Elise Mendoza
Palm Beach Central High School
Wellington, Florida, United States
Cuba, Renewable Energy
April 15, 2026

Food Insecurity in Cuba: Utilizing Floating Photovoltaic Cells to Provide Reliable Electricity and Indirectly Improve Food Security

Cuba is an island located in the Caribbean. As of Sunday, April 12, It has a population of around 10,903,809 (WorldOMeter, 2019), with around 17.9% of the population being rural (Ritchie, 2026), and 82.4% being urban (WorldOMeter, 2019). Unfortunately, of these 10.9 million residents, 37.8% (around 4.2 million people) are food insecure ("Cuba's Deteriorating", 2017), which is defined as the lack of consistent access to nutritious, affordable food.

Cuba is known for being hot, with temperatures able to reach a high of 100.4°F. There are 2 distinct seasons: winter and summer. Winter brings average temperatures of 64.4°F to 77°F, while summer averages around 82.2°F ("Cuba Climate"). Cuba has lots of mountains, hills, highlands, and plains. Most hills and mountains cover ¼ of the island and are located mainly on the coast, while the majority of the mainland is flat with rolling plains that have been cultivated partly for sugar and tobacco production ("Cuba Climate").While tobacco and sugar are the most commonly exported crops, the main crops to be grown include sugarcane, citrus fruits, cassava, plantains, potatoes, tomatoes, and corn (Levinson, 2018).

Cuba's government is a one party socialist republic with communist party leadership led by President and head of state Miguel Díaz-Canel. However, the state only holds 25.6% of lands as cultivated ("ICT4", 2026). Initially after the Revolution, the government seized private properties and dictated what quantities and prices goods were allowed to be sold, including in farming and fishing. This dramatically impacted the farming industry and food supply (cfcadmin, 2024). This impacts food security because without an effective farming industry, there is not a reliable source of food for citizens to eat. Recently, since 2008, the Cuban government started to give farmers 33 acres (25 football fields) of land for individual farms, which, if the yields are successful, can be expanded to up to 165 acres (125 football fields) (Crowell, 2016).

Cuba has a decreasing average number of people per home of 3.2 compared to 4.9 people 50 years ago (Quiñones), which means their population has also been decreasing. The average household may be able to secure higher paying jobs in commerce and personal item repair to get paid 4240 Cuban Pesos ($11.60 USD) per month. However, the majority of people (64% of the workforce) are state workers and get paid 5839 pesos monthly (Robinson, 2025). This means many families also have to rely on secondary jobs to provide for their family.

While Cuba is an island in the Caribbean and is surrounded by water, they have very little food coming in from fishing. Problems plaguing the fishing industry include antiquated equipment, overfishing and strict fishing license regulations determining who is allowed to fish. Recently, the country has been developing a catfish industry to compensate for their lack of fish in the ocean, though it also struggles due to a lack of

electricity to run the water pumps (“Cuba”, Fao). This severely restricts the dietary options Cubans have reliable access to, which means they rely more heavily on other food sources such as agriculture, which is struggling as is.

A typical meal in Cuba consists of rice and beans, pork and beef, root vegetables like yucca and sweet potatoes, and citrus fruits (“10 Essential”, 2025), with most of these being relatively available in their community. Fortunately, most of these are high in fiber, and some (like beans) are even high in protein as well. In order to obtain these foods, families rely on government rationing systems in addition to purchasing from street vendors and stalls. This limits how accessible an adequate meal is in Cuba since a full meal is not guaranteed every day. These everyday meals are cooked using techniques such as marinating, slow cooking, frying, and stewing (Ramons “Exploring”).

Families in Cuba have access to free healthcare due to programs started with the help of the Soviet Union over 60 years ago in 1959. This healthcare is accessible to all and is free of charge. However, medicine shortages have plagued the nation for decades. Youth are also offered free education from preschool through university. In fact, Cuba has one of the highest literacy rates in the world at over 99% literacy (Battle, 2015).

Cubans have access to basic infrastructure such as telephones, electricity, roads, and clean water, but they are not adequate. Cuba has been struggling with an electricity crisis for years now, and since 2024, they have had repeated total grid collapses, and blackouts lasting 18 to 20 or more hours a day (ElectricChoice, 2026). This is partly due to the fuel shortage leaving power plants unable to meet even ½ of the electricity demands the country experiences. Cuba is also impacted by numerous housing crises, food shortages, and even lack of professional opportunities that all make everyday life a challenge.

