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Haiti, Soil Depletion

Haitian Soil Depletion and a Road to a More Food Secure Future

When Americans go to the grocery store they are guaranteed to find more food than they could possibly ever consume. Not only is the bare minimum provided, but foods of luxury as well. However, this kind of consumption is not possible everywhere, especially in Haiti. Haiti's history is fraught with tragedy; which combined with the lack of quality education, poor farming practices, high unemployment, and low wages leads to an environment in which the possibility of not knowing when one will eat next is very real for many Haitians. Food is a basic necessity that must be met for all, and even taking a few steps to improve food security in Haiti could save the lives of many Haitians.

Haiti is located on the Western half of the island of Hispaniola, which rests near the equator in the Caribbean Sea and therefore has a tropical environment. Haiti is also semi-arid, due to the mountains that lie to the East. Haiti has a growing population of 10,646,714 people as of November, 2018. The Haitian government that rules over that growing population, while a republic similar to that of the United States, is extremely corrupt and has a very hard time providing basic services to the people of Haiti. 66.4% of the land in Haiti is cultivated for agriculture and the main crops grown on that land include: coffee, mangoes, sugar cane, rice, corn, sorghum, wood, and vetiver. Industries that are non-agrarian include textiles, sugar refining, and flour milling (*The World Factbook, 2018*). The average farm size is 2 acres or less. By contrast, the average farm size in the United States is over 222% larger, at 444 acres of land.

The average Haitian family has 4 people. Their diets consist of starchy fruits and vegetables, and they usually eat 2 meals a day. The 44.7% of people that live in the country typically get their food by subsistence farming, but they are usually unable to grow enough food to live comfortably (*The World Factbook*). Most families cook their food over an open fire (*Haiti, 2016*). The average yearly income is 350 U.S. dollars and most people work in agriculture and in other industries such as fishing or textiles (*The World Factbook*). While education is offered in Haiti, most schools are private and have high tuition which is a key barrier to many Haitian families. 40% of families do not have access to healthcare due to an extremely weak health system, and high prices compared to income (*Overview, 2018*). 57.7% of Haitians have improved water and 38% have electricity (*The World Factbook*). Food production in Haiti is inefficient, and along with high unemployment and low income many Haitians barely have enough money to buy food to provide sustenance (*Haiti, 2018*). However, one of the main challenges that prevents food security for many Haitians, especially those that live in rural Haiti, is the constant challenge of infertile and degraded soil.

Soil infertility is not a new problem in Haiti. It has its origins in the oppressive history of Haiti, and has been compounded by the environmental conditions of Haiti. Haiti's topography is not conducive to building up fertile soil. About 75% of Haiti's terrain can be characterized as mountainous, and more than 60% of the land has a slope gradient of over 20 degrees. As a result, most Haitian farmers have to farm on a slope and therefore, their topsoil is very susceptible to erosion. In fact, 1,319 metric tons/km² of soil erodes each year in Haiti. A second natural contributor to soil infertility is the bimodal rainfall pattern of Haiti. With rainy seasons only occurring in the Spring and Fall, drought is often present in the non-rainy seasons. Along with seasonal droughts and the hilly terrain, the natural soils are very poor for plant growth. Soils in Haiti are either Udepts and Ustepts (shallow soils), Fluvents (sandy soils), or Udults (acidic soils with low fertility). Therefore, Haitian soils are intrinsically fragile (*Bargout, 2013*). Human activities and agricultural practices have also accelerated the degradation of Haitian soils. The extreme

monoculture planting of coffee and sugar by plantation owners during the 17th and 18th centuries leached much of the soil of its nutrients. Along with the deforestation of Haiti, due to the demand for firewood. In 1940, about 30% of the land in Haiti was forested. In 1970, that same value was 10 percent. Finally, Haitian farmers often apply bad farming practices to their land such as over-tillage, removal of crop residues, lack of mulching, and the failure to apply manure. These farmers also can't afford fertilizer to improve their soils. For the rural population of Haiti agriculture is their livelihood; due to soil infertility Haitian farmers often struggle to provide for themselves and their family, much less the rest of Haiti. For the children and the elderly, soil infertility has created a reality in which there is a very real possibility of not knowing where their next meal will come from (*McClintock*). It is obvious that some sort of intervention is necessary to prevent further degradation. One of the most forgotten and underrated resources in the environmental dialogue today and in history is soil. Soil is not just dirt, it is a living and complex ecosystem where the symbiotic relationship of billions of microbes, fungi, macroinvertebrates, and plants. Well managed soil harbors valuable nutrients, can hold rainwater, and can filter out pollutants from a farmer's fields (*Natural Resources Conservation Service*). Soil has been one of the most essential parts of agriculture for thousands of years. And poorly managed soil was the downfall of many civilizations such as Mesopotamia and the Indus River Valley civilization. The effects of infertile and degraded soil can be seen throughout Haiti, maybe not explicitly, but they are felt at every level of Haitian Society.

