covers the costs of production, thereby assuring a profitable return.

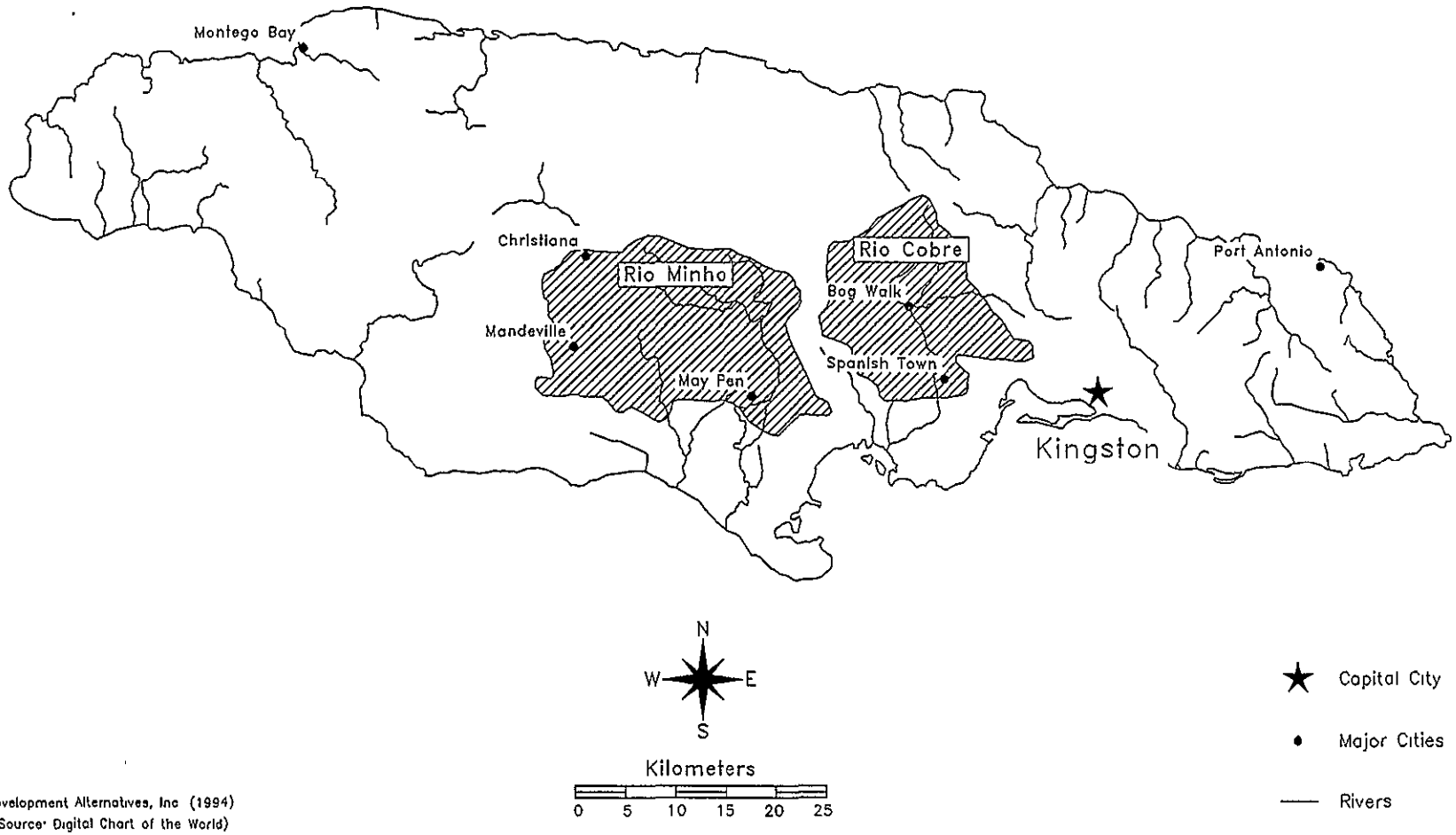
GLOSSARY

A.I.D.	Agency for International Development
CDIE	Center for Development Information and Evaluation
FAO	Food and Agriculture Organization of the UN
GOJ	Government of Jamaica
HAP	Hillside Agriculture Project
IICA	Inter-American Institute for Cooperation on Agriculture
IRDP	Integrated Rural Development Project
IRR	Internal Rate of Return
JAS	Jamaica Agricultural Society
LMC	Local Management Committee
MinAg	Ministry of Agriculture
MOA	Ministry of Agriculture
NGO	Non-governmental Organization
NPV	Net Present Value
NRCA	Natural Resources Conservation Authority
RADA	Rural Agricultural Development Authority
RMCEP	Rio Minho Cocoa Expansion Project
UNDP	United Nations Development Programme
UNITAS	Development Organization of the Moravian Church
USAID	United States Agency for International Development
UWI	University of the West Indies

Agriculture in Jamaica

Rio Minho and Rio Cobre Watersheds

where IRDP and HAP were implemented



Development Alternatives, Inc (1994)
(Source: Digital Chart of the World)

I. INTRODUCTION

Jamaica's most important environmental problems, those that affect the largest number of people, are related to water. In particular, the degradation of watersheds leads to topsoil loss which, in turn, reduces agricultural productivity and increases the need for chemical fertilizers. Associated with the increased soil erosion is reduced retention of rainwater by the soil, which causes faster runoff and more flooding.

Jamaica is particularly susceptible to watershed degradation, as approximately 80 percent of the land surface is hilly or mountainous, and more than 50 percent has slopes greater than 20 degrees. According to the World Bank, of Jamaica's 33 watersheds, 19 were badly eroded in 1993.

About half of the land area of Jamaica is put to agricultural use, and agriculture, without soil conservation measures, is a principal cause of watershed degradation. Although the number and size of farms continues to decline as the role of agriculture in the economy declines, the fact remains that agriculture, including hillside agriculture, still constitutes an important source of economic growth. The majority of hillside farms, which are the focus of USAID's sustainable agriculture activities in Jamaica, are small; 70 percent are under two hectares, and 95 percent are under four hectares.

USAID has supported the development of sustainable agriculture in Jamaica since the late 1970s, primarily under two projects: the seven year, $22.2 million Integrated Rural Development project (1977-1984); and the ten year, $10.0 million, Hillside Agriculture project (1987-1997).

In May/June 1994, 17 years after the first of these two projects was initiated, a three person team visited Jamaica to assess the impact of USAID's support of sustainable agriculture activities. The team was comprised of an economist, an agronomist, and a social anthropologist. The results of the assessment are organized as follows. Part II summarizes the background against which the USAID interventions were developed; Part III reports the team's findings regarding program implementation, program impact, and program performance; and Part IV lists lessons learned.

The two USAID-supported activities used dramatically different approaches to addressing environmental concerns and soil and water conservation problems -- and they had dramatically different results. The assessment, therefore, represents a study of contrasts, and these contrasts are highlighted in the report.

II. BACKGROUND

A. Environmental and Natural Resource Conditions

Jamaica has a total land area of 2.7 million acres of which more than half was in agricultural production at the time of the last agricultural census (1968/69). Much of small farm agriculture is found on the central limestone plateau and the hilly uplands. These areas range in altitude from near sea level to more than 3,000 feet. They are unsuited for the intensive, plantation-style agriculture found on the coastal plains and in the inland valleys.

The UNDP/FAO study on which IRDP was based identified 33 major watersheds in Jamaica, comprising nearly 400,000 acres. The Pindars and Two Meetings watersheds were chosen for project intervention due to their high degree of soil erosion, their potential for agricultural development, and their importance as water supplies. The Rio Minho and Rio Cobre watersheds, comprising 425,000 acres of hilly uplands and occupying much of St. Catherine, Clarendon, and Manchester parishes, were chosen as the principal targets of HAP; see map on p. ix. These hillsides are characterized by steep eroded slopes, gorge-like valleys, and intermittent streams with swift flows and floods of short duration (A.I.D., 1987).

The major physical factors which constrain sustainable agricultural production on the Jamaican hillsides is their susceptibility to soil erosion and the generally low fertility of the soils. In the IRDP zone of intervention, 58 percent of the land was classified as too steep for crop production (A.I.D., 1977). In St. Catherine and Clarendon parishes where HAP was initiated, over 50 percent of the land was rated as unsuitable for cultivation due to the steep slopes and the shallow soil. Twenty-seven percent of the land in St. Catherine parish and 30 percent of the land in Clarendon parish are suitable for cultivation, but with major limitations due to the risk of erosion, soil constraints, and poor drainage (A.I.D., 1987).

Strongly acidic Ultisols, which erode easily and become infertile when they are cultivated, occupy large portions of the steep lands of the Rio Minho and Rio Cobre watersheds. A study of the fertility status of 15 soils in these two watersheds revealed that they are generally deficient in phosphorous and potassium and would require the application of fertilizer to ensure sustained crop production (Armstrong, 1986).

Average rainfall for the island is 1,500 mm, and, while there is substantial variation in amount, the distribution is generally bimodal, with rainfall peaks in May-June and September-October. While drought is rarely perceived by farmers to be a problem,

there is some experimental evidence that crops are likely to suffer periods of water stress during the drier months (Armstrong, 1986). Due to its elevation, the limestone plateau has a mean temperature of 22 to 25 degrees C and is well suited for crops such as potatoes, vegetables, and coffee.

Multiple cropping systems predominate on the rugged hillsides where a large array of both annual and perennial crops are cultivated on most farms. Coffee, cocoa,[1] mango, and banana are often grown in mixed stands at a low level of management, frequently in association with other fruit, root, tuber, or forestry species. Annual crops, which are often grown in monoculture on the steep erodible lands, typically include yams, potatoes, and red peas. These high value annuals, which are grown for sale at the local market as well as for home consumption, are responsible for much of the erosion and reduced soil fertility of the hillside farming system.

B. The USAID Approach

USAID has provided assistance to support Jamaican hillside agricultural development, including resource conservation and management, since 1973. The first USAID effort specifically designed to encourage soil conservation and new types of agricultural production was the Integrated Rural Development Project (IRDP) which focussed on the rehabilitation of two major watersheds previously identified by technical studies: the Pindars River and Two Meetings watersheds. IRDP was signed in 1977, and project implementation began in 1978-79. It ended in 1984 at a total cost of $22.2 million.

IRDP had two major goals (A.I.D., 1977, p. 96):

-- To improve the standard of living of farmers in Jamaica by increasing income and providing improved roads, housing, electricity, etc.; and

-- To establish an agricultural production model that could be replicated on small hillside farms. This model was to be based on continuous multiple cropping techniques suitable for land that was terraced or treated with appropriate soil conservation measures.

The specific purposes of the project as stated in the Project Paper were:

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[1]The term "cocoa" is used almost universally in Jamaica to refer both to "cacao" (unprocessed "cocoa") and "cocoa." Therefore, though technically incorrect, this report also uses the term "cocoa" to refer to both products.

-- To increase agricultural production in the Pindars and Two Meetings watersheds;

-- To control soil erosion in the two watersheds; and

-- To strengthen the human resource capability of the Ministry of Agriculture (MOA).

IRDP was characterized by a rigid, top-down design, which was to serve as a blueprint for subsequent projects in watershed management and soil conservation. Although the integrated nature of the project involved many components, soil treatments through the construction of terraces was primary. Other components included infrastructure, training, marketing and extension, technical packages for the terraced lands, agricultural credit, and technical assistance. Project implementation required the participation of the MOA, the Forestry Department, and the Ministry of Public Works in addition to the American technical advisors. As discussed below, the execution of IRDP was fraught with problems, and when it ended, it was considered a technical, social, and political failure.

Subsequently, the Hillside Agriculture Project (HAP) was designed. It had objectives similar to IRDP, but an entirely different design approach, stressing flexibility and a more demand driven approach. It began in 1987 and will be phased out in 1996-97. Interventions were originally concentrated in the Rio Cobre and Rio Minho watersheds, but after the mid-term evaluation, were expanded to cover the eight eastern parishes of Jamaica. In contrast to IRDP, HAP had a single goal:

-- To increase the economic well-being of the residents of the hillsides in a manner that promotes rational land use patterns.

Its purpose was to increase the productivity and expand the acreage of perennial crops, both for export and domestic use.

The strategy of HAP is to promote: (a) perennial cropping; (b) improved technologies; and (c) community participation. This strategy was deliberately designed to avoid the pitfalls of IRDP. It was to be implemented by allocating sub-project grants, providing technical assistance and training, and establishing an information network among participants in the project.

HAP was to have as primary outputs:

-- Economically viable technological packages for the production of perennial crops;

-- Increased awareness of, and emphasis on, trees by hillside farmers in their farming systems; and

-- Adaptive testing of technology packages in various micro-climatic situations.

III. EVALUATION FINDINGS

The evaluation findings reported below are organized as follows: Part A focuses on program implementation; Part B discusses program impact; and Part C concerns program performance.

