

Emma Ehlers
Edgewood-Colesburg Community School District
Edgewood, Iowa
Panama, Factor 6: Sustainable Agriculture

Sustainable agriculture is an ongoing problem in Panama, especially for the people that have fallen below the poverty line. Across Panama, many different tribes of natives make up most of the poverty population. According to the Economic Commission for Latin America (2008) 80.5 percent of the native population is poor and 51.9 percent are extremely poor (Meditz, S. 1987). Rural Panama is suffering the worst because old farming techniques such as slash and burn have not been eradicated. Therefore, the land is being raped of its nutrients and fertility. This problem affects most of the rural families that are barely able to harvest enough crops to feed themselves.

A typical farming family in Panama is composed of a mother who works outside of the farm to be able to make more money, a father who works the land full time to produce food for his family, and two children. The children would go to school through high school and then come home to get a job or help work the land. In some cases, if the family were poor enough, the younger girls would make money through prostitution. The boys of the family would get jobs on a construction crew with hopes of bringing home more money; otherwise, they would stay home to help their father produce a harvest until they were old enough to get a job elsewhere. A typical family in Panama would have a diet reflecting where they lived in the country. If the family were living on the coast, they would eat fish, and other seafoods, and if the family lived more inland, they would eat whatever wild game they could hunt. This wild game is most of the protein in their diet, and the mothers who prepared the food for the family would mix the meat into a soup with root vegetables and corn to have a meal that would provide the children with something that reflected a balanced diet (Moore, 2000).

The problem most rural farming families run into is that the land is not fertile enough to support a crop more than one or two growing seasons, and the infertile soil is why families are always struggling to harvest enough to eat. The land just does not have the capacity to support crops, let alone yield a high enough harvest for the families to have enough extra produce to be able to sell any of it. When faced with this challenge, families can implement the use of a cover crop and green manure. Once the cash crop (main crop) is planted, then a cover crop like wheat, rye, or clover is planted. After the cash crop is harvested, the rural farmers graze their animals on the cover crop that would be still growing. Then when they are finished grazing the animals, the cover crop is plowed under and used as green manure, and that helps to put nitrogen and other needed minerals back into the soil. Sustainable agriculture affects many people in Panama and can be solved by implementing cover crops to add fertilizer back into the ground.

First of all, the lack of sustainable agriculture affects not only the way rural families get food, but also how they make money. If they aren't producing enough extra to be able sell, they don't have any extra money to buy clothing or be able to send their children to school. The climate in Panama is tropical, including a rainy season and a dry season. On the Atlantic side of the continental divide, heavy rainfall restricts farming but enhances fishing. Whereas on the Pacific side, the dry season, from December to April, gives farmers the chance to harvest their crops. Lack of high quality soil restricts the growing of certain crops; however, the areas that do have good soil fertility are used under the assumption that farmers will practice conservation methods, but many do not. In most areas the topsoil is very thin and therefore erosion is an ongoing problem. The citizens living in mountainous areas have the most trouble growing crops and would be raising livestock such as cattle, pigs, and chickens. Sustainable agriculture is a problem that needs to be addressed, and if the problem is ignored, families will be forced further into

poverty because they cannot produce enough crops or make enough money to adequately take care of their families (Meditz, S. 1987).

One popular farming technique used by poor, rural farmers is the slash and burn process, which puts a constraint on agricultural cultivation. Trees, bushes, and weeds are cut and then burned to clear a location chosen by the farmer for crop ground or pasture for livestock. Slash and burn is bad because when the trees are burned, the trees release all of the carbon dioxide that was in their cells into the atmosphere causing what scientists call the "Greenhouse Effect"; which is basically the planet warming to a temperature it wouldn't normally be if greenhouse gases weren't a problem (Meditz, S. 1987). When farmers use slash and burn, the ground produces a good crop the first year and a poor crop the second year; this is because after one harvest the land has no fertility left. The land is cultivated for two years and then farmers select a new plot to be cleared and let the old plot rest for ten years before farming it again in hopes of the plot growing back vegetation and replenishing the soil with needed nutrients (EPA & Division, n.d.). In the early to mid 1900's there was a population boom in Panama and more and more people moved to the rural areas to farm. There were so many new farmers that there wasn't enough land for everyone. Having the ten-year rotation made it really hard for the new farmers to get land they could farm right away because the land needed to rest for ten years. Due to this, the farmers got greedy and stopped waiting and shortened the ten years to two years. Therefore, the land was further raped of its fertility and at a much faster rate than before. Poor rural farmers practice subsistence farming, or harvesting enough crops to just feed themselves and nothing else because the soil is unable to support much more than that due to the harsh effects of slash and burn (Meditz, S. 1987).

