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# Introduction

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# Preface

The Indian Journal of Legal Affairs and Research is a testament to our unwavering commitment to excellence in legal scholarship. This volume presents a curated selection of articles that reflect the diverse and dynamic nature of legal studies today. Our contributors, ranging from esteemed legal scholars to emerging academics, bring forward a rich tapestry of insights that address critical legal issues and offer novel contributions to the field. We are grateful to our editorial board, reviewers, and authors for their dedication and hard work, which have made this publication possible. It is our hope that this journal will serve as a valuable resource for researchers, practitioners, and policymakers, and will inspire further inquiry and debate within the legal community.

# Description

The Indian Journal of Legal Affairs and Research is an academic journal that publishes peer-reviewed articles on a wide range of legal topics. Each issue is designed to provide a platform for legal scholars, practitioners, and students to share their research findings, theoretical explorations, and practical insights. Our journal covers various branches of law, including but not limited to constitutional law, international law, criminal law, commercial law, human rights, and environmental law. We are dedicated to ensuring that the articles published in our journal adhere to the highest standards of academic rigor and contribute meaningfully to the understanding and development of legal theories and practices.

# USE OF LAND AND FOOD FOR THE EXPANSION OF BIOFUELS IN INDIA: SYMPATHETIC OR NOT

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## Abstract:

The majority of the developed world's transportation networks run on liquid-based petroleum fuels. Current expected global limitations of the liquid fuels have prompted leaders from business everywhere the industrialized globe to research as well as the to produce liquid biofuels derivative from food yields namely corn, sugarcane, soybean, palm oil and canola. Food and food-related demand, as well as agricultural production can be separated into the categories of biofuel and food competition. The recent high-pitched increases in the price of feed grains, food grains, vegetable oils and oilseeds have coincided with expansion of production of biofuel in the Europe, United States and South America. Indian is travelling the same route. Since the enlargement of agrarian zones applied for biofuel production, there has been a heated debate concerning the greenhouse gas releases tempted by indirect change in usage of land. Development of second-generation biofuel fueled by wood from sustainably achieved prevailing woodlands would outcome in a adverse unintended change in land usage factor by 2030, which would mean that overall emissions would be 27% lower than under the "No biofuel" scenario. The expectations for policy from biofuels have been widely debated. Growing the use of biofuels in developing nations is currently fraught with danger and uncertainty due to unforeseen repercussions related to food and land use changes. Which factors will be crucial in influential forthcoming biofuel authorizations in emerging nations and whether the compromises among energy and food are fewer in number or unjustified for emerging nations are the current policy questions. In this Chapter the researcher will enlight effect of using land and food for biofuel expansion to achieve a more equitable balance between sustainability and Nation's need.

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**Keywords:**
Renewable energy, Bioenergy, Biofuel, Biomass, Energy efficiency, Sustainable Development, Climate Change.

## 1. Introduction

Non-Fossil Fuels like Biofuel derives its energy through living carbon complex. Biofuels comprise biomass-derived liquid fuels, solid biomass, fuels and several biogases. Notwithstanding the intention of producing biofuels as a possible substitute to fossil fuel resources, their sustainability has been heavily criticised. Given recent energy crop yields, massive quantities of land and water would be essential to create sufficient biomass to considerably decrease dependency on fossil fuels. Intense debate about cumulative demand for biomass in energy market, which could consequence in a hazardous rivalry with human food necessities, as well as higher food prices.

Biofuel production has an impact on food prices, making it difficult for analysts to identify the actual source of sustenance. Biofuels are formed and utilised it at globe, with agricultural products serving as the primary feedstock. Furthermost one of the grave issues with cumulative biofuel making is that it strives for agrarian resources with food manufacture and usage. This increase in biofuel production will have an effect on global agrarian commodity markets. It may also have an effect on food safety at all stages. The instantaneous linking to food safety was made mainly through the implication that higher food values would be detrimental to societies that are inclusive net purchasers of food, as opposed to those who may be net venders and assistance from advanced market values for their marketed productivity.

In this perspective, it's critical to deliberate agrarian practises used to raise biomass and their indirect and direct impact on soil nutrients in order to precisely stability the environmental influences of production of biofuels. The effect of biofuels on soil should be evaluated not only in terms of the type of land transformed, but also in relations of farming efficacy outlines.

