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Brazil, Factor 6: Sustainable Agriculture

Brazil: Sustainable agriculture techniques to improve soil fertility

Brazil is one of the larger countries in the world, with an area of about 3.2 million square miles and a population of 197.8 million people (World Factbook, n.d.). Since a third of the population is in a situation of food insecurity, about 66 million people do not have access to enough food (Neves and Peduto, 2010). Because of this, food security has been a priority in Brazil for some time now. Brazil is a country originally discovered by the Portuguese, and won it's independence on September 22, 1822. It is currently listed as a federal government, and has 26 states and one federal district. Its current president is Dilma Rousseff (World Factbook, n.d.). The climate in Brazil is tropical and temperate. 84% of people live in urban areas, which means only 16% of the population live in rural areas, and most of these are farmers. Brazil has an emerging national economy. It is part of the BRICS group, standing for Brazil, Russia, India, China, and South Africa. These countries are up and coming players in global affairs (Ghosh, 2013).

The average family in Brazil is made up of a mother, father, and about four children (de Onis, 1985). Family time is considered important, and families will usually eat together, especially lunch, as it is the most important meal of the day. The average diet is made of a traditional meal of rice, beans, and meat (Scharf, 2011). Recent studies have shown, however, that they are starting to convert to more sugary, salty foods. Another trend is the amount of coffee being consumed. An average Brazilian will drink three cups of coffee per day (Scharf, 2011). A person living in urban areas, which is most of the population, will buy their food from stores and markets.

Education in Brail is struggling, but getting better. On average, 45% of people living in poverty will have less than a year in school (Kubacka, 2012). Farm families might have less because children are needed to help out on the farm. Another problem with families living in rural areas is the fact that they have limited access to schooling. Up until fairly recently, there has been a problem with teacher absences that have resulted in lower quality education (Kubacka, 2012). This has led to students having to repeat years over, and this sometimes results in students becoming frustrated and dropping out of school. Recently, there have been re-vamped laws and programs designed to reduce these problems. They have not been completely resolved, but have been drastically reduced. Despite the problems in the education system, the literacy rate in Brazil is at 90% (Kubacka, 2012).

Health care in Brazil is an interesting case. In Brazil, Health care is a right, so in theory, everyone has access (Yates, 2013). However, it does not quite work like that. Most rural places do not have access to Health care or clinics. In places that do, things like medication are not covered. Some doctors have actually recommended that their patients sue the government because of it (Yates, 2013). Health care in Brazil has a lot of room for improvement. Out of 46 countries, Brazil is ranked number 36 in skill and competence of medical staff. They are ranked 43 in cost and affordability (Brazil Health, 2013).

The average family has many barriers to overcome. In farming families, this includes agricultural productivity. The barriers there include the lack of land and money to expand (de Faccio Carvalho, 2002). Also, families living in rural areas have limited access to education and health care. The lack of education usually stems from either not being able to get to a school, or being needed on the farm. Most farmers will have less than six years of education (de Faccio Carvalho, 2002).

Poverty is the main reason families in Brazil are not able to afford food. However, this has started to be addressed. Former President Luiz Inacio Lula da Silva implemented a program in October 2001 called Fome Zero, or Zero Hunger Project. President Lula actually won the World Food Prize in 2011 (Cassel, 2011). By using his Zero Hunger strategy, Brazil was able to meet the first Millennium Development Goal set by the United Nations, which was cutting poverty in the country by half (World Food Prize, 2011). The goal was to have this done by 2015, but was accomplished by 2009. Part of the Zero Hunger Program was the Bolsa Familia program, which provided financial aid to poor families. Another important part was the Food Purchase Program, which distributed food to poor families through schools, community restaurants, etc. An especially important part of that program is that is acquired food from smallholder and family farms (World Food Prize, 2011). This increased the income of family farmers by 33% between 2003 and 2009 (Family Farming, 2012).