A solution to Haitian soil degradation requires a sustainable yet effective approach. The solution must also be cheap and not require a great amount of technical skill, as Haitian farmers are usually not well educated. The following three proposals are promising solutions. The first, and likely most important, is probably No-Till agriculture. The technique of No-Till farming is pretty self explanatory; instead of tilling the soil to plant the crop, farmers will instead plant each seed individually in its own small "hole", for the lack of a better word (*AgPhD*). While this may seem inefficient, for the small scale farmers of Haiti, this is no issue. Farmers must be instructed to leave the crop detritus from the last year on the fields. No-Till farming has several positives that would help to mitigate the soil issues of Haiti. Firstly, without tilling, the soil will not be turned over and exposed to erosive elements. Therefore, nutrients and rich soil will not be lost to erosion. No-till farming also helps to build up organic matter, along with biological communities in the soil. However, there is a downside to no-till farming. In a no-till system there is no complete "kill step." Therefore, the crop from the previous year/season could become a weed in the current year/season (*Cowan, 2018*). Nevertheless, the next solution, mulching, is a fantastic way to combat weeds in a no-till system.

Mulching is a decent way to combat weeds and erosion. Mulching is a very simple concept that would be very simple to implement on small-scale Haitian farms. Mulching is the covering of exposed soil using wood chips, plant detritus, compost, or manure (*Natural Resources Conservation Service*). Mulching has several positive effects on soil. Firstly, mulching is a great way to combat weeds that may arise from no-till farming. Secondly, mulching can cool soils, which in Haiti could increase crop range. Mulching also improves soil tilth and structure. However, mulching has its flaws. Organic mulches could be expensive, and farmers might cut down more trees for mulch, further contributing to erosion (*Cowan*). This, of course, can be combated by proper education; mulch made out of plant detritus would be highly recommended. The combination of mulching and no-till farming is the foundation of this solution. Each technique feeds and build off of each other creating a strong weapon to fight soil infertility.

The final solution to compliment the others is one that has been used with success in many developed nations, such as the United States. Cover cropping is a good way to combat the issues associated with Haitian soil degradation. This technique has been adopted by many modern farmers in the United States and other developed nations. Cover cropping is the planting of crops, like legumes or alfalfa, to cover soil that would otherwise be exposed. In Haiti, cover crops that are somewhat drought resistant should be

grown; such as a Sorghum Sudangrass hybrid (*Bowman*). Other crops that could be planted are trees. Particularly fruit trees such as mango, papaya, and orange trees. However, other non-fruit trees could be planted, like acacia trees (*Trees Give Life in Rural Haiti: Pwogram Pepinyè, 2017*). Not only would these help to reforest the island and prevent erosion, which is a central factor in the soil infertility issues of Haiti, but it would also provide poor farmers with an extra source of income from the fruit. Cover cropping will provide several benefits to the soil. Firstly, cover cropping helps to prevent erosion, which is the most major problem in modern Haitian agriculture. Cover cropping will also help to bring nutrients from deep in the soil closer to the surface, making them more accessible to the crops that need them. But with the good also comes some drawbacks. Cover cropping could be expensive and the range of the crops could be limited. However, the mulching mentioned above might be able to help with the range issue (*Cowan*). Now that three solutions have been offered, how are they going to be implemented? Would using these practices be compulsory?

