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Brazil, Factor 7: Animal Agriculture

Factor 7: Sustainable Cattle Production Practices in Brazil

Brazil is the second-largest cattle producing country in the world and is an important contributor to the world's agricultural industry. Beef is an important export commodity for Brazil. Currently, Brazil is considered a developing country, but is poised to become a leader in sustainable cattle practices and in providing food for the world's population. The Brazilian government and other organizations, such as the United Nations, have put in place various agreements to ensure that sustainable practices are encouraged and being used. Increasing herd fertility and dealing with environmental and climate issues, such as deforestation, will improve Brazil's cattle production and benefit both Brazilian producers and the environment.

Brazil is in eastern South America, with much of its east side bordering the Atlantic Ocean. The total area of Brazil is 8 515 770 square kilometers; it is a comparable size to the United States of America. Brazil's bordering countries are: Argentina, Bolivia, Colombia, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela. Many of the natural resources that have had or currently have had an influence on Brazil's economy are: bauxite, gold, iron ore, manganese, nickel, phosphates, tin, uranium, petroleum, hydropower and timber. Brazil is as diverse in geography, as it is in cultures. There are some rolling hills, some plains, mountains, and some coastal areas. Of Brazil's total land mass, 61.9% of the land is forest, 32.9% is used for agriculture, 23.5% is used for pasture and the rest is for other uses like permanent crops, urban areas and arable land. The total population of Brazil is 205 823 665 with an annual growth rate of 0.75% as of 2016. Although agriculture is a vital aspect of Brazilian culture and economy, 85.7% of the population lives in urban areas (CIA Fact Book, 2017).

Family is one of the most important aspects of Brazilian culture, therefore family farms are one of the most important factors in the Brazilian agricultural economy, as they employ more than fourteen million rural workers (Peixoto, 2017). Family composition is the nuclear family (two parents and children living in the same home) and possibly some of the extended family living with each family. If extended family does not live with other family members, they would live very close to one another. The fertility rate has been declining since the 1960s due to the aging population and is now around 2.1 children per woman (CIA Fact Book, 2017). The most difficult barriers effecting subsistence farm families is the lack of education and technology. Though it is now improving, government programs for educating rural citizens have been scarce or non-existent, and many farmers do not possess the skills or equipment to yield a proper crop or product. Farmers not being able to produce enough crops also effects their wage, access to food markets and adequate nutrition. Because they do not have enough money, subsistence farmers do not have the goods to sell or the money to transport items to the market. Not having proper education or equipment can have a serious impact on the families' access to a way to sell the produce they do not need themselves. Adequate nutrition can also be a huge problem especially in young families with growing children. If they do not have access to proper amounts of the essential vitamins, minerals, proteins and other important nutrients, it can have a serious impact on their health and well-being. This becomes an even more urgent issue when the rural family doesn't have access to a good health care facility (Crego, 2017). The average subsistence farm is quite small as they only produce what they need to survive. Most farms would have chickens and a few cattle, they might grow crops such as, coffee, soy and corn. They would mostly use hand tools in means to plant and harvest crops, as the average subsistence farmer does not have enough money to afford

machinery to assist him (Crego, 2017). Another factor negatively affecting subsistence farm families are the children moving to urban areas in hopes of finding a higher-paying job or career. Even though this theoretically, could help the whole family, having multiple sources of money as the children would likely send part of their salary to their parents, takes away important and necessary labourers (Peixoto, 2017).

