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Addressing Food Insecurity in Nauru via Aquaculture

When thinking of the global obesity epidemic, the United States may be the first to come to mind. However, the USA is far from being the most obese country in the world – that title belongs to the tiny country of Nauru in Oceania. *Forbes* names Nauru as the “fattest country in the world”, as 94.5% are overweight, 71% of those are obese, and the average BMI is between 34 to 35 (Strieb). Though Pacific Islanders were initially believed to be genetically predisposed to be overweight, further research has indicated it is largely from the introduction of Western diets (Healthcare Global). Nauru once reveled in high-quality fish and fresh produce during its economic peak in the 1970s but has since relied on imports of instant noodles and prepackaged meals. The obesity epidemic in Nauru requires governmental action to introduce healthy, sustainable food sources that will supplement the lifestyles of its citizens for years to come.

Nauru is a microstate and country in Oceania, and the third-smallest country in the world. Annexed by the German Empire in the mid-20th century, Nauru and other Pacific Islands became victim to multiple bouts of colonization before settling as an independent republic in 1968. Phosphate mining has been commonplace since Nauru’s discovery until the late 1990s, when reserves were exhausted. Once the second wealthiest nation in the world by GDP per capita, Nauru has since lost its role as an economic superpower and relies on foreign aid, especially from Australia and Taiwan (Kiste). The traditional sedentary lifestyle with an unhealthy diet led Nauru to have “the worst health conditions in the world”, according to Takaaki Nishiyama. Since 1968, most citizens have believed that because of their wealth, exercise is not needed, though the average wealth of Nauruans has significantly decreased since then. A traditional Pacific diet consisted of marine fish, including skipjack tuna; fruits, such as coconuts and bananas; and root vegetables, such as taro. In the development of Nauruan culture, size was seen as a sign of wealth, as it represented access to filling, rich food (Marks). During the 1990s, as fertile phosphate deposits depleted, land was declared to be non-arable as a result of strip-mining. To reach the substance, miners removed any source of earth that might have been able to sustain a crop to access the minerals beneath. As a result, Nauru’s main source of income had effectively vanished, and the government scrambled to secure cheap, cost-effective food for its citizens. Jack Hitt notes the lack of a variety of such food: “empty shelves [which] held only one thing for sale: white bread” (Hitt). Trade agreements with much wealthier countries, such as Australia or New Zealand, resulted in increasing reliance on imports and reduction of the traditional fishing and gardening culture (Nishiyama). Attempts were made to reinstate fishing in lieu of gardening, but as Nauru’s domestic product decreased, the government was forced to sell sections of its territorial waters to fishing agencies in countries such as Japan. While Nauru’s obesity epidemic may seem a result of reluctance to eat more sustainably, national economy and dependence on imported food play a larger role in the disease.

An average family in Nauru is made up of 6.0 persons per household, each of which have a life expectancy of 59.7 years. Of the 10,000 or so citizens on the island, 23% are unemployed, and only 7.9% attain an academic degree (“Nauru Stats at a Glance”). Traditional gender roles are especially prominent in Nauru, where women and girls are expected to tolerate and keep quiet about sexual assault or violence, while also having to receive the most basic health care possible if injured. Women are also more susceptible to obesity than their male counterparts, though Nauruan men tend to overdrink and have more mental health issues. Their children, while educated with a high literacy rate suffer from high levels of basic needs poverty (24%), with 23.3% more vulnerable of falling into such poverty, according to the UNICEF Situation Analysis of Children in Nauru. Though there is no indication of food poverty occurring in the country, most of the population gets by on cheap food products, following a diet of rice, instant noodles, soda, and “anything in a tin” (Hallett). Although Nauru is well aware of its issues, economic and social circumstances limit the country’s ability to truly encourage change. As a result, it is imperative to successfully implement innovation methods to combat Nauru’s most pressing issue: obesity, and the health concerns associated with such.