A. Program Implementation

This section assesses the relative importance of four specific strategies that are typically associated with successful sustainable agriculture programs: (a) technological change; (b) awareness and education; (c) institution building; and (d) the policy environment. In order to assure comparability, the relative importance of each of these four strategies was assessed in the other CDIE-sponsored country cases studies on sustainable agriculture as well.

1. Technological Change

Very different technologies were promoted by IRDP and HAP to meet the objective of conserving soil and water resources while increasing the productivity of Jamaica's hillside agriculture. Since IRDP preceded HAP and in many ways served as an example of the promotion of inappropriate technologies, it is discussed first. The discussion of HAP that follows is more detailed since it has had a much broader impact than IRDP.

IRDP: IRDP was remarkable for the bold approach it took to soil conservation through the construction of terraces, ditches, and waterways, and by the use of heavy earth moving equipment on difficult terrain. The project used an agricultural production model that, if proven successful, could have been applied to small hillside farms in Jamaica's other watersheds. In addition to increasing agricultural production and stopping soil erosion in farmers' fields, IRDP was to facilitate control over water resources in the river valleys downstream. Other initiatives undertaken under IRDP were the reforestation of lands too steep to be farmed, conversion of farm land to pasture, and construction and rehabilitation of access roads.

Seventy-eight percent of the land in the IRDP area, or 17,500 acres, was on slopes of between 5 degrees and 30 degrees. This land was considered farm land that required soil conservation treatment. The choice of specific treatment was based principally on soil depth and slope, and the various techniques included bench terraces, orchard terraces, hillside ditches, individual basins, and several types of waterways.

Bench terraces, constructed by machine or by hand, were built on slopes ranging from 7-25 degrees and were planted in yams or vegetable crops. Orchard terraces, which consist of a series of

flat terraces separated by steep slopes, were built on land with a 25-30 degree slope; perennial crops were planted on these terraces, and the slopes were left with a grass cover. Hillside ditches were built on land with less than a 25 degree slope; perennial crops were grown along contour lines on the slopes between the ditches. Individual basins, used in conjunction with hillside ditches or orchard terraces, were also suitable for planting perennial crops on slopes of less than 25 degrees. The various waterways that were constructed required either grass, stone, concrete, masonry, or wire and stone channel protection.

The cropping component of the production model was based on the use of continuous multiple cropping of land that had undergone soil conservation treatment. Important elements of the model included the use of optimal intercropping, fertilizers, chemical sprays to control pests and diseases, and continuous mounds for yam cultivation. Research was carried out by the Government of Jamaica (GOJ) and at the demonstration center managed by the project. Research results were conveyed to farmers by the increased force of government extension agents working under the project.

HAP: Many lessons learned from the problems encountered during the implementation of IRDP were applied during the design of HAP. There were at least four differences in the technologies extended to farmers under HAP compared to those under IRDP. First, HAP concentrated on simple perennial crop technologies and species with which the farmers were familiar and for which there was a known market. Second, the principal approach to soil conservation was indirect; that is, the soil conservation benefit accrued almost as a by-product of the economic benefit that resulted from planting tree crops on steep hillsides. Farmers were encouraged to increase their acreage in high value perennial tree crops, with the expectation that they would reduce their acreage in annual crops that were most responsible for soil erosion. Third, the direct erosion control measures that were extended to farmers were relatively easy to apply and required no extra inputs. Fourth, adaptive research on new perennial crop-based, or agroforestry, cropping systems involved farmers as well as agricultural technicians.

The specific technologies promoted by the project were not determined during the design of HAP, but rather during the design and implementation of the 25 sub-projects of HAP. The two most common production technologies were resuscitating existing cocoa and coffee fields and planting several species of perennial crop seedlings. Associated with these production technologies was the application of direct erosion control practices such as planting vegetative barriers, constructing and cleaning ditches, constructing wooden barriers, plugging gullies, digging individual plant basins, and placing tree cuttings along contour lines.

Resuscitation. Cocoa and coffee resuscitation included pruning or cutting back existing plants, reducing shading from nearby trees or bananas, increasing the density of the plantings, applying fertilizer and mulch, weeding, and using chemical pest and disease control measures. The relative strength of the extension services of the Coffee Board and the Cocoa Board, together with the availability of seedlings and other required inputs, helped to make these two crops the most sought after of all the crops available to the farmers. Moreover, the availability of established market channels assured that the increased production obtained from the resuscitation could be sold. Resuscitation of cocoa trees was particularly attractive because yield increases could be realized within a year of the intervention.

Seedlings. The distribution of seedlings of marketable perennial crops other than coffee and cocoa was the second approach used by HAP to encourage planting trees on hillsides. The project targeted one acre per participating farmer and offered the farmer one or more of the following perennial crops: coconut, timber, papaya, ackee, avocado, nutmeg, shade plants, mango, sour sop, leucaena, sweet sop, jack fruit, passion fruit, guava, bread fruit, pimento, cashew, nasberry, star apple, cinnamon, and pineapple. In several cases, new varieties or improved production practices were extended along with the seedlings and fertilizers. These included the use of dwarf coconuts, the practice of top-working mangoes,[2] the intercropping of pineapples with annual crops, and the pruning of star apples. On-farm trials carried out under the MinAg/IICA sub-project provided additional information on optimum production practices for coconut, avocado, mango, pineapple, sweet sop, coffee, and cocoa.

The widespread distribution of trees other than coffee and cocoa was in response to farmers' requests for assistance in maximizing returns from their multi-storied tree crop fields. Although the farmers were most interested in increasing returns from annual crops, and although they were willing to make a medium-term investment in cocoa or coffee, they also wanted to explore the possible long-term benefits of other tree crops for which there may be a market (Caribbean Agricultural Communications Services Limited, 1991).

Thus, the primary strategy used by HAP for improving soil and water conservation was planting perennial tree crops. Trees and the soil holding properties of their roots protect watersheds by reducing the flow of water over the soil and by holding the soil

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[2]This practice consists of cutting back the canopy of existing mango trees and grafting improved varieties to the old rootstock. This contributes to increased production, ease of harvest, and the reduction of unwanted shading of nearby crops.

in place. Trees also reduce the forces of wind and rain. By obstructing the flow of water over the soil surface, trees also contribute to the build up of organic matter on the ground surface and increase the percolation of water into the soil. Tree roots provide channels for the infiltration of water through the soil profile and bind the soil to prevent its loss by gravity fall and waterflow.

Other, more direct soil conservation practices carried out under HAP also served to reduce the effects of heavy rains and runoff on soil erosion. Individual plant basins, combined with plant material left on the soil surface, reduce sheet erosion, increase water infiltration, and supply organic matter to improve soil fertility. Ditches, grass or wooden barriers, and reinforcement of contours serve to reduce erosion, improve infiltration, and channel excess water off the field. Gully plugs serve to reduce water velocity in the vertical channels that carry water drained from the fields and roads.

2. Awareness and Education

One of the factors often associated with the success or failure of sustainable agriculture programs is whether or not the public is aware of soil erosion problems and how those problems can be alleviated through proper resource management and conservation techniques. In Jamaica, education and awareness were emphasized in varying degrees under IRDP and HAP. However, because of institutional shortcomings, the inadequate mechanisms used to ensure farmer participation, and the relatively low level of community involvement, the effectiveness of the messages was diminished and the public's awareness of soil erosion and its significance for sustainable agriculture was attenuated.

IRDP: Education was to be the first step in the execution of IRDP. The designers of the project stressed the importance of ensuring that the potential beneficiaries were aware of the benefits of terracing and the possibilities of increased production under new cropping patterns (A.I.D., 1977, p. 21). Additionally, the terracing activities to promote soil conservation would begin only after the ". . . Agricultural Extension Service undertakes a comprehensive publicity campaign aimed at enlisting 100 percent participation of farmers . . ." (A.I.D., 1977, p. 23). The project staff sought to enlist participation, but because of the project's heavy, top-down approach, true grass roots participation was not achieved nor was a process of community definition of problems and development priorities. Instead, the public was simply informed about measures and actions which had already been decided elsewhere.

The agricultural extension service was to inform the public about the benefits of the proposed technologies and to educate the potential beneficiaries about the benefits of soil conservation

measures. It was to develop ". . . innovative yet modest approaches in agricultural extension, marketing, and input supply systems . . ." and subsequently to transfer information and demonstrate the benefits of the proposed technologies by working in "five demonstration and training centers and 50 sub-centers in the project area" (A.I.D., 1977, pp. 19, 21). According to a 1980 evaluation, however, the extension agents were not technically qualified to provide reliable information to farmers about the range of factors inherent in complex cropping techniques, and the farmers were essentially left on their own to deal with new problems as they arose (Curtis, 1980, p. 44).

The Jamaica Agricultural Society (JAS) was to be another source of information dissemination and education. But it, like the extension service, was weak. In fact, the only clear message understood by farmers was that IRDP would distribute cash subsidies to participants who worked on building terraces.[3]

However, even if the agricultural extension programs had been strong and the JAS effective in sensitizing and educating the farmers about the program's objectives, the fact remains that the technologies proposed by IRDP were inappropriate. In fact, some farmers lost productive land, and new cropping systems were never adopted. There were no demonstrable benefits of terracing land, and thus, even before the project ended, the terraces were either destroyed or, in the best cases, hardly maintained.

HAP: HAP was introduced to the public through personal contacts with potentially interested institutions and through a national level mass media campaign. The project was also promoted at annual fairs and JAS meetings where farmers would gather. The project management staff developed a handout on how to prepare, write, and present a sub-project proposal. These activities were carried out not only to generate sub-project proposals but also to raise the awareness of the public about the benefits of soil conservation.

In spite of the importance given to soil conservation in the design of sub-projects, sub-project proposals lacked specificity about the measures to be taken both to promote an understanding of the benefits of soil conservation and to actively engage farmers in soil conservation practices. The site visits showed that most often the farmers continued to practice simple conservation measures that traditionally had been in their repertoire. There were few cases where new conservation measures had been introduced by HAP or where HAP technical personnel had

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[3]Because the cash subsidies were significantly above the local market wage rate, they distorted the labor market, and laborers were diverted from farming operations to the more lucrative project-related work (Blustain, 1981, Part II).

contributed effectively to raise the awareness of the farmers about the long-term benefits of a well-grounded soil conservation program.

Instead, HAP, with its basic theme of increasing production, focussed the educational component primarily on the operations connected with resuscitation and planting new seedlings; that is, clearing the land while leaving adequate protection, adjusting overhead shade, fertilizing, pruning, and controlling pests. While the introduction of these new techniques constitutes a positive step in conserving soil resources, site visits revealed that the majority of farmers do not actively engage in the construction of improved soil conservation structures (stone, tree or grass barriers, gully plugs) or in the upkeep of existing structures, unless the situation is critical to the maintenance of their coffee or cocoa trees. Finally, the effectiveness of information transfer and publicity about HAP objectives is questionable since, in several sub-project areas, some farmers had never heard of the project while others, living in close proximity, were project participants.

The site visits to both IRDP and HAP areas illustrated that the participating farmers had a limited understanding and awareness of the project's goals to reduce soil erosion and promote long-term sustainable agricultural practices. Instead, most farmers perceived the projects only in terms of the short-term, material benefits and/or subsidies provided to them. It is revealing that IRDP was perceived as a "good" project by the farmers in the areas visited because it gave cash to the people, not because it promoted soil conservation or improved cropping techniques. This misunderstanding not only reflects the lack of an effective extension network capable of disseminating information in a manner designed to engage the farmers' interests, but also is related to issues of beneficiary selection, participation, and organization which are discussed below.

3. Institution Building

National and local institutions often play the critical role of encouraging the adoption and continuity of practices in resource conservation and sustainable agriculture. USAID's attempts to strengthen national and local institutional capabilities under IRDP and HAP have met with limited success, and the benefits of these or similar projects will be short-term and limited to relatively few beneficiaries without: (a) agricultural research to develop and/or adapt new technologies; (b) agricultural extension to disseminate the technologies and to educate farmers; and (c) institutions that foster the active participation of farmers in decisions related to activities that affect them.

National Level Institutional Strengthening

IRDP: One of the goals of IRDP was to strengthen MOA's human resources by providing technical advisors (seven expatriates) and training. Long-term technical assistance comprised 25 person years at a cost of $1.260 million, and short-term technical assistance consisted of 60 person months at a cost of $270,000. The technical assistance effort focussed on the formation of effective extension agents who could carry out program development rather than "responding to crises and providing government subsidies" (A.I.D., 1977, p. 44). Although it was felt that this assistance would be required to "institutionalize capacity in all the project's components" (A.I.D., 1977, p. 44), it took a form which would not significantly institutionalize local capacity.

By 1980, several of these key advisory posts had not been filled, including the farming systems specialist (who was also responsible for the promotion of grass roots organizations) and the marketing specialist (who was to develop training modules for the first stage of the marketing program). These unfilled posts compounded the problem of institution building and reduced the effectiveness of program implementation. As a result, MOA never fully attained the capability to be one of the principal implementors of the project and was never able to effectively assume responsibility for the soil conservation works.[4]

Another goal of IRDP was to strengthen MOA's capabilities in the area of agricultural research, which was limited to very few trained people and a weak organization. The research was to be conducted at demonstration centers where innovative methods and technologies would be developed and adapted to local conditions and subsequently replicated at the 50 "sub-centers" located on volunteer farmers' lands (A.I.D., 1977, pp. 42, 44).

