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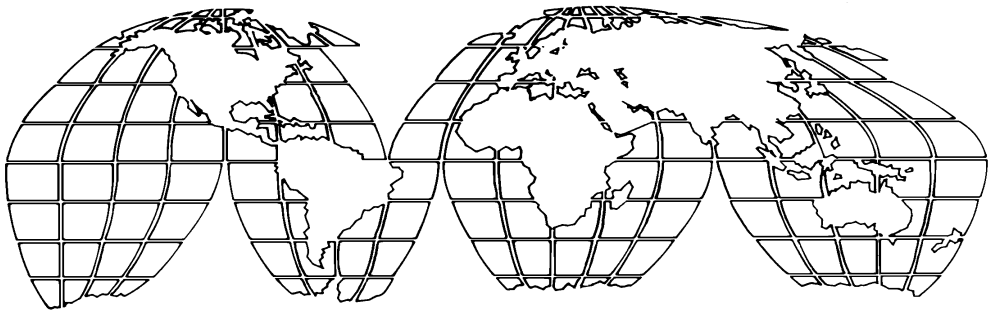
Agriculture and the Environment: In Jamaica, a Study in Contrasts



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Summary

USAID has supported sustainable agricultural development in Jamaica since the late 1970s, primarily through two projects: the Integrated Rural Development project (IRDP) and the Hillside Agriculture project (HAP). The projects used dramatically different approaches to addressing soil and water conservation problems—with dramatically different results. IRDP promoted construction of terraces along hillsides using heavy equipment, whereas HAP promoted planting of perennial trees (mainly coffee and cocoa) using hand labor.

IRDP introduced an inappropriate conservation technology, costly and ill suited to local conditions. It could claim virtually no positive results or benefits, whether biophysical, economic, environmental, or social. In contrast, HAP has reached 9,550 beneficiaries and affected nearly 7,000 acres of hillside land. Two 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. Coffee production has nearly doubled, and cocoa production has nearly tripled in project areas. Because perennial trees were planted primarily on land *not* the most susceptible to erosion, plantings served mainly to prevent future erosion problems rather than to solve existing ones.

The positive results of HAP can be attributed to three factors: 1) conservation measures and production technologies USAID introduced were simple, relatively inexpensive, and already familiar to the farmers, and they required few changes in existing practices; 2) participants had secure land tenure and a positive attitude toward farming; and 3) because participants were provided free seedlings, free fertilizer, and free advice, they had a strong incentive to adopt improved production practices and conservation measures for maximum profit.

HAP was effective also because it reached the population it intended to benefit, a population not limited to the smallest or the poorest farmers and including both men and women. Although the economic rate of return was less than originally estimated (primarily because expected increases in coffee yields were overestimated), it still is respectable. But program benefits may not be sustainable because local institutions are not in place to ensure delivery of agricultural inputs or technical advice.

Background

Jamaica's most important environmental problem, the one affecting the largest number of people, is degraded watersheds. Watershed degradation leads to topsoil loss, which in turn leads to 1) reduced agricultural productivity and use

of more chemical fertilizer and 2) reduced rainwater retention by the soil, faster runoff, and more flooding.

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

In May–June 1994, a three-member team from the Agency's Center for Development Information and Evaluation visited Jamaica to assess the impact of USAID support of sustainable agriculture activities. The team based its findings on a review of documents, especially past evaluations; on structured interviews with people in Jamaica knowledgeable about USAID programs in sustainable agriculture; and perhaps most important, on visits with 28 farmers at 11 subproject sites to assess impact on intended beneficiaries.

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USAID's Assistance Approach

USAID has supported soil conservation measures in Jamaica since the late 1970s, primarily through two projects. They are the 7-year $22.2 million Integrated Rural Development project (1977–84), of which the Agency contributed $11.4 million, and the 10-year $10.0 million Hillside Agriculture project (1987–97), of which USAID is contributing the full amount.

The projects used dramatically different approaches to addressing environmental concerns and soil and water conservation problems, and they had dramatically different results. IRDP used heavy earth-moving equipment to construct terraces, ditches, and waterways (often made of concrete) to control soil erosion on steeply sloping terrain. The treated land was then planted with crops. In contrast, HAP provided tree crops (primarily coffee and cocoa seedlings), which when planted on steep hillsides both helped control soil erosion and provided farmers with income. HAP also introduced improved agricultural technologies and conservation practices associated with production of tree crops. They included resuscitating trees, constructing ditches, and planting vegetative barriers. The assessment, therefore, is a study in contrasts.

