Project Report on the

Port-à-Piment Agriculture, Forestry, and Environment Program

to the Countess Moira Charitable Foundation

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THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

ORE

PROJECT BACKGROUND

The Earth Institute, one of the founding partners for the Haiti Regeneration Initiative (HRI), aims to be an innovative catalyst for efforts to restore ecosystem and livelihood stability using a ridge-to-reef watershed approach in rural Haiti.

The Earth Institute (EI) and its Haitian partner the Organization for the Rehabilitation for the Environment (ORE) are currently designing a new Millennium Village Project for the watershed of Port-à-Piment in southwestern Haiti that is to be launched imminently. The primary objective of the Millennium Village Project is to demonstrate and implement effective strategies for achieving the eight Millennium Development Goals of which include reduce hunger and poverty and increase environmental sustainability. Key to achieving the Millennium Development Goals in Haiti will be to ensure that the strategies that EI and its partners have utilized in 14 village sites in Sub-Saharan Africa are adapted for the site-specific social and environmental context of Haiti and can be efficiently scaled-up to national levels. EI and ORE are thus researching techniques specific to the challenging environment of Port-à-Piment that will improve agricultural production, reduce post-harvest losses and increase market access while effectively protecting the environment.

The Haiti Regeneration Initiative and local community have identified the need for dramatic increases in crop yields to reduce pressure to cultivate marginal lands, ensure food security and to raise incomes. Most of the farmers in the watershed are currently growing annual crops on steep mountainous terrain. Their yields are far below national averages and their farming techniques are resulting in extreme soil erosion. In 2010 after the major earthquake in Port-au-Prince, the Catholic Relief Services conducted a rapid assessment on the availability of seeds at the household scale. Data from this study suggest that the use of improved seeds is fairly limited in the South. In addition despite a national subsidy for fertilizer, access is extremely limited throughout the region. Having access to seed, particularly improved seed that is adapted to local conditions, and sufficient nutrients for plant growth are critical for increasing yields and are fundamental starting points for any agricultural development program.

To meet the Millennium Development Goals farmers must have access to improve seed and plant nutrients to increase productivity but must do so while reducing soil erosion and runoff. Best practices in watershed management will be required to increase soil fertility, improve water retention, reduce flooding, and lower landslide risks. Such solutions need to be tightly integrated, and be designed and implemented with a place-based ecological mindset, with firm, lasting participation and leadership from local communities and institutions. This project, made possible by funding from the *Countess Moira Charitable Foundation,* was launched to take the critical first steps in this process, and to build effective long-term solutions for the many challenges Haiti faces for agriculture, forestry and the environment.

OBJECTIVES

The goal of this project was to achieve a set of key objectives that would lay the groundwork for an extensive, effective, agricultural development program throughout the Port-à-Piment watershed. A major focus of the project was to empower farmers to have control over the development of the genetic resources of their farming system through seed selection and storage. The specific objectives of the project were to:

- Determine the key challenges and opportunities for agriculture, forestry and environmental sustainability
- Identify seed and seeding rates most appropriate for the watershed
- Evaluate the effectiveness of fertilizer use on various soil types in the watershed
- Demonstrate various farming options and best management practices throughout the watershed
- Establish grain storage facilities
- Train extension agents and farmers on best management practices, and post-harvest handling
- Begin the development of a mobile phone base agricultural monitoring program

The activities to meet these multiple objectives were designed to be complimentary and to provide critical buidling blocks for future work. As in all of the Millennium Villages, the work here was designed to integrate research and action. The model is structured so research informs the design and selection of the most appropriate interventions, and then is used to critically evaluate their efficacy. The goal of this integrated approach is to provide scientifically sound results that can enable project managers, agriculture extension and ultimately farmers to evaluate their activities and adapt their intervention strategies to make them most effective for the social, economic and environmental conditions unique to each site.