According to a 1980 evaluation, research had been carried out at only four demonstration centers, and only two sub-centers had been established (although another 11 had been identified). The evaluators indicated that there was no research focus (domestic vs. export crops, traditional vs. non-traditional crops), and that new crops were receiving only limited attention (Curtis, 1980). In addition, there had been no analysis of production costs and returns, and this diminished the credibility of the extension program. Finally, there was no structured two-way communication between the agricultural research unit which managed the demonstration centers and the agricultural extension unit which managed the sub-centers, nor was there a regular flow

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[4]In fact, the Forestry Department had already received assistance through USAID's Forestry Development Loan to carry out reforestation activities and, in theory, had the technical and physical capability to reforest the proposed area of 5,000 acres (A.I.D., 1977, p. 28).

of experiences transferred from the demonstration centers to the sub-centers. This further reduced the effectiveness of research and extension (Curtis, 1980, pp. 41 ff).

In addition to strengthening MOA's agricultural research and extension activities, IRDP sought to strengthen the JAS and agricultural marketing and credit institutions (People's Cooperative Banks). The intention was to use the JAS as the organization through which interested groups of farmers would participate in the project. However, the JAS was (and continues to be) little respected in the project area.

In addition to the technical assistance, 40 person years of training (both long- and short-term) was programmed for Jamaican nationals at a cost of $470,000. These trained officers were to replace the long-term foreign advisors at the conclusion of the project. But the project design was flawed here as well, since there was no clear definition of the number of persons that were to be trained or the specific nature of the training they were to receive.

HAP: In contrast to IRDP's strong institution building goals, HAP's goals were more modest and grounded on the concept of community participation. In fact, an underlying premise of the project was that an institutional capability to provide technical advice to farmers already had been established. Although this was the case with the Cocoa Board and the Coffee Board, RADA, which was entrusted with assisting in the implementation of some sub-projects and with providing continuity of technical advice to farmers, remains one of the weakest institutions. It lacks trained technical personnel; appropriate supervision; and the means to deliver messages, monitor activities, and encourage the maintenance of conservation practices. HAP supported only limited technical assistance, and the training element consisted largely of training of trainers and observation visits to other countries with a focus on coffee and cocoa. In assessing the sustainability of the sub-projects, it seems that implementation could have been more effective if the project had incorporated more technical assistance and training, particularly in the area of community organization and in strengthening RADA's extension expertise and program support.

Although agricultural research was not one of the primary goals of HAP, the design nevertheless called for ". . . a vigorous and focused campaign to bring perennial crop technology [existing in other countries] to Jamaica, and the requisite means to adapt this technology to the needs of the small hillside farmers . . . Further, the technology needs to be disseminated and incorporated into present farming systems" (A.I.D., 1987, p. 18). Improved technologies were to be tested in a program of adaptive research under the MinAg/IICA sub-project. The 1989 evaluation indicated that no *new* technologies were in use, but that known technologies

were in use and that training was better focused on improving the local understanding of these known technologies (Koehn, 1989).

Local Level Institutional Support

IRDP: IRDP recognized, at least in theory, the institutional and social constraints of the project area. The design pointed out that "Little work has been done to organize group action or to determine the needs of the people" (A.I.D., 1977, p. 44), and the social soundness analysis stated that project feasibility hinges upon several factors including the institutional structure which have "serious but manageable constraints" (A.I.D., 1977, p. 53).

These constraints were to be overcome through the formation of local groups of farmers that would coordinate their plans and engage in unified action to improve the credit, inputs, and marketing services available in the project area. The project proposed no preconceived "best" structure of group activity but attempted to assist and develop groups of farmers organized as cooperatives, associations, or societies (A.I.D., 1977, p. 34). It envisioned that by the end of the project "the concept of program planning with local participation will have been clearly demonstrated and accepted as the normal approach for extension throughout the country" (A.I.D., 1977, p. 33).

However, the design did not carefully think through the process of community organization or identify effective modes of participation. In the absence of other local level institutions that could be used as anchors for project implementation, the project began to create Development Committees, but their *ad hoc* nature did not reflect the communities' interests at large. Blustain indicates that the leadership of these committees was highly coincident with the overall membership of the committees; that is, the leaders, and only few farmers, were involved. The committees functioned primarily to select farmer participants, and this did not depend on farmer involvement. All this resulted in unsuccessful efforts on the part of IRDP to promote local level institutions which were supposed to be a key element in project implementation.

No effective institutions or groups were created at the beneficiary level. Instead contractual types of relationships were established between the farmers and the project staff: the staff gave cash to the farmers and the farmers built terraces. Thus, instead of effectively promoting community organization and active farmer involvement, IRDP aggravated an already entrenched welfare mentality. The incentive for the farmer was to make money, and the benefits from the project were perceived in terms of how much money the farmer had received from the project. Because there was no incentive to be actively involved after the land had been physically treated, participation was reduced to an individualistic, one-shot affair. After the treatments, few

farmers ever saw a field officer again; indeed, some did not even see them while the works were in progress, and this led to unfinished implementation of soil conservation works on the farms (Blustain, 1981, Part II, p. 16).

HAP: In contrast to IRDP, a core feature of the HAP design was incorporation of a truly community participatory approach that avoided top-down, coercive types of actions that had contributed to the failure of IRDP. In principle, the project would fund demand-driven, "self-managing" sub-projects developed by the farmers who would actively participate in the planning and decision-making process. However, the first sub-project, which was not approved until 18 months after the project was signed, and the majority of the other initial sub-projects were designed with the assistance of HAP management, which illustrates that the process of community participation in development is basically unknown in Jamaica. This was understood at the time of design. As noted in the project paper, a "cautious" approach was adopted in light of the difficult socio-cultural environment of small Jamaican farmers "who are accustomed to a paternalistic type of benefit distribution system" (A.I.D., 1987, p. 19).

Although the project required the formation of groups of producers as a pre-requisite for implementing the sub-projects, the 1988 evaluation indicated that farmer participation in the identification and design of sub-projects was the weakest part of the project, which was corroborated during the site visits in 1994. This was partly because the "groups" were used primarily to select the participant farmers and to funnel the project's benefits to the participants rather than to include the beneficiaries in the design of the sub-projects. In fact, contrary to the original concept, the identification of activities to be undertaken as well as the implementation and management of the sub-projects were not done by the farmers themselves but by institutions exogenous to the communities (notably the Coffee Board, the Cocoa Board, RADA, and JAS). These decisions were then communicated to farmers either individually or in group meetings, thereby short-circuiting farmer participation at the decision-making level.

Under these conditions, many farmers saw little benefit in belonging to a group because there was nothing to be gained from it. Although some farmers continued to attend group meetings, they often considered the meetings a waste of time. Instead, farmers related to input suppliers on an individual and patron-client basis, much as they did during IRDP, rather than horizontally with each other to diagnose common problems and establish bases for common action.

In a sense, the sub-projects are "demand-driven" because they are designed by agents of institutions who know which productive activities are most suited to the areas selected. The farmers

select the perennials they want to grow (such as coffee, cocoa, mango, avocado) from the range of options and/or activities defined by the institutions designing the sub-projects. As a result, the activities are beneficial to the institutions as well as to the producers. But this is not a genuine participatory approach, nor is it really demand-driven. The farm plans for the participating farmers are done by the technical personnel implementing the sub-projects, and even at the farm level, the farmers do not come up with a plan for the farm, but rather for a section of the farm.

The Local Management Committees (LMCs), groups formed by HAP, identify interested farmers, which are often the most influential in the community, to take part in the selection of beneficiaries. The LMCs together with the technicians entrusted with sub-project implementation try to select those farmers who are most likely to adopt the improved practices and who will maintain the trees and the land. However, by selecting the "best" farmers, this screening mechanism fosters the continuation of individualistic and clientistic ties and does not ensure that poor farmers benefit from the project. In addition, the more marginal farmers (including widows and other women) who have smaller holdings, fewer resources, and lack the knowledge of how to access project resources were often not selected by the LMCs. In some sites visited by the evaluation team, some farmers had never heard of the project, while neighboring farmers were beneficiaries of the project.

Another illustration of weak local institutions is that the majority of farmers do not understand the cooperative structure or how cooperatives function. Interviews with farmers and with representatives of the Coffee Board and the Cocoa Board revealed that farmers often are not familiar with the services that cooperatives render, do not understand the methods cooperatives use to collect dues for their services, and do not understand why the prices for their products (and consequently, the payments to members), fluctuate. As a result, they participate only marginally in the cooperatives, often feeling cheated and unable to ensure that they are not. The lack of farmer involvement in groups is also partly related to the scale of the sub-projects, which in some cases was so small, with so few beneficiaries, that a critical mass could not be formed.

In areas where community-wide institutions existed before HAP, there is greater hope for more concerted group development in the future. These institutions typically outlive the short-term activities of any project, and as a result they can have a long-term impact both by encouraging the practices initiated by HAP and by fostering community-wide participatory activities.

Land Tenure Systems

Small hillside farms in Jamaica are comprised of land falling into one of five categories of ownership or tenure:

-- Owned land to which there is title or commonly recognized ownership. This land can be bought or sold and is usually exploited by the owner and his immediate family.

-- Family land to which there may or may not be title, but where rights to the land are shared by siblings, one of whom usually exploits the land. Such land cannot be sold without the prior consent of all the right-holders, many of whom may no longer reside on the farm.

-- Leased land which can be leased to farmers by the government under various land lease programs or by private owners for varying lengths of time. Lease contracts are written and give the lessee the right to all products of the land.

-- Rented land which is usually rented out by private owners on a short-term basis with the rent paid annually.

-- State land, also called "captured land," which is illegally used by squatters for temporary cropping. These are generally marginal lands with steep slopes.

An average small farm usually consists of five plots, one of which is generally owned, with the remainder falling under other types of tenancy. The plots of land exploited by a single farmer are rarely contiguous. They are used for different crops depending on the status of tenure as well as on the slope and altitude of the land and the distance of the land to the household. Security of tenure is one of the major factors that affects farmers' willingness to make long-term investments such as in perennials and soil conservation structures.

IRDP: These different types of land tenure were known when IRDP was designed, and some were recognized as constraints to investing in terraces. It was understood, for example, that for conservation measures to have the desired impact, neighbors would have to cooperate and agree to terrace a large area of land rather than a patchwork of individual plots. However, there was no mechanism to ensure that neighbors or kinsmen with adjacent plots of land would cooperate, and no incentive for them to do so. The economic gains associated with the technology were insufficient for farmers to terrace anything beyond their individual plots; and even then, only those plots that they owned and could afford to leave out of production for a period of time (with the cash payments they were given for building the terraces treated as partial compensation for the lost production). There is little evidence that terraces were built on lands most vulnerable to erosion, which are on the steeper slopes and generally used for annual food production.

HAP: The same tenure constraints applied under HAP. Perennial crops are attractive to farmers with secure tenure, including where a portion of family land is exploited by its next heir. The trees are typically planted together with other crops, the diversity of which depends on the farmer's access to other land and to the type of tenure. Thus, if a household has access to two plots of land, one plot (the plot with secure tenure) is likely to be devoted mainly to tree crops, while the other plot (with less secure tenure) is likely to be devoted to food crops. Sometimes farmers will make long-term investments on land to which they do not have secure tenure. For example, a farmer may see little risk in investing in land with a long-term, renewable lease. Most farmers, however, avoid planting trees on land to which they do not have guaranteed long-term access.

4. Policy Environment

This section assesses the extent to which the policy environment in Jamaica was conducive to the implementation of sustainable agriculture programs during the 1977-1994 period. It focuses on whether or not the national government: (a) viewed preservation of the environment as a national priority; and (b) implemented economic policies that would encourage farmers not to destroy the natural resource base on which future agricultural production would depend.

The answer would seem to be that, until very recently, the Government of Jamaica (GOJ) had not given environmental issues the attention they deserve. But the situation began to change in the early 1990s. In 1993 the GOJ recognized the importance of the environment by elevating environmental concerns to cabinet status within the Ministry of Tourism and the Environment. In addition, it created the Natural Resources Conservation Authority (NRCA), an umbrella institution given a broad mandate to cover environmental regulation, environmental monitoring and enforcement, policy advice concerning the environment, and coordination of environmental activities of all government agencies. Finally, the GOJ completed its National Environmental Action Plan, which was printed in 1994 to coincide with National Environmental Awareness Week (and, coincidentally, with the team's visit).

