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### **Sustainable Solutions for Haiti's Smallholders: Combating poverty through environmental restoration**

In January of 2010, Haiti came into the public eye when the country was hit by a 7.0 magnitude earthquake. The destruction was catastrophic. Port-au-Prince, Haiti's capital, as well as a significant portion of southern Haiti was left in ruins, and chaos ensued from lack of any disaster recovery plan. As of February, the Haitian government estimated the death toll to be 230,000, with about 300,000 injured, and 1 million Haitians homeless—overall an estimated 3 million affected (Washington Post; BBC News). Approximately \$5.3 billion in public aid was promised in March from a United Nations donor's conference, but despite the initial enthusiasm from the international community, six months after the earthquake, CNN news reported that only 2% of the promised money had been donated. Nevertheless, there is hope. Amidst the tragedy, opportunities emerge for rebuilding the country's infrastructure, economy, education, and the lives of its people. The solution is in the hands of Haiti's smallholders, Haiti's farmers. A key approach will be developing environmental consciousness and sustainable techniques through exploration of alternative energies, implementation of sustainable farming practices, and widespread education.

The Republic of Haiti is situated in the western third of Hispaniola, the second largest island in the Caribbean; the remaining two-thirds of the island is occupied by the prospering Dominican Republic. Although once the richest slave colony in the West Indies, Haiti is now the poorest country in the Western Hemisphere with a gross domestic product of \$1,300 per person. Currently 80% of Haiti's population lives beneath the poverty line of two dollars a day, and over two thirds of the population are reliant on the agriculture sector that is characterized by subsistence farming. Although elementary school is compulsory, the public education system requires a tuition fee. As a result, most students cannot afford to attend school; 70% of students drop out before completing the fifth grade. Overall, barely half of the Haitian population is literate (CIA World Factbook, "Haiti"). Compounded to the overwhelming poverty and lack of education, Haiti suffers ongoing tyranny and dictatorship, and is consistently ranked one of the world's most corrupt countries by the Corruption Perception Index (Transparency International).

On the other side of the island, the Dominican Republic flourishes, awash with opportunities in tourism, free-trade zone manufacturing, and sugar-cane plantations— industries that continue to grow despite the global economic recession. Due to economic success, the gross domestic product of the Dominican Republic is \$8,300 per person, over six times the gross domestic product of Haitians (CIA World Factbook, "Dominican Republic"). Consequently, the poverty rate of the Dominican Republic is nearly half that of Haiti's. In addition, over the past decades, the Dominican Republic's growing tourism sector has led to governmental stability unheard of in Haiti. Although both countries once contained identical natural resources and share similar geography, there is a staggering discrepancy between the two countries' economies, governments, education systems, and standards of living. The Dominican Republic's success in comparison to Haiti's poor circumstances is a suggestion— if not an indication— that the majority of the Haiti's problems are man-made.

Haiti holds the distinction of being the first black republic, the product of successful slave revolt in 1804. From the 1600s to the 1800s, the French transported half a million slaves from Africa to toil in highly profitable sugarcane, coffee, cocoa, cotton, and indigo plantations. Only 30,000 whites, predominantly Frenchmen, controlled the colony, which reportedly produced more income for France than that of Britain's American colonies combined (Blashfield 45-6). The 1804 revolution marked the first successful

major slave revolt the world had ever seen. Haiti became a precedent and inspiration for slaves around the world who were fighting for their own freedom. Ironically, since becoming independent, Haitians have struggled to maintain their freedom, perhaps even more so than any other previous slave-holding country. Due to centuries of mismanagement and exploitation, the smallholders, the small farm owners, of Haiti lack freedom in their government as well as the land they earn their living from. Without these freedoms, the people lack control of their own destinies. Therefore, the common people need to be empowered through education and environmental endeavors in order to achieve a prosperous and sustainable future.