Nauru’s shocking obesity rates have called for numerous operations to improve its citizens’ wellbeing, most of which were unsuccessful. According to Grace Ganz, Nauru placed a 30% tax on “imported sugar, confectionery, [...] and high-sugar foods” in 2007. However, the World Health Organization notes that in order to sufficiently combat the disease, it will “require changes in food imports and agricultural policy” (Hallett), and the tax has not stopped many citizens from buying other items, like chips and snacks high in sodium and saturated fats. Exercise programs, including a three-mile walk around the Nauru International Airport, have been organized by health officials but failed to make any real impact due to regular consumption of empty calories. Imports of fresh produce seem unrealistic; vegetables spoil quickly, and it requires much more money to import successfully. Most solutions are short-term, unsustainable, and financially insecure.

The situation of obesity in Nauru requires a more aggressive approach, beginning with food sources and sedentary culture in the nation itself. Pisciculture, or the cultivation of fish, has long been a part of Nauruan tradition, especially through the rearing of milkfish in Buada Lagoon. Nauru’s only lake is one of two sources of freshwater on the island and happens to be an endorheic ecosystem that is slightly brackish at a salt concentration of 2% (“Protected Areas and World Heritage Programme – Buada Lagoon”). Buada Lagoon and the Moqua Well are the only sources of freshwater on the island, rendering the island highly dependent upon rainfall. During climatic extremes such as El Niño, monsoon-level rainfall is often seen alongside droughts that exacerbate the limited freshwater supply (Anderson, et.al). Despite this situation, the lake supports aquaculture in the raising of numerous edible fish, including various kinds of tilapia and the aforementioned milkfish. Milkfish, prized for its delicate flavor and fatty composition, was phased out of farming following the introduction of Mozambique tilapia, a freshwater fish especially tolerant of salty water, in the mid-1960s, which was meant to curb the rising populations of fruit flies and mosquitoes living in the area (FAO). Instead, the tilapia overpowered the milkfish, resulting in a rising population of a fish that Nauruans do not consider palatable. The creation of Taiwanese concrete basins (20m long, 10m wide and 1.5m deep) in 2001, equipped with oxygenators, nets, and uniquely engineered feeding techniques, would have allowed fish farmers to raise milkfish using seawater without the presence of tilapias (Allwood, et.al). However, a lack of funds made Taiwan give up the project, leaving only the concrete

shells intact. In addition, the uncurbed tilapia and rising sewage levels in the lake are sources of concern for those wanting to reinstate aquaculture.

Milkfish, or *chanos chanos*, are fish commonly used for aquaculture in shallow brackish or freshwater ponds. Found in warmer sections of the Pacific and Indian Oceans (Weitzman), milkfish is prized in Southeast Asia, especially Taiwan, and numerous Pacific islands for its versatility, relatively low price, and tender flesh. In the Philippines, Indonesia, and Taiwan, where the milkfish are most commonly consumed, they are raised by one or a combination of three methods: sea cages, concrete tanks, and/or shallow ponds. Nauru, as a small Pacific island, is most inclined to use existing concrete tanks to protect milkfish from being dominated by tilapia in the lagoon once more. Following the establishment of the fishes' habitat, naturally occurring algae and rapidly multiplying duckweed will sustain the fish from fry to adult. Though financial costs and disease will limit the immediate expansion of domestic pisciculture, meticulous planning and routine will inevitably result in an accessible, sustainable food source. 2021 World Food Prize Laureate Dr. Shakuntala Haraksingh Thisled demonstrated the benefits of fish farming and its role in human nutrition via the creation a fish-based food system with enough essential micronutrients and fatty acids to sustain rural Southeast Asia (World Food Prize Foundation). Application of Dr. Haraksingh's technique in Nauru through reinstated milkfish cultivation could transform the diets, incomes, and livelihoods of some of the world's most obese.



Credit: Northwestern University

Although the Taiwanese left many concrete tanks behind, they must be readied with further equipment to be fully functional. This semi-intensive method of raising fish is more profitable at the cost \$6.67 USD per thousand fry in 1998, in comparison to the \$27.40 USD required for the same number of fry when using intensive methods (Lee, et.al). The tanks, already outfitted with oxygenators and nets, are able to channel naturally occurring algae to feed the growing fish. The milkfish, which are usually no more than 1 meter in length, are therefore removed from potential predators, which would usually take advantage of fry (Luna). An alternative method that may be explored is the reinstatement of milkfish within Buada Lagoon. Although milkfish did not survive well when free to interact with tilapia, the physical barrier of net sections can prevent further ecological blunders. By following Taiwan's example and using preexisting structures, Nauru can provide citizens with a greater variety and availability of fish to eat in place of nutritionally lacking fast foods. Despite the need to rebuild industries from the bottom and its tediousness, Nauru would finally be able to become self-sufficient and deny the imperialistic tendencies of other financially successful countries to step in and offer help.