Until the latter half of the 1980s, the government had been heavily involved in managing the economy, and state involvement generally had negative consequences for the environment. Since then, there has been substantial progress toward deregulation, but there is still room for improvement. One example illustrates the point. According to the Coffee Board, farmers received about J$487 per box of coffee from the parastatal in 1993. The team interviewed one farmer who sold his coffee to a private entrepreneur and received about J$1,000 per box of coffee, more than twice as much. Of course, farmers who sell their coffee to

the Coffee Board receive certain benefits, such as having their coffee sprayed for disease. The costs of these services are deducted by the Coffee Board from the amount it pays the farmer, as they should be, and this helps to explain why farmers who sell to the private sector receive a higher price. However, the indirect costs of operating the parastatal are also deducted from the farmers' payment, and these indirect costs are believed to be much higher for commercial parastatals than for the private sector. If so, then coffee farmers marketing to the private sector would receive a much larger proportion of the world market price of coffee than those selling to the Coffee Board.

The World Bank has recommended that the GOJ approve several other economic policy changes that would positively affect the use of natural resources. These include: (a) enacting a national policy on land use, which, by clarifying land ownership, would provide a greater incentive to practice conservation measures; (b) accelerating and extending the on-going process of land titling in rural areas; and (c) reviewing property taxes, which, because they are relatively low and uniform for all land types, do not discourage the production of annual crops on unsuitable land, such as steep hillsides (World Bank, 1993, p. 11). In addition, prices established by the government for the use of public land, water, and other public resources are far below their true economic value, thereby encouraging their misuse or overuse.

But even if a good price and incentive system were in place, significant improvements are needed in agricultural extension to help farmers manage their land and water resources better. RADA has undergone budget cuts in recent years, which may explain its relatively ineffective role in providing technical advice to farmers. In the case of traditional export crops, like coffee and cocoa, the commercial parastatals may need to play a stronger role. Cooperatives and church groups may also be part of the solution.

It seems quite clear that during much of the 1977-1984 period, when IRDP was implemented, the political environment was geared more toward assuring jobs for members of the party in power than in protecting the environment. As a result, an expensive bureaucracy was established to implement IRDP, but the bureaucrats cared more about political patronage than about watershed development. In contrast, the political environment during the 1986-1994 period, when HAP has been implemented, has been much more conducive to supporting environmental programs and other development activities.

B. Program Impact

This section assesses the impact of USAID's sustainable agriculture program in Jamaica. It covers three levels of

impact: the impact of IRDP and HAP on peoples' practices; the biophysical impact of these two activities; and their socio-economic impact.

1. Impact on Practices

The impact of USAID's sustainable agriculture program on the farming practices of Jamaican hillside farmers has been significant. This is due to the successes achieved under HAP, rather than IRDP which promoted an inappropriate technology.

IRDP: The soil conservation sub-component of IRDP had, by 1982, reached only 14 percent of the targeted acreage, and only 6 percent of the targeted land was under intensified cropping (A.I.D., 1982). Though end-of-project statistics are not available, it is clear that the project did not have a large impact on soil conservation, agricultural productivity, or water management. The poor output of the project is further confirmed by evaluation reports and interviews with key informants that cite three technological reasons for the limited impact:

-- The construction of terraces used heavy equipment that was more expensive and unmanageable than expected. The project should not have attempted to reach all farmers with the technology, and instead should have considered the farmers' preferences for fewer, hand-built terraces.

-- The production technology that was designed to encourage farmers to use terraces was based on incorrect economic assumptions. In addition, the ability to adapt and extend the production technology was hampered by the lack of integration between the research and extension components of the project.

-- There was too much emphasis on erosion control measures and too little flexibility in the design to allow for a change in priorities when the technology proved to be inappropriate for the target farmers.

HAP: Under HAP more than two million cocoa and coffee plants have been resuscitated, over one million cocoa and coffee seedlings have been planted, and more than 300,000 seedlings for other tree crops have been planted (Table 1). The project has been implemented on nearly 7,000 acres and has reached over 9,500 beneficiaries. The high adoption rate indicates that HAP was having a significant impact on farmers' practices. Farmer interviews together with the results of a 1991 comparative analysis of 14 sub-projects indicate that most participating farmers were already growing coffee and/or cocoa when the project began. As a result, farmers were not reluctant to adopt the technologies promoted by HAP, since these were similar to their

Table 1. Hillside Agriculture Project, Jamaica, Sub-project Achievements as of January 1994

Sub-project	Beneficiaries	Acres	Cocoa Trees		Coffee Trees		Other Trees
			Planted	Resuscitated	Planted	Resuscitated	Planted
Unitas	230	210	5,560	3,927	39,450	45,000	11,863
Manchester/RADA	200	70	0	0	35,850	12,722	1,960
Blackwoods	256	110	9,983	24,000	20,800	66,000	5,450
Windsor	245	107	7,200	58,000	3,500	28,000	4,650
RMCEP (Phase I)	3,000	2,563	208,300	765,800	400	0	43,325
Mango Top	300	--	0	0	0	0	1,000
Elgin	245	134	9,717	66,000	1,500	23,500	3,500
NCPC (Phase I)*	700	400	0	0	0	0	38,245
Longsville*	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Agroforestry	600	433	60,796	185,000	39,606	34,000	57,812
N.W. St. Catherine	612	252	0	0	57,565	118,759	4,780
Kellits/Crofts Hill*	657	486	55,700	0	0	0	8,820
Above Rocks	207	200	22,550	7,000	15,679	4,850	15,765
MinAg/IICA	168	135	51,533	13,226	35,700	4,390	66,541
St. Mary Cocoa	800	505	148,395	246,800	0	0	22,072
Guys Hill Coffee	300	206	50,910	164,800	32,450	164,800	2,760
Bermaddy	300	285	5,304	0	20,040	0	3,143
Giblatore	300	290	1,300	200	41,427	0	6,384
West St. Andrew*	156	226	21,000	45,800	1,000	0	3,100
Longroad*	148	46	6,135	7,500	850	0	4,531
Mammee River*	121	121	625	180	21,374	0	2,901
Trinityville*	5	10	0	0	6,775	0	2,775
Total	9,550	6,789	665,030	1,588,235	373,916	502,021	311,377

Source: USAID/Kingston, Status Report for 25 sub-projects of the Hillside Agriculture Project, January 1994. Three of the 25 sub-projects consisted of surveys and technical support and are not reported in Table 1. Seven of the sub-projects (*) were on-going in January 1994 and 15 had been phased-out.

existing practices (Caribbean Agricultural Communications Services Limited, 1991).

Two hundred farmers interviewed for the 1991 comparative analysis were asked about the effectiveness of the techniques taught by project extension agents. Fertilizer application was considered effective by 69 percent of the respondents; plant spacing, by 52 percent of the respondents; pruning, by 47 percent; planting methods, by 32 percent; and soil conservation techniques were considered effective by only 10 percent of the respondents (Caribbean Agricultural Communications Services Limited, 1991). For sub-projects that had been operating long enough for cocoa and coffee acreage to increase, a majority of farmers interviewed stated that they had, in fact, increased the area under cultivation. Likewise, in four sub-projects that had emphasized cocoa production, over 80 percent of the farmers had increased the area devoted to cocoa. However, the majority of farmers interviewed by the team in the areas of completed sub-projects indicated that they were unwilling or unable to purchase new seedlings to expand acreage in tree crops, or to purchase fertilizer for use on their existing coffee and cocoa fields.

Thus, there was a general willingness on the part of farmers to selectively adopt management techniques promoted by the project and to expand the land in production while the project was supplying free seedlings, inputs, and information. There is little information, however, to indicate that HAP technologies were being used on farmers' fields when the inputs were not supplied by the project.

The demand for non-traditional tree crop species indicates farmers' willingness to adapt their farming systems to include new cash crops as markets become available. Of course, such adaptation is not difficult because many of the trees provided under HAP do not require a dramatic change in cropping patterns. In addition, the new species can be used for shading coffee, planted around perimeters, or planted in erosion prone areas to aid in soil conservation. Mango top-working is a good example of a new technology for an old crop that has several benefits, including increasing production, facilitating harvest, and reducing unwanted shading.

2. Biophysical Impact

IRDP: The effect of IRDP on the environment and the productivity of farm land that was treated under the project has not been documented. However, according to key informants and farmers interviewed by the evaluation team, the bench terraces built under the project had a short-term detrimental impact on soil fertility. Many of the terraces and waterways have been abandoned or neglected by the farmers, so their long-term impact is, at best, neutral. On the other hand, concrete lined

waterways and handmade hillside ditches had also been built under IRDP, and the land in these areas has been in continuous perennial tree cropping since their construction. Although these interventions served very effectively to minimize soil erosion, it appears that such cases are few.

One of the more successful elements of IRDP was the reforestation of steep slopes on both private and public lands. Although the number of acres that were eventually reforested (of the 5,000 acres anticipated in the design) is unknown, there are still extensive pine stands in the IRDP area and the timber is now beginning to be exploited. The benefits of reforestation alone, although not measurable, surely improved the quantity and quality of water resources and decreased the danger of floods and soil washouts.

HAP: HAP has had a positive effect on both coffee and cocoa yields. Cocoa Board personnel indicated that cocoa yields increased from 10 boxes per acre to 30 boxes per acre in two years when HAP recommendations were applied. The comparative analysis carried out four years after the start of HAP indicated that cocoa production increased by 45.6 percent, on average, for the sample of farmers that was interviewed, from 13.2 boxes per acre to 21.4 boxes per acre (Caribbean Agricultural Communications Services Limited, 1991). Increases in coffee yields were more variable among sub-projects and farmers than increases in cocoa yields. For farmers interviewed in the comparative analysis, yield increases ranged from zero to 96 percent; the average increase for all sub-projects was 21.4 percent (Caribbean Agricultural Communications Services Limited, 1991).

In addition to improving soil fertility (which, in turn, contributed to increased yields), the adoption of HAP technologies on 6,800 acres also improved soil surface vegetative cover and soil organic matter content. The direct soil conservation measures carried out under HAP reduced the movement of water across fields and down slopes. These measures included the construction and clearing of 3,106 chains of ditches; the formation of over 1,000 gully plugs; planting 1,364 chains of grass barriers; the formation of 2,174 chains of wooden barriers; and digging 3,483 individual plant basins (USAID/Kingston, 1994).

Most of the tree planting carried out under HAP has taken place on land already in perennial crop cultivation. As a result, the major soil conservation benefits have resulted from the increased density of trees, the increased ground cover associated with improved tree crop management, and the control of runoff. There is little evidence that the most erodible soils -- those under annual cropping on steep slopes -- have been planted in perennial species. Reduced soil erosion on fields under annual crop

production might have been realized if agroforestry technologies had been more widely adapted and extended.

3. Socio-economic Impact

The soil conservation technologies promoted under IRDP and HAP have both long- and short-term socio-economic impacts. The long-term environmental impact of conservation practices includes the retention of soil and the capacity to exploit the land over a longer period of time than would have been possible without the conservation practices. The short-term impacts are measurable in terms of changes in agricultural production and changes in income, food security, and social well being.

Environmental Impact

There have been no measures of soil loss for either of the two projects that would permit an assessment of the environmental impact of the activities undertaken.

IRDP: The large bench terraces constructed under IRDP, whether machine- or man-built, were altered or destroyed soon after they were constructed because the farmers realized that their design was flawed and they were causing a considerable loss of moisture. The smaller terraces built by the farmers themselves have also been significantly altered. Given the lack of documentation concerning the terraces and waterways constructed under IRDP, and because only vestiges of terraces still remain, one can only conclude that the long-term environmental impact of IRDP was probably neutral. In any event, there is no evidence of lands that have been rendered unproductive or heavily eroded.

HAP: Under HAP, the plantings took place on plots that, for the most part, were already in perennial tree production; therefore, the amount of land planted in trees did not increase significantly. Any positive long-term environmental impact was due, instead, to the increased density of tree cover, the increased ground cover, and the concomitant reduction in soil runoff. Without data on soil loss, and because the specific interventions that took place on the farmers' plots varied considerably, it is difficult to assess the environmental impact of these measures. It is clear, however, that the lands most susceptible to erosion -- the annual crop fields on steeper slopes -- were not targets of any soil conservation measures, and whatever practices were applied to these fields were determined by the individual farmers based on their existing knowledge.

Impact on Agricultural Production

IRDP: The 1981 evaluation of IRDP (Blustain, 1981, Part I) as well as the 1980 evaluation concluded that significant increases in agricultural production would be achieved only if the farmers

were furnished with a complete technological package, which they were not. Blustain interviewed 58 farmers who had participated in the project for at least two years and found that agricultural productivity was not significantly improved as a result of the project interventions. Only 23 percent of the farmers had adopted proper intercropping practices, and 66 percent of the farmers were applying fertilizers and pesticides improperly. Blustain notes, however, that there was a significant change in land use between 1979 and 1981, with a decrease in fallow and/or ruinate[5] and an increase in permanent crops (particularly citrus and coffee) and semi-permanent crops (Blustain, 1981, Part I). The farmers interviewed by Blustain indicated that these changes in land use were due partly to IRDP and partly to improved markets for these crops and declining markets for traditional crops such as bananas. In some cases, these changes in the crop repertoire were also due to improved transport and road infrastructure.

