



USAID
FROM THE AMERICAN PEOPLE

CONSTRAINTS TO INVESTMENT IN PERRENIAL CROPS IN DEED WATERSHEDS

JUNE 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by DAI.

CONSTRAINT TO INVESTMENTS IN PERRENIAL CROPS IN DEED WATERSHEDS

Program Title: Développement Economique pour un Environnement Durable

Sponsoring USAID Office: USAID / Haiti

Contract Number: EDH-I- 00-05-00004-00

Contractor: DAI

Date of Publication: June 2009

Author: M.Bush, N.Hobgood, F.Pierre, M.Godfrey

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

CONTENTS

1. INTRODUCTION	5
2. FARM SYSTEM CONSTRAINTS TO INVESTING IN PERENNIALS	5
2.1 Constraints from a peasant farm system perspective	5
2.1.1 Risk management	6
2.1.2 Peasant access to land, labor, and capital	6
2.1.3 Land tenure and incentives	6
2.1.4 Classes of peasant farmers	6
2.1.5 Investment opportunities within the Haitian peasant farm system	8
3. CONSTRAINTS & DEED PRODUCTION THEMES	9
3.1 Constraints in relation to DEED-targeted production themes	9
3.1.1 Intensification of high value production on vulnerable hillside and valley systems	9
3.1.2 Intensification of high value production on irrigated plains with transfer of labor from hillside zones	9
3.1.3 Intensification of permaculture systems around habitations	10
3.1.4 Intensification of permaculture systems on potentially vulnerable hillsides	11
3.1.5 Milk processing and fodder cultivation	12
3.1.6 Promotion of commercial fruit trees	12
3.1.7 Development of apiculture	12
3.1.8 Development of aquaculture	13
3.1.9 Production of Jatropha	13
3.1.10 Production of dry land herbs and spices	13
3.1.11 Production of flowers for hotel markets and export	13
3.1.12 Development of sustainable woodlots	13
4. OTHER FORMS OF NON EROSION GROUND COVER	14
4.1 Fallow land	14

1. INTRODUCTION

The DEED project is based on the idea, born out from the experience of previous USAID projects including the Productive Land Use Systems (PLUS) and Hillside Agriculture Program (HAP), that improved management of natural resources in vulnerable watersheds requires as a precondition that farmers in those watershed receive increased returns to agricultural production in order to justify investments in soil conservation or changes in harmful agricultural practices that contribute to soil erosion.

Rather than starting from a premise that is based on an external actor's judgments about "what the land needs," DEED's approach starts from the standpoint of the farmers in the two targeted watersheds by asking what do they require in order to raise their agricultural incomes in a way that will improve the management of natural resources such as soil, water, and trees.

In practice, this requires the introduction of new crops, infrastructure investments, training in new technical packages and the establishment of market linkages—all of which must be planned and tested with the participation of farmers to demonstrate that they will actually lead to increased revenues.

This report discusses the principal constraints facing farmers in DEED's target watersheds in Limbé and Montrouis with regard to investment decisions involving longer term commitments of land and labor, and the role that insecurity (particularly formal land tenure) plays in shaping those decisions. Two perspectives inform the following discussion of constraints to establishing perennials: (i) constraints built into the overall Haitian peasant farm system as it presently functions, and (ii) constraints to farmer investment in specific types of perennials targeted by DEED.

2. FARM SYSTEM CONSTRAINTS TO INVESTING IN PERENNIALS

From the standpoint of local farmers, what constraints do they confront in order to expand production of perennials, and by extension, to reduce land area devoted to erosion-intensive annual crops on fragile slopes and the upper watershed?

2.1 Constraints from a peasant farm system perspective

Peasant farmers are not subsistence farmers. They invariably produce for the market as well as household consumption. Most farmers (80% of farm households) are poor and produce less than the minimum necessary to support household needs. All peasant households purchase

food items and other basic necessities that require expenditure of scarce cash. Therefore most peasant households depend heavily on the sale of annual food crops whose production tends to be more evenly spread out during the year compared to perennial crops such as coffee, cacao, and mangos.

Peasant reliance on annual food crops to meet petty cash requirements is a significant constraint to expanding land devoted to perennials, particularly in an economic context where the price of food crops has tended increase at faster rates than perennial export crops, and also where the prices of export crops have tended to be highly unstable over time. This situation favors food crops for the local market as the primary focus of peasant production.

