

# Biofuels, A Sustainable Alternative to Fossil Fuels?

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**Abstract.** Finding a sustainable alternative to fossil fuels is important for mitigating climate change. Currently, there is no sustainable alternative to fossil fuels that is affordable, accessible, and manageable on a global scale. A commonly proposed alternative to fossil fuels is biofuels, which are fuels composed of plant-based materials (e.g. maize and sugarcane). In this article, I will explore whether biofuels are a sustainable alternative to fossil fuels. I argue that the use of biofuels should not increase as an alternative to fossil fuels because of the negative implications biofuels have on environmental sustainability, food security, and poverty levels. Using the contentious political economy framework posed by Neville (2015), I show that the negative implications associated with biofuels often intersect with each other. This work contributes to the field of political economy, and to green energy policy. In finding that biofuels are not a sustainable alternative to fossil fuels, investments in new technologies will help find an alternative that is affordable, accessible, and manageable.

## Introduction

Finding a sustainable alternative to fossil fuels is an area of importance for political actors that recognize the severity of climate change. In 2014, 79 per cent of greenhouse gas emissions in the United States were the burning of fossil fuels, and Americans were responsible for consuming 19.05 million barrels of oil per day (Environmental and Energy Study Institute, 2017). Ending fossil fuel dependency is difficult because there is currently no sustainable alternative that is globally affordable, accessible, and manageable. The Environmental and Energy Study Institute (2017) cite hydrogen fuel cells, wind energy, and geothermal technologies as possible alternatives to fossil fuels. For states that can afford these technologies, they have potential to be an alternative to fossil fuels, but finding a sustainable alternative to fossil fuels should account for the global south. In the global south, these technologies are not affordable, accessible, or manageable, and would take significant investments and time to develop. To address this problem, the Environmental and Energy Study Institute (2017) list biofuels as an alternative to fossil fuels, and argue that since every region has access to feedstocks, it can be an alternative. There are also theoretical explanations that highlight the potential benefits of biofuels (for example, de Gorter & Just, 2010; Rist et al., 2009). However, food is a limited resource, and biofuel production poses challenges for poverty reduction and food security in the global south.

Poverty is prevalent internationally, and it is estimated that over three billion people live under \$2.50 USD per day (Shah, 2013). Food security is also an important global issue with 795

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million people undernourished, and 780 million people classified as hungry (World Hunger Education Service, 2016). Given these challenges, it is important to recognize that biofuel development impacts various regions differently. This poses the question: are biofuels a sustainable alternative to fossil fuels? This article will argue biofuels are not a sustainable alternative to fossil fuels because of their negative implications on environmental sustainability, food security, and poverty. Despite the inherent appeal of a plant-based fuel, the negative implications of biofuel development often intersect in the global south, harming the world's most vulnerable people. The research conducted will support the central argument by analyzing the negative impacts of biofuel development (i.e. environmental sustainability, food security, and poverty) independently, and will then apply the contentious political economy framework, posed by Neville (2015), to show how these negative implications often intersect.

To develop the argument, there will first be a brief overview of what biofuels are and how they are produced. After this, there will be an analysis of the environmental impacts of biofuels, which include increased land grabbing, deforestation, and the debate on whether biofuels actually mitigate the impacts of climate change. There will also be a discussion on how increasing biofuel production impacts food security, focusing on the food vs. fuel debate derived from the 2007-08 global food crisis. To highlight how negative implications of biofuels intersect, the case of the Tana River in Kenya, using Neville's contentious political economy framework, will be analyzed. The last part of this article will provide a brief critique to confront some of the popular arguments supporting increased biofuel production. Before analyzing the negative impacts of biofuels, it is important to briefly address what biofuels are, and why they became part of the discourse on sustainable alternatives to fossil fuels.

## **What are Biofuels?**

### ***The Production and Use of Biofuels***

Biofuels are produced in several ways, have certain uses that make them appealing, and some states have made it law to have a specific quantity of biofuels mixed with fossil fuels. In its most basic definition, biofuels are a renewable source of energy derived from select plant-based materials, and are primarily used for fuelling transportation. Currently, most liquid biofuels are ethanol and biodiesel; ethanol is primarily made out of sugar or starch based crops, such as sugarcane and maize (Scragg, 2009: VI). Some states view biofuels as a positive investment to reduce their carbon footprint; the European Union requires that its member states ensure 10 per cent of energy consumed is biofuel energy by 2020 (Lane, 2015). Although biofuel use is increasing, biofuels account for only 1 per cent of transportation fuels consumed, and 0.2 per cent of energy used worldwide (Food and Agriculture Organization of the United Nations, 2008: 22). Reflecting on this small percentage, the production of biofuels would have to increase by approximately 500 per cent to meet the global energy demand.

