A Storm's a Brewin'

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Abstract

This article analyzes the effects of human coffee consumption on three different levels: globally, nationally in the United States, and locally on Bryant University's campus. This article follows the process of coffee production from the first planting of the bean, to the coffee being poured into the consumer's cup. The paper dives deep into an analysis of how Bryant University students consume coffee and view global coffee consumption. Not only does this paper explore how Bryant University students view the presence of coffee in their daily life, but it also finds out through a qualitative and quantitative survey if students are aware of how coffee planting, harvesting, packaging, distribution, and consumption is hurting the environment. While exploring the alternative, believing that climate change is hurting the production of coffee, it was found that students are worried about the future of coffee being in danger without understanding why this problem could be occurring.

Key Words

Coffee consumption, Coffee Beans, Climate change, Environment, Production

Introduction

The cultural norm of daily coffee consumption has been around for decades. With the opening of the first Dunkin' in the 1950s and the first Starbucks in 1971, coffee franchises all over the United States have been developed[1] demonstrating human coffee consumption has become a problem, globally, nationally, and locally. "Coffee is grown in more than 60 tropical countries…by an estimated 25 million farmers."[2] Since coffee is a very lucrative business for the millions of farmers, they are dependent on this crop. According to Jaramillo, in 2011 the coffee industry was a "90 billion-dollar (US) coffee industry."[3] As coffee grows at an exponential rate, the industry is now well beyond $90 billion. From the planting and harvesting of the coffee bean to the extensive transportation process, to the destination of the consumer's coffee cup; the environment is hurting due to this process.

On the other hand, Bunn and his team, seem to be concerned more with the rise in global warming and the damaging effects it has on coffee production. According to the article titled "A Bitter Cup: Climate Change Profile of Global Production of Arabica and Robusta Coffee", "Coffee could migrate to higher latitudes (Zullo et al. 2011) or altitudes (Schroth et al. 2009) but this would not benefit current producers (Baca et. 2014) the migration could threaten ecosystems" (Bunn et. alt. 90).[4] Since coffee must grow in a specific warm climate, farmers would have to change the location of the coffee farms which costs them time, money, and

[1] Avey, Tori. "The Caffeinated History of Coffee." *PBS*, Public Broadcasting Service, 8 Apr. 2013, http://www.pbs.org/food/the-history-kitchen/history-coffee/.
[2] Läderach, P., Ramirez-villegas, J., Navarro-racines, C., Zelaya, C., Martinez-valle, A., & Jarvis, A. (2017). Climate change adaptation of coffee production in space and time. *Climatic Change, 141*(1), 47-62. doi:http://dx.doi.org/10.1007/s10584-016-1788-9
[3] Jaramillo, Juliana, et al. "Some like It Hot: The Influence and Implications of Climate Change on Coffee Berry Borer (Hypothenemus Hampei) and Coffee Production in East Africa." *Plos One*, vol. 6, no. 9, 2011, p. e24528. *EBSCOhost*, doi: 10.1371/journal.pone.0024528.
[4] Bunn, C., Läderach, P., Ovalle Rivera, O., & Kirschke, D. (2015). A bitter cup: Climate change profile of global production of arabica and robusta coffee. *Climatic Change, 129*(1-2), 89-101. doi:http://dx.doi.org/10.1007/s10584-014-1306-x

resources. Not only would current farmers be put out of business, but new farms would have to be created, eliminating more forest areas while abandoning the preowned land.

Global Impacts

Considering coffee is a universal product that most people enjoy on a day to day basis, the production of this famed commodity has potential negative impacts on the environment. Deforestation, soil alterations, and high-water use are just a few of the negative impacts that stem from the farming of coffee. "For every cup of coffee consumed, it is almost certain that one square inch of rainforest was destroyed." [5] When looking at the maps displayed below, Figure 1 shows the various countries, sometimes referred to as the "coffee belt", responsible for growing and producing coffee beans. Figure 2 highlights the areas where major rainforests are located.