2.1.1 Risk management

With such a large percentage of small farmers living on the margins of survival, peasant farming overall is more strongly oriented to minimizing risk rather than maximizing gain. The need to manage risk tends to promote a diversity of holdings and tenure arrangements in order to spread around the risk. Different plots within the same farm unit are located in different micro-agronomic zones and managed in different ways. Well-watered highlands tend to have more land devoted to perennials, and a greater diversity of cultigens. Arid slopes tend to have more extensive (and less intensive) cropping strategies, fewer crops, longer periods of fallow, fewer planting seasons, and a greater reliance on grazing and commodity storage during slack seasons.

One of the risks to peasant farming on slopes is the seasonal frequency of major storms. Storm damage to perennials has engendered a shift away from perennials such as coffee groves to greater reliance and more land area devoted to destructive annual food crops.

2.1.2 Peasant access to land labor and capital

Capital is by far the scarcest of the peasant household's production factors. Capital shortages are a significant constraint to peasant production and tend to foster destructive land use practices. Labor is the least scarce factor of production while land is the pivotal factor. As the most significant form of peasant wealth, land is readily bought and sold. Since land changes hands easily, there may be some disincentive to invest in perennial crops except as a long-range investment strategy among better off peasant farmers. On the other hand, land with economically productive perennials tends to sell at higher prices, which provides some incentive to plant trees or other economically productive perennials.

2.1.3 Land tenure and incentives

The predominant feature of peasant land tenure is its mixed character. Farmers generally work several plots under several different modes of tenure, simultaneously renting, sharecropping, owning and renting out land. Furthermore, peasant land tenure is characterized by a dual system of formal, legal tenure as well as holding land by custom in ways neither provided by nor excluded by law.

The varied character of land holding affects agricultural decision-making. The relative security of a plot clearly affects the farmer's willingness to invest in perennials or build costly earthworks for soil conservation. Where land is not owned outright by those who work it, as is the case with a significant percentage of fragile hillsides, there may be positive incentives for farmers to overexploit plots under only temporary control. On the other hand, the much discussed general climate of insecurity of tenure in Haiti may neither be as widespread nor as amenable to legislated, externally imposed solutions as is commonly suggested.

While customary arrangements for access to land may not be defensible in a court of law, these same customary arrangements serve to protect a farmer's long term access to land. Field studies suggest that *long term access to land*, whether by customary arrangements or formal legal title, is the pivotal factor in peasant willingness to invest. Long term access to land in DEED watersheds is based at least as much on a farmer's special ties and obligations – a kind of personal social capital – as it is on formal, updated title to land.

For example, in Délugé (Montrouis), small farmers rent land from a large landholder (Nadal), including land in irrigated areas. Some farmers have rented plots of land from the Nadal family for many years and have shown a willingness to plant perennials such as mangos and breadfruit – due to their family history of long term access to these rented lands. Similar arrangements apply to state leaseholders on *domaine privé de l'état* in both watersheds, i.e., such state leaseholders are subject to annual payment of rents to the tax office but have proved willing to plant perennials such as coffee-shade-fruit groves (e.g., Bassin in Marmelade). Nevertheless, there is heightened risk to expanding perennials on lands held under state leasehold.

In Montrouis and the Matheux highlands, most small farmers reportedly rely heavily on inherited land dating back to land grants from the early years of independence. These lands have long been subject to disputes especially in Piatre, Léger, Ti-Bois, Fond Baptiste, 5^{ème} Délices, and Delpêche. In some areas, customary arrangements for mediating land disputes include longstanding land committees composed of the heirs to original land grants, including for example the representatives of literally hundreds of heirs who presently farm an original land grant of 547 *carreaux* (424 hectares) in Ti-Bois and 100 *carreaux* (129 hectares) in Léger.¹ This

¹ See DEED baseline study (Aprilo 2008) of Montrouis watershed (Chapter 4, Le Foncier).

system appears to work well at present, but the area of Montrouis retains a heightened risk of land disputes, and this is a possible constraint to fulfilling DEED objectives.

2.1.4 Classes of peasant farmers

The Haitian peasantry is not a single homogenous class. Variations in peasant economic status are reflected in highly differentiated relations to the market, different landholding patterns, and varied cropping strategies. Wealthier peasant families generally have greater access to savings. These families are more likely to invest in land, livestock, and perennials. Wealthier peasants are generally more oriented to perennial and exports crops and can afford both the higher capital inputs and the lag between investment and return on investment required by perennial crops.