Biofuels are shaped by directly converting biomass into liquid fuels that may be diverse with prevailing fuel. Ethanol and biodiesel are the two most common conveyance biofuels. These fuels can be shaped from a widespread choice of biomass bases. Archetypally, first-generation (1G) biofuels are generally made from the edible feedstock. Ethanol is mostly formed by fermenting sugarcane and beet carbohydrates or starch from food grains such as wheat, maize, potatoes and

paddy. Biodiesel from the First-generation is made through numerous palm oil, sunflower oil, vegetable oils, canola oil, including soybean oil. Fuels from the Second-generation are manufactured from the biomass like lignocellulosic, which comes from the energy yields or waste biomass alike agrarian and residue from forest. The synthesis of biodiesel from algal biomass, frequently known as third-generation biofuel, has recently raised as a substitute. Third generation (3GB) algae-based biofuels have the latent to offer a high-yielding, non-food, non-arable land usage source of bioethanol, biodiesel, hydrogen, and further fuels that are now in the research and advance phase. Fourth generation biofuels (4GB), also known as photobiological solar fuels and electro fuels, are still in the initial stages of expansion. They directly convert solar energy into fuel cheap, utilizing limitless and readily available raw ingredients.

According to IEA (International Energy Agency) estimates, India would overtake China as the third largest ethanol manufacturer by 2023. India positions seventh amongst topmost ethanol manufacturers in 2016, and it will have exceeded Germany, Canada, and Thailand to become the fourth largest manufacturer by 2021. India is forecast to match China's ethanol productivity in 2022 and, by 2023, to overtake China to occupy third place behind the US and Brazil.[3]

## 2. The Rationale for Biofuel use

Biofuels proposition both favourable and adverse in terms of economic, environmental and societal sustainability. Reduced greenhouse gas (GHG) emissions, energy safety through less crude oil imports and rural growth are the utmost significant universal drivers of biofuels. These are the identical assistances that the Niti Aayog report offers: Upsurge energy safety by potentially reducing crude oil imports, enhancing local entrepreneur and sugarcane agriculturalist engagement in the energy sector, and lowering vehicle emissions.[4] While the advantage to farmers is clear because cumulative demand for any agrarian yield, not only biofuel yields, benefits farmers, the benefits to energy and the environment are more equivocal and extremely context dependant.

[3] IEA, Renewable 2021 Biofuels, https://www.iea.orgn (Last visited on 28th January,2023)
[4] Adina Ana Muresan, Shady Attia, *Energy efficiency in the Romanian residential building stock: A literature review,* Volume 74, RENEWABLE AND SUSTAINABLE ENERGY REVIEWS-SCIENCEDIRECT, Pages 349-363 (2017) (Last visited on 12th January,2023)

## 3. Land Usage and Environmental Impact of Biofuel Production

Apart from promoting energy security, the interest in biofuels in the developed world is also intended at mitigating the risk of climate change by replacing petroleum fuels. Biofuels have a great latent for declining GHG discharges in the conveyance sector, according to the IPCC (2007).[5] Emerging nations, on the other hand, such as India, have numerous goal line in encouraging biofuels, together with energy safety, rural expansion, and land reclamation. The Indian government has been antagonistically studying the nation's biofuel potentials since 2001. The 2009 biofuel policy, a watershed moment in India's biofuel desires, plans for a 20% bioethanol/biodiesel blend by 2017.[6] Based on Biofuel Production there are Some Pitfalls which may clear the vision for identifying sustainability of Biofuel Production. The Pitfalls are as follow.

### 3.1. Pitfalls of Biofuel Production Based on Land Use

According to the National Policy on Biofuels - 2018, the EBP program pursues to reach a blending ratio of 10% ethanol with gasoline by 2021-22[7] and 20% by 2030[8], which is being studied for a probable allowance to 2025. Recent bioenergy is the world's most vital form of renewable energy, accounting for 55% of renewable energy and more than 6% of global energy source. By 2030[9], the Net Zero Emissions by 2050 Scenario anticipates a quick growing in the usage of bioenergy to supplant fossil fuels. Between 2010 and 2021, the usage of contemporary bioenergy enlarged by around 7% per year on average, and it is on the growth. Extra efforts are needed to accelerate contemporary bioenergy deployment in order to meet the Net Zero Scenario, which calls for deployment to upsurge by 10% per year between 2021 and 2030 while avoiding undesirable societal and environmental effects. [10] The precise pitfalls are described further below.

