What Numbers Tell: Contribution of Vegetable Oils towards Sustainable Development Goals

MINISTRY OF FOREIGN AFFAIRS
REPUBLIC OF INDONESIA

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What Numbers Tell: Contribution of Vegetable Oils towards Sustainable Development Goals

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FOREWORD

The public discourse over the cultivation of tropical vegetable oils – in particular their potential threat to endangered tropical and sub-tropical ecosystems – has become strongly polarised. Professional spin-doctors flood social media with propaganda against targeted vegetable oils, and the negative opinions they generate result in ongoing calls for boycotts [1,2]. Yet, after decades of boycotting various commodities (among many others beef, palm oil, soybean and timber and wood fibre [3]) the spin-doctors have all but failed to conserve (let alone protect) the ecosystems they so highly value.

The oversimplification required to argue for a boycott of a target commodity all but lead to the pursuit of yet another solution that was "clear, simple and wrong" [4]. For instance, the complex interactions between the numerous agricultural and forestry commodities and stakeholders [3,5,6] and must be ignored to argue for a false dilemma: vegetable oil "versus" conservation. Hence, boycotts of (mostly tropical) commodities mainly demonized the various private and public initiatives that aim to transform their cultivation and processing through "buycotts" [1,2] and – much more so – the vulnerable farmers cultivating these commodities.

It is therefore necessary to reset the global debate with an objective assessment of the favourable and unfavourable aspects of the vegetable oil sector. This is more so the case, when considering the (potential) impacts of the vegetable oil sector on many (most?) Sustainable Development Goals. This means assessing all vegetable oil's impacts on the various Sustainable Development Goals and untangling the polarised opinions regarding them [2] in a balanced, evidence-oriented and global setting. Only then can the discourse concerning the impacts of vegetable oils from tropical, sub-tropical and temperate areas achieve a level playing field and determine global partnerships and (f)actual strategies for transforming the whole vegetable oil sector.

During 2021, the Indonesian Auditor Network continued its cooperation with the Foreign Policy Strategy Agency (formerly the Policy Analysis and Development Agency) of Indonesia's Ministry of Foreign Affairs, to follow-up on its previous study on the impacts of vegetable oils on Sustainable Development Goals. The cooperation expanded the study to cover 24 indicators under 8 Sustainable Development Goals, and expanded its scope from four to twenty vegetable oil crops: 1) castor seed, 2) coconut drupe, 3) cotton seed, 4) groundnut, 5) hemp seed, 6) jojoba seed, 7) kapok fruit, 8) linseed, 9) melon seed, 10) mustard seed, 11) oil palm, 12) olive drupe, 13) poppy seed, 14) rapeseed, 15) safflower seed, 16) sesame seed, 17) shea nut, 18) soybean, 19) sunflower seed, and 20) tung nut.

On this occasion, I would like to extend my gratitude and warmest appreciation to the various people who have enriched this study with their detailed contributions. In particular I wish to mention Dr. Siswo Pramono and Dr. Teuku Faizasyah (Director General and Acting Director General of the Foreign Policy Strategy Agency of Indonesia's Ministry of Foreign Affairs), Dr. Rio Budi Rahmanto (Head of the Centre for Multilateral Policy Strategy) and Mrs. Rahmawati Wulandari (Coordinator for Economy and Development at the Centre for Multilateral Policy Strategy) and their expert support teams, as well as Dr. Khaled Obaideen (Advisory Board Member of the Indonesian Auditor Network) and Dr. Asep Suntana (Trustee of the Indonesian Auditor Network) for their invaluable support of the study.

This study starts to map the multi-dimensional cloud of interactions and impacts between vegetable oil crops and SDGs. It identifies serious data gaps concerning the impacts on various SDGs, in particular 13 and 15 (Climate Action and Life on Land), suggesting that the environmental and – more so – the social impacts by the vegetable oils sector remain poorly understood. The study also identifies the current leaders and laggards amongst the vegetable oils with regards to their contributions to the SDGs. I hope this report entices the readers to further explore the intricacies of the global vegetable oils sector and to engage in joint dialogues and research on its impacts.

Bogor, September 2021
Bart W van Assen

Trustee
Indonesian Auditor Network

[1] Hoffmann S, Balderjahn I, Seegebarth B, Mai R and Peyer M 2018 Under Which Conditions Are Consumers Ready to Boycott or Buycott? The Roles of Hedonism and Simplicity *Ecol. Econ.* **147** 167–78

[2] Teng S, Khong K W and Che Ha N 2020 Palm oil and its environmental impacts: A big data analytics study *J. Clean. Prod.* **274** 122901

[3] Curtis P G, Slay C M, Harris N L, Tyukavina A and Hansen M C 2018 Classifying drivers of global forest loss *Science (80-.).* **361** 1108–11

[4] Mencken H L 1880–1956 "For every complex problem there is an answer that is clear, simple, and wrong." (American journalist, essayist and satirist)

[5] Marques A 2021 Distant drivers of deforestation *Nat. Ecol. Evol.* **5** 713–4

[6] Jayathilake H M, Prescott G W, Carrasco L R, Rao M and Symes W S 2021 Drivers of deforestation and degradation for 28 tropical conservation landscapes *Ambio* **50** 215–28

ABSTRACT

The challenges of poverty and other economic, social and environmental impacts led to the establishment of 17 Sustainable Development Goals (SDGs), with detailed indicators created to measure the 17 SDGs against the three major perspectives (social, economic, and environmental) that renewable energy may help achieve.

In 2015, the international community gathered at the United Nations and adopted the 2030 Agenda for Sustainable Development, which laid out the 17 SDGs. These goals cover the aspects three pillars of sustainable development (social, economy and environment). Since then, policy and decision makers discussed how to determine the ultimate pathway to achieve these goals. In order to support the policy and decision makers to determine the best pathway, 244 indicators were developed and adapted to measure the 17 SDGs.

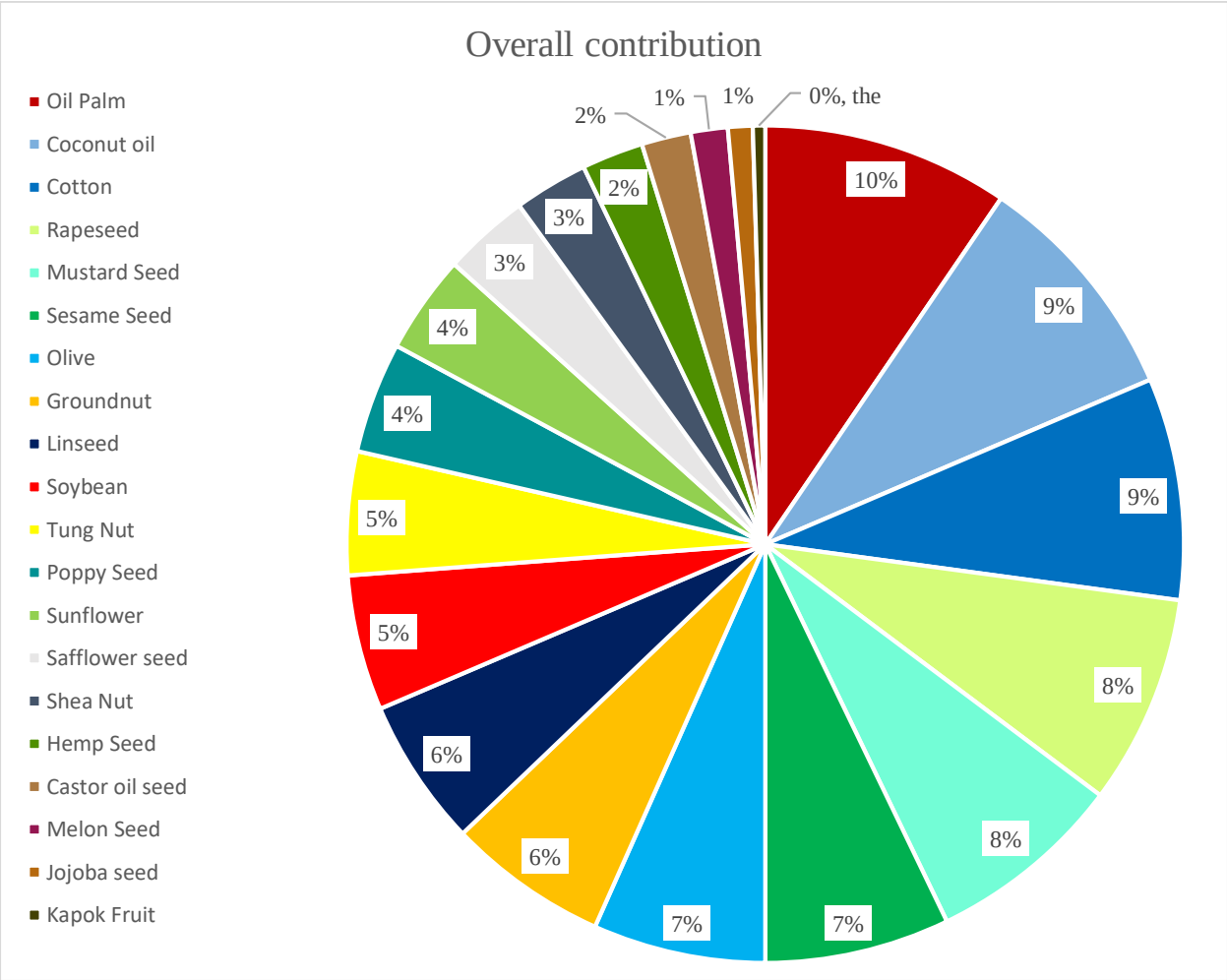
Vegetable oils play a major role in achieving the SDGs. However, the exact contributions by vegetable oils on the SDGs remains unclear. Based on this need in 2020, we published a report that uses a self-developed matrix to assess selected indicators. In 2021, we expanded the scope of the initial report to include more vegetable oil and use additional and updated data. The vegetable oils covered in this report are: 1) Castor oil seed, 2) Coconut oil, 3) Cotton Seed, 4) Groundnut, 5) Hemp Seed, 6) Jojoba seed, 7) Kapok Fruit, 8) Linseed, 9) Melon Seed, 10) Mustard Seed, 11) Oil Palm, 12) Olive, 13) Poppy Seed, 14) Rapeseed, 15) Safflower seed, 16) Sesame Seed, 17) Shea Nut, 18) Soybean, 19) Sunflower Seed, and 20) Tung Nut.

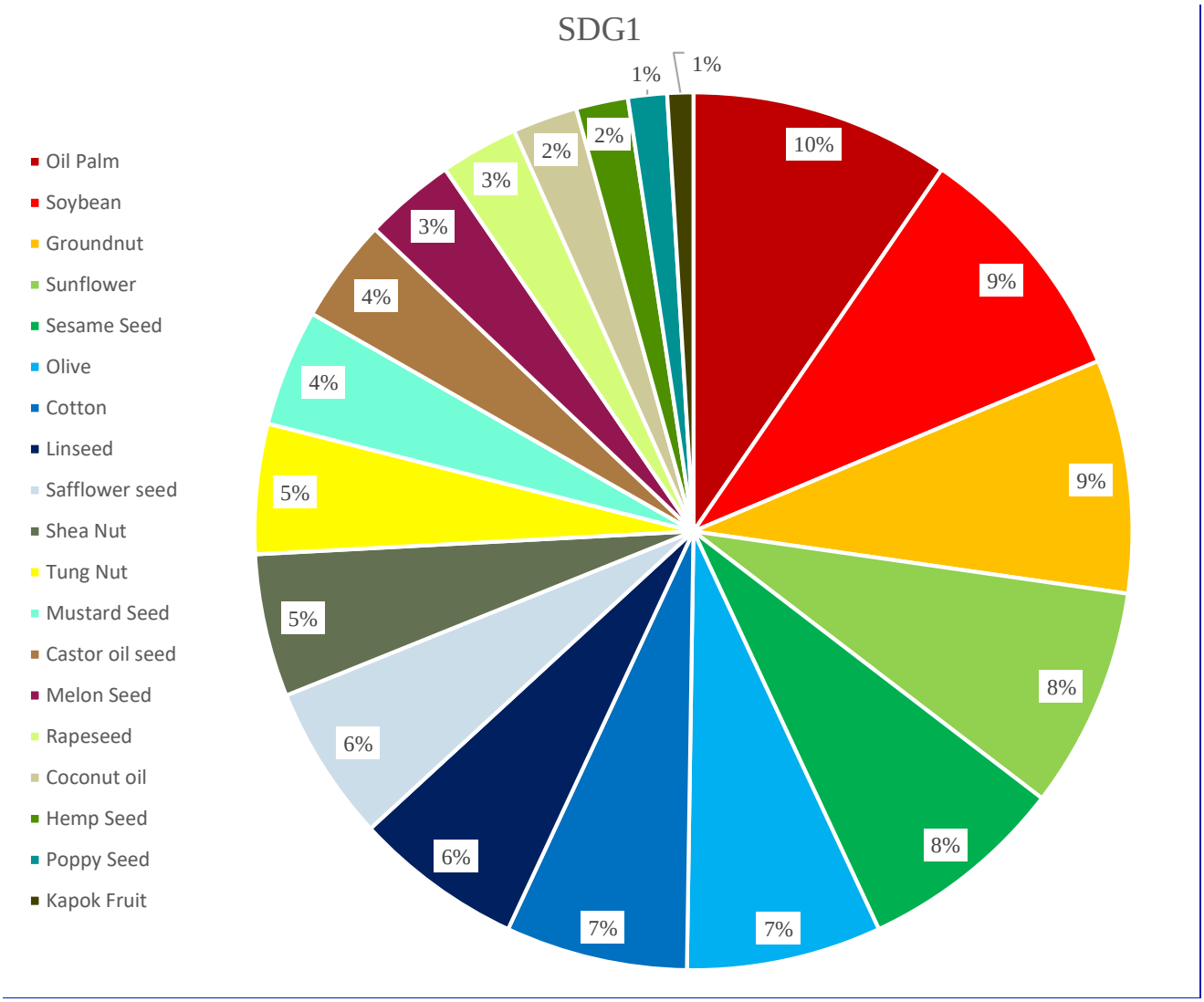
Our matrix covers the three pillars of the sustainable development (social, economy and environment) for nine of the fifteen SDGs. Similar to the previous report, our data sources were limited to reliable sources only. The following SDGs have been covered in the analysis:

