

**AGRICULTURE IN A FRAGILE ENVIRONMENT:  
MARKET INCENTIVES FOR NATURAL RESOURCE MANAGEMENT  
IN HAITI**

[This is the text of the final report with digital photographs removed to accommodate electronic transmission. The title page includes a photograph in the full report, along with six other pages in the body of the report. The present version of the report with images retains captions for those images that have been removed.]

by

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## EXECUTIVE SUMMARY

**Purpose.** This report reviews the Hillside Agriculture Program (HAP) and other natural resource management (NRM) activities in Haiti and proposes guiding elements of project design for a new agricultural and environmental activity. The primary objective of this new activity is to stabilize cropped hillsides in key critical areas via reforestation and soil and water conservation, especially on vulnerable sites that pose significant danger to human health and safety.

**Findings from the field.** A team of natural resource specialists visited numerous field sites and hillside farms in the Southeast, Artibonite, and the North, and drew the following conclusions from field observation and discussion.

*Virtually all slopes observed were in agricultural use, even in remote areas. The team encountered no empty lands, no agricultural frontier.*

*In site visits the team observed numerous farmers increasing their investment in tree crops as a response to new markets.*

*The team spoke with numerous poor farmers investing scarce resources in conservation structures.*

*These farmers had access to markets, long-term land use rights, technical assistance, extra-familial labor resources, and usually some financial capital.*

*The team encountered NRM-oriented producer groups operating like businesses.*

*The team found that charcoal was not necessarily the enemy of hillside stabilization.*

### Major Conclusions

**Context.** At the macro level, Haiti's acute environmental crisis is very much a direct consequence of the pervasive character of rural poverty. The harsh reality is that Haiti's slopes have far surpassed their carrying capacity for the growing population of small peasant farmers whose livelihood depends on the land.

At the macro level, the most significant possible action to alleviate Haiti's environmental crisis would be to create viable lowland alternatives to farming slopes. At the micro level on slopes, the most significant action would be to shift away from annual food crops to tree crops and other perennials. Opportunities for doing so include the following.

1. **Overall:** New economic and natural resource management opportunities are available to farmers and programmers today because of more favorable markets, more technical options, stronger producer organizations, and a more open stance at current Ministries of Agriculture and Environment.

2. **Markets.** Both exterior and interior markets are more accessible to peasant farmers due to business oriented producer groups, greater quality control, and better links to quality niche markets.

3. **Market-driven NRM.** Substantial progress has been achieved in the development of NRM technologies adapted to the Haitian landscape. Producers have established these technologies on a broad range of sites, usually in response to extension services; however, farmers have also demonstrated a willingness to maintain and extend NRM technologies at their own expense when such investments have a near term impact on productivity. *In short, environmental conditions on Haiti's slopes reflect market forces.*

4. **Business oriented producer groups.** Stronger producer groups have added significant value to their production by taking over critical parts of the value chain, allowing small farmers unprecedented access to new commodity and capital markets.

5. **Local NRM governance.** The team found evidence of successful links between revenue generation, investment in NRM, and local governance.

#### 6. **Challenges:**

- (a) Despite the emergence of a number of strong producer organizations with impressive business skills, many farmers and groups expect subsidy for NRM and exhibit a "project mentality." This makes it complicated for NRM programs to find appropriate motivational mechanisms.
- (b) The team observed numerous cases of people treating parcels at their own expense; however, *scaling up hillside stabilization to cover larger contiguous catchment areas tends to be elusive, though not impossible.*

### **New Opportunities**

Nevertheless, incentives for hillside farmers to invest in reforestation and other measures to mitigate erosion are fundamentally different today than a decade ago.

1. **Stronger markets for tree crops.** HAP successfully promoted export markets for mangos, coffee, and cacao, and tested markets for non-traditional exports including organics. New market incentives led producers to increase their investment in tree crops, thereby contributing to greater hillside stability. Such tree crops bode well for strategies that seek to cover critical zones of the landscape.

2. **Associated crops.** Niche markets such as Haitian Bleu coffee presently favor Haitian producers but are subject to change over time. The team recommends that producer groups and programmers view niche commodities as a way to "buy time" and *diversify into other crops and even other economic activities.* Crops readily associated with coffee and cacao should be a high priority for crop diversification, including other perennials and high-value food crops. Also, mango production, for example, coincides with agro-ecological zones that produce avocados.

3. **Availability of a wide range of productive soil and water conservation measures and accompanying expertise.** The AOP, AFII, PLUS and other projects pioneered and extended a wide array of NRM technologies in a broad range of Haitian landscapes, including sustainable production of fast growing hardwoods as a tree crop, especially in drier zones; gully plugs that create fertile production sites for high-value food crops; and fodder-producing hedgerows and highly productive crop bands (*bann manje*) on slopes. *In short, well adapted technical solutions are available in-country, and there is an ample supply of in-country expertise capable of improving and extending such technologies.*

**3. Smallholding farmers and producer groups play greater roles in marketing and watershed management.** (i) HAP assistance has resulted in better prices and increased small farmer involvement in premium markets. (ii) Farmer incentives to invest in tree crop systems were compounded as stronger producer groups helped farmers get a higher proportion of the final price for their produce. (iii) Hillside farmers in some areas have organized around NRM treatment of microcatchments. *There is now an unprecedented opportunity to build on these initiatives and scale up market-driven NRM to landscape levels.*

### **Towards a Program Theory**

In reviewing project experience and the decision making framework for small peasant farmers in Haiti, the team took note of a series of constraints and opportunities for NRM adoption. This suggests a development hypothesis for future programming:

- Access to markets for better managed production on small farms
- Democratically-based producer groups that run on business principles
- Knowledge of the market chain to target interventions or business negotiations at the most effective price
- Producer authority and responsibility for managing local resources including forest resources
- Access to labor
- Adequate social capital resources to facilitate cooperation around shared interests that cross garden boundaries and catchment systems
- Access to adequate mechanisms for managing agricultural risk
- Access to information that capitalizes knowledge and experience.
- Timely access to competent technical assistance
- Access to capital
- Access to equipment, inputs, improved varieties of crops or livestock, and productive technologies
- A sufficient margin or alternative income to defray near term opportunity costs for NRM investments or higher profit agricultural systems

### **Lessons learned from NRM experiences in Haiti, 1950-2005**

**NRM economics.** Soil conservation and protection of the environment are *not* the primary objectives of mountain peasants who invest in NRM on Haiti's slopes; however, farmers adopt such practices when they generate concrete economic benefits.

*Therefore, the basic challenge for NRM extension is economic viability – not awareness training.*

**A major constraint: scaling up from scattered plots.** Projects and farmers have succeeded in establishing and maintaining trees and conservation works on scattered plots; however, it has proved difficult to treat all contiguous plots within a watershed due primarily to the fragmented character of peasant landholdings.

**Landscape level shifts.** When the right combination of factors comes together, Haitian peasant farmers in some areas have invested scarce resources in costly conservation works and perennials, enabling production of high value crops at the landscape level.

## Hillside Agriculture Program (HAP)

**Market strategy.** HAP promotion of increased producer benefits via access to more favorable markets has been a notable success. The reasons for increased producer benefits include the following:

- (a) higher prices for premium products,
- (b) improvements in the quality of produce delivered to market, and
- (c) stronger producer groups able to negotiate more favorable prices.

**Terms of trade.** Entry into the market of HAP-assisted producer groups has had a dramatic impact on the overall farmgate price for selected commodities. Through changes in the terms of trade, the number of benefiting producers extends far beyond project support for particular producer groups. For example, average farmgate prices for mangos increased overall by 17 percent.

**Trends and counter trends.** The trend for the past 30 years has been to replace coffee and cacao groves with higher-value, erosion intensive food crops. Exodus from traditional perennial crops, especially coffee, has had a negative environmental impact since these crops are shade grown under a tree canopy that protects the soil against erosion.

**Impact of Haitian Bleu.** The niche market for Haitian Bleu runs counter to the historic tendency toward decline. The favorable price incentive for Haitian Bleu has had a positive impact on production and hillside stabilization. Conversion of coffee groves to annual crops has decreased or ceased in some areas visited; however, planter expansion of coffee has not been as robust as for mangos or cacao. Haitian production is also meeting a relatively small proportion of current and potential market demand, so there is ample room to expand production.

**Cacao.** HAP initiatives have been successful in restructuring the cacao market. From the producer perspective, cacao is once again an attractive investment. Field interviews show recent evidence of increased cacao planting and grafting. Since cacao is typically grown as a shade crop, producers have also planted and maintained other trees. Haiti is meeting only 20 percent of current demand for Grade A cacao, so again there's room for growth.

**Mangos.** HAP assistance produced results critical to the vested interests of producers, including significant improvement in the quality of fruit purchased from producer associations and an increase in the price paid to the producers. Through grafting, producers also transformed low value mango trees into high value centers of profit.

**Price incentives to invest in mangos.** These results translated into new producer investments in old and new mango plantations. This response points to a reversal of incentive structures over the past five years, when people on some sites, according to field interviews, were converting from tree crops to annuals. These results also underline the critical importance of market incentives for land-use decisions. Increased interest in the mango export market has also affected growers in other areas outside of HAP assisted production zones.

**Non-traditional export crops.** HAP also tested new markets for non-traditional export crops. Innovations in the cultivation of *ignames* and taro were very successful. These innovations were readily adopted and spread spontaneously to other farmers. Lessons learned include the following: (i) Farmers readily respond to market forces and are open to change; (ii) the export market chain for non-traditional crops has great potential but is not yet fully established; (iii) farmers and market-oriented projects must take fully into account the underutilized potential of the internal market and should not focus primarily on the external market for such products.

**HAP intermediary role and capital markets.** Producer access to capital has been an important factor in the growth and financial success of producer associations; however, the HAP *intermediary, facilitating role* has been a critical element of this process – benefiting Fonkoze as well as producer groups. HAP has access to market information and ties at all levels of the value chain for specific commodities. One promising development is closer producer group business partnerships with exporters. Another is producer access to credit. Fonkoze loans established an unprecedented link between microfinance services and producer associations for the export of coffee, cacao, and mangos.

#### **Land tenure and willingness to invest.**

- *Land tenure is an issue but not a barrier to extending NRM technologies on Haiti's hillsides and watersheds.*
- Land users on Haitian hillsides make investment decisions based on length of access to a plot regardless of its formal tenure status. Length of access is based primarily on customary arrangements and a farmer's personal social capital.
- Haiti's watersheds and the agricultural landscape in general are highly fragmented. *Land fragmentation is a greater barrier to NRM than formally insecure tenure.*
- To overcome this constraint, the primary challenge is to harness farmer incentives to cooperate across garden boundary lines by building collective social capital, motivated by the prospect of increased revenues or decreased risk.
- In some areas, farmers have shown a willingness to collaborate around NRM adoption at the watershed level.

**Charcoal as a renewable resource.** Charcoal markets are not necessarily the “enemy” to transforming Haiti's hillsides. Fuelwood species and sustained-yield charcoal production have demonstrated their potential as an economically viable NRM strategy, especially in semi-arid agricultural zones, or during extended periods of drought in both dry and humid sites, and on sites slated to go into long-cycle fallow.

**Prospective market opportunities.** The team identified a number of market-driven opportunities that the Mission should consider in its new program.

- *Wood and Charcoal.* Given the strong market for timber, poles and charcoal in Haiti, there is a strong potential for more hillsides to be covered by wood gardens, especially in drier agro-climatic zones.
- *Dairy:* Dairy products are among the most important of Haiti's imports. Haiti producers could mobilize in response to this demand and contribute to hillside stabilization using grass and fodder species.
- *Local value added.* Major new investment in food processing holds the promise

- of significant increase in value added to fruit and vegetable crops, including fruits that do not meet criteria export as fresh produce.
- *Exporters.* Greater attention should be given to working with exporters, including access to loan capital and technical assistance for branding Haitian products and exploring new markets.
  - *Non-traditional export crops.* HAP made promising explorations and market tests in this sector, and future programming should build upon these experiences. Priority should be given to crops that lend themselves to hillside production – *in association with tree crops that already have well developed market chains.*
  - *Multiple markets.* Marketing initiatives should not be limited to export markets. Small farmers can best manage risk by producing for a range of markets, especially the internal market system.
  - *Local markets.* The most impressive, self-sustaining NRM investments by small farmers have been motivated by cash crops sold on the internal market (hillside terraces for vegetables, gully plugs for plantains, terracing with sugar cane and pineapples, etc.). There should be further exploration of crop varieties with early and late harvest cycles or slack season harvests that maximize the market price advantage, building on HAPs work with off-season harvest of yams.
  - *Co-management.* Co-management of forests has been effective in countries around the world as a means to (a) increase local revenues, (b) improve forest management, and (c) empower local populations. This should be considered for critical protected areas such as Parc La Visite.
  - *Organic Products.* This appears to be a promising field. There should be more detailed assessment of the range of potential organic markets appropriate for Haitian conditions of production and certification requirements, including other products besides mangos.

### **General Recommendations for Follow-on Programming**

*Link market-driven strategies more closely to watershed management.*

*Build on the expanding markets for hillside producers, including drier production zones.*

*Broaden and intensify development of democratic, business-based producer groups.*

*Broaden and intensify direct partnerships between producer groups and the private sector, including lending institutions, exporters, and value-added processors.*

*Intensify and broaden support to producers and communities willing to invest in natural resource management that (a) increases revenue and (b) stabilizes hillsides.*

*In general, scale up market-driven strategies for NRM protection of contiguous gardens in microcatchment basins and watersheds, including selected forestry activities and expanded production of perennial crops.*

*Selectively support forest and park service initiatives that devolve authority and responsibility to local producer groups for co-management in protected areas.*

*Use project implementation mechanisms that favor longer term continuity of programming and are able to leverage in-country knowledge and experience.*

## Proposed Strategic Objective

***“Increase incomes and reduce vulnerability to natural disasters through market incentives and landscape-level natural resource management.”***

**Priority watersheds.** Twenty-five of Haiti’s 30 major watersheds are almost devoid of cover. MARNDR has selected 13 watersheds as priority. Site selection should include both dry and humid watersheds.

**Drylands.** In seeking more robust markets, HAP logically focused on more humid zones with fewer production challenges. This proposed SO would continue to work in humid areas but also extend the area of support to drier areas including portions of current HAP zones of operation as well as new zones both dry and humid.

## A National Strategy Assessment

In the 2005 Appropriations Bill, the US Congress directed that USAID develop a plan for reforesting vulnerable areas of Haiti. The present study is thus the first stage of inquiry with a view to devising a broad-based hillside stabilization and reforestation strategy for the USAID Mission. A second independent team will build on the present assessment by conducting a broader review of the Haitian environment, including consultation with the Government of Haiti and other stakeholders.

The highest order priority for a prospective national-level strategy will be to identify Haiti’s most vulnerable landscapes. A closely related exercise will be to categorize vulnerable landscapes in ways that will help the USAID Mission develop options for addressing the vulnerability of these landscapes, taking into account the sustainable livelihood interests of the people who live there.

Therefore, a new Strategy Team will set the stage for a national scale strategy by (a) identifying and ranking the level of threat from Haiti’s various landscapes, and (b) identifying the most effective NRM and agricultural options for reducing these threats.

Salient questions deserving of further investigation include the following:

- What is the range of organic markets appropriate for Haitian products and their sustainable production on small Haitian farms?
- What are the limits of market-driven tree crop expansion (biophysical, markets)?
- For sites that may not lend themselves to market-driven NRM strategies, suggest other practical options for their protection or sustainable use.
- Assess farm-level opportunity costs as a barrier to NRM investments.
- What is the prospect for building sustainable social capital around local microcatchment basins?
- How can forest co-management activities be implemented so as to strengthen local investment in natural resources?
- What policy and institutional reforms are needed to create a more enabling environment for rehabilitation of denuded landscapes?
- What is the potential for GOH to be a stronger partner in scaling up watershed management initiatives? If there is potential, how could it be better exploited?

- Does investment in disaster early warning systems and disaster preparedness yield tangible environmental benefits?
- Information on the charcoal value chain should be updated and assessed.
- How could resources and vested interests of the diaspora (e.g., absentee landholdings) be effectively mobilized in support of enhanced NRM?
- For vulnerability assessment , it would be useful to develop more detailed information on large blocks of state land, especially unassigned commons.

*Ravine gardens: Substantial rock walls and plantains in a steeply pitched ravine*

## PREFACE

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## ACRONYMS

AFII	Agroforestry II
AID	Agency for International Development
AOP	Agroforestry Outreach Project
ASSET	Agriculturally Sustainable Systems and Environmental Transformation
CASEC	Conseil Administratif de la Section Communale
CBO	Comunity based organization
CCI	Cadre de Coopération Intérimaire
CIDA	Canadian International Development Agency
CRS	Catholic Relief Services
CS	Cooperating Sponsor
DAI	Development Alternatives, Inc.
DAP	Development Assistance Program
DGI	Direction Générale des Impôts
EDH	Electricité d'Haïti
FACN	Fédération des Associations de Cooperatives de Café
FAO	Food and Agriculture Organization
FFW	Food for Work
FPPTP	Forest and Parks Protection Technical Assistance Project
GEF	Global Environmental Facility
GOH	Government of Haiti
HAP	Hillside Agriculture Program
IDB	Inter-American Development Bank
INARA	Institut National de la Réforme Agraire
LAMP	Land Use Management Plan
LORD II	Local Resources for Development II
LUIS	Land Use Incentive System
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles, et du Développement Rural
MPP	Mouvman Peyizan Papay
NGO	Non-governmental organization
NRM	natural resource management
ONFAP	Office National de Forêts et des Aires Protégés
PADF	Pan American Development Foundation
PAE	Plan d'Action pour l'Environnement
PLUS	Productive Land Use Systems
SO	Strategic objective
SOFIHDES	Société Financière Haitienne de Développement, S.A.
SWC	Soil and water conservation
TA	Technical Assistance
TWMP	Targeted Watershed Management Project
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USD	United States dollar
USDA	United States Department of Agriculture
USG	United States Government

## TABLE OF CONTENTS

I. Introduction.....	1
Section A. NRM Results and Lessons Learned	
II. Reforestation and Soil Conservation in Haiti, 1950-2005.....	3
Engineering Works.....	3
FFW, Rock Walls, and Scattered Plots.....	3
Trees, Biological Structures, and Scattered Plots.....	4
Collective Action, Scaling Up, Watersheds.....	5
Market Strategies and Collective Action .....	7
Lessons Learned from the NRM Experience .....	7
III. Hillside Agriculture Program, 2001-2005.....	10
Summary of Hap Indicators and Results .....	10
Major Markets .....	11
Institutional Capacity Building and Viability under HAP .....	22
NRM Initiatives.....	24
Research under HAP .....	25
IV. Critical Themes in Natural Resource Management .....	26
Rights and Access to Land .....	26
Government Policy and Watershed Stabilization.....	31
Alternate Energy Sources and Wood Gardens.....	32
Biodiversity Conservation .....	35
Other NRM Donors .....	36
Section B. Conclusions and Recommendations	
V. A Program Planning Framework .....	38
New Opportunities .....	38
Guidance for Developing the Strategic Objective .....	40
VI. Thematic Recommendations .....	44
NRM-Based Market Opportunities.....	44
Land Rights and Watersheds.....	48
Capital, Credit, and NRM Investments.....	49
NRM Governance .....	50
Institutional Capacity Building .....	52
Research.....	53
Wood Gardens.....	55
Biodiversity Conservation and Protected Areas.....	55
VII. A Mission Strategy for National Watershed Management .....	57
Bibliography .....	61
Annex A. A Strategic Objective for Watershed Stabilization .....	65
Overall Recommendations.....	65
Illustrative Results Framework.....	66
Illustrative RFP language: Instructions to Offerors .....	68
Illustrative Technical Approach to Watershed Management.....	70
Annex B. Strategic Choices by Agro-Ecological Zone .....	76
Annex C. Holdridge Life Zone Classification.....	78



## ***I. INTRODUCTION***

**Purpose.** The present report reviews the Hillside Agricultural Program (HAP) and other natural resource management (NRM) activities in Haiti and proposes guiding elements of project design for a new agricultural and environmental activity. The primary focus of this review was to identify successful program interventions and lessons learned from NRM initiatives in Haiti. In light of these findings, the review serves as a point of reference to propose NRM activities for implementation following the Hillside Agricultural Program, presently scheduled to end in March 2006.

**Congressional mandate.** During the past year destructive storms inflicted severe flood damage in Haiti. In the wake of these natural disasters, the U.S. Congress enacted legislation requiring AID to submit a report “setting forth a plan for the reforestation of areas in Haiti that are vulnerable to erosion which pose significant danger to human health and safety.”<sup>1</sup>

Thus, the present review also serves as the first stage in a longer term process of stakeholder consultation and field inquiry to devise a broad-based hillside stabilization and reforestation strategy for the USAID/Haiti Mission, as mandated by Congress. Accordingly, a second independent team will carry out a wide-ranging assessment of the Haitian environment, including extensive consultation with the Government of Haiti, other donors, non-governmental organizations, grassroots associations, and private citizens.

**Context.** At the macro level, Haiti’s acute environmental crisis is very much a direct consequence of the pervasive character of rural poverty. According to the norms for agricultural production, close to two-thirds of Haiti’s land mass is too steep for sustainable production of annual crops; however, the reality is that two-thirds of all cultivated land in Haiti is on mountain slopes, and the bulk of this production is vested in erosion-intensive annual food crops. Despite high out-migration from rural areas, Haiti’s rural population continues to grow. The harsh reality is that Haiti’s slopes have far surpassed their carrying capacity for the growing population of small peasant farmers whose livelihood depends on the land.

At the macro level, the most significant possible action to alleviate Haiti’s environmental crisis would be to create viable lowland alternatives to farming the slopes. At the micro level of hillside cultivation, the most significant possible action would be to shift out of annual food crops in favor of tree crops and other perennials.

**Objective.** In this perspective, a primary objective of future program interventions would be to stabilize cropped hillsides in key critical areas via reforestation and soil and water conservation, especially on vulnerable sites that pose significant danger to human health and safety. Program methods should promote conditions that favor hillside producer investments in technologies geared to improve livelihood while decreasing degradation.

**Assessment team.** For the present report, the assessment team reviewed documents and used rapid rural assessment techniques during visits to the field. The team

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<sup>1</sup> Bill Sec. 549(e). Destructive storms included Tropical Storm Jeanne in the Trois Rivières and Gonaïves watersheds (September 2004), and the torrential spring rains that damaged critical watersheds of the Massif de la Selle, including Mapou and Fonds Verrette (May 2004).

interviewed peasant farmers, small traders, representatives of producer cooperatives, agribusiness people (mango exports, essential oils), government officials (Ministries of Agriculture and Environment), NGOs, USAID Mission and other USG personnel, HAP office and field staff, non-AID funded project personnel, and other donors (IDB, FAO, World Bank). This team was composed of both USAID and non-USAID experts including an NRM specialist, forester, agronomist, cultural anthropologist, and energy specialist. A senior Haitian agronomist from the Haiti Mission also participated actively in field site visits and interviews.

**Stocktaking.** In its quest for lessons learned, the team used a “stocktaking” approach to identify the results of past investment in NRM and marketing. The team worked backward to identify what constraints were overcome and what actions were taken to overcome these constraints. When shortcomings were found, the team sought to understand the reasons for blockages.