#### 3.1.1. The Need for Massive Biomass

Supplementary efforts are desirable to accelerate contemporary bioenergy deployment

[5] THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/report (Last visited on 12th January,2023)
[6] MINISTRY OF PETROLEUM & NATURAL GAS, https://mopng.gov.in (Last visited on 25 th January,2023)
[7] *Id.* at 6
[8] PRESS INFORMATION BUREAU, https://pib.gov.in (Last visited on 25th December ,2022)
[9] CLIMATE ACTION TRACKER, https://climateactiontracker.org (Last visited on 11th December,2022)
[10] IEA, https://www.iea.org/data-and-statistics (Last visited on 28th January,2023)

in order to light the Net Zero Scenario, which calls for deployment to upsurge by 10% per year amongst 2021 and 2030 while avoiding undesirable societal and environmental effects. The precise pitfalls are designated additional below.[11] Biofuels were principally created through the fermentation of starch crops (ethanol), sewage sludge, municipal waste, dry distillation of wood (methanol), and others (biogas) as well as transesterification of higher fatty acids (biodiesel). These fuels are considered first-generation and are projected to control for numerous years to come because they can be burnt in prevailing unmodified engines and are modest and cost-effective to yield. Presently, efforts are being made to incorporate further renewable raw materials like as cellulose, which is much more difficult to process, into biofuel production, as well as to develop more multifaceted biotechnological technologies. [12] According to universal experience, biofuel manufacture based on 1G feedstock does not assurance lifecycle compensations.

Land-use change throughout feedstock manufacture is the most key component influencing lifecycle releases. Existing natural vegetation must be demolished to encourage new land for biofuel making, resulting in the release of stockpiled carbon and, thus, a net carbon debt.

### 3.1.2. An upsurge in the quantity of land required to produce biofuel

The required land range and land class for increasing biofuels are vital to the argument over the environmental and economic effects of biofuel manufacture. The design area essential to build a 100 Kilo Litres per Day (KL/D) Fuel Grade Ethanol plant in India in 2022 is predictable to be between 18 and 20 acres.[13] Land utilized for production of biofuel was predictable to be at 13.8 Mha (Million Ha.) in 2004, accounting for around 1% of contemporary cropped zone.[14] In 2007, the zone projected is 26.6 Mha. (Million

[11] Contescu CI, Adhikari SP, Gallego NC, Evans ND, Biss BE. *Activated Carbons Derived from High-Temperature Pyrolysis of Lignocellulosic Biomass*., 4(3):51, JOURNAL OF CARBON RESEARCH-MDPI (2018) (Last visited on 10th January,2023)

[12] Hill, J., Nelson, E., Tilman, D., Polasky, S., & Tiffany, D., *Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels Proceedings of the National Academy of Sciences of the United States of America*, 103(30), NATIONAL LIBRARY OF MEDICINE, Page-11206–11210, (2006) (Last visited on 8th January,2023)

[13] MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE GOVERNMENT OF INDIA, http://environmentclearance.nic.in (Last visited on 10th January,2023)

[14] *Supra* note 10

Ha.)[15] The amount of land desired to harvest first-generation biofuel in 2020 is premeditated by separating the projected biofuel demand for the two scenarios by the recommended biofuel yield yield per hectare. Since Jatropha biofuel production is still in its undesirably established, diverse biofuel yields- high, medium and low are being calculated because erratic results can be forecasted over time.

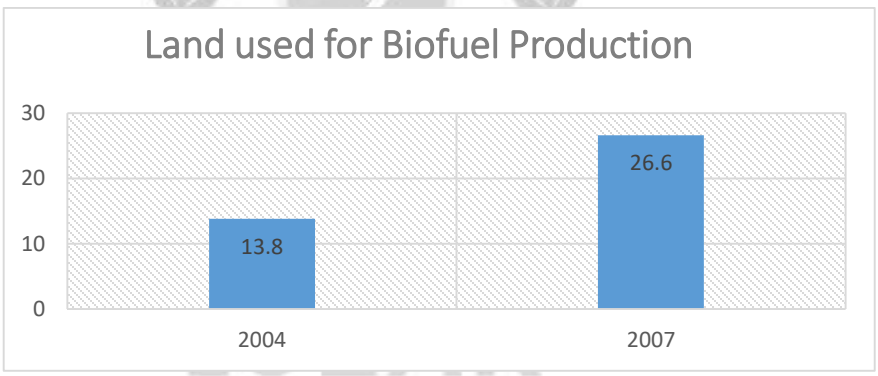
**(Table–1: Land Used for Biofuel Production in year 2004 and 2007)**

[Figure in Mha]

| | Land used for Biofuel Production |
|---|---|
| 2004 | 13.8 |
| 2007 | 26.6 |

[Source of Information: FAO (2008[16])]

(Table-1)




(Figure-1)

Sugarcane is principally a crop used by people on a consistent basis in emerging nations such as India, and its making is in high demand to meet the demand for sugar manufacture. Considering sugarcane's high food consumption, its potential for sustaining biofuel demand may be constrained. In India, ethanol is presently produced frequently from sugar molasses. Rising molasses on marginal areas is a authentic selection, but yields are likely to be modest. The conversion of forest land to farmland