Poor peasant households also rely primarily on private land. Most of the rural poor in targeted watersheds are not, for example, landless sharecroppers. They are more likely to be small landowners who supplement farm income by occasional or seasonal day labor and petty commerce. Overall, the vast majority of peasant families are landowners; yet the majority of them are also land poor. To a large extent, the primary land related limitation on broader establishment of perennials is not so much land tenure insecurity as it is the prevalence of undersized land units that are economically non-viable and emphasize erosive annuals and other non-sustainable agricultural strategies.

2.1.5 Investment opportunities within the Haitian peasant farm system

Despite farm system constraints noted above, there are certain points of entrée that tend to favor perennials. These include small farm reliance on the market, mixed cropping strategies, and indigenous agro-forestry associations. Therefore, DEED seeks to build upon such traditional practices with a view to expanding perennial-based production – and expansion of farmer revenues – based on more productive use of what farmers already do. These practices are taken into account in targeted DEED production themes. Opportunities within the traditional peasant farm system include but are not limited to the following:

- traditional patterns of planting trees and other productive perennials in the immediate environs of the house-and-yard (*lakou*), other nearby gardens (*jaden prè kay*), and humid ravines or humid slopes;
- restoration or expansion of traditional agroforestry associations such as coffee/fruit/shade trees/*igname*;

- expansion of high value perennial crops such as mangos through grafting and establishment of tree groves or tree gardens rather than relying on widely spaced or individual trees;
- tree-enriched and improved managed of fallow, especially in drier zones that rely on slack season harvest of wood and charcoal including coppicing species such as *prosopis juliflora* (mesquite, called *bayahonn*);
- special attention to the cash flow requirements of the agricultural calendar, including more efficient storage of commodities in keeping with peasant requirements for *stores of value* (e.g., beans, dried coffee, tubers stored in the ground) and other forms of savings, such as livestock;
- improved techniques and germplasm enabling off-season or extended season production of high value commodities for the internal market;
- production for new markets with higher price incentives such as the Dominican Republic, including high value perennials such as avocados;
- alternative employment including value added opportunities for transforming hardy local crops that tend to be underutilized, such as breadfruit (Montrouis), and increased slack season employment to generate scarce cash and fill the gap between harvests;
- special attention to recruiting the upper economic tier of small farmers, and also absentee landlords with heightened incentives for expanding perennials, and a greater tolerance for the extended time frames required;
- carefully calibrated introduction of new products or new agro-forestry associations or packages that build upon traditional practice and small farm scales of production.

3. CONSTRAINTS AND DEED PRODUCTION THEMES

The peasant farm system framework presented earlier is applied below to specific categories of perennials or packages identified by DEED as Targeted Agricultural Production themes for DEED watersheds. The following discussion is also informed by recent field interviews with farmers in both targeted watersheds.

DEED staff and local partners targeted agricultural production themes based on the following criteria: (i) known market demand, (ii) improved NRM practice, and (iii) small farmer and producer group capacity to implement proposed technical and commercial packages. See the

recent report entitled, “DEED Targeted Agricultural Production: Market Linkages and Constraints Assessment.”

3.1 Constraints in relation to DEED-targeted production themes

3.1.1 Intensification of high-value production on vulnerable hillside and valley systems

Especially bananas, hot peppers, onions, broccoli, lettuce, cabbage, carrots, tomatoes, and shallots.

This strategy might be called the Fermathe-Kenscoff model in which farmers are motivated by the market to invest heavily from their own resources in expensive inputs and conservation structures – because it pays. Constraints to establishing or expanding this model in targeted watersheds include the *high labor cost* of conservation works in order to establish this system on slopes – at far higher costs than the bean/corn/millet association it is designed to replace, and the *high cost of agricultural inputs* including fertilizer and seed stock, again far more expensive than corn and bean seeds planted on unprotected slopes, and *high transport costs* to carry bulky, perishable vegetables crops to major urban markets.

Also, historically, the Fermathe-Kenscoff vegetable strategy had benefited from (i) significant outside investment in crops and conservation structures, and (ii) and many years of agricultural extension services from both public and non-public sources that targeted conservation-based vegetable production in the Fermathe-Kenscoff area – not far from the most important vegetable markets in the country. These factors are potential constraints in that DEED, a time limited project, does not have the luxury of offering a lengthy and expensive phase of agricultural extension services to vegetable farmers.