**Field visits.** Field site visits included terraced vegetable growing areas of Fermathe and Furcy, pine forests of Parc La Visite near Seguin; coffee, taro, and bamboo production zones of Macary, Fond Jean-Noel, Cap-Rouge, and Jacmel (Southeast); mango producers in Leogane, Gros-Morne, Ennery, and Cap-Haitien; coffee producers in Marmelade and Plaisance; and cacao producers and tree planters in Grande-Rivière du Nord and Port-Margot (North)

*Landscape level change: Vegetable cropping on terraces in Ft. Jacques*

## SECTION A. NRM RESULTS AND LESSONS LEARNED

This section discusses some of the important results from over 50 years of NRM investment in Haiti, HAP efforts to improve markets for selected commodities, and links between NRM investments and markets.

### ***II. REFORESTATION AND SOIL CONSERVATION IN HAITI, 1950-2005***

Since 1950 there have been a series of different approaches to conservation over time. These include the following trends:<sup>2</sup>

#### **Engineering Works**

Between 1950 and 1970, a number of bilateral projects with the Haitian government used an engineering strategy of “*équipement du territoire*” imposed by fiat on private and public lands. This top-down approach targeted geographic zones and constructed conservation structures without regard to land tenure or other interests of local landholders or land users. In this approach, conservation was strictly a technical problem solved by mechanical structures, primarily dry wall bench terraces and contour canals. This was a public works activity based on paid labor. This approach proved unsustainable with little or no subsequent maintenance of structures.

#### **FFW, Rock Walls, and Scattered Plots**

**Local public works.** During the 1960s and 1970s, some conservation-oriented NGOs worked with government promoted “community action councils” in rural areas, using food-for-work as a mode of payment to construct dry wall terraces and contour canals. This was a variant on public works strategies to construct mechanical structures, but primarily on private lands belonging to smallholders. This approach was somewhat more participatory than the engineering approach.

**FFW as daily wage.** There was a distinct difference in perception between donors and smallholder beneficiaries in most food-for-work programs from this era. For the NGO or donor agency, the food was intended as encouragement for voluntary labor. In contrast, for the peasant worker the payment in kind was perceived as a daily wage worth more than the prevailing wage for agricultural day labor. In the end, it was more often than not the salary that interested the worker rather than the conservation structure *per se*. The farmer sometimes viewed such structures as interfering with normal cropping patterns and tended to make available the least productive or even abandoned parcels for dry wall terracing.

**A Case of landscape change.** An important exception to the pattern described above was the linkage of dry wall terraces with high value vegetable cropping, particularly in the area of Ft. Jacques and Fermathe. In this case, the conservation structure became an essential feature of production for high value cash crops readily marketed in the nearby Port-au-Prince metropolitan area.

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<sup>2</sup> See White and Jickling (1992) and Smucker (2002).

Farmers eventually maintained these structures and extended them independent of external subsidy. Over time, farmers in the area created slope-wide and landscape-wide transformation as planters shifted out of corn and bean production into vegetable cash crops on terraces. This pattern persists to this day and has expanded into neighboring areas, including sharply pitched slopes above Kenscoff and Furcy where few rocks are available for building terraces. In the absence of rocks, vegetables are cropped on narrow earthen terraces or ridges rebuilt across the slope with each new planting season.

## **Trees, Biological Structures, and Scattered Plots**

**NGO channels.** In the 1980s, donors relied more and more heavily on NGOs as channels for conservation and agricultural extension services. In the 1990s, even the Ministries of Agriculture and the Environment established contracts with conservation oriented NGOs. This period saw the emergence of substantial farm forestry programs, agroforestry, and a broad range of interventions going beyond the use of mechanical structures for conservation. These programs targeted scattered farm plots for conservation treatment, and explicitly took into account farmer interests and concerns. This era saw a shift in emphasis from soil conservation to revenue generation.

**Agroforestry outreach.** This included the USAID-funded Agroforestry Outreach Program (AOP) implemented by PADF and CARE. The extensive scale and ten-year duration of PADF and CARE farm forestry in the 1980s were virtually without precedent in Haiti, particularly for investments in reforestation. As a major consequence, thousands of farmers adopted tree cropping as a new component of production on small farms. Farmers planted trees on their own land at their own expense. Farmers were motivated to do so because changes in policy gave farmers full harvest rights over the trees they planted.

**Harvest strategy.** The farmers tended to hold mature trees as a store of value, and harvested trees when they needed cash. They preferred to hold out for high value wood products particularly plankwood and polewood. They made charcoal out of waste wood not suitable for higher value products. Some farmers managed trees as charcoal gardens.<sup>3</sup>

**Planting strategy.** Farmers chose to plant AOP trees on more productive sites, intercropping traditional food crops with widely spaced trees, and integrating trees into garden boundaries and living fence. In some cases, particularly on drier sites, farmers continued to grow traditional food crops until more closely spaced trees shaded over, taking annual crops out of production and transforming such plots into perennial gardens or woodlots. The present assessment team saw evidence of all of these choices during field treks.

Farmers were not inclined to plant trees on more distant sites further away from home. On such sites, farmers deemed trees to be unduly vulnerable to nocturnal thieves,

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<sup>3</sup> For a post-project farmer decision making study undertaken 13 years after AOP trees were first planted, including detailed harvest information and selection of tree planting sites, see Smucker and Timyan, "Impact of Tree Planting in Haiti, 1982-1995."

demanding relatives, and browsing by livestock. Farmers also tended not to plant trees on their more degraded hillsides.

**Farmer rationality.** These farmer decisions were economically rational since the farmers were planting trees as a crop. Therefore, their vested *economic* interests lay in planting on more productive sites even though greater *environmental* benefits might have accrued from densely spaced plantings on degraded slopes.

**Vegetative structures on scattered farm plots under PLUS.** In the 1990s, the PLUS project (Productive Land Use Systems) picked up and expanded innovations in PADF outreach initiated in the late 1980s (AOP) and further developed under Agroforestry II (AFII). AFII supplemented AOP tree extension with on-farm tree production – promoting backyard nurseries rather than large regional nurseries. AFII also produced more fruit species, stabilized ravines (gully plugs), enhanced soil conservation and fertility on hillsides (living hedgerows, “trash” barriers, green manures), and invented the *bann manje* (food or crop band), a living hedgerow that produced food crops within the conservation structure itself. In many cases, the “food band” turned out to be far more productive than the alleys between these conservation structures on steep slopes.

## **Collective Action, Scaling Up, Watersheds**

**Small groups.** Participatory approaches based on collective action emerged in the 1980s and 1990s. Such approaches used small planter groups as a channel for conservation training and as voluntary labor for conservation structures, including treatment of ravines, adjoining plots, and micro-catchments as well as scattered parcels. This approach also made more of an effort to build on traditional practices, for example, harnessing rotating exchange labor (similar to *eskwad*) to cover the considerable labor cost of building and maintaining conservation structures.

Examples of various types of participatory approaches in the 1980s included small group movements in Maissade, Gros-Morne, Chambellan, and Papaye; and grassroots organizations and NGOs in the Targeted Watershed Management Project (TWMP). In the 1990s, PLUS used extension groups to treat whole ravines and zones of concentration; ASSET used planter groups for labor mobilization and a channel for community-based land use planning.

**Using farm groups to scale up.** Intervention at the level of adjoining parcels and microcatchments was a noteworthy innovation in the 1980s and 1990s. Participatory approaches and organized groups of planters facilitated conservation treatments that went beyond the level of scattered parcels.

For example, the LORD II project in Maissade used labor exchange groups to treat whole microcatchment basins. Introduction of living barriers followed by disease-resistant cane in the latter stages of the project resulted in landscape level changes. Farmers transformed degraded pasture and sorghum gardens into high-value sugar cane fields on slopes and in shallow ravines. This in turn precipitated farmer investments in value-added cane processing (syrup, raw sugar, raw rum) during the post-project period.<sup>4</sup>

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<sup>4</sup> See White and Runge (1994, 1995) and Smucker (2003, 15-19), “Do Small Farmers in Haiti Invest in Natural Resource Management without External Subsidy?”

**Watersheds.** The Targeted Watershed Management Project (TWMP) of the 1980s and early 1990s had two components, Pwoje Sove Tè and the Macaya Biosphere Reserve. Pwoje Sove Tè channeled support through four major NGOs that worked with peasant farmers in the region. TWM worked in critical upper watersheds and sought to increase revenues to small farmers while protecting habitat and biodiversity in Pic Macaya National Park, Haiti's last remnant of rainforest. TWM promoted conservation-based alternatives to erosion-intensive bean production on slopes. The project relied heavily on conservation-oriented public works employment as a strategy for displacing agrarian pressures on the park.

**Parks and buffer zones in upland watersheds.** In 1996 the World Bank funded the Forest and Parks Protection Technical Assistance Project (FPPTP) implemented by GOH Ministries of Environment and Agriculture. This project built on TWMP watershed activities in the Macaya Biosphere Reserve and established similar programs in two other national protected areas, Parc La Visite and the Pine Forest Reserve, both located along the La Selle ridge in the headwaters of critical watersheds. The FPPTA worked closely with forest service and parks services of the agricultural ministry. The project also worked in buffer zones and introduced local co-management, including protected area councils representing civil society, local jurisdictions, and local elected officials.

**Local level land use planning.** In the late 1990s, ASSET worked in the upper watersheds of the Rivière Blanche and Rivière Grise. The project promoted water collection, intensive vegetable cropping adjacent to the residential compounds, and multi-parcel zones of concentration for soil conservation. In its latter phases, the project promoted local NRM governance through embryonic community-based land use management plans (LAMPs) and the use of *gwoupman* (small labor rotation groups) for conservation works. NRM groups organized around common property issues such as fire suppression, free range grazing, deforestation of fragile areas, water scarcity, and abandoned lands.

**The challenge of scaling up.** All of these programs built on grassroots peasant organizations and sought to go beyond scattered parcel approaches to conservation, albeit with varying degrees of success. Some progress was made in scaling up from scattered plots to entire ravines and microcatchments, but project initiatives suffered from discontinuity of effort. *Effective, self-sustaining NRM treatment of whole watersheds continued to be elusive – except where they supported high value cash crops.*

**NRM groups.** Participatory NRM strategies are now well established in Haiti. The assessment team encountered former members of the park advisory council for Parc La Visite who still meet together voluntarily in response to problems in the park such as fire suppression and illicit logging. The peasant movement (MPP) based at Papaye counts thousands of members who continue to work together in small groups on the Central Plateau. The FAO project presently underway in Marmelade uses a participatory approach to attain conservation treatment of ravines, adjoining parcels on slopes, and micro-catchment basins using a method based on local governance, access to credit, and paid public works.

## Market Strategies and Collective Action

This approach emerged in the late 1990s based on producer cooperatives and planter groups seeking to enhance planter revenues via cash crops and new market opportunities. In its latter stages of evolution, the PLUS actively promoted increase in small farmer revenues via cash cropping. This strategy was geared to generate economic returns adequate to cover the farmers' costs and enhance overall farm income – revenues sufficient to amortize farmer investments in soil conservation and improved germplasm.

The marketing approach was further developed by HAP and is presently the defining feature of the HAP program and its planter association partners engaged in mango, cacao, and coffee production, and other non-traditional export crops. Market-oriented strategies are very much a current trend, including USAID Cooperating Sponsors such as World Vision, CRS, CARE, and Save the Children.

Before PLUS and HAP, farmers sometimes cut down mango trees and showed little interest in establishing new plantations of coffee, cacao, or mangos. In response to HAP marketing efforts, farmers have established new plantations and spent scarce cash resources to purchase grafted seedlings. Farmers in HAP service areas are also far less inclined to cut down existing stands of coffee and cacao, a shift that is having a positive environmental impact. The dramatic reversal that resulted from PLUS introduction of improved mango varieties in Grande Savanne in 1997 is a notable example of this counter trend. (This will be covered more thoroughly in the mango section in the discussion of HAP below.)

## Lessons Learned from the NRM Experience

**Economic motivation.** *The basic challenge is economic viability, not awareness training.* The most fundamental lesson was that long-term environmental payoffs were primarily a byproduct of farmer decisions made for other more compelling economic reasons. In reviewing various studies of tree planters, Murray and Bannister noted, “The stated goals of tree planters in all studies were overwhelmingly economic.”<sup>5</sup> This observation still holds and also applies to the impact of HAP marketing initiatives on farmer tree planting behaviors discussed later in this report.

**Profits and risk management.** Recent post-project study of 23 sites and a dozen former NRM and conservation projects (not just tree projects) drew a similar conclusion:<sup>6</sup>

- The farmer's goal is to enhance cash profits while minimizing risk.
- The farmer's most pressing NRM goal is not soil conservation per se but more immediate goals such as moisture retention, soil fertility, and fertilizer retention – effects that assure higher profit.
- In short, soil conservation and protection of the environment are not the primary objectives of mountain peasants who invest in NRM on Haiti's slopes; however, farmers adopt such practices when they generate concrete economic benefits.

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<sup>5</sup> See Murray and Bannister, 2004, “Peasants, agroforesters, and anthropologists: A 20-year venture in income-generating trees and hedgerows in Haiti.”

<sup>6</sup> Smucker (2003, 25).

**Sustainability and maintenance of NRM.** *Do farmers take initiative to maintain and extend conservation structures at their own expense?* The answer is “yes” – when the economic payoff justifies it.<sup>7</sup>

- Farmers tend to target their more productive sites for continued maintenance of NRM structures
- Continuity of NRM is more evident in pockets of fertility (especially gully plugs in ravines) with moisture-demanding crops rather than drier eroded slopes devoted to cereal grains.
- Some farmers take initiative to maintain barriers on nearby productive slopes as well as ravines, thereby treating a local microcatchment-based NRM system.
- In a few areas, closely spaced terraces or major shifts in cultivation have transformed entire slopes at the landscape level, a transformation sustained by direct farmer investment and by tangible benefits of improved NRM.

**A major constraint: scaling up from scattered plots.** Projects and farmers have succeeded in establishing and maintaining trees and conservation works on scattered plots; however, *it has proved difficult to treat all contiguous plots within a watershed due primarily to the fragmented character of peasant landholdings.*

**Organizing around microcatchments.** Projects that made an effort to organize farmers as interest groups at more local levels, e.g., around concrete shared interests in a ravine, have succeeded in treating whole ravines and microcatchments. *Participatory strategies based on farmer groups facilitate the task of scaling up.*

**Landscape level shifts.** When the right combination of factors comes together, farmers have invested heavily from their own scarce resources in conservation works and perennials, enabling production of high value crops. Examples of this encountered in the field include the following:

- Terracing linked to vegetable cropping,
- Integrated system of living hedgerows, fuelwood, sugar cane, and processing,
- Small scale irrigation works (rice, plantains, vegetables),
- Closely spaced tree planting, including fruit trees and hardwoods,
- Humid perennial gardens with high-value associations such as yam/taro/plantains, often in association with coffee or cacao or citrus trees,
- sugar cane, mangos, livestock, and forage on drier slopes.

**Public works vs. volunteer labor.** Both voluntary labor and paid “public works” have been effective in mobilizing labor around NRM. Paid labor has been useful for the high costs of establishing new structures; however, there have been problems with sustainable maintenance of such structures. This constraint has been overcome when NRM investments demonstrably increased revenues to individual farmers, or, when farmers organized voluntary labor rotation groups. Paid and unpaid strategies have sometimes undercut each other when used for similar purposes.

**Linking and leveraging NRM project experience.** The AOP, AFII, PLUS and other projects pioneered a wide array of NRM technologies. Review of project experience

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<sup>7</sup> *Ibid.*

shows clear trends and evolution over time. Awareness of these trends, and a sense of what works and what does not, is a valuable resource to inform programming.

- Early reliance on mechanical structures shifted to widespread use of biological structures for hillside conservation.
- Outreach strategies tended to become more participatory over time, and more reliant on small groups of farmers including rotating labor groups.
- After the failure of engineering works, the primary geographic focus shifted to scattered peasant plots; however, more recently, there has been some success in scaling up treatment of adjoining plots, slopes, microcatchments, and watersheds.
- Initially, outreach strategies targeted micro-site erosion control and the conservation benefits of NRM. More recently, the focus shifted to the direct economic benefits of trees and conservation in which environmental benefits are a secondary consequence.
- Building on the success of explicitly economic strategies, the current trend is in the direction of market-driven hillside interventions and promotion of a modern business orientation among Haitian farmers and farmer organizations.

#### **Other summary findings from NRM projects.**

- Peasant farmers proved willing to plant project trees on an unprecedented scale and at their own cost for land and labor, and they did so for the economic benefit of hardwoods as a harvestable crop.
- Farmers tended to hold mature trees as a store of value, a means of mitigating agricultural risk. They harvested trees when they needed cash, preferring to hold out for high value wood products.
- Farmers planted trees on a much wider range and variation of land tenure than expected. Prevailing land tenure arrangements did not prevent farmers from planting trees in large numbers. *The pivotal factor proved to be tree tenure rather than land tenure.*
- Planting trees stimulated major land use shifts on individual plots but not generally at the level of watersheds. Broader environmental impact was limited due to the inherent fragmentation and dispersal of peasant farm plots.
- Management of state lands in protected areas of critical upland watersheds (Forêt des Pins, Parc La Visite, Parc Pic Macaya) has been plagued by program discontinuity, and by government forest and parks services with limited resources and a very limited presence in formally protected areas.
- The FPPTA protected areas project and ASSET both demonstrated that it was feasible to organize locally around NRM and common property issues.
- Co-management of resources in protected areas is a viable option whose potential remains underutilized.
- Gully plugs in ravines create pockets of fertility for cultivation of high value crops such as plantains, taro, and precious woods. Gully plugs significantly increase revenues within the first year of ravine treatments.
- Trees and anti-erosion structures increase the market value of land.
- Farmers proved responsive to market opportunities.

### **III. HILLSIDE AGRICULTURE PROGRAM, 2001-2005**

The original HAP design targeted both increased marketing and increased productivity through NRM; however, in 2003 the project's overall funding was reduced by \$12.0 million resulting in a precipitous cutback in production, conservation and agricultural research activities. This cutback brought extension services to a halt since they were subsidized by the project; however, field interviews indicated that not all production work stopped. In some cases HAP continued to provide support for production, and in other cases, producers continued work initiated under HAP and PLUS. In retrospect, however, it appears that contractual arrangements based on NRM-specific subcontracts made it easier to drop NRM sides of the program when HAP was confronted by major funding cuts.

#### **Summary of Hap Indicators and Results**

Overall, HAP met all annual targets in 2004 and surpassed most LOP targets. The elimination of the NRM indicators in 2003 reflects the program's shift away from NRM programming and many production-level activities. The table also demonstrates the revised program's overwhelming emphasis on the marketing aspects of the value chain, especially coffee, cacao, and mangos, and some continuing marketing assistance for yams, pumpkins, and hot peppers.

**Table 1. HAP Performance Indicators and Results in 2004**

<b>Indicator</b>	<b>2005 Targets</b>	<b>2004 Targets</b>	<b>2004 Results</b>
Percent increase in agricultural crop revenue	20%	20%	20.42%
Production value of selected HAP crops	\$2.2M	\$1.8M	\$1.87M
Percentage increase in average crop yields	Indicator eliminated in 2003		
Percentage of farmer plots producing for HAP assisted markets & protected by NRM methods	Indicator eliminated in 2003		
Value HAP-assisted small farmer export sales	\$1,556,000	\$1,131,000	\$1,328,928
CBOs using accurate accounting systems	10	10	10
Cumulative value loans with HAP assistance	\$350,000	\$300,000	\$902,246
Number of HAP beneficiaries	50,000	45,000	70,343
Hectares protected with NRM methods	Indicator eliminated in 2003		
Farmers using one improved NRM practice	Indicator eliminated in 2003		
CBOs with over \$50,000 export sales	6	6	6

The "export sales" line in the table above indicates that HAP support for CBO access to commodity markets was successful. The 2004 results were 17 percent over the target. As will be discussed in the following sections, the reasons for increased benefits for CBOs included (a) *higher prices paid for premium product*, (b) *improvements in quality of produce delivered to the market*, and (c) *stronger CBOs able to negotiate more favorable prices*. For example, as shown in Table 2 below, HAP-supported coffee producers were able to sell for nearly 23 cents/pound while the average paid to others was 18.6 cents. The same advantages were reported for cacao and mango.

Entry into the market of HAP-assisted CBOs had a dramatic impact on the overall farmgate price for selected commodities, benefiting a larger number of producers than just the members of HAP-assisted CBOs. According to HAP reporting, the entry of HAP

assisted CBOs into the mango market raised mango prices at the farmgate by 17 percent overall. The CBOs have also significantly increased their market share in their immediate production zones and collectively have attained a significant share of the national export market, especially for cacao and mangos.

**Table 2. Summary of Selected CBO/HAP Crops, Average Prices, & Market Shares**

Crop	# CBOs	CBO price (G/lb)	Local mkt price (G/lb)	Local mkt share (%)	Natl export mkt share (%)
Cacao	10	14.09	11.68	92.6	30.3
Mango	12	26.72	23.49	64.7	19
Coffee	40 <sup>8</sup>	22.77	18.60	64.0	11.7
Pumpkin		3.5	2.67	11.7	-

SOURCE: HAP report on 2004 Performance Indicators. The columns identified as local market price/share refer to CBO purchase of products in their local production zones. CBO price includes the rebate payment (*ristourne*) to the members of planter associations.

The relatively higher prices that flowed to HAP-supported CBOs in 2004 generated a 20 percent increase in producer revenues. Another measure of impact was the increase in export sales for HAP-supported CBOs. As per Table 3, there were six CBOs that exceeded \$50,000 in exports

**Table 3. CBOs with Export Sales of 50,000 Dollars or More in CY 2003**

CBO	Commune	Crop	US \$
CAFUPBO	Petit-Bourg au Borgne	Cocoa	206,500
CAPUP	Port Margot	Cocoa	65,519
CODEPRATV	Tapona	Cocoa	65,519
FACN	Federation of coffee coop's	Coffee	534,288
KOPAKGM	Gros-Morne	Mangos	94,238
OPRA	Petite Rivière de l'Artibonite	Mangos	74,000

As further discussed below, increased benefits from tree crops spawned reforestation investments by farmers, particularly in mangos and cacao.

## Major Markets

### *Coffee*

**Origins.** The Federation of Coffee Producer Associations (FACN) was initiated in 1990 to help coffee growers regain some of the markets lost in the 1980's. It started with 11 coffee grower associations and has now grown to 40 member-associations. The federation and its associations are owned by member farmers, each of whom pays a membership fee. The FACN first received assistance from USAID in 1994.

**Downward spiral of coffee production.** During the eighties and nineties, depressed prices drove coffee from being the major crop in Haiti to a much less important one for both export and production. FACN representatives stated that approximately 100,000 bags were exported from Haiti in 1980 but only 20,000 now. Given the drastic drop in

<sup>8</sup> FACN member associations. FACN also works with 6 associations that are not FACN members.

coffee prices and increasing prices for food crops, many farmers converted land out of coffee and into annuals.

This exodus from coffee has had a negative environmental impact. Most coffee in Haiti has always been shade grown under a perennial canopy that protected the soil against erosion. The transformation out of coffee on mid and higher altitude hillsides dramatically increased the vulnerability of whole watersheds to natural disasters. For example, the steep barren slopes observed in Marmelade—a major source of flood waters in Gonaïves—were reportedly covered with coffee systems before succumbing to the drastic drop in coffee prices in the 1980s.

