

# How can we make plant-based jet fuels sustainable?



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## Abstract

Plant-based jet fuel is the focus of many studies. Why? Many people think that these fuels are a good alternative to fossil fuel jet fuels. They think they are a sustainable option for air travel. To be sustainable, plant-based jet fuels need to meet society's needs. These needs are economic, environmental, and social. Almost all the studies about plant-based jet fuel focus on environmental impacts. They also discuss the economics of plant-based jet fuel.

We wanted to figure out how switching to plant-based jet

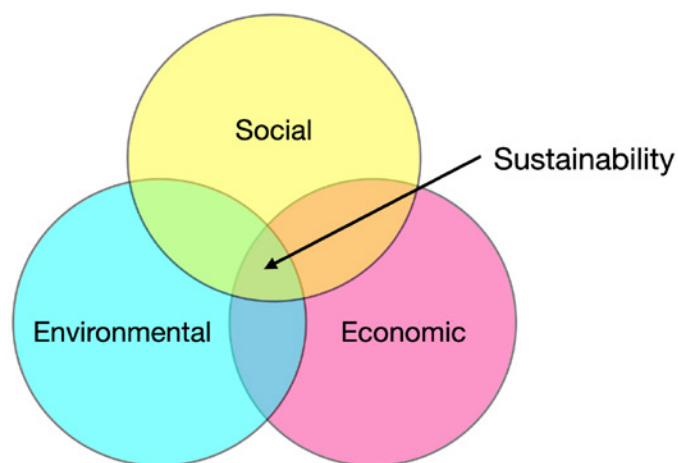
fuels can meet important social needs. So, we identified the important social indicators to consider. Based on several scientific studies, we found that plant-based jet fuels can serve as a sustainable alternative for air transportation. People need to design this new industry to address each social indicator, not only environmental and economic ones. They must also find ways to balance competing needs, known as trade-offs. We recommend research to figure out how to manage the different trade-offs effectively.

## Introduction

Jet fuel powers airplane engines, allowing planes to transport people from one place to another. **Currently, commercial airplanes use jet fuel that comes from fossil fuels.** These are not **sustainable** resources. One reason is because society is using them at a rate that is faster than Nature can make them. Plus, burning fossil fuels harms the environment. It produces greenhouse gases and air pollutants. **These negatively impact human health and biodiversity.**

An alternative to fossil fuel-based jet fuel is plant-based jet fuel. **People produce plant-based jet fuels by processing plants or plant residues.** The most common plants used to make plant-based jet fuel are maize, wheat, and canola.

To make plant-based jet fuel sustainable, people need to analyze it from three perspectives. The economic perspective thinks about the cost of the fuel. The environmental perspective thinks about the effects the fuel has on ecosystems. The social perspective thinks about effects on people's health and well-being. When the use of a resource meets the needs of all three perspectives, it is sustainable.



**Figure 1:**

Sustainability means meeting the needs from the economic, environmental, and social perspectives.

Most research about plant-based jet fuels focuses on the environmental and economic perspectives. But the social perspective is also important! What are the social

indicators needed to change to plant-based jet fuel? We reviewed existing research to find out!

## Methods

We reviewed 121 articles. We found them in scientific journals and government databases. We also analyzed reports written by international agencies. One of these

agencies is the United Nations (UN). The articles came from countries all over the world. All the articles were from the years 2014 to 2024.

## Results

Our review identified six social indicators. These help check the social sustainability of using plant-based jet fuels. The social indicators were food security, health and safety, worker rights, equity, community engagement, and cultural diversity. Plant-based jet fuel will be sustainable if it can address questions asked for each indicator. Examples of these questions include:

- Food security: Does the production of plant-based jet fuel affect the amount of food available for people to eat?
- Health and safety: Does using plant-based jet fuel reduce