In Brazil, 84% of the farms are family farms. To be considered a family farm, the farm must meet the following criteria: 1. The property must be no bigger than four fiscal modules (This can be from half a hectare in southern Brazil to 100 ha in the Amazonian region) 2. The owner's family must provide the majority of the labor, and 3. The farm must be the main source of the family's income (Family Farming, 2012). These farms usually combine livestock production and crop production. Family farms are on the smaller side. Although 84% of the farms in Brazil are family farms, these only take up 24% of the total farmland in Brazil. These farms are still important, though, because family farms employ 76% of available farm labor and provide 38% of the gross value of agricultural production (Family Farming, 2012). On the other side of the spectrum, there are the commercial farms. There are several larger farms in Brazil. 1% of the farms in Brazil are larger than 1,000 hectares, and take up 45% of the total land used in agriculture (de Faccio Carvalho, 2002) Overall, farms in Southern Brazil are smaller than the rest of the country.

As mentioned before, typical farms in Brazil are very small. The total size of most farms is less than 100 hectares. Most farmers are over 52 years old, have less than six years of schooling, and make less than 100 dollars a year (de Faccio Carvalho, 2002). Because of this limited income, over half the farmers in Brazil have off-farm revenue sources. These might include aquaculture and community forestry (de Faccio Carvalho, 2002). Most farms are also technologically limited. Nearly half the farms have no access to electricity and 60% have no tractors. Less than 1% of farmers carry out natural resource protection (de Faccio Carvalho, 2002). Regardless of these restraints, Brazil produces a wide variety of crops, including soybeans, coffee, cotton, rice, beans, corn, wheat, citrus, cocoa, tobacco, and bananas. They also raise a significant amount of cattle. Brazil is the number one exporter of cattle in the world. 1 in 51 pounds of beef in the world is produced in Brazil (de Faccio Carvalho, 2002).

Because of the limited income of smaller farms, fertilizers are not always used, so sustainable agriculture was already unknowingly making an appearance in Brazil. Sustainable agriculture is the act of farming using the principles of ecology. Sustainable agriculture usually has a positive effect on the food quality, and depending on the way it is used, can increase food productivity without resorting to genetically modified crops. Sustainable techniques include crop rotation, natural pest predators, and soil enrichment (Sustainable, 2008). Crop rotation is rotating crops so that the same crop is not grown on the same patch of land several years in a row. The idea behind this is that different crops require different nutrients, and take the same nutrients out of the soil year after year. If the crops are rotated, it gives the nutrients a chance to replenish. This is especially effective with soybean crops because they actually put nitrogen back into the soil (Sustainable, 2008). Cover crops are crops grown on the land when the main crop is not being grown to help prevent erosion. This may not be as effective in Brazil because they are able to grow food all year round. Another technique used is natural pest predators, which involves releasing predators that would normally consume the pests in the wild. Using natural pest predators are an effective way to rid the environment of pests while not introducing pesticides that can possibly contaminate the food (Sustainable, 2008).

A key part in sustainable agriculture is soil enrichment. This can be done in many different ways. One way of doing this includes chemical fertilizers, which have a negative impact on the environment. Chemical fertilizers are spread through runoff, into the watershed, rivers and eventually end up in the ocean. Nitrogen fertilizers being used in southeastern Brazil have caused serious pollution in lagoons near Rio de Janeiro, and several other locations near the ocean (Saquarema, n.d.). Other more environmentally friendly solutions are to use manure or compost on the land.

Sustainable agriculture is already making an appearance in Brazil. Brazil has recently enacted legislation that adds soil remineralization to its environmental policy (Remineralization, n.d.). Remineralization is using rock dust to the soil to restore nutrients. This will have a positive affect on the credibility of alternative farming practices, as a whole country is adopting this policy.

Sustainable agriculture and soil enrichment is important because it helps preserve the land for generations to come, while still enabling farmers to produce enough food to feed their country. This is especially important in Brazil. As mentioned earlier, poverty in Brazil was reduced in half by 2009. There are systems in place to get food to families who are not necessarily able to afford it. Brazil's population growth is only 0.83%, so they don't need to expect a huge increase in the population (World Factbook, n.d.). They are able to produce enough food to feed everyone in Brazil. However, there are still a couple of problems. One is that Brazil is already at the point where it doesn't have to support only itself anymore, since they are part of the BRICS group. They will probably become even more pivotal in world affairs than they are now, especially in agricultural production (Ghosh, 2013). The other problem is being able to keep producing enough food to feed itself.