[15] N.H. Ravindranath, C. Sita Lakshmi, Ritumbra Manuvie, P. Balachandra, *Biofuel production and implications for land use, food production and environment in India*, Volume 39, Issue 10, ENERGY POLICY- SCIENCEDIRECT, Pages 5737-5745 (2011) (Last visited on 2nd January,2023)

[16] *Supra* Note 15

is barred in India under the National Forest Policy. Additionally, cropland is unlikely to be converted for biofuels production because it has been steady for more than 20 years, and government support in India is mostly for increasing biodiesel crops on wastelands. As a result, degraded grassland or wasteland are expected to meet the requirement of land for the production of biofuels. According to a study conducted in developing nation like India by Leduc et al. (2009)[17], if the harvest of a biofuel-based crop falls by 50%, discharges will inevitably upsurge due to enlarged transportation distances to accumulate the essential amount of raw material to produce the same quantity of biofuel.

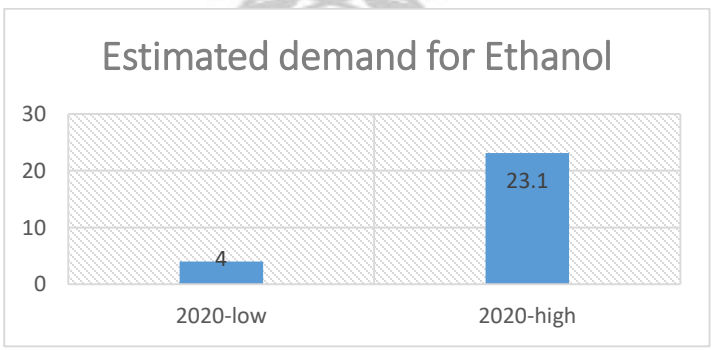
**(Table-2: Projected demand for the biofuel in India for 2020)**

[Figure in Mha]

| | Estimated demand for Ethanol |
|---|---|
| 2020-low | 4 |
| 2020-high | 23.1 |

[Source of Information: The Energy and Resources Institute (TERI)[18]]

(Table-2)




(Figure-2)

[17]G. Favreau, B. Cappelaere, S. Massuel, M. Leblanc, M. Boucher, N. Boulain, C. Leduc, Land clearing, *Climate variability, and water resources increase in semiarid southwest Niger: A review*, Volume 45 Issue7, WATER RESOURCE RESEARCH (2009) (last visited on 11th December, 2022)

[18]Dr Lasya Gopal, Dr Yogesh Gokhale, Dr Mini Govindan, *Food and Land Resources: Incorporating Watershed-Based Approaches for Better Sustainability-Productivity Balance*, TERI- THE ENERGY AND RESOURCES INSTITUTE (2021) (last visited on 2nd January, 2023)

The harvest of biofuel crops, the distance from the biofuel production facility to the biomass source, and how the feedstock is transported are all significant factors in influential biofuel-related releases. The cultivation of a biofuel crop, the distance between a biofuel manufacturing unit and a biomass source, and the manner of raw material delivery are all serious factors in influencing the quantity of releases associated with the biofuel.

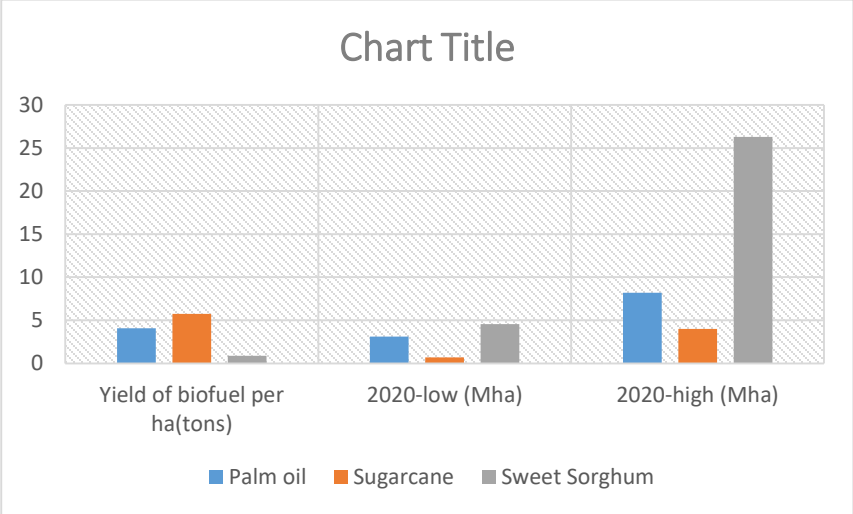
**(Table -3: Required Land for meeting projected demand for biofuel in 2020)**

