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Guyana, Entomophagy

### **Entomophagy and Other Improvements**

What's generally small, outnumbered humans 200 million to one, AND is edible? The answer is insects.

Since the dawn of time, our ancestors used these creepy crawlies as a stable source of protein and nutrients that could not squish and eat them in return. Insects, unlike other animals, were always available and during the warm months, they were, and still are, very prolific. One female generally lays hundreds if not thousands of eggs that develop into delicious little bite-sized babies. Throughout history, humans have continued with their insect-eating habits. In fact, the United States, Canada, and Great Britain are the only countries in the world that don't eat insects on a regular basis. Entomophagy, or the human use of insects as food, could potentially be the solution to hunger and other problems in countries such as Guyana.

Guyana, as a country, is mostly made up of rural area with a population of approximately 795,000. 72% of the population lives in rural areas compared to 28% that live in urban areas. Not very long ago the population saw a drop because heavy emigration was happening in the 1990's all the way up to 2012.

Guyana is run by parliamentary republic which is very similar to our democracy. Major crops for Guyana include but are not limited to cultivated crops such as sugarcane, rice, and vegetables, livestock such as cattle, hogs, and chickens as well as fish and shrimp. Other exports include edible oils and fresh fruits. Cultivated crops currently take up 8.4% of the country. The average farm size is between 2 and 5 hectares or equivalent to a medium-sized family farm in the United States. These farms experience tropical climate conditions that are characterized by hot, humid weather and two rainy seasons, the first one being between May and August with the second happening between November and January.

In this tropical country, the average sized family is 3.6 people but since there can't be part of a person it would respectively be rounded to 4 persons per household. Typically this 4-person family would be fed on one-pot meals generally consisting of sweet potatoes and fresh fruits, fish and seafood. Along with slow cooking, other cooking methods also include frying, boiling, baking and, in some cases, fermenting. In order to put food on the table, people of Guyana are employed in service, management, and agriculture

jobs to provide for their families. Most children in Guyana get an education for an average of 10 years even though 16% of children ages 5-14 are already employed. Although 88.6% of children are enrolled in school appropriately, health care is still limited in Guyana. Contamination of food and water are also concerns as well since Guyana's population are at high risk for food and waterborne illnesses.

Challenges for Guyana concerning the water quality, availability of healthcare, and food safety are currently moderately severe and has continually remained at this constant level. Although the people of Guyana are not dirt poor, they are only the next step up with the majority of the population being at a lower-middle income. One of the main causes for the shortage of quality water, food, and healthcare is due to the uneven distribution of the population across the country. That being said, urban areas are far better off with these health issues compared to the rural area that makes up the majority of the country. Especially influenced by these health issues are the elderly and young children that are generally more susceptible to diseases. Minority groups are affected just as much as the majority of the population is. Improvements in health care, water quality, and food safety would benefit the population of Guyana as a whole.

Along with relying on well-known solutions in agriculture and nutrition, eventually, the need will arise to "think outside the box." The solution that will be proposed here could potentially crawl "outside of the box" on its own. With Guyana being a country blessed with a tropical climate and an abundance of vegetation, it would be an ideal place for the production of insects since food is readily available and the hot, humid climate would allow production insects to thrive without the need for excessive temperature regulation. The first half of the solution could improve Guyana's economy directly by creating more exportable products and indirectly by boosting the yields of other crops would be beekeeping. The second half of the solution would be to produce and harvest insects for a direct source of nutrition. The production of insects is a smart decision for three main reasons.

First of all, compared to other animals that are produced for human consumption, insects grow extremely rapidly. Ideal species for production could be produced in a matter of a couple of months with the high humidity and hot climates of Guyana. For example, the house cricket has been found to thrive at temperatures between 80 and 90°F as long as food and moisture are abundant. Female house crickets can lay up to 728 eggs each that will hatch into nymphs who will reach adulthood in around 60 days. If the ratio of male to female crickets is equal that would mean one female would produce around 364 daughters. If those were to be kept for reproduction, within a matter of a year their production numbers could range in the millions just from the first female cricket. It would be recommended, however, to start with several thousand crickets in order to produce a good-sized harvest. Studies have also shown that the production of insects pound for pound is healthier for the environment than other livestock concerning water pollution, feed, and space requirements.