Reforming milkfish farming would allow Nauru to rebuild a sustainable aquaculture, and in turn, improve the nonexistent agriculture on the island. Fish bones and carcasses can be used as fertilizer to improve Nauru's loose, porous soil unsuitable for farming crops (Lee). The carcasses' nitrogen would be able to add nutrition to an otherwise ineffective soil, which could be used to initiate a revival of Nauru's traditional agricultural lifestyle. The diet of decades past, filled with bounty of fresh fruits and vegetables, can be grown from parched soil revitalized by decaying fish. While it paints a gruesome picture, the ability of fungi and bacteria to use these nutrients and excrete valuable organic matter is biologically natural and should be taken advantage of in such a desolate area. Another option to explore is the technique of aquaponics, which cultivates crops without soil alongside edible fish to maximize the amount of food produced ("Aquaponics Resources: Texas A&M AgriLife Extension"). Pollution is a high concern for aquaculture, as excessive buildup of feces and nutrients can produce algal blooms and other toxic conditions. In aquaponics, the nutrient-rich waste created by the fish fertilize the crops, lessening the need for fertile soil (Cao, et.al). In conjunction with reintroducing nutrients to the local land, aquaponics is a viable option for Nauruans to subsist on. It uses similar techniques to the aforementioned milkfish farming, with necessary tanks and pipes. If designed correctly, installations can be extremely energy efficient. However, in order for aquaponics to be successful, the resources and expenses must boost maximum production capacity. This kind of industrial capacity is not possible in such a small nation as Nauru. In Puerto Rico, the government sponsored a vertical farming operation in Mayaguez. However, Puerto Rico is a much larger and wealthier territory than Nauru. What more, only certain crops can be grown through this type of farming. Traditional Pacific foods, such as coconuts and bananas, come from trees that may be cultivated on fertile soil. It is therefore more viable for Nauru to rely on more traditional methods of sustainable farming than to try to finance expensive and consuming techniques. This investment and focus on a single industry can improve the future of many Nauruan citizens in different ways, therefore creating an open path to a healthier lifestyle without the threat of obesity-linked diseases.

While a sustainable food source would encourage many citizens to eat healthier, the government needs to act in accordance with the actions of its countrymen. Though the introduction of new food would allow for ready access to a larger, easier dietary option, Western imports will continue to be consumed due to the addictive nature of unhealthy salts and sugars. Nauru must

extensively limit the “aid” of Australia, Taiwan, and New Zealand in favor of establishing a more self-sufficient economy. Without the financial burden of having to order large shipments and cargo loads of food, Nauru can focus its efforts on reclaiming its territorial waters once sold to Japan. These waters, with their warm temperature and relative shallowness, can also be taken advantage of via milkfish cultivation to reignite the historical Pacific tradition of fishing. In addition, the inefficient sewage collection and treatment, which can cause contamination from *Escherichia coli*, should be improved and can be done so without excessive financial requirements. Buada Lagoon meets the criteria of the Ramsar Convention of Wetlands of International Importance, and Nauru can therefore establish intergovernmental connections with foreign countries without relying on their intervention (“The Ramsar Convention and Its Mission”). Potential protective measures should include improving sanitation and focusing on the collection of wastewater, which can be made into gray water clean enough to water crops. Governmental action can therefore improve the lives of Nauruans, allow a rise in international prominence, and establish self-sufficient industries.

Obesity may be a highly prevalent problem in the modern world, but unique tactics may address the issue in a sustainable fashion. From the initial root cause of diet, issues such as fish farming and economic self-sufficiency can be addressed, one step at a time. With active efforts to reform Nauru into a healthy community, other countries may be inspired and continue to offer a chance to live a better lifestyle.

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