Evaluation Findings

The evaluation assessed projects relative to their implementation, impact, and performance.

Project Implementation

Conservation technologies. As mentioned, conservation technologies introduced under the two projects differed markedly. IRDP promoted construction of bench terraces—level platforms 11 to 26 feet deep—using heavy equipment, whereas HAP promoted planting of trees using manual labor. The former was expensive; the latter, cheap. The former was complex; the latter, simple. The former was clearly inappropriate, as some farmers actually lost productive land (they had to remove crops to make way for the terraces); the latter was familiar to most farmers and consistent with existing cropping patterns.

Education and awareness. Attempts to create greater awareness among the rural population about long-term negative effects of watershed degradation had little effect on the rate at which farmers adopted conservation technologies introduced under either project. Farmers adopted the technologies not because of potential long-term benefits resulting from less soil erosion but because of near-term benefits promised to those who participated. IRDP paid farmers cash to construct terraces; HAP gave farmers seedlings, fertilizer, and technical advice as long as they agreed to plant the seedlings, use the fertilizer, and take the advice. Near-term benefits (whether in cash or kind), not awareness about watershed degradation, in-

duced farmers to adopt the conservation technologies.

Institution building. Both projects sought to strengthen institutions to help ensure sustainability of conservation and production activities. IRDP directed its efforts at the national level by providing technical assistance and training for extension officers in the Ministry of Agriculture. It also strengthened agricultural institutions that provide marketing and credit services. In contrast, HAP assumed, optimistically, that capacity already existed at such institutions as the Coffee Board, Cocoa Board, and Rural Agricultural Development Authority (the Agriculture Ministry's extension service) to deliver agricultural inputs and market outputs and provide technical advice.

IRDP established local-level development committees, but these did not emphasize farmer involvement and were short lived. Created to identify beneficiaries, the committees in practice failed to involve ordinary farmers. They included only a few local leaders and did not endure beyond the life of the project.

For its part, HAP *required* farmer involvement through groups called local management committees. The committees were established to select beneficiary farmers and provide regular management. Serving on them were influential farmers and other members of the local community. As with IRDP, however, participation was weak. Committees generally ceased functioning after subprojects ended.

One criterion the committees used to select beneficiaries under HAP was whether they owned the land on which perennial tree seedlings would be planted. Perennial trees represent a long-term investment. Secure land tenure was necessary to ensure that farmers would reap the rewards of that investment 15 or 20 years down the line. However, because formal land tenure security was a criterion for participation, poorer farmers who might hold land under family tenurial arrangements were excluded.

Issues of land tenure were also important under IRDP. The premise was that construction of terraces and successful soil management required the cooperation of farmers owning adjacent plots of land. Despite this, no mechanisms were designed to ensure such cooperation. Farmers participated on a strictly individual basis.

Policy environment. During much of the period 1977–84, when IRDP was implemented, the political environment was geared more toward ensuring jobs for members of the party in power than toward protecting the environment. An expensive centralized bureaucracy was established to implement IRDP, and bureaucrats cared more about political patronage than watershed development. They embraced, moreover, a top-down approach to management and developed a rigid blueprint for solving farmers' conservation problems.

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By contrast, the political environment during the period 1986–94, corresponding with HAP, was 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. It has, for example, elevated political responsibility for environmental concerns to cabinet status (the minister of environment and housing), created the Natural Resources Conservation Authority, and published its National Environmental Action Plan. In addition, policies designed to promote economic liberalization and deregulation have helped create an environment in which farmers are better able to increase financial returns to export-crop production. Some observers might assume the policies to be antienvironment; in

point of fact, though, they provide incentives for small farmers to plant erosion-controlling cocoa and coffee trees. The policies were initiated in the mid-1980s.

Program Impact

The Hillside Agricultural project has yielded positive results, partly because farmers were already aware of the technologies introduced and partly because their adoption required no major change in farmers' cropping patterns. The most widely adopted technologies were resuscitating coffee and cocoa trees and increasing the density of perennial tree crops. But other soil conservation practices were adopted as well. Many farmers, for example, began leaving plant material on the soil surface as mulch to reduce sheet erosion, increase water infiltration, and improve soil fertility. Farmers constructed ditches and wooden barriers and reinforced contour ridges to control water runoff. And they used gully plugs—dams consisting of rocks, sticks, and the like—to reduce water velocity in channels that drain fields and roads.

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Biophysical impact. 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. Primarily, though, the project has emphasized land already in perennial crop production rather than land characterized by the most severe erosion problems.