### ***Why Biofuels? Explaining the Push for Increased Biofuel Production***

The push for increased biofuel production began in the 1970's, and was not because of the innovative possibilities of biofuels, or the opportunity to mitigate climate change, but primarily because of increased oil costs during the 1973 Oil Crisis. The Oil Crisis was a revelation of the global dependence on fossil fuels; Organization of the Petroleum Exporting Countries (OPEC) implemented a trade embargo on fossil fuels as a result of the United States supporting Israel in

the Israeli-Arab War (Scragg, 2009: 107). States were forced to quickly mitigate this sudden oil shortage, and some immediately turned to biofuels. For example, Brazil implemented a program called ‘Prolacool’ to increase the production of ethanol from sugarcane, and the United States pushed for an increase in biofuel production using maize (Scragg, 2009: 107). It is clear through analyzing the Oil Crisis that the foundations for biofuel production were not based on mitigating climate change, but instead, on reducing the political and economic impacts of an oil shortage. Unfortunately, biofuels are not an environmentally sustainable alternative to fossil fuels because they do not mitigate climate change, they warrant increased land grabbing, and lead to increased deforestation.

## **Biofuels and the Environment**

### ***The Climate Change Fallacy***

Climate change is an issue that impacts all people, and has a variety of noticeable impacts due to increased carbon dioxide emissions (CO<sub>2</sub>) in the earth’s atmosphere. For example, sea levels have risen by 17 centimeters in the last century, the global average temperature has risen by one degree, and glaciers are receding at an alarming rate (North American Space Agency, 2017). Although these problems impact all people, climate change also has particular implications for small-scale farmers. In a warming climate, farmer production capacity is significantly reduced (Clapp, 2016: 3). While climate change reflects the need to find a sustainable alternative to fossil fuels, it is important to address why biofuels are not this alternative.

Biofuels are not environmentally friendly in their production because they emit CO<sub>2</sub>, the primary contributor to climate change (Timilsina and Mevel, 2014: 121). La Via Campesina, an organization that advocates for food sovereignty among small-scale farmers, also speaks to the negative impact biofuels have on climate change. For La Via Campesina, biofuels are not a reliable alternative to fossil fuels because the CO<sub>2</sub> emitted in their production will contribute to global warming, and since biofuels can only be produced in certain places, the CO<sub>2</sub> emissions to transport them globally would be high (La Via Campesina, 2007). As the global demand for fossil fuel is higher than ever before, the demand for the alternative will be high as well. Increasing biofuel production would require more land, creating necessity for land grabbing and deforestation, each with have significant environmental impacts.

### ***Land Grabbing and Deforestation***

Land grabbing is the process of taking land against the will of a specific party, usually farmers and communities as a whole (Oxfam, 2017). Land grabbing is necessary to increase biofuel production, negatively impacting small-scale farmers. As a result of land grabbing, over 81 million hectares of land has been taken from small-scale farmers globally. Instead of this land benefiting farmers and communities, over 60 per cent of it is used to grow export crops, which include crops used to make biofuel (Oxfam, 2017). Land grabbing also has severe environmental impacts, which is seen in the case of Tanzania.

Tanzania has experienced land grabbing for biofuel production, which has negative impacts on the environment. First, there has been high water consumption for biofuel crop irrigation (Haaland & Havnevik, 2011: 119). Water is a scarce resource in states throughout the global south, and increased land development for biofuel crops requires water for crop irrigation, depriving it from human consumption. Second, biodiversity is jeopardized when land grabbing

occurs for biofuel production. In Tanzania, most wildlife was destroyed because of aggressive land clearing and development needed for biofuel production (Haaland & Havnevik, 2011: 119).

Deforestation is another environmental problem associated with increased biofuel production, which is seen in the case of Indonesia. Forests are an important resource for mitigating climate change because they act as a carbon sink, but deforestation is occurring globally at a rate equivalent to 48 football fields per minute (World Wildlife Fund, 2017). Land for biofuel production plays a role in select deforestation cases, and this role would increase if more biofuels were produced to meet the global energy demand. In a quantitative analysis of biofuels and deforestation, it was found that 4.8 million hectares of land have already been deforested for increased biofuel production globally (Mevel & Timilsina, 2014: 119).

Deforestation is associated with biofuels made from palm oil in Indonesia. Although palm oil biofuels are viewed as carbon friendly and innovative, new biofuel plantations have destroyed some of the world's most pristine forests throughout Indonesia (Human Rights Watch, 2013). The environmental impacts of biofuels are clear, but it is also important to recognize how food security is risked by the increased production of biofuels, which is seen in the 2007-08 food crisis.