KEY ACTIVITIES AND OUTCOMES

To achieve the multiple objectives of the project, over the last year EI and ORE worked closely with farmers and farmer's associations on a large number of integrated activities. Initially EI scientists and ORE agronomist met frequently to identify and prioritize the critical management challenges for the watershed and to design an effective strategy for providing solutions. The program that was developed for this project was based on an integrated set of activities that focused on education through research and demonstration. The strategy was based on an initial informal farmer field survey, which helped formulate the design and location of demonstration/trial plots and grain storage facilities that would be the focus of farmer trainings and outreach.

INFORMAL FARMER SURVEY

ORE agronomists made numerous visits to farms throughout the Port-à-Piment watershed to acquire basic information about crop preferences, planting times and crop rotations. In addition to collecting basic agronomic information the objective of the surveys was to identify the major challenges and potential opportunities for improving livelihoods in various parts of the watershed.

Through this series of informal interviews, the main crops were identified and a preliminary crop calendar was developed. The cropping calendar illustrates how management practices even for the same crops can vary extensively within a few kilometers as elevations and microclimates change dramatically in very close geographic proximity within the watershed. A general cropping calendar was established for the region based mainly on differences in elevation:

- **February Planting:** The lower elevations of the watershed are planted predominately as an intercropping of black beans with maize and pigeon peas. In this association, the last crop to be harvested is pigeon peas, 12 months later.
- **July Planting:** In the higher elevations, black beans are typically planted in monoculture.
- **October Planting:** Primarily at higher elevation and in the irrigated plains black beans are planted in monoculture.

Agricultural production is currently dominated by a select number of annual crops: beans, maize, pigeon peas and root crops including yam, cassava and potatoes. After consultations with the communities, black beans were identified as the most profitable annual crop year round and consequentially was selected for trials. ORE interviews indicated that the majority of farmers in the watershed were familiar with mineral fertilizer use but never used it themselves. Access to mineral fertilizers is limited within the watershed and is not available above Rendel (anywhere in the upper watershed). Farmers have access in Torbek but stated that they make fertilizer purchases in neighboring Communes such as Les Anglais.

The survey identified a number of perennials that are grown throughout the watershed that could be developed into cash crops and significantly improve incomes. Farmers throughout the watershed are producing a number of fruits with important economic potential (mango, chadèques, oranges, custard apple) but production currently lacks any organized marketing. Communication and transport were identified as the major constraints for marketing these products to regional or international markets.

In addition to the fruit crops, coffee was also identified as an important cash crop. The region was once a major coffee production zone but coffee has almost been completely replaced by annual crops or by intensive production of charcoal. Most of the coffee plantations were ripped out and the cooperatives that once managed the production and marketing were disbanded more than ten years ago. Charcoal prodcution is now a major income generator for the area and farmers are able to sell charcoal to major regional markets as far as Port-au-Prince.

The survey also identified a number of community organizations involved in various components of income generation throughout the watershed. Community organizations are involved in: socio-economic development (production of cultural crafts), agriculture (cropping and animal husbandry), trade (grain storage, trade, storage for coffee) and services (coffee mill). A total of 25 organizations were identified, 11 in the Rendel drainage and 14 in the Potu drainage. Of those organizations five were specifically women's groups.

Key Outcomes:

- Informal farmer interviews completed in various regions of the watershed
- Basic cropping calendar determined for different elevations and microclimates
- Priority crops identified for demonstration/trial plots
- Potential high value crops and their critical marketing challenges identified
- Inventory of community organizations completed

