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Seychelles: A Balance of Imports and Exports

Seychelles, widely known as a dream destination, full of ecological and cultural diversity and a welcoming environment to visitors. It is a chain of islands off of the north-eastern coast of Africa, consisting of a mainland and numerous other small islands. The country of Seychelles consists of a section of sea north of Madagascar which contains approximately 155 tropical islands, some granite and some coral, the majority being uninhabited. The surface area of the mainland, Mahé, is approximately 174 square miles. The flora and fauna of these islands are many of the most diverse and beautiful in the world, due to the country's early realization of negative human impact upon the environment. Despite appearances, the economy of the country is vastly unstable, and, though not currently failing, requires aid. A large majority of the edible products consumed in the country are imported, as the country cannot grow enough food due its size and the variety of crop the area can produce. As such, the country has cast its lot into the tourism industry, subjecting the country's economy to the spikes and dips of the industry of tourism, which are greatly dependent upon the prosperity and peace of other countries. To divert the country's resources from the tourism industry to its own agriculture, hydroponic growing techniques could be incorporated into the farming methods currently exercised on the islands. This would both divert man power from tourism services, as well as provide locally grown produce to the families of Seychelles.

The typical Seychelles family attains a great deal of income in stark contrast to the typical sub-Saharan African family. The average income of such families is approximately \$30,000 USD, which is many times what the average sub-Saharan family receives annually. However, 20% of household income is spent on purchasing food for the family, as compared to 10.8% in America (Carry Trader.) A staple of Seychelles cuisine is rice, which does not grow on the island, contributing to imports. Other dietary staples in Seychelles are coconut milk, fish, and meats such as chicken, beef, pork, or goat. The heightened expenditure of income on food is due to produce costing more because of airfare, import taxes, and other markups on the product.

Education is virtually universal on the island, with a literacy rate of approximately ninety percent, and equality in the education of boys and girls. However, after primary and secondary education, no further schooling is available due to no universities or colleges on the island, again placing emphasis upon how little room there is on the island. Primary healthcare on the island is well established, but advanced healthcare is unavailable; this is not as much of a problem as it would seem, as most serious tropical diseases have not been introduced to the island. There is one hospital on the island.

The mainland of the Seychelles does not have a definite contrast between rural and urban areas. The rural and urban areas are intertwined, giving no official designation for either. Most farms rarely exceed two hectares, and most are an average of half of a hectare. Many farms, mostly coconut plantations, exist off the mainland, and reside upon many of the numerous small islands of which Seychelles consists. There are 6,000 hectares under agricultural production, however only 200 are intensely cultivated (Central Intelligence Agency, Seychelles.) The crops designated for growing on this land are tea, copra, vanilla, lime, and essential oils. None of these crops are edible on their own, contributing even more to the lack of regionally grown produce; however, they do count for some of the exports of Seychelles, providing stable income to maintain the imports that are necessary. Yet another barrier to local food production is that the range of crops able to grow in the area is quite low. Introducing hydroponics would allow for many other crops to be introduced, including a staple of the Seychelles diet: rice, as well as other grains, again

lowering the need for imports. In addition to the dedicated farms on the island, many urban families grow produce or livestock on their own property, usually chickens accompanied by a larger animal, such as pigs, cows, or goats.

Hydroponic growing techniques are a rapidly expanding endeavor, especially in countries such as Seychelles, with little arable land or area to grow on. These methods are a person and environment friendly solution, allowing crops to be raised en masse, without worry of harming the environment or land reserves, as these techniques utilize no soil. This method of farming is especially useful in the conservation of fertilizer, land, and water. As such, in areas with lessened food security, hydroponics are a viable solution to most issues, as they are affected very little by influences once installed. They are almost 100% efficient with their use of water, only 1-1.5% of the water from the beginning is spent after each harvest ("Hydroponics"), making it exponentially more efficient. In addition, the water used is constantly applied directly to the roots. The plant becomes more efficient and grows freely, being given all the nutrient and water solution it can absorb.

Where food insecurity is due to an inability to reach markets, hydroponics can aid as well. Hydroponics units can be very slight and rather mobile, to reach areas where individuals can purchase produce grown. In addition, due to their variety of sizes and the ease of which one can be designed and maintained, one could easily be procured and maintained in a poor household, however the poorest areas must have financial aid to afford fertilizer and seed. On the other end, advanced hydroponic systems can be intensive and expensive simplified hydroponic growing is much simpler and cheaper with low operational and maintenance costs. Even though units can be constructed with lower costs, yields from such systems are lower in comparison to advanced hydroponics the yield still outweighs the regular farming yields. In addition, cheap and easily available materials such as fish aquarium tanks, ceramic pots, and aluminum cans can be used. This is, however, strictly for small scale household hydroponics systems. These are also useful in urban areas where space is limited.

From these statistics it can be seen that implementing such a plan would be beneficial as it is self sustainable. The gardens are not only a source of fresh produce rich in vital nutrients but also a source of income thus the beneficiaries can use the money to send their children to schools and for other needs. Because this is an income generating project it can still be carried out even if there are no free funds because the farmers can work with private companies to secure micro-loans which will be paid back after the produce is sold. Small-scale hydroponics systems should be integrated and encouraged in Seychelles, promoting both the effectiveness of the plan as well as educating the population to the effectiveness and technique of hydroponic growing. Persuading the community to accept and advertise hydroponic growing will be a hindrance.