One of the biggest issues in Cuba currently is the lack of electricity. Renewable energy is in a high need and is currently increasing in popularity due to the worsening energy instability crisis the country is facing, which currently is caused by a shortage in access to oil.

Energy insecurity affects rural and urban populations since it causes less productivity in agriculture for small-scale farmers. This is because small-scale farmers rely on energy for almost everything ranging from irrigating their crops to storing their produce (“Clean Energy”, 2025). Even harvesting foods is impacted by a lack of electricity. Without a more efficient way of powering tractors, farmers are relying on gas, which can cost up to $40 per gallon on Cuba’s black market (Bickelhaupt, 2026). This significantly decreases the crop yield since tractors can’t sustainably run full-time, which results in less food production. Food storage also becomes difficult since without electricity, families cannot power their refrigerators full time, which increases the risk of food spoilage and subsequent diseases. In fact, improper cooling is the main source of foodborne illnesses such as E. coli in the United States (“Most Foodborne”), which can be applied to other countries. All of these indirectly play a role in the lack of food security Cuba is facing.

Cuba’s lack of renewable resources also causes them to rely on high-sulfur fuel oil and crude oil, which releases sulfur dioxide (SO2). This not only affects residents health since breathing in sulfur dioxide can cause health problems such as lung and cardiovascular disease and even asthma, but it can also negatively

impact the environment since it can contribute to issues like acid rain which impacts soil and water and damages biodiversity, as well as impacting grown crops, forests, and even contributes to ocean acidification (Casacuba, et al., 2023).

Thankfully, there is a possible unconventional solution to combat these prevalent issues in Cuba, such as investing in floating photovoltaic cells (floatovoltaics) just like Japan did at their Yamakura Dam in order to harness solar energy. The way these work is that lots of solar panels are attached together to float just above the water's surface, while they are tethered to the ground to prevent them from floating away. Since Cuba receives an average of 5.4kWh/m2 solar capacity each day (Gupta, 2025), the country has numerous opportunities to improve their solar usage. Cuba has the majority of its water territory unused, allowing for a perfect spot to place these floatovotlaics. In fact, having solar panels in water makes them up to 5%-15% more efficient than normal photovoltaic cells (C.j., Ramanan, et al., 2024) due to the cooling effect the water has on the panels. This is because for every degree above 77°F, a solar panel's efficiency drops by 0.3%-0.5% ("How Heat", 2025), which adds up considering Cuba's average temperature is much higher no matter the time of year. In addition, by having more solar panels in bodies of water, this frees up more space to be used for agriculture to grow crops. This could provide more energy to be used for a variety of things, such as powering irrigation systems to make farming more efficient. This reduces the amount of time spent culturing crops, which makes food production easier and more effective, which means there would be more food available for residents. Floatovoltaics could also provide energy to be distributed to citizens to use to power fridges to be able to run full time, which would increase food supply that is safe to eat due to reducing food spoils from improper refrigeration. By providing more energy, tractors would also be able to run full time, which increases food productivity and harvests, which means there is a more reliable access to a source of food.

This solution has the capability of meeting the demands of the population with the addition of a backup source such as generators, which could collect their energy from the renewable energy source, and transport energy to various areas. These would amp up the current state of renewable energy existing in Cuba to make them more able to provide for the people. In fact, harnessing solar and wind power is not new to Cuba. They have 4 wind farms, and 7 solar panel parks ("Help Cuba", 2026), that have helped ease the effects of the energy crisis, with solar energy generating 38% of Cuba's electricity ("Help Cuba", 2026), however they are not adequate enough to supply energy to meet such a high demand.

One upside of investing in floating photovoltaic panels is that it is a very realistic option, so it would be highly effective at providing a reliable energy source. This is because Cuba has lots of unoccupied real estate in the water from 75% of its coastal and marine waters being unprotected ("How the", 2021), which is over 10 million acres. Since a floating photovoltaic park that is 250 acres large can produce 100 megawatts of power ("Floating Solar", 2025), which can power over 20,000 homes, this allows for numerous parks to be built while still leaving a significant amount of ocean area free. This would hopefully provide an increase in energy availability all throughout Cuba so people can experience an improvement in their daily lives. As stated earlier, this would provide a much more reliable source of energy to power tractors and fridges, which play massive roles in food security in Cuba.

