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Brazil: Competing Interests Concerning Food Security and Environmental Issues

Introduction

The world is at a crossroads. Although countries agree that climate change is a serious issue, there is no agreement as to what should be sacrificed in the name of climate stability. Many people do not believe it is just to restrict the use of resources of those who still suffer from poverty, malnourishment, or other more immediate maladies. The Brazilian Legal Amazon presents an example of how these different priorities play out in the world.

Background

The Amazon biome is a vast region, covering 44% of South America's territory and nine of its sovereign states. Of these states, Brazil holds the largest share with 63% of the Amazon falling in its borders. This region is known as the Brazilian Legal Amazon (BLA) and includes the nine Brazilian states in the Amazon basin (Ortiz et al.). Many of the issues which the Amazon faces occur in or originate from the BLA and therefore Brazil shall be the lens through which the Amazon will be understood and addressed. The Amazon itself covers 58.931% of Brazil's territory, with agriculture covering another 33.925% and the rest being occupied by industrial, commercial, and residential development ("Brazil"—World Bank). This contrasts with only 10% of employment occurring in the agricultural sector, with 21% in industry, and the remaining 69% in services (Jobs Data for Brazil). Apart from the Amazon biome, the rest of Brazil is subtropical with a temperate climate in the South which is home to uplands and hills opposed to the North's rolling flatlands ("World Factbook").

Much like its terrain, Brazil has had a varied history, being once a colony, an indigenous monarchy, a military dictatorship, and now a rising economic power (Lonely Planet). With a population of 209.4 million people, 86.6% of whom reside in cities and the other 13.4% living rurally, Brazil is the 5th most populous nation; the national language is Portuguese but Spanish and English are also used ("World Factbook". Its largest exports are Soybeans, Iron Ore, Crude Petroleum, Raw Sugar, and Automobiles ("Products Exported"). This nation is currently under a presidential, democratic, federative republic headed by Jair Bolsonaro ("World Factbook"). The largest religions in Brazil are Catholicism (specifically Latin Catholicism), and Protestantism (of the Pentecostal variety) (Pew Research Center). The largest ethnic groups are the Brancos ("European" Brazilians,) the Pardo (mixed-ethnicity peoples such as the mulattos, cafuzos, and cabochons), and the Preto (Afro-Brazilians) which comprise 43.13%, 47.73%, and 7.61% of the population respectively (Sawe).

Brazilian families are tightknit and intergenerational. It is socially acceptable for children to live with their parents until they are 30 or they marry while older generations will often move in with their children (CultureGrams). The extended family plays a role as a safety net for many individuals, with 90% of Brazilians believing "they know someone they could rely on in a time of need" (Better Life Index). Rural families tend to have more children than urban families, but on average, there are 3-4 people per household with approximately one room per person ("Human Development"; Better Life Index). For breakfast, coffee with milk with toasted ham & cheese sandwiches are staples, dinner is often soup and cold cuts, but the main meal is lunch: rice, beans, and meat are always present, usually served with potatoes, manioc, and other vegetables (CultureGrams; Adoption Nutrition).

The average urban resident of Brazil is relatively well-off: They live in a concrete apartment with a living room and a separate kitchen; they will probably live until the age of 75 and have an average of 12,701 USD in yearly disposable household income (CultureGrams; Better Life Index). The average Brazilian will usually complete 16 years of education, with compulsory primary and secondary education for all Brazilians; as for upper secondary education, only 49% of Brazilians attend (Monroy et al.). Women tend to have completed more years of education as men but are not as represented in the workplace (“Life in Brazil”). The urban poor has it the hardest: They live in *favelas*, makeshift homes constructed of scavenged materials with no access to basic services (CultureGrams). Fortunately, these situations are not the majority, with access to safe water, proper sanitation services, and electricity standing at 98.2%, 88.3% (“Water Crisis”) and virtually 100% respectively (World Bank). Living is made easier due to healthcare being a constitutional right in Brazil, with a massive public health system that currently covers 80% of the population (“Healthcare in Brazil”).

Access to food and nutrition is a more complicated issue. Brazil has improved *immensely* in providing all citizens access to food. In 2010, nearly a third of all Brazilians suffered from food insecurity (Amaral and Peduto). By 2019, Brazil was recorded as having a prevalence of undernourishment under 2.5%, a level similar to Western Europe (“2019—Hunger Map”). The problem has not been food unavailability—net food production is enough for all Brazilians to receive 340 kg of food per year (in grain equivalent)—it has been that many Brazilians do not have the income to afford said food and/or the infrastructure necessary to access it (Amaral and Peduto).