(Figures in tons and Mha)

| | Yield of biofuel per ha(tons) | 2020-low (Mha) | 2020-high (Mha) |
|---|---|---|---|
| Sweet Sorghum | 0.88 | 4.56 | 26.28 |
| Sugarcane | 5.76 | 0.7 | 4.01 |
| Palm oil | 4.08 | 3.12 | 8.21 |

[Source of Information: FAO (2008)[19]]

(Table-3)




(Figure-3)

According to the Ministry of Petroleum and Natural Gas (MoPNG), India touched 9.45% ethanol blending on March 13, 2022. The leading projects that this will reach

[19] *Supra* note 16

10% by the end of fiscal year 2022. In December 2020, the Government's direction first revealed its intent to enhance it by 20% blending target frontward.[20]

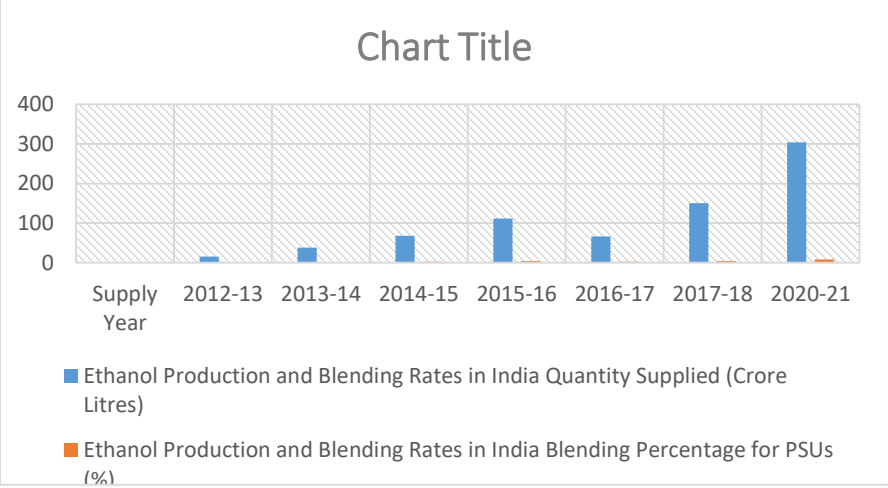
**(Table 4: Production of Ethanol and Rates for Ethanol Blending in India)**

(Figures in Cores Litres and Percentage)

| **Ethanol Production and Blending Rates in India** | | |
|---|---|---|
| **Supply Year** | **Quantity Supplied (Crore Litres)** | **Blending Percentage for PSUs (%)** |
| 2012-13 | 15.4 | 0.67 |
| 2013-14 | 38 | 1.53 |
| 2014-15 | 67.4 | 2.33 |
| 2015-16 | 111.4 | 3.51 |
| 2016-17 | 66.5 | 2.07 |
| 2017-18 | 150.5 | 4.22 |
| 2020-21 | 304 | 8.1 |

**[Source:** Ministry of Petroleum and Natural Gas (MoPNG)[21]]

(Table-4)




(Figure-4)

[20]THE HINDU, Ethanol blend in petrol to be raised to 20% in 3 years, https://www.thehindu.com (2023) (Last visited on 10th January,2023) (Last visited on 15th January, 2023)

[21]Ministry of Petroleum and Natural Gas (MoPNG), https://mopng.gov.in/en/petroleum-statistics/indian-png-statistics, (Last visited on 25th January, 2023)

### 3.1.3. Usage of fertilizers for Biofuel Crops

This is a problem that food crops, biofuel crops, lawns and orchards all face. Fertilizer helps all of these plants grow faster. However, these fertilisers can be harmful to the atmosphere, ecosystem and enlarged production of biofuel could pose a key pollution risk to renewed water sources.

Nitrogen and phosphorus are common components of fertilisers. While mutually of these embellishments stimulate rapid and energetic expansion in a wide range of crops, they do have a disadvantage. Excess fertiliser in the soil from overdo or inappropriate application can rinse through all local watersheds transferred into rivers, streams, lakes, and underground aquifers. Once the pollutants are in the water supply, terrible things can happen.

Phosphorus has been interlinked to restricted algal blooms because the microscopic aquatic plants feed on it and proliferate speedily, often slaughter other plants and aquatic creatures by restrictive the amount of oxygen in the water or making injurious compounds. Nitrogen in drinking water can generate a number of health difficulties, as well as methemoglobinemia, a disorder that causes newborns to be incapable to utilising the oxygen in their blood.[22] Cautious fertiliser application can help avoid widespread pollution, but cumulative production of biofuel to meet global demand opens the door to additional faults in this area.