Cuisine is an extremely important part of Brazilian culture. Many of the meals are a family affair making food very important to all Brazilians. Feijoada is the national dish, and it originated from African slaves who would smuggle leftover pork from their masters' houses. It is a thick black bean stew with pork, served over rice. Manioc, also known as cassava, is a staple in Brazilian cooking, it is a starch root full of carbohydrates, much like a potato. The average breakfast meal, for farmers in Brazil may consist of tropical fruits like papaya, local cakes, tapioca, couscous, grilled ham and cheese sandwiches or bread with butter and or jam. To drink would be coffee, tea, juice or a chimarrão which is a strong, small, caffeine-rich cup of coffee much like an espresso. Lunch is the largest meal of the day and would mainly be made up of rice and beans entrees, although it depends on the geographical area. For example, in the Southeast, maize, cheese, fish and eggs are very important in the area's cuisine. Southern Brazilian cuisine is heavily swayed by gauchos, the cattle ranchers, and a lot of barbequed meat is used in cooking. Common ingredients in the North and Northeast are local tropical fruits, peanuts and fish. A small meal between lunch and dinner often has cookies, cakes, bread, coffee, tea or chimarrão. Dinner is a light meal of soups, salads, vegetables, pasta and of course rice and beans. Common fruits that are very important in Brazilian culture are: mangoes, guava, hog plum, pineapples and acai berries (McPhee, The Foodie Bugle, 2011). Small subsistence farm families would mostly consume food they grew themselves, as markets would often be far away and they would not hold any other jobs to pay for other food.

Health care in Brazil is an issue that effects all Brazilians as many cannot afford the care that either themselves or their loved ones need. Federal health care is available to anyone legally living in Brazil, including foreign residents. Those who cannot pay for health care themselves can go through the government funded hospitals or private practices. In Brazil, government-funded health care covers the costs of: doctors' fees, lab fees, and hospitalization, surgery, and prescription drugs. The best health care in Brazil is offered by private firms and is only used by Brazil's higher class, which is about 20% of the population (internationalliving.com, 2013). Despite the access to health care, the infant mortality rate in Brazil is eighteen deaths to every one thousand live births, and there are approximately 826 700 people living with HIV/AIDS. Common diseases are: bacterial diarrhea, hepatitis A, dengue fever, malaria, schistosomiasis and zika virus (CIA Factbook, 2017). Access to healthcare in rural areas is extremely limited, and even if subsistence farming families had access to a hospital or doctor it would be the inferior public health care system. The public health care system in both rural and urban areas, suffers from a proper lack of funding which makes it even more difficult to have proper health care in remote areas of Brazil for small farming families (Crego, Fabricio, 2017).

Education in Brazil has been an immense problem ignored by the government for many years; however, the government is now taking steps to improve the education system. The number of illiterate citizens went from 16.3 million to 13.2 million from 2000 to 2012, due to government programs and initiatives. A total of 92.6% of the total population is literate and the average citizen spends fifteen years in school. However, nearly 13% of the population is still functionally illiterate, which means that they know simple words and numbers, but cannot understand a complete sentence or number problem. In 2014, the Brazilian government set up a program called Plano Nacional de Educação (PNE). This program is made up of more than twenty-one aims and goals to increase the number of years one has to go to school, the number of students attending colleges and universities and the access to further training and education for teachers. In Brazil, there are both public and private schools, though 80% of the student population attend public school. In recent years,

however, the number of students attending private school has increased by 14%. This is because of the public school system's lack of teachers, security, poor infrastructure and overcrowded classrooms. Sending their children to private schools allows parents to guarantee their children a chance at a good education. As of 2016, education in the form of pre-school, primary and secondary school are mandatory for students age six to seventeen. Both public and private universities are available in Brazil, but the private establishments are not as sought after as the public, government-funded universities (thebrazilianbusiness.com, 2015). This being said, many rural families are still not able to send their children to school. One reason may be that the nearest school is too far away, as they would have to travel to the nearest town and in some cases that may be more than a two hour bus ride. The family might have five or six children and it would be too expensive to send them all to school so they would end up helping on the farm, because it is also too expensive to hire workers. (Peixoto, 2017). There is also a very high chance that the nearest school might not be suitable for the family if it is an expensive private school or may not offer the best education if it is an underfunded public school.