Main Challenge

Food security is a complex topic with no universally applicable definition. Instead of defining food security, the Food and Agricultural Organization (FAO) of the UN has described “four pillars” which describe what is necessary for food security: “Physical Availability of food” “Economic and physical Access to food”, “Food Utilization”, and “Stability of the other three dimensions over time” (Ortiz et al.).

The BLA is the greatest thorn in Brazil’s side when it comes to food security, both on a local and global scale. When one-third of Brazil’s population was food insecure, many areas of the BLA fared a lot worse. While some BLA states’ food insecurity peaked at 20%, others faced food insecurity reaching 40%-52% of the state (Ortiz et al.). The food security situation has improved—undernourishment has reached a consistent all-time low (World Bank)—but the situation in the BLA is still problematic. As of 2019, under-five stunting (when height is too low compared to age) ranges from 15% to 25% prevalence approximately in the BLA; compared with the rest of the nation whose prevalence is under 10% (“Nutrition Profile”). Stunting is a result of poor food utilization and can affect the educational and economic achievements of persons (“Nutrition Targets”). Furthermore, one of the best indicators for stunting is low birth weight, which has *increased* in Brazil from 7.8% prevalence in 2003 to 8.4% in 2015 (“Nutrition Profile”; “Nutrition Targets”). Considering that stunting is very low in Brazil’s south, it is probable that the increase in the prevalence of low birth weight occurred mostly in the BLA, leading to their disproportionate stunting.

The reasons for the BLA’s food insecurities are myriad and not particularly obvious. The Amazon biome is rich in ecosystem services that in theory should alleviate the situation. Ecosystem services are the “conditions and processes through which natural ecosystems... sustain and fulfil human life”: The biome’s biodiversity diversifies diets (bush meats and fish provide crucial protein) and trees provide timber and purify water for drinking/irrigation. The previous examples are called *provisioning* eco-services (Ortiz et al.) due to their direct benefits. The many smallholding farmers who live in the Amazon rely instead on

supporting eco-services; these cycle nutrients and limit extreme weather events, allowing sustainable agriculture to take place even if limits agricultural productivity and farmer income (Ortiz et al.).

The reason the BLA continues to suffer from food insecurity despite its ecosystem services is its reorientation away from assuring local food security to meeting global food demand through deforestation. With deforestation comes the destruction of direct ecosystem services through decreasing humidity, increasing fires, and the crowding out of traditional agriculture (Ortiz et al.). The main source of Amazon deforestation is the clearing of land for soybean crops and cattle ranching. A combination of low-yields and high demand causes the soil to become barren quickly. The previously pastured lands then become soy crops, pushing ranchers further inward with slash-and-burn techniques. This is possible due to the very low input costs (especially land). All in all, the beef and soy industries account for more than 80% of Amazon deforestation (“Cattle Ranching”; “Soy Ag”). Extensive agriculture of the kind oriented towards exportation is not suited to the Amazon basin's low soil fertility and high precipitation which leads to increased nutrient leaching (“Traditional Land Use”).

This would not be a food security threat if the soy and beef were consumed by the local population, but most of the demand for soy and beef comes from China. As the Chinese middle class grows, they demand better sources of protein in higher quantity, which has led to Brazil exporting 79% of its soy and 37.8% of its beef to China in 2017 (“Products Exported”; Chan and Araujo). These industries are an economic boon, providing crucial revenue to local communities and causing Brazilian and foreign governments to invest in the BLA’s infrastructure, the worst in the country; over 72.4% of its roads are in poor condition as of 2018 (Chan and Araujo; Vardi). On the other hand, the support received allows these industries to press unequal advantages. Commercial landowners have the resources to occupy land illegally, use forced labour, and force people off their land while smallholders (farms supporting a family through subsistence and commercial agriculture) cannot. The negative externalities of deforestation-induced climate change are of particular note since the extreme droughts and flooding levels associated with climate change can make traditional agricultural unviable while commercial farms which use nitrogen fertilizer and expensive irrigation can weather the hard periods and easily take over bankrupt smallholding farms (Ortiz et al.)

