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The USAID Agroforestry Systems An Alternative to Meeting Haiti's Food, Fiber and Fuel Needs

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Because of a high ratio of population to arable land, extensive cropping and grazing practices, and ever increasing demand for fuel and wood products, Haiti's once abundant forestry resources rapidly are disappearing. The country's current forest resources are unlikely to meet growing levels of demand beyond this century unless consumprion and production trends are reversed. Concurrently, the removal of forest cover is causing serious erosion problems and reductions of agricultural productivity. The US Agency for International Development has mounted a program of agroforestry that emphasizes the rapid propagation and distribution of improved multipurpose tree crop species throughout Haiti to address these problems. The underlying premise of the program is that Haitian peasants will intercrop forest, fruit and food crops and indirectly address the problems of deforestation and erosion provided acceptable returns are foreseen from such practices. Through technical and socioeconomic research, efficient nursery techniques, and extension through local organizations, the program has planted over 11 million rapidly maturing multipurpose hardwood and fruit tree seedlings on 20,000 small-farmer plots. Many farmers who participated early in the program, which commenced in the spring of 1981, are now harvesting hardwood species for lumber and/or fuel needs.

The natural resources of Haiti, threatened by the most acute trends, are in the most deteriorated state of any nation in the western hemisphere. A few facts and estimates serve to outline the severity of the situation.

The population of Haiti is unofficially estimated at over 6 million, with an annual growth rate of 2.2%. The per capita GNP is the lowest in the western hemisphere at US $300, and is much lower than this in the rural areas where 80% of the population lives. Average per capita dietary intake is 20% deficient in calories per day, and 31% deficient in protein consumption (AID, 1983). Haiti has a total area of 2.8 million hectares (ha), or 10,714 square miles. Over 60% of the land has a slope of 20% or greater. Only 29% of the land is considered suitable for agriculrural cultivation, but 43% of the land is actually used, including many steep slopes.

The rivers of Haiti run brown with the sediment they carry due to soil and streambank erosion, which has been described as the most severe in the world. As a result, soil water-holding capacity is decreased, which leads to pseudo-droughts, irrigation systems and water reservoirs becoming inoperable, and soils rendered infertile. Agriculrural production decreased 2.5% annually during the period 1970-1979, and has declined further in recent years. In the 1960s, USAID/USDA estimated that erosion was affecting 80% of the arable land (Zerbe et al., 1980). Today, one-third of the originally arable land is no longer useful for agricultural production because of soil erosion.

Cropland expansion onto steep slopes contributes to soil erosion, but the primary cause is deforestation due to charcoal production.One-third of Haiti, 933,000 ha, is classified as forest lands, but most of this area is lighrly stocked, degraded land. There are very few areas of dense forest remaining. Rural Haitians realize the importance of tree cover to soil conservation, but survival needs for fuel and income contribute to the continuing trend of tree cutting.

Fuelwood provides 72% of Haiti's energy needs. Ninety-five percent of wood consumprion is for energy. Because of limitations on other indigenous energy sources, fuelwood will continue to be used for energy supply. Fuelwood consumption is expected to increase 3% annually through the rest of the century. Natural wood production on the sparse woodlands, which comprise about three-fourths of Haiti's forest land, is estimated at about 1m³/ha/year. There is currently a fuelwood production-consumption deficit of 2.4 million m³ per year. The wood content of the sparse woodlands is estimated at 30 m³/ha, and it is estimated that about 80,000 ha are stripped annually to meet the demand deficit (World Bank Forestry Project, 1982). At this rate the forests of Haiti will disappear within a decade.

The loss of the remaining forest cover would further worsen the soil erosion and food production problems, and would also adversely alter the current climatic patterns. Also, Haiti would become entirely dependent on costly imported energy, to be paid for by scarce foreign exchange.

Amidst this gloomy portrait of ecological degradation, it should be pointed out that Haiti is not a cursed land. It has been blessed with lands and a climate that can provide bountiful harvests if managed wisely. The USAID Agroforestry Program was developed towards this end. The purpose of this paper is to describe the program and to report on some important accomplishments in terms of dealing with Haiti's environmental degradation problems.