There are numerous examples of how hydroponic techniques have been successful in supplying a population with locally grown produce. One such example and model in the use of hydroponics systems is Australia. It is ranked in the top ten world commercial hydroponic producers, ranked by area. With over 240 hectares under hydroponic production, it is the largest lettuce producer in the world. The hydroponic strawberry production is greater than the strawberry production in the United States (Carruthers, Steven). Australia's motivation for utilizing hydroponic growing, however, was the food insecurity of the indigenous communities in Western Australia. Approximately seventeen percent of these communities do not have regular access to produce, and eighty-four percent had to travel an average of 101 kilometres to reach the produce that was available. Currently, hydroponic developments and techniques are doing much to reduce the food insecurity issue ("Increasing Food Security in Remote Communities through "Aquaponics").

Uruguay has incorporated techniques known as ‘simplified hydroponics’ into their lifestyle. A project was undertaken, which encouraged families to incorporate small hydroponic gardens into their property, and to plant food crops. As much urban area in Uruguay is built atop landfills and other unsafe sites, much of the country’s soil was filled with a variety of pollutants, which made hydroponics an attractive alternative. The project was a success, with as many as ninety percent of families asked complying. A small number of families that agreed actually succeeded in raising their income. Many other families succeeded in using their resources stemming from their simplified hydroponics units to pay for the units themselves, as well as to provide a stable and substantial amount of food product for the families. A significant number of families were able to trade their grown vegetable product for complementary foodstuffs, furthering the success of the project. In addition to the increased income and food availability, the self-esteem of families in the area improved as well (*Social Uses of Simplified Hydroponics*). The successes of Uruguay could be replicated in Seychelles on both a larger and a similar scale, with larger facilities built in their designated areas while families build smaller units in their homes, comparable to families growing herbs or produce in their gardens. The limitations may be the solution used in soilless culture as well as public know-how.

Japan has succeeded in revolutionizing the technology involved in hydroponics, as well as being a pioneer in the industry itself. Japan has 1,500 hectares exclusively dedicated for soilless culture. Sixty-nine percent of these are used for the production of vegetables, while seventeen percent is used for growing flowers, and fourteen percent for fruit tree production. It is also important to note that Japan’s geography and situation are fairly similar to that of Seychelles, as they are both island countries and have limited resources relative to those of mainland countries. Japan has invented many different systems and substances to provide a more ergonomic as well as cost effective industry for their own hydroponic methods. As such, there is much to learn from them. Their systems utilize a method involving floating rafts over a deep flow waterbed. These are primarily used for leaf crops and starting smaller plants to be relocated to a more suitable setup for the plant (Approaches, Policies, Strategies). The small difference between growing in Japan and the Seychelles is climate. Northern Japan has a temperate climate, necessitating closed greenhouses, which are considerably more expensive to build and maintain.

The incorporation of hydroponic techniques has much to do with overcoming barriers pertaining to funding and importing the required materials. In September of 2011, the government signed the Comprehensive Africa Agriculture Development Programme (CAADP) Compact. This agreement committed Seychelles to invest 10% of public funds into agriculture for the purpose of raising farm productivity, using sustainable, climate resilient methods. It revolves around the expansion of the farm area, remembering sustainable and responsible land and water management, improvement of infrastructure, market access, the enhancement of food supply and security, as well as the development of research and adoption of new technologies (Approaches, Policies, Strategies.) The government could incorporate these funds by advertising the effectiveness and efficiency of utilizing hydroponics to build upon how most islanders already grow their own food in a garden as well as funding the labor and education. Smaller farms or plantations could be offered subsidies to incorporate hydroponic techniques into their existing farming methods. In addition, loans could be taken and distributed equally and paid off by many of the organizations related to the security and food production on the island. Hotels and other sectors of the tourism industry could play a role in the monetary management of hydroponic projects undertaken. Both industries could benefit by hotels supporting these hydroponic setups, while these setups repay the hotels by providing produce, forming a lucrative partnership between the industries. The hydroponic areas themselves could be incorporated with little effect upon space on the island or the local environment. Seychelles consists of a large chain of islands, with most of them barren granite islands, which are mostly uninhabited. The structure, though greatly variant due to the sizes of islands, would comprise of a large allotment with poles supporting a film over the beds. These beds would be six inches to a foot in depth, possibly molded by concrete and lined with a plastic of some sort. These beds would

contain floating rafts growing strawberries, spinach, or starting other plants to be moved into a separate greenhouse. Greenhouses may be scarce, as they are expensive and not as efficient for leaf crop when contrasted with a large scale raft system.

The community would have a large role in the spread of hydroponics. Exactly what role it plays is dictated by how everything falls into place. The large scale hydroponic company or sector of a company should be encouraged to sympathize and work with the community, as St. David's Hydroponics does in Onario, Canada. Companies should endorse communities to form hydroponic clubs, to help each other find supplies or advice, and to share ideas as well as incorporate some competition to strive for improvement. Decisions like these by the companies should aid the growth and spread of knowledge and experience within communities.

To achieve the food security for which every country strives, Seychelles must shift from its economic dependence in the tourism industry to the local production of foodstuffs. With the massive amount of imports, should the tourism sector fail, much of the country would starve. As displayed by the efforts of Australia, Uruguay, and Japan, hydroponic farming does indeed have the potential to feed and support a nation. These countries demonstrate that the incorporation of hydroponics into the islands very well may shift the economic dependence upon tourism in the country of Seychelles, allowing Seychelles to become self sufficient and focus its efforts elsewhere. With aid and support, it could provide the support and stability that the country needs, going far to not only stabilize, but to raise the standard of living in the Seychelles, introducing jobs and freeing the typical family's income for things apart from food. Once the security has been addressed, the country could provide much for itself and others with its income from tourism, without the need to spend it on importing equipment, fertilizer, seed, or other farming equipment.

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