Proposed Solution:

Any attempt to alleviate the issues of food insecurity would be incomplete if it only addressed one side of the equation; easy solutions do not exist and false dichotomies between agricultural intensification (meeting local and global demand for food) and preservation of ecosystems is not helpful (Ortiz et al.).

The very first step is to conduct more research into the Amazon region’s social and economic situation. Most data are both outdated and aggregated on a national level, meaning that inferences from that data must be taken with a grain of salt. It is necessary to understand the Amazon as a separate region and then include its interactions with the rest of the world (Ortiz et al.). Only then can trends be identified, and solutions be formulated. This requires intranational and international cooperation to understand the asymmetries and imbalances of the biome. One universally beneficial step is to track the changes in land use as well as the weather in the Amazon; many tools of this sort already exist but the information has not reached a wide audience within the Amazon itself (Ortiz et al.). One telling example is that due to the complex climate situation of the Amazon newcomers cannot adapt as well and cannot collaborate as effectively with farmers and may be discouraged from entering the farming world (Ortiz et al.).

Specific solutions must follow certain general guidelines to remain environmentally stable. According to Ortiz et al., agricultural intensification can greatly improve human nutrition and health if the Amazon rainforest is not destroyed any further, abandoned croplands or pastures are reused, currently-cropped

lands become more efficient, human-oriented food is prioritized over animal feed or biofuels, local food security is of the same importance as global food demand, and that any intensifications do not interfere with the traditional diet and lifestyles of the peoples who live in the Amazon, especially indigenous peoples and smallholders; this is all possible thanks to the Amazon's incredible size and richness. Cooperation between interests is preferable than competition among them. For example, the plights of the rural poor and the urban poor, although having different causes, could have a similar solution such as focusing on local food production.

One method attempted in the past is implementing carbon revenues, which compensate smallholders for conducting traditional agriculture and not using certain inputs such as synthetic fertilizers (Ortiz et al). This is a way of giving a monetary value to ecosystem services and promoting agriculture centred around feeding the local population. The three main problems with this solution are the competitiveness of carbon revenues, the source of said revenues, and what smallholders are to do with their extra revenues. If carbon revenues are not sizeable enough, then smallholders practising agroforestry will not be able to compete with larger or more varied farms and will, therefore, prefer to opt-out of any carbon revenues (Ortiz et al.). The second problem is the source of said revenues: governments may not themselves be able to provide for carbon revenues, and even if they could provide said revenues, few would be able to justify it in the face of other programs which may have a wider appeal.

This particular issue could be fixed thanks to the involvement of organizations outside the government. The NGO Trias with a cooperative financier Cresol sponsored a microcredit program in the Brazilian Amazon which sponsored farmers who harvested the acai berry, which has become very popular in foreign markets but does not address the issues of local food production and deforestation. This is not due to a disregard for that cause but simply the different priorities of many NGOs (Trias). Alternatively, the Initiative for Sustainable Forest Landscapes (ISFL) administered by the World Bank Group (WBG) works across an entire jurisdiction to improve the environment enabling better land management and balancing all of the different stakeholder priorities ("Approach"). The ISFL consistently incentivizes results with climate finance over 10 years, assuring that stakeholders have a long-term incentive to follow the guidelines; the only problem is that Brazil is not part of the ISFL ("Approach").

The last issue with carbon financing is the flipside of farmers not having a sufficient income. Due to the restrictions imposed by many carbon revenues programs—such as a ban on synthetic fertilizers—and the natures of smallholding farmers, which do not need heavy machinery and are not interested in expansion, there is the possibility of smallholders receiving revenue which they cannot properly invest unless they have opportunities to improve their standards of living (Ortiz et al.). One straightforward way to solve this is by improving the infrastructure in the Amazon. Through making markets and cities more accessible, cleaner, and safer, smallholders have opportunities to spend their carbon revenue that improve their standard of living. Infrastructure is already being invested in to increase the BLA's agricultural output, but it does not aid indigenous peoples or smallholders in significant ways (Chan and Araujo).