Agriculture in Brazil is very important to the country's culture, economy and history. Brazil is not thought of as an agricultural country because of the tropical landscapes of some areas, however, they are the world's largest coffee and sugarcane producer, the second largest soybean producer and they have the second largest herd of cattle in the world. Other commodities the country produces are corn, milk, poultry, pork and tropical fruits. There are approximately 5.2 million farms in Brazil and about 84% of them are family or subsistence farms (economics.ucr.edu, 2015). These farms make up for 70% of the country's food production and employ three-quarters of all farm labourers in Brazil (Rural Poverty Portal, 2017). Some of the most concentrated number of cattle in Brazil are found in the Amazon. There are approximately two hundred million head of cattle being raised in the Amazon area. There is little input needed when raising cattle in the Amazon, as it makes for easy transportation and the land is inexpensive, but about 450 000 square kilometers of deforested Amazon rainforest is being transformed into cattle pastures. The main reason for this is that soybean land is replacing cattle pastures on the edge of the forest, forcing farmers to move farther and farther in. Common cattle breeds are Hereford and Polled Angus in the southern states such as Rio Grande do Sul and Santa Catarina and Zebu in the Minas Gerais area, which have been crossbred to create the Hindu breed.

Raising cattle in Brazil can put extreme pressure on the environment, the producer and consumers, the economy and the cattle themselves. Factors affecting the sustainability of Brazilian cattle production include: herd fertility, environmental factors, such deforestation, and laws and regulations.

Brazil has had trouble raising cattle effectively due to one very large issue-getting cows pregnant. This issue comes from the heat and humidity that affects both the bulls and the cows. Many studies have been done on both bulls and cows in attempts to show the results of the weather on these animals, including one in 1978 by a group of Oklahoma scientists. During this study, the scientists put one group of bulls in a controlled environment where the temperatures were ninety-five degrees Fahrenheit for eight hours and then changed the temperature to eighty-seven degrees Fahrenheit for the sixteen hours left in the day. This simulated an average day in the sub-tropics. Another group of bulls were placed in an environment where it was seventy-three degrees all the time, and after eight weeks, all the bulls were placed in the seventy-three degree all day for eight more weeks. During the entire sixteen week period, the scientists conducted various tests on the bulls like rectal temperature and semen tests. The first group of bulls, who were heat-stressed, had an average rectal temperature 0.9 degrees higher than the second group of bulls. Motility in the heat-stressed bulls' sperm significantly decreased and did not return until eight weeks after the study had finished. This shows exactly how bull fertility can be altered by hot weather in Brazil ("The impact of hot weather on bull fertility", cattlennetwork.com, 2014). Cow fertility is just as an important issue with very

similar causes and results to bull fertility. Heat-stress has two main consequences on cow fertility—estrus concentration and her ability to conceive following insemination. As with bulls, if a cow's internal temperature, in her uterus for example, is just 0.5 degrees Celsius higher, it can decrease fertility by 12.8%. Heat can also effect lactation of cows, and therefore, affect the calf's growth (catttlenetwork.com, 2014).

Though weather in Brazil has a huge impact on both cows and bulls, there are some ways to work around it. Some of the less effective methods are putting animals under fans or misters, which would keep them cooler than normal, but usually not enough to have a significant impact on fertility. Other more proven ways are to use artificial insemination (AI), embryos, or to manage breeding. Using AI makes breeding in Brazil much easier, as it is fairly low-cost and makes it easier for the cow to keep her calf. An even more effective form of getting cows pregnant is to use embryos. As long as the embryo is older than seven days, it should react well with the recipient cow. Managing and planning when cows will be bred is theoretically the most effective way to get cows bred. Breeding cows in the cooler season will hopefully help a cow conceive better than breeding her in the hot season ("Partners in Reproduction", 2008). However, subsistence farmers do not usually use any of these methods. The main reasons that rural subsistence farmers don't use AI or embryos is that they are too expensive for the average farmer. Proper herd management is still not used by subsistence farmers because of a lack of education, whether it be going to school, training, or general knowledge. In order to improve these issues government programs and funding could be put in place in order to assist farmers and therefore the beef industry. Should there be a vast improvement in bull and cow fertility, the consumer will benefit because there would be more access to higher quality meat, which would also encourage producers to breed and market more cattle. As a result, this would improve the overall cattle industry, which would then contribute to a more profitable economy in Brazil. Fertility issues have always been present in the Brazilian cattle industry and continues to be today, but there are now ways to improve and work around heat-stress and infertility, which would then have a positive impact on the cattle industry in general.