**Niche markets.** Over the last ten years, FACN (with USAID support) has helped producers get a higher proportion of the price and a substantially higher price for coffee. This is based largely on establishing Haitian Bleu as a brand or blend with consistent flavor and aroma. FACN introduced washed coffee, and USAID assisted Haitian Blue entry into US, Japanese and European niche markets. Through FACN the producer associations negotiated directly with coffee roasters, cutting out middlemen. By taking over processing operations, they gained greater control over the quality of the coffee that was finally marketed. This allowed them to sell a higher proportion of their stock on the premium coffee market. The improvements in the quality of FACN coffee were reflected in the prices that the Federation receives. As compared to an average world price of around \$0.60/lb, Japan paid \$3.00, the US \$2.00 (going up to \$2.25) for Haitian Blue and Europe \$2.00 for European “Fair Trade.” It was estimated by FACN that 55% of the exports go to Haitian Blue.

**Price benefit.** The increase in the quality of coffee marketed through FACN affected both livelihoods and farming practices at the farm level. As noted in Table 2 above, the average price paid for FACN coffee is substantially higher than the average price on the local market. If one compares what producers used to get to what they get today, the difference is more striking. For example, in Marmelade the team found that coffee prices several years ago were 2-4 g/lb. Last year they received 38g. While the spread was not the same in every community visited, the trend was the same.

**Impact.** This increase in price to farmers had an effect on production, and, ultimately, on hillside stabilization. Having been burnt on coffee in the past due to fluctuating markets, people remained wary of overinvestment in coffee, but there is evidence on farms and in coffee nurseries that some farmers have expanded coffee groves. While planter propagation of coffee was not as robust as for mangos or cacao, it appeared that conversion of coffee groves to annual crops had slowed or even stopped in some areas visited. This trend was encouraging for the fight to stabilize Haiti’s hillsides. In hillsides visited, the combination of coffee bushes and tree cover provided security against erosion and rapid runoff. The team observed ravines where people had maintained coffee and shade tree systems on sites subject to erosive runoff if the vegetative cover were removed. Given the increased strength of the markets for Haitian coffee, prospects have improved for people to consider re-establishing coffee orchards on steeper hillsides.

*What are the prospects for coffee-based systems to grow and to broaden impacts on livelihoods and hillside stabilization?* There are undoubtedly demand limits to niche markets for Haitian coffee, but the team feels there are good prospects for a broader impact, particularly in traditional zones of more concentrated production of coffee. First,

the trend is market driven, and a core of farmers has responded to the market. Second, the current potential for FACN premium coffee is substantially greater than the current supply – perhaps 300 percent higher than what FACN can presently supply. Future demand could conceivably be higher if there were reliable supplies in conjunction with a brand-focused marketing campaign. Third, FACN has shown progress in taking over functions previously subsidized by the HAP. To be sure, challenges and questions remain. These along with some evidence for optimism are discussed below.

**Federation, progress, and challenges.** As a federation, the FACN provides marketing and other certain services to member associations. These services include final processing and blending, export and distribution, technical assistance for quality, and business-development services. Associations pay for initial processing and transport to the processing plant at Tombe Gateau.

FACN, with HAP support, provided business management training to the association officers, and technical assistance to help in the processing and management. This was aimed at helping associations function more like businesses and become more transparent in their operations. The results were mixed. Some associations were running sound business operations with surpluses while others were losing funds.

The team found that under HAP, FACN had become much more independent. Many of the functions paid for by HAP were paid out of revenues generated by the sale of coffee. These include paying for quality control, cupping, manager salary, and some intermediary services in relations with Fonkoze, the credit provider, to reduce the risks of a bad loan. A major result was achieved last year when the cupping and blending operations shifted from Seattle to Tombe Gateau. As judged by testers in the US, there was no drop in quality after Tombe Gateau assumed cupping and blending. Furthermore, the consultant in Seattle who was primarily responsible for cupping and blending is no longer paid by HAP. Instead, he receives a percentage of the total sale for working with the roasters and acting as a consultant in the US.

Another measure of progress was the quantity of premium-quality coffee sold. FACN calculated that six containers of Haitian Blue was the break-even point. Last year they shipped 11 containers of mixed blends; however, this year it will be fewer because of lower yields. Thus, while progress was achieved, it was sometimes erratic.

To respond to the results of capricious climates and other obstacles in Haiti (some man made), FACN experimented with other marketing channels. For example, they purchased coffee from three private growers last year. While no decision has been made on whether to continue this line, this was a positive indicator of growth in FACN business capacity.

**Future of the federation.** FACN is also facing a particular challenge stemming from the growing independence of the Marmelade Center which is setting up a parallel processing and blending operation that mirrors the Tombe Gateau Center. This raises serious questions about the need for two such centers in the country, and the risk this represents of undercutting Haitian Blue as a consistent and identifiable brand. Current and projected volumes of Haitian Blue in the foreseeable future do not justify two such centers. Furthermore, Haitian Blue is a mix of coffees from throughout Haiti. Using a single blending center makes it easier to establish and maintain the best blend. Therefore, the existence of two blending centers runs the risk of diluting the brand's

quality and precipitating loss of markets. Furthermore, the existence of a second center raises the question that one or more associations could conceivably withdraw from FACN.

**Associations as businesses and local service providers.** The associations serve multiple purposes as a business enterprise. They provide facilities for farmers to wash and dry their beans. They transport beans to the processing center (Tombe Gateau). They provide an organizational base that allows individual coffee growers to shorten the market chain to the buyer and to get premium prices for premium products. The associations allow coffee producers to get a portion of the final price when they deliver their crop and then to get a rebate when the crop is finally marketed to the buyers. They have also served as a channel for technical assistance to help growers with the production of coffee and associated crops.

**Institutional weaknesses.** As noted above, the team found a wide range of results from the business development assistance, including associations where members were getting 38g/lb and others where they got only 18g/lb. Some received rebates (*ristournes*) and others did not. Associations were scheduled to meet once a year to distribute *ristournes* and discuss costs and operations. The team found some who did this, but others had not met in two years, apparently to avoid criticism of association officers and managers unable to distribute *ristournes*. Some associations stated that operations were open and transparent. Others said they did not know the various costs deducted from the gross amounts going to the federation and associations. Many were suspicious of how the final profits and distributions were calculated. Association members and officers interviewed gave a variety of reasons for these differences in operation, e.g., inadequate quality of coffee beans delivered by members, expenses at the association level, fluctuation in yields, and in some cases theft.

**Withholding the harvest.** One of the factors affecting profit margins associations was the limited volume of coffee harvest collected by local associations. It was clear from talking to farmers that most planters chose to deliver only a portion of their coffee crop to their producer associations. The farmers' stated reason for this practice was the value they attributed to *retaining a stock of home dried coffee as a store of value or savings* rather than selling all of their harvest as fresh berries to be prepared by the FACN system as washed coffee.

If FACN and its member associations wish to increase the volume of harvest collected, they need to respond to member-farmer concerns for cash flow and should propose alternative means for holding savings in a secure and accessible manner. Closely related is producer concern for managing risk, i.e., not putting all of one's proverbial eggs in one basket, especially if associations demonstrate inability to distribute much awaited *ristournes* on a regular and timely basis. In general, *capturing a higher share of producer harvests would also require a heightened degree of producer trust in the reliability of their associations and the federation.*

**Opportunity cost as constraint to production.** Another constraint to increasing the FACN share of member harvest is a generalized producer reluctance to actively manage stands of coffee through such techniques as radical pruning. The primary producer objection to severe pruning is the short term loss of harvest (two years) that is required in order to reap the longer term benefits of increased production. In short, most farmers are small-scale producers who are reluctant to incur the opportunity costs of this type of

pruning regimen. Therefore, future technical assistance and training should directly address this issue in order to foster wider scale adoption of pruning and other techniques that entail near to medium term opportunity costs.

## ***Cacao***

During the 1980s and 1990s prior to HAP, the price of cacao was very low. For example, farmers interviewed during fieldwork reported they had been getting as low as four *gourdes* per pound in Port Margot. Consequently, the farmers were gradually replacing cacao plantations with annual food crops such as corn and beans that fetched higher prices at that time on the local market. Furthermore, local stands of cacao were old and marked by declining productivity. Subsequently, chocolate processors became interested in buying high-quality, shade-grown cacao and were willing to pay a premium for it.

Given these two trends, HAP initiatives were successful in restructuring the cacao market in Haiti as follows:

- Identification of two exporters willing to pay a premium for Grade-A cacao,
- Furnishing drying equipment and technical assistance enabling cooperatives to produce higher quality cacao beans,
- Reducing intermediaries and related costs in the marketing chain,
- Providing a loan guarantee fund to facilitate FONKOZE loans to cacao cooperatives as an advance against harvest,
- Increasing the capacity of producer associations by institutional strengthening.

On the production side, HAP helped planters regenerate stands of cacao by grafting old trees and by pruning trees less than 20 years old. The project also promoted cacao nurseries, furnished good quality seeds, shade cover, and plastic bags. Planters established new plantations and expanded old stands of cacao. Clonal orchards were improved at Grande Riviere du Nord in the North and Marfranc in the Grand'Anse, the only two clonal cacao groves in the entire country.<sup>9</sup>

From the producer perspective, cacao was once again attractive. Members of HAP-supported cacao producer associations received over 14 *gourdes*/pound last year compared to the national average of 11.68 *gourdes*. In contrast to three or four *gourdes* per pound in the 1990s, current higher prices constitute a strong production incentive, and cacao farmers have responded to the market. Field interviews show evidence of a recent increase in cacao planting and the grafting of improved stock. Since cacao is typically grown as a shade crop, producers were also planting other trees and maintaining larger trees to serve as shade.

As in the case of coffee, however, the question arises as to whether or not the market will incite the additional investment required for large scale growth in the production of Grade A cacao. Haiti is reportedly meeting only 20 percent of current demand for Grade A from Haiti. While this seems to bode well for producers, some have reported that the premium for Grade A is not sufficient to justify extra investment. It would be useful for a

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<sup>9</sup> The clonal grove located on land belonging to Cooperatif Jean-Baptiste Chavannes (Grande Rivière) was recently vandalized and turned into a soccer field, according to officers.

future assessment or program to carry out a more systematic investigation of the Haitian cacao sector and its potential.

## ***Mangos***

**Declining market share.** Haiti has been losing its share of the US mango market. Twenty years ago, the market share for Haitian mangos was 46 percent. This later dropped to 16 percent and is now four percent. At the same time, the absolute volume of Haitian mangos to the US remained about the same (with some inter-year fluctuation.) As the US market grew exponentially over this time, other countries (especially Mexico) increased production and export. This response to the US market by other countries has continued. Dominican Republic will soon surpass Haiti through orchards and advanced systems.

*In the face of the growing US market, why was there not a production response from Haitian growers?* Prior to HAP, growers received very low prices for their fruit and did not receive a premium for higher-quality fruit. They were separated from the exporters by a series of middlemen. For some, the most economical use of mangos, particularly fibrous varieties, was to feed them to swine. When swine flu wiped out many of these swine, local demand for traditional varieties declined. Consequently, according to some reports, farmers converted a growing number of mango trees to timber and other wood products including charcoal in the 1990s.

**Reversing the trend.** PLUS and HAP helped turn this trend around and set the stage for capitalizing on the growing US market. Through HAP support, producers transformed low value mango trees into high value centers of profit with mango prices increasing from 3 – 4 *gourdes* per dozen in 1997-1998 to 35 *gourdes* per dozen at present in some centers visited. Some of the ways that HAP achieved this was by the following:

- Promoting mango producer associations and direct price negotiation between exporters and producer groups rather than a series of intermediary agents of exporters buying from individual producers,
- Training producer associations to operate like businesses,
- Facilitating producer associations access to commercial credit,
- Assisting producers to improve their stock,
- Training producers in harvest methods in keeping with quality criteria for export,
- Conducting market research and market testing,
- Training producers to be quality grafters.

**More favorable terms of trade.** HAP assistance produced results that are critical to the vested interests of producers. Program assistance resulted in significant improvement of the quality of fruit purchased from the producer associations and an increase in the price paid to the producers. This was reflected both in the price paid and the revised definition of unit of purchased, i.e., the definition of a “dozen.” Field interviews indicated that ten years ago producers were paid four *gourdes* for a dozen mangos, and a “dozen” was defined as 18 to 20 fruits. Currently, producers have been receiving 35 *gourdes* per dozen with the dozen defined as 14 fruits. Furthermore, HAP technical assistance and training in producer harvest and handling significantly reduced export factory rejects, and therefore also reduced the exporter’s need to “discount” the number in a dozen.

Other results include the following:

- Due to their ability to negotiate as a group and deliver higher-quality fruit, HAP-assisted producers have increased their share of the value chain:
- Six CBOs have had export sales of 50,000 dollars or more as noted in Table 3.
- HAP-supported groups gained an increasingly greater share of the export market. Their share went from two to 20 percent of volume, giving them more leverage in the market.
- Because the cooperatives are active and a sure point of sale, producers are less likely to sell a “tree” (fruit harvest) at a discounted rate prior to harvest.
- Through changes in the terms of trade, the number of producers benefiting from HAP extends far beyond project support for particular producer groups. The ability of HAP partner groups to negotiate higher prices for premium products helped increase average overall farmgate prices for mangos by 17 percent

**Price incentives to invest in mangos.** These results translated into new producer investments in old and new mango plantations. This response points to a reversal of incentive structures over the past five years, when people on some sites, according to field interviews, were converting from tree crops to annuals. These results also underline the critical importance of market incentives on farm site land-use management decisions.

Increased interest in the export market for mangos has affected growers in other areas outside of the production zones of HAP-supported producer groups. The team visited large landholdings (over 100 acre blocks of land) in Léogane and Gros Morne being converted from annual crops to *Françisque* mango orchards. In both cases, the large landholders negotiated with sharecroppers for co-ownership of the trees or tree harvest. In one case, the sharecroppers stand to receive two-thirds of the crop. In the other case, the sharecroppers own the harvest but are required to sell their export-quality fruits to the landowner, a mango exporter. In both cases, the landowners are converting from annual crops to mango orchards on highly erodible land. In both cases, the market incentive is driving financial and social investments that should translate into reduced vulnerability.

**Case studies of success.** The market principle was tested under the PLUS program. In Grande Savane near Saut d’eau, 60,000 export-quality mangos were harvested in 2004, the result of a PLUS grafting campaign in 1997. In this campaign, low-value mango trees were transformed by 12,000 high-quality grafts. As a result, truckloads of export quality mangos were harvested in 2004 in an area that previously had no mango exports at all. Harvest projections for 2005 are for 120,000 export-quality mangos from this area. This harvest success has precipitated a new grafting campaign for an additional 30,000 grafts in the area, generating significant business income for grafters and substantial ground cover.

Wood shortage was an unanticipated consequence of the grafting campaign in Grande Savane as people started to conserve grafted trees instead of converting them to lumber and charcoal. This in turn created demand for hardwood seedlings from the nursery in Saut d’Eau. Market conditions today favor reforestation of mango (as well as cacao and coffee). Therefore, instead of harvesting low-grade mangos for timber and fuelwood, producers have options today that they could not consider ten years ago.

Grande Savane Plain from Saut d'Eau Falls: A case study of market-driven reforestation  
*12,000 top-grafted mangos in 1997 generated 60,000 export quality mangos in 2004. Top-grafting abruptly curtailed the harvest of mangos for wood products and created a wood shortage that motivated farmers to plant hardwoods.*

In Gros-Morne, Haiti's primary center of production for the Franisque mango, the booming mango market generated demand for both high-quality seedlings and graftings. These demands translated into opportunities for Cooperatives and individuals to initiate nursery operations. For example, the KOPAK cooperative in Gros Morne sold 60,000 mango Franisque seedlings at 10 *gourdes* per seedling for a profit of 2 *gourdes* per seedling, and timber species for 5 *gourdes* per 100. The nursery's commercial aspect was a significant indicator of sustainability.

Grafting Franisque mangos created a market for the services of qualified grafters and provided significant income to producers trained by HAP and others. In Gros Morne, 13,000 trees were grafted over three years at a rate of around 50 *gourdes* per graft. Some grafters interviewed in the field claimed earnings of 1,500 to 2,500 *gourdes* per month from grafting.

Grafted trees may produce 20 dozen mango fruits after two years. Producers also generated side dividends from the sale of fuelwood or charcoal from cut limbs. Once mature, grafted mango trees may produce as much as 200 to 300 dozen fruits per year. These market-driven trends bode well for hillside stabilization in zones where people produce for a top-end export market. The team visited several mature mango orchards on hillsides and erosion was negligible even in areas where Hurricane Jeanne hit last September.

At the moment, as noted above in the case of Gros-Morne, people were rapidly planting trees. Moreover, a portion of mango seedlings was planted on drier hillsides, a promising development given the need to reforest dry as well as humid hillsides. It is not entirely clear how strong the mango market is and how much of a gap currently exists between the potential supply and demand. That question should be addressed in the next assessment. Given the reputed comparative advantage of the Haitian Françoisque mango in terms of flavor and sweetness, it could prove beneficial to establish the Haitian mango as an identifiable brand and market it accordingly.

**Exporters.** The ability of Haitian Exporters to get a bigger share of the export market will be the key to sustained growth of the subsector. To date HAP has had a mixed relationship with the exporters. In the beginning exporters feared that HAPs work with producer cooperatives would undercut their profits. The exporters used intermediary buyers who dealt directly with individual producers. These buyers focused more on negotiating the absolute lowest price rather than product quality.

After five years there was still tension between HAP and some exporters, but other exporters had begun to see advantages in working with producer groups capable of collecting larger volumes of high quality produce. One exporter took note of the advantage of dealing with an organization of producers rather than individuals. Another signed an agreement with the Fèm Solid Cooperative (Ennery) in which the exporter agreed to purchase the fruit at the collection center and cover transport costs to Port-au-Prince, thus reducing the cooperative's transport costs as well as the cost of purchasing produce subsequently rejected for export. One exporter stated that he uses both systems of buying the harvest – producer groups as well as intermediaries buying from individual farmers, although he still buys an estimated 65 percent of his produce via traditional intermediaries.

Exporters are a key link in the market chain and need to be brought along as the mango market evolves. They have a vested interest in promoting sustainable production via support for growers and increased production. Future program efforts should actively build on this vested interest.

**Processing rejects for export.** One promising but underutilized strategy is the processing of fruits not acceptable for export as fresh produce. Shaisa/La Famosa is the only mango exporter currently using rejected mangos in a processed product (mango hot sauce); however, another export firm (JMB) is investing heavily in a state-of-the-art frozen fruit and vegetable processing plant near Port-au-Prince. This will presumably heighten demand for mangos and other peasant-produced crops, including mangos rejected for the fresh fruit export market.

Dried mangos may be another viable sector. HAP reported that one investor was prepared to build a small factory for dried mangos, but was stymied due to lack of

financing (300,000 dollars). This investor reportedly sought a production loan from SOFIHDES, but was rejected on the grounds that the applicant was not a Haitian national. Another potential investor (an American firm) was also interested in this sector, but pulled out due to excessive risk attributed to the current political climate.

**Organics.** Another potential new market sector is organics. HAP together with exporters organized a Haiti stand at the Chicago ATO show, reportedly the biggest organic show in the United States. HAP reports that Haitian exporters who participated in the ATO show now believe they can break into the regular US mass market gourmet channels. This is a dramatic shift in the perspective of these mango exporters.

HAP has also assisted three producer groups and three growers with organic certification for mangos. Organic certification may be a promising sector for other commodities produced by small Haitian farmers, especially other tree crops such as the Haitian avocado or lime. More detailed assessment of the range of potential organic markets appropriate for Haitian conditions of production and certification is well worth investigating by a future assessment team or project.

### ***Non-Traditional Export Crops***

HAP also tested new markets for non-traditional export crops such as taro, green peppers, and *igname* (*Dioscorea cayenensis-rotundata*).<sup>10</sup> This marketing component included the following activities:

- Identifying local and international markets for these cultigens,
- Weekly collection of internal market prices in selected marketplaces in Haiti,
- Collecting information on the volume of these commodities available in selected marketplaces,
- Improving market ties between producers and exporters by reducing the number of intermediaries in the market chain and by offering substantially higher prices to producers.

HAP also trained planter groups in improved techniques for production and soil conservation for these crops including the following:

- Preparing soil and seeds for *ignames* and taro,
- Planting *igname* in improved seed mounds,
- Increasing soil fertility by using efficient methods for applying organic fertilizers for *ignames*,
- Training in shade control techniques for *ignames*,
- Production of off-season *ignames*,
- Establishing demonstration sites for leguminous species such as *Canavalia* to improve soil fertility in agroforestry alleys on moderate slopes.

Innovations in the cultivation of *ignames* and taro were very successful. These innovations were readily adopted and spread spontaneously to other farmers. Both of

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<sup>10</sup> The *igname* (French) is commonly called “yam” in English but should not be confused with the sweet potato, also called yam. Rather, the *igname* is a vine crop that produces a starchy tuber.

these tubers are advantageous to NRM goals in that they lend themselves to production in close association with tree crops on slopes.

HAP carried out an important study of Haiti's internal marketing system for yams, peppers, and tropical pumpkins – products which lend themselves to sustainable production. Major findings include the following:

- Madam Sara trading intermediaries operating within Haiti's internal market system make an average profit of about 20 percent per voyage.
- Madame Sara traders do not generally go above a 10,000 *gourde* ceiling in working capital, equivalent to about 270 dollars (at 37 *gourdes* for 1 USD).
- The Croix-des-Bossales market in Port-au-Prince is the key reference point for all agricultural commodities produced and consumed in Haiti.
- The biggest potential to improve efficiency is to improve security conditions on roads that transport internal market produce.
- Project-subsidized market operations have no chance of beating Madam Sara traders on the basis of pure economic efficiency.

*Cap-Rouge: Yams in association with trees*

*Soil build-up behind rock walls now has sufficient depth for deep-rooted yam tubers, a highly valued cash crop in local markets that also has good prospects for export.*

## **Institutional Capacity Building and Viability under HAP**

### ***Performance against Indicators***

**Financial management.** According to HAP reporting on indicators (see Table 1), HAP attained its target of 10 partner CBOs using accurate accounting systems. This is an important benchmark since sound financial management is the minimum requirement for a viable business operation. The ten CBOs meeting this requirement reportedly presented accurate financial reports in general assemblies of their association members. In keeping with another HAP indicator of capacity building, six CBOs had export sales of 50,000 dollars or more as noted earlier in Table 3.

**Transparency and trust.** Special concerns for further institutional development among CBO partners include the building of trust, sharing information with the membership base, and assuring transparency within associations. HAP has made a special effort to promote internal reforms at FACN in order to strengthen accountability; however, field interviews uncovered evidence of member confusion regarding accounting procedures, and noted that association members and leaders were not fully aware of the financial structure of costs, profits, and rebates (*ristournes*). Furthermore, in their relations with FACN, member-association leaders did not entirely trust financial reports emanating from the federation, and were concerned about procedures and restrictions on withdrawal of funds from association reserve accounts held by the federation.

**Institutional development.** Overall, there are a number of indications that HAP made substantial process in helping CBOs be competent business organizations. CBOs and FACN have taken over functions formerly provided or funded by HAP. For example, Gros-Morne and Ennery mango cooperatives are now paying for full time managers from their own resources. Moving the FACN towards maintaining and paying for essential staff (project manager, taster) has also been a success. FACN now directly handles cupping and blending of coffee. Some producer groups have established business partnerships with exporters, e.g., Fèm Solid in Ennery.