- GOAL 1: No Poverty
- GOAL 2: Zero Hunger
- GOAL 3: Good Health and Well-being
- GOAL 6: Clean Water and Sanitation
- GOAL 7: Affordable and Clean Energy
- GOAL 8: Decent Work and Economic Growth
- GOAL 12: Responsible Consumption and Production
- GOAL 13: Climate Action
- GOAL 15: Life on Land

The results from our comprehensive approach build further upon the previous results, with similar outcomes. While the impacts of vegetable oils on SDGs remain poorly documented overall, the main data gaps encountered mainly concern SDGs 13 and 15 (Climate Action & Life

on Land), but also SDGs 1-3 (No Poverty, Zero Hunger & Good Health and Wellbeing). In other words, the environmental and – more so – social impacts from the cultivation and processing of vegetable oils remain poorly understood. Nonetheless, we have identified the current leaders and laggards in contributing to the SDGs amongst the vegetable oils: cotton seed, mustard seed, oil palm and rapeseed versus castor seed, jojoba seed, kapok fruit, melon seed & poppy seed. The following Figures shows the contribution of the selected vegetable oils:




SDG1
Oil Palm
Soybean
Groundnut
Sunflower
Sesame Seed
Olive
Cotton
Linseed
Safflower seed
Shea Nut
Tung Nut
Mustard Seed
Castor oil seed
Melon Seed
Rapeseed
Coconut oil
Hemp Seed
Poppy Seed
Kapok Fruit
10%
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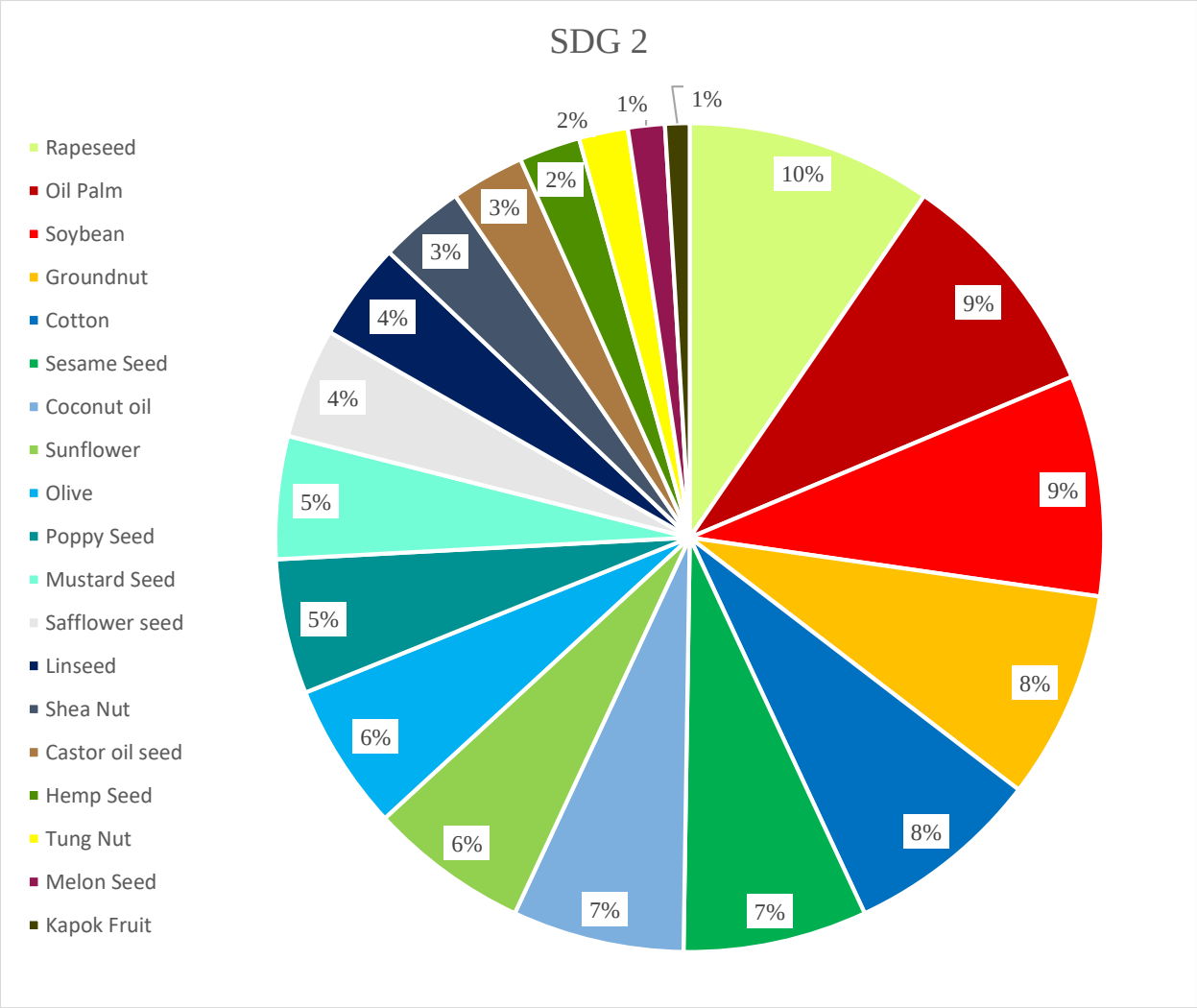
SDG 2
Rapeseed
Oil Palm
Soybean
Groundnut
Cotton
Sesame Seed
Coconut oil
Sunflower
Olive
Poppy Seed
Mustard Seed
Safflower seed
Linseed
Shea Nut
Castor oil seed
Hemp Seed
Tung Nut
Melon Seed
Kapok Fruit
10%
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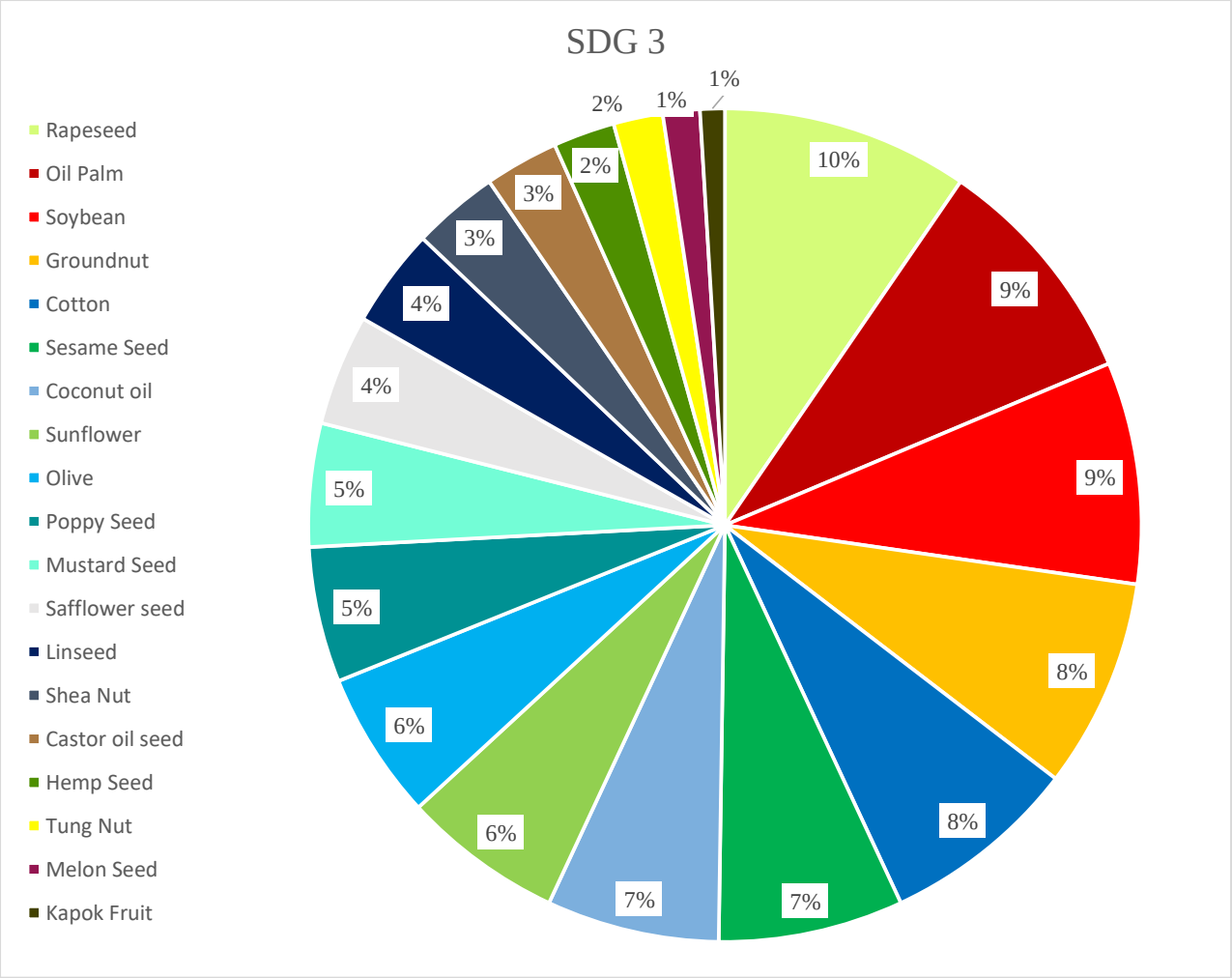
SDG 3
Rapeseed
Oil Palm
Soybean
Groundnut
Cotton
Sesame Seed
Coconut oil
Sunflower
Olive
Poppy Seed
Mustard Seed
Safflower seed
Linseed
Shea Nut
Castor oil seed
Hemp Seed
Tung Nut
Melon Seed