The environment and climate are the factors that impact Brazilians the most, along with food production. These factors can increase and decrease productivity, income and food availability. Many families are negatively affected by these factors and which cause serious issues. Some of these problems are not being able to adequately feed animals due to poor crops, which then results in poor nutrition for family members and low income as when they sell what they have produced as it is a poorer quality product. In some areas, this problem has decreased due to initiatives like fair trade and to herd management. Fair trade ensures farmers in developing countries, like Brazil, receive equal pay for what they are producing. This can heavily benefit subsistence farmers by offering small producers adequate pay for their work, giving them more money to invest in higher production strategies and technologies. Good herd and farm management can have a vast effect on the income for the producer and the quality of the meat purchased by the general public. By farmers determining a balanced, economic, and sustainable way of feeding, pasturing and taking care of their animals, it results in better cattle and improves the farmer's lives. The climate can also have both positive and negative effects. The most common types of cattle in Brazil are zebu who thrive in hot, humid, tropic and sub-tropic climates. Many of the other breeds in Brazil, like taurine breeds, do not handle heat well (thebrazilbusiness.com, 2017). One way to improve the way Brazilian cattle handle their environment and have higher productivity are to breed Zebu and European cattle. This combines the many factors that make these breeds good to raise in Brazil, to make animals that can both handle their environment and produce higher quality beef. For the most part, this factor of environment and climate is improving due to government and non-government organizations working hard to improve it by controlling deforestation.

Cattle pastures in Brazil are a very controversial topic, as they are the leading cause of deforestation in the country. Pastures are extremely necessary due to the large number of cattle in Brazil. From 1993 to 2013, the Brazilian cattle herd made a huge increase in numbers, by 200%. Historically, pasture expansion has happened in mostly empty areas like São Paulo, Goiás and Mato Grosso. Here, there was plenty of space for producers to develop the land for years, until the 1970s, when the national herd began to increase by 5% every year. As a result, more land was cleared for pastures, this time in the northern and mid-west areas of Brazil. In the 1980s, farmers began clearing land in the Amazon rainforest because of the good land quality, high production probability and the low land prices. Recently, there have been many improvements in the slowing of deforestation due to cattle herds. This is mostly because of zero deforestation agreement that were signed by three of Brazil's largest and most powerful meat-processing plants, JBS, Marfrig and Minerva. This agreement was adopted in 2009, and its purpose was to reduce deforestation from raising cattle through the meat-packing companies. The agreement states that the companies cannot purchase any cattle from ranches that clear any more trees than they are legally allowed. By law, cattle rancher in this area must keep at least 80% of their land forested. Then, just a few months later, the group of companies signed another agreement, known as the G4 agreement, which stopped the companies buying supplies from any producers who did not stop deforestation on their farm completely. In both agreements, it also stated that any suppliers to any of the three companies had to register on a public environmental registry that showed their land boundaries and could show any and all changes in forest cover. After just four years, 96% of their customers had registered, and 85% of them said they did it so that they could sell animals to JBS. The reason government and non-government organizations asked slaughterhouses to enforce these agreements was that they were much more persuasive to the producers as these companies were the ones paying the farms for their product (sciencemag.org, 2016).