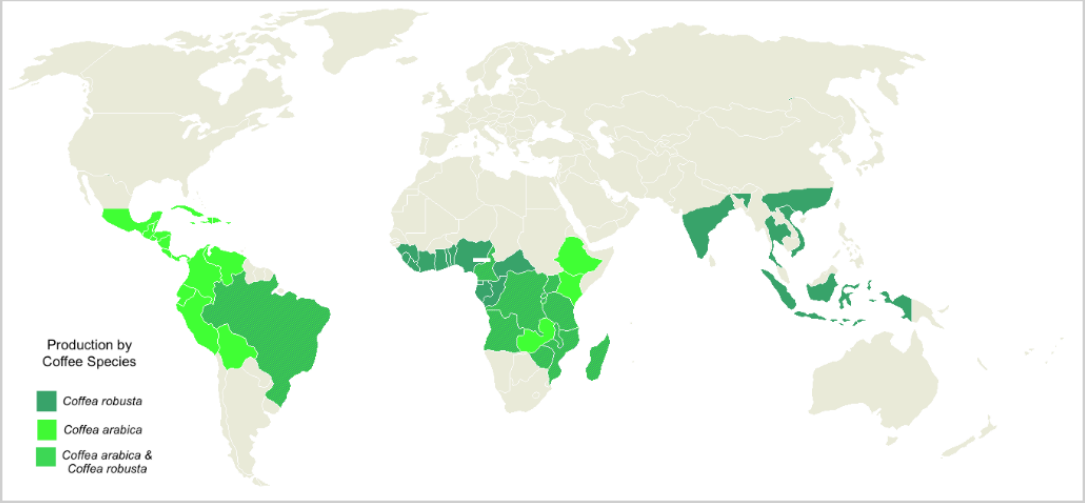


Figure 1: Map displaying the various countries responsible for growing coffee beans. The three shades of green represent the three species of coffee beans produced.[5]

[5] Morrison, R., et al. "2.2 A Bitter Brew- Coffee Production, Deforestation, Soil Erosion and Water Contamination." *Environmental ScienceBites*, The Ohio State University, ohiostate.pressbooks.pub/sciencebites/chapter/a-bitter-brew-coffee-production-deforestation-soil-erosion-and-water-contamination/.

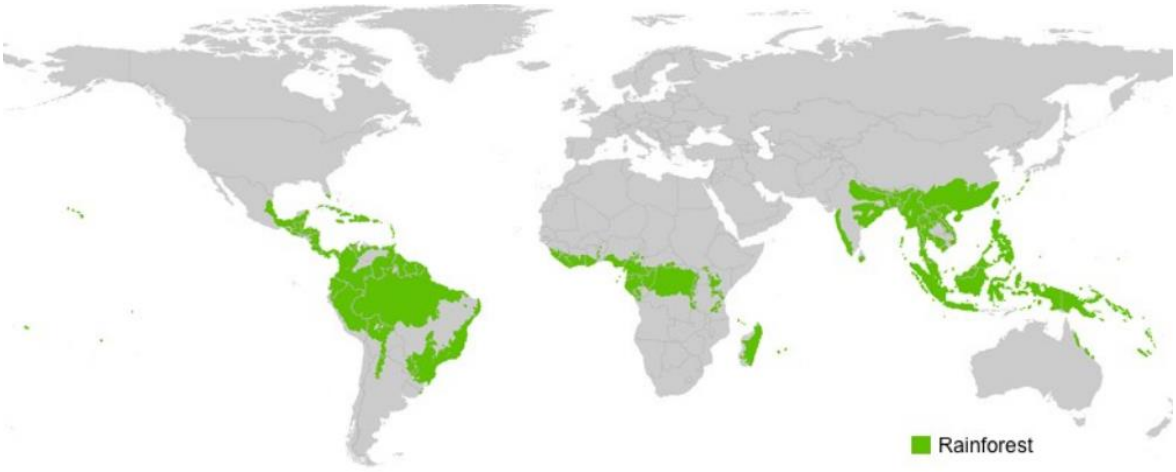


Figure 2: Map displaying the rainforest areas around the world.[5]

When comparing these two maps, there is a major overlap between the countries producing coffee beans and the locations of native rainforests. In the article "The Coffee Industry Is Worse Than Ever for The Environment," "They argue that getting rid of the trees eliminates a crucial habitat for native wildlife, such as tropical birds and monkeys, and makes the land more susceptible to erosion and climate change." [6] Joe Satran defines deforestation as eradicating the trees while, Victor Arce and co-authors state that deforestation is, "The loss of forest and the potential loss of native biodiversity resulting from coffee cultivation and processing is substantial." [7] As deforestation occurs, the loss of native species increases because their habitat no longer exists. As our climate warms, and the development of new coffee farms emerge, more land will have to be clear cut.

