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Haiti, Factor 1: Plant Science

Haiti: Increasing Access to Good Soil for Jobs and Food Security

How many days do we wake up and not realize how fortunate we are? I know that I take many of the amazing things we have in the United States for granted. People in the U.S. today are worried about having the newest phone, the best jeans, and competing well with everyone else. People in Haiti are worried about food for the next day, jobs, and the wages they have. Our needs are completely different from theirs and as much as it is okay to accept that reality, it also is not. Technology and innovative ideas exist in the world today for solving many of the problems that face the Haitian people and many of these ideas and solutions are low in cost and have low ongoing maintenance commitments. There are important food production techniques could be taught that would have a powerful impact on their food production and food security.

Haiti is a country with a long and turbulent history. In 1492, Christopher Columbus discovered Navidad, which is now called Haiti on his first journey to America. The natives living there ended up destroying this settlement, but Columbus went on to discover Isabela, which was located east of Navidad, on the northern coast. This Spanish colony was called Santo Domingo. San Domingo provided supplies to the conquistadors who were exploring Mexico and other area throughout the Caribbean. One of Columbus' brothers was in charge of Santo Domingo and was able to compel the labor of the natives. ("Political and Economic History of Haiti") By the 17th and 18th century Haiti was considered a very wealthy colony. During that time Haiti had strong agricultural practices and was profitably raising both sugarcane and indigo. This was made possible because Haiti was considered the biggest slave working colony. There is evidence that they actually worked their slaves to death. The harsh conditions the slaves endured led to a slave rebellion in 1804, fighting against United States and European powers that supported and benefited from the products made possible by the work of Haitian slaves. During years when slavery prevailed in Haiti, there was little effort made to educate the people, no trade with these people, and lastly having the land split apart which meant that the crop cash went down. These actions continued over into the 20th century, which meant that Haiti never had the chance to progress with other countries (Williams, J, n.d.) Not only did Haiti have problems with the education and land splitting, but in the 20th century they were governed under the dictatorship of Francois "Papa Doc". Francois and his son ruled for 29 years, brutalizing the country and killing tens of thousands of people. The educated people who were able immigrated to either the United States or Canada. But the election of 1990 of Jean-Bertrand Aristide would hopefully show a change for the country. Shortly after, Aristide was overthrown and the United States led an intervention in 1994. Haiti continued to be plagued with judicial killing, torture, and brutality. In 2006, Rene Preval, an ally of Aristide was elected to be president. Prevail's goal was to work towards long-term sustainability. Only four years into his tenure a tragic earthquake occurred on January 12, 2010. The death toll for this earthquake was between 100,000 and 500,000 people. With this event, progress toward development has been set back. (Azikiwe, n.d.)

Life in Haiti among those living in poverty is challenging for a number of reasons, including family size, housing options, limited diet, a low literacy rate, and limited access to quality health care. Families in Haiti typically have four or five children. Many children are not able to stay with their families due to cost for the parents, so they stay in the orphanages. ("Five years after the earthquake, Haiti's children need families, not orphanages") Complicating matters further, in the 2010 earthquake many Haitians lost their homes. There was over 1.5 million people who homeless. Today, many people still don't have homes, but for the people who do, their living conditions are often not safe. So many people with the land of Haiti being so hilly have staked houses upon houses. You start one home and you can be sure that

another place will be put on top of that. This is unsafe and not a smart choice with the possibility of hurricanes or earthquakes. (Eli, n.d.) The typical diet for Haitian families consists of corn, cassava, millet, rice and fruits. These people don't get much animal protein such as meats, milk, and eggs due to the prices for these products, both to produce or to purchase. Another thing that is a major issue in Haiti is there literacy rate. The literacy rate for Haiti is 53%. With the cost of education in Haiti and all schools their being private, most parents can't pay for their children to go to school or if the families have multiple children then they would have to choose one or two kids to go to school because of the cost for the families. Finally, as with all undeveloped countries there is limited access to quality health care. In Haiti, there is one doctor per eight thousand people. Medical facilities are poorly funded with too few staff to keep them up and running well. With a population of 10 million, health care needs are of serious concern. These are all major issues that challenge the Haitian people as they try to improve their lives. ("Haiti At A Glance")