The Dust Bowl of the nineteen-thirties in the United States was caused by many American farmers using similar poor farming practices such as over-tillage. However, educational programs dedicated to teaching farmers how to properly manage their soils would guarantee that a catastrophe on the scale of the Dust Bowl would never happen again (*About the Dust Bowl*). This example goes to show how powerful just teaching farmers proper techniques is. This is exactly what Haitian farmers need. The solutions above are useless unless Haitian farmers are educated about them. Haiti needs some sort of program that is similar in scope to the extension services provided in the United States. While the Haitian government is in no shape to provide these services, the Peace Corps is a group with the intellectual and fiscal resources to carry out a program of this sort. In fact, the Peace Corps already does agricultural extension work in countries such as Ghana (*Peace Corps Volunteer Openings*). Now detractors might contest that mere education would not be enough to change Haitian farmers' ways, and that these practices should be compulsory. Forced change is a fantastic practice if all one wants to do is create contempt towards those who are trying to "help." If Haitian farmers understand that the solutions above will help them and make their lives better, they will implement them. Over time, as Haiti stabilizes, and starts moving towards a more politically secure future, the Peace Corps could slowly phase out and replace themselves with Haitian counterparts. Now who would these Haitian counterparts be?

While Haiti has several relatively prominent public universities which could possibly home and operate a national agricultural extension system, none have such a program. The Université d'État d'Haïti (State University of Haiti) is the perfect candidate to house and operate a national extension service, as it already has a School of Agriculture and is the nation's largest and best university (*Faculté d'Agronomie et de Médecine Vétérinaire*). In the first year or two of the project, the Peace Corps would build the framework for Haiti's new agricultural extension program. They would construct small "Agricultural Help Centers" throughout the country in the major agricultural states, particularly mountainous ones, such as Artibonite, Centre, Nord, Nord Est, Grande Anse, and Nippes as these are likely the states with the most need for aid (*Haiti: Agricultural Damage, 2016*). For a time, the Peace Corps would staff and run these facilities. The Peace Corps would start to integrate these small centers into the communities in which they were built, building trust between local, smallholder farmers and the educators and experts at the "Agricultural Help Centers." Slowly, over perhaps a decade, the Peace Corps will phase out their own staff and replace those volunteers with Haitian educators and experts. These extension workers would be students, chosen from the State University of Haiti: School of Agriculture and other Haitian universities to participate in a training and education internship program provided by the Peace Corps. These interns would be given an employment opportunity after their graduation from university at one of the "Agricultural Help Centers." It would be preferable that the current government of Haiti be separated from the program. The Haitian government is extremely corrupt, and it is partly to

blame for the food insecurity in Haiti. Excluding the government from decision making and instead engaging with Haitians on the community level will help to keep this program efficient and effective.

Each “Agricultural Help Center” would be built near local agricultural markets, as these centers need to be accessible for farmers and in an important location, central to local communities. Every center would have similar components. Each would have a small classroom, for educating local farmers on sustainable farming techniques that will improve soil fertility. Every center would also have a small library, filled with books on farming practices and techniques for those who can read. They would also have workshops for the staff of the centers. Perhaps a few of these centers could also have experimental plots where new sustainable techniques could be tested and demonstrated for local farmers skeptical of these new techniques. Centers would also have housing for their employees. Each center would be staffed by about five people, as the centers would be small and the Peace Corps would want to keep a sense of familiarity and trust with the center’s staff. Center staff would advertise their center and sustainable farming techniques in the local markets, as well as traveling out to remote and rural farmers with an education kit which could be contained within the back of a pick-up truck or a small S.U.V., much like George Washington Carver’s “Jesup Wagon” which he used to educate poor Alabama farmers, who could not reach the Tuskegee Institute for agricultural education (*Traveling Trunks, 2015*). These traveling education kits would be used in the same way as Carver used his “Jesup Wagon.” It would be driven on a circuit to remote rural farms and communities, educating those farmers on sustainable farming techniques, particularly those mentioned in the above paragraphs.

The most important thing that can be done to make this program effective is to integrate it to the local communities. In the book *The Third Pillar*, the author, economist Raguram Rajan, makes the claim that a reason for the deterioration in order and civility can be directly traced to the lack of trust between authorities at a state or national level and communities. This must be avoided. Working with community members to figure out what will help the Peace Corps the best in educating Haitian farmers on improving soil fertility and preventing erosion will be the most effective way of solving this complicated issue. Working on the community level will also help to keep this program adaptive and versatile.

Soil degradation in Haiti is a very solvable issue. Not that it is easy, but there are solutions to this issue. The future of Haitian food security is dependent on whether or not Haitian soil can support the amount of crops that Haiti needs to support itself. At the current point, the soil is unable to support the needs of Haiti. However, if the sustainable solutions provided above are implemented in some form, the issue could be remedied and the current situation improved. While these solutions are in no way a remedy for all the problems that Haiti faces they are a few steps into a brighter future. It is the right of every human to have enough food so that they may live a decent life, that is ultimately what remedying soil degradation will help to do.

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