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Argentina, Sustainable Agriculture

We are facing our sixth mass extinction and have until 2030 before the effects become detrimental. This extinction is not occurring due to an asteroid but it is attributed to the actions of humans. Plants and animals are dying at alarmingly fast rates and the link between all of this is climate change. The UN climate report wrote, "Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate." (Masson-Delmotte, et al, 2018, p. 2) What this event means is that our planet is heating up at an extremely fast and unnatural rate. Humans are destroying our planet by emitting excessive greenhouse gases into the atmosphere, polluting water, destroying animal habitats, and one of the most pressing issues is deforestation. Argentina has been cutting down trees in the Gran Chaco for decades to grow soy and farm cattle. Little effort has been made to disrupt these practices or change how farmers execute them. There is limited time before the byproduct of climate change will become nearly impossible to mend. The application of new farming methods and government intervention will need to occur to save the Gran Chaco.

The population of Argentina is 45,129,169 on the 27th of July 2019. 89% of the population is urban leaving 11% of the population as rural. The entire land area of Argentina is 2,736,690 sq. km with only 1,487,000 sq. km functioning as agricultural land. This means that a little over half the land is arable, under permanent crops, and under permanent pastures. Some of its largest exports consist of soybean meal (15%), corn (6.8%), soybean oil (6.6%), delivery trucks (5.6%), and soybeans (4.8%). These exports are sold largely to Brazil (16%), the United States (7.8%), China (7.4%), Chile (4.7%), and Vietnam (3.8%). The Argentine government is a republic. Their government instills power in the citizens, they elect government officials and their chief of state is the president. Currently, the president is Mauricio Macri. He has been president since 2015 and is running for reelection in the fall of 2019. He is a part of the Republican Proposal party a center-right political party. When looking at the typical family size in Argentina, you find around 3 people per household, and the economic status of each family can vary and influences their life styles. Depending on the region housing can differ. An example of that is in Buenos Aires where most people live in apartment buildings. However there are also housing shortages within the city so some families turn to living in shacks made out of wood. Some common food consumed in Argentina consists of asados (grilled meat), empanadas (pastry stuffed with a variety of ingredients), milanesa (breaded meat that is fillet), dulce de leche (caramelized sugar in milk), and they drink mate (steeped dried yerba mate leaves). Supermarkets you can find there are Jumbo, Carrefour, Disco, and Coto. Typical jobs you can find in Argentina are farmers, healthcare careers, positions in schools, and factory workers. The average salary of someone living in the capital of Buenos Aires per year is around \$45,13. Buenos Aires had an unemployment rate of 9.48% in 2018. Argentina has a well organized education system with four levels starting with pre primary (kindergarten), primary (elementary), secondary (12-17 years of age), and higher education (Universities, vocational programs, etc.). Their healthcare systems consist of the public, which covers 50% of the population, private covering 5% of the population, and social security sector covering the last 45%. One of Argentina's health concerns related to food is food waste with 16 million loads of food are being wasted annually said the Borgen Project.

Argentina is located in the southern part of South America and is the eighth largest country in the world. It borders Bolivia, Brazil, Chile, Paraguay, and Uruguay. The coastline extends for 4,700km along the Atlantic Ocean. The greatest width of the country is 1,420km while the greatest length is 3,800km. When looking at the geography of the Argentine Republic, you can divide the country into four main geographic regions: the Andes, the North, the Pampas, and Patagonia. The Andes are a section of a larger grouping of mountains that run through several South American countries and are the largest mountain range excluding Asia. The North, also named the Gran Chaco, has 130 million acres located in Argentina and is the second largest forest with the Amazon being the largest. It is full of thorny vegetation and has low forests and savannas. This region is in great threat of deforestation and is losing massive amounts of its forests yearly. The Pampas, which signify “flat plain” are a flat grassy plain that can have occasional caps of volcanic ash. Patagonia is 800,000 sq. km that extend to both Chile and Argentina, full of mountains and icefields. The climate in Argentina varies depending on the time of year and region you are in. It is characterized by climates such as tropical and subtropical arid sections, temperate, and subpolar.

