A Soil Scientist Visits Haiti
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It began a dozen million years ago, give or take, with precipitation: a gentle snow of microscopic seashells, each containing a pinprick of calcium carbonate. On the seafloor beneath what would one day become the Caribbean Sea, the tiny shells, called tests, coated the mud with thin films and later after decades, centuries, millennia, and eons, they reached depths exceeding miles.

Pressed beneath their own accumulating mass, motionless aside from occasional sighs and slumps, the microscopic tests of foraminifera, single-celled protists with hard carbonate shells, annealed, becoming row upon row of Miocene limestone.

A tectonic plate supports the beds of limestone. The plate is oval in shape, not so large as these things go, but moving nonetheless, ever eastward, rising over the floor of the western Atlantic. The submerged Atlantic seafloor boils to the surface to form the Lesser Antilles: Dominica, St. Lucia, Martinique are all riding active volcanoes. To the north, the West Indies, so named by a very lost Christopher Columbus, are islands of limestone bedrock at the shoulder of the Caribbean plate. Here, the basement beneath the ocean has levitated above the surface of the sea in a series of earth shattering quakes to form Hispaniola, Cuba and Jamaica. Fossilized plankton, once a gentle snowfall on the floor of an ancient sea, is now the rocky foundation of large Caribbean islands.

When Christopher Columbus returned from Hispaniola on his first voyage in 1492 he told the Queen stories of its forests that strained her imagination. Compared to Iberia’s sparse and shrubby landscape, Columbus spoke of trees taller than the highest steeple in Spain with girths requiring half a crew of men with arms outstretched to reach around.

In 1664 the French wrested control of the western third of the island from Spain during the age of colonialism. Remote islands were for commerce. French schooners carried fresh timber, boiled molasses, and rum to the continent. Emptied ships headed south from Paris to Dakar, where French traders loaded holds with enslaved Africans for shipment to Saint Dominique, as Haiti was then called.

Below deck, the holds were packed with hundreds of Africans drawn from tribes who spoke no similar language beyond vomiting and passing watery stools on their bare legs and one another. For seven weeks, men were shackled shoulder to shoulder on slick mahogany floorboards harvested from the island that was to be their prison. Between 15 and 25 percent died on the voyage, most of dehydration or disease. Survivors lay in lightless spaces, the ceiling was lower than five feet in many
cases, and so densely quartered a bent knee would more than stretch a prisoner’s chains, but also touch the back of a sick or dying neighbor. Deckhands gagged when once a day they dropped food through a hatch into darkness below.

France established control of the island in 1664 and worked both its soils and slaves to exhaustion. Importation of slaves to tend sugar, cotton, cacao, coffee, indigo, and tobacco was so extensive that by the end of the eighteenth century, the French were purchasing 40,000 heads a year. This number remained high because Africans who were worked to death far exceeded the number that could be reared on the island.

By 1804 when Haiti’s slaves became the first people in the world to overthrow rulers who bred, raised, sold, and harnessed other people for profit, the damage to Haiti’s earth was already done. The world’s first black republic inherited a third of an island that had already lost much of its soil fertility and was well on its way to seeing the last of its upland topsoil disappear into its silt-choked rivers and murky bays.

In the 19th and 20th centuries, the rich alluvial soils alongside the Artibonite River, north of Port-au-Prince, were occupied and managed by large corporations, many of them American. When irritated Haitians agitated for access to better quality land and freedom from the tyranny of slave-like plantation work the U.S. Marines invaded. From 1915 – 1934, American military might protected the flats for American businesses like the Haitian American Sugar Company and the West Indies Trading Company.
The comparatively fertile plains of the Artibonite Valley, Haiti.

Haitian families with nowhere else to live were forced out of the valleys moving to higher hills and steeper slopes in attempts to scratch out a living. They burned away scrub to plant millet and yams. Their goats consumed any native plants that survived the fires. Tropical deluges dislodged soil from cracks between rocks. Pebbles and then boulders rolled down hill. Removing vegetative cover from steep slopes is the surest way to create an erosion problem of epic proportions. Over the course of two centuries, large portions of Haiti washed into the sea. What remains is a moonscape in some locations, a thorny bramble of unappetizing shrubs and cacti in others.
Landscape without soil or trees in the mountains above the Artibonite River, Haiti.

In 1956, Hospital Albert Schweitzer began caring for the sick in the remote Haitian village of Deschapelles, in the lower reaches of the Artibonite Valley. The river meanders between two chains of mountains raised by the inexorable eastward creeping of the Caribbean plate upon which it rides. Far from the capital of Port-au-Prince, the Hospital now serves 350,000 Haitians. They have unflaggingly ministered to those with illness or injury through dictatorships, coup d’états, and political unrest.

The wisdom of its director, Ian Rawson, son of its founders, Larry and Gwen Grant Mellon, is to recognize how many patients come to the hospital with complications resulting from malnutrition. Too many people trying to survive on too little arable land. I was in Deschapelles in March 2012 with my longtime colleague, Rich Bowden, at Rawson’s invitation.

The Artibonite valley, where Rich and I walked for miles and drove high into the mountains, is even more overpopulated than it was just two years ago. After the earthquake of January 12, 2010 leveled Port-au-Prince, 70,000 survivors, and according to some estimates maybe as many as 400,000, relocated to the valley with the hospital. It is a valley bounded by stony limestone uplands without trees, forests, or topsoil.
Six years ago Hospital Albert Schweitzer launched its optimistically monikered, Haiti Timber Reintroduction Project, called HTRIP by the locals, with a goal of soil conservation and tree planting. Rich and I agreed, however, there is no soil to conserve. There probably hasn’t been in many locations for more than a century and a half. It is very difficult to make new soil quickly.