The team found considerable variation in the effectiveness of cooperatives; some were very effective in helping members get best prices and some appeared to have underperformed, leaving their members with little. Most require ongoing training and accompaniment in order to evolve into self-sustaining businesses. As noted earlier, one promising development is closer business partnerships with exporters. Another is producer access to credit, an important factor in the business success of the producer groups.

### ***Access to Credit***

**Credit.** A leading indicator of business development is the ability of producer groups to borrow and repay loans. Between September 2001 and December 2004, HAP partners received a total of 107 Fonkoze loans with a cumulative value of over 900,000 dollars. The loans were made to cacao, coffee and mango planter associations enabling them to buy harvest for resale to exporters and other markets. In the case of coffee, the loans were intermediated by FACN at the federation level whereby working funds were advanced under lines of credit to FACN member associations which then reimbursed

Fonkoze via FACN. The FACN deals directly with Fonkoze as intermediary between the microfinance institution and member associations (see further discussion below under the credit section).

**Linking producers with microfinance institutions.** HAP has actively built trust between rural producer groups and Fonkoze, a microfinance institution. The project helped prepare its partners to be trustworthy borrowers by facilitating training, including SOFIHDES training, and established a loan guarantee fund to back Fonkoze loans to HAP-assisted groups. These loans were made at market rates, and one side effect has been the integration of agricultural lending into the Fonkoze loan portfolio in keeping with Mission concerns for greater use of credit to promote production – in this case by expanding production of environmentally friendly agricultural products.

HAP has also sponsored CBO credit analysis by GRAFIN. This helped to secure Fonkoze marketing loans for three producer associations. According to HAP, there have been only three defaults out of 107 Fonkoze loans. Two of the defaults were disaster-related. At the close of 2004, loans were in arrears for five coffee planting associations in Baptiste, and one delinquent cacao loan in Dame-Marie, raising the possibility of a default.

**Intermediary role of HAP.** As a facilitating intermediary, HAP had the benefit of access to market information and ties at all levels of the value chain for specific commodities, including exporters and financial service providers. Fonkoze loans established an unprecedented link between microfinance services and producer associations for the export of coffee, cacao, and mangos. These services included a 200,000 dollar loan guarantee and 6-month loans to cooperatives. This enabled producer groups to buy the harvest, bypass market intermediaries, and sell export-quality products directly to exporters.

As one consequence, HAP technical expertise also helped Fonkoze open up a whole new client sector. It fostered Fonkoze's ability to evaluate producer associations, product sectors, and loan risk including price trends in the market and seasonal prospects for harvest. In effect, HAP intermediary services subsidized both partners to the loan – the lending institution and the loan beneficiary. Fonkoze would not have been willing to make initial loans to producer groups in the absence of HAP as intermediary and without the loan guarantee.

HAP relinquished some of its intermediary roles as producer groups developed a credit history and direct ties to Fonkoze. For coffee producer associations, Fonkoze credit is channeled through the FACN federation rather than directly to producer associations, and the federation (particularly its manager) plays a HAP-like intermediary role between financial institution and producer cooperative.

**Building on existing institutions.** A lesson learned was the importance of building on existing institutions rather than creating new ones. Other rural development projects have developed lending institutions. Many required continuous project support and then disappeared once the project ended. In contrast, the HAP experience shows substantial progress in building direct links between producer associations and Fonkoze as a microfinance institution.

## NRM Initiatives

HAP continued PLUS-style NRM extension activities until budget cuts in 2003 forced a drastic reduction in funding for NRM and production activities. As noted in other discussions in this report, the team found the incentive structures for extending soil and water conservation (SWC) measures to be complex. Getting it right will be critical for the success of future initiatives to reduce Haiti's vulnerability to natural disasters as well as to rural economic growth.

**NRM techniques.** The team saw a lot of variation in soil and water conservation techniques across sites. People appeared more willing to invest in gully plugs and *bann manje* (food bands) than most other measures. The *bann manje* were particularly effective if they contained pineapples or sugar cane. In a number of cases, the value of crops in the band was higher than in the alleys between bands. Gully plugs were strategic in that they were effective for treating ravines at the microcatchment level while creating pockets of fertility for high-value crops. Some gully plugs were constructed from rocks that farmers hauled up from nearby river beds and placed on slopes under food-for-work; however, some farmers constructed gully plugs at their own expense, making use of earlier training under the PLUS or HAP programs.

The team found that HAP-related gully plugs held up under the heavy storms of 2004. There was some movement of stones, but the plugs generally maintained their integrity and reduced run-off—thus proving their effectiveness in reducing vulnerability. In cases where damage had occurred, the team noted that people repaired them at their own expense, without external subsidy.

Dry walls on hillside fields appeared to be less popular. On less productive slopes, the amount of “natural capital” created by dry walls was relatively limited compared to the other sites. In the fields visited, people had repaired such dry walls without external incentives; however, spontaneous spread of the technology had not generally occurred - except in high-value vegetable zones between Fermathe and Kenscoff (as discussed earlier).

**HAP extensions.** HAP had initially continued the system of Performance Based Contracts (PBA) established under PLUS. In the PBA system, the project subsidized costs for establishing soil conservation structures (checkdams, wattled barriers, rock wall terraces, small rock barriers, grass bands), including small payments for extension agents. This activity was significantly reduced when HAP subsidy for NRM outreach were dropped in 2003.

The PLUS/HAP extension model worked well and achieved good results in introducing conservation technologies and improved farming techniques. Local farmers were selected as extensionists and given training on conservation and improved agriculture practices. The extensionists then organized training groups of 15 to 30 farmers who also supplied labor for conservation works on demonstration sites such as ravines and also on individual farm plots. In this system, local farmer organizations were subsidized through cash, tools, vegetative materials, and technical assistance. When the project left, many of the planter groups disbanded.

**Spontaneous replication of NRM techniques.** Some area farmers have subsequently recruited extension agents to build conservation structures. Ravine treatments several years old were recently observed in continuous use, repaired, and producing high value crops. Spontaneous replication of such works appears limited. Former extensionists encountered in the North and the South expressed a great deal of interest in the prospect of a new project renewing subsidy to construct new structures and repair those already built. It appears that the PBA approach has not generally proved sustainable at the CBO level.

Among farmers encountered in the field, independent investment in conservation structures appears to be more common among farmers who are a little better off and who have had the benefit of training. The team saw active maintenance of sites with higher production values. Some conservation efforts continued after NRM program activities ceased. Planter groups that continued were those using traditional forms of labor mobilization such as exchange labor groups. Nevertheless, there's a common expectation that NRM activities are dependent on outside technical and financial subsidy. Furthermore, most such actions observed were undertaken on scattered parcels rather than systematic protection of watersheds.

## **Research under HAP**

HAP carried out various field-based studies including Haiti's internal market, the mango sector, non-traditional export crops, post-project sustainability of NRM in a broad range of projects and sites unrelated to HAP, and the potential of grassroots organizations to function as businesses. Agronomic research was also undertaken under contract with CIAT.

The CIAT research program was cancelled when HAP funding was curtailed in 2003; however, CIAT continues to conduct comparable research in partnership with World Vision, a USAID Cooperating Sponsor under the current DAP (Title II). CIAT efforts under HAP included the following:

CIAT developed the Bat 309 bean for its high tolerance of Mosaic and resistance to drought, two factors affecting bean production. CIAT integrated this variety into a local multiplication program for bean seed in HAP intervention zones.

Northern field trials in 2002 of *pois inconnu* (*Vigna unguiculata*) were planted in association with corn on moderate slopes of Dondon, and demonstrated that *Vigna* provided the equivalent of 80 kg per hectare of nitrogen fertilizer. This result offered opportunity to reduce production costs and reduce farmer dependence on expensive chemical fertilizers.

CIAT trials for manioc identified 4 high performing varieties: Innivit, Yema de Huevo, Barahonera, and CMC-40-Cuba. The Yema de Huevo is characterized by high production of pro-vitamin A, an important factor in children's vision. This variety is well accepted in World Vision program sites on the Central Plateau. The Innivit is a sweet variety of yam that produced the equivalent of 70 tons/hectare in trials.

## ***IV. CRITICAL THEMES IN NATURAL RESOURCE MANAGEMENT***

This chapter looks at a series of topics that have a direct bearing on natural resource management. These findings are not based specifically on assessment of HAP but draw from field studies, the experience and impact of a range of projects past and present, government policy, and prospects for a more enabling environment.

### **Rights and Access to Land**

*How does the land tenure system work on Haiti's slopes, and what bearing does it have on program efforts to improve natural resource management and farmer incentives to invest in conservation works, trees, and other high value perennials? How important is state land for improved natural resource management?*

**Fragmented holdings.** Most farmers in Haiti are mountain peasants who manage “land portfolios” composed of several non-contiguous field plots. Therefore, Haiti’s watersheds and the agricultural landscape in general are highly fragmented.

**Minifundia.** Peasant smallholders predominate over large holdings in the agricultural landscape. Most peasants are owner-operators of at least some of the land they farm; however, most such smallholders are simultaneously landlords and tenants.

**Formal land tenure system.** Peasant holdings are firmly grounded in the concept of private property. Land succession and inheritance are based on a principle of partible inheritance in which all recognized heirs have rights to an equal share. Formal land transactions and updated title derive from the French notarial system and require payment of sizeable notarial and survey fees. There is no functioning national cadastral system.

**Law versus custom.** Two parallel but interactive systems, one legal and the other customary, mark land tenure arrangements in Haiti. There is a lively land market in rural Haiti; however, most mountain peasant land is bought and sold without updating title, and most sales do not pass through the notarial system. By some estimates, 95 percent of land sales in rural Haiti are handled informally on the basis of a simple sales receipt. Inheritance also commonly passes from one generation to another informally. In sum, ownership rights stem primarily from inherited, kin-based rights and extra-legal agreements. Owners of informally divided inheritance plots commonly refer back to legal master deeds three or four generations removed.

**Land tenure and risk.** In the rural Haitian context, formal title is not necessarily more secure than informal arrangements, although it is demonstrably more expensive and considerably less flexible than the informal system. FAO-funded research by the Haitian Institute of Agrarian Reform (INARA) drew the following remarkable conclusion: *the judicial system is incapable of guaranteeing land tenure security even for those able to take full advantage of it.*<sup>11</sup>

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<sup>11</sup> See Chapter 2, La sécurité foncière et ses garants, and Chapter 3, La gestion des conflits: droits et propriété et tribunaux: “Le dysfonctionnement des institutions préposées à assurer la sécurité foncière...est générateur d’insécurité foncière et reproducteur de conflits foncières,

**Customary land tenure system.** In a context of high risk within the formal system, and its judicial insecurity, it is hardly surprising that peasants leverage kin-based rights and obligations within the customary system including extra-legal agreements, local social sanctions, and a visible presence on the land. In effect, the customary system offers a more manageable and less expensive level of risk. In current practice among mountain peasants, customary forms of access prevail, and secure access is not defined primarily by secure and updated title.

**Land tenure categories.** Categories of access to land include direct access by virtue of ownership and indirect access through tenancy or usufruct. Modes of access include the following:

- ownership via formal or informal purchase, and formal or informally divided inheritance and gifts;
- use rights (usufruct), including designated pre-inheritance plots;
- tenancy in the form of sharecropping or annual and multi-year cash rentals,
- land controlled by *jeran* land managers for absentee landlords,
- leasehold on state land (called *domaine privée de l'état*), payable annually to the local tax office, the Direction Generale des Impôts (DGI).

**Rates of land ownership and tenancy.** According to national surveys, Haitian farmers own 37 percent of agricultural plots by purchase, 23 percent by virtue of divided inheritance, and 15 percent by undivided inheritance. About 10 percent of agricultural plots are accessed through cash rents and 10 percent from sharecropping. In short, outright land ownership is the predominant form of access to farmland (75 percent of all agricultural plots). As a corollary, the majority of small farmers in Haiti are undoubtedly land poor, but they are not generally landless except for leaseholders on state land.<sup>12</sup>

**Private domain of the state.** Most state leaseholders are small peasant farmers working small plots on large blocks of state in specific regions of the country. The vast majority of Haiti's *communes* have little or no land in the *domaine privée de l'état*. The number of state leaseholders was estimated at five percent of rural households in 1993 (perhaps 35,000 leaseholders) occupying 10 percent of agricultural land.<sup>13</sup> Victor (1993, 329) estimates state land at 100,000 to 300,000 hectares. There are no accurate inventories of farmers on state land or accurate measures of state land. Large well-known blocks of state land include the following:

- protected highland areas of La Selle and La Hotte (the Pine Forest and La Visite and Macaya National Parks),
- old sisal plains of the Northeast (Dérac),
- sizeable arid regions of the Northwest called *tè kadas*,
- the infertile Savanne Diane on the Central Plateau,
- all of Haiti's offshore islands.

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violents ou larvés." FAO/INARA (Institut National de la Réforme Agraire), 1997. Définir une politique agro-foncière pour Haiti: Éléments d'Orientation (TCP-HAI-4553), Port-au-Prince.

<sup>12</sup> These figures are based on five national level surveys dating from 1978 to 1998, and summarized and analyzed in Smucker, White, and Bannister (2002).

<sup>13</sup> Oriol (1993), "La mauvaise gestion des terres de l'état," in La République Haitienne, état des lieux et perspectives. G. Barthelemy et Christian Girault, editors, Paris: ADEC-KARTHALA.

**Offshore islands as private domain of the state.** Haiti's largest blocks of state land are the offshore islands. Virtually all land on offshore islands is classified as *domaine privée de l'état* and occupied by peasant farmers and fishermen, technically under state leasehold. The population of Haiti's three largest islands, La Gonave, La Tortue, and Ile à Vache, is 111,709 people, including over 24,000 households according to the Census of 2003. These insular populations make up the vast majority of state leaseholders living in the state's "private domain." There are also state leaseholders in the area of Haiti's three major protected areas.

**State leasehold.** The national tax office, the Direction Générale des Impôts (DGI), manages state leases under the "private domain of the state." Technically, the leaseholders are obligated to pay annual rents to the DGI. Peasant leaseholders on state lands have long managed their leases *as though they were private property* – buying, selling, renting, sharecropping, and even inheriting their lease rights (*cessions*) through informal agreements with other peasant farmers.

**Degree of agricultural occupation of state lands.** Small peasant farmers have long occupied nearly all state lands deemed arable by small farmers, including offshore islands. The two national parks and the national pine forest are the last remaining remnants of Haiti's nineteenth century agricultural frontier. In the wake of the Dominican massacre of Haitians in 1937, the Vincent government resettled refugees in agricultural colonies including several localities of La Gonave and the Pine Forest. In the late 1990s, the National Institute of Agrarian Reform (INARA) resettled small farmers on some sections of a large former sisal plantation around Dérac.

**Protected areas.** As "protected areas," the Pine Forest and La Visite and Macaya Parks are not available to leaseholders; however, state leaseholders still live in these areas as borders have not been clearly defined and demarcated, and the descendants of old agricultural colonies still live in the Pine Forest. All three protected areas are deeply marked by uncontrolled agrarian incursions and squatting. These protected areas would lend themselves to local co-management agreements based on zoning and measured harvest of wood products, particularly in light of the economic value of the indigenous Haitian pine (*Pinus occidentalis*).

**Tragedy of the commons on state land.** Some state lands such as the arid zones of the Northwest are subject to illegal free-range grazing, uncontrolled deforestation, mining of wood resources, and production of charcoal production on a sizeable scale – a classic case of the Tragedy of the Commons. The pinelands and rainforests of protected areas in the La Selle and La Hotte ridges of the southern peninsula are marked by illicit harvest of pines, planks, poles, and fatwood, and illicit agricultural use including grazing and gardening.

**Water courses.** Aside from these large blocks of state land, there are scattered micro-plots of public land and geographic features that lend themselves to mismanagement including watercourses, ravine bottomlands, and flood plains. There are also scattered private plots that have been "abandoned" due to severe erosion, as in deforested upland areas of Bellefontaine where the ASSET project worked in the late 1990s.

An important issue for watershed management is the ownership of ravines in areas otherwise characterized by private holdings. The bottomlands of larger ravines are often

viewed as state lands and therefore unmanaged commons subject to unsustainable or low-value uses. On the other hand, if treated with gully plugs and other conservation structures, ravine gardens can be among the most productive sites of a valley-ridge system. To some extent, converted ravines shift farm production away from the hillside to the gully bottom. Therefore, ravine ownership requires clarification, especially larger ravines, since public versus private ownership of such sites affects willingness to invest. Such ravines would be prime candidates for land use planning and local NRM governance initiatives.

**Public irrigation works.** Another possible roadblock to improved watershed management is the degree of control exercised by government over larger irrigation systems in which the land is private but the irrigation works are state-owned and controlled. This situation may discourage user investment and also interfere with efforts to promote links between upper and lower parts of a watershed. In contrast, there is evidence that individual and collective users able to exercise direct control over irrigation works have heightened incentive to invest and maintain the system.

**Private commons.** Among categories of access noted earlier for private holdings, the most vulnerable to misuse are undivided inheritance plots (*byen minè endiviz*). These are collectively owned inheritance plots that have not yet been divided even informally. In many cases, no one individual assumes responsibility for such plots. Multiple heirs may be inclined to overgraze such plots or rotate short-term access for erosion-intensive annual crops such as beans. Despite the heightened vulnerability of undivided *byen mine* as a category, farmers (heirs) have sometimes been willing to plant and protect trees on such undivided land. In some cases they have done so as a means of establishing individual rights to a particular portion of the land.

**Land tenure and willingness to invest.** Wiens and Sobrado (1998) reviewed survey data from 4,026 households and found no significant relationships between tenure categories (on private land) and agricultural practices tested except for sharecropping. Smucker (1988) studied tree-planting behavior in six communities. He found that peasants preferred to plant trees on purchased plots and divided inheritance; however, they also regularly planted trees on undivided inheritance lands as well as sharecropped and rental plots. A study by Pierre-Jean and Tremblay (1986) reported similar findings for adoption of soil conservation technologies.

Bannister (1998) collected data on all plots worked by 1,540 PLUS farmers, a total of 2,295 plots. He found that farmers had installed conservation structures on 41 percent of their plots and reported significant yield increases. Technologies associated with higher production values – crop bands (*bann manje*), gully plugs, trees, and grafting – were more common on plots characterized by greater fertility and by long-term categories of tenure (ownership), but farmers had also established such technologies on short-term modes of access. Bannister concluded that there was no definitive relationship between tenure status and adoption.

McClain and Stienbarger (1988) noted a strong correlation with *length of occupancy* rather than *tenure category* as the decisive factor in predicting tree cover in Les Anglais, including trees on short-term tenures such as sharecropping. Fieldwork uncovered similar practices in other areas. For example, during the PLUS era sharecroppers in Banat were planting trees and maintaining living hedgerows on land they had farmed for years as tenants. Grassroots peasant organizations in the area of Camp-Perrin were

actively planting trees under a taungya arrangement and were also building and maintaining conservation structures on land belonging to absentee landlords – all in exchange for gardening rights that extended over a period of years.<sup>14</sup>

**Land tenure and treatment of micro-catchments.** White and Runge (1994,1995) found no correlation with tenure categories in the successful treatment of entire microcatchments in Maissade. They identified two pivotal factors in successful treatment of multiply owned watersheds:

- significant economic gain from the action, and
- a critical mass of local social capital in the form labor exchange groups.

In these cases, producer groups (local interest groups and exchange labor groups) proved willing to treat all parcels within a microcatchment – even if users or owners of certain parcels did not actively invest their own labor or contribute other costs.

Furthermore, White (1992) found that farmers who belonged to extension groups and participated in rotating exchange labor arrangements were far more likely to adopt new technologies than other farmers (79% versus 29%). Also, farmers on upper and middle slopes actively collaborated in watershed treatment, refuting the hypothesis that holders of side slope and downstream plots had greater incentives to participate. In fact, the upper and mid-stream farmers were more likely than downstream farmers to benefit from gully plugs, thereby providing ample economic incentive for upstream investment, and downstream farmers were more likely to benefit from flood control.

#### **Summary findings on land tenure and willingness to invest.**

- Land tenure is an issue but not a barrier to extending NRM technologies.
- There is no definitive or one-to-one relationship between particular tenure categories and a farmer's willingness to invest in NRM technologies.
- The most tangible incentive for NRM investment is return on investment, i.e., prospects for future economic gain. Therefore, *land users make investment decisions based on timeline, length of access to a plot regardless of its formal tenure status.*
- A farmer's personal stock of social capital (kinship ties and other special ties and obligations) mediates access to land and labor through customary arrangements.
- If a farmer's stock of social capital is high, the farmer is willing to adopt conservation technologies on both long and short-term tenures including leasehold and sharecropping.
- Overall, soil fertility appears to be a more important determinant of investment than land tenure category.
- Aside from economic incentive, critical issues for conservation works are farmer access to labor and other social capital resources.
- Other salient factors in peasant decisions to invest include the relative size of a plot, and its proximity to the farmer's residence,
- A major constraint to treatment of slopes and catchment basins is multiple ownership and fragmentation of holdings.
- Where there is sufficient economic incentive, and farmers have access to collective forms of social capital (rotating labor groups or grassroots

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<sup>14</sup> G. Smucker, 2001 (19-20), *Farm to Market: Conservation Farming in Haiti*, PADF-PLUS, Haiti.

- organizations), farmers have shown a willingness to collaborate around NRM adoption in watersheds marked by fragmented holdings and multiple ownership.
- **State lands:** Current evidence suggests that small peasant farmers have occupied almost all state lands with productive agricultural potential.
  - Accordingly, *there appears to be relatively little margin for resettling farmers onto large blocks of state land with agricultural potential.* This issue is worth verifying via field investigation of Haiti's remaining large blocks of state land.
  - There is evidence of intense agrarian pressure on the most productive remnants of unoccupied state lands, particularly the three high mountain protected areas.
  - In principle, portions of the Pine Forest and National Parks (La Visite and Macaya) would lend themselves to decentralized co-management arrangements.
  - *Blocks of state land in arid zones such as the Northwest are highly vulnerable to free-range grazing and uncontrolled mining of wood resources.*

## Government Policy and Watershed Stabilization

**Ministry of Environment.** Haiti's 1999 Environmental Action Plan (PAE, Plan d'Action pour l'Environnement) is the principle instrument of environmental policy. There has been little effort to implement this policy due to political turmoil and the inability to mobilize resources. Current Ministry of Environment spokesmen view the policy as a guiding framework for prioritizing donor assistance in this sector. The PAE provides for NRM planning at the level of local government jurisdictions rather than natural geographic units such as watersheds.

In 2004, the Ministry of Environment identified the following environmental priorities:

- renewable sources of energy to diminish the unsustainable exploitation of wood resources,
- management of natural resources including recovery of degraded lands,
- institutional reinforcement and reform in the environmental sector of governance,
- risk management and planning for natural disasters.

The Ministry views reforestation as one tool within a broader NRM framework that takes into account the widespread problem of poverty, including the promotion of revenue generating activities. According to Ministry spokesmen, a forthcoming forestry action plan should also take into account customary rights, tree planting incentives, and "demystification of the land tenure problem," i.e., *length of access to land rather than its formal tenure status.*

Reform of government environmental institutions presently underway includes the following:

- establishment of an inter-ministerial commission headed by the Prime Minister with the Minister of Environment serving as executive-secretary,
- a national council to coordinate all government structures relating to the environment,
- creation of an autonomous National Office of Forests and Protected Areas (ONFAP, Office National de Forêts et des Aires Protégés ) with direct management responsibility for La Visite and Macaya National Parks as well as the national pine forest reserve (Forêt des Pins),

- strengthening the environmental ministry including a deconcentrated presence outside of Port-au-Prince, and
- passage of a new institutional law (*loi cadre*).