Program Description

Institutional The USAID Agroforestry Program was designed to utilize the strengths of both large and small scale organizations. Through various approaches, it provides a testing ground in which to identify institutional designs which can be successfully used in subsequent projects. Program development has been an unmet need in Haitian reforestation for a long time. Large programs have had to deal with long start up times, burdensome administrative details, and learning to operate in unfamiliar local environments. On the other hand, the medium and small scale non-governmental development organizations (NGOs) which

FIG. 1. Flowchart showing the inter-institutional and operational relationships of the USAID/Haiti Agroforestry.

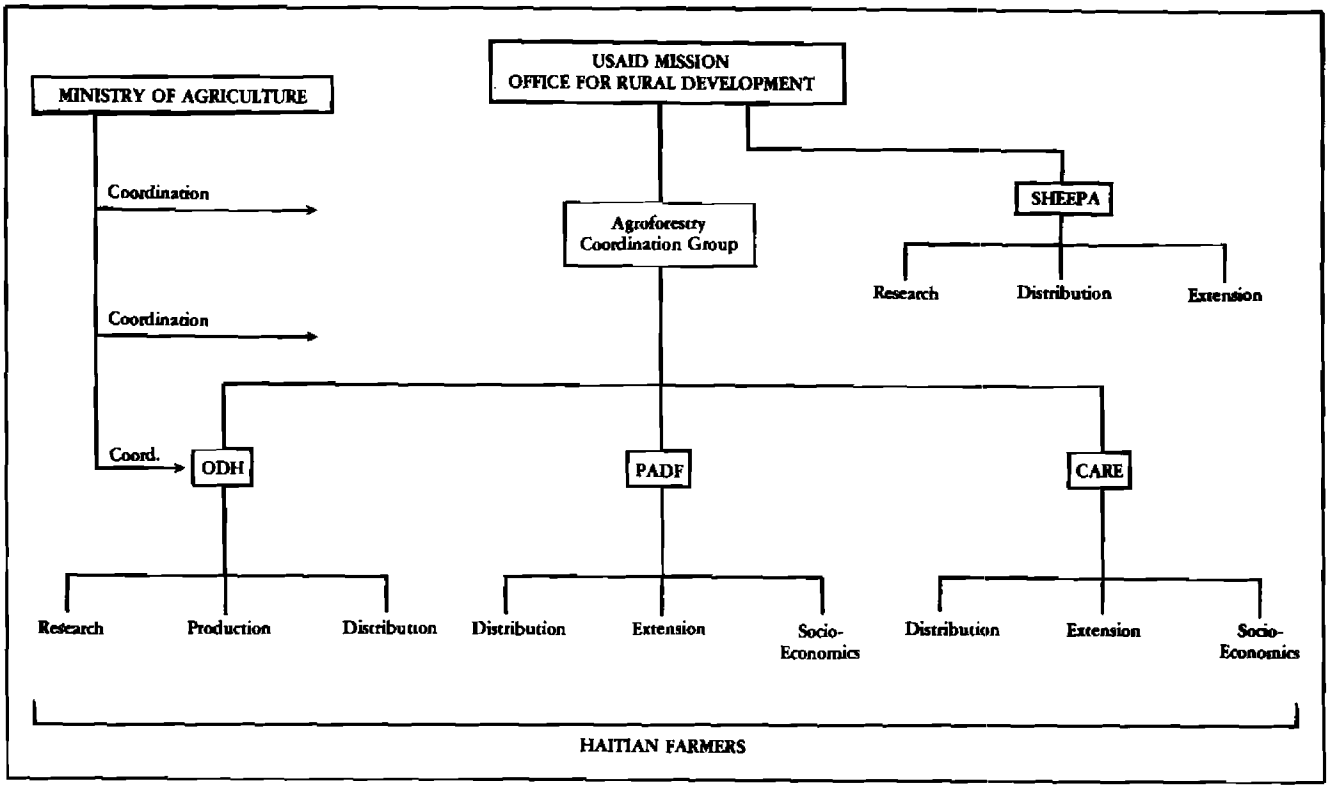

Fig. 1 illustrates the operational and inter-institutional aspects of the program. It is directed by the USAID/Haiti Office of Agriculture and Rural Development through a small group consisting of a project officer, one coordinator and one technical advisor. There are four principal NGO implementing agencies: Operation Double Harvest (ODH), which is responsible for seedling production and research; The Pan American Development Foundation (PADF) and CARE, both of which are tasked with seedling distribution, outplantings and socio-economic data gathering; and starting in 1983, the Haitian Society for Studies and Execution of Agricultural Projects (SHEEPA), was awarded a grant to multiply and distribute improved varieties of fruit tree species of economic importance to Haiti. Because of the large volume of useful data being generated by the project, a direct link is maintained between the Ministry of Agriculture and the program coordination unit. Also, due to the large number of ecological zones encountered in Haiti, a project research unit is being established to address such issues as: appropriateness of varieties for a range of edaphic and climatic conditions, comparative returns of tree cropping versus traditional annual cropping, soil related problems, economics of tree cropping for fuelwood and lumber, and farmer awareness and receptivity to the program.

Operational In 1981 USAID/Haiti began an Agroforestry program that emphasizes farmer cooperation in the planting of valuable tree species on privately owned land with clearly defined proprietary rights and interests. Using extension outreach, rural Haitians are motivated and educated in tree farming. The trees are harvested after 3-6 years for use and sale as fuelwood and polewood. Some of the species naturally reproduce via coppicing, and can thus provide several harvest rotations before replanting is necessary. Also, fruit trees which will produce food and income are propagated and planted.

have been carrying out reforestation projects have not been able to muster sufficient financial and technical resources to make a substantial impact. Working separately, the individual projects were not coordinated with each other.