Most Haitians have limited employment opportunities. In Haiti, the two most common job categories are to be working on the farms and or working in factories. For these jobs, the wages people have are very low compared to the U.S. The people of Haiti have wages ranging from $1.55-$5 per day. ("Haiti: Minimum Wage Increase") The Haitians who work in these factories lots of time are making t-shirts for companies such as Walmart, Hanes, and Gildan. They get paid $1.45 an hour and it takes 19 people to make just a dozen t-shirts. ("Haiti's employment push turns to textiles as farming traditions uprooted") As for the other main job of farming, many crops the farmers grow are: rice, maize, beans, coffee, sugar cane, mangoes, and bananas. Something the United States government is doing is partnering with the government of Haiti to help show them new techniques and technologies to help them with these crops and help them become more sustainable. ("Agriculture and Food Security") With these two common jobs for Haitians their unemployment rate is standing at 40.6% as of June 2015. ("Haiti Unemployment Rate") The people of Haiti tend to buy their food at farmer's markets or grow it themselves, because it is cheaper for the family to grow it.

The topic I have chosen to explore to improve the lives of the Haitian people is to apply knowledge of plant science and soil building to helping the Haitian people strengthen their food security. The soil in Haiti is very dry and rocky. Efforts to improve soil quality could help Haiti to develop more productive agricultural production. With higher yields in agriculture they could feed their population a more varied diet, and also produce better products with better soil. Helping with this soil issue could also help raise the household income by creating more jobs for people in Haiti. Productive family businesses, for example, could lead to being able to send children to school and increase the literacy rate. It could provide jobs to both the husband and wife of the family and allow more flexibility if it became a family household job.

One of the major barriers to improving the agricultural productivity is the soil structure in Haiti. The soil is very dry and rocky. In addition, Haiti has steep slopes and minimum crop input which results in erosion rates going up and low crop yields. Over 63% of the land in Haiti has slopes of 20% or greater. (Hylkema, 2011) This changes the quality and structure of the soil. In Haiti there are large areas with inceptisols and entisols which results in a lack in soil fertility and health. Entisols are new soils which have just been moved by natural factors such as wind, floods, or gravity depositing soil from one place to another, as in a landslide or flood. Entisols don't show horizon development, or healthy soil layers, and are not generally as fertile. On the other hand, inceptisols are soil that has been in place long enough to are start showing horizon development, which is a sign of more fertile soil. You will see color change in the layers with the organic material and clay building up. (Soil Genesis and Development, n.d.) Inceptisols are better than entisols because in most cases and will do better for growing crops. Inceptisols occur in areas such as young land, and forest. Entisols are found in floodplains and steep slopes when the amount of erosion overpowers the amount of soil developed. If we can teach the Haitian people to recognize what healthy soil for growing food crops looks like and promote practices for building healthy soil, such as using the

inceptisols to grow plants, it could potentially help the goal of creating more jobs and food producing land for families and communities. (Hylkema, 2011)

Improving soil quality would not only increase the amount of food produced, it would also increase the nutritional quality of that food and also improve the environment. Having higher nutrients, moisture retention, aeration and structure in the soil to help produce better products. Having this change could help reduce poverty by having a wide variety of people in this business. It would help with hunger and create more jobs! This would benefit women as well as men because it could take place as a family business and allowing them to help with the process. Small farmers would be able to increase crop yields with better, healthier soil. This could then help Haiti's farmers and agriculturally related business and hopefully reduce the country's poverty rates.

The pathway for Haiti to improve their soil and food production is complicated by several factors. One of the most significant issues is their climate. Haiti has two rainy seasons. The first is from April to June and the second is from August to mid-November. During these rainy season they average three to seven rainy days per month, receiving anywhere from 1 to 3.5 inches of rain. Since Haiti does not have large numbers of deep-rooted trees and unsustainable topsoil, they commonly have flash floods and mudslides. It is also common for them to have drought and hurricanes after these seasons. The hurricane season in Haiti is from July to October. The temperature year around ranges from 70-90 degrees. In July through August it can climb to 100 degrees. At night the temperature goes down by about 10 degrees. The rain varies so you can't depend on that to always be there to water the plants and crops. Conserving useable water in Haiti is something that is taken very seriously. (Crawford-Adiletta, n.d.) They do have a water crisis unlike we do. Forty percent of Haitians do have access to clean water. ("Haiti") Another challenging issue is the steadily growing population. With increasing population numbers there needs to be more jobs available as well as more food, water, and shelter. There are many things that need to be looked into to make this all work well.