Climate change is one of the largest issues the world has seen to date. Through the emissions of greenhouse gases into the atmosphere through transportation, electricity, industry, commercial and residential buildings, and agriculture, the global average temperature has had record breaking highs in the past fifty years. Humans are the main source of this rise in temperature and have taken more resources from the earth than it can comfortably sustain. According to the NRDC, “Global warming occurs when carbon dioxide (CO₂) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth’s surface.” (Macmillian, 2016, p. 1). These pollutants trap heat which warms our planet but much of the radiation is unable to escape causing an excessive amount of heat on our planet. Greenhouse gases are vital for life on earth because without them the earth's “surface temperatures would be cooler by about 33 degrees Celsius (60 degrees Fahrenheit), and many life forms would freeze.”(Rutledge, et. al, 2012, p. 1). If we don’t regulate the amount of greenhouse gases going into the atmosphere our planet's temperature will continue to spiral upwards and the health of living creatures on this planet will suffer.

Forests play an important role in the ecosystem as they sustain biodiversity, reduce the effects of climate change by the absorption of CO₂, and offer many natural resources to small communities and large corporations. Without them, we lose our natural carbon sinks that provide us with fresh air to breath and clean water to drink. Many forests are being cut down due to agricultural expansion to feed the growing demand for cattle. One of the main food sources for livestock is soy meal a protein source derived from the process made to make soy oil. Much of this farming is done in South America in countries such as Argentina, Paraguay, and Bolivia. These countries have been destroying one of South America's largest forests, the Gran Chaco, at a rate of one hectare per minute (similar to the size of a football field). According to The Nature Conservancy, this forest is 130 million acres and is home to “3,400 plant species, 500 bird species, 150 mammals, 120 reptiles and some 100 amphibians.” Argentina has lost around 25% of their portion of the Gran Chaco in the past 20 years. The majority of this deforestation is attributed to illegal soy farming made possible by the lack of law enforcement and advancements in genetic engineering. Soy is more resilient to growing in arid climate which in the past hasn’t been ideal for farming.

On December 19, 2007, Argentina enacted a law to conserve the native forests after citizens made and signed a petition to force the government to acknowledge and act on the deforestation occurring in the country. The Law on Environmental Protection of Native Forests (Law 26,331) is a framework of guidelines that require each province to determine a system to combat deforestation. This law has categorized the levels of protection of different forest regions in to three groups. Category one (red) is most highly protected forest, based on their ecological resources, locations, contributions to the ecosystems, etc. Indigenous communities and scientists can use this land. Category two (yellow) is of a medium conservancy level and poses certain values to the environment. Tourism, scientific research, and other sustainable uses are acceptable in this sector. Category three (green) poses less need for conservation and can be transformed in an appropriate manner if it abides by the guidelines of this law. By passing this law, the Argentine Republic made huge strides towards the goal of reversing the effects of deforestation and bringing awareness to the issue. It has been twelve years since all of this occurred and nothing much has changed. People continued to cut down forests and use prohibited land, facing either: a warning, fines ranging from \$300-\$1000, or a suspension/revocation of their sanction. These small consequences are not heavy enough to deter large companies who make millions from their crops to find new land elsewhere.

With soybean meal, soybean oil, and soybeans amounting to 26.4% of Argentina's exports and generating around \$10.75B for the country, its influence on the economy weighs quite heavily. They are the world's third largest soy and corn exporters and rely heavily on those crops to feed their livestock which they export as well. The country has "defaulted on its external debt (debt held by foreigners) eight times since independence in 1816." (Nelson, 2018, p. 1). It has been hard for the government to stabilize its financial situation but when Maruicio Macri was elected as president in 2015, he conducted a series of reforms to steer the country in a better economic path. It appeared to be making strides until he regressed into a more traditional form of governing and they issued \$56 billion in external debt. With a government in this financial state, their priorities are centered on getting money to pay off their debt and are less focused on the environmental impacts their methods have on the planet. Indigenous communities such as the Wichí are losing their homes as bulldozers tear down the forest they used for hunting, honey, fruit collection, etc. Other small farmers and gauchos are also suffering as larger companies who have great economic power take their land from them to create soy farms.

There are a variety of steps the government and the people of Argentina must take to resolve all the issues that have been created over the past few decades. In order to make a significant change in reducing deforestation, new farming techniques must be applied to create healthier forests while concurrently supporting the economy. "The term sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations;
- enhance the quality of life for farmers and society as a whole."(Gold, 2007, p. 1)

