

Reclaiming Haiti's Future

Located in Latin America, Haiti is the most populous and third-largest Caribbean country by land area, serving as the home for 11.75 million people (CIA, 2021). The country's beautiful mountain views and rugged terrain attract tourists, and also pose significant challenges to the development of agriculture. Positioned near the boundary of the North American and Caribbean plates, Haiti suffers massive and destructive earthquakes that affect not only the country physically but also socially and economically. In addition, insufficient rainfall, deforestation, and drought kills Haiti's agriculture and limits the ability for the country to maintain sustainable agriculture. As a result, Haiti relies heavily on imported agricultural goods. The scarcity of crops due to water shortages can be eased by harvesting rainwater, genetically modified crops, and installing irrigation systems, improving soil moisture, reducing erosion, and supporting sustainable farming.

As of 2023 Haiti's rural population had been reported at 40.34% and almost half of the country was employed for agriculture purposes (Trading Economics, 2024). In 2022 65.1% of Haiti's land was classified as agricultural land, while only 36% of it is arable (Trading Economics, 2022). Most cultivated land is family owned and worked by local farmers, their families, and workers who work for small wages. Money is scarce, hours are long, and most of the work is done by hand. Despite the hardships faced, farmers understand both the importance and risk of the industry. In Haiti these farmers face many obstacles, the main being drought. Consequently, countries like Haiti face widespread malnutrition. However, sustainable practices like water harvesting serve as a potential solution.

Water harvesting is the process of collecting and storing rainwater for later use. Throughout the year Haiti experiences fluctuating amounts of rain. Leaving the land in a dry spell that at times can not be tracked nor prepared for by locals and farmers. Other countries like the United States have practices that allow farmers access to specific water resources with limitations to the amounts that they can take, or allocate financial assistance in the event of a natural disaster, like the USDA Farm Service Agency. Haiti on the contrary, does not have a system in place that will provide crop assistance. Leaving the entire country at a disadvantage when farmers can not afford to mass produce.

Only a small percentage of Haiti's land is irrigated(CIA, 2021), but there is an opportunity for this to change; which is where water harvesting comes into play. If the process of water

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harvesting were to be implemented in Haiti, water-holding containers close to multiple farms or on every piece of land that is used for agriculture would be best. With the lack of affordable and accessible water transport systems, farmers would be under an economic strain if they were unable to easily access water for crops. Collecting water not only will provide farms with a controllable and easily accessible supply of water for crops, but also with water that can be used in various ways. In other practices, water harvesting can be used as the main water source for homes, drinking, and laundry. Water harvesting is also cost-efficient, saving 35% of utility costs in hotels in Jamaica (Carpha, 2023).

Rainwater harvesting has been present in Haiti since the mid 1980s, continuously improving throughout the years. However, 40 years later and the country still faces obstacles leaving no real solutions. Similarly to the hotel in Jamaica (Carpha, 2023), small regions in Haiti have set up community systems that allow individuals to share water. The Yale Tropical Research Institute conducted a study assessing rainwater harvesting in the Artibonite Department of Haiti. Although at times useful, there were many issues recorded such as water quality, finances, and limited access. Whereas private and at home systems offered more pros than cons. These findings suggest that while community based rainwater systems are oftentimes more appealing, individual based systems are more practical in rural settings.

To collect rainwater farmers can use runoff systems, as they are more affordable and realistic. Haiti is a country that practices primarily subsistence farming; because of this, farmers might have their own homes or other buildings already on their land. In these cases, just adding the needed materials(storage containers, gutters, and a downspout system) would be highly beneficial. If there is no building or catchment system already in place, a simple structure will need to be built. With the use of a slanted roof, rainwater would trickle down into gutters, and then travel through a downspout system, and into the collection containers. Once collected, rainwater can be used during dry spells to irrigate crops. During high rainfall periods, farmers can conserve water to use later when needed. Access to a reliable water source will allow farmers to grow an abundance of produce, indulge in a variety of crops, and extend their growing seasons.

In order to run an effective, basic-level water harvesting system farmers would simply need a container to collect water(barrels), a downspout system(PVC pipes, buckets, bottles), a gutter system(PVC pipes, plastic, aluminum), and a catchment surface(rooftop, tarp). Building this system can cost anywhere from 100-500 dollars, estimated for one acre of land. However, the land size, crop amount, additional materials and systems(like filtration), and whether the tanks are for the community or not can raise or lower the cost.

