

Jasmyn Srinivasan
New Providence High School
New Providence, NJ, USA
University of Connecticut
Storrs, CT, USA
Brazil, Sustainable Agriculture

The Balancing Act: Brazil's Need for Profit and Preservation

As the global population continues to expand, the question of the planet's carrying capacity begins to arise. It becomes apparent that the food supply cannot sustain these new demands under the current systems. This, however, is not just a problem of food supply, but also of production and distribution methodology. For instance, despite Brazil's economic development and major agricultural exports, a large portion of Brazilians currently experience food insecurity. The constant expansion of global commodity crop trade has resulted in the overexpansion of agricultural land, resulting in habitat fragmentation across the nation. Meanwhile, massive ships full of food exports seem to leave little behind for Brazilians themselves. Trade, community dynamics, and agricultural practices must all be considered in order to prioritize land conservation without sacrificing economic growth. Incentives to encourage sustainable agricultural practices by commercial farms can help Brazil to utilize its rich supply of natural resources to promote prosperity in future generations.

Brazil is the largest country in South America by area, and, as of 2023, the population of Brazil is estimated to be just under 219 million (Central Intelligence Agency). Brazil's population growth rate has been steadily declining over the past fifty years, and it now sits at around 0.5% annually, under the global average ("Population Growth"). The majority of Brazilian citizens reside in urban areas, as most communities have developed away from agrarian lifestyles. For the past half-century, Brazil has been experiencing a rapid demographic transition and subsequent decline in fertility. The total fertility rate now sits around 1.75 children per woman (Central Intelligence Agency), making the average family size only 2.8 people ("What the Latest Census Says").

Brazil has the largest amount of arable land of any country, and, as of 2021, agricultural land accounts for 29% of the country's total land area ("Agricultural Land"). As the largest net exporter in the world (Valdes), Brazil's main agricultural commodities include soybeans, coffee, sugar, and cotton (Barron). At present, 70 percent of Brazilian farms are 500 or more acres. In comparison, 85 percent of farms in the United States are 500 acres smaller ("U.S.-Brazil Farm Size Comparison"), which indicated a dominance of factory farms. The country is dominated by tropical and equatorial climates, with some subtropical regions. A large portion of Brazil is occupied by the Amazon rainforest, as well as some grasslands. Much of Northern Brazil experiences high temperatures and large amounts of rainfall as part of a tropical climate, while Southern Brazil is more temperate (Central Intelligence Agency).

As Brazil has gone through increased industrialization, typical diets have shifted to include more processed and prepared foods. Traditional Brazilian diets contain lots of rice, black beans, fresh beef, and vegetables, however an increasing proportion of the population is shifting to consume more processed bread, soft drinks, and ready-to-eat meals (Andrade et al). Strong economic growth in Brazil has allowed many families to rise out of poverty and form a new working middle class. Unfortunately, this new social class remains economically vulnerable, as most jobs are service sector occupations that pay little more than the minimum wage (Clément et al). Although public healthcare is accessible to all citizens in Brazil, private providers are generally known to have higher-quality resources ("BRAZIL | Summary").

Currently, the biggest agricultural challenge Brazil is facing is maintaining high levels of productivity while working toward global sustainability goals. Poor large-scale farming practices have left large plots of land degraded and unfit for long-term growing. In addition, although 70% of the Brazilian population is fed by family farms, small farms make up only 23% of the arable land in Brazil (Thomas). It is possible that this imbalance could lead Brazilian families to feel unsupported by their government. Most family-run and subsistence farms grow a variety of crops to feed their families and to be sold locally. However, the land around these small farms continues to be colonized by proponents of large-scale agribusiness (Gibbs). A conflict between economic growth and protection of family farms arises, and the desire for nationwide profit at the expense of sustainability unfortunately wins most of the time. Brazil continues to grow its agricultural exports, particularly soybeans, which are a major component of the growing processed food industry. This trend has led to the expansion of large factory farms, most of which employ industrial farming practices, such as mechanical plows, synthetic fertilizer and pesticide use, and concentrated animal feeding operations (CAFOs). These agricultural practices ultimately degrade the land by causing soil compaction, reduced water infiltration, nutrient runoff, and eutrophication. Another one of the main problems that emerges is a loss of biodiversity, as forests are converted into cattle ranches and soy cultivation fields. Brazil now accounts for 50 percent of the global trade of soybeans (Mousseau and Gaitan-Urbe), and this number is only growing. As rich, carbon-sequestering portions of the Amazon Rainforest are converted into monoculture fields, the area loses valuable habitat and species diversity. In addition, though they are extremely profitable, monoculture farms are vulnerable to pests and disease. Since there is no crop rotation, they also often leave soil depleted of specific nutrients, leading farmers to increase their use of synthetic fertilizers and pesticides to keep up the productivity of their crops.