Kapok Fruit
10%
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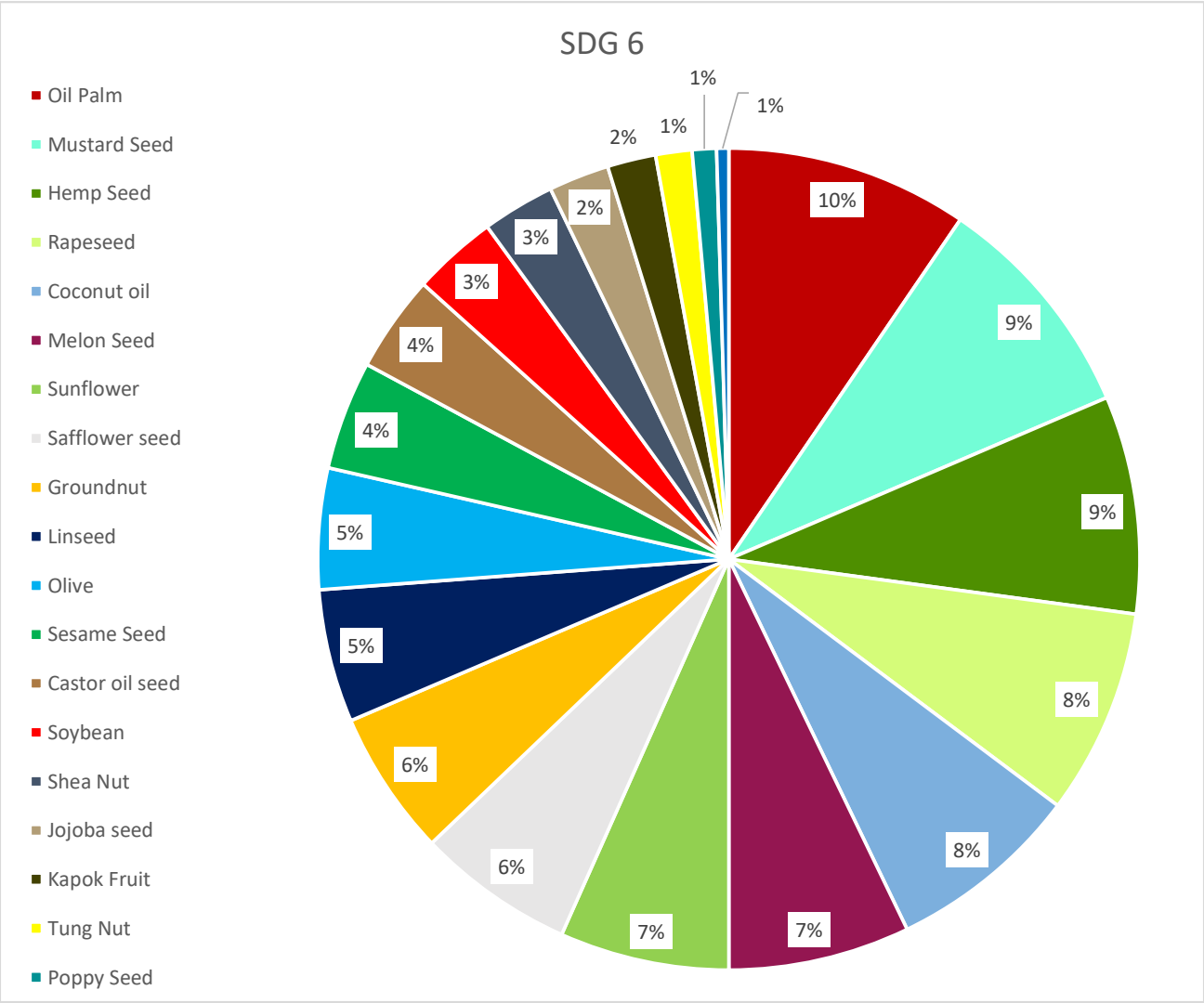
SDG 6
Oil Palm
Mustard Seed
Hemp Seed
Rapeseed
Coconut oil
Melon Seed
Sunflower
Safflower seed
Groundnut
Linseed
Olive
Sesame Seed
Castor oil seed
Soybean
Shea Nut
Jojoba seed
Kapok Fruit
Tung Nut
Poppy Seed
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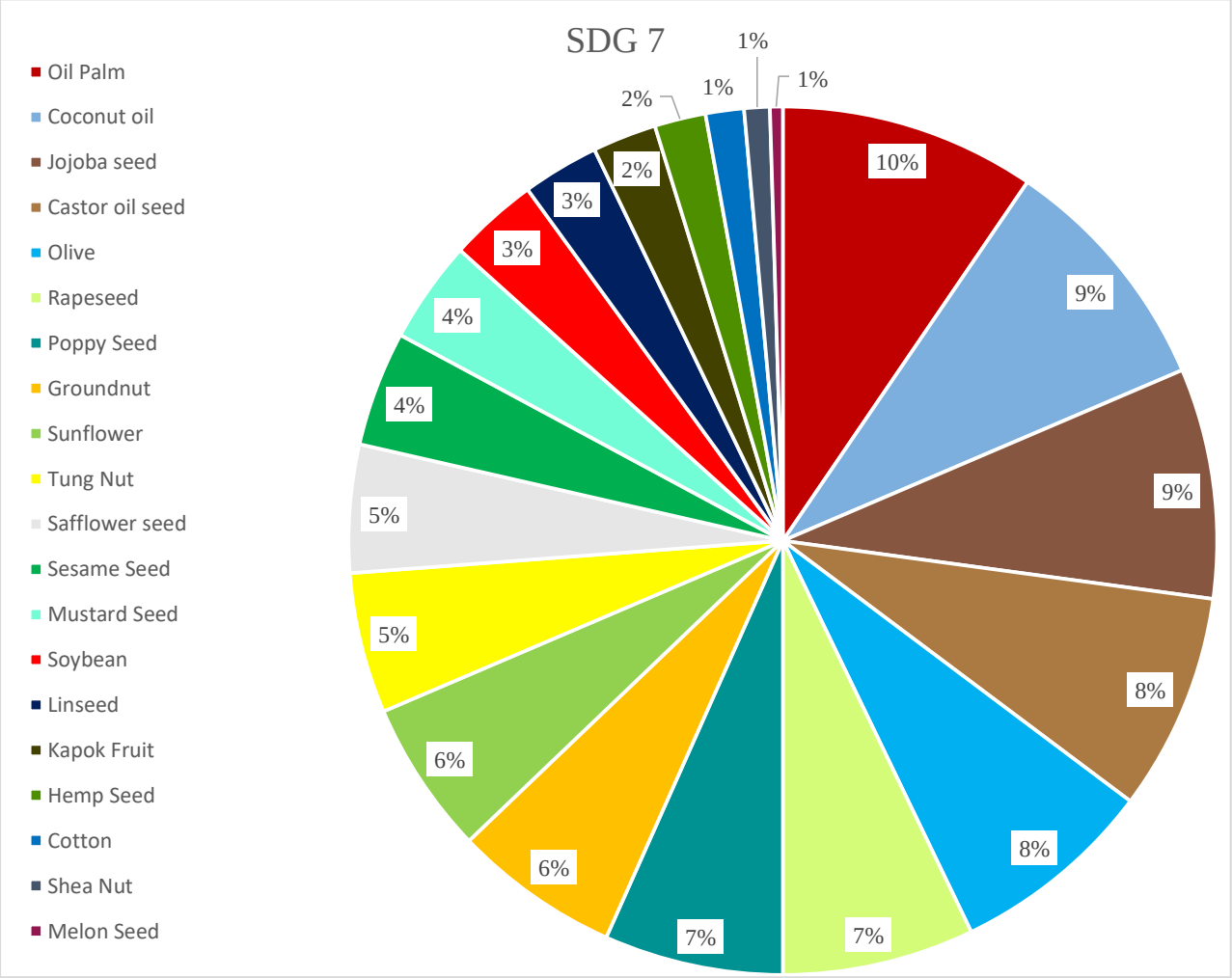
SDG 7
Oil Palm
Coconut oil
Jojoba seed
Castor oil seed
Olive
Rapeseed
Poppy Seed
Groundnut
Sunflower
Tung Nut
Safflower seed
Sesame Seed
Mustard Seed
Soybean
Linseed
Kapok Fruit
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Cotton
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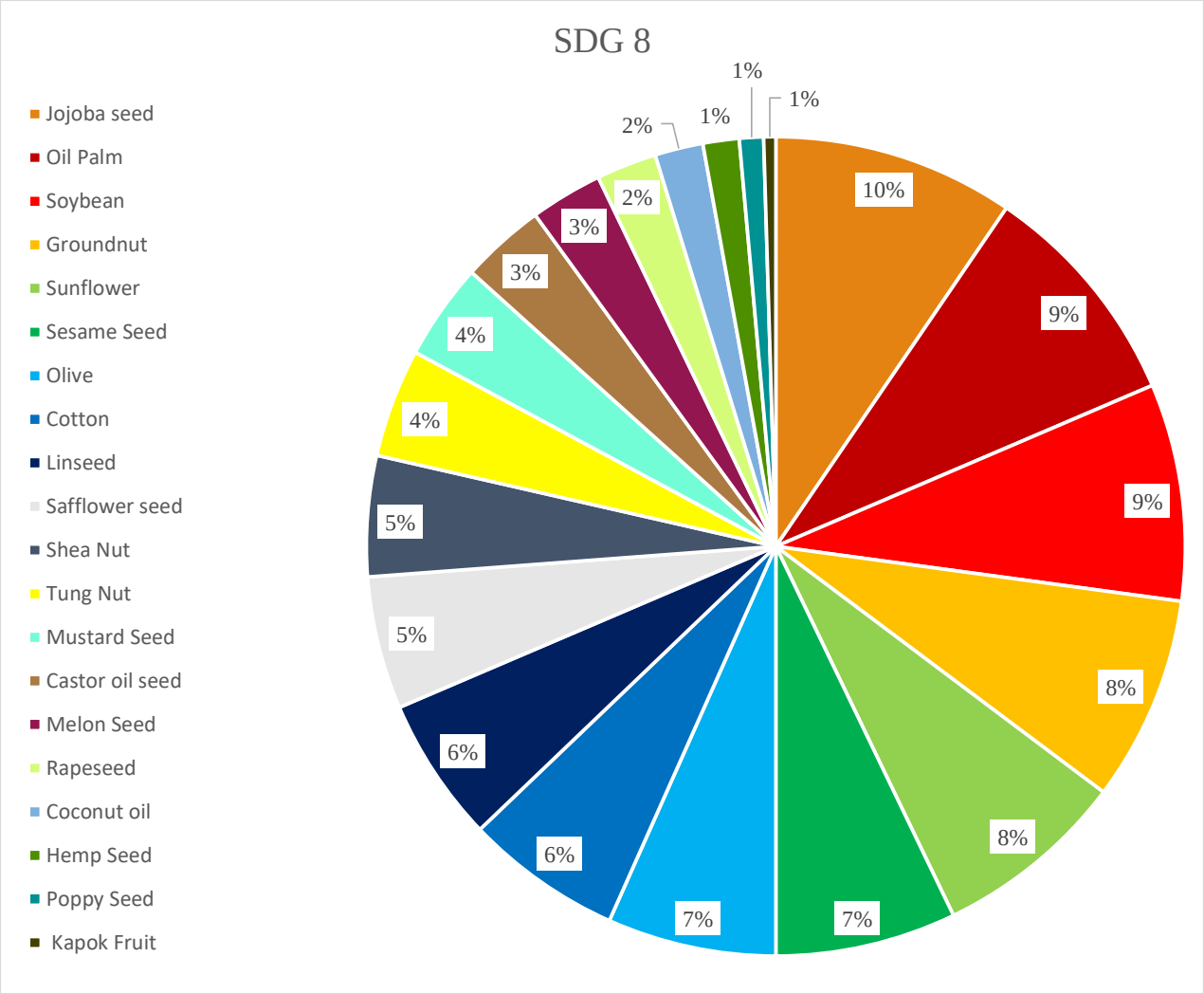
SDG 8
Jojoba seed
Oil Palm
Soybean
Groundnut
Sunflower
Sesame Seed
Olive
Cotton
Linseed
Safflower seed
Shea Nut
Tung Nut
Mustard Seed
Castor oil seed
Melon Seed
Rapeseed
Coconut oil
Hemp Seed
Poppy Seed
Kapok Fruit
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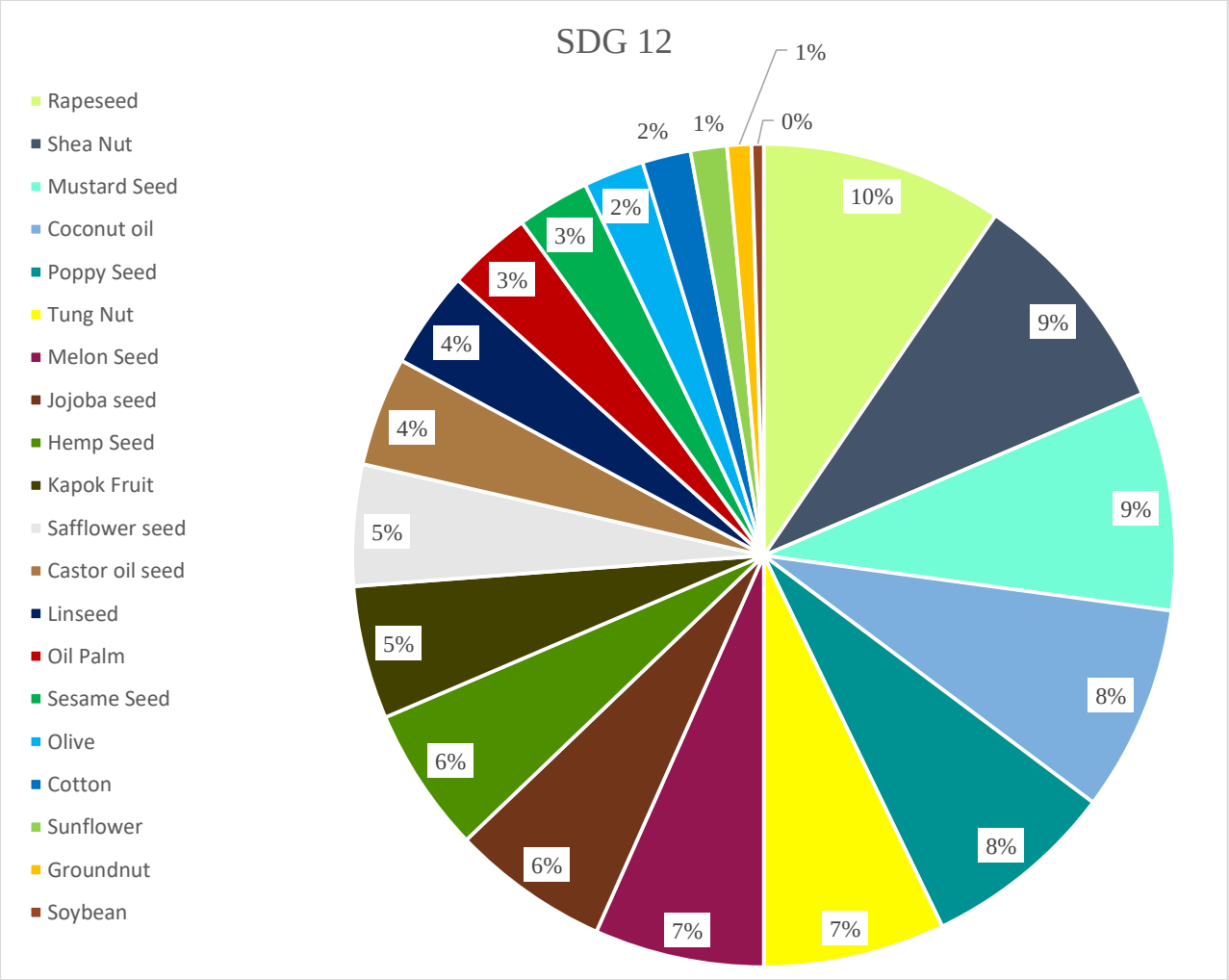
SDG 12
Rapeseed
Shea Nut
Mustard Seed
Coconut oil
Poppy Seed
Tung Nut
Melon Seed
Jojoba seed
Hemp Seed
Kapok Fruit
Safflower seed
Castor oil seed
Linseed
Oil Palm
Sesame Seed
Olive
Cotton
Sunflower
Groundnut
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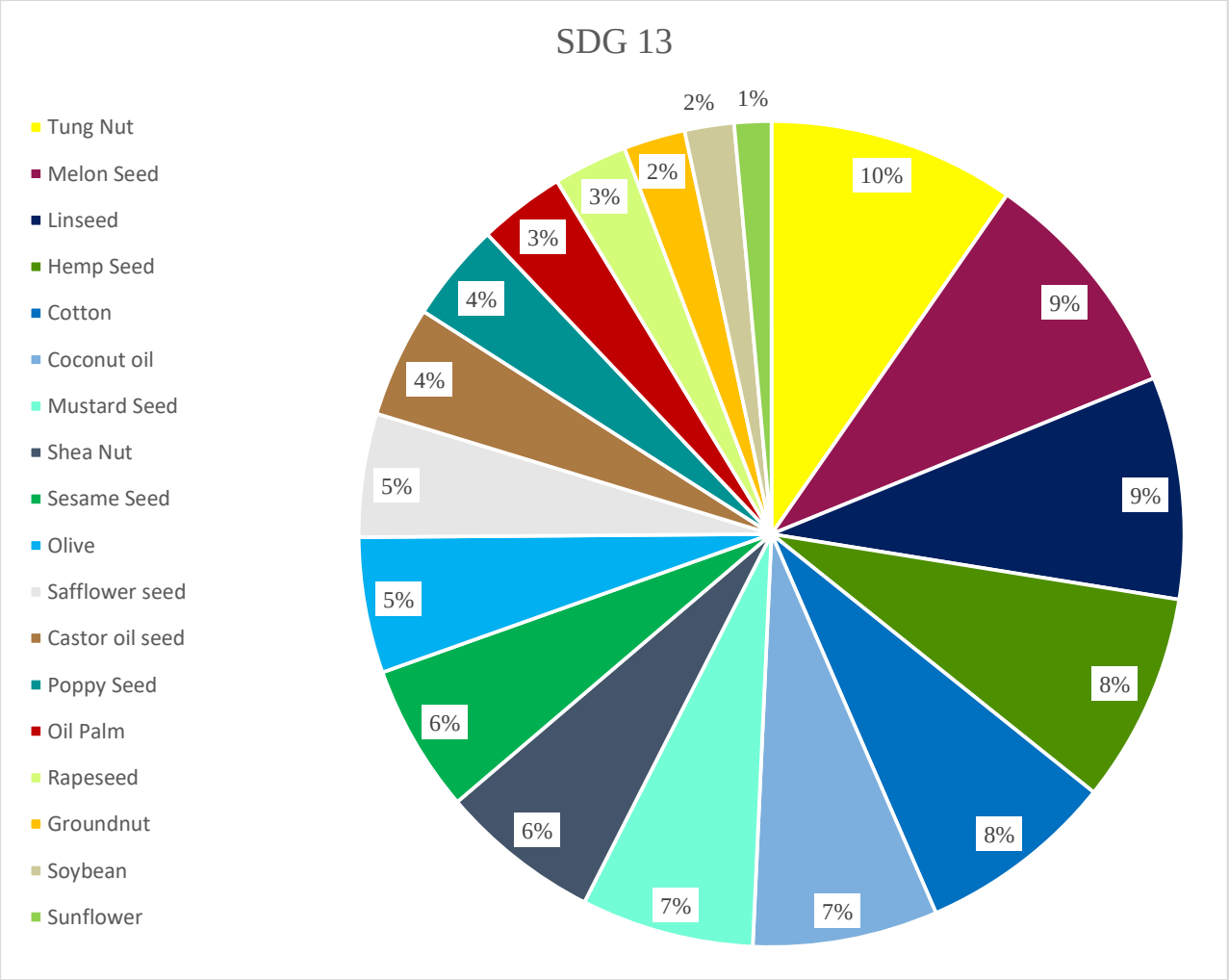
SDG 13
Tung Nut
Melon Seed
Linseed
Hemp Seed
Cotton
Coconut oil
Mustard Seed
Shea Nut
Sesame Seed
Olive
Safflower seed
Castor oil seed
Poppy Seed
Oil Palm
Rapeseed
Groundnut
Soybean
Sunflower
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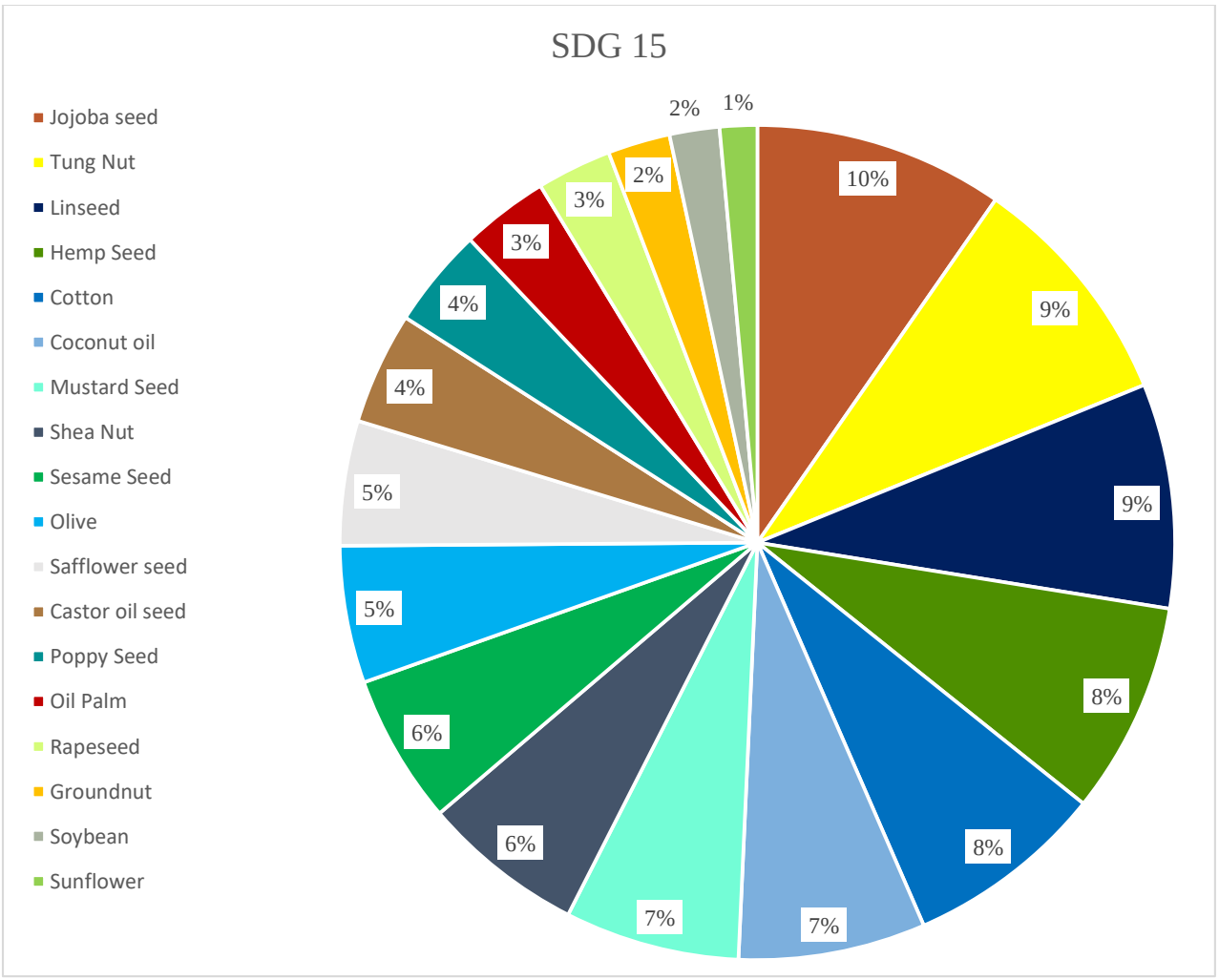
SDG 15
Jojoba seed
Tung Nut
Linseed
Hemp Seed
Cotton
Coconut oil
Mustard Seed
Shea Nut
Sesame Seed
Olive
Safflower seed
Castor oil seed
Poppy Seed
Oil Palm
Rapeseed
Groundnut
Soybean
Sunflower
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INTRODUCTION