### 3.1.4. Monoculture

Endless fields of soybeans, maize or wheat with analogous harvests stretching as far away as the eye can see, are symbols of agrarian accomplishment in many parts of the world. Unfortunately, the image also portrays monoculture, an agrarian problematic that biofuels may exacerbate.

Monoculture is the practise of growing a single highly strenuous harvest rather than turning dissimilar harvests through a farmer's grounds over time. While this is an economically pleasing practise, exploiting economies of scale to upsurge crop productivity for the farmer, it can have serious environmental consequences.

[22] Peter M. Bierman, Brian P. Horgan, Carl J. Rosen, Andrew B. Hollman, Paulo H. Pagliari, *Phosphorus Runoff from Turfgrass as Affected by Phosphorus Fertilization and Clipping Management,* Volume 39 Issue 1, JOURNAL OF ENVIRONMENTAL QUALITY, (2010) (last visited on 18th December, 2022)

Hundreds, if not thousands, of acres of unbroken crop offer an irresistible target for plant pests; pest populations can explode out of control in such a tempting environment. Similarly, nutrients reimbursed to the soil through crop alternation and consenting fields to fallow dissolve under intensive monoculture farming. Long-term monoculture farmsteads must utilised far more mock fertiliser than additional sustainable counterparts, cumulative water pollution. And the unique nature of a monoculture harvest increases the farmer's danger of total loss; envision the devastation if a simple strain of corn blight hit an ethanol-producing corn farm.[23]

Monoculture remain problematic in production of biofuel; it's also a problem in large-scale food crop production, which has been studied for years. Since many popular biofuel crops, such as soybeans and maize, are also vital food supplies for most of the world, it stands to cause that monoculture problems may grow as demand of biofuel increases considering increased need.

## 4. Emphasised on Fuel requirement over Food Security

All over the world there is a focused discussion considering the conflict over the effect of production of biofuel for security of food is at the centre of the "food vs. fuel" debate. By 2050, the FAO projects that there will be 9.1 billion people on the globe.[24] Along with this population increase, there will be a speedy urbanisation, a growth in income, and nutritional habits transformation.

Food prices are said to rise as a result of competition amongst the production of biofuel from first generation and required resources for production of food like water and land utilizes for other purposes. To combat the anticipated future demand for food, an increase in agricultural output of 70% is required. Concerns have been raised about the exploitation of important acreage for fuel crops, which may boost food costs and perhaps produce a food shortage. Retail price increases in India fell to 6.77% in October, down from 7.41% in September, as food inflation eased. "The possible threats to food safety and water security stood by the revised ethanol blending targets. It

[23] Javier Mateo-Sagasta, Sara Marjani Zadeh, Hugh Turral, Jacob Burke, *Water pollution from agriculture: a global review, The Food and Agriculture Organization of the United Nations, The International Water Management Institute* (2017) *https://www.fao.org* (last visited on 20th December, 2022)

[24] FAO, "How to Feed the Word in 2050", http://www.fao.org (Accessed January 20, 2023).

is modest to understand how challenging demands from the fuel sector could endanger equally water and food safety because sugar cane is a water-exhaustive harvest grownup on land intended for food making.

As stated in the National Policy on Biofuels, the central government approved climbing the deadline for blending 20% ethanol into gasoline from 2030 to 2025–2026.

According to the official line of reasoning, " as concerns have been raised about the exploitation of important acreage for fuel crops, which may boost food costs and perhaps produce a food shortage. Retail price increases in India fell to 6.77% in October, down from 7.41% in September, as food inflation eased." For ethanol made from sugar cane juice, syrup, and molasses, premium prices have been announced. The use of "excess rice or damaged food grains" as feedstock for the production of bioethanol would profit from the suggested incentives, despite being small in comparison to feedstock based on sugar. In contrast to making ethanol from corn, cellulosic ethanol is created from inedible plant portions or organic resources, thus there are less chances for the conflict between food and fuel. Crop residues, however, keep soil organic matter high and prevent soil erosion. Keeping the equilibrium amongst the residue elimination rate and long-standing soil well-being is the main challenge in sustainable soil management. Following are some potential pitfalls based on the food vs. fuel argument.

## 4.1. Pitfalls Based on Food Security

The expansion of biofuels from food crops such as soybeans, corn, and sorghum have the potential to extremely modify the accessibility of food around the world. The supply and demand economics of biofuels can endanger some regions' food safety or the population's admittance to fairly assessed, nutrient-dense food. For instance the prices of Corn climbs as corn demand rises for production of biofuel.