The mechanization of agriculture ultimately disadvantages small organic farmers, who may not have the means to compete with mass-producing farms in this manner. Brazil's crop market is slowly being overtaken by export-focused industrial farms, and attention must be brought back to conscious organic farming in order to manage land responsibly for the long term. Pesticides are responsible for hundreds of worker deaths every year, as well as the deaths of non-target species, and Brazil has seen a 700 percent increase in pesticide use over the last 40 years (Silva). In addition, the lack of species diversity means all plants are harvested at once, which leaves soil vulnerable to erosion (Balogh). Eroded soil and the fertilizers and pesticides in it can contaminate waterways, leading to negative health effects in the surrounding communities. Furthermore, degraded soil will eventually become unfit for growing. Commercial farms will move onto new forested land to convert into crop fields, while community members are left with large areas of unusable land.

Additionally, the rise of mono-cropping in Brazil has significantly reduced the diversity of foods in people's diets. As the food trade becomes controlled by large companies invested in soy cultivation, staples in Brazilian diets are replaced by ultra-processed foods (Huber). The replacement of fresh produce with processed grain products ultimately contributes to malnutrition and a higher prevalence of obesity.

The issues of land conservation and protecting local agribusiness go hand in hand. While small farmers in Brazil can make strides toward implementing sustainable agricultural practices, they do not have nearly the scope of resources as industrial farms. Economic incentives are generally the most effective in promoting sustainable practices, as they compensate farmers should they need to alter their infrastructure. For instance, the Brazilian government might offer reduced corporate taxes to farms that can prove implementation of environmentally conscious practices. This would have to be a dramatic shift from

Brazil's current climate of tax-exempt pesticides and taxes on native seeds, but it is possible with enough public pressure. There have already been some steps taken to encourage high productivity on existing land. Some possible methods of increasing biodiversity and reducing pesticide use on large farms without reducing profit include utilizing crop rotation, planting cover crops, and implementing biological controls with species such as wasps. Soybeans are natural nitrogen fixers, and they can be extremely beneficial to the soil if planted correctly.

In the United States, farms have primarily attempted to reduce chemical pesticide use by adopting insect-resistant crop varieties, such as Bt corn and cotton (Fernandez-Cornejo et al). This strategy is economically advantageous because it increases crop yields without the need for more acreage of farmland. When crops have their own insect-resistant genes, the area of land needing to be treated with pesticides decreases drastically, specifically for crops such as corn and soy. However, this solution does not come without its challenges, as genetic modification actually reduces biodiversity within species. Although these crops are more resistant to pests, they are also vulnerable to environmental change due to their continuing lack of genetic diversity. In addition, the health effects of consuming genetically modified foods are not yet conclusive. Thus, it becomes clear that utilizing genetically modified crops would not be appropriate for promoting long-term organic farming and sustainability. Many sellers of genetically modified seeds, such as Monsanto, do not allow farmers to seed-save. As a result, producers become dependent on corporations for their livelihood, which would again hurt small farmers disproportionately.