The textbooks say to preserve soil locals should construct terraces of stone. A terrace checks rainfall keeping it from racing unimpeded down a slope, preventing water from ripping up soil wholesale like a sheet from a bed and flinging it into the nearest river. When the rain ends and the water recedes a farmer should find topsoil has accumulated behind his wall. Any topsoil at all in the mountains of Haiti, even a shallow collection behind a stone terrace, is a fine place to grow crops and HTRIP has encouraged rural farmers to rearrange boulders in exchange for free food. Since there is not much soil left in higher elevations to amass behind the stone walls, however, waiting for soil to gather is going to be a painfully sluggish process.
Terraces prepared by villagers in exchange for food delivered by Hopital Albert Schweitzer.

Theory and experimentation go onto suggest that replanted trees can save a country. Tree roots hold onto soil; leaves impede the impact of torrential rains; dead leaves add desperately needed organic matter to the soil beneath them; wisely
selected species produce edible fruits and nuts; in time some trees will produce usable timber; and others produce branches that can be harvested on a renewable schedule to make charcoal.

The villagers we met receiving food as payment for moving stones and planting trees wore clothes that were threadbare. The logos on what must have been their only shirts bore the mascots for Indiana University’s Hoosiers, the sponsors of obscure Minnesota triathlons and faded Orange Crush ads. These are all the sure signs of people who have received donated clothes because they cannot afford to purchase their own. Their pants were ill-fitting, torn, and dusty. Young boys had no clothes at all. Young girls wore only cotton underpants they could barely keep hoisted above tiny bottoms.

How, we wondered, could these people give up any farmable land in exchange for a forest that might not produce revenue for a decade? Without enough water to clean themselves or their clothes, how could they be asked to divert some to nourish saplings?

Residents in Barbe, Haiti, a village hit hard by Haiti’s cholera epidemic.

Rich and I generated a few ideas. Aquaponics. Grow fish in barrels. The country has many barrels. Pipe wastewater from the fish barrels into grow-trays and raise hydroponic tomatoes and lettuce without soil. The cleansed water can recirculate to
the fish tanks. When the fish are grown, eat them, too. That will work if we can figure out how to pump water from the barrels of fish to hydroponic basins in a country with no electricity. We'll need to learn what it costs to outfit a solar panel, battery, and a pump.

Another idea is to cut down every fourth row of trees planted by HTRIP. Currently the trees are tall enough they are shading out crops that farmers are trying to grow beneath them. In some locations, there is enough accumulated soil and decomposing leaf litter where the trees have grown to provide a dividend to planted crops. Yields in the newly sunlit rows should be much higher than production from the same crops growing in unfertilized fields. After two years, chop down another row and replant trees where the crops just were. Start a 10-year rotation plan. The added yield in the tree-amended plots might make up for the lost acreage.

Also, tap the toilets. After a cholera outbreak sickened more than 200 people in the mountain village of Barbe, Hospital Albert Schweitzer constructed 20 toilets for Barbe’s residents. It was one of the only places I saw anywhere in Haiti with toilets. Most everyone lives in a stone-block house (limestone boulders, after all, are quite plentiful) guaranteed to crush its inhabitants during a severe temblor. A typical house is one story high and about the size of a child’s bedroom; no plumbing and no electricity.
Because outhouses reside above airless cesspools of human waste they produce methane. PVC stacks release the gas so the expanding vapor does not burst through the floor or, in the unlikely event an errant brushfire reaches the front door, blow the outhouse to kingdom come. A well-placed balloon of some sort at the top of the stack could capture that methane. Handed to the mother of the house, that balloon of odorless natural gas could be used to cook rice and beans. I know because I've done it with a bunch of college juniors who once prepared a cup of tea for me from a barrel full of fish poop. Cooking with natural gas could also mean that villagers might not need to take so many trees to make charcoal.

There is neither a shortage of good ideas for saving Haiti, nor any scarcity of people anxious to help. Large contingents of missionaries in matching florescent tee-shirts, color-coded by church group, occupied extensive blocks of seats on both my flight into and out of Port-au-Prince. Yet, I have no illusions. Arriving as an outsider with clever ideas has rarely proven effective in changing the course of a country's trajectory. Fortunately, Haitians in great numbers are also working very hard to reassemble their own country.

Repairing Haiti for the long haul will require more than sending tents after earthquakes, rehydration salts for cholera victims, or persuading locals to cook their meal for the day with gas that is but one step removed from their bowels, though anyone with any heart should donate to such causes. To really assist Haitians as they attempt to alter their course from tragedy to prosperity requires a close analysis of history and geography.

The damage inflicted on Haitian civil society began soon after European colonists populated the island with beaten, disposable African slaves and then treated both its human chattel and its soil as disposable, replaceable artifacts. Haitians anxious to improve the quality of life for themselves and their children, have been handed the unenviable task of building a country from the ground up. When a soil scientist looks at Haiti he sees ground that is mostly bony substratum, stripped of its moist, dark earth, the foundation of life.

For additional photos of Haiti, click here, https://picasaweb.google.com/117694375514059706325/Haiti2012?authuser=0&authkey=Gv1sRgCljz2a2n3sqBcg&feat=directlink