One form of sustainable agriculture that could be very beneficial is agroforestry which is agriculture that implements trees and shrubs with crops and livestock. There are five forms of agroforestry which include: alley cropping, forest farming, riparian forest buffers, silvopasture, and windbreaks. The three most useful methods would be alley cropping, riparian forest buffers, and windbreaks. The first form of farming is alley cropping, which involves planting trees in rows while pairing them with crop companions to effectively use the available land. The benefits that this system contains are: improved crop yield from 6-56 percent, minimized soil erosion and healthier soil, diminish water pollution, animal habitats, and diversified farm portfolios. The second method is Riparian forest buffers, which are trees, shrubs, and other plants that lay alongside a river. A publication on agroforestry by the USDA wrote "deliver a number of benefits including filtering nutrients, pesticides, and animal waste from agricultural land runoff; stabilizing eroding banks; filtering sediment from runoff; providing shade, shelter, and food for fish and other aquatic organisms; providing wildlife habitat and corridors for terrestrial organisms." The last form of agroforestry is windbreaks and they are trees and shrubs that block the wind from crops. They are beneficial for soil, wildlife habitats, increase crop yields, increment in bee pollination, as well as other assets. Each of these sustainable agriculture practices can improve the efficiency and land usage to grow more crops while creating new habitats and minimizing the effects of climate change.

In order to convince farmers into adopting these new practices, we need to reach out to the public and private sectors to gain funding for these operations. Taxation is an option but reaching out to large companies who are focused on making a positive environmental impact will generate larger funds. In article 9 of the Paris Climate Agreement, it stated "1. Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in the continuation of their existing obligations under the Convention. 2. Other Parties are encouraged to provide or continue to provide such support voluntarily." Developed countries and large corporations have a significant role in supplying funds to underdeveloped countries to contribute the finances to solve their climate change needs. Money obtained from the public and private sector would be given as subsidies to farmers to compensate them for implementing environmentally friendly agriculture and to ensure they are making a profit. We can also use these funds to subsidize the companies buying soy from Argentina if they choose to import soy that was farmed sustainably.

Getting the government of Argentina more involved in actively ending deforestation will improve the effectiveness of sustainable agriculture practices. The Law on Environmental Protection of Native Forests (Law 26,331), had the right idea on taking steps towards diminishing deforestation but in reality, left small impacts. It set guidelines to follow, but had no strict enforcement and was loosely followed by each province. In the FAOs Climate Change for Forest Policy-Makers, it included a four-stage policy process that gave a model on how to execute forest policies to have a greater outcome. The four stages listed were: Evidence and analysis (identify policy challenges), planning process (strategies are determined), implementation (plans are launched), and monitoring and evaluation (collect data on the operation and evaluate its progress). By using a more effective system, the Argentine Republic can closely follow the use of the red, yellow, and green zones, and any other forest policies they create in the future. Another reason, Law 26,331 did not pan out how it was intended was because they set no specific goals under an intended time frame. To create more headway on ending deforestation, the government needs to specify the amount of forest they intend to replenish/protect, how they are going to do so (set up a plan that all provinces must follow), and when they intend to achieve these goals.

An important role that civilians must participate in is advocating for the change they wish to see. Voting for representatives which share these ideas on ending deforestation and climate change will have a huge influence the policies and laws in the country. Educating younger people of voting or soon to be voting age about climate change will spark a generation to care about the issues facing the environment in their community and others worldwide. You can also get involved with organizations such as the WWF, and The Nature Conservancy, to see what resources you can offer to help them in their efforts in protecting the Gran Chaco. It is also your job as a living being on this earth to protect your planet through researching the food you eat, and the environmental footprint it leaves behind. On October 27th, 2019, Argentina is having their thirty second presidential election, and I highly advocate that their citizens research the candidates thoroughly to determine which of them will prioritize ending deforestation.

The conditions of the Gran Chaco are at a point that the Argentine Government, the private sector, citizens of Argentina, and other more developed countries must intervene to repair the damages left behind and that continue to occur from deforestation. Whether it is a bag of chips, a hamburger, or even a slice of bread, soy products can be found in most food items these days. We find ourselves more dependent on soy products without realizing the global impacts it entails. The soy crisis in this region needs to be addressed and use alternative methods to create a sustainable form of cultivation. The most prominent solutions to finding new forms of farming would be alley cropping, riparian forest buffers, and windbreak. These methods with subsidizing farmers to practice them and companies to buy from them will allow for these processes to occur. Creating a better system to monitor the progress of these methods and forest laws will result in a more active government that is constantly adapting to new challenges. The final step in reducing deforestation is voting for government officials which will take strides to protect the environment. This generation will be the one that determines the future of the next. We cannot leave an earth with no resources to sustain those that come after us. In the words of Jane Goodall, "You cannot get through a single day without having an impact on the world around you. What you do makes a difference, and you have to decide what kind of difference you want to make."

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