Therefore, the usage of carbon revenues or microloans to supplement the income of smallholders must be paired with the improving travel and communications infrastructure for smallholders (and even sanitation services in the poorest regions). This could be accomplished using PPPs or Public-Private Partnerships. As defined by the World Bank's PPP Reference Guide, a PPP is a "long-term contract between a private party[ies] and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility". PPPs are useful tools for developing and funding infrastructure (especially in developing countries) for three reasons: they can secure additional funding for infrastructure projects, aid in the project selection process, and assure efficiency and long-term

maintenance (“Reference Guide”). If smallholders, with the aid of carbon revenues, offered to cover part of the burden for renewing rural roads and expanding the services of rural communities, the Brazilian federal government or state governments would be more willing to support infrastructure projects (Dutra).

The Brazilian government has already been a great utilizer of PPPs, with there being a PPP Unit in the Ministry of Planning, with 8 state jurisdictions, approximately 100 contracts signed, and \$50 billion invested since 2004 and as of 2018 with the establishment of a legal framework. (“PPP Framework”, Dutra). The problem lies in that none of the state jurisdictions lies in the BLA (“PPP Framework”). Compounding this problem is the fact that at the municipal level, which would be the level most appropriate level for smallholders, have a high number of failures due to “limited technical capacity... insufficient resources for hiring expert advisers; lack of appropriate regulations; [and] ignorance of the high level of financial commitments [required]” (Dutra). To remediate this, in 2016 and 2017 the Brazilian government has provided local governments with the means to access technical assistance and structuring funds through public banks. Municipalities would partner with either Bank of National Economic and Social Development or Caixa Economica Federal, the bank would hire a consulting firm to partner with the bank in structuring the project (Dutra).

Unfortunately, there are still some crucial steps that need to be taken for PPPs to be a viable method of building infrastructure in the Amazon. As of 2019, investment in PPP projects in Brazil was \$2.6 billion as opposed to 2012’s approximately \$59.2 billion in foreign flows and concessions (Gauthier, “Brazil PPP”). Although this is an improvement over 2018’s .5 billion dollars in investment, the Brazilian system’s “favouring [of] medium-sized companies and international participation” will not make smallholders and small municipalities any more attractive (“Brazil PPP”). In 2018/19, the largest and 3rd largest pipeline projects, as well as the largest and 4th largest active projects by investment value, have been in or for the city of Sao Paulo (“Brazil PPP”), showing that more populous and richer municipalities are of a higher priority to investors (Gauthier). Many communities are stuck: they cannot improve their nutrition without proper infrastructure, but without proper infrastructure, they will not be invested in.

This is where the WBG can again be of service. Through lending and providing educational/consulting resources, WBG can bridge the gap between investors and small municipalities while stymieing predatory practices (“Overview”, “Brazil PPP”). The WBG hosts the PPP Knowledge Lab, a database of all things relating to PPPs in every country and sector, including guides and PPP certification for magistrates and practitioners (“Overview—PPP”). WBG also provides direct assistance through consultation on defining projects, providing financial assistance, and guarantees to mitigate the risk. In Brazil, the WBG Considering the World Bank’s stated interest in developing local economies, investing in Amazon infrastructure aimed at smallholders and indigenous peoples would not be something out of the realm of possibilities (“Overview—PPP”), they have previously helped with creating PPPs for Sao Paulo’s road network, helping the state government with increasing transparency and the bankability of concessions, establishing the standard to which the rest of Brazil is to be held (“Reforms”).

In the realm of concrete solutions, agro-silvopastoral systems (ASPs) may be the best tool for establishing food security on a local level while ensuring the health of the Amazon biome and the widespread availability of ecosystem services. Defined as a form of production that “combines pastoralism and agriculture in a partially wooded environment” (Laporte-Riou et al.), ASP is a form of agroforestry (“Silvopasture”). These systems are engineered to maximize the benefits from ecosystem services in such a way that the productivity of agriculture is not diminished: ASPs protect against climatic hazards and bad harvests by providing multiple sources of feed and income in addition to diversifying the spatial and temporal distribution of labour in a farm (Ortiz et al; Laporte-Riou et al.). Some features of ASPs are

trees, which provide windbreaks, leading to less water evaporation and land erosion; the introduction of biological pest control which increases productivity; crop-pasture rotation, in which animals raised one year can consume harvest residues and fertilize the fields for harvests the following year; shade, which is necessary for the well-being of livestock and foraging plants, and the deeper tree roots limit nutrient and water runoff (Hügel et al; “Silvopasture”).