The goal of this research is to assess the environmental, economic, and social impacts of vegetable oils. Due to perceived concerns about negative impacts on biodiversity loss, greenhouse gas (GHG) emissions, pollution, and land conversion, the rapid expansion of the vegetable oils sector has been scrutinized in recent years. The purpose of this research is to review the cultivation and processing of vegetable oils and their impacts on environment, economy, and society.

The Sustainable Development Goals (SDGs) encompass all pillars of sustainable development (social, economic, and environmental). Since its adoption in 2015, policymakers and decision-makers have battled to find the optimal path to these objectives. 244 indicators were created and adopted to measure the 17 SDGs in order to determine how well they were met.

Vegetable oils play a significant role in accomplishing these SDGs, while the exact contribution of vegetable oils to the SDGs is mostly unknown. A matrix has been devised to better comprehend this contribution, as well as to assess policy and decision-makers' ability to estimate the impact of vegetable oils. The matrix includes the three pillars of sustainable development (social, economic, and environmental) as well as ten SDGs that are influenced directly or indirectly by the vegetable oils sector [1].

This report provides a comparison between the total contribution of vegetable oils toward SDGs. The analysis is based on selected indicators. The selected indicators covered the three pillars of sustainable development, i.e., economic, environmental, and social. In addition, the following SDGs was covered in the analysis:

- **SDG 1: No Poverty**- End of poverty in all forms.
- **SDG 2: Zero Hunger**- End hunger, improve food security and nutrition, and encourage sustainable agriculture.
- **SDG 3: Good Health and Well-being**- Ensure that all people of all ages have healthy lives and are well-adjusted.
- **SDG 6: Clean Water and Sanitation**- Ensure universal access to water and sanitation, as well as long-term management.
- **SDG 7: Affordable and Clean Energy**- Ensure that everyone has access to energy that is affordable, reliable, sustainable, and modern.
- **SDG 8: Decent Work and Economic Growth**- Encourage long-term, inclusive, and sustainable economic growth, as well as full and productive employment and decent working conditions for everybody.
- **SDG 12: Responsible Consumption and Production**- Ensure that consumption and production trends are long-term.
- **SDG 13: Climate Action**- Take urgent action to combat climate change and its impacts.
- **SDG 15: Life on land**- Ensure that the living being are safe and sound.

Key Reimbursements of vegetable oils include:

Provide for the growing demand for non-renewable petroleum resources.

Health benefits: Vegetable oils are a significant part of the human diet, with soybean, palm oil, rapeseed, and sunflower oil being the most widely produced edible vegetable oils. They include edible fatty acids (saturated, monounsaturated, or polyunsaturated), which play an important role in cellular metabolism by storing and releasing energy.