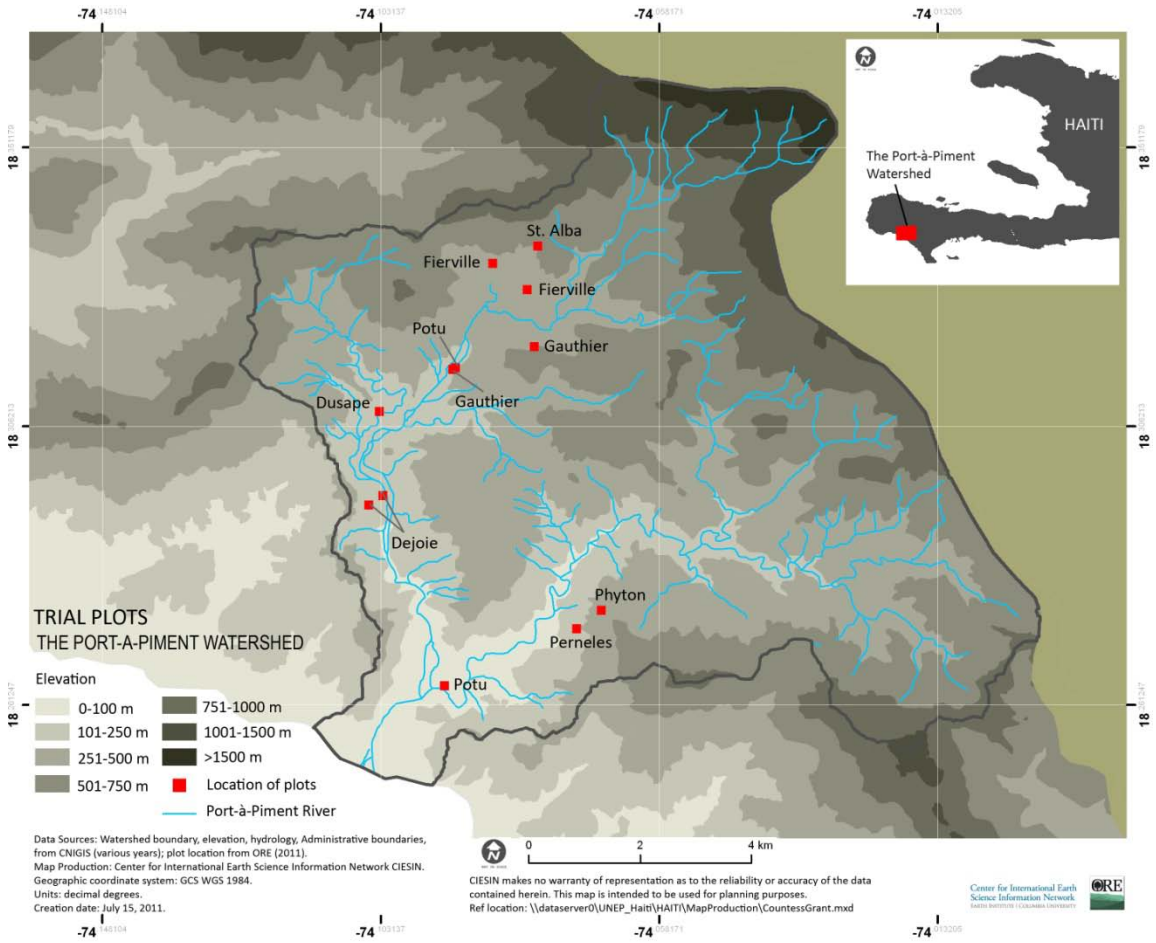

Figure 1. In 2009, it was estimated that the Port-à-Piment watershed reached 30,000 residents and more than 5,500 households. About half of the population is concentrated along the two main river drainages of the watershed the rest is scattered around approximately 102 km^2 watershed characterized by steep slopes, eroding soil and uneven microclimates. Demonstration/trial plots were established within both major drainages of the watershed and in areas that would have extensive community visibility.

DEMONSTRATION/TRIAL PLOTS

Using the information gathered through the informal survey and an extensive literature review EI and ORE designed a set of field trials to identify and demonstrate best management practices for growing and selecting black beans adapted for intercropping with maize. The objective was to demonstrate a farming strategy that could potentially double or triple staple food crop production and contrast this system with current low yielding techniques and varieties.