### 4.1.1. Impact on Food Price

The outcome of biofuels on prices of food is a contentious issue with varying opinions. Depending on the researcher, the effect of biofuels on food prices has been estimated to range from a 3% increase to a 75% increase.[25] The FFPI, however, increased by up

[25]Olivier Dubois, *Moving from 'Food versus Fuel' towards 'Food and Fuel'*, BIOENERGY & DEVELOPMENT MEETING, BERLIN (2015), http://www.worldagroforestry.org/berlin-conference-presentations (Accessed December 20, 2017).

to 18 points, or 14.3%, from 2021 to 2022 overall, averaging 143.7 points. The FAO Sugar Price Index rose 5.1 points (4.7 percent) from 2021 to 2022, averaging 114.5 points overall. This was the highest annual average since 2012.[26]

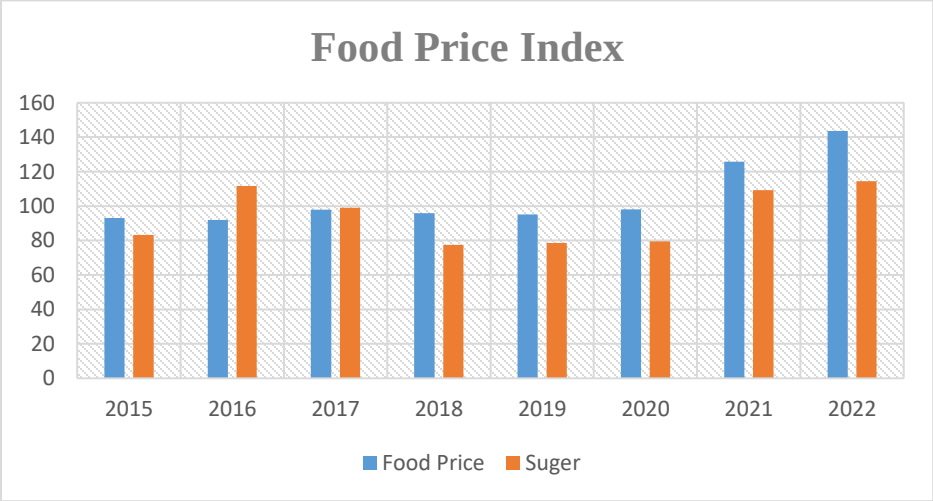
**(Table – 5: Food Price Index and Price of Sugar in India)**

(Figures in Percentage)

| | Food Price | Suger |
|---|---|---|
| 2015 | 93 | 83.2 |
| 2016 | 91.9 | 111.6 |
| 2017 | 98 | 99.1 |
| 2018 | 95.9 | 77.4 |
| 2019 | 95.1 | 78.6 |
| 2020 | 98.1 | 79.5 |
| 2021 | 125.7 | 109.3 |
| 2022 | 143.7 | 114.5 |

[**Source:**Food and Agriculture Organization of the United Nations[27]]

(Table – 5)




(Figure – 5)

[26]FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, https://www.fao.org (Last visited on 28th January, 2023)
[27]*Id* at 26.

### 4.1.2. Burning Crops

The primary political force behind biofuel production worldwide is the benefit to farmers and rural economies. India, which has limited resources, may only see a few benefits at a high cost. Unhealthy atmosphere and poor air quality have been caused by the burning crop residue burning issues. Despite these issues government regulations and other steps leads with this frequently practiced. The expected influence of changes in agrarian emissions on air quality across India and the probable assistances of district-level ingenuities using an adjoint study method. The burning of agricultural residue resulted in 50,000–100,000 premature deaths annually between 2003 and 2019, with Uttar Pradesh, Haryana and Punjab accounting for 67-90% of these deaths. Delhi, about 250 kilometres (155 miles) away, may also experience the smoke's noxious haze as it adds to the national capital's smog. Not just Delhi is in trouble. Large areas of northern India are polluted by the fumes from stubble burning, endangering the health of hundreds of millions of people.