Rainwater harvesting helps to tackle crop irrigation and drought, but drought is not the only natural disaster preventing Haiti from thriving agriculturally. Earthquakes have caused major disruptions to crop growth in Haiti(UN News, 2021), forcing subsistence farming. Haiti will most likely always succumb to the impacts of earthquakes but there can be solutions allowing for efficient growth of crops, like underground sprinkler systems. These systems are primarily for the purpose of crop irrigation but in turn will reduce drought and be designed to sustain earthquakes.

Underground sprinkler systems can be connected directly to the water collection containers. These systems use gravity or low-pressure pumps to distribute the stored rainwater evenly to crops, reducing manual labor and water waste. Pipes can run underground from the harvesting tanks to sprinkler lines laid beneath crop rows, ensuring consistent soil moisture levels even during dry periods. Because the system is buried underground, it is less likely to be damaged by earthquakes. Ideally the sprinklers would be built with flexible material that would allow movement. Having this in between rows of crops would also provide structural support.

Although there are not many if any countries that have invested in infrastructure that is both underground and sustainable against earthquakes, this would be a perfect opportunity to look into that research. This design not only makes the irrigation method more durable but also safer and longer-lasting than surface systems, which are more exposed to earthquake damage or theft. Cities like California and countries like Japan that experience earthquakes use sprinkler systems in buildings. A sprinkler system similarly designed would need flexible piping, swing joints, pop-up sprinkler heads, valves, and a controller, all designed to withstand ground movement during earthquakes.

For a network this complex, farmers might not be able to afford the needed materials or have trust in the system. However, there is a common approach which can supplement this route, like a drip irrigation system. Drip irrigation is a structure that allows for direct water supply to the roots of crops. Compared to regular sprinkler systems, drip irrigation saves more money and more water(The University of Rhode Island, 2024). Extending the supply of the harvested water. Flexible tubing, emitters, a water filter, a pressure regulator, and connectors to deliver water directly to plant roots would be needed for a dripping system.

Crops grown in Haiti include: corn, rice, cassava, yams, sweet potatoes, and various forms of coffee beans. These crops vary in the amount of water that is needed to maintain their growth. For example corn and rice both need large amounts of water whereas sweet potatoes do not need to be regularly watered. We can properly keep these crops growing in their respective growing seasons while not consuming all of the water that farmers have by genetically altering the plant.

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To alleviate any concerns farmers and locals could be educated on the works of Dr. Norman Borlaug with genetically altering wheat to ensure growth in different regions. Similar to his work we can focus on the specific gene in corn that promotes growth and drought endurance. Researchers in the United States(USDA ERS, 2019) and in other countries around the world have already started to look into drought-resistant corn, finding that it is indeed possible to make it happen.

Researchers from Stanford University found that there are hormones and detectors in the plants that allow them to use their roots to find water sources. Auxin and ethylene are co-dependent hormones that control when and where roots will go when they are in search of water. While the researchers are not certain about how they can modify the corn, there is a need in multiple countries.

Another crop that Haiti should consider looking into a genetically altered version is rice. Rice is a crop that can thrive in Haiti but is being heavily imported because of Haiti's drought complications. In 2023 Haiti spent roughly \$340 million dollars worth of rice(The Observatory of Economic Complexity, 2025) simply because their land is not suitable for growth because of drought. A country that can produce this product should not have to spend so much money on importing. Money that has in the past been spent on funding importations can later go towards funding the new water harvesting system. By doing so Haiti could be doing their economy, government, and citizens a huge favor. Not only saving them money in the long run but also allowing the money to have a continuous flow into their economy. Which is desperately needed because the country is in a decline with its mass poverty and food insecurity rates(Britannica, 2019).

Notably, Haiti's sister country, the Dominican Republic, has a huge difference in agricultural success. This success is a direct result of a supportive government. The DR government over the years has advanced policies, directly expanding the middle class and urbanization(World Bank,2025). The agricultural sector also benefits from public policies and incentives designed to improve productivity, competitiveness, and sustainability. While there are other factors that contribute to their success it's the involvement from the government leading the achievement. The Haitian government is not using their resources in the same way as the DR government which is exactly why there is such a huge difference. Knowing these differences in government it can be argued that Haiti's main issues stem from the lack of governmental support.

Farmers can barely afford to grow crops for their own families. Investing in setups like these can be too costly for individual farmers or even for the country to pay for. In order to fund a project like this I would suggest collaboration with organizations. The World Food Programme is

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a great example of an excellent partnership. In 2022 the WFP established a small program, compensating farmers who planted trees to combat deforestation affecting soil and horticulture health. Local partnerships are just as important as well. In Bailly, Haiti, a local church partnered with farmers to find an efficient way to plow land using bulls(Bright Hope, 2022).