Thus, IRDP was not successful in carrying out soil conservation measures or achieving better cropping practices in order to increase agricultural production. Nevertheless, there were unanticipated changes, such as in land use and in the repertoire of crops grown in the IRDP area, which came about largely as a result of changing markets and other conditions exogenous to the project.

HAP: The resuscitation of over 2 million coffee and cocoa plants and the planting of over one million new seedlings clearly resulted in increased production of coffee and cocoa. Although changes in production have not been regularly monitored under HAP, most farmers interviewed by the team estimated that their coffee and cocoa production had nearly doubled. However, there was considerable variation among farmers, which, together with exogenous factors, make it difficult to attribute this increase solely to the project. In addition, the results of some farmer interviews may be inflated because they took place in the presence of former project officials.

According to field interviews, coffee production (in mixed stand) ranged from 15 boxes per acre to 29 boxes per acre (which was considered average by the Coffee Board). In some cases, there was no production at all, or very little, because the coffee trees had not yet begun to bear. In the case of cocoa production, some farmers reported small increases, from 10 boxes per acre before the project to 12 boxes per acre after the

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[5]Ruinate refers to land that is considered unproductive primarily because of the nature of the soil. It is not clear if such land was opened up for production as a result of land treatments under IRDP or because pressure on the land increased when some plots became unproductive as a result of the terracing.

project. Wealthier and more successful farmers reported larger increases, in one case from 6 boxes per acre before the project to 13 boxes per acre after the project, and in another case, from 23 boxes per acre to 41 boxes per acre. However, these are only estimates, since it is difficult for the farmers to remember precisely how many boxes they sold throughout the year, when the cocoa is collected bi-weekly and production is not constant during each bi-weekly period. It is interesting to note that some farmers who were not participants in the project reported yields that were comparable to the after project yields of participants.

If the beneficiary farmers continue the cultural practices and follow the technical advice they learned during the project, including the proper use of fertilizers and insecticides, their production is likely to be maintained or increase. However, farmers reported problems which will hamper increased production, including lack of cash or credit to purchase fertilizer, lack of spraying, high labor costs that preclude adequate care of the plants, and lack of technical advice. In fact, for most sub-projects that had been phased out, most farmers were no longer applying fertilizers and the cooperatives were no longer spraying the trees.

Traditionally, perennial trees are planted, but not actively cultivated, in Jamaica. Instead, they are treated as a long-term investment to provide income when the farmer is too old to engage in the production of other crops as well as a source of insurance if the annual crops fail. Traditionally, Jamaican farmers, particularly those with a small farm, have not invested in paid labor to ensure optimum production of perennials. Rather, the coffee, cocoa, or fruits are viewed as sources of additional income available without much expenditure of cash, effort, or time. The assistance provided by HAP in the form of tree seedlings and free inputs permits farmers to improve their production and raise their income. But because of these traditional attitudes and practices, many farmers are unlikely to continue the improved production practices or to devote capital and labor resources to the perennials unless there is clear evidence that they will be profitable with little risk. Even then, farmers are unlikely to abandon their annual crops which provide both subsistence and cash.

HAP has not promoted any changes or innovations in the production of annual crops, and there has not been any apparent change in the annual cropping calendar. Farmers continue to produce annual crops (which they call "cash" crops) both for home consumption and for the market. Annual crops provide the weekly source of income that farm households require for their subsistence and other household needs. Nearly all farmers interviewed planted yams which are seen as being more lucrative than either coffee or cocoa. The distribution of household labor accommodates annuals

well, since the men cultivate them and the women market them. Only in the case of relatively large holdings do annuals require hired labor for land preparation, which wealthier households can afford. Since labor is one of the most critical bottlenecks in the entire cycle of agricultural production, the allocation of family labor to annuals vis a vis perennials depends on the perceived benefits (compared to the potential risks, including low prices) of each, in terms of food security and weekly income for the household.

Impact on Income, Food Security and Social Well Being

Farmers under both IRDP and HAP benefitted in the short-term, either by receiving cash subsidies or free inputs and technical advice. However, long-term impacts are much less apparent from IRDP compared to HAP.

IRDP: IRDP generated employment, but the relatively high wages paid to farmers by the project had a long-term negative effect on the wage labor pool by increasing the cost of labor; even today, labor is too expensive for many farmers. The Home Economics component of IRDP (added late in the project) sought to improve the quality of nutrition and income of the farm households by promoting, among other things, home gardens; these were not successful (Blustain). It also established a small craft cooperative and marketing outlet designed specifically to aid women in the project area (Evaluation, p. 21 ff, and Blustain, Part I).

The social infrastructure component of IRDP may well have been the most successful by having the greatest number of indirect beneficiaries. Although falling far short of the projections in the initial project design, IRDP, through various GOJ agencies, funded the construction of about 20 miles of roads, contributed to improvements in the potable water supply in the Christiana area (estimated to serve at least 25,000 people), increased the rural electrification network by at least 70 miles, and constructed at least 80 houses in rural areas (Evaluation, p. 21).

HAP: The increased production of perennials under HAP resulted in higher incomes, but the exact increase in household income has not been monitored. Higher incomes, however, do not in this case automatically signify improvements in the quality of life or food security of the farm household, since the perennials require that some of the increased earnings be re-invested in fertilizers, insecticides, and labor to sustain the increased level of production (farm interviews). Most farmers reported that the choice was either to invest in perennials or to invest in schooling for children and home construction, knowing that the latter choice implied lower production and income.

One unanticipated effect of HAP has been an increase in labor requirements, particularly for coffee production. This has resulted in additional demands on family labor, shifts in the allocation of labor within the household, and an increased need for hired labor which constitutes one of the major constraints in the farming systems. In the case of poorer farmers, this additional labor requirement is met either by providing additional hours of family labor or through labor exchanges (which are becoming increasingly rare). Women and children are called upon to help at the peak time of harvest, and it was reported that in some cases young women have entered the labor market as hired labor during the coffee harvest (personal interview). If coffee and cocoa production is sufficiently lucrative, farmers will not be reluctant to invest in hired labor and under-utilized family labor.

In conclusion:

-- Household income has generally increased and should continue to be augmented if the perennials are not neglected.

-- Annuals and, to a lesser extent, cocoa provide income that households require on a weekly basis. Although the income from the sale of annuals is primarily controlled by women who spend the earnings on food and other household necessities, men equally benefit from the gains.

-- Coffee and cocoa revenues are not controlled exclusively by men, as in some countries, but are part of the pool of household income. Thus, women have not been negatively affected by HAP, and the entire household has benefitted.

C. Program Performance

This third section of findings assesses the sustainable agriculture program in Jamaica in terms of four measures of performance: effectiveness, efficiency, sustainability, and replicability.

1. Program Effectiveness

There are two components of program effectiveness: (a) <u>coverage and equitable access</u>, or the extent to which activities and benefits were available and accessible to the intended beneficiaries; and (b) <u>intended consequences</u>, or the degree to which anticipated benefits were realized. A program is effective, then, if it reaches the population it intends to benefit, if the potential beneficiaries have an equal opportunity to participate in the program without restrictions, and if the results of the program are those desired and anticipated in the design of the activities. Factors that may affect program effectiveness include: (a) the selection of technologies; (b)

the definition of the problem and the proffered solutions; (c) the extent to which the technologies and solutions provide short-term benefits; and (d) the willingness of beneficiaries to adopt and continue the practices recommended by the program.

Coverage and Equity

IRDP: According to the 1980 evaluation of IRDP, only 30 percent of the target population (farmers with under 5 acres of land) had been reached by 1980 (Curtis, 1980), and when it ended, IRDP had not succeeded in reaching even half of the potential beneficiaries. The goal of covering 17,700 acres as projected in the initial design was reduced by more than 50 percent to 8,586 acres. Because the project lacked a monitoring and reporting system, as well as accurate baseline data, it could not assess or measure progress, including the degree to which soil loss had been reduced as a result of project interventions.

The initial assumption that JAS chapters could be "revitalized" to serve as the anchor for group formation, selection of beneficiaries, and implementation of some project activities was incorrect. Therefore, the project had to form Development Committees which were artificial entities and incorporated only a sub-sector of the target population, namely the leaders who could funnel resources into the communities. They, together with the technical staff of the project, also decided who would participate in the project. This truncated the effectiveness of the technical aspects of the project, which required that contiguous blocks of land be treated in order to control erosion, and it also fomented further the ties of clientism and social inequality pervasive in the rural areas.

HAP: In the case of HAP, there was a conscious effort in the design to use a participatory and bottom-up approach. However, this original concept was not followed, and the lack of effective group organization and beneficiary participation at the initial stages of sub-project design resulted in problems of coverage and equity. These problems were manifested by:

-- Only partial participation of beneficiaries (primarily through the committees in charge of screening potential beneficiaries);

-- No effective beneficiary participation in design decision-making; and

-- Sub-projects that were designed by the implementing agencies, not by the farmers, and which, therefore, were only partially "demand-driven."

As part of the process of sub-project design, preliminary surveys and visits to farmers were undertaken to establish the criteria

for the selection of beneficiaries and to assess the willingness of potential beneficiaries to participate. One critical criterion for beneficiary selection for all sub-projects was security of tenure. Other criteria included the level of production (a minimum of 4-5 boxes of cocoa per acre, for instance) and the size of land holding. Inputs would be provided for only one acre (regardless of the total size of landholdings), and the amount of subsidies permitted per family were determined independently of the land area to be covered or the income of the household (J$3,500, except in the case of RMCEP which was J$2,500). Other criteria were also used in the selection process for individual sub-projects. Sometimes these criteria were highly structured (as in the case of IICA); in other cases, the criteria were random, personalized, and *ad hoc*; in some sub-projects (Manchester/RADA, for instance) the selection criteria were not obvious.

As a result, wealthy farmers, who could satisfy any of the criteria, were sometimes selected, while small farmers with little production (under the 4-5 box criterion, for instance) were excluded. Some farmers were excluded because they had so little land that they could not add perennials, even though they probably would have benefitted most from the increased incomes stimulated by coffee or cocoa production. Thus, the selection criteria, plus the desire of the LMCs and the technical personnel to select the "best" farmers, skewed the coverage of project benefits in favor of the better off members of the communities.

Intended Consequences

The soil conservation objectives were met in part under IRDP and generally are being met under HAP. However, objectives to strengthen institutions at the national and local levels fell far short of design expectations in IRDP and are only partially being met in HAP.

One of the main limitations of IRDP in achieving its objectives was its definition of the problem and the solutions it proposed to solve the problem -- including inappropriate and costly technologies. The project subsidized the initial high cost of the technologies, but the maintenance costs were also high, so that only the wealthy farmers could afford the upkeep of the structures (if they chose to do so). HAP, on the other hand, through the promotion of perennials, has addressed some of the problems confronting hillside farmers, and the beneficiaries for the most part have been pleased with the activities.

Although both projects intended to raise the awareness of the public about the advantages of soil conservation and rational land use, such an "environmental ethic" has not been institutionalized. For this to occur, there must be tangible benefits evident to the farmers as well as an active education

campaign designed to improve knowledge of soil conservation, watershed protection, and tree crop cultivation practices.

2. Program Efficiency

IRDP, for all intents and purposes, did not contribute to increased agricultural production nor did it reduce soil erosion or enhance the environment. From an economic point of view, the costs of the program ($22.2 million, of which USAID contributed $11.4 million) were greater than the benefits.

The thrust of HAP was to stimulate the growing of perennial (mostly tree) crops on hillsides, initially in two watersheds. The intent was: (a) to increase the incomes of small farmers who lived in the two areas, and (b) to improve watershed management (and reduce erosion) which, in turn, would result in better flood control, reduced dredging, and improved water for both irrigation and domestic uses. The trees could be planted either in pure stands or interplanted with other tree crops or with annual crops. The more the trees were intercropped with annual crops (or replaced annual crops), the more soil erosion would be reduced.

HAP was designed at a time when the economic environment seemed quite favorable to farmers who produced for the export market, certainly more favorable than when IRDP was designed. For example, a series of devaluations was expected to benefit farmers who produced export crops (such as coffee and cocoa),[6] and deregulation was expected to reduce the marketing inefficiencies of the commercial parastatals charged with marketing these export crops. This section summarizes the results of the economic analysis conducted for HAP in 1987 and reassesses the assumptions on which it was based. At least one key assumption -- projected coffee yields -- was overly optimistic, and thus, the economic rate of return that was estimated in 1987 was also optimistic.

Summary of 1987 Analysis. The most important direct economic benefit of HAP was the increased income that would be derived from planting the tree crops, primarily coffee and cocoa, but also fruit trees (such as mango) and timber trees (such as mahogany). A second important economic benefit would be derived from stabilized watersheds and reduced soil erosion, manifested in terms of flood control, reduced dredging, increased water supplies for irrigation, and improved water for domestic uses. Indirect economic benefits included: (a) additional processing that would be stimulated by the additional perennial tree crops;

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[6]Other things being equal, the devaluation of a country's currency favors exporters vis a vis importers. In this case, the increased revenues from exports were expected to more than offset the increased costs of imports, such as fertilizer.