### 4.1.3. Extensive use of Fertilizer

This is a global issue that faced by food crops, biofuel crops, lawns and gardens all. When fertilised, all of these plants grow more effectively. However, those fertilisers may have negative environmental effects, Enlarged production of Biofuel may stance a serious risk of freshwater pollution. Phosphorus and Nitrogen are two components of many fertilisers. While these two additives encourage quick and robust growth in many crops, they also have a drawback. Excess fertiliser in the soil from overuse or improper application can wash through local watersheds and into lakes, river, underground aquifers and streams. Bad things may also occur once the chemicals are existing in the water supply. Localized algae blooms have been linked to phosphorus because the tiny aquatic plants it feeds on grow quickly and kill other plants and aquatic life by lowering oxygen levels or by releasing toxic chemicals. One of the health problems produced by nitrogen in drinking water is methemoglobinemia, a disorder that inhibits newborns from utilising the oxygen in their blood.[28] Applying

[28]Montarop Yamabhai, Suttipong Sak-Ubol, Witsanu Srila, Dietmar Haltrich, *Mannan biotechnology: from biofuels to health*, Volume 36, 2016 - Issue 1, CRITICAL REVIEWS IN BIOTECHNOLOGY (2016) (last visited on 3rd January, 2023)

fertiliser carefully can aid avoid extensive pollution problems, but to meet global demand the Government emphasise on extensive production of biofuel but it creates more room for error in this range.

### 4.1.4. Transgenic (GM) plants

Farmers are progressively planting genetically altered forms of the crops corn, soybeans, and cotton, which are all potential sources of biofuel. Genetically altered crops are changed in the lab to better tolerate herbicides, ward off pests, or yield more. This is not the selective breeding practiced by farmers for many years. Any deleterious effects on the environment caused by the widespread expansion of GM plants may have an indirect impact on human health. Concerns about genetically modified plants and the environment have been raised. For example, GM plants may sexually hybridise with non-GM plants by exchanging ovum, GM plants may grow into invasive weeds, and the conditions needed to grow GM plants may have an impact on local wildlife populations.

When a modified strain of corn underwent initial testing, it unintentionally developed undesirable and occasionally dangerous traits. Researchers discovered that crops modified to combat a moth that preys on corn produced pollen that could harm monarch butterfly larvae.

### 4.1.5. Shortage of Food Availability

Crops and plants with high sugar content are used to make biofuels. However, the majority of these yields are also used to produce food. Even if waste through plantation may be used as a raw material, these commodities will still have a market. It takes up agricultural space meant for other crops, which may result in a variety of issues. Even though the use of land for the production of biofuels may not result in a severe food scarcity, it will place burden on the current upsurge in crop production. People frequently worry that rising food prices may result from increased use of biofuels.

## 5. Conclusions:

Biofuels are becoming more popular worldwide, but especially in India. Developing nations like India has announced a policy on biofuel intending of reclaiming degraded lands, encouraging

energy security, and providing rural communities with livelihood opportunities. The quantity of wastelands that are available in India make the required land feasible. Therefore, the enlargement of biofuel harvests in wastelands is undesired to have a substantial influence on food making in India, where the zone used for food production appears to have stabilised. Additionally, the biofuel policy only promotes production on marginal or wastelands. In developing country like India, there is an operative ban on translating forest land for non-forest uses, such as the production of biofuels. To reduce any negative effects and to foster latent synergies with regard to the recuperation of degraded lands, the formation of rural livings, and the promotion of energy safety, India must develop and adapt sustainable biofuel production practises. India desires to investigate the possibility of deploying the envisioned next-generation crops for biofuel. Because the primary feedstock for biofuel making is agricultural product, amongst the most significant issues with growing biofuel making is that it strives with food and usages associated to food for natural and agrarian resources. The price of agricultural commodities globally as well as food safety at the individual, household, national and international levels will be impacted by increased biofuel production. To meet the purpose, the prevailing supply of sugarcane-consequent ethanol and jatropha-consequent biodiesel via the first-generation biofuel technique is insufficient. Utilization of food production, land and a sustainable environment including effects on the agrarian market. According to the existing study, biofuels have a hopeful and positive future as alternatives to traditional energy sources like coal and petroleum. Additionally, there has been a upsurge in the value-added facilities provided by the agrarian sector, which has benefited both labourers and landowners.

A lack of government backing for sustainable supply chain rules and solutions, entrepreneurship backing, and grants or incentives to foster competition amongst bioenergy producers are all significant impediments to biofuel making. Some of the barricades may be indifferent through the application of new policies and tactics, as well as changes to current ones. To encourage the biofuel business in India, the usage of blending biofuel with conventional petroleum should be made binding, and costs should be subsidized. While supporting government policies and active assignation from the neighbourhood civic and private initiatives can keep the program running in the short term, a robust long-term approach is required. Given the accessible feedstock substitutions, technology position, and regulatory potentials, the existing trajectory is unlikely to be adequate in the long run. A significant research energy on the making of first, second, third,

and fourth generation feedstock is required to meet the nation's forthcoming bioenergy requirements.

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