Despite ongoing challenges with political instability and violence, Haiti's government has the ability to support initiatives that can be the stepping stones for a thriving agricultural future. The \$340 million spent annually on rice(The Observatory of Economic Complexity, 2025) could be invested in national programs focused on rainwater harvesting infrastructure, crop research, and irrigation technology. Partnering with international aid organizations, agricultural engineers, and universities could also reduce the financial burden while ensuring technical support and sustainability. In the long run, this kind of investment would not only decrease reliance on imports but also strengthen Haiti's economy from the ground up, creating jobs and promoting stability in regions most affected by poverty and food insecurity. Collaboration whether it's locally, global, or national provides triumph for Haitian farmers.

Haiti faces a complex set of agricultural challenges, rooted in drought, natural disasters, and limited infrastructure. However, by investing in practical and sustainable solutions like rainwater harvesting, irrigation systems, and genetically modified drought-resistant crops, the country can take significant steps toward food security and economic resilience. These strategies would empower Haitian farmers to grow more with less water, reduce the need for costly food imports, and redirect national funds back into local development. While challenges remain, targeted improvements in agricultural technology and water management offer a clear and achievable path toward a more self-sufficient and stable future for Haiti.

Works Cited

- Britannica. "Haiti - Agriculture, Forestry, and Fishing." Encyclopædia Britannica, 2019, www.britannica.com/place/Haiti/Agriculture-forestry-and-fishing.
- CIA. "Haiti - the World Factbook." Www.cia.gov, 2021, www.cia.gov/the-world-factbook/countries/haiti/.
- Dickinson, Daniel. "Farmers in Haiti: Growing Crops in Spite of Drought and Floods | World Food Programme." Www.wfp.org, 22 Mar. 2022, www.wfp.org/stories/farmers-haiti-growing-crops-spite-drought-and-floods.
- McCann, Alyson. "Drip Irrigation." The University of Rhode Island, 2024, web.uri.edu/safewater/protecting-water-quality-at-home/sustainable-landscaping/drip-irrigation/
- "Failure and Potential: Rainwater Harvesting in a Rural, Mountainous Haitian Village." Tropical Resources Institute, Accessed 31 Aug. 2025. <https://tri.yale.edu/tropical-resources/tropical-resources-vol-32-33/failure-and-potential-rainwater-harvesting-rural>
- "Haiti." World Bank Development Indicators, Accessed 31 Aug. 2025. <https://tradingeconomics.com/haiti/indicators-wb-data.html?g=agriculture+%26+rural+development>.
- McFadden, Jonathan. "USDA ERS - Drought-Tolerant Corn in the United States: Research, Commercialization, and Related Crop Production Practices." [Www.ers.usda.gov](http://www.ers.usda.gov), 13 Mar. 2019, www.ers.usda.gov/amber-waves/2019/march/drought-tolerant-corn-in-the-united-states-research-commercialization-and-related-crop-production-practices.
- Natural Hazards Understanding the Hazard Lack of Earthquake Bracing on Sprinkler Systems. www.fm.com/-/media/project/publicwebsites/fm/files/resources/p0042.pdf.
- "Overview." World Bank, Accessed 1 Sept. 2025. <https://www.worldbank.org/en/country/dominicanrepublic/overview>
- "Rainwater Harvesting in the Caribbean." Carpha.org, 2023, carpha.org/saintlucia/Rain/Rainwater%20Harvesting%20Toolbox/about2.htm.
- Rodriguez, Malia. "How Farming in Haiti Is Transforming Families' Lives." Bright Hope, 23 Aug. 2022,

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www.brighthope.org/blog-stories/serving-the-poor/how-farming-in-haiti-is-transforming-families-lives/.

“The Observatory of Economic Complexity.” The Observatory of Economic Complexity, 2025, <https://oec.world/en/profile/country/hti>

UN News. “Hunger Spikes in Haiti Following Deadly Earthquake.” UN News, 9 Sept. 2021, news.un.org/en/story/2021/09/1099492

“U.S.-Dominican Republic Agricultural Trade: Growth and Opportunities Ahead.” USDA Foreign Agricultural Service, Accessed 1 Sept. 2025. <https://www.fas.usda.gov/data/us-dominican-republic-agricultural-trade-growth-and-opportunities-ahead>

“Welcome to Zscaler Directory Authentication.” Stanford.edu, 2025, humsci.stanford.edu/feature/new-study-could-lead-development-more-drought-resistant-corn.

World Food Programme. “Hunger in Haiti Reaches Historic High with One-In-Two Haitians Now in Acute Hunger.” Wfp.org, 30 Sept. 2024, www.wfp.org/news/hunger-haiti-reaches-historic-high-one-two-haitians-now-acute-hunger.