The Integrated Rural Development project attempted to introduce a conservation technology that, as it turned out, was wholly inappropriate. The project had a short-term detrimental effect on soil fertility in at least some fields where bench terraces were built. The heavy equipment used to construct terraces disturbed the topsoil, making the land less fertile and less suitable for agricultural production than it was before. Elsewhere, the effect was, at best, neutral, because terraces and waterways were abandoned or neglected by farmers.

Two elements of IRDP, though, did succeed. There was reforestation of land on steep slopes. Extensive pine stands thrive in some IRDP areas as a result of the project, and timber is being used for commercial purposes. And in some cases effective contour trenches were constructed under the project.

Economic impact. HAP has clearly had a positive impact on agricultural production. According to farmers interviewed by the evaluation team, coffee production increased from less than the national average of 20 boxes an acre to almost 30. Likewise, cocoa production increased from 8 or 10 boxes an acre to about 30. The increases were due to higher yields from existing trees (the result of resuscitation, fertilizer application, and use of improved practices) and planting seedlings more densely. The extent to which increased production translated into increased income depended on, among other things, world market prices for coffee and cocoa.

Environmental and social impact. HAP's impact on the environment is less clear. That is partly because before-and-after data have not been collected and partly because HAP was implemented on land that was *not* the most susceptible to erosion. HAP may have had a positive impact on the short-term food security of participating farmers (since they could use any increase in income to buy food). It also improved farmers' long-term social security (since perennial trees provide an annual source of income to the owner for 15 to 20 years).

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. With a few exceptions, it did not contribute to environmental stability.

Program Performance

HAP was generally effective and efficient, but its sustainability is questionable.

Effectiveness

As of January 1994, HAP had reached 9,550 beneficiaries farming 6,789 acres—on average, about two thirds of an acre per farmer. Most hillside farms in Jamaica are small (70 percent are less than 5 acres and 95 percent are less than 10 acres), but HAP (through the local management committees) did not deliberately attempt to reach the smallest or poorest farmers. To the contrary, it sought those who 1) had secure land tenure, 2) were young (the average age of Jamaican farmers is relatively high, 55 years), and 3) were dedicated in their work. Because of these criteria, the more marginal farmers (including widows and other women) were infrequently selected.

All participants, regardless of farm size or income level, received the same benefit: enough seedlings and fertilizer to cover not more than 1 acre of land, which could not be valued above J$3,500 per beneficiary (later reduced to J$2,500). In instances where sale of incremental coffee or cocoa production generated additional income, there is no evidence that the husband benefited more than the wife or vice versa. Interviews with farmers provided convincing evidence that additional income was treated as family income and shared between the two.

Although production has mounted, the extent to which farmers have 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 a devaluation, though, most farmers (especially those who grow coffee) were receiving more for their product (in local currency) in 1994 than before the project began. But devaluation also means imported commodities, such as fertilizer, will cost more.

Despite price fluctuations on the world market, it is unlikely most farmers will cut down or abandon their coffee and cocoa trees. Farmers are risk-averse. Perennial tree crops provide insurance against other crop failures, and they afford security in old age.

Efficiency

As stated, IRDP 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 ranged from 9 percent to 22 percent, depending on assumptions concerning adoption rates, commodity prices, wage rates, and yield increases.

But the economic analysis overestimated yield increases for coffee, the most important component, by a factor of 2 or 3. It assumed coffee yields would increase to 144 boxes an acre by the end of year 7 and 192 boxes an acre by the end of year 9. In actuality, yields were about 30 boxes per acre at the end of year 7, and potential yield is at best 120 to 150 boxes per acre. (When internal rates of return were recalculated under the assumption coffee yields were one half those projected in the 1987 analysis, they were substantially lower, ranging from 6 to 18 percent, and benefits of the project were cut in half.)

Sustainability and Replicability

A general absence of local institutions to provide agricultural inputs, markets, and technical advice seriously threatens the long-term sustainability of the Hillside Agricultural project. Sustainability will be enhanced to the extent these needs can be met by revitalized national institutions (such as the Coffee Board), redirected local institutions (such as the church or common-interest groups), or private companies.

A few churches, cooperatives, and nongovernmental organizations continue to provide agricultural inputs in some areas, but that is the exception. And although a well-established marketing system for coffee and cocoa is operated by the commercial parastatals, they operate less efficiently than the private sector. As a re-

sult, over the long run the farmer is paid less for his crop than he otherwise would be. The main institution charged with providing technical support to farmers is the Rural Agricultural Development Authority, the extension arm of the Ministry of Agriculture; but RADA is not equipped with the staff or the budget to provide services farmers actually need.