The problem of pest management in an organic farm system still remains. In Brazil, there was a massive effort to implement integrated pest management in the cultivation of soybeans from the 1970s to early 2000s, but the initiative has since seen a reduction in popularity. Biological controls were used to control insects around soybean plants, but insecticide use soon increased again due to their low costs. As long as the demand for soybeans is high, Brazil will naturally continue to invest in their production. The solution has to involve shifting from mono-cropping soybeans to integrating cover crops and companion crops. By doing so, the soil will be able to retain more nutrients, and soybean growing may actually become more productive. Additionally, the inclusion of a more diverse range of crops in one field attracts more native animal species that serve as a natural source of pest management. Incentivizing the protection of biodiversity over purely national profit not only increases the resilience of the farm amid environmental change, but it also promotes long-term food security.

The proposed solution would involve a revitalized integrated pest management program for soybeans, tax incentives for increased diversity and organic methods of crop cultivations, as well as protections for small farmers who sell locally. Similar resources for small farmers have been established in the United States, such as the Farm Storage Facility Loan, which provides capital for small farming businesses with diverse productions to store and clean their produce ("Resources for Small and Mid-Sized Farmers"). This idea can be achieved in Brazil through the AGRI3 Fund, a network of commercial financial institutions aimed at helping farmers invest in sustainable agricultural practices ("The AGRI3 Fund"). If loans and grants from the AGRI3 Fund are directed toward soybean farms that utilize biological controls and intercropping, larger producers will be encouraged to shift away from pesticide and fertilizer use and embrace more organic practices that support the local ecosystem. The healthier soil that comes from reduced mechanization and chemical use will reduce the need for agricultural land expansion, thus protecting Brazil's rich forests from destruction. Furthermore, with the money continually coming into the country via soybean exports, the government can offer tax breaks to farms which practice intercropping. Incentives could be provided when farms integrate endemic tree species or native cover crops into their fields. Not only does this practice increase the biodiversity on agricultural land, it also helps soils retain nutrients and stability. If carried out properly, this plan would encourage large farms to contribute to

efforts to revitalize the species diversity in crop fields, increase longevity of farmland, and protect rainforest habitats from further development. Ideally, this plan would be taken on board by the Brazilian Institute of Environment and Renewable Natural Resources, alongside the Ministry of Agriculture, Livestock, and Food Supply. All of this being said, this plan can only be successful and sustainable if the livelihoods of family farmers are placed at the forefront. Policies that prioritize local farms in supplying food to schools and nutrition assistance programs can help offset the costs of adopting new agricultural practices.

It is vital to remember that family farms are the backbone of any agricultural economy, as they provide for local communities in ways that large businesses cannot. Encouraging sustainable agricultural practices will assist in protecting small agricultural operations and their land. For instance, land trusts can ensure that subsistence farmers' working lands are protected and not subjected to further development or industrialization ("Family Farms and Ranches"). If the availability of organic crops increases across the country, the prices of buying organic produce will decrease, making healthy foods more accessible to ordinary citizens. It is only a matter of empowering communities to embrace the potential of their agricultural economy to feed Brazil itself, not just other wealthy countries.

Brazil, with its rich supply of natural resources, holds an unlimited amount of potential if leadership is focused on promoting sustainable agricultural business. By utilizing capital from commercial banks to support the transition away from monoculture farming, small farmers can rest assured that their efforts will be fruitful. Ordinary citizens should be empowered by their political representatives to take ownership over their food sources and recognize the impact that a shift in demand can make on sustainable production. A reduction in pesticide use via revitalized integrated pest management efforts, alongside subsidized intercropping and empowerment of Brazilian family farmers, will promote the conservation of existing land and ultimately lead to a greater array of foods on citizens' plates for years to come.