Furthermore, soil altercation is also a major issue when talking about climate change and coffee production. As a byproduct of deforestation, "chemical buildup in soils and loss of forest shade are consequences of mass coffee production." [6] As suspected, chemical buildup and

[6] Satran, Joe. "The Coffee Industry Is Worse Than Ever For The Environment." *HuffPost*, HuffPost, 7 Dec. 2017, www.huffpost.com/entry/sustainable-coffee_n_5175192.
[7] Arce VC, Raudales R, Trubey R, King DI, Chandler RB, Chandler CC. Measuring and Managing the Environmental Cost of Coffee Production in Latin America. Conservat Soc 2009;7:141-4

overflow from fertilizer are extremely damaging to various ecosystems. Along with chemical buildup, the depletion of native trees changes the overall health and quantity of topsoil as well. However, some research shows that some coffee plants can grow in shade. According to The Smithsonian's National Zoo, "habitat on shade-grown coffee farms outshone sun-grown coffee farms, with increased numbers and species of birds, improved bird habitat, soil protection/erosion control, carbon sequestration, natural pest control and improved pollination." [8] If farmers must move their fields due to increasing temperatures and climate change this could be a beneficial alternative for them to think about while preserving our environment. The Smithsonian's National Zoo also highlights that farmers who use the shade growing method to produce their coffee beans will be less susceptible to changing temperatures while keeping their farm in the same location.

Another negative aspect of coffee production is excessive water usage to cultivate the plants. Could coffee plants be using too much water and hurting our environment? In an article titled "The Water footprint of Coffee and Tea Consumption in the Netherlands" it was stated that "In total, the world population requires about 140 billion cubic meters of water per year to be able to drink coffee and tea." [9] Not only do the coffee plants require water, but the beans must be cleaned and removed from the outer husk which requires additional water.

[8] Smithsonian. "Ecological Benefits of Shade-Grown Coffee." *Smithsonian's National Zoo*, 12 July 2019, nationalzoo.si.edu/migratory-birds/ecological-benefits-shade-grown-coffee.
[9] Chapagain, A. K., and A. Y. Hoekstra. "The Water Footprint of Coffee and Tea Consumption in the Netherlands." *Ecological Economics*, vol. 64, no. 1, Oct. 2007, pp. 109–118. *EBSCOhost*, doi:http://www.sciencedirect.com/science/journal/09218009.

National Impacts

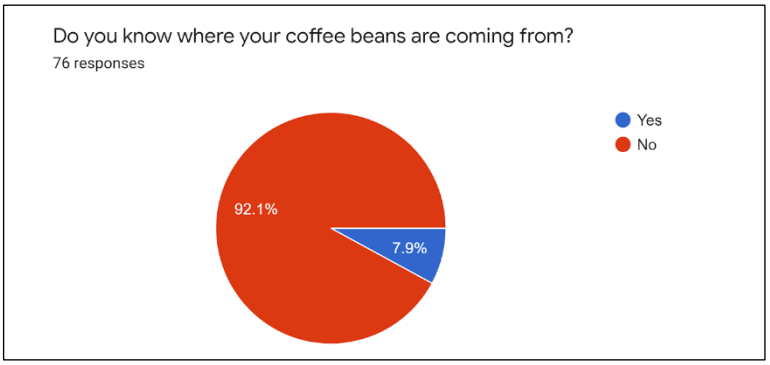
Although coffee is grown in more than 50 countries, Brazil is one of the largest coffee-producing countries in the world; [10] transporting the coffee from Brazil and other nations to the United States comes at an environmental cost. According to the article "Examining the Carbon Footprint of Coffee" by Nico Mills, "The massive freighters used to ship products over international waters are far from eco-sustainable, consuming more than 16 tons of fuel per hour, which is about 380 tons of fuel *per day* at sea." [11] Not only does the freight process admit large quantities of pollution, but we also utilize trucks and trains on land to take the coffee to cafes once it has been shipped overseas. "So far between the farm, the mill, transportation, and the roasters our single pound of coffee beans have accrued nearly 5.5 pounds of carbon emissions." [9] When looking at the cafes such as Starbucks or Dunkin', many people might not believe that "...it is the final transition into the cup at the café that generates as much as 50% of all carbon emissions of the supply train." [9] Once the coffee beans get to their destination, they need to be properly stored at a consistent temperature to stay fresh, meaning the cafes must utilize refrigerators and freezers. When a customer walks into a café and orders a cup of coffee or espresso, they utilize machines to produce the best tasting cup of coffee. Between the coffee grinders, heating systems, and refrigerators the cafe uses a mass amount of energy.

Bryant University's Impact

As of last year, "eighty-nine percent of the United States population regularly consumes caffeine." The USDA conducted a survey with a sample size of approximately 18,000 people and

[10] "Coffee Around the World." *National Coffee Association*, www.ncausa.org/About-Coffee/Coffee-Around-the-World.
[11] Mills. "Examining the Carbon Footprint of Coffee." *The Eco Guide*, 18 Sept. 2016, theecoguide.org/examining-carbon-footprint-coffee.