## **Food Security, Poverty and Farmer Competition**

### ***What Happened in the Food Crisis?***

The 2007-08 food crisis revealed the negative impacts of biofuels, and it is important to understand what happened in this crisis before discussing how it has impacted farmers, and deprived people of food security in the global south. The 2007-08 food crisis occurred when there was a sudden, and drastic increase in global food prices, which resulted in food becoming inaccessible to millions of people, causing riots in several countries (United Nations, 2011: 62). There is still no consensus on what caused this sudden increase, but secret World Bank documents obtained by the Huffington Post reveal biofuels to be the primary factor responsible for the increase in food costs. In this report, it was discovered that biofuel production forced food prices to increase by 75 per cent, and pushed approximately 100 million people beneath the poverty line, statistics previously denied by governments across the United States and European Union (Huffington Post, 2008). Although it is still unclear what caused the food crisis, biofuels were involved and had negative impacts both during, and after the crisis. The negative impacts of biofuels that started in the food crisis are seen globally, in particular three of these impacts warrant further discussion.

### ***Impacts of Biofuels Since the Food Crisis***

Three key impacts of increased biofuel production derived from the 2007-08 food crisis are increased poverty, the debate between food or fuel, and the limited market for small-scale farmers to sell their produce because of high food costs. Poverty and the food vs. fuel debate are issues that relate to the absence of food security, which in general terms, refers to the inability for people to access food. First, as noted above, the increased cost of food derived from the global food crisis caused over 100 million people to sink beneath the poverty line (Huffington Post, 2008). By 2020, increased biofuel production will cause an additional 5.8 million people to go beneath the poverty line, and up to 42 million people will earn beneath \$2.50 USD per day (Cororaton & Timilsina, 2014: 88). Although people that live in urban centers may benefit from employment opportunities created through biofuel production, food producers and the rural poor are likely to be deprived of these opportunities.

Second, the food vs. fuel debate derived from the food crisis presents arguments for and against biofuel production, and this debate still persists. The food vs. fuel debate is an argument between whether biofuels are a positive, or negative, venture in relation to food security. For biofuel supporters, biofuels give an opportunity for farmers in the global south to expand their agricultural capabilities while providing increased employment. In contrast, opposition to increased biofuel production recognize how decreasing food supply increases food costs, making food unaffordable for impoverished people (Koizumi, 2015: 832). Biofuels are increasing the cost of food, and if biofuel production were to meet the global energy demand, it would significantly raise the cost of food for people that already cannot afford it.

The last key impact to discuss is connected to increasing food costs, which relates to the heightened farmer competition to sell produce in a market that is inaccessible to a large number of people. As food prices increase, less people can purchase food, forcing small-scale farmers to compete. There are approximately 500 million small farms around the world that provide 70 per cent of food, yet these small-scale farmers only have access to 30 per cent of resources in the global food market (Clapp, 2016: 3). With rising food costs, it is difficult for farmers to sell their produce with less buyers and resources, which is yet another problem for increased biofuel production.

Throughout this article, there have been examples of negative biofuel implications, developing the idea that biofuels are not a sustainable alternative to fossil fuels. Although it is important to recognize biofuel's impacts independently, these negative implications often intersect, enhancing their impacts in the global south. To show this, there will be an overview of the intersectionality of biofuel impacts in Kenya's Tana River region.

## **The Tana River Case**

### ***Overview of the Case***

Negative biofuel impacts have intersected in the Tana River. In 2010, a series of court cases were filed against the National Environment Management Authority (NEMA), the Tana and Athi River Development Authority (TARDA), and a private company called Mumias Sugar. These court cases were a result of the plan to turn 20,000 hectares of land in the Tana River region into plantations for increased development of sugarcane biofuels. It was decided in 2013 after an intense court battle that any land development in the Tana region was to be approved by the community, which was a victory for farmers and inhabitants in the region. (Neville, 2015: 21-22). This East African case was able to gain worldwide attention because of the debate over biofuels (Neville, 2015: 22-23). To explain the foundations of this case, Kate Neville (2015) applied the theoretical framework of contentious political economy, combining ideas from contentious politics, political economy, and political ecology.