Following Haiti's independence, violent power struggles consumed the country, and the history of Haiti is plagued with power-hungry emperors, kings, and dictators. In fact, within the 72 years from 1843 to 1915, Haiti saw twenty-two different heads of state (Ceong-Lum and Jermyn 25). Partially due to the constant, violent turmoil during the past two centuries, Haiti has transformed from the world's wealthiest slave colony to one of the world's weakest economies. In addition to ineffective leadership and government corruption, environmental degradation of the nation's natural resources has created a perpetual cycle of poverty. Following European occupation, rapid deforestation took place in order to produce vast plantations of coffee and sugar. Even after the departure of Europeans from the island, Haitians continued farming as the main source of their livelihood. Thousands more acres of forests were cleared to create more croplands in order to support the newly freed slaves. In addition, the logging industry that began as a supply for the French colonists' taste for fine furniture has evolved into a major commercial industry for paper and fuel. When Christopher Columbus disembarked on the island in the 15<sup>th</sup> century, 90% of the island was covered in forests. Nowadays, only 2% of the island remains forested (Blashfield 29). Deforestation, in turn, ruins the island's ecosystems, and, as a result, today there is a drastic lack of resources to provide for Haiti's subsistence farmers. The reality is the country suffers from an over-reliance on a crippled agricultural sector. Restoration of the environment is now vital in order to provide Haiti's smallholders with the tools for rebuilding their environment and establishing sustainable agriculture.

E. W. Vedrine, a Haitian author, once described the landscape of his homeland through a comparison of the two sides of the island, "One of the differences between Haiti and the Dominican Republic lies in the ecological color of the two republics. Haiti is brown, the Dominican Republic is green" (Ceong-Lum and Jermyn 47). Amongst the crimes against Haiti's natural environment, deforestation, which began with the arrival of European settlers, is perhaps the most obvious and devastating. Within four centuries, Haiti has lost 98% of its natural forests, and she is currently losing the remaining trees at a staggering 30% per year (48). Moreover, the rapid loss of forests has been further exacerbated in the last fifteen years due to political instability. In 1991, Haiti's trade partners placed a fuel embargo on Haiti in order to force the illegal military government from power. Consequently, the people of Haiti turned to charcoal as means of energy, cutting down trees at an alarming rate to meet the country's demands. Although the embargo ended in 1994, the effects have been widespread. Most of Haiti's terrain is mountainous and ill-suited for agriculture. Thus, deforestation makes the land susceptible to soil erosion, and in fact, approximately 15,000 acres of topsoil are washed into the ocean every year (USAID). The eroded soil floats on the water, blocking the sunlight supply for marine life, which leads to smaller catches for Haiti's fishermen. Decrease in the fish harvest not only dwindles the market's food supply; it also drives the poor to find other means of survival through the further exploitation of natural resources—cutting down trees for fuel and paper. Over time, soil erosion reduces the fertility of the land, leading to less crop production and less food. Finally, deforestation makes Haiti susceptible to flash floods. This is of particular concern due to the prevalence of tropical storms in the area, especially during the rainy season. Without trees to hold the soil in place and absorb rainwater, rivers flood the land, destroying homes and contaminating water sources—resulting in the introduction of diseases such as cholera and dysentery. Because of the extensive environmental destruction, Haitians are forced into poverty; because of poverty, Haitians are

forced to destroy their natural resources. Deforestation alone has caused an unrelenting cycle of environmental degradation and human tragedy.

Other major environmental issues that have been identified include improper waste management, energy shortages, and pollution. There is no established waste management system in Haiti. The predominant method of waste disposal is the “flying toilet” in which waste is put in plastic bags to be thrown into ditches and onto the streets (Schaaf). Due to lack of garbage disposal service, many simply dump their trash into the ocean. This has come to be such a common practice that the shores of Haiti have transformed into stretches of garbage. Garbage that has been littered into the sea combines with the eroded topsoil and washes up to the coastline to create garbage land composites. When the land hardens, people in the cities’ slums claim the areas and live upon them. Lack of a waste management system pollutes Haiti’s lands and oceans, turning the country into a massive landfill. Meanwhile, Haiti’s energy crisis creates air pollution, a source of negative health effects on the Haitian people.