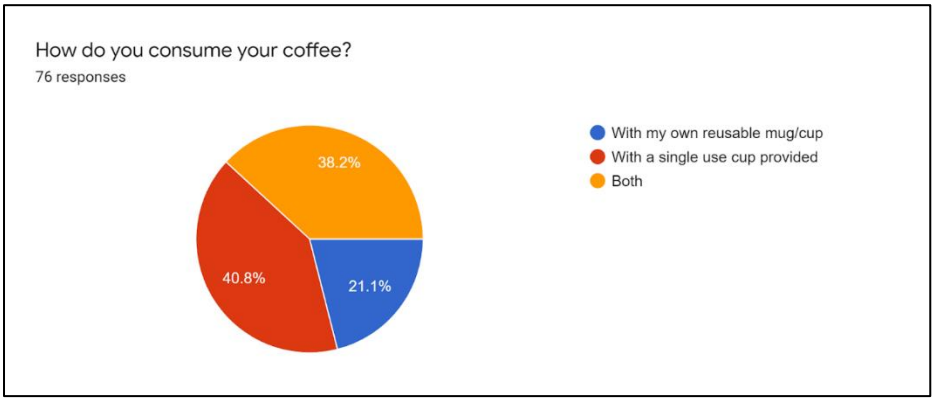
they concluded that "the major source of caffeine was coffee followed by soft drinks and tea." "National surveys such as the Kantar Worldpanel and NHANES have not typically examined college students as a subgroup of the population"[12] (for coffee consumption) which spiked the idea and the opportunity to implement a survey on campus'. The survey administered had targeted specifically Bryant University students which aligns closely with the age range of the industry demographics; "The major consumer demographics of this [coffee] industry represent people ages 19 to 34..." [13] The survey was administered to only Bryant University students via an electronic survey. Out of 120 students selected to participate in the survey, 76 students responded. After the survey was conducted it was found that out of the 76 students, 77.6% of them drink coffee every day. Out of those students drinking coffee every day, 61.8% of them drink more than 1 cup of coffee per day. Regarding the students drinking coffee every day, 92.1% of them are drinking coffee without knowing where the beans are coming from. Stemming from our cultural ignorance the survey highlights the lack of awareness our campus has when consuming coffee.



[12] Mahoney, Caroline R, et al. "Intake of Caffeine from All Sources and Reasons for Use by College Students." *ClinicalKey*, https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S0261561418301341?returnurl=https://linkinghub.elsevier.com/retrieve/pii/S0261561418301341?showall=true&referrer=.

[13] Menke, Andrew. "The Global Coffee Industry." *GlobalEDGE Blog: The Global Coffee Industry >> GlobalEDGE: Your Source for Global Business Knowledge*, GlobalEDGE, 19 Apr. 2018, globaledge.msu.edu/blog/post/55607/the-global-coffee-industry.

A finding that stood out in the survey was that even though the students do not know where their coffee beans are coming from, 84.2% think the planting, harvesting, distribution, and consumption of coffee affects our environment. Cafes and coffee shops are starting to make a conscious decision on how they serve their coffee. Compostable or recyclable cups are being implemented into cafes and customers are beginning to bring their reusable mugs to reduce the amount of waste. We can even see this movement happening across the Bryant University campus. It was found that 21.1% of the students are actively using their own reusable mug/cup every day. However, it was also found that 38.2% of people use both a reusable mug and single-use cups. We believe that this could be potential progress in starting a new trend of reusable cups around campus.



Conclusion

It is concluded in this paper that there is a vicious cycle between coffee production and climate change. Through conducting research, it was found that not only is the production and consumption of coffee playing a big role in climate change, but the planet's rising temperatures are taking a toll on coffee production as well. With warmer temperatures along the coffee belt, farmers risk the potential loss of their farms or are forced to move locations. After all, there is a problem with our climate impacting the word more and more each day. As a society, it should be known that the damaging effects of producing, harvesting, transporting, and drinking of coffee also affects the environment. A problem occurs when one does not understand the impact a

single person or a community has on consuming various products, such as coffee, leading to environmental degradation. Based on the survey conducted about Bryant University's coffee consumption, it is now known that students did not fully understand the environmental impact their coffee drinking habits have globally, nationally, and locally. While teaching college-age students (the industry demographic) healthy and sustainable consumption habits it will resonate well with future generations to come. Attempting to reduce the consumption of coffee products on a college campus can significantly benefit the environment and lead to national and global benefits.

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