There are several ways to sustainably increase food production and soil quality in Haiti. Hydroponics is a way of growing plants without using soil. They use gravel, sand, and liquids with added nutrients. This would be especially helpful in areas where the native soil is too rocky and dry to be productive. While there are expensive commercial hydroponic set-ups available, hydroponics can be as inexpensive as using a five gallon bucket, cutting a hole in the lid, placing a net cup in the hole, putting an air pump in the bottom of the bucket, and planting your plants from there.Using this more inexpensive route would also ensure that the growers could do their own repairs without having to worry about a huge cost being involved. Most necessary repair parts would be readily available in case something does go wrong. The low cost of hydroponics isn't the only perk. Hydroponic growing operations would also bring families and communities together. Creating these operations as community projects allow local families to use the food and they would be able to produce more jobs by selling surplus items at the local farmers markets. ("Cheap DIY Bato/Dutch Bucket Hydroponic System")

Tree T-PEE's are another potential solution to increase sustainable food production. This was a product designed by a farmer long ago who wanted to prevent his trees from frost bite at night. He then realized that this could also serve as another type of irrigation. This product helps water conservation, fuel and fertilizer reduction, and root growth. It helps save water, fuel, and electricity. It is in the shape of a cone and goes around the tree. Instead of the tree only getting 10% of the water, it is getting 100% of the water, because it is coming through a little pipe (which is a drip or sprinkling irrigation pipe) and isn't wasted on the areas that doesn't have a plant. In Haiti's rainy seasons, steps could be taken to help farmers to develop a rainwater collection system for storing the water and then using that water during the drier seasons. One of the best features is the fact that tree t-pees are made from recycled products. This is important in Haiti because waste disposal is an ongoing problem throughout the country. These cones are made up of 100% plastic. The product has a 20 plus year working span with very little maintenance

expense. Unfortunately, many people in Haiti wouldn't be able to afford this due to poverty and lack of local availability. The product is relatively inexpensive, starting at $8. If they could have access to these devices, over time Haiti could potentially have a great number of these and they would be saving water. The product I believe is a great idea for Haiti to help save water. ("Tree T-PEE")

The third idea would be teaching the Haitians to build keyhole gardens. Keyhole gardens first became popular in Africa then the people of Texas started to build them because of their hot and dry climate. Keyhole gardens create a way to have great gardens with lots of nutrients during the hot and dry months. These gardens actually work best in the hot and dry climates but they can be used in other climates as well. A keyhole garden is meant to hold in moisture and nutrients from a working compost pile that is placed in the center of an enclosed raised bed. Keyhole Gardens are created by marking out a 6-8' circle on the ground. The center of the circle is marked, along with a 'notch' in the perimeter to allow a person to step into the keyhole to add soil amendments and to harvest the food growing there. From there, an enclosure is built up around the circumference of marked circle and keyhole notch using any variety of items that might be available, including wood, stone, recycled plastic or broken concrete. Once the enclosure reaches a height of about 4 feet, work moves to creating a 5'tall, porous cylinder in the center of the garden. This space is eventually filled with composting materials that will feed the plants growing the garden and can be made of hardware cloth, PVC pipe with holes drilled in it, etc. Work continues with filling the enclosed space around the empty cylinder with materials that will become the plant growing medium. The idea is to mimic the way the forest floor creates topsoil. The bottom layer is created with heavier wood, logs, and sticks. The next layer can be leaves, grasses, wood ash, plant fiber, cardboard and other plant materials that might be available. The upper layers can include layers of compost, petroleum-free newspaper, worms, wood ash, straw and finally, topsoil. This layering of growing materials is repeated until the desired height is reached. Once the keyhole garden is completed, a wide variety of plants can be grown in the resulting nutrient-rich soil, regardless of how rocky the underlying soil might be. Something else to think about is making a top cover for the center circle of nutrients during seasons of heavy rain. This prevents the nutrients leaching out. Covers can be made simply from something like straw. This would be another way to help the families and communities bring in more jobs and food for the families as more keyhole gardens are built, increasing the availability of more varieties and larger quantities of nutritious food. ("Keyhole Gardens")

Organizations such as *Send A Cow* make going across the country and explaining keyhole gardens possible. *Send A Cow* is a humanitarian aid organization which builds keyhole gardens for families throughout sub-saharan Africa. They have lots of supporters and donations which support the company to go to Africa to teach the people there these practices of keyhole gardening. *Send A Cow* teaches families one-on-one as well as schools. This makes it great for kids to see these things that they could easily help their families with at home. Keyhole gardens are a simply way to grow different things that people at almost any age could do. (Lessons From Africa, n.d.)