Haiti's Ministry of Agriculture would seem to be a natural channel for a reforestation program, but its technical and administrative staff is already overextended. At this time the Ministry cannot efficiently absorb and administer a large scale reforestation program. A report written in 1977 that is still relevant today stated, "There is no question concerning the genuine sincerity, dedication, knowledge and honest concern regarding the country's soil conservation programs on the part of the technical staff of this unit. Yet the personnel, facilities, and operating budget provided them . . . is pitifully inadequate. An assistance program thrust upon this unit would, under present conditions, receive no response." (Ewel, 1977.)

As the sponsoring organization, USAID provides financing, technical assistance and project coordination. Implementation is carried out through NGOs. The participating NGOs are experienced in rural Haitian development. Because they are already operational in Haiti, start up cost and time is reduced. Because the NGOs have a grassroots network, USAID is not overwhelmed with the day-to-day management of details. These are handled at a more local level that is better equipped to understand and efficiently manage them. The NGOs are provided with the financial support to carry out programs on a scale that begins to address the large scale problems, with a minimum of administrative staff. USAID coordinates the NGO's activities to optimize the country-wide effect. The separate NGO operations provide models for testing. Successful models could be incorporated into broad scale forestry projects both within Haiti and elsewhere during the latter half of the decade and beyond.

The tree planting and growing efforts are based upon the economic self-interest of the farmer. Sixty percent of all Haitian farms are owner operated, though few farmers have deeds. The effect of land tenure insecurity on farmer behavior makes it important to establish tree ownership. Seedlings planted in situations of indeterminate ownership have a low survival rate due to neglect and grazing. An evaluation of erosion control programs in Haiti notes that "The principal determinant of success or failure is the degree to which the new practices are associated with visible increases in annual domestic income for the participating farmers. When such increases have become visible, the Haitian peasant has shown himself to be extraordinarily swift to alter his traditional techniques and to adopt new behaviors" (Murray, 1979).

Individual motivation to manage the trees is promoted by clearly establishing planter control of harvesting decisions and monies earned. In some cases the projects have used cost incentives where the planter is paid a small sum (US $.05) for each tree surviving six months and again at twelve months after planting. Planters have extension services made available under the project. In order to participate, a farmer must meet with an extension agent, take measures to protect seedlings from grazing livestock, and in most cases, must plant a minimum of 200 seedlings on his land. To insure a wide distribution and to keep the program from being usurped by large landowners, a maximum of 500 trees per planter is set. The cash cropping of trees is not a foreign process in the rural economy. There is already an existing market in wood and fruits. Very few farmers are purely subsistence farmers, 35% of production is marketed off the farm.