Another benefit of installing floatovoltaic cells is that it opens up the possibility to pair the solar farm with the aquaculturing of species such as shrimp, since the solar panels provide shade by blocking the

overhead sun. Since many shrimp species thrive in shaded saltwater areas, this allows the floating solar panel farms to provide both a reliable energy source and an additional food source.

However, it is important to be mindful of Cuba's tendency of experiencing unforgiving waves that hold the power to destroy these parks. That is why it would be recommended that there be some type of wave barrier around the perimeter of the floating solar panel parks to stifle the waves and make them tamer to the point where they have little to no effect on the photovoltaic cells and alleviate that potential issue.

One potential limitation to this solution is that Cuba's communist government might not support these advances, especially in more urban areas, due to the fact that they would have less control over electricity. Since that is out of anyone's control but theirs, all that can be done is to hope that they are more open to these installations if they are funded by an outside agency, since that would mean they do not officially belong to Cuba, rather another organization.

In addition, as a result of recent political changes, there is opportunity for Cuba to be more open to accepting help from other resources. Some of Cuba's most trusted oil providers, Russia and Iran, are currently still in respective wars, so they are less able to donate oil to Cuba. The killing of Iran's leader on February 28th during airstrikes from the U.S. and Israel ("Iran's", 2026), as well as the ongoing blockade of the Strait of Hormuz since April 13 (NPR Staff, 2026) further prevent Iran from aiding in Cuba's worsening oil shortage. Most importantly, Cuba's biggest oil provider, Venezuela, recently had President Nicolás Maduro captured and arrested on January 3rd ("Venezuela", 2026), meaning Venezuela is now cooperating with the American government. This is important because they can now no longer help supply Cuba's oil, which heightens their severe struggle to get oil for electricity. This could lead to Cuba becoming increasingly desperate for electricity and more willing to accept new ideas than ever before.

In order to afford this project, the government would have to work with intergovernmental organizations such as the International Renewable Energy Agency (IRENA), along with getting further help from China to help support this endeavor. Thankfully, IRENA is known for supporting countries in their transition to sustainable energy, so Cuba would be no different. China has already been supporting Cuba in funding some renewable energy projects already, so it would not be outrageous for them to contribute towards floatovoltaics as well. As long as Cuba is able to designate areas of their water territory towards this project, and secure funding from China and/or organizations like IRENA, this solution is relatively feasible and would hopefully improve food security in the years to come.

Tackling Cuba's widespread food insecurity requires a unique approach, and it starts with providing a reliable energy source to allow the country to thrive despite their current lack of stable electricity.

Works Cited

Bickelhaupt, Haley. “A “Neighbor” in Need: Why Cuba’s Energy Collapse Could Spark a U.S. Ag Export Surge.” AgWeb, 30 Mar. 2026, www.agweb.com/news/neighbor-need-why-cubas-energy-collapse-could-spark-u-s-ag-export-surge. Accessed 15 Apr. 2026.

Casacuba, et al. Cuba’s Electric Grid: Challenges and Opportunities BRIEFINGS on CUBA. 2023.

cfcadmin. “CubaBrief: The Main Reason behind Cuba’s Economic Debacle.” Cuba Center, 18 June 2024, cubacenter.org/uncategorized/2024/06/18/cubabrief-the-main-reason-behind-cubas-economic-debacle/. Accessed 15 Apr. 2026.

C.j., Ramanan, et al. “Towards Sustainable Power Generation: Recent Advancements in Floating Photovoltaic Technologies.” Renewable and Sustainable Energy Reviews, vol. 194, 1 Apr. 2024, p. 114322, www.sciencedirect.com/science/article/pii/S1364032124000455, https://doi.org/10.1016/j.rser.2024.114322.

“Clean Energy Powers Rural Resilience in Cuba.” IFAD, 2025, www.ifad.org/en/w/rural-voices/clean-energy-powers-rural-resilience-in-cuba.

Crowell, Susan. “Cuban Agriculture at a Glance.” Farm and Dairy, 5 Oct. 2016, www.farmanddairy.com/news/cuban-agriculture-at-a-glance/372416.html.