The final idea would be to teach the Haitians about building hugelkultur raised beds. These first started as an ancient farming technique in eastern Europe. The word 'hugelkultur' is actually German, meaning hill culture or hill mound. These growing spaces can look different because there are so many different ways to go about building them, depending on the available materials and climate. To most it looks like a little mountain of dirt that could end up being calling a garden where you plant your vegetables and whatever else you are putting on it. The first step is to choose the dimensions of the growing bed and the height it needs to be. It can be lower or quite high and can cover a few square feet or many square feet. Some choose make them as low trenches so that when all the food is growing it is about at ground level to help the area around it as well. Some, like to stack it high and have it end up with what we could call a mountain effect. Either way the start consists of putting logs and thick twigs on the bottom or first layer. Next, some dead leaves or dry straw is added. Following that in the middle most would want to add in lawn clippings or green leaves. After that is when the mature compost is added in. Lastly, the topsoil is

added on top. Once the hugel is build, the seeds or plants can be added. Some choose to mix layers in a different order or to make multiple layers of materials, but that main thing is to have the logs on bottom, because over the years the wood decomposes and acts such as a sponge that helps provide a more steady supply water and nutrients to the plant. These hugelkultur beds can be made in urban areas or on lots of acreage. They also have the ability to eliminate irrigation, which is important in hot places such as Haiti. The larger the hugelkultur the better! Even in the hot summer months they are still very well off and green. An excellent characteristic of hugelkultur beds is that once are established for around three years the plant growth is known to be five times better than it was before. These would be an excellent system to develop in Haiti because it would cost simply nothing to start. It's all naturally made with available materials and can help with their soil problems for growing food for families and communities. (Winter-Herbert, n.d.)

The agricultural solutions discussed in this paper definitely fit with the concept of sustainable development. Helping those involved in humanitarian efforts in Haiti to see these solutions as worthwhile investments in time, materials, and manpower would be an important step in helping Haiti begin using these growing methods to lower poverty rates, increase jobs, and potentially help increase crop yields. Demonstrating what could happen if these growing techniques were developed on rural farms and with farm families could pave the way for important, sustainable improvement in food production. This would be a major change for farmers, because they would have the opportunity to increase their crop yields and grow their businesses to help the Haitian economy. It would create more jobs for these people, and hopefully take Haiti out of the ranking for being in the most undeveloped countries. The families and jobs this plan would create could make a generations-long difference for Haitian families.

The United Nations works hard to promote sustainable development. In fact, in 2016 the United Nations decided to take charge of the hunger issues in Haiti and they created an emergency operation. This is to help with the one million people over in Haiti facing hunger issues. The United Nations got together with Haiti's government and came up with a two-phase plan called the emergency/recovery plan. The first phase will help one million Haitians and give these people an unconditional cash transfers, meaning that the people will have immediate access to cash and it's their choice how they use this money. The second phase of this plan is that 200,000 people will receive cash transfers in exchange for participation in asset creation activities. This is where we come in. Talking with the United Nations and showing them these gardening techniques would provide them with four ideas to promote among the Haitian people as asset creation projects for the people of Haiti to participate it. It would help the people of Haiti in many ways because they would be getting the cash they need from the United Nations as well as learning valuable information to start these gardening techniques which would hopefully help the hunger issues they are currently facing. (The Republic of Haiti, n.d.) Using an international aid organization such as *A Growing Culture* would be one way to make this possible. *A Growing Culture* sends aid workers into different poor farming areas to help them learn more productive growing techniques and develop more sustainable agriculture. (A Growing Culture, n.d.)

Not all of Haiti's problems can be fixed by soil improving initiatives. There are still long-standing cultural, political, and economic barriers facing the Haitian people. Helping people to grow more and varied food crops is a significant step in helping individuals and families to move ahead. There are many people passionate about helping others in need and with such simple ways we could help lower the poverty rate, feed more people better food, and help their country to develop more stability. One way of looking at the problems is to recruit a team of volunteers to go to places such as Haiti to teach people about growing food, the nutrients, and the different methods. Another way of looking in is to start fundraisers to have money to start these ideas such as the keyhole gardens or hydroponics. Support letters, online offerings, or even having the women of Haiti make simple things like bracelets and sell them for a higher price is a simple and easy way of raising money. These kind of events do not happen overnight and take time, but with someone passionate enough about Haiti and the health of the country there is enough

room in the world to prove to the people that this is a major barrier that needs to be fixed in order to help Haiti grow.

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