The incentive to harvest trees is an economic reality in Haiti. A primary difference between this program and past programs is that the incentive to cut trees is used to drive the process of growing trees. The small farm structure of Haitian agriculture has previously only been considered in defining the problem, rather than as a powerful resource for resolving it. In this program the attainment of objectives results from indivually motivated economic activity.

Technical Important aspects of the Agroforestry Program are in species selection and in development of efficient nursery production and delivery systems. Well adapted, fast growing, drought resistant species with suitable wood characteristics are used for tree cash cropping and erosion control. The principal species used in the project are:

Azodirachta indica, [C (Creole name), E (English name)]
Neem - Exotic
Drought, insect and animal resistant, fast grower. Good for firewood.
Leucaena leucocephala, (C, E) Leucaena - Exotic
Good fuelwood (firewood and charcoal). Nitrogen fixing species.
Cassia siamea, (C) Casse de Siam, (E) Cassia - Exotic.
Drought, insect and animal resistant. Firewood.
Casuarina equisetifolia, (C) Pin d'Australie,
(E) Australian Pine.
Eucalyptus spp., (E) Eucalyptus - Altitude adaptability.
Simaruba glauca, (C) Frene, (E) Ash - Indigenous.

Of the wide variety of fruit trees planted, the most numerous have been:

Anacardium occidentale, (C) Acajou, (E) Cashew nut.
Mangifera indica, (C, E) Mango.
Citrus sinensis, (C) Zoranj dous, (E) Sweet orange.
Persea americana, (C) Zaboca, (E) Avocado.

The Winstrip seedling propagation system, as developed by one of the NGOs, allows for growing and transporting large numbers of seedlings with a minimum of bulk. One person can easily carry 500 Winstrip seedlings to a planting site in one trip, compared to only twelve seedlings grown in the traditionally used plastic tubes.

Another important technical consideration is in providing planting schemes which allow for a farmer to raise trees in association with annual crops. On land that is no longer agriculturally productive, farmers are encouraged to plant woodlots. On flat croplands, border plantings of trees are recommended. These trees provide an increase in income and wood or fruit supply, while only slightly interfering with crop production on field margins. On slopes that are used yearly for agriculture, but which are vulnerable to soil erosion, the recommendation is to plant borders and rows of trees across the fields. Thinning these rows to leave only the best trees provides some quick returns. Enough space is left between the rows for annuals. The trees are a cash crop themselves and help to stabilize the soil while rebuilding its productivity. On very steep slopes and other lands that traditionally benefit from a fallow period, trees are intercropped with annuals. The farmer will be able to grow two or three harvests of food while the trees get established. Once the trees are shading the ground, the annuals are phased out until the first trees are harvested within a period of two to three years. Following this harvest, the restored plots are again available for annual production.

For fuelwood and polewood production, USAID has established a four-year US $8M project implemented through three NGOs: The Pan American Development Foundation (PADF), CARE, and Operation Double Harvest (ODH). In addition, two contractors at USAID provide technical assistance services and project coordination. For fruit propagation and variety trials, a US $.6M two-year grant has been awarded to SHEEPA.

The forest tree components of the program were begun in the spring of 1981 with the first production of seedlings at a central nursery constructed near the capital city of Port-au-Prince. This facility, which produces three million seedlings a year and operates eight demonstration tree farms in the surrounding area, will have absorbed about 10% of the project funds. These demonstration tree farms have been established on land leased from private owners. The NGO is responsible for cultivation and harvesting on these lands, using locally hired farmers. After expenses are recovered, half of the profits go to the landowner and half go to the NGO. The idea is to illustrate the profitability of cash cropping fast growing tree species such as Leucaena and Neem.

The central nursery is also investigating large scale production techniques, potting mixtures, species characteristics, and adaptability trials.

The largest component of the Agroforestry project is directed towards regional and local outreach programs. Beginning in January 1982, two international NGOs, PADF and CARE, have been conducting meetings in hundreds of villages. Four agroforestry teams are operating throughout Haiti. Sub-grants made to other smaller NGOs, such as religious missions and community councils, have generated over 90 sub-projects. PADF provides materials and direction for these sub-projects, the local organizations provide personnel and contacts. Twenty regional nurseries built by these sub-projects provide seedlings to Haitian peasants for planting on their own land. Participating farmers receive extension assistance in planning, planting, and caring for the seedlings through the village meetings and in one to one meetings with trained field agents. A vitally important aspect of the project is follow-up visits after one, six, and twelve month intervals. Project trained, Haitian extension agents measure survival and growth rates, growth conditions, and provide further

technical and moral support. Continuous project evaluation keeps track of the number of participants, of seedlings planted and surviving, and of training classes given.