- Boost immune system
- Help improve metabolism
- Promote cell growth
- Improve digestion
- Rich in nutrition
- Naturally trans-fat free

Use in soaps and perfume compositions (industrial/commercial applications): There is a tremendous need to research and develop novel sources of fatty acids that fulfil both nutritional and industrial needs, given the depletion of natural resources and the harmful impact on the environment.

In January and February 2020, the vegetable oil sector was characterized by a slowdown in demand growth in China and India due to lower out-of-home consumption. This has been affected by COVID-19 pandemic in China, and to high local costs in India. Other considerations include some countries improving their crushing capacity, resulting in an increase in seed imports at the expense of purchases of oil and meal. As a result, exports from major suppliers of vegetable oil, such as Indonesia and Malaysia, grew at a slower pace than expected, resulting in lower prices. As a result of these causes, Indonesia increased biodiesel mandates, which increased local demand for palm oil. Malaysia's domestic market was balanced by a modest decrease in palm oil production.

Oilseed production is expected to expand by 1.2 percent annually over the next decade, signifying slower growth than the previous ten years. This is partly due to lower demand for rapeseed oil as a biodiesel source in Europe. Soybean and other oilseed meal (cake) and oil production will continue to dominate demand and grow faster than other applications, such as direct consumption of soybeans, groundnut, and sunflower seeds for food and feed. Figure 1 shows the demand growth of some selected vegetable oils. As it can noticed that the demand increased in all the selected vegetable oils.

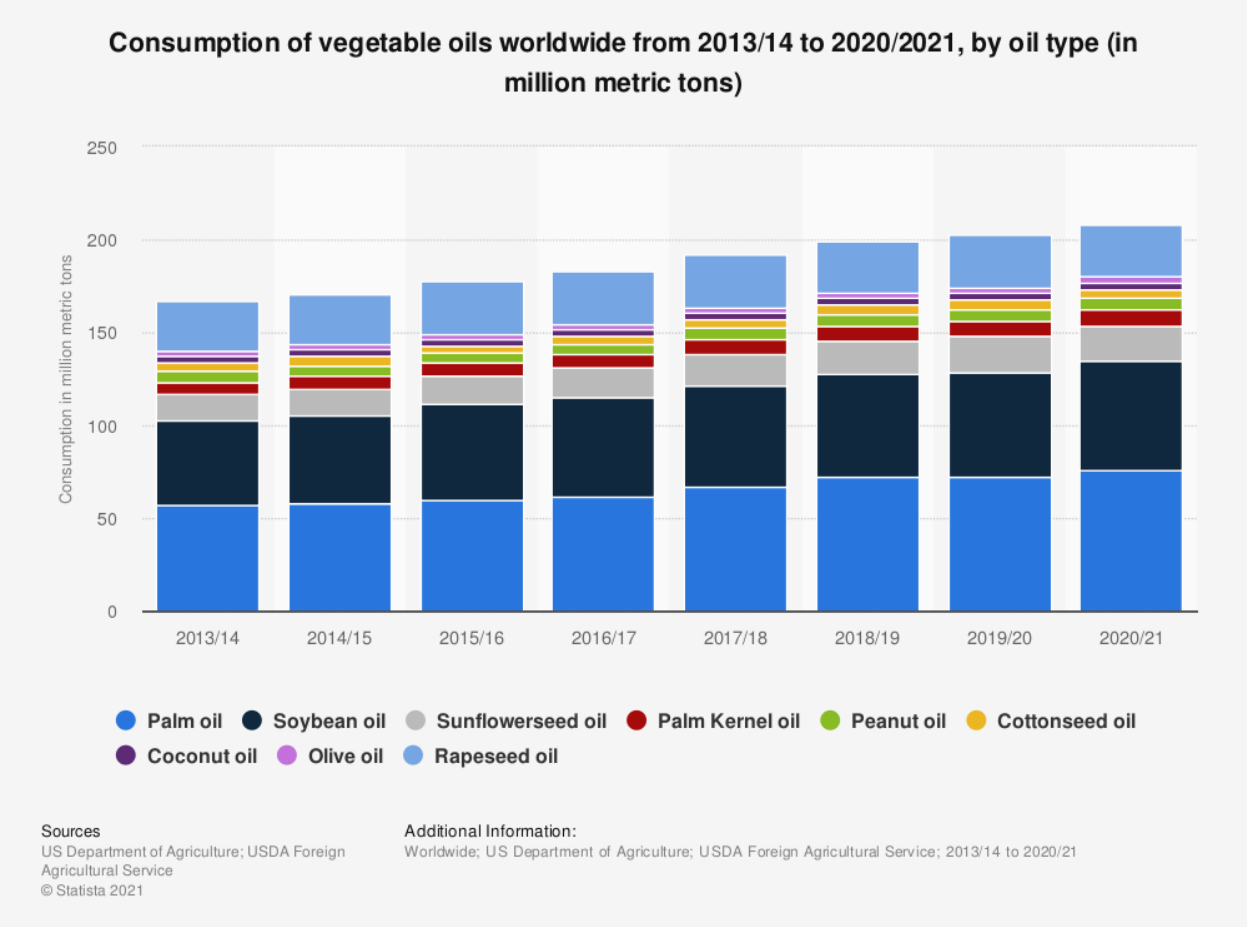


Figure 1: Consumption of vegetable oils worldwide from 2013/2014 to 2020/2021, by oil type (in million metric tons)

PROPOSED INDICATORS

The following section presents the selected indicators chosen to assess the impact of the vegetable oils into the Sustainable Development Goals (SDGs).

NUTRIENT'S PROVIDENCE AND REDUCING HUNGER, FOOD SUPPLY.

Indicator	SDGs	Sustainability Dimensions	Measurements
Nutrient's providence and reducing hunger	Goal 2: Zero Hunger, Goal 3: Good Health and Well-being	Social	Food supply (kcal/capita/day)

This indicator shows the total amount of kilocalories provided to a person daily by vegetable oil. The SDGs that are covered in this particular indicator are Goal 2 (zero hunger) and Goal 3 (good health and well-being) as these deal with the food supply that impact the hunger ratio and good health and well-being of people all around the globe.

NUTRIENT'S PROVIDENCE AND REDUCING HUNGER, PROTEIN SUPPLY QUANTITY.

Indicator	SDGs	Sustainability Dimensions	Measurements
Nutrient's providence and reducing hunger	Goal 2: Zero Hunger, Goal 3: Good Health and Well-being	Social	Protein supply quantity (g/capita/day)

For each oil, this indicator provides the total protein in g delivered for each individual daily. This indicator covers two SDGs, namely Goal 2 (zero hunger) and Goal 3 (good health and well-being) of the people by measuring the protein supply quantity.

FOOD WASTE.

Indicator	SDGs	Sustainability Dimensions	Measurements
Food waste	GOAL 12: Responsible Consumption and Production	Environmental, Economic	Total losses in tonnes

This indicator depicts the total residuals generated with the use of various oils and covers the Goal 12 (responsible consumption and production).

VALUE OF AGRICULTURAL PRODUCTION, CURRENT MILLION SLC.

Indicator	SDGs	Sustainability Dimensions	Measurements
Value of agricultural production	GOAL 1: No Poverty, GOAL 8: Decent Work and Economic Growth	Social, Economic	Gross production Value (current million SLC)

The value of gross production has been compiled by multiplying gross production in physical terms by output prices at the farm gate. Thus, the value of production measures production in monetary terms at the farm gate level. In this indicator, Goal 1 (no poverty) and Goal 8 (decent work and economic growth) are covered.

VALUE OF AGRICULTURAL PRODUCTION, CURRENT MILLION US$.

Indicator	SDGs	Sustainability Dimensions	Measurements
Value of agricultural production	GOAL 1: No Poverty, GOAL 8: Decent Work and Economic Growth	Social, Economic	Gross production Value (current million US$)

Gross production value was calculated by multiplying gross production in physical terms by farm gate output prices. The USD was used as a reference in this indicator.

WATER USE EFFICIENCY, LITRES OF FRESHWATER PER KG.

Indicator	SDGs	Sustainability Dimensions	Measurements
Water use efficiency	GOAL 6: Clean Water and Sanitation	Environmental	Litres of freshwater per kg

Freshwater withdrawals per kg of oil on a global scale. This is measured in litres of freshwater per kg of food products. Goal 6 (clean water and sanitation) is covered in this indicator.

WATER USE EFFICIENCY, GLOBAL AVERAGE WATER FOOTPRINT.

Indicator	SDGs	Sustainability Dimensions	Measurements
Water footprint	GOAL 6: Clean Water and Sanitation	Environmental	Global average water footprint (m^3 ton−1)

This indicator covers the clean water and sanitation Goal 6 (clean water and sanitation) and measured the water footprint of the different oil.

LAND USE EFFICIENCY, LAND USE PER KG.

Indicator	SDGs	Sustainability Dimensions	Measurements
Land use efficiency	GOAL 12: Responsible Consumption and Production, GOAL 15: Life on Land	Environmental, Economic	Land use per kg

This indicator covers Goal 12 (responsible consumption and production) and global mean land used to produce one kg of different oil (m^2 per kg).

LAND USE EFFICIENCY, GREENHOUSE GAS EMISSIONS PER KG.

Indicator	SDGs	Sustainability Dimensions	Measurements
Land use efficiency	GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action, GOAL 15: Life on Land	Environmental, Economic	Greenhouse gas emissions per kg

This indicator covers Goal 15 (life on land) and Goal 12 (responsible consumption and production) of the SDGs as it measures the greenhouse gas emissions per kg.

CONTRIBUTION TO GDP.

Indicator	SDGs	Sustainability Dimensions	Measurements
No poverty	GOAL 1: No Poverty	Social, Economic	Contribution to GDP (%)

Gross Domestic Product (GDP) is a monetary measure of the monetary value of finished goods and services. Those purchased by the final user in a given period produced in an economic territory country. This indicator covers the poverty conditions or Goal 1 (no poverty).

SUPPLY CHAIN CERTIFICATION.

Indicator	SDGs	Sustainability Dimensions	Measurements
Supply chain certification	GOAL 12: Responsible Consumption and Production	Environmental, Economic, social	Multicriteria measurements

Supply chain certification indicator covers Goal 12 (responsible consumption and production) and measures the multicriteria measurements. Companies will be able to use certification and other sustainability activities much more effectively. However, due to the limitation this measurement, it was not included in this report.

CONTRIBUTION OF COMMODITY TO ECONOMY.

Indicator	SDGs	Sustainability Dimensions	Measurements
Contribution of the commodity to the economy	GOAL 1: No Poverty,, GOAL 8: Decent Work and Economic Growth	Social, Economic	Contribution of the commodity to the economy, in US$

This indicator contributes to the commodity to economy and covers Goal 1 (no poverty) and Goal 8 (decent work and economic growth).

JOBS CREATION.

Indicator	SDGs	Sustainability Dimensions	Measurements
Jobs creation	GOAL 1: No Poverty, GOAL 8: Decent Work and Economic Growth	Social, Economic	Total number of jobs created

This indicator measures the total number of jobs creation by following the SDGs, namely Goal 1 (no poverty) and Goal 8 (decent work and economic growth).

SMALLHOLDER SUPPORTING.

Indicator	SDGs	Sustainability Dimensions	Measurements
Smallholder supporting	GOAL 1: No Poverty, GOAL 8: Decent Work and Economic Growth	Social, Economic	Total number of smallholder farmers

This indicator measures the number of smallholders of farmers and their role to eradicate poverty (Goal 1) and improvement in the decency of work and economic growth (Goal 8).

CONTRIBUTION TO ECONOMIC.

Indicator	SDGs	Sustainability Dimensions	Measurements
No Poverty	GOAL 1: No Poverty and, GOAL 8: Decent Work and Economic Growth	Social, Economic	Contribution to Economic

This indicator measures the economic contributions by means of improvement in poverty ratio (Goal 1) and decency of work and economic growth (Goal 8).

PRODUCTION OIL YIELD AS BIODIESEL FEEDSTOCK.

Indicator	SDGs	Sustainability Dimensions	Measurements
Production oil yield as biodiesel feedstock.	GOAL 7: Affordable and Clean Energy, GOAL 12: Responsible Consumption and Production, GOAL 15: Life on Land	Social. Economic	Productivity (litre/ha),

This indicator measures the Oil Yield Productivity in order to achieve the Goal 7, Goal 12 and Goal 15, which are affordable and clean energy; and responsible consumption and production; as well as life on land, respectively.

SATURATED FATTY ACIDS

Indicator	SDGs	Sustainability Dimensions	Measurements
Nutrient's providence and reducing hunger	GOAL 2: Zero Hunger	Social	Saturated fatty acids per 100g

This indicator measures the Saturation of Fatty acids per 100g in order to meet the hunger demand to achieve Goal 2 (zero hunger) in the SDGs.