Although these environmental problems appear to occur on a regional level, environmental sustainability is in the interests of the rest of the continent and the rest of the world. Conservation and restoration of the environment is a global problem, one that correlates directly to world poverty. The problems are interconnected. In order to break the cycle of poverty, the world’s farmers must strive towards sustainability in agriculture. In the past, no entity has been successful in enabling the people of Haiti to do so. Thus, people need to take their own measures, to depend on their own individual capability— solutions must be attainable by the individual smallholder.

The alarming rate of deforestation is due to the popular practice of burning wood sources to cook food and use as an energy source. In addition to charcoal made from wood, many Haitians use paper briquettes—also derived from Haiti’s forests— to cook their food. Similar to charcoal, paper briquettes produce harmful fumes for the household and atmosphere and provide insufficient energy. In fact, an MIT based research group led by Amy Smith in 2006 found that paper briquettes could not produce enough energy to heat water, let alone cook meals. Biomass briquettes, flammable fuel made from agricultural waste rather than wood, present a possible alternative. The same research group tested a variety of agricultural wastes—sugar cane, corn husks, peanut shells, corn cobs—resulting in the creation of a cheap sugar cane charcoal with a cleaner burn and a higher energy output than its wood charcoal counterpart (CNN, “Impoverished Haiti”). The advantages of better air and better breathing become important when one considers that worldwide, 1.6 million deaths occur due to acute respiratory infections caused by breathing indoor cooking fires. These deaths typically afflict women and children under five years old (World Health Organization). Furthermore, sugar-cane waste, which is deemed useless in every other aspect, does not pose a threat of reducing food supply, and has a widespread availability, is not fully utilized as a fuel. Additionally, sugar-cane charcoal is a significantly cheaper energy source than wood charcoal. A bag of wood charcoal that lasts about 45 days costs about \$70 Haitian dollars, while most Haitian adults make less than \$100. Wood charcoal is already the most inexpensive energy source on the market. Cheaper alternatives would provide enormous relief to Haiti— where a fifth of an average family’s income is spent on cooking fuel (CNN, “Helping Improve Lives”). Without government intervention, smallholders have the ability to adopt biomass briquettes, a first step to potentially mitigating deforestation and the country’s carbon pollution problem.

In turn, a proposal for reversing the damage caused by the extensive deforestation exists in the exploration of biofuel tree crops. Touted as “green gold in a shrub” by Scientific American in 2007, the jatropha tree (*Jatropha curcas*) is an especially promising biofuel energy alternative. The jatropha tree’s oily seeds may be pressed to produce energy efficient biodiesel; the energy dense by-products may be burned as biomass, another alternative cooking fuel, or used as fertilizer. Jatropha yields four times more fuel per hectare than soybeans and ten times more fuel per hectare than corn (Fitzgerald). Unlike other biofuel crops plants, the jatropha tree does not potentially threaten the supply of food commodities, a

critical concern when considering the application of biofuel crops on mass-scale market. This is due to its unsuitability for use as food—its seeds are toxic. Moreover, the plant is hardy and can be cultivated in dry, arid conditions with minimal water. In fact, as of 2007, India has set aside 11 million hectares of “wastelands” to grow jatropha (Hind). Jatropha tree crops are specifically suitable for Haiti’s smallholder farmers for a variety of reasons. For one, the jatropha tree is native to Haiti, and is already grown by many farmers as a natural fence to separate their farmlands and protect their crops from wild animals. Also, deforestation mainly occurs in Haiti’s mountainous regions, much of which are unsupportive of agriculture, and constitute four-fifths of Haiti’s natural geography (Blashfield 18). In those areas where attempts at agriculture are futile, robust jatropha tree crops will be able support farmers and reconstruct Haiti’s forests. If applied throughout the country, environmental advantages include reduction of the extensive erosion. As with other biofuels, the use of jatropha biodiesel would diminish the country’s carbon dioxide output because the plants capture the carbon dioxide released from burning biodiesel. Jatropha also possesses great economic potential in the lucrative biofuel market. Those of Haiti’s smallholders that farm in unsuitable land may switch to biofuel tree crops to sell a cheap energy alternative to their local villages. The successful cultivation of native jatropha crops would spread with demand for cheap energy, creating an industry for biofuel tree crops within the country. Replanting trees in the form of biofuel tree crops could potentially reverse Haiti’s devastating rate of deforestation, prevent soil erosion—which causes a myriad of natural disasters—and lessen the country’s air-water-land pollution.