**Ministry of Agriculture.** The Ministry of Agriculture announced a national agriculture policy in 2004 that proposes a landscape level vision for the Haitian environment. It is consistent with the four Ministry of Environment priorities noted above and also includes an emphasis on national and local land use management especially watersheds, irrigation systems, and resolution of land disputes. The policy anticipates development of a national forestry action plan including land use planning, spatial data management, sustainable use of wood resources including renewable energy, and prevention of desertification.

**Collaboration.** There is at present a virtually unprecedented level of institutional collaboration between the Ministries of Environment and Agriculture, including agreement on creation of the new National Office of Forests and Protected Areas (ONFAP), an innovation that transfers forestry and parks services away from the agricultural ministry.

The present Minister of Agriculture is also enthusiastic about market driven approaches to natural resource management including fruit trees, increased biomass production on dry slopes, and sustainable production of wood-based energy. The Minister proposes more frequent exchange and wider dissemination of information from non-governmental donor initiatives such as the HAP, and broader dissemination to Haitian farmers of information on commodity prices and market trends.

**Moving from policeman to partner.** In conversations with the Minister of Agriculture and his senior staff and with the senior staff of the Minister of Environment in the present interim government, the team found significant indications that these critical institutions embrace a partnership approach to development. Some senior staff noted that they did not see themselves as policemen as in previous times, but rather as partners with the population, NGOs, etc. Building on this change in perspective, co-management in protected areas will be one scenario put forth in recommendations noted in Annex A.

## **Alternate Energy Sources and Wood Gardens**

**Charcoal as a renewable resource.** Is production of wood charcoal a Friend or Enemy of the environment? The team found that charcoal markets are not necessarily the “enemy” to transforming Haiti’s hillsides. Charcoal is not generally the first choice of wood producers when harvesting wood products. Rather, producers tend to harvest trees for higher value wood products. The shift in management of Grande Savanne wood resources is a case in point. When high-grade mangos were introduced through widespread top-grafting of Grande Savanne’s abundant mango trees, farmers ceased to cut low-value mango trees for their multiple wood products including lumber and charcoal. Charcoal production has doubtless contributed to the loss of vegetative cover; however, the team observed numerous sites where tree gardens and charcoal production were managed as a renewable resource.

Over the course of the assessment the team took note of numerous forms of wood use and sources of charcoal. None included wholesale cutting of trees to make charcoal. Examples of charcoal sources included the following:

- Multiple instances of pruning of trees for shade management where the pruned limbs were gathered for charcoal production (cacao farm, crops, coffee)
- Collection of downed limbs from tropical storm events
- Prunings from orchard maintenance at Grand Marnier facilities
- Use of waste wood and scraps after polewood and plank harvest
- Felling of unproductive and low-value mango or coffee trees after market decline
- Clear-cutting of plots left in fallow, especially multi-year cycles of fallow in drier agricultural zones.

The team noted that mature trees were managed for higher value poles and planks rather than charcoal, except for waste wood. Field interviews indicated that wood and fruit species were being planted and managed for retirement purposes, anticipating a farmer's need to reduce labor costs in old age. There were several instances of tree gardens managed for sustained charcoal production. Often the species used are coppicing species such as Mesquite (*P. juliflora*) or Cassia in dry regions. There is also ample field evidence that charcoal harvest tends to increase greatly where new roads are built. There is also evidence that wood resources are mined for a variety of purposes including charcoal production on unoccupied state lands (commons), usually arid zones unproductive for agricultural use.

**The role of charcoal in post-harvest study of AOP trees.** In 1995, SECID carried out field studies and gathered post-harvest data on AOP trees planted between 1982 and 1986. Detailed farm site observations of tree gardens, stems, and coppices indicated that after 13 years, AOP trees had produced in excess of two metric tons of wood per hectare per year – not counting additional annual harvests from coppice (0.5 metric tons) and natural regeneration (0.25 metric tons).<sup>15</sup> Field observations noted that some wood species had replaced themselves several times over via coppice stems, and that coppice regeneration had the capacity conservatively to more than double biomass production.<sup>16</sup>

The authors of this study concluded that PLUS wood plantings in the 1990s may have doubled the rate of biomass production of early AOP plantings, averaging four or more metric tons annually per hectare. Meanwhile, the untrammelled growth of Port-au-Prince and other urban centers such as Gonaïves, St. Marc, and Cap-Haitien generate growing demand for wood charcoal and construction wood – a steady market for wood products regardless of the season including slack seasons for agriculture.

**Tree harvest for multiple wood products.** Farmer interviews in 1995 indicated that significant levels of wood harvest by value began between eight and eleven years after planting. About half of the wood harvest was sold for charcoal and house lumber – the

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<sup>15</sup> These findings are drawn from Smucker and Timyan 1995, pages vi, 49, 50, 52-64, 70. This is the most detailed information presently available on harvest of AOP trees planted on small farm plots.

<sup>16</sup> For species sampled in the 1995 harvest studies, the most vigorous coppice was observed in *Leucaena leucocephala* ssp. *glabrata*, *Leucaena diversifolia* ssp. *diversifolia*, Cassia (*Senna*) *siamea*, *Azadirachta indica*, and *Eucalyptus camaldulensis* (*Ibid.*, 65).

lowest and highest-grade product categories, and the other half was used for household consumption. Charcoal, almost entirely a cash crop, represented nearly a third of the harvest by monetary value, and 80 percent by wood volume. Products for house construction, including planks and polewood, constituted 60 percent of harvest by value and 15 percent by volume.

**Charcoal as cash crop.** Remarkably, charcoal was the single most important category of harvest for *cash income*; however, charcoal harvest was most commonly a response to urgent needs for cash. Charcoal is readily converted to cash within 10 days of tree harvest. Aside from its role as emergency fund, some farmers managed trees specifically as sustainable *charcoal gardens*. Charcoal gardens took two forms:

- (a) clear-cutting where trees were planted to enrich multi-year cycles of fallow, especially in drier agro-ecological zones,
- (b) selective harvest from permanent woodlots with multiple production goals (planks, polewood, charcoal, fuelwood, shade management).

**Charcoal and semi-arid agricultural zones.** AOP trees were almost invariably planted on actively gardened sites that included erosion-intensive annual crops on slopes. In many cases, farmers planted on sites that they intended to leave in fallow after the trees were well established and therefore less subject to browsing damage. This was a strategy for enriching the benefits of fallow, including wood products such as juvenile polewood, charcoal, and fuelwood. Notably, fallow-related charcoal harvest was more common in drier zones dependent on grazing and semi-arid (e.g., areas with a high proportion of land devoted to sorghum). The 1995 study also found that charcoal production had significantly increased during the Embargo period marked by severe economic hardship (1991-1994).

**Fuelwood species as cash crop.** The study concluded that producing fast growing tropical hardwoods as a cash crop (for multiple wood products including charcoal) could effectively compete with food crop revenues under certain local conditions: semi-arid agricultural zones, degraded agricultural sites, and periods of drought or crop failure.

**Other sources of alternative fuels.** Bagasse is widely used as the primary fuel for artisanal sugar production (boiling down syrup) and distillation of *kleren* (raw rum). Raw artisanal sugar (*rapadou*) is still produced on the Central Plateau. Some rural areas near Maissade visibly demonstrate the dramatic impact of conservation structures linked to resistant varieties of cane that gave rise to landscape level changes in the local environment and economy.

Other biomass fuels have been considered, but each faces a large infrastructure challenge as well as political hurdles. Small generating facilities would need to achieve a regular supply of fuel (a chicken and egg dilemma), and also negotiate grid use with EDH as a public utility. There is also the problem of the management and billing infrastructure that would have to be addressed. Nevertheless there is potential for biomass grasses (vetiver) and also oilseed crops (castor bean and jatropha) for biodiesel.

An interesting option for biodiesel would be the commercial baking and dry cleaning sectors. These industries have been shifting gradually to diesel powered energy (away from fuelwood). They constitute a specialized and specific enough market that would

lend itself to biodiesel. Research on the use of biodiesel would need to be done, as well as initiating large-scale growth of biodiesel species. In the interim, other biodiesels (corn or soy oil, waste frying oil) could generate momentum towards this supply. With the high cost of imported fuel and taxes, there might be enough impetus to begin a switch. Other sectors with a potential interest in biodiesel include the numerous small generators in Haiti, government diesel vehicles, company fleets, and regional power grids.

**A note on solar.** Solar power is often thought to be a simple solution to the low levels of power needed for developing countries. Personal solar arrays could provide energy for a household or run small equipment, e.g., an irrigation pump. Solar has certain disadvantages including complexity, cost of startup, and theft. Solar may also undercut motivation to organize around a problem. In the case of an irrigation pump, there would be little incentive to organize around recurring costs for a solar pump. In contrast, fuel requirements for fuel-based pumps provide a focus for dialogue around water-user management and recurring costs. Nevertheless, solar pumps might be appropriate technology for small perimeter and artisanal irrigation systems in Haiti.

## **Biodiversity Conservation**

Despite its small relative size, Haiti has an unusually broad diversity of ecosystems and endemic species. Ecosystems include alkaline, inland lakes, coastal mangrove forests, dry-scrub forests, savannas, and moist forests on peaks reaching almost 3,000 meters. About 30 percent of Haiti's plant and animal species are endemic to the island of Hispaniola, a greater percentage than in the larger and less environmentally degraded Dominican Republic.

This biological richness is due to the wide range of rainfall and topography, and the fact that Haiti is a combination of two geologically distinct islands, one supporting a biology with origins in the North-American continent, and the other, the South American continent. The recently published, Global Environmental Facility (GEF) sponsored study, *A Conservation Assessment of the Terrestrial Ecoregions of Latin America and the Caribbean*, found that both the moist forest and pine forest ecosystems of Hispaniola were regionally outstanding.

A majority of the remaining contiguous, closed-cover forest in Haiti is located in and around three national reserves -- the Pine Forest National Reserve, the Pic Macaya National Park, and the La Visite National Park. Fortunately, these three areas encompass the habitats of a great number of threatened and endangered endemic animal and plant species. For example, some 80 percent of remaining Haitian bird species are represented in the La Visite National Park.

In addition, La Visite is a high priority as the site of the headwaters of several of Haiti's most productive agricultural areas and the aquifer from which Port-au-Prince draws the majority of its potable water. Within protected areas, three main categories of benefits are likely to be generated: preservation of biodiversity, recreational/tourist benefits, and harvest of forest products.

**Preservation of biodiversity.** The three protected areas, and particularly the Pic Macaya and La Visite National Parks, are important natural habitats because of their genetic diversity, including many species endemic to the area. Few such ecosystems

remain in Hispaniola. Because of its altitude range, the Macaya area supports mature broad-leaved forests as well as cloud forest, thus creating numerous micro-catchments with a rich diversity of species.

Of the nearly 500 flora recorded in the Macaya, about a third are endemic to Hispaniola and 15 percent to the Macaya area. Aside from its rich diversity of birds, the area is also a wintering area for numerous species from North America. The two surviving land mammals of Hispaniola are found in the Macaya area. The La Visite area, containing hardwood forest on the steep slopes and pine forest on its plateau, has over 308 species of vascular plants including 90 species (29 percent) endemic to Hispaniola and 36 (11 percent) endemic to the Massif de la Selle. In addition, over 20 species of butterflies, 45 species of land mollusks, at least 12 species of amphibians, and 67 species of birds are reported in the area of the park. Of the 21 endemic bird species on Hispaniola, 17 (81 percent) are found inside the park area.

**Threats.** The greatest threat to biodiversity is agrarian pressures on the two parks and the pine forest reserve. At Parc La Visite the team observed newly established plots cut out of the forest. In 1983 there were 83 households living in the park area. By some current estimates, there may now be as many as 3,000 households. The fate of the park is also affected by political pressures and campaign promises. For example, new settlers and farm sites were established in the 1990s after a senator campaigning for office stated that the park should be for the people. The parks service has little visible presence in the area.

## **Other NRM Donors**

Haiti's environmental crisis has had increased media coverage in the wake of natural disasters in 2004. Recently, a well known grassroots peasant movement in Haiti, the Mouvement Peyizan Papay (MPP), was honored by an environmental prize when its leader, Chavannes Jean-Baptiste, received the Goldman Prize. A number of donors mobilized resources in the period since the departure of Aristide in February 2004. Donor/GOH groups of the CCI (Cadre de Coopération Intérimaire, 2004) dealing with watershed stabilization include the Environmental and Agriculture Thematic Groups, and the Gonaïves disaster response group. The CCI environmental group is chaired by the UNDP.

The IDB plans to initiate a watershed management program this summer focused on five lower-level watersheds of the Petite Rivière. Prospective activities include promotion of mangos and other fruit trees as viable and environmental stabilizing crops. IDB also plans to undertake other projects including watershed management, rural diversification, and intensification. IDB uses local government jurisdictions as the basis for creating environmental plans at commune and departmental levels, including a plan for the Artibonite department.

The IDB and UNDP have both provided GOH institutional support. UNDP assistance focuses on environmental advocacy, communications, and environmental information and early warning systems. In the Northeast, the UNDP is preparing departmental and commune level environmental plans.

CIDA is working on watershed management in the Artibonite. GTZ also provides bilateral assistance to the Artibonite. The Global Environmental Facility (GEF) provides assistance in watershed management jointly with the IDB. The Ministry of Environment reports that the MINUSTAH has agreed to help train environmental police to be assigned to protected areas.

The World Bank is presently conducting studies including an ESMAP study of the energy sector. The World Bank is also promoting its Community Driven Development in Haiti with PADF as implementing partner. This model has been implemented in pilot form for less than a year. It provides small grants to grassroots organizations on a competitive basis with awards chosen by community representatives.

CIDA has been heavily involved in the Artibonite Valley and the electrical energy infrastructure. CIDA is currently supporting efforts to decentralize energy supply and management, and to replicate the success of local control in Jacmel (until EDH recently refused to allow the price increases necessary to maintain 24 hour power).

For some years, the FAO has implemented an NRM project in Marmelade using a participatory approach based on dialogue, training, and conservation works. The FAO project has shown success in using production credit in high mountain watersheds, emphasizing agro-sylvo-pastoral strategies with credit for seeds and purchase of livestock.

During the past five years the Haiti-Taiwan cooperation program has supported bamboo culture and products including technical schools and workshops in Marmelade and Macary (Marigot). Peasant farmers in these areas have shown an interest in propagating bamboo because it grows fast and is useful for posts; however, markets for bamboo products are not yet well established nor is bamboo well integrated into the Haitian agricultural system.

## SECTION B. CONCLUSIONS AND RECOMMENDATIONS

### *V. A PROGRAM PLANNING FRAMEWORK*

#### **New Opportunities**

Incentives for hillside farmers to invest in reforestation and other measures to reduce erosion are fundamentally different today than five to ten years ago. Therefore, in developing a strategy to reduce vulnerability to natural disasters, people can use options that were not available in the recent past. Recommendations in this report build upon these options.

These changes include stronger markets for products of tree crop systems, availability of a wide range of technologies that both increase productivity and reduce erosion, some public policy and institutional reforms, and stronger producer groups.

**Stronger markets for tree crops and other closely associated crops.** As noted, the HAP successfully increased export markets for mangos, coffee, and cacao. The incentives to invest in tree crop systems were compounded as stronger producer groups helped farmers get a higher proportion of the final price for their produce. As noted earlier, these incentives led producers to “reinvest” in tree crops, thereby contributing to greater hillside stability.

The team noted that these three commodities compete in a world market that has been historically fickle; however, for the time being these three commodities are favored by *niche markets*. As an example of the current advantage of *niche markets*, FACN sells quality coffee beans in the US at prices substantially above world markets – \$2.25 for *Haitian Bleu*), \$3.00 in Japan for *large beans*, and \$2.00 in the EU for *Fair Trade Coffee*.

Niche markets presently favor Haitian producers but are subject change. Therefore, the team recommends that producer groups be encouraged to see these commodities as a way to “buy time” and *to diversify into other crops and even other economic activities*. Indeed, HAP has already worked with producers to help them diversify, including local market alternatives to exports in case world markets take a dive. For example, in coffee that the team visited, HAP provided technical and marketing support for yams, taro, and pumpkins. At Macary and Marmelade, local coffee producer associations were working with the Taiwanese to promote bamboo production and processing. In many cases, bamboo was associated with coffee production. Post-HAP programming should continue this strategy, including market surveys for alternative crops, particularly tree crops and other crops that provide ground cover.

As a measure of the demand for tree crop products promoted through HAP, the team noted that HAP-supported producer groups fell short in meeting market demand. For example, it was estimated that cacao cooperatives were meeting only 20 percent of the potential market offered by M & M/Mars for Grade A chocolate.

This mix of three tree crops also bodes well for developing strategies that cover critical zones of the landscape. Cacao does well in two particular agro-ecological zones of the country. Mangos do well in a broad range of sites including drier slopes. Coffee has

greater potential for expansion into other highland zones. According to Moral (1961), optimum conditions for Haitian coffee are 300 to 800 meters in elevation, and rainfall between 1,100 to 1,700 millimeters. The team was shown such areas that had formerly been in coffee but were cleared for annual crops in the 1980s and 1990s. Some of these same areas were sources of flood waters from Tropical Storm Jeanne.

**Availability of a wide range of productive soil and water conservation measures and accompanying expertise.** The AOP, AFII, and PLUS Projects introduced, pioneered and extended a wide array of NRM technologies that have been taken up on a variety of landscapes. HAP and other programs provided training to a private sector cadre in such skills as grafting and pruning. Consequently, farmers had more opportunities to see for themselves the impacts of various technologies instead of having to go through the costly process of trying out new technologies. They also had access to competent technical assistance in building structures or doing grafting.

Prior to the drastic budget cut in 2003, HAP provided substantial technical assistance for production. As would be expected in a case where unexpected budget cuts forced an early termination of activities, the results have been mixed. For example, technical assistance for improved management of coffee trees did not overcome grower resistance to losing a year or two of production after radical pruning; however, support to yam growers for germinating beds to propagate improved yam seed has had a promising impact. Notably, yam is an important crop association in the local coffee-based production system.

**Favorable elements of public policy.** Policy change is slow and erratic in Haiti; however there has been progress. The removal of penalties for cutting trees was the pivotal policy change that allowed farmers to integrate trees into their farming systems in far larger numbers and treat them as cash crops. This created new incentives to plant trees.

The likely creation of ONFAP as an autonomous agency may increase prospects for better management of protected areas including some degree of local co-management. Both the environment and agriculture ministries favor local land use planning and devolution of authority to regional and communal levels. Both ministries favor market-driven approaches to NRM, and express the desire to promote an enabling environment for private sector and non-governmental initiatives. The two ministries have proved able to work together under the present interim Government of Haiti, including agreement on the creation of ONFAP.

**Smallholding farmers and producer groups play greater roles in marketing and watershed management.** As noted in Section A on findings, producer groups were taking over more of the value chain. This has resulted in better prices and increased involvement in premium markets. In some cases, people are organizing around microcatchments.

HAP and its partners focused on the smallholder, a most fortunate thing for stabilizing hillsides as most hillsides are worked by smallholders. Smallholders farm most of the high and mid-altitude hillsides that are both (a) appropriate for coffee and (b) vulnerable to erosion and rapid run-off. Since a vital target of this program is to restore vegetative cover to the upper slopes of vulnerable hillsides, farmer incentive to re-establish coffee and other perennials will be critical. Consequently, the next program should continue to

strengthen producer associations for all major tree crops. Criteria for selecting areas in which to work would be two-fold: (a) Those that have the potential to produce high-value crops, and (b) those that are vulnerable to erosion and rapid run-off.

## **Guidance for Developing the Strategic Objective**

This section provides suggestions for general guidance to developing the Strategic Objective. This begins with observations on constraints to people investing in natural resources management initiatives such as tree crops and soil and water conservation. This section also proposes guiding principles based on various observations made in the field during this and other trips and discusses three types of capital found to be inextricably linked. This section focuses on general guidance rather than specific suggestions and takes note of factors to embrace or avoid. This sets the stage for proposing a strategic objective and illustrative follow-on programming in Annex A.

### ***NRM Constraints and Opportunities as Development Hypothesis***

The team took note of the following constraints and opportunities for local investment in NRM. Identification of constraints and opportunities emerged from observing people who had invested in NRM and then asking the questions: Why did people invest in NRM now and not before, or why did some people invest in NRM while others did not? The following factors were those that often characterized the “adopters.” These factors serve as a basis for proposing a working development hypothesis.

A working hypothesis has two uses. One is to guide development of the Strategic Objective and the other is to update the Mission’s thinking as new information and experience become available either to validate or question the logic of the hypothesis.

The following is drawn from adopter responses to constraints observed by the team:

- Producer groups had access to markets for the products of better management.
- Smallholders were members of democratically-based producer groups that run on business principles
- Producers had the authority and responsibility to manage local resources, including forest resources.
- People had adequate social capital resources to cover labor and other needs, and cooperate across garden boundaries.
- Groups and individuals had access to information systems that capitalize knowledge and experience
- Producers had access to capital
- Producers had access to inputs and equipment.
- People had timely access to competent technical assistance.
- Improved varieties of crops, livestock, and productive technologies were available to producers.
- Producers had access to technologies or other methods of deferring the opportunity cost of introducing sustainable and higher profit agricultural systems.

## ***Guiding Principles***

The following is a concise treatment of cautions and suggestions harvested from various sections of this report. While most may appear self-evident, they are based on comparing projects that worked with those that did not. Some principles apply to a program while others apply to development in general.

- *Build on inherent incentives.* Thoroughly analyze the *structure of incentives and vested interests* of farmers and other stakeholders. Root program interventions in the inherent benefits rather than artificial incentives for NRM. As a corollary, do not undercut motivations for people to invest their own resources in activities that have inherent value. Uneven sets of incentives across projects severely distort the incentive system (e.g., one project gives food-for-work for soil and water conservation measures while a neighboring one does not). Do no harm; actively identify strategies that avoid or reduce a common tendency toward “project mentality.”
- *Build on existing track records and lessons that foster continuity of successful efforts.* Haiti is rich in NRM experiences and knowledge and these assets should be considered before building on imported ideas. This argues in favor of contracting mechanisms that maximize program continuity (building on success) and are able to leverage in-country expertise.<sup>17</sup>
- *Use and strengthen existing technical expertise.* Avoid importing expertise that exists locally. When importing expertise, do so primarily to strengthen Haitian expertise.
- *Set in place a Knowledge Management System* (see draft RFP in Annex A). Make the outreach strategy a learning process. Identifying lessons through *stocktaking* usually pays off. Give particular attention to innovators, both at farm and project implementer levels. Promote a process whereby planners and implementers learn from on-going experiences. Assess unexpected outcomes for their value as opportunities.
- *Take an opportunity approach rather than a problem-based approach.* Initiate new ideas in geographic zones of reasonable potential. Go with assets rather than basing program interventions primarily on the analysis of constraints.
- *Map assets* (markets, biophysical features, jurisdictions, settlement patterns, etc.) and *interest groups*, i.e., people with shared interests and rewards, stakeholders, natural allies, labor exchange groups, grassroots organizations.
- *Identify stakeholders and integrate them into program development, planning, and implementation.* Identify and support groups that already have an interest and a motivation to invest their own resources. Stakeholders might include local producers, market intermediaries, private sector, local elected officials, local and central government bodies.
- *Build partnerships.* Use genuinely participatory approaches where ideas are exchanged and partnerships developed. Develop a business-partner relationship with targeted groups where both sides “negotiate” on what each brings to the table.