Agricultural equipment used by the rural farmers in Panama is very primitive. Plowing is generally not practiced on these farms; however, the farmers would have access to a plow but not want to use or not have a horse or oxen to pull it through their fields. Farmers plant their seeds by placing seeds in holes poked into the ground with a stick. Tree cutting, land clearing, weeding, and harvesting are all done with the use of a variation of knives ranging from an axe to a machete. These knives and the sticks make up the majority of all the farm equipment used by a farmer. Larger corporations would own more farmland, have more modernized equipment, and more acres. These larger operations would also have the money to be able to buy the more fertile lands and employ workers to work for them. In some cases, the hired employees would be other poor farmers that had been bought out by the bigger farms (Meditz, S. 1987).

"Theodore Roosevelt once said, 'The more you know about the past, the better prepared you are for the future.'" Thinking back to feudalism and the Middle Ages, society is reminded that the three-field rotation and cover crops helped pull the peasants out of poverty, and in turn allowed them to pay their vassals in money instead of goods. Monks did years of research and studies on how they could help improve the agriculture of feudalism. The iron plow replaced the wooden plow, and horses were starting to become domesticated and used instead of the oxen. These two minor improvements helped the peasants raise production and made them more efficient. However, the three-field rotation was the major improvement that increased production. The peasants began using 67% of their land instead of 50%, and they also started planting legumes as their main crops, because even back then they knew that legumes were high in nitrogen and would help add nutrients needed to grow crops as well as support livestock. Due to these new technologies, food was more abundant and more people moved to the cities. Before there was a food surplus, peasants had really bad nutrition, were always sick, and didn't live very long

lives. After the new techniques, there was more food available to the peasants, and they had a more balanced diet that allowed them to be healthier and live longer lives. The surplus of food made it so peasants could sell their extra food for money, as well as trading and bartering for other commodities or resources such as new tools or plows made by a blacksmith. Because of this new trading and bartering system, powerful cities such as Constantinople were created and anyone wishing to trade went to these cities because that is where the merchants were. Panama can learn from history to help make their agriculture, and cities better (Ellis, 2011, p. 212-238).

Panama could have the same results if the farmers would implement the ideas developed in the Middle Ages with updated technology. In Panama, urban residents moved to rural areas to take advantage of rising farm markets, but after investing all their cash, they were unable to move back into their urban residences. The farmers had spent all their money buying their land, the seeds, and the equipment needed to produce a harvest, thus when the farm market stopped growing, farmers had all of their cash flow tied up into farm investments and found it difficult to feed their families until the crop could be harvested for a profit. If Panama implanted the three-field system, the country's people would have a surplus of food and their poor farmers would be able to pay back their debts as well as pull themselves out of poverty. As the farmers get themselves out of poverty, those that want to do something different with their lives will be able to do so because they can afford it. This would help Panama become more powerful and help it have widespread trade with more countries (Ellis, 2011, p. 212-238).

To help solve the problems of erosion, infertile soil, and lack of pasture ground for livestock, the rural farmers of Panama need to implement the use of cover crops and a three-field rotation. The average farm size is roughly six acres, and farmers would split their land up into three, two-acre portions. One portion would be for the cash crop, like corn, which is one of Panama's highly exported crops. Another portion would be a legume such as the pigeon pea, which according to Engels (2015), is high in nitrogen and puts needed nutrients back into the soil, and can also be harvested for food value. The final portion would be a cover crop, like clover, to graze the cattle. Clover seed is very flexible and can be planted by simply scattering the seeds on the ground and letting them grow. Once the plant has grown up enough to cover the barren ground, the cattle can be turned out to graze on the clover. As the cattle graze, the cattle also spread their feces all over the ground, and their feces is the best fertilizer a farmer could ask for. Having a place to graze their cattle that will produce enough forage to adequately feed the cows will help rural families raise a cow that has enough meat on its bones to provide the family with a good amount of food, as well as a cow that can produce enough milk to give the family a good amount of calcium.

In order to eradicate the poor soil conditions, and implement the three field system, the government of Panama would need to utilize the Peace Corps, and other missionary groups. Organizations such as these would be responsible for directly teaching the farmers how to get the best yield out of the new rotation system. These individuals would be working side by side with the farmers in their fields throughout the growing season, explaining how and why this works, and assisting with the day to day care of the crops. As a result of the extra help on the farm the children of the family would be given the chance to attend school on a more regular basis. While at school children would be given the opportunity to learn about sustainable farming practices. Thus everything would then be coming full circle, with the new rotation system the farmer has more food, more money to enhance the local economy, the money is then also used to send children to school, and the circle continues.

Having more money makes healthcare and education easily accessible for the family and their children. With more money comes less stress and work, and in turn more time for the kids to be going to school. When the family is less stressed then they will be in better health and have more money to pay for health care instead of self-diagnosing if serve injuries occur. The children attending school would be offered the chance to take classes on better and more sustainable agricultural practices, in hopes for the children to take what they learn and share it with their parents. Having a better education and good healthcare will turn the future around for the Panamanians.

While only having two acres to graze livestock on could be a problem for someone in the United States that has more than two cows, it is not a problem for Panamanians because the average family only has one or two cows total. One would be used for milk and the other would be fattened for butchering. The cows need a lot to eat to gain weight for butchering, and without fertile soil there isn't enough grass to support cows on a 100% grass-fed diet. After implementing new strategies, cattle would have vast areas to graze, thus making them fit to butcher. Large farming corporations would have more acres of grass and be able to afford to feed the cows some kind of grain to put extra weight on them. They would also sell their animals, so their hides can be made into leather and then sold elsewhere, making money for the corporation.