3.1.2 Intensification of high-value production on irrigated plains with transfer of labor from hillside zones

There is evidence from recent field interviews that lowland irrigation systems serve as labor magnets for underemployed farmers, including upland farmers who seek seasonal work downstream, although these laborers do not necessarily come from vulnerable slopes within targeted watersheds. Field interviews also indicate that rates of pay for downstream agricultural labor must compete with the growing demand for unskilled labor in the Dominican Republic, especially among young men from upland areas in the Limbé watershed.

In sum, according to farmer interviews in irrigated areas, constraints to more intensive production include high labor costs, high costs for agricultural inputs, especially commercial fertilizer, and limited access to reasonable terms of credit. There is also a certain risk related to

land tenure arrangements, especially in Montrouis, where irrigation works are commonly held by large landholders but worked by annual land renters, and also where there is a recent history of land disputes.

3.1.3 Intensification of permaculture systems around habitations in high altitude zones, including igname/coffee/cacao/fruit/timber associations

A potential constraint, or challenge, is the need to adapt the strategy to specific sites due to the range and variation in agro-ecological production strategies within watersheds. For example, the enriched *jaden lakou* strategy must take into account the different requirements of cooler highland areas of Montrouis (Fond Baptiste) that still include vegetable production along with coffee and fruit groves, versus drier mid-range zones (e.g., Ivoire) more reliant on grazing, dry climate cereal grains, charcoal production, and woodlots. This requires a more labor intensive and niche-based strategy for the project rather than a less demanding larger scale reliance on a single agronomic strategy.

Other constraints include the prospective high costs of upfront investment in nurseries and treatment centers, non-formal training and animation requirements for improved management, and insect (*skolit*) damage to coffee beans, and other pests and disease (*mayoka*, *malchabon*) recently identified by farmers.

In effect, the *jaden lakou* is also a logical starting point for introducing fruit orchards, similar in character to coffee groves. Constraints to doing so include small farmer reliance on multiple harvests of a range of crops in order to assure cash flow throughout the year, and a corollary reluctance for small farmers to rely primarily on the harvest of perennials. Another constraint is the small size of land units among smallholders. Farmers with more land are far more inclined than the land poor to invest in fruit orchards and woodlots.

DEED is proposing expanded production of *ignames* using living trees as vine climbers, and a higher density of fruit species such as high altitude bananas (*fig banann*), for which there is a growing market, and which can be used as vine climbers for *ignames*. This is a culturally appropriate strategy since it builds upon and enhances the value of what already exists, the *jaden lakou* or traditional house-and-yard garden. Furthermore, farmers note that tree based *ignames* tend to have extended periods of harvest and can be managed sustainably. According to *igname* farmers, constraints to sustainable *igname* production include high labor costs, disease, and a significant reduction in arable soils and soil depth.

Another constraint is reportedly a consequence of recent demographic trends. Farmers in Camp-Coq (Limbé) report that highland families are presently resettling downstream near major roadways. This tends to decrease *jaden lakou* in vulnerable highland zones, as such niches require a near constant presence, i.e., *currently inhabited house-and-yard compounds*. Farmers note as a constraint that *ignames* are more subject to theft if they are planted in distant

fields rather than around the house-and-yard. The up to downstream population trend may also tend to increase planter reliance on environmentally destructive production of beans on slopes, as beans can be farmed from a distance.

In the Camp-Coq area, farmers who rent land have less incentive to plant trees together with *ignames*, and are more inclined to use pole climbers, therefore a land tenure constraint. *Ignames* can grow well in association with living trees; however, *igname* seed stock is expensive, and tree based *ignames* require larger and more expensive seed stock, whereas small seed stock can readily be grown on pole climbers rather than trees. Secondly, tree based *ignames* are more labor intensive, and therefore require more expensive labor inputs than pole climbers. Thirdly, *ignames* may interfere with fruit tree production, e.g., oranges, and there is a tendency for competition between the *igname* tuber and the orange roots.

According to *igname* farmers interviewed, plantains and bananas work well as *igname* climbers; however, bananas and plantains may be choked by *igname* vines. Farmers took note of trees that do not suffer from *igname* association including mango, sucrin (*pwadou*), laurier, pomme rose, goyave, *Catalpa longissima* (*chenn*), and Sarman, noting that forest species are more compatible with *ignames* but slower growing than fruit trees. Furthermore, although fruit trees are more susceptible to damage from *igname* vines, they also produce harvestable fruit more quickly than forest trees are able to produce harvestable timber. In other words, tree climbers that do not produce a harvestable product within a shorter time frame are less valued.