“Cuba Climate and Geography | WorkingAbroad.” Working Abroad, www.workingabroad.com/travel/cuba-geography-and-climate/.

“Cuba.” Fao.org, 2024, www.fao.org/4/W7560E/W7560E07.htm.

“Cuba’s Deteriorating Food Security and Its Implications for U.S. Agricultural Exports.” Usda.gov, 2017, www.ers.usda.gov/publications/pub-details?pubid=110175.

Don Ramons. “Exploring Cuban Cuisine: Ingredients, Techniques, and Popular Dishes.” Don Ramon, www.donramonrestaurant.com/exploring-cuban-cuisine-ingredients-techniques-and-popular-dishes/.

ElectricChoice.com. “Cuba’s Electricity Crisis: What Happened & Why.” ElectricChoice.com, 19 Mar. 2026, www.electricchoice.com/blog/cuba-electricity-crisis/.

“Floating Solar Panel Arrays: Complete 2025 Guide to Floatovoltaics.” SolarTech, 30 Oct. 2025, solartechonline.com/blog/floating-solar-panel-arrays-guide/.

Gupta, Hemant. “Unlocking the Future of Renewable Energy in Cuba - the Borgen Project.” The Borgen Project, 8 Sept. 2025, borgenproject.org/renewable-energy-in-cuba/.

“How Heat Affects Solar Energy Production | Articles | PureSky Energy.” PureSky Energy, 2 July 2025, pureskyenergy.com/news-community/articles/how-heat-affects-solar-energy-production/.

“How the American Embargo Impacts Environmental Conservation in Cuba.” Sierra Club, 23 June 2021, www.sierraclub.org/sierra/how-american-embargo-impacts-environmental-conservation-cuba.

“ICT4 Cuba - System Dynamics.” Columbia.edu, 2026, www.columbia.edu/itc/sipa/nelson/ict4cuba-export/mainSpace/System%20Dynamics.html. Accessed 15 Apr. 2026.

“Iran’s Ayatollah Ali Khamenei Is Killed in Israeli Strike, Ending 36-year Iron Rule.” NPR, 28 Feb. 2026, https://www.npr.org/2026/02/28/1123499337/iran-israel-ayatollah-ali-khamenei-killed. Accessed 1 Aug. 2026.

Levinson, Sandra H, and Franklin W Knight. “Cuba - Agriculture, Forestry, and Fishing.” Encyclopædia Britannica, 20 Dec. 2018, www.britannica.com/place/Cuba/Agriculture-forestry-and-fishing.

"Most Foodborne Illnesses Stem from Improper Cooling." Www.purdue.edu, www.purdue.edu/uns/html4ever/0003.Linton.foodcooling.html.

NPR Staff. "The U.S. Strikes Iran after Trump Announces a Renewed Blockade and Tolls in Hormuz." NPR, 13 July 2026, https://www.npr.org/2026/07/13/nx-s1-5891746/us-iran-strait-of-hormuz-updates. Accessed 1 Aug. 2026.

Quiñones, Rolando. SOCIAL POLICIES, FAMILY ARRANGEMENTS and POPULATION AGEING in CUBA.

Ritchie, Hannah. "Population and Demography." Our World in Data, 6 Apr. 2026, ourworldindata.org/profile/population-demography/cuba.

Robinson, Circles. "Today's Average Cuban Salary Now Equals US $16 per Month - Havana Times." Havana Times, 20 Apr. 2025, havanatimes.org/features/todays-average-cuban-salary-now-equals-us-16-per-month/.

the. "Help Cuba Go Solar." Belly of the Beast, 19 Feb. 2026, www.bellyofthebeastcuba.com/news/help-cuba-go-solar. Accessed 15 Apr. 2026.

"Venezuela and U.S. Military Strikes: Considerations for Congress." Congress.Gov, 2025, https://www.congress.gov/crs-product/IN12618. Accessed 1 Aug. 2026.

WorldOMeter. "Cuba Population (2019) - Worldometers." Worldometers.info, 2019, www.worldometers.info/world-population/cuba-population/.

"10 Essential Cuban Dishes: A Complete Guide to Cuban Cuisine." Cookunity.com, 2025, www.cookunity.com/blog/cuban-cuisine-essential-dishes.