POLYUNSATURATED FATTY ACIDS.

Indicator	SDGs	Sustainability Dimensions	Measurements
Nutrient's providence and reducing hunger	GOAL 2: Zero Hunger	Social	Polyunsaturated fatty acids per 100g

This indicator measures the Poly-saturation of Fatty acids per 100g to meet the Goal 2 (zero hunger) of the SDGs.

MONOUNSATURATED FATTY.

Indicator	SDGs	Sustainability Dimensions	Measurements
Nutrient's providence and reducing hunger	GOAL 2: Zero Hunger	Social	Monounsaturated fatty acids per 100g

This indicator measures the Mono-saturation of Fatty acids in 100g to improve the hunger ratio and meet Goal 2 (zero hunger) in the SDGs.

GENDER EQUALITY.

Indicator	SDGs	Sustainability Dimensions	Measurements
Gender Equality	GOAL 5: Gender Equality	Social	Gender Equality

This indicator measured how much the purposed research is benefited to achieve the Goal 5 (gender equality). However, based on the comprehensive review we couldn't find related data. On the other words, there was data gap in the gender equality vegetable oils industry.

PESTICIDE USE

Indicator	SDGs	Sustainability Dimensions	Measurements
Pesticide Use	GOAL 15: Life on Land	Social	Life on Land

This indicator is used to measure the impacts of Pesticides used in purposed research on the life or living creation on land to achieve the Goal 15 (life on Land) in the SDGs.

FERTILIZER USE

Indicator	SDGs	Sustainability Dimensions	Measurements
Fertilizer Use	GOAL 15: Life on Land	Social	Life on Land

This indicator is used to measure the impacts of Fertilizers that are used in purposed research on the living beings on land to achieve the Goal 15 (life on Land).

PARTNERSHIP.

Indicator	SDGs	Sustainability Dimensions	Measurements
Partnership	GOAL 17: Partnerships to achieve the Goal	Social	Partnerships to achieve the Goal

This indicator measures the Role of Governments and other departments in order to achieve all the SDGs. However, similar to the gender equality, the data were very limited therefore these indicators were excluded.

ROLE OF VEGETABLE OILS IN SDGs

CASTOR OIL

Saturated fats/fatty acids (SDG 2)

The castor seed oil provides about 2.0 g of saturated fats per 100 g of product, which is lower to other vegetable oils in its category but still can be cultivated and utilized to earn the livings and improve the hunger ratio in the globe.

Polyunsaturated fats/fatty acids (SDG 2)

The castor seed oil provides about 9.0 g of polyunsaturated fats per 100 g of product, which is lower to many other vegetable oils in its category but is higher than some vegetable oil crops. The castor seed oil still can be cultivated and utilized to earn the livings and improve the hunger ratio in the globe.

Land use (SDG 12 AND SDG 15)

In terms of sustainable development, the less land used to create a kg product, the better for the environment overall. Castor seed oil production is one of the few global lands uses that has grown in importance through time, as opposed to the bulk of important agricultural crops, which have stayed surprisingly steady in terms of output acreage. Castor seed oil has a global land use of 3.75 m^2 per kg.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Greenhouse gas emissions for castor seed oil is around 3.2 greenhouse gas emissions per kg product globally, with rapeseed (3.77 greenhouse gas emissions per kg), soy (6.32 greenhouse gas emissions per kg), and palm oil trailing far behind. As a result, castor seed oil contributes to responsible consumption and production goals, as well as guaranteeing a long-term existence on the planet.

Productivity (SDG 7; SDG 12 AND SDG 15)

In comparison to other selected vegetable oils, castor seed oil has the fourth greatest productivity in converting to biodiesel, whereas shea nut has the lowest productivity. Castor seed oil yields 1,413.00 litre per hectare globally, implying that it contributes significantly to the achievement of SDG targets relating to clean and affordable energy, responsible consumption, and production, and guaranteeing a sustainable existence on land.

Water footprint (SDG 6)

Castor seed oil production has the highest water impact. Notably, the blue water footprint is higher. Because caster seed oil uses a lot of water, it's one of the most water-intensive products. Castor seed oil has the highest global average water footprint at 24,740 m^3 per tonne of product.

Pesticides (SDG 15)

Castor seeds are among those vegetable seeds that are very resistant to pests and hence do not require insecticides or pesticides to protect them from attack; nonetheless, herbicides are required for weed management.

Fertilizer (SDG 15)

Fertilizers and insecticides account up 55.36 percent of the caster seeds' consumable energy. Nitrogen fertilizer accounts for 41.88 percent of this total. This increases the use of chemical fertilizers, which can be damaging to the environment. Organic resources, such as compost, can, however, be utilized to ensure sustainability.

Food supply (SDG 2 AND SDG 3)

Throughout the world, caster seed is a good and rich source of energy. Castor seed oil gives 12.0 Kcal per capita per day. This ensures that it makes a significant contribution to ending poverty and improving health and well-being.

MUSTARD SEED

Saturated fats/fatty acids (SDG 2)

The mustard seed oil has around 11.58 g of saturated fats per 100 g of product, which is not the lowest or highest among the other vegetable oils in its category, but it may still be cultivated and used to earn a living and reduce global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

The mustard seed oil contains about 21.23 polyunsaturated fats per 100 g of product, which is moderate compared to other vegetable oils in its category. It can still be cultivated and used to provide nutrition to people while also allowing farmers to earn a living, which can play an important role in reducing the global hunger ratio.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Greenhouse gases are the primary source of climate and atmospheric disturbances. Mustard seed oil has the low worldwide greenhouse gas emissions per kg of product which is 2.9 globally, with rapeseed (3.77), castor seed (3.2), soy (6.32), and palm oil lagging far behind. As a result,

mustard seed oil helps to achieve responsible consumption and production goals while also ensuring the planet's long-term survival.

Contribution to GDP (SDG 1)

The production of mustard seed oil adds a considerable 21.8 per cent to Canada's GDP, demonstrating the importance of these oils in assisting the economy of these countries and playing a part in reducing poverty and ensuring good work and economic prosperity for the people of these countries.

Productivity (SDG 7; SDG 12 AND SDG 15).

According to the investigation, mustard seed oil has a low productivity in converting to biodiesel when compared to other selected vegetable oils, with soy having the lowest productivity. Globally, mustard seed oil yields 572.0 litre/ha, implying that mustard seed oil contributes slightly to the achievement of SDG targets relating to clean and affordable energy, responsible consumption, and production, and guaranteeing a sustainable life on land.

Water footprint (SDG 6)

Mustard seed production has a low water impact. The blue water footprint is really little. Because mustard seed uses very little water, this is a good thing for the environment. Mustard seed has the lowest worldwide average water footprint at 2809 m^3 per tonne of product. Which means it requires low water to cultivate as compared to some other vegetable oils that have higher water footprint.

Pesticides (SDG 15)

In farming, a major challenge to agriculture is the attack of insects, which can injure the fields and lower overall productivity, and mustard seed is vulnerable to insect pests such as mustard aphids. In order to avoid this, mustard seed requires insecticide for protection.

Fertilizer (SDG 15)

Fertilizers are applied to farms in order to improve their productivity. Mustard seed cultivation responds well to nitrogen fertilizer, with output increases of 30% or more. To avoid stunted growth, phosphorus fertilizer is also necessary. These fertilizers boost overall yield while also enhancing quality and growth.

Food supply (SDG 2 AND SDG 3)

Mustard seed oil can be used as a source of energy all over the world, but it has a limited food supply. Mustard seed oil provides 0.88 kilocalories per person per day. This assures that it contributes only a small amount to alleviating poverty and increasing health and well-being.

Saturated fats/fatty acids (SDG 2)

Coconut oil offers roughly 82.50 g of saturated fats per 100 g of product, which is the greatest saturated fats per 100 g provider among the other vegetable oils in its category. It can be widely cultivated, and farmers can utilize it to earn large sums of money while also helping to alleviate global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, coconut oil has the lowest polyunsaturated fats (1.70 per 100 g of product). It can still be grown and utilized to offer nutrition to people while also allowing farmers to earn a livelihood, which can help to reduce the global hunger rate.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Climate and atmospheric disturbances are mostly caused by greenhouse gases. Coconut oil emits the least amount of CO_2 equivalent per kg product, with a global average of 0.41. Coconut oil is one of the best sources to reduce air pollution because it emits the least amount of greenhouse gases. As a result, coconut oil helps to achieve responsible consumption and production goals while also ensuring the planet's long-term survival.

Contribution to GDP (SDG 1)

The Philippines' GDP is increased by 9.3% as a result of coconut oil production, illustrating the importance of these oils in boosting the economies of these countries and helping to reduce poverty and ensure excellent jobs and economic success for the people of these countries.

Productivity (SDG 7; SDG 12 AND SDG 15)

When compared to other selected vegetable oils, coconut oil has one of the best productivities in converting to biodiesel, with soy having the lowest productivity, according to our study and to [2-14]. Coconut oil yields 2,689.00 litre per hectare globally, meaning that coconut oil plays a significant role in meeting SDG targets for clean and affordable energy, responsible consumption and production, and ensuring a sustainable existence on land.

Water footprint (SDG 6)

Coconut farming has a low water footprint. The impact of blue water is mild. Coconut oil is healthy for the environment because it utilizes moderate amount of water. The global average water footprint (m^3 ton-1) of coconut oil is 4,490. As a result, it requires less water to grow than some other vegetable oils, which have a higher water footprint.

Pesticides (SDG 15)

Coconuts are one of the few vegetable seeds that are pest-resistant and hence do not require insecticides or pesticides to protect them because of their natural shell's high level of protection. Pesticides are not required for growing coconuts.

Fertilizer (SDG 15)

Fertilizers are used on farms in order to increase productivity. Monoculture farming works well with coconut growing. Coconuts are grown in monocultures, which degrades soil quality and may necessitate the use of chemical fertilizers. These fertilizers increase total yield, while also improving the quality and growth of the plants.

Food supply (SDG 2 AND SDG 3)

Coconut oil can be utilized as an energy source anywhere on the planet; however, it has a limited food supply. 5.00 kilocalories per person per day are provided by coconut oil. This ensures that it makes a modest contribution to poverty reduction and improved health and well-being.

OIL PALM

Saturated fats/fatty acids (SDG 2)

Palm oil has approximately 49.30 g of saturated fats per 100 g of product, making it a good source of saturated fats per 100 g among the other vegetable oils in its category. It can be widely grown, and farmers may use it to earn their livelihood, while simultaneously helping to reduce world hunger.

Polyunsaturated fats/fatty acids (SDG 2)

Palm oil has an average polyunsaturated fat content (9.30 per 100 g of product) when compared to other vegetable oils in its category. It can still be farmed and used to provide nutrition to people while also providing a source of income for farmers, thereby helping to decrease global hunger.

Land use (SDG 12 AND SDG 15)

In terms of environmental sustainability, the less land required to produce a kg of product, the better. Palm oil production is one of the few global lands uses that has increased in importance through time, in contrast to the vast majority of key agricultural crops, which have remained remarkably stable in terms of output acreage. The global land use for palm oil is 2.42 m^2 per kg.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Palm oil produces roughly 7.32 kg of CO_2 equivalent per kg product globally, which is greater than some other vegetable oils, but still far less than the use of other non-renewable resources. As a result, palm oil helps to achieve ethical consumption and production goals, while also ensuring the planet's long-term survival.

Contribution to GDP (SDG 1)

As a result of Palm oil production, Indonesia's GDP climbed by 3.5 percent, demonstrating the value of these oils in strengthening economies, reducing poverty, and ensuring fantastic jobs and economic prosperity for the people of these countries.

Total number of Jobs created (SDG 1 AND SDG 8)

While statistics on job creation is sparse, it has been interpreted as proof that palm oil is responsible for the creation of a huge number of jobs. With 750,000 employments generated in Indonesia and 721,000 jobs created in Malaysia, it is apparent that palm oil has played a key role in job creation and, as a result, general economic growth.

Total number of smallholder farmers (SDG 1 AND SDG 8)

Data on smallholder farmers whose livelihoods are supported by the production of various types of oils demonstrates this. However, based on the facts we have, it is clear that palm oil benefits smallholder farmers in Indonesia and Malaysia tremendously. It provides support to 2,600,000 smallholder farmers in Indonesia.

Productivity (SDG 7; SDG 12 AND SDG 15).

According to our study and to [2-14], when compared to other vegetable oils, palm oil has the highest productivity in converting to biodiesel, while soy has the lowest productivity. Palm oil contributes significantly to reaching SDG targets for clean and affordable energy, responsible use and production, and guaranteeing a sustainable existence on land, since palm oil yields 4,736.00 litre per hectare globally.

Water footprint (SDG 6)

Oil palm cultivation has a low water footprint. The blue water footprint is really little. This is good news for the environment, as palm oil uses the least amount of water of any crop. Palm oil has high global average water footprint at 4,971 m^3 per tonne.