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<sup>17</sup> This would also argue against subcontracting mechanisms that make it easy to drop whole program areas when an implementer is faced with funding cuts, as was the case with the Hillside Agriculture Program when it was forced by funding constraints to drop NRM-related activities.

- *Stakeholders should have their own resources at risk.* Build on principles of shared economic risk. Do not be afraid to walk away from partnerships if the other side does not respect the agreement. Allow people to fail but provide means to mitigate catastrophic loss. Provide organizational and enterprise management training during implementation of economic or watershed management activities (see draft RFP in Annex A).
- *Build or strengthen organizational structures that have an incentive to ensure the upkeep and maintenance of any capital investments.* Identify groups with vested interests and what they are willing to invest in capital improvement. Promote financial sustainability of investments and openly discuss and create an exit strategy from the beginning stages of program outreach.
- *Support activities that strengthen linkages with natural capital, economic capital, and social capital.* Invest in activities that both generate revenue and decrease degradation. Identify specific investment opportunities that serve as an incentive for people in affected areas to organize, set and implement rules, negotiate with other groups (e.g., the central government, other community groups, other jurisdictions, etc.), achieve shared goals, mitigate conflict, etc.
- *Conduct planning based on thorough value-chain analysis and identification of linkages to natural and social capital building.* Quantify these linkages as feasible, and identify strengths, weaknesses, and points of entrée in the value chain.
- *Root program outreach on principles of “subsidiarity.”* I.e., Resolve problems at the most local level possible. Don’t delegate solutions up that can be handled at the local level.
- *Ensure that responsibility and authority are linked and have tangible benefits;* devolving authority requires devolving responsibility. Link program support to an active participant role where participants have a stake in the outcome.

### ***Building Natural, Financial, and Social Capital***

Where the team saw people investing in NRM, most had produced or strengthened three inextricably linked forms of capital: natural, economic, and social. The soil that built up behind contour lines and gully plugs created pockets of productive land—natural capital—that did not exist before. People used these pockets to increase economic capital not only by planting more crops but also by planting higher-value crops. By reducing vulnerability to natural disasters, these structures protected against economic loss downstream. In most of these cases, social capital was created as people came together around the stabilization of a hillside field, organized rotating labor exchange for conservation works, or joined together for collection and sale of produce at more favorable prices. In some of these cases, participants set and implemented rules on land management.

**Using the multi-capital framework for planning.** When planning NRM interventions to reduce vulnerability or increase productivity and income, planners should think in terms of these three forms of capital. If reducing vulnerability is a primary concern, the planner needs to be aware that the primary motivation for most producers is increased financial benefit and reduced risk. If planners target vulnerability on a microcatchment or watershed scale, they should examine the play of incentives and the inherent value of treating a watershed, and identify prospective local vested interests as a focus of organization. Consequently, the planner might decide that it would be more effective to

begin by creating economic and social capital rather than initiating direct construction of natural capital.

**Using the framework for developing alliances.** A number of people have pointed out that NRM is an effective vehicle for both rural economic growth and local governance. As noted above, the creation of natural capital through NRM provides people with more productive assets. In the case of governance, microcatchments and forests are natural areas around which to organize and implement rules—the essence of governance. If people organize themselves around a forest over which they have authority to manage, their decisions have real consequences. The same can be said for a marketing cooperative where producers gain access to capital and markets that they could not get as individuals.

People in Economic Growth and Democracy-and-Governance Offices may be unaware of the contribution of NRM to their respective sectors. By using the multi-capital framework to point out linkages, agriculture and environment sectors can build alliances to advocate for resources, authority, or an enabling environment .

#### NRM Governance

*Agricultural slope linking conservation treatments across garden borders in Vèjon.*

## ***VI. THEMATIC RECOMMENDATIONS***

### **NRM-Based Market Opportunities**

The team identified a number of market-driven opportunities that the Mission should consider in its new program in addition to ongoing support for perennials that have proven themselves such as mangos, specialty coffee, and cacao.

- *Wood and Charcoal.* As noted earlier, team members documented cases where wood and charcoal gardens contributed to sustained-yield forest management that provided ground cover. Given the strong market for timber, poles and charcoal in Haiti, there is a strong potential for more hillsides to be covered by wood gardens, especially in drier agro-climatic zones. Strengthening the producer roles in the market will contribute to realizing this potential. The team recommends that the next program include activities that increase the proportion of the value chain that goes to producers as a way to induce the establishment of managed wood gardens. A number of good charcoal species coppice readily (regrowing rapidly to provide a near-permanent vegetative cover) and are adaptable to dry hillsides that contributed to disastrous floods in 2004. *Prosopis juliflora* is one such species. The forthcoming Watershed Strategy Team should assess these options and the enabling conditions for scaling up commercial wood production, including charcoal production.
- *Dairy.* Dairy products are reported to be among the most important of Haiti's imports. The team thinks that Haiti producers could mobilize in response to this demand and in the process contribute to hillside stabilization. For example, the team observed high-quality grasses being grown as part of a number of hillside farming systems. In other countries with steep hillside agriculture, dairy farmers have increased revenues and reduced erosion by managing hillside plantings of high-quality fodder and browse plants.<sup>18</sup> Critical to achieving this potential would be development and support of producer groups. This recommendation will require further assessment of the market potential for dairy products as well as the technical feasibility of producing high-quality browse on hillsides.
- *Local value added.* Major new investment in frozen food processing holds the promise of significant increase in value added to high-quality fruits and vegetables, including fruits not acceptable for export as fresh produce. There may be potential for other forms of processing such as dried fruit (see findings on mango processing in Chapter III). These markets require further market assessment. Future programming should also facilitate financing for investments in processing.
- *Exporters.* Greater attention should be given to working with exporters, including access to loan capital and technical assistance for branding Haitian products and exploring new markets. HAP and Haitian exporter participation at a recent organic trade fair in Chicago shows promise for mass marketing of Haitian produce.

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<sup>18</sup> Heifer International worked on such schemes in conjunction with ICRAF in Uganda as part of a program to increase revenues from dairy and meat and to stabilize hillsides through erosion-arresting grasses and trees.

*Shifting land use in Gros-Morne*

*Corn in the foreground contrasts with sugar cane and mangos in the distance.*

*A hillside fully stocked with mature mango trees demonstrates the potential for transforming land use from erosive food crops to high value perennial crops on steep slopes outside of Cap-Haitien.*

- *Non-traditional export crops.* HAP made promising explorations and market tests in this sector, and future programming should build upon these experiences. Priority should be given to crops that lend themselves to hillside production in association with tree crops that already have well developed market chains and assured markets (fruit, coffee, cacao, etc.). There should be further exploration of piggybacking non-traditional exports onto existing well-established market chains.
- *Multiple markets.* Marketing initiatives should not be limited to export markets. Small farmers can best manage risk by producing for a range of markets, especially the internal market system.
- *Local markets.* Overall, the most impressive, self-sustaining NRM investments by small farmers have been motivated by cash crops sold on the internal market (hillside terraces for vegetables, gully plugs for plantains, terracing with sugar cane and pineapples, etc.). There should be further exploration of crop varieties with early and late harvest cycles or slack season harvests that maximize the market price advantage, building on HAPs work with off-season harvest of yams.
- *Regional markets.* Future programming should focus greater attention on assessing and maximizing the potential of regional markets, especially the Dominican Republic and neighboring islands.
- *Co-management.* Co-management of forests has been effective in countries around the world as a means to (a) increase local revenues, (b) improve forest management, and (c) empower local populations. In discussions with senior Haitian officials, the Team found them sympathetic to the concept. In other countries, successful strategies included policy and institutional reforms, the development of democratically-run cooperatives run on business principles, and roads.
- *Organic Products.* This appeared to be a promising field. There should be more detailed assessment of the range of potential organic markets appropriate for Haitian conditions of production and certification requirements, including other products besides mangos.
- *Biodiesel.* In view of a current shift to diesel fuels in the commercial baking and dry cleaning sectors, it is worth exploring the potential of biodiesel fuels as a sustainable energy option.

### **Building a Business Approach to NRM Maintenance and Recurring Costs**

Maintaining agriculture and NRM initiatives once they are established and covering recurring costs are concerns that need to be considered during the planning stage. A common problem is that many NRM initiatives are developed and implemented from the standpoint of a project without taking into account the priorities of farmers. *As a result, many farmers join the initiative as an employee of the project instead of undertaking NRM work as a way to meet his or her priority needs.* When the initiative breaks down or requires repair, the farmer is inclined to wait for a project to show up and provide repairs or parts. In view of the unsustainable approach used, this is a perfectly rational position on the part of the farmer.

The future program should take several approaches when developing local agricultural and NRM initiatives:

1. It should see whether the farmers have the same priorities and see inherent value in the initiative, be it an irrigation system or a gully plug to stop ravine erosion.
2. Consultations on the business aspect of running a farming business should identify costs and materials needed to integrate conservation structures into a farming system.
3. Consultation and business planning should take place on how to recover fixed, recurring, and replacement costs and repairs for NRM structures and practices, including labor requirements.
4. Training should always be considered as a key element. The training should be both organizational and technical. Agriculture and NRM activities are effective vehicles for bringing people together to do as members of a group what they could not do as individuals (as in traditional rotating exchange labor groups that form around agricultural work).
5. Consultation on accessing needed and recurring technical assistance should be undertaken in terms of local availability and the capacity of farmer organizations.

The team saw cases of how elements of the above approach were effective. Where farmers had received training on dry walls and hedgerows built on the contour, they repaired the wall after a storm or after animals disrupted it or when preparing the land for planting. Some said that they continued to build these structures on their own land or to help others build or repair theirs.

Detailed planning for recurring costs (point 3 above) is important, particularly for initiatives that generate revenue streams. For example, if a small irrigation perimeter produces revenue from the sale of produce, the operators should receive training in setting up a business plan that, *inter alia*, assesses the worthiness of the enterprise and allows for expenses to be covered. Those expenses would include operating costs (fuel, lubricants), maintenance (parts, servicing, etc.), amortization for the next machine, and labor. The operator's business plan should include a system where he or she puts portions of the revenue stream aside to cover all those expenses. For longer term expenses (maintenance or amortization), the farmer would put them into an interest bearing account against which he or she could borrow. For example, women's groups have borrowed against these accounts to set up their own revolving credit fund for investments in other revenue-generating activities. The team saw the use of amortization accounts for credit used by the Fèm Solid cooperative in Ennery.

Identifying costs (point 2 above) has been used successfully by several NRM initiatives, particularly the Heifer Program that helps farmers with improved races of animals. Under this concept, a member of a group who met the group's criteria receives a female animal from the program. The criteria almost always include the promise that the farmer will contribute the first female offspring back to the group for distribution to another member. An innovative twist to this concept was taken by the Heifer program and ICRAF where criteria included the establishment of 100 meters of high-quality forage as part of a hedgerow. The rationale was that the hedgerow would put the farmer into a better position to get the most from the improved breed. It also included the common objective of helping to stabilize hillsides.

The team saw several variations of the Heifer approach where farmers were given improved sugar cane or forage grass to put into hedgerows. One of their obligations was to pass on an equal number of shoots or cuttings to their neighbors. Another option

would be to build upon traditional exchange labor practices, and promote improved techniques and conservation works as a new activity and skill set for such labor groups, facilitating maintenance of conservation structures deemed useful by planters, and providing some additional income by working for others willing to pay for conservation works, as has happened in Gros-Morne.

In sum, *avoid forcing results through the use of artificial incentives*, particularly if changes in trust and confidence are involved. For example, particular attention is required to build trust between rural producer groups and formal financial institutions without distorting the market value of capital. If this is short-circuited because a program's schedule requires quicker results, the consequences will likely include a distortion of incentives and more challenges to address in the future.

## **Land Rights and Watersheds**

**Organizing around watersheds.** As discussed earlier in Chapter IV, *land fragmentation is a greater barrier to NRM than formally insecure tenure*. The dispersed character and highly fragmented distribution of small holdings complicates any effort to install watershed-wide conservation treatments, or to promote landscape level shifts away from erosion-intensive annual crops to more sustainable perennial crops.

**NRM incentives and local land use planning.** To overcome this constraint, the primary challenge is to harness farmer incentives to cooperate across garden boundary lines - motivated by the prospect of increased revenues and/or decreased risk. NRM cooperation across garden boundaries might also facilitate – through reciprocity or enhancing one's personal stock of social capital – a farmer's access to extra-familial agricultural labor for other needs and other gardens (also an economic benefit).

- A conservation strategy linked to high value crops within a microcatchment basin or across an entire slope is socially feasible; however, this requires significant investment in organizing farmers, creating new forms of social capital, and a long enough timeframe to make it worthwhile.
- Development agents (*animateurs*) should facilitate the creation of watershed-based interest groups based on concrete economic and NRM goals, local-area land management plans (LAMPs), and NRM as a focus of local governance.

**Focus on land users and creation of social capital for watershed treatments.** In order to build on the inherent benefits of NRM as the primary incentive, development agents should give priority to assessing and then strengthening or creating local social capital in order to scale up NRM treatments (rather than, for example, seeking to update title to land).

As a corollary, if there are adequate supplies of local social capital in a watershed, an extension program or local farmer organization would not need to target NRM technologies towards or away from any particular category of land tenure within the watershed. It could prove useful for farmer groups to undertake physical cadastral surveys to locate plots and identify land use decision-makers and direct users of the land; however, legal cadasters to establish title are unnecessary and impractical. In fact, legal cadaster could precipitate interminable conflict and cause tremendous disruption to the on-the-ground land access system.

**Organize watershed users as interest groups.** At a watershed level, farmers could organize around common property issues such as scaling-up parcel treatments to adjoining parcels and entire slopes, fire suppression, sanctions against free-range grazing, identification and treatment of fragile sites such as springs, ravines, and other areas vulnerable to erosion. By way of illustration, there is also precedent in Haiti for farmers to collaborate on maintenance of tertiary farm-to-market roads, and of course on the marketing of cash crops such as mangos, coffee, and yams.

**Orient program interventions to local land use plans.** Program interventions would be implemented in keeping with microcatchment plans developed by land users to stabilize slopes, reduce risk, and increase revenues.

Illustrative NRM strategies on drier slopes might include livestock linked to improved forage grasses and trees in hedgerows on vulnerable hillsides. Improved breeding stock could be distributed using the Heifer Project method of sharing offspring with farmers vested in hedgerow forage. In a prime mango production zone, local land use planning might include covering an entire slope with mangos. Technical assistance could be provided for flatlands to out-compete production of erosion-intensive cash crops on slopes, and thereby shifting high erosion crops to flatlands or irrigated parcels (e.g., maize, beans, peanuts). Land use plans and interest groups could also organize around linkages between downstream irrigation and upstream farmers.

**Defray opportunity costs.** One of the constraints to investing in NRM is the opportunity cost for doing so, e.g., severe pruning of cacao and coffee entails near term harvest loss in exchange for future gain. Program outreach should explore methods of defraying opportunity costs that prevent hillside farmers from converting annual crops to perennials. Methods observed in the field include the following:

- Defer rents or harvest shares in exchange for expanding fruit tree production.
- Make charcoal with the waste wood resources generated by pruning trees for grafting.
- Use the taungya system for continuous production of annual crops until trees shade over (e.g., yams or taro).
- Rely on alternative employment.

**State land.** It would be useful to develop more detailed information on the location and amount of state land, its legal status and boundaries, and the number and activities of leaseholders and other users. Most arable state land is already occupied or under leasehold; however, better information at local commune levels would facilitate planning including possible reclamation of badlands, management plans for range-land, and identification of fragile zones and flood risks. Some productive highland areas under formal protection would lend themselves to sustainable harvest through co-management agreements.

## **Capital, Credit, and NRM Investments**

Producer access to capital has been an important factor in the growth and financial success of producer associations; however, the HAP *intermediary, facilitating role* has been a critical element of this process – benefiting Fonkoze as well as producer groups.

- Fonkoze as a microfinance institution should now evolve to the point where it no longer requires external loan guarantees to cover the risk of lending to agricultural producers.
- For producer groups, the challenge is master the skills and cohesion required to function independently of an intermediary such as HAP.
- One scenario would be for producer groups to pay for commercial intermediary services, e.g., commodity sector analysis, risk assessment, audits, training, and technical assistance.
- A second scenario would be for producer groups to develop closer business partnerships with exporters, including exporter provision of technical services and credit based on shared vested interests and negotiations between exporters and producer groups.

#### **Recommendations for credit:**

- Continue to build trust and confidence between producer associations and commercial finance institutions.
- Promote a more favorable enabling environment for the microfinance sector, including legal authorization to provide a broader range of banking services to producer groups, and market rates for agricultural loans.
- Build on existing institutions. Link producer associations to existing financial lending institutions rather than creating new ones.
- Build on the HAP/Fonkoze/Producer experience and integrate other financial institutions into producer networks through technical assistance, confidence building, and direct producer group ties to financial service providers.
- Assess credit needs and the availability of credit for planters and planter associations including rates, duration, and guarantees.
- Extend the loan guarantee fund to large producers.
- Promote association access to credit that allows them to advance larger amounts to producers, thereby facilitating the association's harvest of commodities at the optimal moment.
- Continue to support training and technical assistance to producer associations, enabling them to function as businesses and gain access to bankable loans.
- Support the development of local NGOs and firms capable of providing business-development services to producer associations.
- Support producer interest in generating savings. This might include promotion of linkages between producer cooperatives and reliable credit unions, or assisting producer cooperatives with transparent and reliable procedures for holding individual member savings. Take into account producer cooperative experience with *ristourne* rebates offered to cooperative members after the end of harvest.

## **NRM Governance**

### ***Government Ministries***

**Co-management of natural resources in protected areas.** Under a co-management strategy, the Haitian forestry and parks services or an autonomous office (ONFAP) would have the authority and responsibility to develop sustained-yield management plans based on an inventory. Communities surrounding these forests would be offered the opportunity to work with the parks and forest services to implement the plan. Details would be negotiated between the parks and forest services and grassroots associations

and would include sustained-yield harvests focused on good stewardship of the forest as well as improved livelihoods.

**Other relations with critical ministries.** The project will build collaborative relationships with the Ministries of Agriculture and Environment based on periodic exchange of views and sharing of information between the project and ministry personnel. This collaborative relationship would include field trips to project sites, exchange of information on technical strategies, and sharing of activity and evaluation reports.

Project implementation will also adhere to Ministerial policies on watershed planning and management. The project will assure that its activities are compatible with planning at the level of local government jurisdictions, especially at commune and communal section levels in keeping with the national environmental action plan.

### ***Local Governance***

**Organize around shared vested interests within watersheds.** Land-management issues are strong vehicles for strengthening local governance. To make full use of the linkage between local governance and watershed management, the team recommends that *more emphasis be given to organizing at the most local practical levels around watershed stabilization.*

The biggest hurdles in the development and implementation of a watershed-level plan will be organizational and economic, not technical. This will require a field-based, consultative process based on training and *animation* (community organization) skills. Time and patience will be required as negotiations take place among land users within catchment basins.

The team found an interest and will on the part of hillside populations to take actions to stabilize hillsides. Given their economic interests and attachment to the land, some of these populations had already invested at a microcatchment level in conserving soil and moisture. Many were rewarded last year when damage from Tropical Storm Jeanne was mitigated by gully plugs, contour hedgerows, orchards, etc. Several farmers talked about expanding these investments; however, the team did not generally see the type of scaling up that generates landscape level change.

### **Scale up NRM.**

1. Actively create local social capital by organizing farmers directly involved in particular microcatchments, slopes, or watersheds, i.e., organize around site-based interest groups or prospective “communities of interest.”
2. Promote business skills. Support enterprise-focused, democratically-based producer groups. The latter might include but should not be limited to those supported under HAP.
3. Solicit the support of local elected officials and the most local level bodies of government.

**Use local government.** Locally-elected officials, particularly CASECs and mayors, bring the weight of the law and local government support for watershed management. Local

elected officials should work together with local, interest-based groups in negotiating land use management plans, mediation of conflict, and imposing sanctions for violation of watershed rules, e.g., payment of damages for animal predations or cutting trees near springs (roles that CASEC members play at present). Local elected officials would also be a natural focal point for development of watershed-scale collaboration across jurisdictional lines (communes and communal sections). If communes have land management plans, such plans could be linked to watershed management planning.

**Promote local land management planning.** An initial role of the program should be to facilitate discussions and negotiations among the various players in a watershed. The team recommends that the program use a LAMP planning process to help people form local groups or associations at the microcatchment level, and networks or federated groups at the watershed level. This would include helping existing producer groups such as HAP partner cooperatives to develop such plans. The planning should include financial as well as technical analyses and should provide mechanisms for paying recurring costs.

**Judicious use of local public works.** There will likely be public works as part of such plans, including roads, check dams in more sizeable ravines, and other infrastructures. The incorporation of such capital expenses will give the program an opportunity to introduce training that would help people identify and plan for recurring costs. The planning should include ways to mobilize resources to pay for these costs. The program should also assess whether reform of national policies would help people develop and manage a watershed-scale plans.

**Transparency.** The process for developing and implementing a Watershed Stabilization Plan should be open, transparent and participatory at all stages. This will increase trust, confidence and buy-in by the hillside population ultimately responsible for its success or failure, and it also empowers people—an important side benefit. For example, procurement of goods and services to stabilize the hillsides should be both participatory and open. For infrastructure, local municipalities should contribute costs in cash. The procurement selection process should be open and transparent.

## **Institutional Capacity Building**

**Build on traditional group forms.** One proven strategy is to build on successful organizational elements that already exist. For example, conservation works tend to be expensive and labor intensive. The most successful, self-sustaining forms of labor mobilization for NRM investment and maintenance have been traditional exchange labor groups, and hybridized “conservation groups” that utilize the same organizing principles as traditional rotating labor groups or traditional rotating credit groups. The organizing principle underlying both types of these indigenous groups is that *all members of these small face-to-face groups share equally in the costs, benefits, and risks of a joint endeavor.*

The strategy of building on “indigenous” groups, or creating new groups based on the indigenous model (induced groups), would fit well with new needs for NRM governance that go beyond scattered parcel treatments into local land use management planning (LAMPs), and NRM treatment of neighboring plots, slopes and ravines with multiple users, and watersheds. The small group strategy has proved itself in many areas of

rural Haiti, e.g., the Papaye peasant movement (MPP) on the Central Plateau or the 1980s *gwoupman* movement in rural areas of Gros-Morne. It also works well when integrated with larger producer associations, i.e, a producer association composed of a number of geographically dispersed small groups that share labor or other joint benefits, and maintain regular face to face contact at the most local level (locality or neighborhood or microcatchment).

#### **Other recommendations for building institutional capacity:**

- Provide training to producer associations in enterprise and financial management. Make training specific to the needs of producer association business activities. Set in place a process for audits.
- Provide transparency training that increases the accountability of leaders to the membership, allowing members to know the costs of operations.
- Provide TA to help association members diversify production and sources of income, including market surveys.
- Build trust and confidence between producer associations and commercial financial institutions.
- Facilitate local supplies of technical assistance by using competent Haitian firms or NGOs to provide business training to producer associations. Do not import technical assistance that can be procured locally.
- Provide support to FACN on marketing and overall management. Work with the centers at both Tombe Gateau and Marmalade to ensure firm collaboration on maintaining Haitian export brands.
- Promote the capacity of producer groups to supply quality and quantity of products in response to seasonal demand on the international market.
- Provide capacity building to northern producer groups engaged in *igname* production. Promote direct negotiations between producer groups and exporters. Identify better market opportunities.
- Provide training and institutional reinforcement of FACN member associations in addition to training at the federation level. Address such issues as:
  - the producer association's decision making process for determining the local purchase price for export crops;
  - transparent relations between associations and the coffee federation including sharing of information on post-harvest costs, transport and processing,
  - transparent relations between associations and individual members.
- Assist associations to develop a better system for reducing heavy losses of produce during transportation.