Brazil is a tropical and temperate region, and its soils are mainly farrasols. These are extremely weathered soils, leeched of nutrients from crops being planted year after year (de Faccio Carvalho, 2002). This is not ideal for the fact that they are going to need to produce more and more food for the foreseeable future. To produce more food the approach some will take is to cut down rainforests to convert into farmland. This is not a sustainable solution. Other than the loss of habitat and biodiversity, the world's rainforests produce 20% of the world's oxygen (Taylor, 1996). Not to mention that there is enormous potential to find a cure for diseases like cancer in plants found in the rainforest. That leaves us with getting more out of the land we have, while still preserving the soil. The answer to this lies not in converting to just organic farms or just commercial farms, but to get both types to work together to find more ways to get more out of their land.

The techniques used in sustainable agriculture mentioned earlier can help with preserving the soil in organic, commercial, and family farms. A new soil enrichment technique is a product called Biochar. Biochar is a new product developed from terra preta soils; terra preta literally means black earth (Lehmann, n.d.). Scientists found these dark earths in the Amazonian region. The leading theory in the origin of these soils is that they were a product of soil management by the indigenous people in Brazil. Whether it was intentional or not is still up for debate. These soils store an amazing amount of carbon and organic matter compared to the soils around them (Lehmann, n.d). They have up to 150 g C/kg soil, as opposed to 20-30 g C/kg soil. In terra preta soils, the depths at which organic matter is found can be 1-2 m deep, while the average depths are 40-50 cm (Lehmann, n.d.).

Some scientists think that terra preta soils were the result of vegetation fires. This theory was taken to develop biochar, which is charcoal produced from organic material. TBiochar can be made from several materials, including: woodchips, bone, and manure, and so on (Biochar, 2013). Wood-derived biochars are more carbon rich while manure and food waste-derived biochars are higher in nitrogen and phosphorus levels (Biochar, 2013). What they all have in common is the effect on the soil and environment. Atmospheric benefits include reduced nitrous oxide and methane emissions, reduced odor,

and it captures carbon in the soil. Soil benefits include decreased nutrient runoff, and increased soil carbon, soil fertility, and overall soil health (Biochar Initiative, 2014).

The OpenWorld Biochar Coalition has started working on developing on site biochar facilities that are already taking place in Brazil. If more family farmers start making their own biochar, it could drastically increase crop yields and have a positive effect on the soil (Harrington-Griffin, 2013). A Project in India that has potential to work in Brazil is the Bhoochetana program. It means, "Soil rejuvenation." The government took readings of nutrient content in several regions, and showed the results to the farmers, allowing them to see what nutrients needed to be added to the soil. The hope is that the government would pay for the nutrients needed, at least for a little while (Bhoochetana, 2011). In the meantime, farmers can try other methods like adding manure or plant material to increase crop production and make more money. Once they are making more money, the have the potential to be able to afford the nutrients. This project has the potential to work in Brazil, since soil quality is so important there (Bhoochetana, 2011). The government could help smaller farms pay for biochar in addition or in place of other soil amendments. Larger commercial farms can buy biochar, which would create a supply and demand, and maybe even start a biochar industry in the country. This in turn would create more jobs, allowing people to make enough money to buy food. Communities can support this by starting their own biochar projects, or making sure to buy their food from small local farms to provide support for the smaller farms. The government can help by providing microloans for soil amendments, including biochar. Microloans allow people to only borrow what they need, so that they do not need to pay unnecessary interest. The government could also set aside funds for further research into soil amendments and biochar to enable farmers to more efficiently fix their soils.

Sustainable agriculture is the future of farming. It is the only way we will be able to keep producing food for generations to come while still protecting our planet. In places like Brazil, this is especially important, because they have a very important ecosystem that needs to be protected, and they need to be able to keep producing food, in spite of their soil problems. Sustainable agriculture can help solve all of that. Brazil has a bright future, and it can be made even better by sustaining the ecosystems and improving farming techniques.

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