Pesticides (SDG 15)

Insect attacks are a big issue to agriculture, as they can harm the fields and reduce total output, and pesticides are necessary for high yields in palm cultivation. However, improper application and management of the pesticide can cause serious health and environmental problems.

Fertilizer (SDG 15)

Fertilizers are applied to crops to boost productivity. These fertilizers are used in palm production to boost total output while also improving plant quality and growth. Fertilizers are essential in order to achieve higher yields. Environmental damage can be minimized with careful practice.

Food supply (SDG 2 AND SDG 3)

Palm oil can be used as a source of energy in every part of the world. It also has one of the largest food supplies. Palm oil provides 61.00 kilocalories per person per day. As a result, it contributes a good amount to poverty reduction and increased health and well-being.

COTTON SEED

Saturated fats/fatty acids (SDG 2)

Cotton Seed offers about 25.90 g of saturated fats per 100 g of product, making it a good supply of saturated fats per 100 g when compared to other vegetable oils in its category. It can be widely farmed, allowing farmers to earn a lot of money while also helping to alleviate world hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, cotton oil has a high polyunsaturated fat content (51.90 per 100 g of product). It can still be produced and utilized to feed people while also providing a source of income for farmers, so contributing to the reduction of global hunger.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Cotton seed oil emits around 1.80 kg of CO_2 equivalent per kg product globally, which is higher than certain other vegetable oils but still lower than the use of other non-renewable resources. Cotton seed oil, as a result, contributes to ethical consumption and production goals while also ensuring the planet's long-term survival.

Productivity (SDG 7; SDG 12 AND SDG 15).

Cotton seed oil has the poor productivity in converting to biodiesel when compared to other vegetable oils, according to our study and to [2-14]. Cotton seed oil yields 325.00 litre per hectare globally, which contributes little to meeting SDG targets for clean and affordable energy, responsible use and production, and ensuring a sustainable living on land.

Water footprint (SDG 6)

Cotton seed oil production uses high water amount. Cotton seed oil consumes consider of vegetable oil in term of water usage which is bad news for the environment.

Pesticides (SDG 15)

Pesticides are required for high yields in cotton seed production, and insect attacks are a major issue for agriculture because they can injure the crops and diminish total output. However, hazardous pesticides are used in the production of non-organic cotton seeds, which can harm soil and animals.

Fertilizer (SDG 15)

Fertilizers are used to increase the production of crops. In cotton seed production, these fertilizers are utilized to increase total yield while also enhancing plant quality and growth. Fertilizers are necessary for larger yields, which is why cotton requires a lot of nitrogenous fertilizers as well as phosphorus and potassium doses.

Food supply (SDG 2 AND SDG 3)

Cotton seed oil is a renewable energy source that may be used anywhere in the world. It also possesses one of the largest food reserves in the world. Cotton seed oil has a calorie content of 13.00 per person per day. As a result, it makes a minor contribution to poverty reduction and improved health and well-being.

OLIVE

Saturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, olives provide roughly 13.81 g of saturated fats per 100 g of product, making it a good source of saturated fats per 100 g. It can be widely farmed, allowing farmers to make a lot of money while simultaneously contributing to world starvation relief.

Polyunsaturated fats/fatty acids (SDG 2)

Olives have an average polyunsaturated fat content (10.52 g per 100 g of product) when compared to other vegetable oils in their category. It can still be grown and used to feed people while also providing farmers with a source of income, contributing to the elimination of global hunger.

Land use (SDG 12 AND SDG 15)

The less land required to produce a kg of goods, the better for environmental sustainability. In contrast to the vast majority of essential agricultural crops, which have stayed surprisingly steady in terms of output acreage, Olive's production is one of the few global lands uses that has grown in importance over time. Olive oil has a global land use per kg (m^2 per kg) of 2.60.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Olives emit around 5.40 kg of CO_2 equivalent per kg product globally, which is greater than certain other vegetable oils but still lower than the usage of non-renewable resources and some vegetable oils. As a result, olives help to achieve ethical consumption and production goals, while also protecting the long-term sustainability of the planet.

Productivity (SDG 7; SDG 12 AND SDG 15).

According to our study and to [2-14], olives have an average productivity in converting to biodiesel when compared to other vegetable oils. The global output of olives is 1,212.00 litre per hectare, which helps to meet SDG targets for clean and affordable energy, responsible use and production, and providing a sustainable life on land.

Water footprint (SDG 6)

Olive farming is the most water-intensive. The blue water imprint is noticeably larger. Because olives require a substantial quantity of water to thrive, they are one of the most water-intensive goods. At 14,726 m^3 per tonne, olives have one of the greatest global average water footprints.

Pesticides (SDG 15)

Insect attacks are a major issue for agriculture because they can harm crops and reduce overall output. Pesticides are essential for good yields in palm cultivation, and insect attacks are a major issue for agriculture because they can harm crops and reduce total output. Pests have a high proclivity towards causing damage. As a result, insecticides are employed to reduce damage, which increases olive output but harms the ecosystem. Herbicides are also used to eliminate stray competition for water and nutrients.

Fertilizer (SDG 15)

Fertilizers are used to help crops grow more quickly. These fertilizers are used in palm cultivation to boost total yield while also improving plant quality and growth. As the ground cover for olive plantations is removed. The soil begins to deteriorate, reducing its productive capability and necessitating increased fertilizer use. Organic farmers have a low environmental impact, whereas conventional farmers that use synthetic fertilizers can harm the ecosystem.

Food supply (SDG 2 AND SDG 3)

Olives are a renewable source of energy that may be used everywhere in the planet. It also holds one of the world's largest food reserves. Olives have a daily calorie value of 9.00 calories per person. As a result, it contributes only marginally to poverty reduction and increased health and well-being.

Saturated fats/fatty acids (SDG 2)

Groundnut oil contains roughly 16.90 g of saturated fat per 100 g, which is on par with other vegetable oils in its category. It is strongly suggested to be planted and used to earn a living and reduce global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, Groundnut oil contains roughly 32.00 polyunsaturated fats per 100 g, making it a good supply. It can be grown and utilized to offer nutrition to people, while also allowing farmers to earn a living, which can help to reduce the global hunger rate.

Land use (SDG 12 AND SDG 15)

The less land necessary to produce a kg products, the better for the environment. Groundnut production is among the few global lands uses that has expanded in importance through time, in contrast to the great majority of vital agricultural crops, which have remained relatively stable in terms of output area. The global land use per kg of Groundnut is (9.11 m^2 per kg).

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Groundnut oil emits about 7.54 kg of CO_2 equivalent per kg product globally, which is more than certain other vegetable oils but still less than non-renewable resources and some vegetable oils. As a result, Groundnut oil contributes to ethical consumption and production goals while also ensuring the world's long-term health.

Productivity (SDG 7; SDG 12 AND SDG 15)

When compared to other vegetable oils, Groundnut oil has an average productivity in converting to biodiesel, according to our study and to [2-14]. Groundnut produces 1,059.00 litre per hectare globally, contributing to SDG targets for clean and affordable energy, responsible use and production, and supporting a sustainable life on land.

Water footprint (SDG 6)

One of the high water-intensive crops growing is groundnut growing. The imprint of blue water is substantially greater. Groundnuts are one of the most water-intensive items since they require a large amount of water to thrive. Groundnut have one of the highest global average water footprints, at 7,529 m^3 tonne.

Pesticides (SDG 15)

Insect infestations are a big problem in agriculture since they can destroy crops and diminish total productivity. Pesticides are required for optimal yields in Groundnut cultivation. The tobacco caterpillar, for example, is highly vulnerable to disease and pests. One alternative solution is to use chemical pesticides for protection.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. In Groundnut production, these nutrients are used to increase total yield while also boosting plant quality and growth. Groundnut cultivation necessitates a high potassium and phosphorus content, as well as a variety of micronutrients.

Food supply (SDG 2 AND SDG 3)

Groundnut oil is a renewable energy source that may be used all over the world. It has low food reserves in the world. The daily calorie content of Groundnut oil is 14.00 calories per person. As a result, it makes a negligible contribution to poverty reduction and improved health and well-being.

POPPY SEED

Saturated fats/fatty acids (SDG 2)

Poppy seed oil has an average saturated fat content of 13.50 g per 100 g when compared to other vegetable oils in its category. It is recommended that it be grown and used to earn a living while also helping to alleviate global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

Poppy seed oil has the highest amount of polyunsaturated fats 62.40 per 100 g when compared to other vegetable oils, making it a fantastic source. It can be farmed and used to provide sustenance to people while also helping farmers to earn a livelihood, so contributing to the reduction of global hunger.

Land use (SDG 12 AND SDG 15)

The less land necessary to produce one kg of products, the better for the environment. Poppy seed oil production is one of the few global lands uses that has grown in importance through time, in contrast to the vast majority of vital agricultural crops, which have remained relatively stable in terms of output land. The global land use per kg (m^2 per kg) of poppy seed oil is 8.00.

Productivity (SDG 7; SDG 12 AND SDG 15).

According to our study and to [2-14]Poppy seed oil has an average productivity in converting to biodiesel when compared to other vegetable oils. Poppy seed oil yields 1,163.00 litre per hectare globally, helping to meet SDG targets for clean and affordable energy, ethical use and production, and promoting a sustainable way of life on land.

Water footprint (SDG 6)

Poppy seed production is one of the lowest water-intensive crops. Blue water has a far lower footprint. Poppy seed is one of the lowest water-intensive commodities because it requires a little water to grow. At 2,188 m^3 per tonne, poppy seed has the lowest worldwide average water footprints.

Pesticides (SDG 15)

Insect attacks are a severe problem in agriculture since they can harm crops and reduce total output. Poppy seed farming necessitates the use of pesticides in order to get maximum yields. The most serious hazard to the plant is the poppy stem gall wasp, and insecticides are required to control the losses.

Fertilizer (SDG 15)

Fertilizers are used to accelerate crop growth. These nutrients are utilized in poppy seed production to increase total output while also improving plant quality and growth. In the case of poppy seed, the use of manure, in conjunction with the right application of chemical fertilizers, has been shown to boost production.

Food supply (SDG 2 AND SDG 3)

Poppy seed oil is a sustainable energy source that can be used globally. Poppy seed oil has a daily calorie load of 0.88 calories per person. As a result, it contributes little to poverty reduction and increased health and well-being.

HEMP SEED

Protein supply (SDG 2 AND SDG 3)

Oils, in general, either do not contain protein or have very little of it. Even when they do contribute, it is insignificant. In comparison to other oils, hemp seed oil is the one that contains high protein among most of the vegetable oils. Hemp seed oil offers 31.00 g/capita/day of protein globally, contributing to the Zero Hunger target.

Saturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, hemp seed oil has a lower than the average saturated fat content supply of 4.60 g per 100 g. It may be grown and used to earn a living while simultaneously assisting in the reduction of global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils, hemp seed oil has the largest level of polyunsaturated fats (38.10 per 100 g), making it an excellent source. It may be produced and utilized to provide food for people while also assisting farmers in earning a living, so contributing to the elimination of global hunger.

Productivity (SDG 7; SDG 12 AND SDG 15)

When compared to other vegetable oils, hemp seed oil has a lower productivity in converting to biodiesel, according to our study and to [2-14]. Hemp seed oil yields 363.00 litre per hectare worldwide, assisting in meeting SDG targets for clean and inexpensive energy, ethical use and production, and encouraging a land-based sustainable way of life.

Water footprint (SDG 6)

One of the most water-intensive crops is hemp seed production. Because it requires a lot of water to develop, Hemp seed is one of the most water-intensive commodities. Hemp seed has an average global water footprint of 3,685 m^3 tonne.

Pesticides (SDG 15)

Insect assaults are a major issue in agriculture since they can damage crops and diminish total output. In the case of Hemp seed, herbicides are not required because it can suppress weeds. Pesticides are not required to control pests.

Fertilizer (SDG 15)

Fertilizers are used to help crops grow faster. These nutrients are used in the cultivation of hemp seeds to boost total yield while also improving plant quality and growth. In comparison to other crops, hemp seed requires less fertilizer. NPK fertilizers help the growth process, however the intake is usually completed spontaneously through sources such as animal urine.

Food supply (SDG 2 AND SDG 3)

Hemp seed oil is a renewable energy source that may be used all over the world. It also possesses one of the world's large stocks of food. Hemp seed oil has a calorie load of 10.00 per person per day. As a result, it makes minimal contribution to poverty reduction and improved health and well-being.

Saturated fats/fatty acids (SDG 2)

Rapeseed oil has about 7.37 g of saturated fat per 100 g, which is comparable to other vegetable oils in its class. It is advised that it be cultivated and used to earn a living while also helping to eliminate global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils, rapeseed oil has one of the highest amounts of polyunsaturated fats (28.14 per 100 g), making it an excellent source. It may be produced and utilized to provide food for people while also assisting farmers in earning a living, so contributing to the elimination of global hunger.