Sadly, not all producers believe in using practices that are beneficial both to the producer and environment due to sheer greed. Some unethical farms will raise their cattle on properties that while they are better suited to cattle production, are not registered through the Zero Deforestation and G4 Agreements. These farmers will then move the cattle to land that is registered and sell them as if the cattle were raised on the registered land. To combat these unethical behaviours, a trackable ear tag system could be put in place much like the RFID (Radio Frequency Identification) or CCIA (Canadian Cattle Identification Agency) tags used in Canada, which have been tested to be put into place in some Brazilian states. These tags allow cattle with them to be tracked using radio frequencies. This would help because then any cattle being raised or moved somewhere they aren't supposed to be could be seen. An ear tag would be placed in the animal, with a number on it, which when registered and looked up in a computer database would follow the animal and reveal its current location. This would hopefully cut down the number of cattle launderers because they would know the slaughter houses could then see where the animals they are receiving are from and choose whether or not to purchase from that particular producer (www.beefmagazine.com, 2012).

As a result of these factors (fertility, environment and climate, and deforestation) small Brazilian producers benefit a great deal as they receive higher income, and therefore a higher standard of living, due to the improvement of the quality of their cattle. When dealing with fertility, if a producer is able to use more a more effective way of breeding cows (i.e. cooling methods, AI, embryos), farmers will have more calves being born, which means a higher income when the calves are sold. By combining traits of different breeds of cattle, one can help the cattle adapt to the environment and yet still produce high quality meat. By agreeing to follow the regulations set out by the major meat-packing companies to reach the Zero Deforestation Agreement, small producers benefit economically as they are paid more for supplying these companies with cattle from their farms. When producers take into account these improvement methods, it not only leads to economic development and poverty reduction, but it also helps to preserve the environment in a sustainable manner.

In order to keep Brazil's high standing in the world's agricultural market, Brazil has agreed to be a part of the COP 21 Paris Agreement 2015. Brazil is the first developing country in the world to make a full agreement to help reduce carbon emissions. To do this, the Brazilian government is creating the Forest Code to protect native vegetation and to cut 4.5 tons of carbon in the next thirty years. Also in the next thirty years, Brazil plans to restore fifteen million hectares of pasture land and reforest twelve million hectares. By 2030, the government hopes to meet the agricultural needs and cut greenhouse gases by fifty percent. To do this, producers will need to moderate intensive livestock production, use a non-tillage cultivation system and use an integrated crop-livestock-forestry system, which is a method of harvesting trees, by using cattle and a rotational grazing system to make it easier for producers to have access to the forest where they cut and replant trees (ocregister.com, 2016). International research agencies can also play a role in educating Brazilian producers and other producers in the rest of the world on how to effectively raise cattle in a tropic or sub-tropic climate. As a result of improved education, local Brazilian agricultural agencies would then be able to teach and better equip farmers with the information and equipment they need to produce quality animals in a sustainable and eco-friendly manner. The United Nations (UN) has also encouraged Brazil to continue with its commitment to the Paris Agreement that is renewed on an annual basis at the Framework Convention on Climate Change (newsroom.unfccc.int, 2015). The Brazilian government also worked as a mediator between the meat-packing companies and non-government organizations in order to have a productive and equitable agreement that suited all parties (sciencemag.org, 2016).

In conclusion, while Brazil may currently be considered a developing country by most, cattle producers, various world organizations and government agencies are all taking steps to further develop the cattle industry in a manner that uses successful practices, all the while being eco-friendly and done so in a sustainable manner. Should the industry be developed in such a manner, the producer will benefit greatly in terms of income, use of land, and quality of cattle, which will then increase their family's standard of living, decreasing the poverty rate of Brazil. This will then benefit not only individual families, but the country's economy as a whole. According to the Royal Society Publishing, the world's population will reach 9.15 billion people by the year 2050 (royalsocietypublishing.org, 2010). This increase means that Brazil, being the world's second largest beef-producing country in the world, will need to increase sustainable production even more in order to compete in the world market. The same is true for other parts of the Brazilian agricultural industry in terms of coffee, sugar cane and soy bean production. Should Brazil not maintain sustainable ways to provide the world with agricultural products, it will quickly lose its ranking and profitability in the world's market, which will then greatly affect the economy, the livelihood of the people, and will then lower the standard of living, causing even more wide-spread poverty.

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