ORE worked with local farmer associations to establish demonstration/trial plots on farms in several key agro-ecological zones in the watershed. These farms were distributed widely to maximize visibility among the local communities and address the large variation in soil types. Twelve plots were established from 24th February to 31st March 2011, 9 in the Rendel drainage and 3 in the Potu drainage (Figure 1). In each demonstration/trial farm 16 plots (8 m^2) were planted with four varieties of black beans at two planting densities either with fertilizer or without. The planting densities were either the commonly used low density of 250,000 plants/ha or the alternative high density of 500,000 plants/ha. The plots received either NPK fertilizer (20-20-10) at a rate of 40 kg N/ha, 17.6 kg P/ha and 16.6 kg K/ha or no fertilizer as is typical in the region.

After the plots were established ORE agronomists repeatedly visited the farms to record dates of germination, flowering, weeding, fertilizer application and harvesting. At harvest yields were calculated using seed weight and moisture content (14% moisture). Data was collected on a total of eight demonstration/trial plots; the other four of the 12 were lost to intense rain storms after the beginning of June.

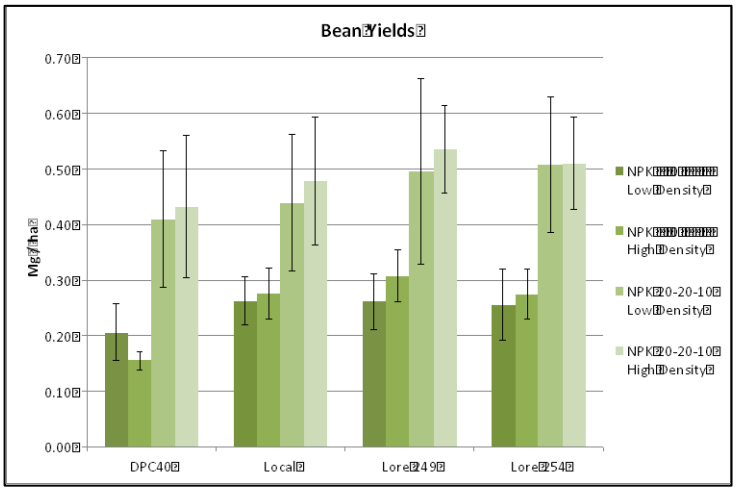

Figure 2. The results of trials clearly showing the effectiveness of fertilizer on bean yield. Four bean varieties, three introduced (DPC40, Lore 249 and Lore 254) improved varieties and one local, are compared at two planting densities, either with or without NPK fertilizer.

Results of the trials clearly show that the addition of mineral fertilizers substantially increases yield for all varieties and densities of planting. The yields of the improved variety, "Lore 249" at a high planting density and with fertilizer was more than

ORE agronomist establishing demonstration/trial plots on the left. On the right, the maize and beans are beginning to establish on the steep, mountainous terrain.

double that of the unfertilized local variety planted at a low density. Aside from the effect of the fertilizer no other clear differences have been identified so far. Neither planting, density nor variety seemed to be very important for yields. ORE is currently in the process of analyzing the data for incidence of disease, insect damage and weed abundance to determine if planting density or variety has any impact on these important factors for productivity and resilience. ORE is also analyzing the costs and benefits of using the improved seed and mineral fertilizer to better understand how increasing access to inputs will change the returns to farm.

Key Outcomes:

- Demonstration/trial plots established on 14 farms with high visibility within surrounding communities
- Data collected from 8 farms on management, plant response and yields
- Results clearly indicate fertilizer could at least double black bean yields in the area

COMMUNITY GRAIN STORAGE FACILITIES

ORE facilitated the installation of 3 grain storage units to be managed by community groups. The storage silo for each group has a capacity of 1,375 kg of grain, enough to enable much of the community to save a portion of their harvests without losses until times of relative scarcity and thus sell at a higher market value. Each group was also provided equipment to enable the farmers to determine moisture content of grain for appropriate post-harvest handling. The farmers were all trained in practical techniques storage and stock management (see below).