#### **Research**

The Team concurs with the Minister's assessment and recommends that the stocktaking net be geographically broad but focused on landscapes that meet criteria for the proposed program, i.e., landscapes that are potential sources of floodwaters as well as capable of supporting high value tree crops.

In addition, the international agricultural research centers have developed a broad array of plant and animal varieties with specific characteristics responding to major problems of small farmers. They have also developed a range of strategies for natural resource

management and small farm production systems. The Title II Cooperating Sponsors (CS) can serve as a valuable focus of research. The CSs have good expertise in their employ and are heavily involved in on the ground research and trials. Finally, NGOs have engaged former GOH researchers who are doing a range of research that would have relevance for producers on a range of sites. These research products should be part of the inventory.

Agricultural research should not be limited to production. Knowledge gaps exist about local and cross-border trade (as well as international). Better knowledge about local and sub-regional markets would help producer groups make better choices about what to grow and where to market it.

To take full advantage of the sunk cost of research to date, research should emphasize selective adaptation of technologies already well established by international research centers. Accordingly, research undertaken by regional experiment stations in Haiti should be applied rather than speculative. Research should respond to one or more concrete problems confronted by the clients. Developing a research program should begin by identifying and prioritizing research topics together with local farmers and farm groups.

The team recommends the use of on-farm demonstration plots to validate technologies that have already been tested. Use such plots for training and agricultural extension. Select practical research themes or technologies in close consultation with local groups and planter associations. Use planter groups to help determine research themes and to establish experimental plots, management arrangements, follow-up, on-site evaluation, harvest, data collection, and final evaluation of results. This approach could be replicated in several localities and scaled up as a planning and informational tool at other levels (commune, region, department, national level).

The stocktaking work should include identification of the enabling conditions associated with people investing in innovative NRM technology and with the activities that contribute to their adoption. (Candidate enabling conditions and actions are covered in several other places in this report.)

Illustrative research topics include the following:

- Economic analysis of soil conservation costs and benefits, taking into account the investment capacity of small farmers.
- Agricultural and economic impact of rehabilitating irrigation systems.
- Agricultural, economic, and environmental evaluation of NRM systems to protect the Quinte watershed.
- Agricultural, economic and environmental impact analysis of high-value fruit trees (mango, coffee, cacao, avocado) as a strategy for reforesting slopes and watersheds.
- Agricultural, economic, and environmental impact analysis of the use of taungya reforestation strategies in the North, Artibonite, and South (case studies).
- Agricultural, economic, and environmental impact study of different coffee and cacao pruning strategies in time and space in the North and Southeast regions.
- Technical assistance for coffee producers to cut harvest loss due to « scolite.»
- Technical assistance for yam producers to cut harvest loss due to « maroka.»
- Evaluation of *Vigna unguiculata* (cowpea) for improvement of soil fertility in

- agroforestry systems.
- *Cratylia argentea* for grass bands, forage, and drought resistance.
- Value chain analysis of economically-important crops with a view to helping producers get a higher proportion of the final price.

## Wood Gardens

**Charcoal gardens and semi-arid agriculture.** As discussed above, fuelwood species and sustained-yield charcoal production have demonstrated their potential as an economically viable NRM strategy. This strategy should be considered, especially on sites characterized by semi-arid agricultural zones, charcoal-making as an important source of slack season employment, and enriched multi-year fallow regimes, e.g., some areas of the Gonaïves watershed.

**Sanctions for unsustainable harvest.** Tree theft and mining of wood resources in dry zones with long slack seasons, including unoccupied state lands in the Northwest, tend to distort the price of charcoal, keeping prices artificially low. The central government is unlikely to address this problem with law enforcement personnel; however, it could be addressed in some areas by local NRM governance and management plans.

**Charcoal value chain.** Wood producers would have more incentive to implement sustained-yield management plans if they produced greater flows of revenue. More information on the charcoal value chain, price structure, access to capital, and current supply zones should be gathered to better assess the potential of charcoal for conservation planting and energy supply, and also to assess whether or not it would be useful to organize sustainable-harvest producer groups in zones of concentrated production, especially on state lands in the Northwest. Charcoal studies dating to the late 1970s should be replicated.

## Biodiversity Conservation and Protected Areas

Besides being a potential source of flood waters, Haiti's protected areas are also important harbors of biodiversity. Because these sites are under increasing pressure to be harvested for timber and/or converted to intensive agricultural activity, the team recommends that the program support approaches that can both generate revenue and protect the vegetative cover. Co-management is one option with a track record for achieving both objectives. The work can build on the previous efforts of the WB and USAID in park and forest management.

Central to such a co-management plan would be the support of local associations or cooperatives with both authority and responsibility to implement a sustained-yield management plan that includes timber harvesting. The association would have to agree to fine and sanction members for violating the plan or banning them from participating.

Harvesting of timber in the park, especially selective thinning of poles is not damaging to a pine forest, quite to the contrary. Thinning provides protection from habitual low-level fires that are part of a natural pine ecosystem. *Thinning and managed fires should be encouraged to maintain the ecological balance, promote seedling establishment, defend against insect infestation, and keep the area productive for medium to larger sized trees.* This ecosystem is similar to North American pine forests that suffer from high intensity

widespread wildfire, precisely because they are not thinned (due to cost) and a history of fire suppression.

Other opportunities include:

- Organizing around selective thinning as an industry
- Supporting watershed protection and cooperation in Parc La Visite, the headwaters of eight rivers including the main Port-au-Prince aquifer.
- Establishing regional botanical gardens organized around the biotypes of rare or endangered species
- Multiplying fruit species of high commercial, medical or ecological value.

In this scenario, government park rangers and foresters would help plan and oversee sustainable harvest and community standards. Rangers would require training in community relations, dispute management, harvest layout, ecology, wildlife biology, firefighting, and management skills, including co-management strategies in protected areas.

## ***VII. A MISSION STRATEGY FOR NATIONAL WATERSHED MANAGEMENT***

In the 2005 Appropriations Bill, the US Congress directed that USAID develop a plan for reforesting vulnerable areas of Haiti. The present study is thus a first stage of inquiry that sets the stage for developing a broad-based hillside stabilization and reforestation strategy for the USAID Mission. Therefore, a second independent Strategy Team will build on the present assessment by conducting a more broadly based review of the Haitian environment, including consultation with the Government of Haiti and other stakeholders.

The present chapter thus identifies issues and information gaps that merit further investigation. These questions emerge from field inquiries and interviews undertaken by the present assessment team in March and April of 2005. These issues should inform the scope of work for the upcoming strategy team whose task will be to propose a *mission strategy for national watershed management and hillside stabilization*.

The report prepared by the Strategy Team should help guide future USAID Mission investments. It should also serve as a tool for leveraging investments by other donors, and for identifying particular sub-sectors or geographic areas that complement NRM investments and programs currently underway. A strategy document should also take into account policy requirements and the longer range time frame and continuity of investment required for NRM investments to make an impact and promote sustainability. It will take into account institutional as well as policy issues, including the roles of both local and national levels of government, non-governmental agencies, grassroots organizations, and current levels of commitment by international donors.

**Guiding questions.** *The highest order priority for a national assessment is to identify Haiti's most vulnerable landscapes. A closely related question is to categorize vulnerable landscapes in ways that will help the USAID Mission to develop options for addressing the vulnerability of these landscapes, taking into account the sustainable livelihood interests of the people who live there. Therefore, the Strategy Team should assemble the basic elements of a national strategy by first (a) identifying and ranking the level of threat from Haiti's various landscapes, and then by (b) identifying and assessing the most effective NRM and agricultural options for reducing these threats, particularly for the most vulnerable landscapes.*

### *Vulnerability Assessment of Haitian Landscapes.*

- A. Identify and categorize the major landscape types in Haiti by, *inter alia*,
  - Topography (e.g., steep slope, valley, plain, etc.)
  - Climate (dry, humid, etc.)
  - Life Zone Classification<sup>19</sup>
  
- B. Carry out a vulnerability assessment of these landscapes:
  - Rank the sites or landscapes that pose the greatest threat to Haitian lives and livelihoods
  - Further categorize these sites according to land-use

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<sup>19</sup> See Holdridge Life Zone Classification System described in Annex C.

- Identify landscapes that lend themselves to market-driven stabilization strategies
- Identify sites that may not lend themselves to market-based approaches.
- Identify high priority state lands, including “unassigned” state lands where land users have little or no incentive to invest in sustainable land use practices?
- Other site assessment issues include the following (illustrative):
  - ⇒ Access roads, infrastructure, irrigation systems
  - ⇒ Population density and patterns of settlement
  - ⇒ Local patterns of landholding, land access, and land distribution
  - ⇒ To what extent are people presently using the land for annual or perennial crops, forestry, range, no productive use, etc.
  - ⇒ Seek evidence of major shifts in land use within the past 30 years? E.g., earlier reliance on tree crops, coffee, other perennials such as sugar cane, decline in stands of *Prosopis juliflora* due to charcoal, etc.

*Taking Stock of NRM, Agricultural Practices, and Production Systems or Strategies*

- C. Prioritize the most vulnerable landscapes noted above and identify NRM, agricultural practices, and agricultural systems that have shown success in reducing erosion or creating the following assets:
- Economic benefits (e.g., improved household incomes, shifts in production)
  - Environmental benefits (reduced degradation, reduced run-off, more vegetative cover, more browse, higher water table, flood control, etc.)
  - Improved NRM governance (e.g., rural localities making and implementing NRM plans and rules, peasant labor groups maintaining conservation structures, etc.)
- D. For each type of practice or system identified above, identify the constraints that were addressed in its adoption. The Strategy Team may wish to consider each constraint resolved as an “enabling condition.” For example, assessment of NRM interventions for the present report took note of the following constraints that need to be addressed (illustrative). The Strategy Team may also identify others.
- Access to domestic and export markets for the products of better management
  - Long-term access to land
  - Authority to manage local resources
  - Knowledge of a range of NRM options
  - Access to technical assistance
  - Access to capital
  - Access to inputs
  - Adequate social capital, transformed into timely labor or financial capital
  - Membership in democratically-based Producer Groups run on business principles
- E. For each of the constraints overcome, identify the activities that contributed to their resolution. Discuss how these activities might become part of a watershed strategy. These activities might include the following (illustrative):

- Training (e.g., training of Producer Groups in business principles, of farmers in soil and conservation techniques, of GOH Technical Cadres in watershed planning and management).
- Policy reform (e.g., changes in policy that conveyed co-management authority to rural communities, changes in policies that allowed financial institutions to work more directly with Rural Producer Groups, etc.)
- Institutional reforms (e.g., changes in policy and training that transformed GOH Technical Cadres from policemen to partners, etc.)
- Knowledge management and communication (e.g., experiences conveyed between farmer groups through farmer-to-farmer visits; radio and TV broadcasts that passed on various experiences, etc.)
- Tactics to build links between financial institutions and producers (e.g., provision of intermediary services, provision of a guarantee fund, training of both bank and Producer Group staffs, etc.)
- Tactics to strengthen links to export markets (e.g., trade fairs, internet searches, direct ties between producer groups and exporters or between producer groups and overseas markets, etc.)
- Infrastructure strengthened (roads constructed, roads protected from erosion, equipment provided, etc.)

*Additional questions for investigation:*

- What is the range of organic markets appropriate for Haitian products, small farm conditions of production, and organic certification requirements? Is there sufficient price incentive and demand to justify increased Haitian production for overseas organic markets?
- What is the growth potential for Haitian cacao as a sector?
- What is the range of marketable food crops or other cultigens that lend themselves to production in close association with tree crops?
- What is the potential for producing biomass for biodiesel or other local energy markets?
- What is the role of trade, particularly trade in fruit crops and forest products, in strengthening natural resource management on vulnerable hillslopes?
- What are the limits of market-driven tree crop expansion (biophysical, markets, capital constraints, opportunity costs, agricultural risk)?
- For sites that may not lend themselves to market-driven NRM strategies, suggest other practical options for their protection or sustainable use.
- Assess farm-level opportunity costs as a barrier to NRM investments.
- To what extent do price incentives favor erosion-intensive food crops over perennials?
- Identify lessons learned from scaling up in Maissade, Marmelade, and Bellefontaine). What is the prospect for building sustainable social capital around local microcatchment basins, e.g., setting and following rules. Is it feasible to organize farmers around watershed management, including co-management of public resources in protected areas?
- How can forest co-management activities be implemented so as to strengthen local investment in natural resources?
- Can capacity building among park and forest managers lead to stronger enforcement of protected areas containing Haiti's remaining forest fragments?

- What policy and institutional reforms are needed to create a more enabling environment for rehabilitation of denuded landscapes?
- What is the potential for GOH to be a stronger partner in scaling up watershed management initiatives. If there is potential, how could it be better exploited?
- Does investment in disaster early warning systems and disaster preparedness yield tangible environmental benefits?
- What special attention to dryland and mangrove ecosystems is needed to ensure their proper management and, in the case of mangrove, to ensure they serve a role in buffering against floods and similar natural disasters?
- Information on the charcoal value chain should be updated and assessed. Can the charcoal value chain be changed such that (a) the producers get a greater proportion of the final price and (b) a portion of the final price goes into a sustained-yield management plan for charcoal production, allowing “charcoal gardens” to be more productive and provide greater ground cover?
- Will introduction of more efficient charcoal-burning stoves reduce fuelwood use?
- Would municipal land use planning reduce impacts of disaster and lead to reforestation or improved environmental conditions?
- Can family planning efforts yield environmental stabilization outcomes in areas where population pressure is a factor in vulnerability to natural disaster?
- How could resources and vested interests of the diaspora (e.g., absentee landholdings) be effectively mobilized in support of enhanced NRM?
- Propose criteria for using public works versus voluntary NRM strategies. Characterize public works approaches that do not distort the incentive system.
- For adequate vulnerability assessment at a national level, it would be extremely useful to develop more detailed information on the location and amount of large blocks of state land, their legal status and boundaries, the approximate number of leaseholders and other users, and the range of activities on such lands, especially unassigned commons.

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## ***ANNEX A. A STRATEGIC OBJECTIVE FOR WATERSHED STABILIZATION***

### **Overall Recommendations**

These overall recommendations are offered as a complement to the Illustrative Results Framework below.

*Link market-driven strategies more closely to watershed management.*

Restore the NRM side of the equation as originally envisioned in HAP program theory. This strategy should emphasize the inherent benefits of NRM in terms of increased production and revenues to farmers from the use and sale of NRM-based products. Link market-driven production to micro-catchments and macro-catchments, scaling up from NRM-related production on individual plots to neighboring plots and larger catchment areas.

*Continue to build on expanding markets for hillside producers.*

An overall lesson was that options and incentives exist for farmers today that did not exist ten years ago. Robust export and domestic markets were an important limiting factor. Continue to build on both export and domestic markets, including sub-regional markets such as the Dominican Republic. Continue to work with exporters. Expand work with producers and exporters for processing and other value-added steps.

*Broaden and intensify development of democratic, business-based producer groups.*

Help producers to make their groups more effective in marketing more and higher quality products, accessing commercial capital, negotiating with outside parties, gaining a higher proportion of the value chain, adding value, stabilizing hillsides, and advocating for themselves. Provide assistance to strengthen these groups organizationally (accountable and representative leadership, transparent operations, effective and competent management of their operations, etc.) and in their business management (decisions according to business principles, responsibility for the costs of their operations, etc.). Help them gain legal status. Assist producer groups to help their members “farm like a business.” Promote member farmer visits to farmers in other regions. Consider together with producer groups the possible costs and benefits of subregional or national confederations.

*Broaden and intensify partnerships between producer groups and the private sector.*

Help producer groups negotiate directly with private sector buyers and commercial lending institutions (e.g., Fonkoze). Help private groups provide business service assistance and technical assistance to producers and Cooperatives. Provide intermediary services that help to build confidence and good working relationships between producer groups and private sector institutions.

Examples of intermediary services the SO contractor could provide would be to assist producer groups to prepare bankable loan applications, and to bundle their loans.

These services should reduce risks to both the borrower and lender without distorting the market prices of capital. They would only be provided for the first several loans.

*Intensify and broaden support to producers and communities who invest in NRM that both increases revenue and stabilizes hillsides.*

Catalogue and categorize experiences in Haiti and elsewhere where relevant investments have been made. Assess the various incentive mechanisms that have been used and ensure that relevant parties are aware of the outcomes of each. The relevant parties would be the GOH, other donors and NGOs, and producer associations. In addition to producer investments in tree crops (particularly mangos, coffee, and cacao), identify other crops that would lend themselves to both revenue generation and hillside stabilization. Identify areas of strategic interest where there do not appear to be models for stabilization and revenue generation, and develop such models (e.g., drier uplands).

*Support GOH decentralization and a shift from NRM “policeman” to partner.*

Assist the Ministers of Agriculture and Environment as they modify and implement policies that devolve both authority and responsibility to producer groups and local governance. Provide training for GOH and private sector cadres as they acquire more professional technical skills. For example, help train Forestry and Park Service personnel assigned to co-management arrangements for park and forest resources. Help them to acquire skills in conducting forest inventories and developing and implementing sustained-yield management plans. As another example, help these Ministries conduct research and/or link them to International Research Institutions to address pest problems.

## **Illustrative Results Framework**

As per the Scope of Work for this assessment, the following sections provide illustrative design elements for a new Program. The elements include an illustrative SO and illustrative Intermediate Results within a Results Framework, indicators, activities, and illustrative language for an RFP, and an illustrative technical approach to watershed management (see graphic depiction of an Illustrative Results Framework at the end of the present annex).

The draft objective of this proposed contract is to ***“Increase incomes and reduce vulnerability to natural disasters through market incentives and landscape-level natural resource management.”***

Illustrative indicators: Revenues of Producer Groups in targeted area; Erosion rates in targeted areas; Percent increase in agricultural crop revenue, Percent increase of farmer’s share of market price; Distribution of revenues within Producer Groups.

Key Intermediate Results (IRs) to achieving the SO:

- a. *“Broad-scale investments in sustainable land management achieved in targeted areas.”* (Area under better management; % of targeted areas with at least one microcatchment treated; % of contiguous field gardens treated in targeted area)
- b. *“Access to markets improved.”* (Value of produce marketed by targeted Producer Groups; % of sales in export and local markets; % increase in revenues from targeted commodities sold in local markets)
- c. *“Democratically-based, business-run Producer Groups strengthened”* (% of Producer Groups with (a) democratically-produced bylaws; (b) regular elections and competing candidates; (c) regular membership meetings; (d) open access to information, (e) business plans, (f) accurate reporting of expenses, profits, and losses, (g) viable business activity, (h) representative and accountable leadership, (i) xx% literacy, (j) open books; (k) % of market prices negotiated.)
- d. *“Access to capital increased”* (Amount of loans to targeted Producer Groups)
  - i. *Confidence of Financial Institutions increased* (% increase of loan portfolios of targeted Financial Institutions serving targeted Producer Groups)
  - ii. *Intermediary Services effective* (% of defaulted loans; % of Producer Groups that ‘graduate’ within three loans from having the guarantee fund used—i.e., these groups may still get TA, training, intermediary services, and loans, but the loans through the producer group may not be covered under the guarantee; % of timely repayments)
  - iii. *Reliability of targeted Producer Groups as commercial bank clients strengthened* (% repayment rate; % of Producer Groups receiving repeat loans; times guarantee fund used)
  - iv. *Effectiveness of Producer Groups strengthened* (% of loans approved; % of loans negotiated without Intermediary Services provided)
- e. *“Authority and responsibility for Producer Groups to manage or co-manage protected area forest resources strengthened”* (Number of Producer Groups that sign management or co-management contracts with the GOH)
  - i. *Resource-use policies reformed* (Policies allow local management or co-management under a contract based on an approved management plan)
  - ii. *Technical assistance cadre strengthened in Forest and Parks Management Sector* (% of cadres trained by the program that receive requests for service from Producer Groups or others; % of cadres qualified by the GOH to conduct inventories and develop sustained-yield management plans)
- f. *Availability of qualified TA increased in horticultural subsector* (% of Producer Groups requesting TA; number of grafters and other service providers earning income from provision of services; TA provided to producers independently of the project)
- g. *“Access to improved technologies and varieties increased”* (% of targeted Producer Groups that use improved technologies and varieties)

- i. *Research system strengthened* (Number of research products adopted by producers)
  - ii. *Extension system strengthened* (Percentage of messages taken up by producers)
- h. *“Effective Knowledge Management System established”* (% of targeted groups using KM system in decision making; % of targeted groups aware of innovations elsewhere)

Other important IRs will be necessary but do not appear to require the urgency of the above list, for example:

*Access to equipment and inputs increased* (% of targeted Producer Groups using improved equipment or inputs)

### **Illustrative RFP language: Instructions to Offerors**

In achieving the contract objective, the contractor shall undertake various activities necessary to accomplish the following “intermediate results (IRs):

- a. *“Broad-scale investments in sustainable land management achieved in targeted areas.”* The Contractor will work with collaborating Producer Groups in targeted areas to plan and implement treatment of microcatchment and macrocatchment areas. The Contractor will propose criteria for selecting Producer Groups and approaches for helping Producer Groups to organize on a microcatchment and/or macrocatchment scale. The Contractor will also propose an approach for negotiating an incentive system with Producer Groups. (The Contractor is free to suggest an approach that includes cost-sharing, particularly on the longer-term investments. Examples of how this has been achieved elsewhere are in Annex xxxx. The approach will be firmly rooted in the principle of producer investment in NRM due to its inherent benefits in terms of increased revenues and more favorable risk management.)
- b. *“Access to markets improved”.* Activities to achieve this IR would be similar to those currently carried out under HAP with particular attention paid to value-chain analysis, non traditional export crops, marketing from the “less-favored” areas, domestic markets, charcoal markets, and markets for forest products. The contractor will also develop a proposal for working with appropriate partners to improve infrastructure such as roads and market centers. The contractor will work with Producer Groups and marketers to improve the quality of the produce with an eye toward getting premium prices.
- c. *“Democratically-based, business-run Producer Groups strengthened.”* The contractor will help Producer Groups manage agricultural and natural resources management activities like a business. They will provide hands-on business and organizational training to Producer Groups in targeted areas in the context of these groups running agriculture and NRM-based enterprises. If necessary, the contractor will provide literacy and numeracy training. The skills developed would

include, *inter alia*, transparent management practices, participatory organizational structures, literacy and numeracy, bookkeeping and accounting, cost:benefit analyses, assessment of investment options and risk management, and development of business plans and bankable loan applications. The Contractor, working in collaboration with relevant GOH entities and other partners, would assist the Producer Groups to become legal entities.