(b) increased economic activity by traders, transporters, and input suppliers; (c) improved balance of payments (resulting from increased exports); (d) increased employment; and (e) improved income distribution (since average incomes in the two watersheds were relatively low).

The principal costs of HAP consisted of the USAID grant ($10 million) which funded technical assistance, training, adaptive research, studies, and commodities (especially seedlings and fertilizer); investments by cooperating institutions (such as the parastatals and the government); and investments and operating costs incurred by beneficiary farmers (such as labor, seedlings, and fertilizer).

The economic analysis assumed that benefits would accrue over a 25 year period and that rates of adoption (number of trees planted) would range from 150 acres per year (most pessimistic) to 600 acres per year (most optimistic). Internal rates of return (IRRs) were estimated for six perennial crops (coffee, cocoa, mangoes, guava, passion fruit, and papaya) under four different scenarios (from the worst case to the best case) -- first on the basis of increased agricultural production only (without taking into account the benefits from improved watershed management), and then on the basis of both increased agricultural production and the value of stabilized watersheds. For each scenario, it was assumed that coffee and cocoa would comprise 60 percent of the new plantings, and the four fruit trees would comprise 40 percent, reflecting the fact that coffee and cocoa were the more important crops in the two watersheds. Table 2 summarizes the results.

Table 2. Estimated IRRs for HAP, 1987

Scenario	Annual Increase in Trees Planted (acres)	IRR (%) Agricultural Production Only	IRR (%) Agricultural Production and Value of Stabilized Watersheds
#1 (worst case)	150	8	9
#2	300	15	16
#3	450	18	19
#4 (best case)	600	21	22

Source: A.I.D., 1987b, Annex F, p. 2.

The four scenarios show estimated IRRs ranging from 8 percent (worst case scenario) to 21 percent (best case scenario) when the only benefit is increased agricultural production. When the value of stabilized watersheds is included in the analysis, the estimated IRRs increase slightly, ranging from 9 percent to 22 percent. Thus, the added benefits of improved watershed management (measured in terms of flood control, reduced dredging, and improved water supplies) do not contribute much to the economic value of the project. This suggests that it may be difficult to justify a watershed management activity solely on the basis of the economic contribution of reduced soil erosion. (However, this is not the only interpretation; see Table 4.)

These estimated IRRs, which are reasonably good, are conservative since they do not include the indirect benefits noted above. However, they are quite sensitive to several assumptions, including the rate of adoption. As Table 2 shows, increasing the acreage planted in perennial trees from 150 acres to 300 acres per year nearly doubles the IRR (for agricultural production only) from 8 percent to 15 percent; and increasing the adoption rate from 300 acres to 450 acres per year, increases the IRR from 15 percent to 18 percent. The estimated IRRs are also sensitive to changes in commodity prices.[7] In contrast, the estimated IRRs are not very sensitive to assumptions regarding wage rates.[8]

Reassessment of Assumptions. The economic analysis undertaken in 1987 was thorough and, given what appeared to be reasonable assumptions at that time, clearly demonstrated the economic worth of HAP. As indicated above, the analysis estimated IRRs based on different assumptions concerning adoption rates, commodity prices, and wage rates, and it undertook a series of sensitivity analyses to determine how each assumption affected the estimated IRRs. However, the economic analysis neglected to determine how sensitive the IRRs were to assumptions regarding yields.

In the case of cocoa, the analysis assumed that new seedlings would begin yielding only at the end of the fourth year, and then only at a rate of 10 boxes per acre; (a box of wet cocoa weighs about 56 pounds.) Yields would then double to 20 boxes per acre by the end of the fifth year; and continue to increase to 30

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[7]For example, a 20 percent increase in prices increases the IRR under the second scenario from 15 percent to 18 percent, while a 20 percent decrease in prices reduces the IRR from 15 percent to 10 percent (A.I.D., 1987b, Annex F, p. 11).

[8]For example, a 50 percent increase in the wage rate under the second scenario decreases the IRR by only one percentage point (from 15 percent to 14 percent); likewise, halving the wage rate increases the IRR by only one percentage point (from 15 percent to 16 percent) (A.I.D., 1987b, Annex F, p. 11).

boxes by the end of the sixth year; and 35 boxes by the end of the seventh year and each year thereafter until the end of the 25th year (Annex F, p. D-3). These assumptions seem realistic. According to the Cocoa Board, average cocoa yields are 8-10 boxes per acre but can increase to 30 boxes per acre with better agronomic practices.

In the case of coffee, however, the assumptions concerning yields seem grossly optimistic. As with cocoa, the analysis assumed that new coffee seedlings would begin yielding only at the end of the fourth year, averaging 18 boxes per acre; (a box of coffee weighs about 60 pounds.) Yields would then more than quadruple to 80 boxes per acre by the end of the fifth year; and continue to increase to 120 boxes by the end of the sixth year; 144 boxes by the end of the seventh year; 160 boxes by the end of the eighth year; and 192 boxes per acre by the end of the ninth year and each year thereafter until the end of the 25th year (Annex F, p. D-2).

Although potential coffee yields in Jamaica (excluding Blue Mountain coffee) range from 120-150 boxes per acre, average yields, according to the Coffee Board, are 20 boxes per acre, but can increase to 60 boxes per acre with resuscitation. The economic analysis for HAP assumed that coffee would account for one-third of the total annual increase in acreage planted to perennial tree crops (more than any of the other five tree crops included in the analysis); (as noted above, the analysis assumed that coffee and cocoa together would account for 60 percent.) Therefore, if coffee yields are substantially lower than assumed in the economic analysis, it is likely that project benefits will be substantially lower than estimated, and therefore, that the IRRs will be lower than those reported in Table 2.

Recalculation of IRRs. Table 3 recalculates IRRs for each of the four scenarios to see how sensitive the results are with respect to variations in coffee yields. The recalculation assumes that coffee yields are one half those assumed in the original economic analysis done for the 1987 project design (as reported in Table 2). Table 3 also provides estimates of the net present value (NPV) of HAP using a discount rate of 10 percent. As expected, the estimated IRRs are lower when estimated coffee yields are lower. But the declines in the IRRs mask the much sharper declines in the NPVs. For example, the losses under Scenario No. 1 more than triple from J$3.9 million to J$14.3 million if coffee yields are half those assumed in the 1987 analysis. In the most optimistic Scenario No. 4, the substantial benefits of the project are almost cut in half with the lower coffee yields, falling from J$90 million to about J$49 million.

Table 2 showed that the benefits of stabilized watersheds did not contribute much to the overall benefit of the project, judging

Table 3. Estimated IRRs (%) and NPVs (J$000) for HAP, Assuming High and Low Coffee Yields

Scenario	Increase in Acres Planted		High Yield		Low Yield	
	Annual	Total	NPV	IRR	NPV	IRR
1	150	3,600	-3,943	9	-14,300	6
2	300	7,200	27,440	15	6,727	12
3	450	10,800	58,823	19	27,753	15
4	600	14,400	90,206	22	48,779	18

Source: Bertrand, October 10, 1994.

from the very slight differences in IRRs. However, based on estimates of NPVs (not just IRRs), watershed stabilization appears to be much more important than was thought in 1987. Table 4 clarifies its importance. In the case of high coffee yields, the IRRs are not much higher with watershed stabilization than they are without watershed stabilization, as was found in 1987. However, the NPVs show that the losses to the project, under Scenario No. 1 for example, would increase by more than half if the benefits of watershed stabilization were neglected, from a loss of J$3.9 million to a loss of almost J$6.3 million. In the case of low coffee yields, which are probably more realistic, the moderate fall in IRRs again masks the relative importance of the benefits of watershed stabilization. For example, under Scenario No. 2, more than two-thirds of project benefits (totaling J$6.7 million) are due to the effects of watershed stabilization.

As suggested above, project benefits are probably lower than those estimated in 1987, because of the optimistic assumptions for coffee yields. At the same time, project costs are probably higher than estimated, because labor costs are higher in 1994 than in 1987. In 1987 there was chronic underemployment in the hillside areas, and therefore the economic analysis used a shadow wage rate estimated at one-half the market wage rate for the first nine years of the project and three-fourths of the market wage rate for each year thereafter. In 1994, the hillside areas were characterized by a scarcity of labor and relatively higher labor costs, which would contribute to an increase in the costs of production and consequently a decrease in the estimated IRRs for HAP.

Table 4. Estimated IRRs (%) and NPVs (J$000) for HAP, With and Without Watershed Stabilization, for High Coffee Yields and Low Coffee Yields

Scenario	IRR		NPV	
	With Watershed Stabiliza.	Without Watershed Stabiliza.	With Watershed Stabiliza.	Without Watershed Stabiliza.
High Coffee Yields				
1	9	8	-3,943	-6,272
2	15	15	27,440	22,782
3	19	18	58,823	51,837
4	22	21	90,206	80,891
Low Coffee Yields				
1	6	5	-14,300	-16,628
2	12	10	6,727	2,069
3	15	14	27,753	20,767
4	18	16	48,779	39,464

Source: Bertrand, October 10, 1994.

3. Program Sustainability

Program sustainability concerns the ability of national and local institutions to continue, maintain, or prolong the activities promoted under specific projects after these are phased out. It also concerns the extent to which the technical solutions that were promoted to solve specific problems were appropriate and, therefore, the extent to which they should be sustained.

Institutional Sustainability

National Level Institutions. There was recognition that national level institutions in Jamaica which were to implement IRDP were weak and required strengthening. Yet USAID's efforts to strengthen these institutions were only minimally successful. The goal of strengthening the manpower capabilities of the MOA in order to ensure that IRDP activities would continue and be replicated elsewhere was not achieved. Moreover, the experience gained by the technical personnel either through training or by

hands-on work in the process of implementation was lost in the throes of political and institutional change. Subsequent changes in the structure of the MOA have resulted in further diminishing the impact of efforts to ensure long-term sustainability.

This has had repercussions for HAP, since there is an absence of commitment and capability on the part of RADA to provide the technical support required in the phased-out sub-projects. Without continued technical support to reinforce the conservation practices initiated under HAP, those practices may not be sustained in the long-term.

Local Level Institutions. Local level institutions capable of concerted action also have a direct impact on program performance and sustainability. Community organization, particularly among poor farmers, is neither easy nor inexpensive to implement. Yet, it is nearly always the best insurance that activities, once initiated, and investments, once made, will be sustained in the long-term. That is, for sustainable agriculture programs to be successful the people must be able to diagnose their problems and jointly strive to solve them.

For HAP, as for IRDP, success -- and sustainability -- will be determined by what happens <u>after</u> the land is treated and <u>after</u> the initial investments in inputs and trees are made. Assuming that the benefits from caring for the perennial crops are worthwhile, group action can help farmers pool their resources to secure better information about sources of inputs and technical advice; find better markets for their products; form secondary support groups (cooperatives, processing centers, input stores); and obtain better infrastructure and maintenance of existing roadways. Weak local groups place the onus of sustaining the practices encouraged by HAP on individual farmers; yet many farmers cannot obtain fertilizers, for example, even if they can afford them because of the lack of transport or its high cost to an individual. In the absence of a tradition of cooperation and self-help among the people in the rural areas, this task of organization will remain difficult.

Technical Sustainability

The technical solutions advocated by IRDP were not sustainable due to the cost of the land treatments and the lack of an agricultural technology which farmers could adopt. In contrast, the technical solutions promoted by HAP are feasible. But their sustainability may be limited because farmers cannot afford to pay for inputs and labor under conditions where the price for their products is low and where the marketing channels are inadequate. Thus, there is a threat of gradual abandonment of the practices learned and of the trees planted.

4. Program Replicability

Both IRDP and HAP assumed that once the benefits of the interventions were demonstrated, non-participating farmers would replicate the activities on their own fields. This was an incorrect assumption on several counts.

First, if a technology is costly and requires significant changes in existing practices, it is unlikely to be replicated. IRDP was not replicated because the technical solutions it proposed were inappropriate and the agronomic packages and new practices that these implied never materialized. In contrast, HAP has promoted a technology that is sound, prevents soil erosion, and is beneficial to farmers. However, HAP may not be replicated elsewhere because of the lack of effective institutions. In addition, most farmers find it difficult to obtain seedlings, fertilizer, and insecticides, and the cost of these inputs and labor exceeds their budget. Although the technologies promoted under HAP require changes in farmers' practices and attitudes, these changes are acceptable as long as the farmers benefit economically.

Second, if a technology is introduced with the aid of subsidies, replicability is possible only to the extent it is affordable in the absence of subsidies. IRDP provided cash subsidies to farmers; in the absence of the subsidies, the farmers were not interested in replicating the techniques introduced by the project. Similarly, HAP provided seedlings and inputs to farmers free of charge in order to interest people in the project; in the absence of the subsidized inputs, some farmers cannot afford to continue the conservation practices, and those who can will do so only if the price they receive for their crops covers the costs. Of the farmers who were not beneficiaries of HAP, many are not interested in spending their own money to adopt HAP practices until the benefits are unequivocally demonstrated.