Works Cited

- "The AGRI3 Fund Is Transforming Sustainable Cattle Farming in Brazil." *UN Environment Programme*, 27 Apr. 2023,
www.unep.org/resources/newsletter/agri3-fund-transforming-sustainable-cattle-farming-brazil.
Accessed 9 Feb. 2024.
- "Agricultural Land (% of Land Area) - Brazil." *World Bank*,
data.worldbank.org/indicator/AG.LND.AGRI.ZS?locations=BR. Accessed 9 Feb. 2024.
- Andrade, Giovanna, et al. "Out-of-Home Food Consumers in Brazil: What Do They Eat?" *Nutrients*, vol. 10, no. 2, 16 Feb. 2018. *National Library of Medicine, National Center for Biotechnology Information, National Institute of Health*, <https://doi.org/10.3390/nu10020218>. Accessed 9 Feb. 2024.
- Balogh, Allison. "The Rise and Fall of Monoculture Farming." *Horizon, The EU Research and Innovation Magazine*, 13 Dec. 2021,
projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/rise-and-fall-monoculture-farming. Accessed 9 Feb. 2024.
- Barron, Michael. "Brazil's Agricultural Industry." *globalEDGE*, Michigan State University, Broad College of Business, International Business Center, 14 Nov. 2023,
globaledge.msu.edu/blog/post/57338/brazil-s-agricultural-industry#:~:text=Brazil,%20ranked%20fifth%20in%20the,provider%20of%20meat%20and%20poultry. Accessed 9 Feb. 2024.
- Block, Melissa. "Brazil's New Middle Class: A Better Life, Not an Easy One." *NPR*, 18 Sept. 2013,
www.npr.org/2013/09/18/223801516/what-does-it-mean-to-be-middle-class-in-brazil?scrllybrkr=c6c0f33. Accessed 9 Feb. 2024.
- Bortolotto, Orcial C., et al. "The Use of Soybean Integrated Pest Management in Brazil: A Review." *Agronomy Science and Biotechnology*, vol. 1, no. 1, 2015,
pdfs.semanticscholar.org/a572/9c3676848b5f22b001ce5f1fd7227cf01b42.pdf. Accessed 9 Feb. 2024.

"BRAZIL | Summary." *Columbia University Mailman School of Public Health*,

www.publichealth.columbia.edu/research/others/comparative-health-policy-library/brazil-summary. Accessed 9 Feb. 2024.

Central Intelligence Agency. "Brazil." *The World Factbook*, 1 Feb. 2024,

www.cia.gov/the-world-factbook/countries/brazil/#people-and-society. Accessed 9 Feb. 2024.

Clément, Matthieu, et al. "Anatomy of the Brazilian Middle Class: Identification, Behaviours and

Expectations." *CEPAL Review*, Apr. 2020,

repositorio.cepal.org/server/api/core/bitstreams/bf71af2c-75cf-4438-97bf-4afa1e671341/content. Accessed 9 Feb. 2024.

Fernandez-Cornejo, Jorge, et al. "Pesticide Use Peaked in 1981, Then Trended Downward, Driven by

Technological Innovations and Other Factors." *United States Department of Agriculture Economic Research Service*, 2 June 2014,

www.ers.usda.gov/amber-waves/2014/june/pesticide-use-peaked-in-1981-then-trended-downward-driven-by-technological-innovations-and-other-factors/#:~:text=This%20increase%20in%20glyphosate%20use,quantities%20applied%20to%20those%20crops. Accessed 9 Feb. 2024.

Gibbs, H. K. "As Brazilian agribusiness booms, family farms feed the nation." *Mongabay*, 2 January 2019,

<https://news.mongabay.com/2019/01/as-brazilian-agribusiness-booms-family-farms-feed-the-nation/>. Accessed 1 Sept. 2024.

"Glycine Max – Soybeans." *Gardenia*, <https://www.gardenia.net/plant/glycine-max-soybeans>. Accessed 1 Sept. 2024.

Huber, Bridget. "Welcome to Brazil, Where a Food Revolution Is Changing the Way People Eat." *The*

Nation, 28 July 2016, www.thenation.com/article/archive/slow-food-nation-2/. Accessed 9 Feb. 2024.

"Family Farms and Ranches." *Land Trust Alliance*,

<https://landtrustalliance.org/why-land-matters/conservation-priorities/family-farms-and-ranches>.

Accessed 1 Sept. 2024.

Mousseau, Frederic, and Gaitan-Urbe, Ana. "Brazil: Time to End the Ravages of Industrial Agriculture in the Cerrado and the Amazon." *Oakland Institute*, 1 Sept. 2022,

www.oaklandinstitute.org/blog/brazil-ravages-industrial-agriculture-cerrado-amazon#:~:text=Over%20the%20past%20two%20decades,the%20climate,%20and%20the%20people%20. Accessed 9 Feb. 2024.