- d. *“Access to capital increased”* The contractor will help Producer Groups gain access to commercial loans by taking actions to achieve the following intermediate results:
  - i. *Confidence of Financial Institutions increased.* The contractor will manage a guarantee fund that covers xx% of the a Producer’s Group initial loan, yy% of the second loan and zz% of the third loan. The contractor will also provide Intermediary Services that includes helping the financial institution assess loan applications.
  - ii. *Effectiveness and reliability of targeted Producer Groups as commercial bank clients strengthened.* In addition to helping Producer Groups develop loan applications, the contractor will provide other advisory services that will help Producer Groups to market the loan request and to manage credit. These services will be provided in the course of the Producer Groups securing loans. As such, it is anticipated that Producer Groups would be able to require a decreasing amount of assistance in the second loan and would require only advisory services by the third loan.
  - iii. *Reforms of laws that make it difficult for Producer Groups to receive services of commercial financial institutions.*
  
- e. *“Authority and responsibility for Producer Groups to manage or co-manage forest resources strengthened”* The Contractor will provide services to both the responsible GOH institutions and Producer Groups in collaborative management of forest resources. The Contractor will work with GOH Institutions and Producer Groups to form collaborative relationships wherein benefits and responsibility are shared.
  - ii. *Resource-use policies reformed.* The Contractor will assist the GOH institutions to develop policies that allow for legally-recognized Producer Groups to enter into contracts with the GOH to manage or co-manage forest resources. The plan would allow for sustained-yield harvesting as well as forest management activities. (Under the contract the GOH would maintain authority over the management of the forest and would be responsible for ensuring that the Producer Group was following the approved management plan. Neglecting to follow the approved management plan would result in the Producer Group losing their rights to harvest.)
  - iii. *Technical assistance cadre strengthened in Forest Management Sector.* The Contractor would provide any training necessary to strengthen the Forest and Park Service cadres in carrying out forest inventories and management plans. This training will include landscape-level planning and implementation of those plans. The training would also strengthen the outreach capacity of the Services.

- f. *“Availability of qualified TA increased in horticultural subsector.”* The Contractor will provide training to producers and others in tree crop improvement and in soil and water conservation measures. This will include grafting and nursery care.
- g. *“Access to improved technologies and varieties increased”* The Contractor will work with the GOH and other partners in strategically improving technologies and varieties that most urgently respond to the needs of producers in meeting the market opportunities. This will include supporting applied research focused on overcoming constraints to increasing productivity and improving quality of the produce.
- h. *“Effective Knowledge Management System established”* The Contractor will work with the GOH and their other partners in (a) identifying and assessing innovative experiences across Haiti (“Stocktaking”), (b) holding broadly-participatory fora to discuss the innovations and constraints to their spread, (c) forming Communities of Practices that allows people with common interests (e.g., producer groups, providers of TA, etc.) to join ideas and forces; and (d) developing a data base of innovations, experiences and knowledge that would be generally accessible through a website.

## **Illustrative Technical Approach to Watershed Management**

In addition to addressing the constraints discussed above, the contractor will also establish and implement a plan to stabilize hillsides at a watershed scale. Following is an illustrative approach that the contractor would follow and/or critique in its proposal.

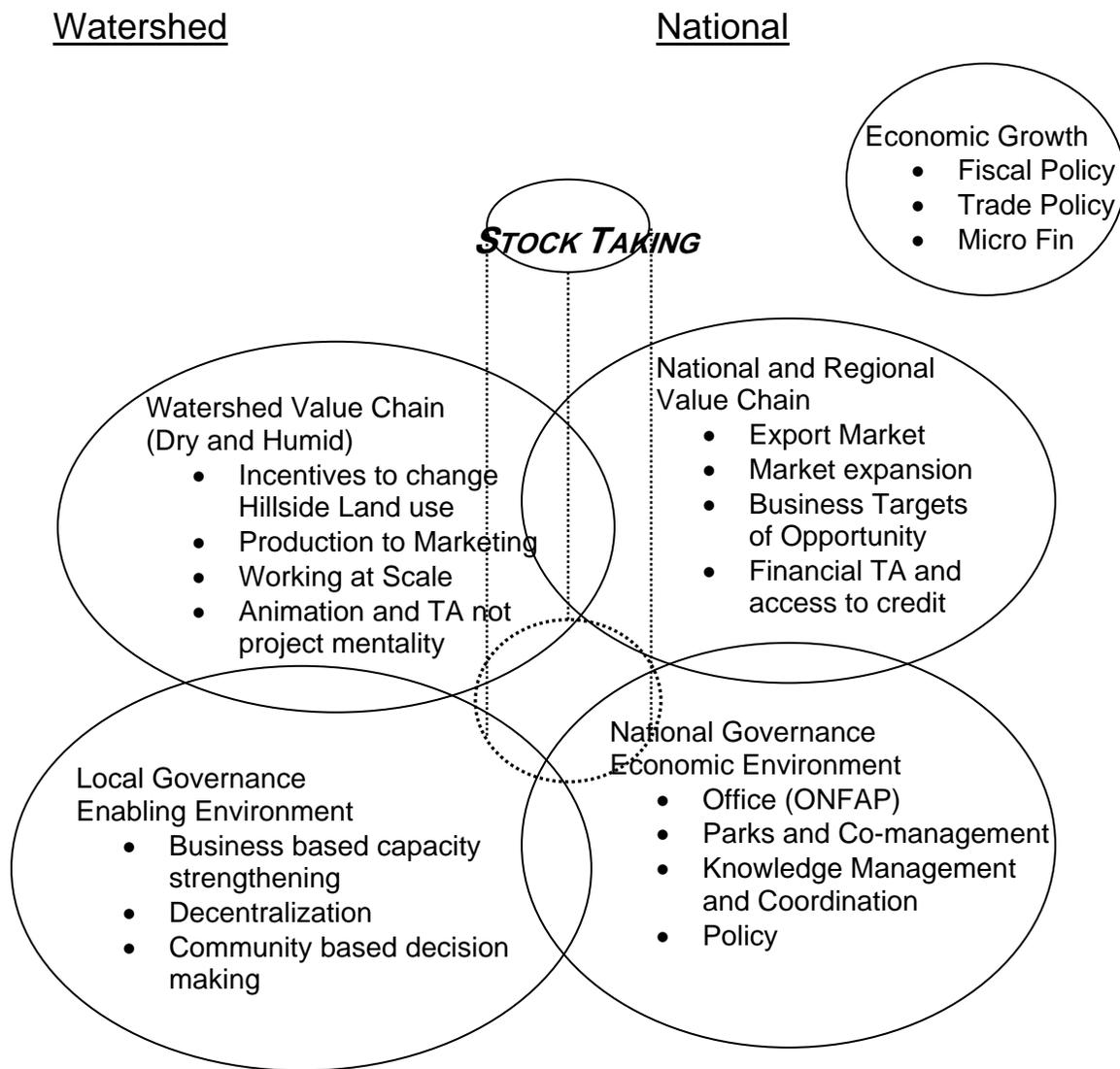
**Strategic Objective:** *“Increase incomes and reduce vulnerability to natural disasters through market incentives and landscape-level natural resource management.”*

### **Land Use Incentive System (LUIS)**

LUIS works at both national and local levels – two distinct but interrelated scales of activity around a central focus that promotes collaboration and the spread of market based ecological and economic change (see graphic depiction below).

1. **Enabling Environment and incentives at the more diffuse national level.** This scale builds upon access to a wide range of markets, including building on HAP efforts at export markets, and a new emphasis on local and regional markets. Opportunities and investments with high and widespread returns will be targeted and exploited to the fullest extent. Additionally, improving the enabling environment via government and private institutional capacity building will be undertaken, as well as financial sector support, technical assistance, and intermediary services.
2. **Focused effort through incentives at the watershed level.** Natural capital, responsible land use decisions, and environmental security will be built in the targeted watersheds by use of incentives at both local and macro scales designed to encourage self-replication that will result in a landscape level

3. **Stocktaking.** The reiterative process of stocktaking, fora to share knowledge, and then the proper management of that knowledge is an essential part of any program that desires to have large-scale impact. This stocktaking process occurs continuously and at all physical scales: farmer to neighboring farmer, to watershed, cross-watershed level, and national levels. This is essential for the organic spread of technology and agro-ecological systems because no donor or government can pay for the restoration of all Haitian watersheds. This process will be catalyzed by coordination among donors, government, and regions, and will build off of the current CCI framework.



## ***Geographic Coverage***

**Priority watersheds.** Twenty-five of Haiti's 30 major watersheds are almost devoid of cover. MARNDR has selected 13 watersheds as priority. Selection must include at least one humid area watershed and one dry area watershed.

Haiti has many and diverse ecological zones (see Annex C for Holdridge Life Zones of Haiti). Many of these zones exist in micro-climates that can change from one ravine to the next; however, the country can be roughly divided into the humid zones, the majority of the country, and drier zones. The primary criterion for the selection of targeted watersheds is the Offerer's justification based on the perceived conditions that will lend themselves to incentivising landscape change in land use, vegetative cover, hydrological function, and rural incomes.

Conditions to consider:

- Size of watershed and ability to manage programs and focus efforts
- The watershed should be at least a 3<sup>rd</sup> or 4<sup>th</sup> field watershed to have a landscape level impact; however, very large or politically complex systems such as the Artibonite should be avoided.
- Existence of capacity that will allow the attainment of Landscape scale and likely spread to neighboring watersheds
- Existing market linkages both locally and regionally and for export
- Existing agro-processing or other private firms
- Existence of "large" landowners or other conglomeration of holdings
- Socio-Political situation in the watershed
- Presence of lower river communities that could interact with the upper watershed, especially in irrigation management.
- Existence of other USAID sector programs
- Existence of other donor or NGO programs and how the project will work with the other programs
- The degree to which a local "project mentality" would serve as a constraint to the spread of technologies and local responsibility

**Linking Uplands and Lowlands.** Unlike farming on flat lands, soil conservation interventions on sloping lands must be planned, designed and implemented on a watershed basis under various levels of resolution, depending on the size of the watershed and catchment in question. The drainage pattern of a watershed, large or small, forms the framework of energy flow and nutrient cycling within the landscape unit. If planning does not occur at the watershed level, activities on a smaller planning unit (eg, a farm or field, or microcatchment) could be undermined by events outside the project's control.

These issues call for the development of a GIS for the targeted watershed. Data would be used to study the interrelations of land use, settlement patterns, cropping patterns, water flows, and conservation structures. Additionally, an up to date biophysical and social baseline is essential for planning the design and focus of any project as well as monitoring changes and the overall results

Opportunities to link upper and lower parts of a watershed include the following:

- Water for lower watershed irrigation works
- Access to water for household use
- Roads and connections to markets
- Rural-urban movements, access to schools, labor supply and demand

**Drylands.** In seeking more robust markets, HAP logically focused on more humid zones with fewer production challenges. This SO will continue to work in humid areas but will also extend the area of support to drier areas including portions of current HAP zones of operation as well as new zones both dry and humid. In the first phase of the SO, a criterion for selecting new dryland sites would include the potential to grow marketable products at sufficient volume to justify the development and support of a Producers Association.

One anticipated challenge to expanding mango production to drier zones will be the establishment of mangos during the initial rainy season. Consequently, while the SO will continue to strengthen markets for mangos and other crops, its activities will be expanded to include the provision of technical assistance to help producers establish mangos in drier zones.

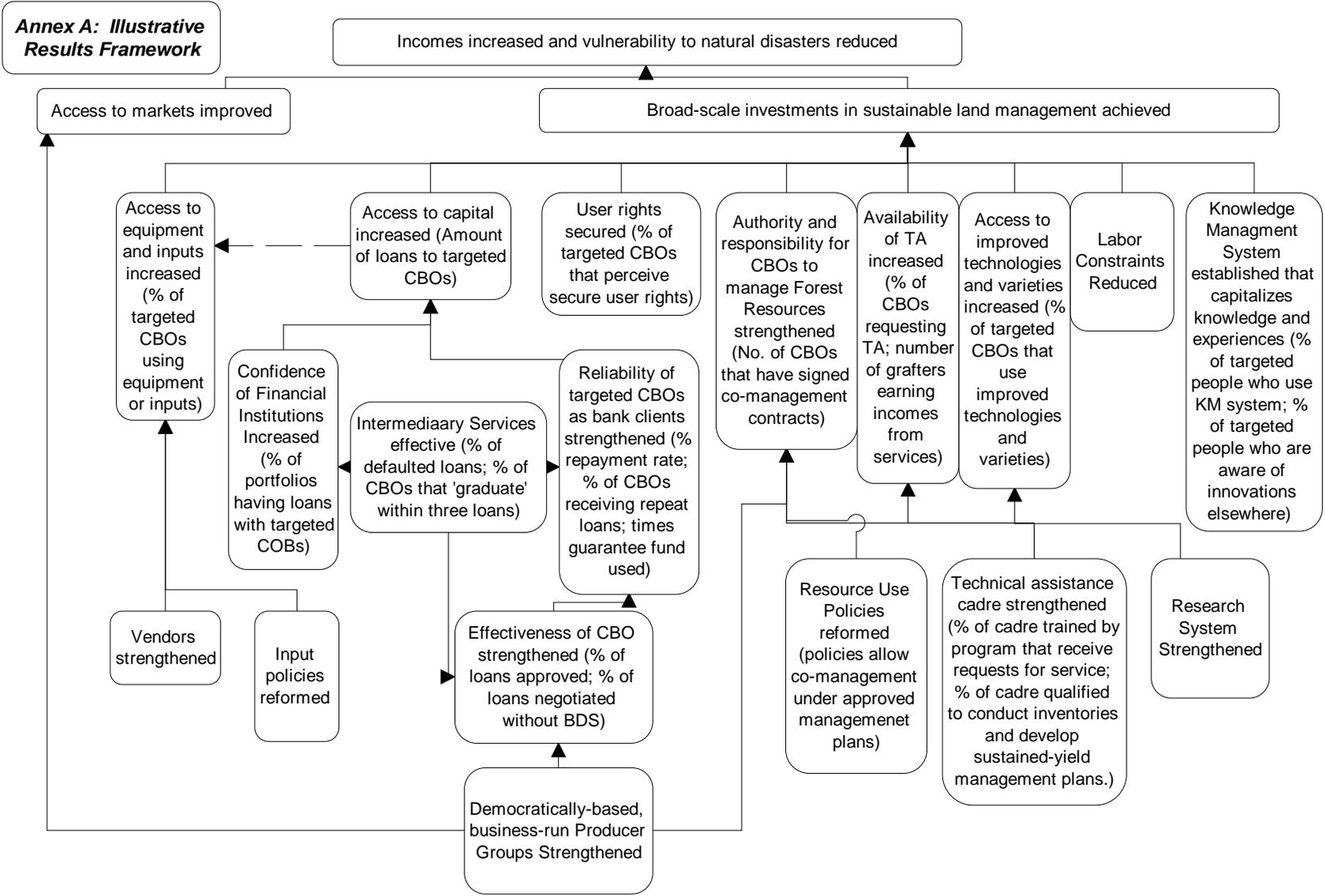
As the SO builds on its existing base of success and makes headway with mango production in both dry and humid zones, it will work with producers to try other remunerative and stabilizing crops. Illustrative examples include livestock and fodder (in areas with high demand for dairy products), pigeon peas, cashew trees, apiculture, *Prosopis juliflora* and other fast growing and multiple use hardwoods, a range of fruit species including citrus fruits and oils, micro-irrigation and water harvesting, neem, castor and *Jatropha*.

The mango market also lends itself to piggybacking other products onto the now well-established market chain for (a) mango exports and (b) heightened demand created by new factory scale processing of mangos and other commodities produced by Haitian smallholders on slopes. This includes non-traditional export commodities that HAP has market tested, e.g., *ignames*, taro, peppers, and the tropical pumpkin.

### ***Agriculture and Hillside Stabilization***

A major challenge to hillside stabilization is the gap between the short-term financial needs of farmers and the mid to long-term requirements for establishing vegetative cover or terraces. In the past, incentives such as cash or food-for-work were given to meet the short-term needs of farmers as they constructed walls or contour hedgerows or planted trees. While external incentives were often useful to introduce new technologies, such technologies have often proved to be unsustainable. Consequently, in order to have an impact on watersheds, new programs should use strategies based on the inherent value of conservation structures rather than artificial incentives, including options such as the following:

- *Hillside plantings of mango, cacao, and coffee systems.* The dominant trend has been to cut back coffee and cacao trees and their accompanying canopy in order to plant annual crops. In some areas there are counter-trends in response to changing markets. Consequently, there are greater chances than before for farmers to reestablish these trees on vulnerable lands. This could be encouraged by ongoing promotion of high-quality markets, distributing improved varieties of stock, and finding a solution to pests such as “escolit” (a coffee pest) and “maroka” (a yam pest).
- *Gully Plugs.* Strategically, gully plugs are important. First, they are an initial line of defense on a hillside system. Secondly, they often provide farmers with a pocket of productive land within a rainy season. Once farmers have these pockets, they invest in their maintenance. To make gully plugs more attractive, consider the FAO approach that works with groups of people in planning collaborative actions at a catchment basin level.
- *Bann manje* (crop band). This hedgerow technique has become popular because it provides crops in the first year. The program should explore ways to make it more attractive by making available planting stock of improved varieties of pineapple, cane, etc.
- *Perennial hedges of trees or forage grasses.* Multiple purpose hedges of wood or grass have been popular in Haiti, especially those where the plant can take by cutting. This could be linked to distribution of livestock.
- *Contour lines with stone and rocks.* These often required payment or remuneration of some sort. While they often provide people with additional natural capital and people often repair them when they are damaged, people tend to put their labor and other resources elsewhere unless compensated. Consequently, these would get lowest priority.



## **ANNEX B. STRATEGIC CHOICES BY AGRO-ECOLOGICAL ZONE**

Following is a summary of the findings from an USDA team (1996), *Observations of Natural Resource Conditions*.

The following is a hierarchy of best use watershed conditions based on the 1996 multi-agency assessment team including a 2-day aerial reconnaissance of selected watersheds. The need and feasibility of a system to manage rainfall and runoff would require additional on-site surveys to evaluate actual conditions and identify specific components of an effective water management system.

Zones 1 through 4 are characterized by slopes and mountains, the largest portion of Haitian land. Multiple forms of tree cover and land uses are well suited to this type of land.

### **Zone 1. Reclamation Zone**

- Landscape severely degraded, very steep slopes, extensive areas of exposed bedrock, very shallow soils, vegetative cover sparse to nonexistent.

- ◆ *Recommend re-establishment of forest ecosystem.*

### **Zone 2. Transition Zone**

- Landscape moderately degraded, steep slopes, some exposed bedrock, shallow soils, vegetative cover limited to low growing grasses and shrubs. It appeared that sustainable annual crop production was neither economically nor technically feasible.

- ◆ *Recommend perennial crops such as tree crops and cut and carry grasses.*

### **Zone 3. Hillslope Agriculture**

- Limited landscape degradation, slopes moderate to steep, soils moderately deep, vegetative cover ranged from perennials such as shade grown coffee, cocoa, citrus, and mango to annual food crops such as congo beans, cassava, and sweet potatoes.

- Characterized by a wide range of existing watershed conditions which appeared to be influenced by historical crop production, amount of external inputs, and level of farmer education.

- ◆ *Recommend appropriate agronomic practices or a combination of structures, agronomic practices, and perennial cropping to provide for sustainable agricultural production.*

#### **Zone 4: Gully Agriculture**

These zones have been restored to high productivity and nearly level lands by the use of gully plugs and living barriers. Soil accumulating behind these structures allow for intensified agriculture.

◆ *Recommend high value deep rooted or erosion prone crops (yams, taro, beans, maize), in association with other high value perennials (plantains, bananas, fruit trees).*

Zones 5 and 6 deal with Haiti's lowland plains. Plains areas are much less common but potentially the most productive of Haiti's lands. They are best used for non-forested production activities.

#### **Zone 5: Irrigated Plains**

- Functioning irrigation systems with diversion and distribution system intact and utilized, or dysfunctional irrigation systems with remnants of diversion system visible and some water distribution evident.

- Strong interest by MARNDR to improve water yield and utilization by constructing water storage structures in the catchment area to augment stream flow and lengthen the duration of the irrigation season.

◆ *Recommend a combination of improving the infiltration rate/water holding capacity of the catchment area, protecting and/or improving diversion structures and distribution system, and encouraging optimum conditions at the field level for both plant production and soil protection.*

◆ *Additional on-site investigations are needed to evaluate the feasibility of constructing water storage structures.*

#### **Zone 6: Dry Zone Plains without Irrigation System**

These areas appear to have less precipitation than the irrigated plains. The ratio of catchment area to plains area is less than one to one. The combination of low rainfall and small catchment area indicates the need for additional on-site evaluation.

- ◆ *Creation of Water harvesting and management business coops*
- ◆ *Establishment of small scale irrigation*
- ◆ *Cut and Carry Livestock operations*
- ◆ *Fruit tree and forage living hedge hillsides*

## ANNEX C. HOLDRIDGE LIFE ZONE CLASSIFICATION

Holdridge devised a classification of indigenous life zones of Haiti in the 1940s. These life zones constitute a priceless point of departure for understanding the Haitian environment, and the agro-ecological potential of Haiti's highly diverse landscapes that vary immensely within short distances and a relatively small land mass (28,000 square kilometers).<sup>20</sup>

1. **Subtropical Thorn Woodland:** Semi-desert conditions, 550mm of rain, xerophytic forest dominated by *Prosopis juliflora* and other dry species. This life zone is typical of the cacti formations of the northwestern peninsula. In the Northwest, this life zone includes relatively large blocks of unassigned state land that are sparsely populated, marked by open range grazing, and mined for wood resources.
2. **Subtropical Dry Forest:** *This is Haiti's second largest life zone and one identified by the Ministry of Agriculture as a high priority.* Under 400 meters in elevation, highly productive where soils are deep and irrigation available as in the Cul-de-Sac Plain near Port-au-Prince, has supported large sisal plantations and extensive stands of *Prosopis juliflora* (mesquite). Other areas of Subtropical Dry Forest are found along the southern coast, the Northwest, Northeast, and lower Artibonite
3. **Subtropical Moist Forest:** *This is the most extensive life zone in Haiti and supports the majority of small peasant farms and widespread cultivation of mangos and avocados.* The common association of avocados with mangos in this Life Zone suggests that avocados are an under-exploited market opportunity since this is the prime production zone for export quality mango Franisque. Characteristic trees include mahogany, tropical oak (*Catalpa longissima*), and royal palm. This Life Zone prevails on the Central Plateau and alluvial plains in the north, center, and south.
4. **Subtropical Wet Forest:** Calcareous soils. Covers low-altitude mountain ridges and small mountains along the northern and southern coasts of Haiti and portions of the Central Plateau. Supports coffee, cocoa, and rubber.
5. **Subtropical Rain Forest:** Lower altitudes of the Massif de la Hotte (southern peninsula), heavy rainfall but not productive for farming, under agrarian pressures and very susceptible to erosion.
6. **Subtropical Lower Montane Moist Forest:** Mountainous areas such as Kenscoff, 800-2000 meters in elevation. Well suited for cultivation of potatoes and other vegetables when using hillside conservation structures.
7. **Subtropical Lower Montane Wet Forest:** This zone includes most of the remaining pine forest in Haiti and should be protected and managed for sustained production of *Pinus occidentalis*.
8. **Subtropical Lower Montane Rain Forest:** Limited area in the high ranges of La Selle including pines and evergreen broadleaf forest.
9. **Subtropical Montane Wet Forest:** Similar to Life Zone number 8.

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<sup>20</sup> See L. Holdridge, *Life Zone Ecology* (1967), and also the AID Country Environmental Profile (1986, 28) for summary description of Holdridge Life Zones.