Third, replication of new practices and technical knowledge associated with soil conservation measures and crops requires that they be internalized by the farmers. The practices and technologies promoted by IRDP could not be internalized partly because the extension component was not successful. Similarly, not all practices and technical knowledge promoted by HAP have been successfully internalized, and there is a strong need for continued technical supervision in sub-projects that have been phased out. Farmers may wish to replicate HAP, but without technical instruction they may adopt practices incorrectly and with negative results.

Table 5 identifies six key conditions that appear to be associated with the long-term sustainability and replicability of HAP and summarizes the extent to which each condition was satisfied in the 11 sub-project areas visited by the evaluation team.

Table 5. Conditions for the Sustainability and Replicability of HAP, Jamaica, 1994

Sub-project	Date Completed	Crop(s)	Conditions Include Existence of or Access to:					
			Extension	Credit	Inputs	Markets	Coop.	Groups
Blackwoods	10/91	Coffee/Cocoa	No	No	Fair	Fair	No	Weak
Elgin	8/92	Coffee/Cocoa	No	No	Fair	Fair	No	Weak
Unitas	12/92	Coffee/Cocoa	Yes	Yes	Moderate	Easy	Yes	Medium
RMCEP (Phase I)	12/92	Coffee/Cocoa	Yes	Yes	Good	Easy	Yes	Medium
Guys Hill Coffee	6/93	Coffee	No	Yes	Fair	Fair	No	Weak
St. Mary Cocoa	6/93	Cocoa	No	Yes	Fair	Difficult	No	Weak
Agro-forestry	10/93	Coffee/Cocoa	No	No	Fair	Fair	No	Weak
MinAg/IICA	12/93	All Crops	No	No	Moderate	Difficult	No	Weak
Manchester RADA	12/93	Coffee	No	No	Fair	Easy	No	Weak
Mammee River	On-going	Fruit Trees	Yes	No	Good	Easy	No	None
Kellits/Crofts	On-going	Cocoa	Yes	No	Good	Easy	No	Weak

Source: Site Visits, June 1994.

4. LESSONS LEARNED

1. Farmers are more likely to adopt technologies and practices that are simple, relatively inexpensive, already familiar to them, and require few changes in their existing practices.

In Jamaica, all four of these conditions were satisfied under the Hillside Agriculture project (HAP): (a) the improved production practices (including pruning and trimming perennial trees and applying fertilizer) as well as the improved conservation practices (primarily planting trees, but also using grass barriers, ditches, trenches, drains, and gully plugs) were simple to adopt; (b) the production inputs (primarily fertilizer and seedlings) were provided to the farmers free; (c) most farmers were familiar with perennial trees (especially coffee and cocoa) because they were already growing them; and (d) farmers did not need to alter their existing cropping system in order to plant trees.

In contrast, the conservation technologies and practices promoted under the Integrated Rural Development project (IRDP) were complex (constructing bench terraces with heavy equipment rather than planting trees with manual labor). They were also expensive, unfamiliar to most farmers, and required farmers to remove existing crops to make way for the bench terraces. (There were exceptions. In some cases, contour trenches were constructed under IRDP, which not only control erosion but also are relatively easy for the farmer to maintain.)

2. Farmers have a greater incentive to adopt improved production technologies and conservation practices when it is likely that significant benefits will occur relatively quickly, within a year or two.

Under HAP, farmers received free seedlings, free fertilizer, and free technical advice -- in return for their own (or hired) labor to plant the seedlings, apply the fertilizer, and use the advice. The farmers adopted the improved practices partly because the inputs were free and provided immediate benefits. Although new coffee and cocoa seedlings do not yield for three or four years, resuscitation of existing coffee and cocoa trees (which had been damaged by Hurricane Gilbert or had suffered from neglect) almost doubled yields within two years -- another significant, short-term benefit.

Under IRDP, farmers also received immediate benefits -- but in the form of cash, not in kind -- in return for constructing bench terraces and other conservation infrastructure on their own land.

3. Sustainable agriculture programs are more likely to be successful when farmers: (a) have secure land tenure; (b) have a positive attitude toward farming; and (c) are young.

The local management committees (LMCs) developed under HAP (which were comprised of influential farmers and other members of the local community) deliberately tried to select participant farmers who would most likely be successful -- whether they were large or small, male or female, rich or poor. The LMCs determined that farmers planting perennial tree crops on Jamaica's hillsides would be most successful when they: (a) enjoyed secure land tenure, for only then would they be assured of the long-term benefits of the perennials; (b) demonstrated a strong constitution and were willing to work hard on the land; and (c) were relatively young and therefore, not only willing, but also able, to work hard, since many farmers were expected to use their own labor to implement the new production practices and maintain the new conservation measures; (this third criterion proved difficult to satisfy, since the average farmer in Jamaica is 55 years old.)

4. The long term viability of programs designed to increase the production of traditional export crops, like coffee and cocoa, depends on the international market.

Under HAP, coffee production of participating farmers increased from less than the national average (20 boxes per acre) to almost 30 boxes per acre over two to three years; and cocoa production increased from about 8-10 boxes per acre to about 30 boxes per acre over two years. The extent to which farmers have also been able to increase their incomes has depended on international market prices and the foreign exchange rate. In recent years, both coffee and cocoa prices have fallen on the international market. Because of devaluation, however, most farmers (especially those who grow coffee) are receiving more for their product (in local currency terms) in 1994 than before the project began. Devaluation, though, also means that imported commodities, such as fertilizer, will be more expensive (in local currency terms), and many farmers stopped using fertilizer when they had to pay the full market price; this will adversely affect their yields, thereby jeopardizing the long-term viability of the program.

In spite of price fluctuations on the international market, it is likely that most farmers will not abandon their coffee and cocoa trees. This reflects the fact that farmers are risk averse, and perennial tree crops provide insurance against other crop failures as well as security in old age.

5. It is better to <u>prevent</u> a problem, like soil erosion, in the first place than to "<u>cure</u>" the problem later on.

In most areas under HAP, farmers did not cite soil erosion as a major problem. Nevertheless, Jamaica's steep hillside terrain is clearly a candidate for severe watershed degradation, and by promoting perennial tree crops, HAP is preventing future soil erosion problems as much as it may be solving existing soil erosion problems.

In contrast, IRDP, rather than preventing or reducing soil erosion, in some cases actually made matters worse. The heavy equipment that was used to construct the bench terraces disturbed the top soil, thereby making the land less fertile and less suitable for agricultural production than it was before.

6. Strong local institutions and beneficiary participation are needed to ensure the long term sustainability of the conservation measures and production practices.

HAP encouraged farmer beneficiaries to participate in the design of sub-projects, and it also promoted the organization of groups of farmers, including the LMCs. However, when the HAP sub-projects were phased-out, the local organizations dissolved. In the absence of these groups, many farmers found it difficult to purchase inputs, obtain technical advice, and market their products. As a result, the long-term sustainability of the conservation and production activities initiated under HAP is questionable.

Although a few NGOs, church organizations, and cooperatives continue to provide agricultural inputs in some areas, this is the exception rather than the rule. And although there is a well established marketing system for traditional export crops (coffee and cocoa) which is operated by the commercial parastatals, they do not operate as efficiently as the private sector, and as a result the farmer is paid less for his crop than he otherwise would be paid. The key institution charged with providing technical support to all farmers (including HAP beneficiaries) is the Rural Agricultural Development Authority (RADA), the extension arm of the Ministry of Agriculture; but RADA is not equipped with the staff or the budget to provide the services farmers need.

IRDP was also unsuccessful in strengthening institutions at the local level; but in contrast to HAP, IRDP made few attempts in this direction. Characterized by a top down approach, IRDP developed a rigid blueprint to solving farmers' conservation problems, created a centralized bureaucracy to manage the program, and did not encourage farmers to work together to maintain the conservation works that were constructed. The Development Committees, which were created to identify beneficiaries, did not involve the farmers, included only a few local leaders, and did not endure beyond the life of the project.

7. The need to support public education and awareness about soil erosion and environmental degradation never ends.

Under HAP (as well as IRDP), a major effort was made to inform hillside farmers about the problems of soil erosion. Public meetings were held to explain why it was important to plant trees and to explain how HAP could help farmers maintain the trees. The fact remains that many people in Jamaica, at both the national level and the local level, believe that public education is the single most important program that now needs to be emphasized.

8. A relatively calm political environment contributes to program success.

HAP, which is relatively successful, has been implemented during a period of political passivity, when 45 percent of the population reports that it doesn't care about government and doesn't expect much from government.

In contrast, IRDP, which was unsuccessful, was implemented during a turbulent period characterized by violence, heated debate, and political interference.

ANNEX A

Evaluation Methodology

A three person team carried out this assessment of the impact of USAID assistance on resource conservation and sustainable agriculture in Jamaica. The team consisted of an economist, an agronomist, and a social scientist. The evaluation methodology used to carry out the assessment was developed by the team during a three day team planning meeting in Washington, D.C. and further refined prior to beginning work in the field.

The evaluation methodology followed the same analytical framework that had been used in similar assessments previously completed in the Philippines, Mali, Nepal, and The Gambia, thereby ensuring comparability among all the assessments. This framework was organized around four strategies that typically have been implemented to support programs in resource conservation and sustainable agriculture worldwide, and the methodology was specifically designed to assess the extent to which each of the four strategies contributed to the long-term impact of USAID programs. The four strategies concerned: (a) technological change, (b) awareness and education, (c) institution building, and (d) the policy environment.

The survey instruments developed for the field study were based on a review of available documentation about the USAID program in Jamaica as well as on analytical work about investments in agriculture and their long-term impact on the environment. The bibliography cites the main documents reviewed. The instruments were adapted from those which had been used by CDIE in similar assessments and were refined as topical guides to provide integrated information in two different contexts.

-- A topical guide for interviews with key government officials and others familiar with USAID-supported activities in environmental protection and sustainable agriculture (Exhibit 1); and

-- A topical guide for the site visits, which sought information about the biophysical nature of each site, the characteristics of the farming systems, the nature of the specific project interventions at the farm household level, and indicators of the socio-economic impact of the interventions at both the village and farm household levels (Exhibit 2).

These instruments were used in the field as guides on which to base structured interviews rather than as formal questionnaires to be administered to the informants. Although they provided some quantitative information, they were designed primarily to

give qualitative information and not to provide statistically representative data. The goal of the interviews was to provide an understanding of the development process which took place, the consequences of the interventions for long-term resource conservation, and the impact of the activities on the beneficiaries at the farm household level.

The team worked in Jamaica for three and a half weeks (May 26th to June 19th, 1994) and visited sites where USAID-supported activities had taken place during a six day period (June 1, June 3-4, June 6-8). The sites were selected according to the following criteria:

-- Sites where both IRDP and HAP interventions had taken place and where both projects had ended (Unitas).

-- Sites where both IRDP and HAP interventions had taken place but where HAP sub-projects were still on-going (Kellits/Crofts Hill).

-- Sites where HAP sub-projects had ended (Blackwoods, RMCEP, Elgin, MinAg/IICA, St. Mary Cocoa, Guys Hill Coffee, Manchester RADA, Agro-forestry).

-- Sites where HAP sub-projects were still on-going (Mammee River).

Given the lapse of time since IRDP ended, the evaluation team was able to carry out only a few farmer interviews in IRDP areas (which were selected if they overlapped with HAP areas). The team concentrated on HAP sub-projects where assistance had officially ended, and therefore, where the impact of the four specific strategies associated with sustainable agriculture programs could best be tested.

The team conducted 28 field interviews, primarily with participating farmers on their farms, but also with many of the former sub-project managers. Because of the settlement pattern, there were no group meetings but rather individual farmer interviews. The information gathered from the interviews was subsequently discussed and analyzed by the team. Each interview required one to two hours.

Table A-1 summarizes the 11 site visits and the accompanying map indicates where the 11 sites are located.