Having the clover and the pigeon pea will help add nitrogen back into the soil, which makes the land more fertile, and the pigeon pea can be harvested for food. It is most often eaten mashed up for breakfast, and is a great source of protein and fiber. This helps solve the infertile soil problem and the erosion issue because there would always be something with roots in the soil holding it in place, so the wind or water can't wear away at it. The cash crop is the crop that makes the family money and they use that money to buy clothes and pay for other expenses. Otherwise, the extra crop is used as food to feed the family. Using the three-field rotation, farmers won't need to cut down and burn anymore of the rainforest because they would have enough fertile land to farm on, therefore, eliminating the need to clear trees for more land.

As humans we tend to turn away from change because it means being uncomfortable. The use of primitive agricultural equipment makes it hard to bring the Panamanians up to speed on advancements because even if they were given a tractor, they likely would not want to use it. It is very expensive to buy fuel to run the tractor, as well as parts to repair it and rural farming families do not have the extra money for those types of expenses. In order to bring them up to speed in the farming industry, small modifications can be made to the equipment they already use. Technological advancements take time. The intention is not to overwhelm the Panamanians but simply to help them produce more of a crop and in turn raise their profits with minor improvements taken one step at a time.

Overall, Panama is a place that is suffering from severe poverty and unsustainable agricultural practices. The Panamanians that live in the rainforest eat only what they can produce, and not having enough to feed their family makes it difficult to have any extra produce to sell. When families do not get enough to eat, they cannot work as hard for as long. It takes energy to work hard, long hours and if families are not eating a balanced diet and getting an adequate amount of food, they don't have enough energy to work. Therefore, production isn't as high or as efficient, and the family can't harvest as much food.

The reason the Panamanians have such trouble harvesting crops is because their land is not fertile, due to using slash and burn. Slash and burn is not only bad for the rainforest but is very harmful to the atmosphere through greenhouse gases. These gases add to the natural carbon dioxide already in the atmosphere causing there to be more carbon dioxide than needed. This is what contributes to the controversial issue of the Greenhouse Effect; which is the planet warming to temperatures that are not natural (EPA & Division, n.d.).

To solve this problem, and enhance agricultural production, Panamanians need to make their soil more fertile by planting nitrogen-fixing plants, such as the pigeon pea and clover, and plant some kind of cash crop like corn. The corn is not a nitrogen fixing plant; however, it is a plant that will have high production and sell for more money. In order to ensure that all parts of land get fertilizer added back to them, a three-field rotation is necessary. Farmers have about six acres of land to work with, so dividing that land up into three, two-acre portions and then rotating where each of the crops are planted will ensure that each chunk of land gets the adequate amount of fertilizer needed to get higher production from their crops.

Picture this: It's the future; families live in stable homes, not shacks; and there is a steady amount of money being made from the crops, ensuring children have everything they need and maybe some of the things they want. Young girls no longer need to sell their bodies through prostitution to put food on their family's table or pay for their siblings to go to school. Farmers are able to pay their debt off and move on to what they really want to do with their lives, instead of just doing what needs to be done. Life is good; children have food available to them whenever they are hungry. Children are allowed to go to school beyond high school in order to pursue their passions, instead of doing what pays the bills. Using the three crop rotation will help make all of the family's' dreams a possibility.

References

- Education System in Panama. (n.d.). Retrieved December 22, 2016, from <http://www.classbase.com/countries/Panama/Education-System>
- Ellis, E. G., & Esler, A. (2016). *World history*. Boston, MA: Pearson.
- Engels, J. (2015). 5 Chop-and-Drop, Nitrogen-fixing perennial legumes for the tropics and beyond. Retrieved December 22, 2016, from <http://permaculturenews.org/2015/12/18/5-chop-and-drop-nitrogen-fixing-perennial-legumes-for-the-tropics-and-beyond/>
- EPA, U., & Division, C. C. The greenhouse effect. Retrieved January 30, 2017, from <https://www3.epa.gov/climatechange/kids/basics/today/greenhouse-effect.html>
- Meditz, S. W. & Hanratty, D. M. editors. *Panama: a country study*. Washington: GPO for the Library of Congress, 1987.
- Panama. (n.d.). Retrieved December 22, 2016, from <http://www.encyclopedia.com/places/latin-america-and-caribbean/panama-political-geography/panama>
- Panama Culture. (n.d.). Retrieved December 22, 2016, from <http://www.everyculture.com/No-Sa/Panama.html>
- Rural poverty portal . (n.d.). Retrieved December 22, 2016, from <https://www.ifad.org/>
- United Nations Statistics Division. (n.d.). Retrieved December 22, 2016, from <http://unstats.un.org/>
- Welcome abroad! (n.d.). Retrieved December 22, 2016, from <https://www.internations.org/>