As for financial sustainability, so long as farmers receive attractive financial returns, they are likely to work aggressively to obtain the inputs and services they need. However, in a small island nation, financial returns depend in large part on the international market.

To the extent HAP is sustainable institutionally and financially, it is also replicable. That is, technologies introduced under the project can be replicated by neighboring farmers as long as they have access to seedlings and fertilizer, markets, and a price that covers costs of production and ensures a profit.

Lessons Learned

Farmers are more likely to adopt production technologies and conservation practices that 1) are simple, 2) are relatively inexpensive, 3) are already familiar to them, and 4) require few changes in their existing practices. All four conditions were satisfied under HAP. First, improved production practices (including pruning and trimming and applying fertilizer) and improved conservation practices (planting trees and using ditches, grass barriers, and the like) were simple to adopt. Second, seedlings and fertilizer were provided to farmers free. Third, most farmers were familiar with perennial trees (especially coffee and cocoa) because they were already growing them. And fourth, farmers did not need to alter their existing cropping system to plant trees. By contrast, technologies and practices promoted under IRDP were complex, expensive, and unfamiliar, and they required changed practices.

{Sustainable programs in hillside farming are likely to be more successful when farmers 1) have secure land tenure, 2) have a positive attitude toward farming, and 3) are young.|

Farmers have a greater incentive to adopt improved technologies and practices when it is likely they will reap significant benefits relatively quickly, within a year or two. The farmers adopted improved practices partly because inputs were free and provided near-term benefits. New coffee and cocoa seedlings do not yield for three or four years, but resuscitation of existing trees (damaged by hurricane or suffering from neglect) almost doubled yields within two years.

Sustainable programs in hillside farming are likely to be more successful when farmers 1) have secure land tenure, 2) have a positive attitude toward farming, and 3) are young. Local management committees developed under HAP sought to select participant farmers who would most likely be successful, regardless of whether they were large holders or small, male or female, rich or poor. The committees *themselves* determined that hillside farmers would be most successful when they met the above criteria.

The long-term viability of programs designed to increase production of traditional export crops such as coffee and cocoa depends on international markets. Production is up, but world prices have been falling in recent years. Many farmers stop using fertilizer when they have to pay the full market price (as participating farmers will when the project phases out). Future devaluations, if they occur, will also discourage fertilizer use. This will adversely affect yields, jeopardizing the long-term viability of the program.

It is better to prevent *a problem such as soil erosion in the first place than to* cure *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. By promoting perennial tree crops, HAP is preventing *future* soil erosion problems as much as it may be solving *existing* ones.

Strong local-level institutions and beneficiary participation are needed to ensure the long-term sustainability of both production practices and conservation measures. IRDP made little effort to strengthen local institutions. By contrast, HAP encouraged farmer beneficiaries to participate in design of subprojects and promoted organization of farmer groups, including local management committees. When HAP subprojects were phased out, however, the local organizations dissolved. In the absence of these groups, many farmers found it difficult to buy inputs, obtain technical advice, or market their products. As a result, the long-term sustainability of the conservation and production activities initiated under HAP is questionable.

The need to provide public education and support public awareness about soil erosion and environmental degradation never ends. Both IRDP and HAP made major efforts to inform hillside farmers about the problems of soil erosion. Public meetings were held to explain why it is important to plant trees and how HAP could help farmers maintain their trees. Even though farmers' decisions to conserve came from near-term benefits rather than environmental awareness, many Jamaicans, at both the national and local level, believe public education about environmental matters is important and needs to be emphasized. That suggests the need for continual and broadened campaigns in the future—especially as free seedlings, fertilizer, and advice continue to be phased out.

This Evaluation Highlights, *by Donald G. McClelland of USAID's Center for Development Information and Evaluation, summarizes the findings of the study* Sustainable Agriculture and the Environment: Jamaica Case Study, *CDIE Working Paper No. 216, by Donald G. McClelland, Noel Beninadi, and Concepción del Costillo. The study is part of a five-country program evaluation. The working paper and this* Highlights *can be ordered from the DISC, 1611 N. Kent Street, Suite 200, Arlington, VA 22209–2111; telephone (703) 351–4006; fax (703) 351–4039; Internet docorder@disc.mhs.compuserve.com. Editorial and production services provided by Conwal, Inc.*

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