Biofuels are naturally a contentious issue because any decision made regarding whether to increase or decrease biofuel production will infringe on a party's interests. A key mechanism in contentious politics is diffusion, which occurs when contentious issues spread to a place of relatability (Tilly and Tarrow, 2007: 215). The negative impacts of biofuels are relatable to people because issues such as land grabbing, climate change, and high food costs are global problems, which impact people in different countries. This is important for connecting various sites where biofuels are an issue, helping people take collective action against biofuel development. If biofuels were addressed at a local level, instead of a global issue, it would make collective action that raises

global awareness difficult. Relatable to multiple biofuel cases, there was an intersection of various biofuel related impacts in the Tana case, making these negative implications more severe.

### ***The Intersectionality of Biofuel Impacts***

Land grabbing, increased farmer competition, and heightened food costs because of biofuel production are observed in the Tana River region. The original issue, in this case, was over land grabbing in order to develop sugarcane biofuel plantations (Neville, 2015: 21). In Africa, there is a high quantity of land that is not being used, leaving it open to grabbing by state and corporate actors (Havnevik, 2011: 24-25). The Tana River area was important to people living and farming in the area, but this did not stop attempted land grabbing from occurring. When biofuels first started gaining popularity, there was optimism in the agricultural possibilities they created, but this optimism quickly faded with the increased presence of land grabbing and the food vs. fuel debate (Neville, 2015: 26). This leads into the next biofuel impact observed in the Tana case: increased farmer competition.

As highlighted by Neville, even prior to the presence of biofuels, there was heavy ethnic competition between people living in the Tana region, and this is typical for most East African countries (2015: 27). In 2012, ethnic clashes between different groups in the Tana region resulted in serious injuries, and 160 deaths. These clashes can be attributed to scarce resources, including limited land and water (Neville, 2015: 29). As previously mentioned, biofuel production requires increased land and water resources, and in a country with a very dry climate, increasing biofuel production causes less resources for farmers to compete over, inherently making conflict resolution less likely. Furthermore, an increase in biofuel production would result in increased food costs, making food inaccessible to more people.

The Tana River case highlights the intersections between the negative implications of biofuel production; impacts on the environment, food security, and poverty levels are often not independent, and frequently occur simultaneously. These findings can be applied to any case involving biofuel where land grabbing occurs, there is farmer competition, and there are high food costs. Before concluding, there will be a brief critique of the claims that argue biofuels are a sustainable alternative to fossil fuels.

### **Critique: Supporting Increased Biofuels**

The argument made in this article refutes the claim that biofuels are a sustainable alternative to fossil fuels. While Biofuels are innovative, and to an extent, can reduce the impacts of fossil fuels, there is a certain threshold where biofuels become bad for the environment, food security, and poverty levels. It is a popular claim that biofuels mitigate climate change (Environmental and Energy Study Institute, 2017), but the level of CO<sub>2</sub> emitted in producing and transporting biofuels is high. It is also a popular argument that biofuels enhance agricultural capabilities (Sobczyk, 2007), which is true, but this comes at an increased cost to small-scale farmers that cannot sell their produce because food prices are too high, or the majority of the rural poor that do not benefit from employment biofuels provide. Climate change is a problem for everyone, but biofuels are not the solution, and cannot be a sustainable alternative to fossil fuels. An aforementioned statistic showed that in order for biofuels to meet the global demand for energy, production would have to increase by over 500 per cent. With the negative impacts of biofuels

already revealed at a comparably lower rate of production, it is difficult to see how biofuels could be considered a sustainable alternative to fossil fuels at greater levels.

## Conclusion

Biofuels are not a sustainable alternative to fossil fuels, and this was observed through the various findings made throughout this article. The push for biofuels into the discourse on an alternative for fossil fuels began during the oil crisis, when a trade embargo on oil caused multiple states to scramble to find an alternative. The first set of observations relating to biofuels and the environment revealed that increased biofuel production does not mitigate climate change; land grabbing, and deforestation for biofuel production have had a negative impact on the environment. The second set of observations relating to food security and poverty revealed that increased cost of food, and farmer competition have negatively impacted farmers and communities in the global south. It is important to recognize that these negative impacts can intersect, occurring simultaneously in a single case, which was revealed in the Tana River region. Although there are some potential benefits for biofuels in reducing the impacts of climate change, significantly increasing their production would magnify the negative impacts already observed when biofuels are produced at a comparably lower rate. This work contributes to the field of political economy and to green energy policy. In finding that biofuels are, in actuality, not a sustainable alternative to fossil fuels, investments in new technologies will help the global community find an alternative that is affordable, accessible, and manageable.