Ojo, Andrea et al. "Taxation on Native Seeds Could Make Restoration Goals Unfeasible." *Socioambiental Institute*, 28 Aug. 2024,

www.socioambiental.org/en/socio-environmental-news/Taxation-on-native-seeds-could-make-restoration-goals-unfeasible. Accessed 1 Sept. 2024.

Panizzi, A. R. "History and Contemporary Perspectives of the Integrated Pest Management of Soybean in Brazil." *Neotropical Entomology*, vol. 42, no. 2, 30 Jan. 2013, pp. 119-27. *National Library of Medicine, National Center for Biotechnology Information, National Institute of Health*, <https://doi.org/10.1007/s13744-013-0111-y>. Accessed 9 Feb. 2024.

"Peoples of the Amazon." *Amazon Aid*,

amazonaid.org/resources/about-the-amazon/peoples-of-the-amazon/. Accessed 9 Feb. 2024.

"Population Growth (annual %) - Brazil." *World Bank*, 2022,

data.worldbank.org/indicator/SP.POP.GROW?end=2022&locations=BR&start=2005. Accessed 9 Feb. 2024.

"Resources for Small and Mid-Sized Farmers." *U.S. Department of Agriculture*, U.S. Department of Agriculture, <https://www.usda.gov/topics/farming/resources-small-and-mid-sized-farmers>. Accessed 1 Sept. 2024.

"Rural Population (% of Total Population) - Brazil." *World Bank*, 2018,

www.google.com/url?q=https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations%3DB

R&sa=D&source=docs&ust=1707521642669226&usg=AOvVaw32Z1d1igroPUfiWCFGiGhQ.

Accessed 9 Feb. 2024.

Schneider, Ronald Milton et al. "Brazil." *Encyclopedia Britannica*, 7 Feb. 2024,

<https://www.britannica.com/place/Brazil>. Accessed 9 February 2024.

Silva, Hesley Machado. "What Happens When You Deny Scientific Evidence? Look at Brazil's Pesticide Problem." *Scientific American*, 5 Jan. 2024,

www.scientificamerican.com/article/brazils-pesticide-dilemma-illustrates-the-health-dangers-of-scientific-denialism/?scrllybrkr=9c6c0f33#:~:text=In%20recent%20years%20the%20consumption,new%20pesticides%20by%20February%202022. Accessed 9 Feb. 2024.

Thomas, Jennifer Ann. "To Feed Its Own People, Brazil Embarks on a Long Road to Turn Its Back on Intensive Agriculture." *Reuters*, 6 Dec. 2023,

www.reuters.com/sustainability/feed-its-own-people-brazil-embarks-long-road-turn-its-back-intensive-agriculture-2023-12-07/. Accessed 9 Feb. 2024.

"Urban Population (% of Total Population) - Brazil." *World Bank*, 2018,

data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=BR. Accessed 9 Feb. 2024.

"U.S.-Brazil Farm Size Comparison." *Stratfor Worldview*, 12 June 2011,

worldview.stratfor.com/article/us-brazil-farm-size-comparison#. Accessed 9 Feb. 2024.

Valdes, Constanza. "Brazil's Momentum as a Global Agricultural Supplier Faces Headwinds." *United States Department of Agriculture, Economic Research Service*, 27 Sept. 2022, Brazil's

Momentum as a Global Agricultural Supplier Faces Headwinds. Accessed 9 Feb. 2024.

Vieira, José Nilton De Souza. "Subsidies and Environmental Sustainability of Brazilian Agriculture."

World Trade Organization, 16 Mar. 2023,

www.wto.org/english/tratop_e/tessd_e/04_subsidies_3_brazil_presentation.pdf, Accessed 1 Sept. 2024.

"What the Latest Census Says about Housing in Brazil." *BRIC Group*, 18 July 2023,

bric-group.com/article/latest-census-on-housing-in-brazil. Accessed 9 Feb. 2024.