Key Outcomes:

- 3 large capacity community grain storage facilities installed
- Equipment for post-harvest handling and storage preparation distributed to 3 community groups

TRAINING

The establishment of the demonstration/trial plots and community storage facilities enabled the hands on training of local farmers in improved techniques for land preparation, plant spacing, mineral fertilizer placement, contour planting of vegetative barriers for erosion control and post-harvest handling. The 14 farmers who were pre-selected to participate in the demonstration/trials were required to attend trainings and hold meetings to share lessons learned with their neighboring farmers. Trainings consisted of soil conservation techniques using an A-frame level (see photo below) to establish hedgerows of forage grasses (Elephant or Napier grass) or pineapple on contour lines prior to planting crops. Two local agronomy technicians also participated in the trial installation and trainings so that they could then be trainers for future workshops. These workshops held at the demonstration/trail plots were designed to be the first components of a farmer-to-farmer training program that will be implemented through the Millennium Village Project throughout the watershed.

ORE also provided trainings for the grain storage units on 14 and 15 June 2011. The trainings included nine members of three women's organizations, two in the area of Potu and one near Rendel. Training included maintaining the units and techniques to optimize market fluctuation with the stock of grain. The topics covered were the review of the traditional system of storage, including cleaning techniques, preparation of grains (corn drying or cluster, threshing, winnowing, grain drying and humidity control, sorting) and maintenance of the storage silo. The classroom sessions were complemented by practical sessions on sun drying, sorting, and humidity control.

Key Outcomes:

- Farmer-to-farmer training program curriculum developed and launched
- 14 farmers trained in soil conservation, contour planting, crop density planning, and fertilizer use
- Two local agronomy technicians trained to be trainers for the farmer-to-farmer program
- 9 farmers from 3 women's organizations trained in post-harvest handling and storage

On the left farmers are learning to use an A-frame level to determine the contour on steep slopes. On the right famers are establishing vegetative barriers to slow runoff, increase water infiltration and reduce soil erosion.

MOBILE PHONE BASE MONITORING PROGRAM

EI staff worked with ORE agronomists to develop a prototype survey tool that will be deployed by extension agents throughout the watershed on mobile phones. Questionnaires were developed to compliment future household surveys that will be implemented by the Millennium Village project. The surveys were designed to enable extension agents to rapidly collect data on crop selection, critical management timing such as planting and harvests, land holdings, farm location and harvest yields. This data will in turn enable EI and ORE to provide site specific management and marketing information more directly to farmers.

Key Outcomes:

- Prototype survey was developed and tested with local agronomist
- Six smart phones were purchased and loaded with the survey
- ORE staff were trained to use the phones and conduct the surveys

NEXT STEPS

While the activities completed in this project have achieved all of the objectives initially laid out there are some immediate next steps that are underway and some new longer-term objectives that have been identified. ORE is currently analyzing the management and economic data from the on-farm field trials to better understand the economic impacts of using fertilizer. Specifically the analysis will show if the returns from the increase in yields will offset the additional costs of using fertilizer and by how much. The analysis will also indicate whether any of the varieties were more resilient to the numerous factors that reduce yield such as weeds, insects or diseases. Then when the maize is ready to harvest, ORE will repeat the analysis and include the intercropped maize results with those of the beans to evaluate the entire farming system as a whole.

In the longer-term ORE will continue to work on improving seed resources, grain storage and to train farmers. A high priority for ORE is to continue breeding the

best performing seeds from the first round of trials. Once a set of preferred seed varieties has been selected, it will be critical to maintain this resource by developing better seed storage throughout the watershed. ORE has a vision of creating a training center in Port-à-Piment where farmers could learn how best to select, store and prepare seed. The center could also provide business training for those associations involved in managing seed selection and storage on a larger scale. Improved training and storage of locally adapted crop varieties will enable farmers in the watershed to have more control over their livelihoods by empowering them to create a farming system more resilient to small scale challenges such as insects and disease and large scale challenges such as natural disasters and climate change.

Key Next Steps:

- Analysis of management and economic data including maize harvest for a full assessment of the maize-bean farming system
- Continue bean seed selection and propagation of top varieties
- Develop a seed training center in the watershed to empower farmers throughout the region

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