## References

- Clapp, Jennifer. 2016. *Food*, 2<sup>nd</sup> Ed. Cambridge: Polity Press.
- Cororaton, Caesar B. and Govinda Timilsina. 2014. "Biofuels and Poverty." In *The Impacts of Biofuels on the Economy, Environment, and Poverty*, ed. Govinda Timilsina and David Zilberman. New York: Springer.
- de Gorter, Harry and David R. Just. 2010. "The Social Costs and Benefits of Biofuels: The Intersection of Environmental, Energy and Agricultural Policy." *Applied Economic Perspectives & Policy* 32(1): 4-32.
- Environmental and Energy Study Institute. 2017. *Renewable Energy*. <http://www.eesi.org/topics/renewable-energy/description> (March 8, 2017).
- Food and Agriculture Organization of the United Nations. 2008. *The State of Food and Agriculture: Biofuels Prospects, Risks, and Opportunities*. <ftp://ftp.fao.org/docrep/fao/011/i0100e/i0100e.pdf> (March 8, 2017).
- Haaland, Hanne and Kjell Havnevik. 2011. "Biofuel, Land and Environmental Issues: The Case of SEKAB's Biofuel Plans in Tanzania." In *Biofuels, Land Grabbing and Food Security in Africa*, ed. Prosper Bvumiranayi Matondi, Kjell Havnevik and Atakilte Beyene. London: Zed Books.
- Koizumi, Tatsuji. 2015. "Biofuels and Food Security." *Renewable and Sustainable Energy Reviews* 52: 829-41.

- La Via Campesina. 2007. *The Myth of Biofuels*. <https://viacampesina.org/en/index.php/main-issues-mainmenu-27/biodiversity-and-genetic-resources-mainmenu-37/267-the-myth-of-biofuels> (March 8, 2017).
- Lane, Jim. 2015. *EU Reshapes its Biofuels Policy*. <http://www.biofuelsdigest.com/bdigest/2015/04/16/eu-reshapes-its-biofuels-policy/> (March 8, 2017).
- Matondi, Prosper B. and Patience Mutopo. 2011. "Attracting Foreign Direct Investment in Africa in the Context of Land Grabbing for Biofuels and Food Security." In *Biofuels, Land Grabbing and Food Security in Africa*, ed. Prosper Bvumiranayi Matondi, Kjell Havenevik and Atakilte Beyene. London: Zed Books.
- Neville, Kate. 2015. "The Contentious Political Economy of Biofuels." *Global Environmental Politics* 15(1): 21-40.
- North American Space Agency. 2017. *Climate Change: How do we Know?* <https://climate.nasa.gov/evidence/> (March 8, 2017).
- Oxfam America. 2017. *The Truth About Land Grabs*. <https://www.oxfamamerica.org/take-action/campaign/food-farming-and-hunger/land-grabs/> (March 8, 2017).
- Rist, Lucy, Janice Ser Huay Lee and Lian Pin Koh. 2009. "Biofuels: Social Benefits." *Science* 326(5958): 1344-46.
- Scragg, Alan H. 2009. *Biofuels, Production, Application and Development*. Wallingford: CABI.
- Shah, Anup. 2013. *Poverty Facts and Stats*. <http://www.globalissues.org/article/26/poverty-facts-and-stats#src1> (April 1, 2017).
- Sobczyk, Klaudius. 2007. *Comment: World view – Agriculture Could Reap Biofuel Benefits*. <https://search-proquest-com.qe2a-proxy.mun.ca/docview/215154649?accountid=12378> (April 1, 2017).
- The Guardian. 2008. *Secret Report: Biofuel Caused Food Crisis*. <https://www.theguardian.com/environment/2008/jul/03/biofuels.renewableenergy> (March 8, 2017).
- Tilly, Charles and Sidney G. Tarrow. 2007. *Contentious Politics*. New York: Oxford University Press.
- Timilsina, Govinda R. 2014. "Economic Impacts of Biofuels." In *The Impacts of Biofuels on the Economy, Environment, and Poverty*, ed. Govinda Timilsina and David Zilberman. New York: Springer.
- Timilsina, Govinda R. and Simon Mevel. 2014. "Biofuels and Climate Change Mitigation." In *The Impacts of Biofuels on the Economy, Environment, and Poverty*, ed. Govinda Timilsina and David Zilberman. New York: Springer.
- United Nations. 2011. *The Global Food Crises*. <http://www.un.org/esa/socdev/rwss/docs/2011/chapter4.pdf> (March 8, 2017).
- World Hunger Education Service. 2016. *2016 World Hunger and Poverty Facts and Statistics*. <http://www.worldhunger.org/2015-world-hunger-and-poverty-facts-and-statistics/> (April 1, 2017).



World Wildlife Fund. 2017. *Deforestation:*

*Overview.* <https://www.worldwildlife.org/threats/deforestation> (March 8, 2017).