Secondly, with the ability to produce large amounts of offsprings rapidly, the use of insects as food would mean a steady source of nutrients to the people who need it most. Guyana's people have had a history of consuming wild insects in times of dearth, however, consuming domestically raised insects would be safer and could prevent various problems concerning illness. Studies have shown that insects are as healthy if not healthier than beef concerning nutrition values with no insects being below beef in nutrition value. Along with providing essential protein, insects also contain important micronutrients that humans must consume daily. Some insects' nutrient profile even matches or exceeds livestock sources such as chicken and pork.

Thirdly, the production of insects does not have to deal with the production of insects for food directly. Other products that can be produced with insects would allow producers to diversify and decrease the risk of raising field crops. Honey bee colonies can be set up in fields to increase the yields of field crops in addition to producing a product of their own. Fruit groves, oil plants such as sunflowers, and even flowering vegetables can all benefit from the abundance of pollinators readily available. Plus, from the

pollination of these plants, products such as honey and beeswax can be sold for extra income. With Guyana housing part of the Amazon Rainforest, there is always the option of producing insects, particularly colorful butterflies and beetles, for use as decorative items as well. This production would not only increase the income being produced from exports but would also encourage people to leave the rainforest standing instead of cutting it for lumber and farmland. Wild specimens of both genders could be collected and raised in captivity. Generally, male insects are more colorful and are what collectors are looking for so the female insects could be released back into the wild to continue the life cycle. The males could then be harvested to create jewelry, wall hangings, and singular specimens for collectors. Then the process could be repeated all while promoting rainforest conservation and benefiting the country's economy.

With respect to the above positives listed on the production of insects for food and profit, the promotion of beekeeping, entomophagy, and production of aesthetic insects is being recommended. These simple changes would benefit wildlife and rainforest conservation, reduce water pollution, increase income for farms, increase product diversity, and increase the yield of other field crops. Beekeeping and producing other insects have a very low cost start up with the biggest expense being equipment or even a building to house the operation. On average, a typical beehive in the United States costs around \$315 with the cost decreasing from there on due to the fact that some equipment can be reused and others can be used for multiple hives. Butterfly and other insect farming begins around \$2,500 which would include a greenhouse or similar space and may not be needed if space is available. Having low-cost startups mean that farmers can start small and invest in the expanding operation when they can.

In Guyana, there is an association called the Ankerville Development Association whose pledge is "to accelerate developments for the benefit of all Guyanese." This group would be a good candidate for the support of this solution although the need may arise that it works with other groups such as banks and other civic organizations to help gain support and funding. The government may need to view new food

sources and make sure that health standards are set to keep food quality high. Other health standards concerning the care of insects and export may also need to be reviewed. Although healthcare is not directly improved by this solution, this improvement plan should cause a ripple effect. If families' income increases, they would be able to afford better health care. With this being said, areas that are not currently able to afford health care may use this increase in income to attract physicians since there would be an increased demand for such jobs and increase in the ability to pay for such services. Other needed improvements would be influenced in similar ways.

With all of the problems of the world, there's no wonder why it's necessary to focus on improving places such as Guyana one little thing at a time. In this case, it is proposed that millions of little things are used to improve health care, water quality, and food safety in the country of Guyana. It has been found that Guyana has a history of eating insects on occasion so only a little push is needed to promote insects as a nutritious new food staple. With the need to feed growing populations, insects show great promise with their prolific and rapid growth behavior. Beekeeping can be valued for its production of specialized products on top of improvement of other crop yields. Beekeeping and entomophagy are both simple yet may potentially hold the key to the World's hunger problems. With such simple changes, even the smallest of things can truly make a difference.

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