According to coffee farmers interviewed, constraints to coffee production include storm damage to coffee groves and related tree cover including fruit trees, reduced coffee harvest due to disease, reduced population of highland coffee growers moving downstream in closer proximity to the national road, and increased highland reliance on pole *ignames* and livestock production instead of coffee groves associated with trees and *ignames*. Farmers also point to poor coffee management practices including the premature harvest of green coffee beans.

According to farmers, another important constraint to expanding perennials is free range grazing (*elvaj lib*) which destroys newly planted cacao and related trees, including tree-*igname* associations. Farmers point to loss during transport as a constraint to increased income from orange production. Farmers also point to credit shortage as a factor in expanding production of perennials, noting that they borrow money from madanm sara traders and reimburse such loans in kind (*ignames* at harvest time).

Land tenure arrangements also have an effect on the use of poles versus trees for *ignames*. Recent interviews with farmers in Camp-Coq indicate that short term land renters (*femye*) are far more inclined to use poles than trees for *igname* vines, a management strategy that significantly increases erosion. According to Camp-Coq farmers, other constraints to

igname/tree associations include uncontrolled grazing, especially during slack agricultural seasons, and the effects of severe storms on coffee groves and other related perennials.

3.1.4 Intensification of permaculture systems on potentially vulnerable hillsides.

This approach is particularly urgent in highland areas of the Limbé watershed (Marmelade), especially in heavily forested areas of the upper Rivière d'Oré. This sparsely populated area includes perennial field gardens as well as house-and-yard coffee groves. Bassin, which is more accessible, has significant blocks of coffee/shade/fruit trees on leased state land (*domaine privé de l'état*), including absentee leaseholders living in Marmelade, Gonaïves, Port-au-Prince or abroad.

Under absentee leasehold, de facto control over garden management commonly shifts to local farmers appointed as "managers" (*jeran*). The *jeran* system is a constraint as they do not appear strongly inclined to protect declining coffee groves. There is evidence from field observations that *jeran* are presently increasing the proportion of land area devoted to annual crops, including erosion-intensive *igname* production using poles rather than living trees.

The absence of an ongoing presence in distant field gardens is a significant constraint on establishment of high value perennials on vulnerable slopes, as farmers prefer to plant perennials and other high value crops near their residences in order to ensure security and closer management. Vulnerable slopes also tend to be more degraded than humid ravines or house-and-yard gardens, and therefore not worth investing in high value perennials or conservation measures.

3.1.5 Develop a milk processing MSE to increase household livestock revenues and encourage improved fodder cultivation practices on hillsides that contribute to soil conservation

Introduction of this technological package, including dairy cattle, controlled pasture, and new supplies of fodder and grasses shows promise, particularly in drier areas such as Ivoire (Montrouis) that have a livestock tradition; however, this will require considerable upfront investment, and labor intensive work with local livestock owners as well as with livestock keepers who may not own the animals they raise.

Organizing a local producer group capable of generating adequate supplies of milk will be an organizational challenge, particularly as it requires sophisticated organizational skills and involves a new value-added technological package with little or no precedent in the Montrouis area. This will require a baseline census of cattle in the targeted area; however, carrying out such a census will require DEED staff involvement and accompaniment, as peasant

organizations in the area have no experience with this type of systematic data gathering and analysis.

3.1.6 Promotion of commercial fruit tree planting either in orchard-like plots or on small farmer plots

The majority of small farmers do not have sufficient land available to devote to orchards, although they will likely be motivated to plant additional fruit trees. Small farmers may also find the delay between planting and harvest to be onerous. Uncontrolled grazing is a significant threat to expanding tree cover. This can be addressed by planting tree seedlings solely in actively farmed gardens that include annual crops, which are generally protected from animal predations.

3.1.7 Development of apiculture in association with flowering tree planting

Uncontrolled grazing, especially in slack seasons when food gardens are empty, is a significant constraint to establishment of flowering tree planting on slopes.

3.1.8 Development of aquaculture as an alternative source of revenue to farming vulnerable hillsides

Aquaculture is not a traditional practice in most areas of Haiti. Therefore it will impose high demand on project resources for technical assistance, non-formal training and field animation.

3.1.9 Production of jatropha for commercial trials

There is little experience in Haiti with jatropha as a commercially viable crop. Expanded production may compete with food production, except in drier zones more reliant on grazing and fewer cultigens. Farmers have little incentive to expand jatropha production beyond its traditional use as living fence unless there is a guaranteed market with sufficient price incentive.