The lack of waste management and sanitation present another alternative energy source—biogas. Biogas is a type of biofuel that is produced through airless digestion and conversion of human waste into gas that can be used for cooking and other energy purposes. The resulting gas is odorless and, most importantly, the system provides a means for effective waste management. A flaw in the biogas plan is the high price of biogas digesters that may cost over a thousand dollars per year to produce, install, and maintain. Free communal biogas latrines can be introduced in villages to control sanitation. The income from biogas can offset the cost of the latrines. Because it is local infrastructure, the implementation of such technologies can be achieved locally without the intervention of the national government.

Restoration of soil fertility is also of utmost significance to the Haiti smallholder in order to ensure successful crop yield. Crop rotation and leaving fields fallow is an obvious but overlooked solution to the problem of how to restore nutrients to the eroding soil. Crop rotation also facilitates full nutrition in the Haitian diet. Choices in crops and types of crop rotation cannot occur haphazardly. The natural environment of every particular area must be analyzed to come to such decisions rather than high profit cash crops in order to conserve the land’s natural resources. Haitian agriculture consists of four main environmental terrains—high bluffs and calcareous uplands, marly-calcareous hill slopes and bottom lands, andesitic or basaltic bluffs, and the Aquin plain— each with a preferred crop combination. The high bluffs and calcareous uplands are characterized by high altitudes, heavy deforestation, poor soil fertility, and frequent rains; the basic crop combination consists of maize, beans, and sweet potato. In contrast, in the forested marly-calcareous hill slopes and bottom lands, soils allow for long-term crops, and its heavy rains provide for two cropping seasons; suitable crop combinations include yam, maize, sorghum, black beans and bananas, coffee and malanga (Roose). The diversity of the land must be understood if soil is to be maintained for future generations. In addition, tackling soil erosion also requires specific prescription of each area. If studied and applied, individualized treatments will provide smallholders with maximum crop yields.

On a final note, without the proper education in environmental techniques, the proposed solutions cannot be applied. Although there needs to be focus placed on the individual smallholder’s capabilities, everything cannot be initiated by smallholders alone. Widespread education for smallholder farmers is essential to the success of agricultural sustainability. The establishment of an Environment Corps— whether one created by the government or by a collection of villages— would be the solution in

facilitating the communication of knowledge in sustainability. Furthermore, investing knowledge in the future Haitian farmers is another important step. Lessons about sustainable agriculture practices in the students' curriculum would begin environmental awareness at a young age.

Haiti is a country of extremes. Although the country suffers from tremendous poverty, severe environmental degradation, and unstable government, the people of Haiti are rich in culture, strong-will, and hope. In context of the recent earthquake, Haiti has the opportunity to start anew. Now under the scrutiny of the public, government corruption can no longer continue unchecked. With the ravage of the natural disaster, the country is forced to rebuild its infrastructure and reestablish its economy. The onslaught of the earthquake raises environmental concerns in other areas; and it is through these environmental concerns, Haiti's smallholders will find their answers. The degradation of the natural environment and the country's poverty are interconnected problems. Empowering Haiti's farmers through environmental restoration, restoration of Haiti's resources, will pave the road towards ending poverty. Proposed solutions for reversing the country's extensive deforestation, energy crisis, and pollution, and therefore poverty, include biomass cooking fuel, biofuel tree crops, biogas, and individualized treatment of land—all of which can only be achieved through education of the smallholders. The future of agricultural sustainability in Haiti lies in the hands of the individual smallholders.

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