Research plots are planted to test the performance of different tree species in a variety of ecological situations. A senior forester contracted to USAID provides technical assistance and supervision for the research activities.

In the northwest region of Haiti, where the need for reforestation is the greatest, two additional agroforestry teams and seven regional nurseries are operating. CARE and HACHO, a Haitian NGO, are working together in this area. CARE and HACHO have an established relationship from other cooperative ventures. HACHO is also the counterpart for a German reforestation program. The USAID-CARE-HACHO relationship is an example of an effective model for future projects. This arrangement provides an established operational structure in the region, coordination with other reforestation activities, and the presence of a Haitian organization which can continue to implement reforestation efforts in the future.

A two-year fruit tree project in the Central Plateau began operations in April 1983. It consists of the selection of fruit tree cultivars, multiplication of the cultivars, training of project staff and farmers, and the distribution of these cultivars to farmers. Three production/research nurseries have been constructed and are producing the seedlings. The farmers pay US $.05 per seedling to help defray nursery costs, and more importantly, as a way to involve planter commitment. Like the wood tree projects, planters own the trees and have complete control of them. The growers meet with extension agents before, during, and after plantings. The fruit tree project is also working on a growers organization, fruit marketing, and training of any groups or individuals interested in horticulture in Haiti.

RESULTS TO DATE

The large nursery near Port-au-Prince has planted one million seedlings on eight demonstration tree farms. These will be harvested when they achieve 10 cm diameter at breast height. There had already been some harvesting of the first batch of trees planted when the project commenced in the spring of 1981. These and other trees harvested from thinning operations are already being sold as construction timbers and for charcoal production. Advances have been made in mass production techniques, including the efficient Winstrip seedling propagation system.

Rural outreach programs have reached over 23,000 peasant farmers who have planted more than eleven million seedlings on their private lands. Over 90 sub-project operations are in place and expanding the institutional infrastructure for agroforestry outreach. Three soil erosion control projects have been started in cooperation with the Haitian Ministry of Agriculture. The number of farmers participating in the fruit tree aspects of the program is approaching 2,000. The original end of project goal of 390,000 improved fruit tree seedlings has been increased to 640,000.

Overall seedling survival rates average about 50%, which is somewhat lower than the proposed goal of 70% survival, but which experience has shown to be an acceptable rate given the diverse conditions of Haiti. Lack of adequate rainfall has been a particular problem.

Research plantings of forest and fruit trees are being monitored for data on species adaptability and productivity.

CONCLUSIONS

The USAID Agroforestry program can only truly be evaluated in the long term when the effects of tree cover can be measured. But, there are short term gains. Over 25,000 Haitian peasant farmers will have planted over 16.5 million tree seedlings by the end of the project, and this number only counts those who have participated directly. As the benefits of tree planting become demonstrated, the process of reforestation will acquire an impetus of its own, spreading from farmer to farmer without outside intervention. Over thirty nurseries are in operation and will continue to supply seedlings. Institutional framework has been developed which can carry on reforestation programs, either by implementing external assistance grants or by becoming self-sufficient. Models for the most effective development strategies are being tested in actual operations, and will provide invaluable experience to subsequent reforestation projects.

Research plots are already generating much needed data on species adaptability and productivity which will be useful in both present and future reforestation management programs.

In the next several years, the wood and fruit trees planted will produce harvests of food, fuel and lumber, providing both material and economic support for Haitian peasants. It is hoped that the training and experiences of hundreds of Haitians in extension, nursery production and agroforestry outreach will bear fruit of a similar nature.

The USAID Agroforestry Program is a comprehensive approach to developing private sector forestry in Haiti. It is coordinated with and complemented by the World Bank Haiti Forestry Project which is developing public sector forestry programs.

The greatest contribution that the USAID Agroforestry Program can make is to demonstrate that Haiti's environmental problems are not irreversible and that solutions are possible.

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