Of course, for such ventures to be pursued by farmers and supported by third-parties there must be evidence of effectiveness and long-term profitability. Fortunately for ASPs, “according to the calculations of the researcher Ernst Götsch, planting forests can be 8 times more profitable than grains, without even taking into account all the ecosystem benefits generated for the planet and its inhabitants, such as... If we turn this into a monetary value, it can be dozens of times more profitable than conventional agriculture, for we walk in the flow of life to make life thrive” (Santos). Investment companies expect 4 to 7% ROI for agroforestry as of 2019 and Project Drawdown estimates \$206 billion to \$273 billion ROI if silvopasture could be increased by 40% (Hanes). For such ROIs and environmental benefits, agroforestry and silvopasture must be combined due to the inherent synergies in ASPs (Hanes). ASPs could be the most realistic way of reclaiming deforested area with local agriculture due to their flexible nature. Trees provide long-term income in the form of timber, fruit, or rubber increases the value of smallholder land (which in turn reduces the risk of being bought out by larger farms), and returns nutrients to the upper soil layers, eliminating the need for expensive fertilizer (“Agroforestry”; Ortiz et al.).

ASPs work because they are a form of “appropriate technology”. An idea developed by economist Fritz Schumacher, “appropriate technology” relies on local resources, is labour intensive and respects local lifestyles to develop a society economically (“Intermediate Technology”). By using local resources, wealth remains in the local economy; by being labour intensive, wealth is distributed among the population; and by respecting local lifestyles, communities can be integrated into the globalized economy without suffering the cultural and health dilution (Hanes, “Appropriate Technology”). As proof of this, ASPs have already been used in the Amazon, with cocoa grown in tree shade developing greater flavour quality and pest control while shaded coffee in Brazil is more resistant to frost and erosion in addition to being more sustainable. This is due to the inherent difference between annual crops—whose harvests cause the majority of biomass to be disposed of during harvest season with—and perennial ASPs, which leave the majority of biomass intact with every harvest (“Agroforestry”).

The only real difficulty with ASPs is that they are very knowledge-intense both in their creation and maintenance since it requires knowledge of crops, livestock, trees, and the local environment. Furthermore, it takes special planning to construct an efficient ASP (Ortiz et al; “Silvopasture”). This specific knowledge is not readily available to many smallholders. The solutions presented must be integrated for significant change to be made. With the help of the WBG, PPPs at a municipal level can access tools and finances to build local infrastructure. Through these improvements, smallholders will have a greater connection to markets, to each other, and vast amounts of knowledge: The PPP Knowledge Lab and the ISFL has the resources needed to establish PPPs and transition to sustainable agriculture (potentially allowing the survival of indigenous forms of agriculture or ASPs). (“Approach”, “Traditional Land Use”, “PPP Framework—Brazil”).

The connections inherent in such improvements to infrastructure themselves are beneficial for establishing communities at higher jurisdictional levels which allow programs to scale up and have their voices heard earlier in the process (“Approach”). The people of the Amazon must be empowered first for them to be able to transition into a more sustainable system (“Brazil PPP ”). A good start would be for the government of Brazil to apply for an ISFL program, which would provide stable, long-terms incentives

for developing profitable yet capital-heavy ASPs. This should not be difficult considering the criteria the ISFL uses to choose its programs: There must be “agricultural drivers of land-use change”, which is exactly the problem the Amazon is facing; there must be an “enabling environment and governance”, something that the Brazilian government has been pushing through development banks, and “engagement and capacity for large-scale programs” (“Programs”). This third requirement cannot be completed with the Amazon’s current standing; if the World Bank aided in the establishment of state PPP jurisdictions in the BLA as well as providing transparent structures directed towards applying for the ISFL, all of the pieces could fit together for change (“PPP Framework—Brazil”).

Conclusion

The BLA has been lagging behind the rest of Brazil in many terms: Infrastructure development, poverty, and food security. While many of the reasons for this lag are deeply entrenched and are affected by powerful external forces, namely, the global demand for beef and soybeans, many concrete steps can be taken to resolve the issues of the region. Mainly, the populations which are the most affected by the adverse effects of climate change, deforestation, and abuse must be empowered and encouraged to support themselves and their local communities. No effort can be done independently due to the interdependent nature of poverty, food security, and climate change; but effective tools do exist and there have been examples of underprivileged communities changing through collective action and creatively living in their environment. It is only a matter of organizations showing solidarity, planning, and dialoguing with the people of the Amazon to catch-up their communities to a changing world.

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