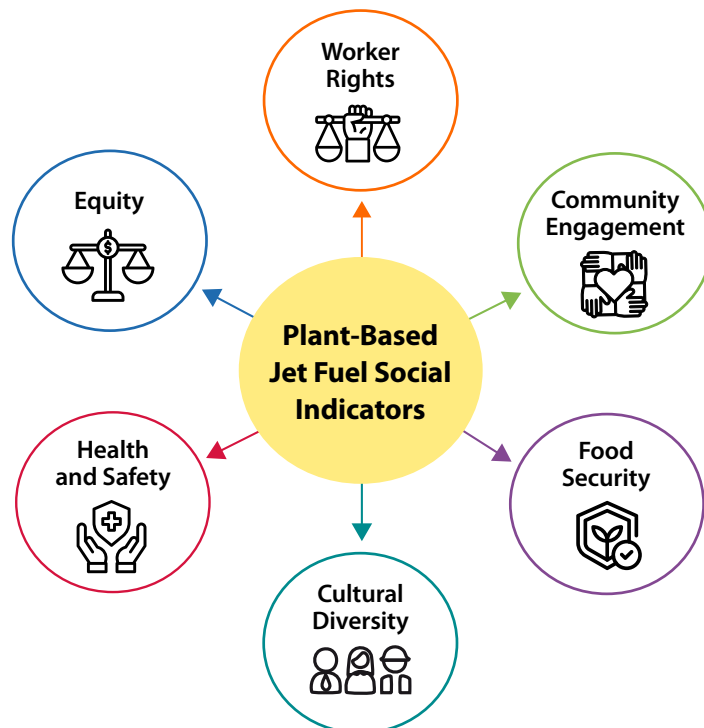
greenhouse gas emissions and pollution levels? Does the industry provide green space near the factories that produce the plant-based jet fuel?

- Worker rights: Do people making plant-based jet fuel have good working conditions? Do they work in places that are healthy and safe?
- Equity: Can people from different backgrounds get jobs in the plant-based jet fuel industry? Do men and women have equal access to jobs to produce and use plant-based jet fuels?

Select a plant-based jet fuel social indicator. What is one question that you can ask to make sure plant-based jet fuels meet this indicator?

**Figure 2:**

Plant-based jet fuel can be sustainable if we consider key social indicators.



- **Community engagement:** Do people at local and regional levels work together to produce plant-based jet fuel?
- **Cultural diversity:** Do people from different cultures work together? When they do, do they exchange their traditions and values?

Each of these social indicators matches one of the 17 UN Sustainable Development Goals. The purpose of these goals is to reach worldwide sustainability by 2030. The aviation industry wants to be sustainable by 2050.

## Discussion

The development of a sustainable plant-based jet fuel industry is possible. But it requires that people design this new industry with the key social indicators in mind. For example, the production of plant-based jet fuels has the potential of creating up to 40 million new jobs. Many of these jobs will require special skills. That means people need to attend training programs. These programs need to have equity. The programs need to be available to people of different backgrounds and genders.

People also have the right to a healthy work environment. As the industry develops, plant-based jet fuel companies need to make sure they have health and safety rules in place. These rules need to make sure that people do not get sick while working with the chemicals needed to make plant-based jet fuel. They also need to make sure that

people do not get injured while working.

Another important consideration is trade-offs. A **trade-off** is a decision that requires you to give up one thing in order to achieve another. The main trade-off in the plant-based jet fuel industry relates to food security. Food security exists when all people always have access to food. This food needs to be nutritious and promote good health. Crops used for food are also used to make plant-based jet fuels. Also, crops need land and water to grow. That means there is also a trade-off for land and water. If people use land and water to grow crops for jet fuel, then this land and water is not available for other things. That means that society needs to figure out how to balance the need for food with the need for energy. Research can help figure out how to balance these competing needs.

## Conclusion

Plant-based jet fuels are a good reminder about the importance of different perspectives. They also show that sometimes one or two perspectives overshadow others. With plant-based jet fuels, people tend to focus on the economics and environmental impacts. But the social factors are just as important. You can apply this lesson when you

make decisions in your everyday life. Make sure to consider the perspectives of everyone involved. And don't forget the less obvious ones. Considering all this information will help you be confident in your decision. It will help make sure that you are doing what is best for everyone.

## Glossary of Key Terms

**Equity** - fairness and equal treatment.

**Plant residue** - the parts of a plant that remain in a field after harvest. These include the leaves, stems, stalks, roots, and seed pods of a crop, depending which part people harvest. For example, farmers leave behind the leaves, stalks, and roots when they harvest corn.

**Social indicator** - a feature of society that can be used to measure the overall well-being of the people in that society.

**Sustainable** - able to be maintained at a level that can meet today's needs and the needs of future generations.

**Trade-off** - a decision that requires you to give up or make compromises on one thing in order to achieve another.

## Check your understanding

- 1 What are the three perspectives that people use to evaluate a resource as sustainable?  
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- 2 How can the plant-based jet fuel training programs be equitable?  
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- 3 How can the use of plant-based jet fuels affect food security?  
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- 4 There are many trade-offs with plant-based jet fuels. What is an example of a trade-off that you have experienced in your life? How did you decide what to do?  
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- 5 Your town wants to switch to a new source of energy. With a partner, write a few questions that you could ask to make sure this energy resource is sustainable. Be sure to write at least one economic, one environmental, and one social question.  
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