TABLE A-1: Summary of IRDP and HAP Sites Visited, June 1994

Name of Site/Sub-project	Number of Interviews	Status of Project	Date of Visit
Mammee River	6	HAP On-going	6/1/94
MinAg/IICA	2	HAP Completed	6/3/94
Guys Hill	2	HAP Completed	6/3/94
St. Mary Cocoa	3	HAP Completed	6/4/94
Agro-forestry	2	HAP Completed	6/4/94
Manchester RADA	3	HAP Completed	6/6/94
Unitas	2	HAP Completed IRDP Completed	6/6/94
RMCEP	3	HAP Completed	6/7/94
Kellits/Crofts Hill	2	HAP On-going IRDP Completed	6/7/94
Blackwoods	2	HAP Completed	6/8/94
Elgin	1	HAP Completed	6/8/94
Total	28		

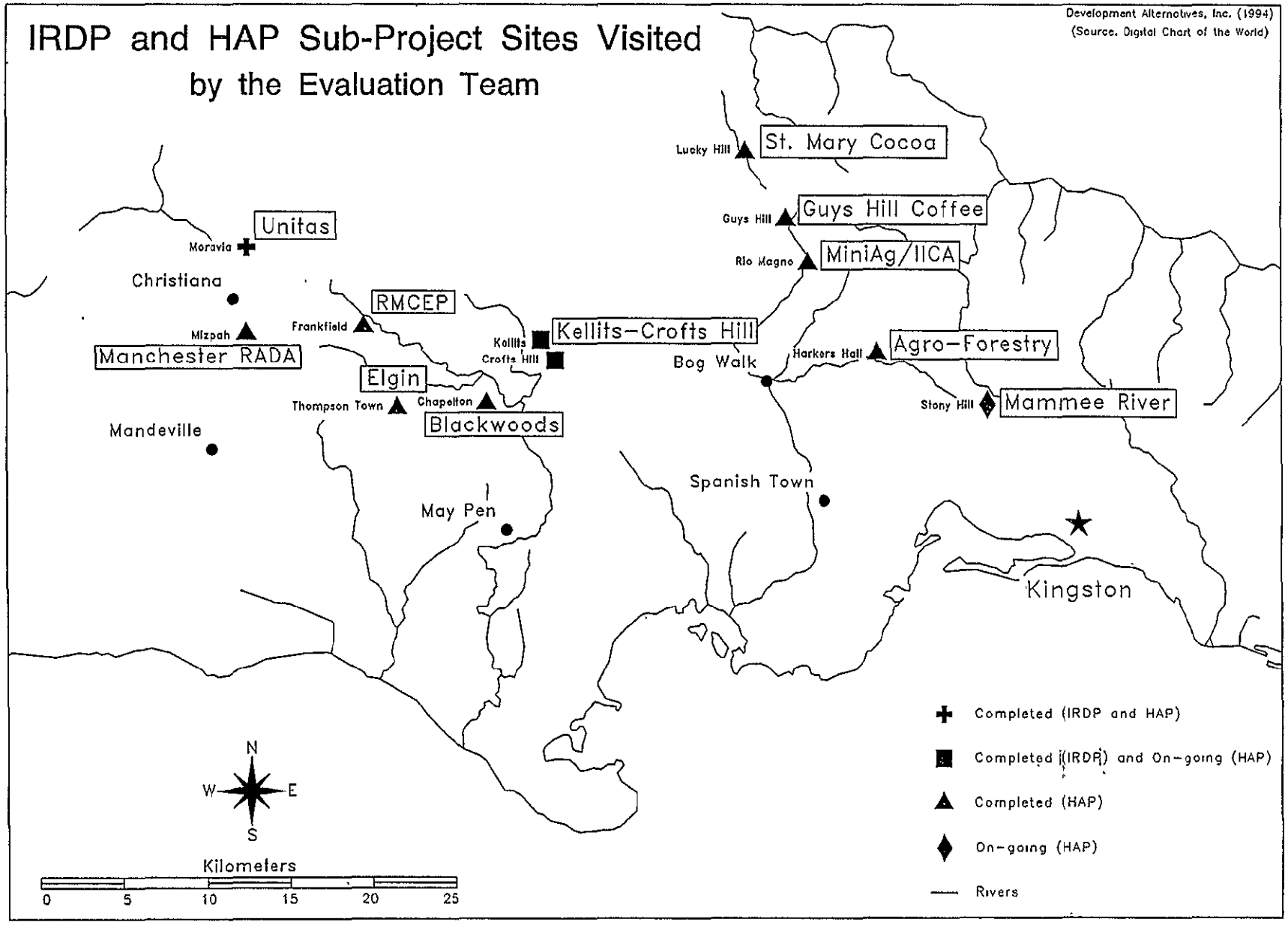
IRDP and HAP Sub-Project Sites Visited
by the Evaluation Team
Development Alternatives, Inc. (1994)
(Source. Digital Chart of the World)
St. Mary Cocoa
Lucky Hill
Guys Hill Coffee
Guys Hill
MiniAg/IICA
Rio Magno
Unitas
Moravia
Christiana
RMCEP
Frankfield
Mizpah
Manchester RADA
Kellits-Crofts Hill
Kellits
Crofts Hill
Bog Walk
Harkers Hall
Agro-Forestry
Elgin
Thompson Town
Chapelton
Blackwoods
Stony Hill
Mammee River
Mandeville
Spanish Town
May Pen
Kingston
N
W
E
S
Kilometers
0
5
10
15
20
25
Completed (IRDP and HAP)
Completed (IRDP) and On-going (HAP)
Completed (HAP)
On-going (HAP)
Rivers

Exhibit 1

Interview Guide

A. Background

USAID is conducting a worldwide assessment of its environmental programs. The purpose is to assess the environmental impact of USAID's assistance in several areas, including forestry, biodiversity, and sustainable agriculture. This team is focusing only on sustainable agriculture, especially soil and water conservation programs. We want to know what the impact of these programs has been; and we want to identify the strategies that appear to be most effective in different kinds of country situations.

So far we have conducted field studies in four countries: the Philippines, Nepal, Mali, and The Gambia. Jamaica is the fifth country, and we expect to complete a sixth field study in Guatemala.

In each country we are looking at completed activities as opposed to on going activities. In Jamaica, we are looking primarily at two projects: the Integrated Rural Development Project (1977-1984) and the Hillside Agriculture Project(1987-1994, extended to 1997).

We are using the same evaluation framework for all of the country field studies. This is so we can synthesize the results and the lessons learned from all the country studies into one summary report on USAID's overall experience in sustainable agriculture.

We want to understand which strategies work better and which strategies don't work so well under different country situations. We are especially interested in four strategies that the USAID projects may have supported: first, support for the institutional framework within which the projects were implemented; second, promotion of environmental awareness and related educational programs; third, the development of environmentally sound agricultural technologies; and lastly, the support of economic and other policies (such as land tenure policies) to help assure a policy environment conducive to sustainable agricultural practices.

B. Key Questions

1. What have been USAID's main contributions in these four areas or in other areas that you believe are important in promoting sustainable agriculture?

2. What has been the impact of these activities? We are thinking here about biophysical changes that occurred as a result of the USAID projects as well as social and economic benefits that may have accrued to farmers and others. We are also thinking about negative impacts as well as positive impacts.

3. What was the single most important factor that led to these changes; (or, what was the single most important constraint or problem that reduced the effectiveness of the projects)?

4. What other activities, beside activities supported by USAID, have been instrumental in promoting sound environmental practices in Jamaica?

5. What do you think are the most important lessons learned since these projects were implemented?

6. What do think is the most important thing to do now to enhance Jamaica's environment in the area of sustainable agriculture?

Exhibit 2

TOPICAL GUIDE: SOCIO ECONOMIC ASSESSMENT

DATE VILLAGE NAME POPULATION NUMBER OF HOUSEHOLDS

NUMBER OF HOUSEHOLDS WITHOUT LAND

NUMBER OF HOUSEHOLDS WITH NON-RESIDENT MIGRANTS

NUMBER OF HOUSEHOLDS HEADED BY WOMEN

==========

I. GENERAL BACKGROUND

BIOPHYSICAL DESCRIPTION

1. When are the rainy seasons and what are their duration?

2. Do you have periods of drought, waterlogging, or excessive plant diseases?

3. What type of rain induced erosion did you have before the beginning of the project? Did you ever lose a field due to erosion?

4. How steep were the slopes that you farmed before the beginning of the project?

FARMING SYSTEM (before/after project intervention)

1. What crops did you grow?

   Annuals for:
   - Home consumption
   - Marketing

   Perennials for:
   - Home consumption
   - Local markets
   - Export

2. What was the area cultivated in each of the principal crops?

3. Did you rotate your crops, use organic or inorganic fertilizers, or pesticides?

4. Did you ever hire labor?

5. How accessible were markets?

6. What were your major constraints to production?

HISTORY OF INVOLVEMENT [Community expectations (promises); dates, actors, processes]

1. When did the community first hear of the project? From whom? What did the people decide to do (technologies)? Who defined what the intervention ought to be? Why did the community want the intervention/project? Who were the people involved in introducing the intervention? What technical services/agents were involved?

2. When did the intervention begin? Why was the site selected; by whom? Whom did the land belong to? (probe on type of tenure, security of tenure, rented land, state land). How was the land being used prior to the intervention? What is the present use of the land?

3. What services/NGOs were involved? How? What did they contribute? Are they still assisting the community? How?

PARTICIPATION (Who, when, how, for what purpose)

1. Who selected the households that would participate? Did the community meet to decide on the activity? What did the community decide on: specific activities, management, how the intervention was to be carried out?

2. Who worked? On what and for how long? Did the participants receive payment? From whom and how much?

3. Did the community form groups to organize work? Who led the group(s)? (name, status, composition, function)

II. EVALUATION AND IMPACTS

EVALUATION OF SUCCESS OR FAILURE (Overall rating, specific activities that were or were not successful, reasons, benefits, costs)

1. Why/why not did you like this intervention? Was the activity successful? Why or why not? What was the single most important reason for success/failure?

2. Did all the people in the project adopt the proposed practices? If not, why not and how many? Did people drop out? Why?

3. Did other unexpected good/bad things come about as a result of the activity (specify)?

4. Has soil erosion stopped as a result of the project?

5. Have there been positive effects of the intervention on the environment, and if so, why?

6. Have there been negative effects on the environment?

7. Who has benefitted from improved conservation practices?

SOCIO-ECONOMIC IMPACTS (Who benefited, nature of benefits, value/amount, who lost, why)

1. Who benefited the most? (sex, class, landholding status, old/new households and families)

2. How did they benefit? (money, food security, time saved, labor, prestige, productivity) How was the money used?

3. Who lost? (sex, class, age) How/what did they lose?

4. Did those who participated most win the most? Why or why not?

5. Did the community benefit as a whole? How?

SUSTAINABILITY, REPLICABILITY (Maintenance, continuity of activity, spread effects, side effects, generation of other activities as a result of initial intervention)

1. Which practices will you continue to use in the future?

2. If prices of inputs change or the price you receive for your product changes what will you do?

3. How is the activity to be maintained? (organization, cost, community contributions)

4. Is the activity maintained now? Why/why not?

5. Have other communities asked for similar interventions? Requested similar assistance? Done it themselves? Where, Who, How?

6. Did this community initiate new activities related to the original intervention? (for example marketing, community savings, other organizations)

COMMUNITY CONCERNS/ISSUES (What happens next, what problems related to the activities/interventions still face the community, what does the community see as a way of solving these problems)

ANNEX B

Persons Contacted and Sites Visited

A. Persons Contacted

Government of Jamaica

Clarence Franklyn
Permanent Secretary
Ministry of Agriculture

Marie Strachan
Director of Planning
Ministry of Agriculture

Hopeton A. Fraser
Executive Director
Rural Agricultural Development Authority (RADA)
Ministry of Agriculture

Dunbar Wright
Natural Resources Conservation Agency (NRCA)

Roy Jones
Director
Department of Forestry and Soil Conservation
Ministry of Agriculture

Vivian Wright
Cocoa Industry Board

Mr. Williams
Coffee Industry Board

USAID/Kingston

Christopher M. Brown
Director
Office of Natural Resources and Agricultural Development

Jane Ellis
Project Manager
Office of Natural Resources and Agricultural Development

Tim O'Conner
Private Enterprise Office

Steve Reeve
Environmental Officer
Office of Natural Resources and Agricultural Development

Mark Nolan
World Wildlife Fund (Belize)
USAID/Kingston (formerly)

Tim O'Hare
Latin America and Caribbean Bureau
USAID/Kingston (formerly)

Hillside Agriculture Project

Joseph R. R. Suah
Project Manager

Arnel Williams
Information Manager

Charles Reid
Sub-project Manager
MinAg/IICA

Ronald Stewart
Sub-project Manager
Guys Hill Coffee

Mr. Gaynor
Sub-project Manager
St. Mary Cocoa

Mr. Ceary
Sub-project Manager
Agro-forestry (St. Catherine)

Carl Parks
Sub-project Manager
Manchester/RADA

Mr. Webber
Sub-project Manager
Unitas

Larry Chung
Sub-project Manager
Rio Minho Cocoa Experimental Project (RMCEP)

Mrs. Russell
Rio Minho Cocoa Experimental Project (RMCEP)

Mr. Burke
Sub-project Manager
Kellits/Crofts Hill

Vernal Taylor

Sub-project Manager
Blackwoods and Elgin

Other

Don Roborthan
Dean
Faculty of Social Sciences
University of the West Indies

Elsie LeFranc
Institute of Economic and Social Research
University of the West Indies

Barbara Graham
Food and Agriculture Organization (FAO)

Patrick T. Evans
Agro Forestry Development Project
Food and Agriculture Organization (FAO)

B. Sites Visited

1. Mammee River

2. MinAg/IICA

3. Guys Hill Coffee

4. St. Mary Cocoa

5. Agro-forestry (St. Catherine)

6. Manchester/RADA

7. Unitas

8. Rio Minho Cocoa Experimental Project (RMCEP)

9. Kellits/Crofts Hill

10. Blackwoods

11. Elgin

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