3.1.10 Trial production of dry land herbs and spices

Vetiver is unsustainable if planted on slopes and uprooted in order to harvest roots for vetiver oil. Vetiver processing in Archaie has also been intermittent and does not presently provide a reliable market for vetiver roots. Trial production of herbs and spices requires high upfront costs and risk sharing arrangements with local farmers until such production can prove itself economically viable.

3.1.11 Trial production of flowers for hotel market and eventual export

Pilot efforts and trials are labor intensive and draw heavily on project resources. Flower production for hotels and exports requires heavy investment in non-formal training to ensure quality control for demanding markets such as hotels and exports. For social as well as economic reasons, DEED staff will need to take special initiative to serve as intermediary in developing models of cooperation between farmers and buyers of cut flowers.

3.1.12 Development of sustainable forest management practices on large landholder private woodlots

There is little experience with sustainable forest management in Haiti, especially on large holdings. Uncontrolled grazing is a significant constraint to establishing woodlots, especially on larger holdings. Field interviews have identified viable traditional practices among smallholders and charcoal producers in some areas of Haiti, including sustainable harvest of *Prosopis juliflora*, and there has been some effort at improved management of long term fallow and establishment of sustainable charcoal gardens in traditional charcoal producing zones.

For example, recent interviews in Fond des Blancs illustrate what could be developed on drier slopes of the Montrouis watershed. Between 1967 and 1982, drier wooded areas of Fond des Blancs were largely stripped of forest cover due to widespread, unsustainable production of wood charcoal. According to field interviews, deforestation was reversed after AID-funded efforts undertook tree seedling distribution as a revenue generating strategy in 1982, and farmers began to re-establish old woodlots, including the planting of charcoal gardens. Presently, the Fond des Blancs area exports some 16 truckloads of charcoal to Port-au-Prince each week, all from sustainable tree harvest and sustainable modes of producing charcoal. The zone relies on fast growing, coppicing species for both charcoal and polewood, primarily *Prosopis juliflora*, neem, eucalyptus, and cassia siamea. In effect, sustainable charcoal production has effectively reforested the area which also relies on corn, millet, and livestock – an agricultural strategy similar to the drier charcoal producing zones of Montrouis.

4. OTHER FORMS OF NON EROSION GROUND COVER

The objective of a strategy of promoting a transition from annual to perennial cropping systems is to encourage and extend permaculture systems that are far less susceptible to erosion because of the natural increase in ground cover associated with these cropping patterns. However, ground cover can also be substantially increased, and soil erosion substantially reduced, by leaving the land fallow—‘*en jachère*’.

4.1 Fallow land

A policy aimed at extending the area of hillside land *en jachère* must be based primarily on finding alternative livelihoods for poor hillside farmers lower down in the watershed where the

potential for soil erosion is minimized or, in the case of non-farm employment, effectively zero. If this policy is to be successful, associated measures must include an agreement with local communities to leave vacated land fallow, and strictly controlling grazing by ruminants so as to give tree seedlings and saplings a chance to survive and thrive.

DEED is promoting this approach through a program of public-private alliances under which DEED provides matching funds to private sector initiatives that clearly contribute to the project's objectives. These include:

- Support for a proposal by the Agro Regional Nursery foundation (ARN) to develop a tree seedling nursery and a 400-ha Moringa (benzolive) plantation in the Ti Bois zone. The development will employ more than 100 local people many of whom will come from the upper watershed. Local community leaders have agreed to leave vacated land fallow—an agreement that will be monitored by the casecs. The Moringa trees will be planted in other areas of the watershed and ARN has agreed to purchase Moringa seeds (and also *Jatropha* fruit) for processing into biodiesel fuel.
- Matching funds for Haiti Solidarité SA to establish a collection and sorting center near Arcahaie for local fruit and vegetables that will be processed into higher value products in a facility already in operation in Port au Prince. Processing will eventually be moved to Arcahaie further increasing employment opportunities in the region for hillside farmers.
- Financial support to a major MARNDR program to rehabilitate six irrigation systems along the Arcadins coast that will both raise production on a unit area basis and increase the area of the land being irrigated. Water user associations have agreed to offer employment opportunities to hillside farmers who will leave the land they are currently working *en jachère*.
- Agreements with large landowners along the Arcadin coast to develop unutilized land under tenant farming arrangements that will prioritize opportunities for farmers from the upper areas of the watershed.