Land use (SDG 12 AND SDG 15)

The lower the amount of land required to produce one kg of goods, the better for the environment. In contrast to the great majority of vital agricultural crops, which have stayed relatively steady in terms of output land, rapeseed oil production is one of the few high global lands employing vegetable oil that has grown in importance over time. Rapeseed oil has a global land usage per kg (m^2 per kg) of 10.63.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Rapeseed oil emits around 3.77 kg of CO_2 equivalent per kg product globally, which is more than some other vegetable oils but lower than non-renewable resources and many vegetable oils. As a result, rapeseed oil helps to achieve ethical consumption and production goals while also maintaining global health in the long run.

Contribution to GDP (SDG 1)

Rapeseed oil production adds a significant 0.50 percent to Canada's GDP, indicating that this oil has a little role to play in assisting these countries' economies, eliminating poverty, and guaranteeing decent work and economic progress for their citizens.

Total number of Jobs created (SDG 1 AND SDG 8)

By exploring the statistics on job creation, it has been assumed that rapeseed oil is responsible for the development of a large number of jobs. Rapeseed oil has clearly played a vital part in job development and, as a result, general economic growth in Canada, with 250,000 jobs created.

Productivity (SDG 7; SDG 12 AND SDG 15).

When compared to other vegetable oils, rapeseed oil has an average productivity in converting to biodiesel, according to our study and to [2-14]. Rapeseed oil yields 1,190.00 litre per hectare globally, assisting in the achievement of the SDGs for clean and affordable energy, ethical usage and production, and encouraging a sustainable way of living on land.

Water footprint (SDG 6)

Rapeseed production is one of the low-water-intensive crop types. Because they require little water to thrive, they are better suited to cultivation. Rapeseed has a global average water footprint of 4,301 m^3 on average.

Pesticides (SDG 15)

Insect attacks are a serious problem in agriculture since they can harm crops and reduce overall yield. in the instance of the rapeseed Pesticides are effective against pests, but they must be combined with the use of bees, which are vital for pollination and may perish as a result of chemical misuse.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. When nitrogen fertilizers are combined with damp circumstances, the yield of rapeseed increases. These nutrients are utilized to increase total yield while also enhancing plant quality and growth when growing rapeseeds.

Food supply (SDG 2 AND SDG 3)

Rapeseed oil is a renewable source of energy that may be used anywhere in the world. It also has one of the world's largest food reserves. Rapeseed oil has 13.00 calories per person per day. As a result, it contributes significantly to poverty reduction, as well as increased health and well-being.

SAFFLOWER SEED

Saturated fats/fatty acids (SDG 2)

Safflower Seed oil has a saturated fat content of 7.54 g per 100 g, which is lower than other vegetable oils in its class. It can be grown and used to make a living while also assisting in the fight against global hunger.

Polyunsaturated fats/fatty acids (SDG 2)

Safflower Seed oil has a high level of polyunsaturated fats (12.82 per 100 g) when compared to other vegetable oils, making it a good source. It might be manufactured and used to feed people while also supporting farmers in making a living, so contributing to the end of world hunger.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Globally, safflower seed oil emits about 2.40 kg of CO_2 equivalent per kg product, which is higher than coconut seed but lower than non-renewable resources and all other vegetable oils. As a result, Safflower Seed oil contributes to ethical consumption and production goals while also promoting long-term global health.

Productivity (SDG 7; SDG 12 AND SDG 15)

According to our study and to [2-14], Safflower Seed oil converts to biodiesel with an average productivity when compared to other vegetable oils. The global output of safflower seed oil is 779.00 litre per hectare, contributing to the achievement of the SDGs for clean and affordable energy, ethical usage and production, and fostering a sustainable way of life on land.

Water footprint (SDG 6)

One of the moderately water-intensive crop kinds is safflower seed production. They can be cultivated because they require a moderate amount of water to thrive. The average worldwide water footprint of safflower seed is 7,221 m^3.

Pesticides (SDG 15)

Insect assaults are a major issue in agriculture since they can injure crops and diminish total productivity. Seed of safflower (Safflower aphid) can be controlled by sowing patterns, insecticides, and biopesticides. The safflower aphid was killed by a variety of chemical pesticides from the organophosphate family. However, because chemical pesticides have a variety of negative consequences on the environment, botanical pesticides are in high demand. Many bio insecticides have evolved to lessen environmental impact and have demonstrated to be effective against safflower aphids. The use of a bio pesticide can be influenced by the availability of the material, the insecticide's effectiveness, ease of handling, and cost.

Fertilizer (SDG 15)

Fertilizers are used to help crops grow faster. Safflower seed sown in early autumn responds to basic NPK fertilizer, resulting in increased safflower seed output.

Food supply (SDG 2 AND SDG 3)

Safflower seed oil is a renewable energy source that can be used anywhere in the world. The daily calorie load of safflower seed oil is 0.88 calories per person. As a result, it makes little difference in terms of poverty reduction and improved health and well-being.

KAPOK FRUIT

Saturated fats/fatty acids (SDG 2)

Kapok Fruit oil contains approximately 23.00 g of saturated fats per 100 g, giving it a good source of saturated fats per 100 g when compared to other vegetable oils in its category. It can be widely farmed, allowing farmers to make a lot of money while also helping to alleviate world hunger by feeding the animal which ultimately will lead to reduce the hunger.

Productivity (SDG 7; SDG 12 AND SDG 15).

When compared to other vegetable oils, kapok Fruit oil converts to biodiesel with an average productivity, according to our study and to [2-14] kapok Fruit oil produces 450 litre per hectare globally, helping to meet the SDGs for clean and affordable energy, ethical use and production, and promoting a sustainable way of living on land.

Water footprint (SDG 6)

Kapok fruit production is one of the fairly water-intensive crop types. They may be grown because they only need a small bit of water to survive. Kapok Fruit cultivation has a moderate water footprint, consuming 2512,000,000 m^3 of water per year and accounting for 0.04 percent of global water usage.

SESAME SEED

Protein supply (SDG 2 AND SDG 3)

Protein is either absent or present in extremely small amounts in oils. Even when they do contribute, it is minor. Sesame Seed oil is the vegetable oil that has lowest protein when compared to other oils. Sesame seed oil contributes to the Zero Hunger target by providing 0.11 g of protein per capita per day.

Saturated fats/fatty acids (SDG 2)

Sesame Seed oil has a lower saturated fat level than other vegetable oils in its category, at 14.20 g per 100 g. It may be farmed and used to earn a living while also helping to combat world hunger.

Polyunsaturated fats/fatty acids (SDG 2)

Sesame Seed oil has the largest amount of polyunsaturated fats (41.70 per 100 g) when compared to other vegetable oils, making it a good source. It might be manufactured and used to feed people while also supporting farmers in making a living, so contributing to the end of world hunger.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Sesame Seed oil produces around 4.20 kg of CO_2 equivalent per kg product, which is greater than certain vegetable oils but lower than non-renewable resources and many other vegetable oils. As a result, sesame seed oil promotes long-term global health while also contributing to ethical consumption and production goals.

Productivity (SDG 7; SDG 12 AND SDG 15)

According to our study and to [2-14], Sesame Seed oil converts to biodiesel with an average productivity when compared to other vegetable oils. Sesame seed oil yields 696.00 litre per hectare globally, contributing to the SDGs for clean and affordable energy, ethical usage and production, and encouraging a sustainable way of life on land.

Water footprint (SDG 6)

The most water is used in the manufacture of sesame seed oil. The blue water imprint is noticeably larger. Sesame Seed oil is one of the most water-intensive products because it utilizes so much of it. At 21,793 m^3 per tonne, sesame seed oil has the second highest global average water footprint (m^3 tonne).

Pesticides (SDG 15)

If not covered, sesame seeds grow slowly and might be severely damaged. Insect assaults are a major issue in agriculture since they can injure crops and diminish total productivity. Root and stem infections are common in sesame seed. The problem this crop confronts is exacerbated by wild weeds and insect pests. Herbicides and insecticides must be used to keep it safe.

Fertilizer (SDG 15)

To attain maximum output, the Sesame Seed crop requires 60 kg/ha of nitrogen. Fertilizers are used to speed up the growth of crops. Other minerals and fertilizers are dependent on the type of soil, which can differ.

Food supply (SDG 2 AND SDG 3)

Sesame seed oil is a renewable source of energy that may be used anywhere on the planet. Sesame Seed oil has a daily calorie load of 3.00 calories per person. As a result, in terms of poverty reduction and increased health and well-being, it makes little impact.

Saturated fats/fatty acids (SDG 2)

At 46.60 g per 100 g, shea nut oil has a higher saturated fat content than other vegetable oils in its category. It is suggested that it be farmed and used to make a living while also aiding in the fight against world hunger.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils, shea nut oil has a low content of polyunsaturated fats (5.20 per 100 g), making it a good source. It may be made and utilized to feed people while also helping farmers make a living, so helping to end world hunger.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Shea Nut oil produces around 3.14 kg of CO_2 equivalent per kg product, which is greater than some vegetable oils but lower than non-renewable resources and most of the other vegetable oils. As a result, shea Nut oil promotes long-term global health while also contributing to ethical consumption and production goals.

Productivity (SDG 7; SDG 12 AND SDG 15)

When compared to other vegetable oils, Shea Nut oil converts to biodiesel with a poor productivity, according to our study and to [2-14]. Shea Nut oil yields 50.00 litre per hectare globally, helping to meet the SDGs for clean and affordable energy, ethical use and production, and fostering a sustainable way of life on land.

Water footprint (SDG 6)

One of the most water-intensive crop kinds is shea nut farming. Shea nut cultivation necessitates a large amount of water. It is used as a raw input for the kernel's growth and subsequent processing.

Pesticides (SDG 15)

Insect attacks are a big problem in agriculture since they can harm crops and reduce overall yield. Shea trees have been linked to around 47 distinct insect species. To avoid this, pesticides are used.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. Natural compost can be used for shea nut production. Because it's organic, it's good for the soil and the environment.

Food supply (SDG 2 AND SDG 3)

Shea Nut oil is a renewable source of energy that may be used anywhere on the planet. Shea Nut oil has a daily calorie load of 0.88 calories per person. As a result, in terms of poverty reduction and increased health and well-being, it makes little impact.

SOYBEAN

Saturated fats/fatty acids (SDG 2)

Soybean provides around 14.29 g of saturated fats per 100 g, giving it a good supply of saturated fats per 100 g when compared to other vegetable oils in its category. It can be widely grown, allowing farmers to make a lot of money while also helping to alleviate global starvation.

Polyunsaturated fats/fatty acids (SDG 2)

Soybean has a high polyunsaturated fat content (57.60 per 100 g) when compared to other vegetable oils in its category. It may still be grown and used to feed people while also providing a source of revenue for farmers, thereby helping to alleviate world hunger.

Land use (SDG 12 AND SDG 15)

The less land that is needed to produce one kg products, the better for the environment. Soybean oil production is one of the few high worldwide lands employing vegetable oil that has grown in importance over time, in contrast to the vast majority of critical agricultural crops, which have remained relatively constant in terms of output land. The global land consumption per kg (m^2 per kg) of soybean oil is 10.52.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Soybean oil emits around 6.32 kg of CO_2 equivalent per kg product globally, which is more than some other vegetable oils but lower than non-renewable resources and other vegetable oils. As a result, soybean oil helps to achieve ethical consumption and production goals while also maintaining global health in the long run.

Contribution to GDP (SDG 1)

Soybean oil production contributes a significant 21.9 percent to Brazil's GDP, indicating the importance of these oils in boosting these nations' economies and helping to reduce poverty and ensure excellent jobs and economic prosperity for their citizens.

Total number of smallholder farmers (SDG 1 AND SDG 8)

This is demonstrated by data on smallholder farmers whose livelihoods are based on the production of various types of oils. However, based on the information we know, it is apparent that soybean oil is extremely beneficial to smallholder farmers. It gives assistance to 216,000 small-scale farmers.

Productivity (SDG 7; SDG 12 AND SDG 15)

According to the investigation, when compared to other selected vegetable oils, soybean oil has the lowest productivity in converting to biodiesel, with soy having the lowest productivity. Soybean oil yields 552.00 litre per hectare globally, meaning that mustard seed oil helps to meet SDG targets for clean and affordable energy, responsible use and production, and ensuring a sustainable existence on land.

Water footprint (SDG 6)

One of the low-water-intensive crop kinds is soybean seed production. They are better suited to soybean oil farming since they require little water to thrive.

Pesticides (SDG 15)

Insect assaults are a major issue in agriculture since they can injure crops and diminish total productivity. The velvetleaf caterpillar, maize earworm, stink bug, and soybean looper are the most common insect pests that attack soybeans. All of these factors are known to diminish output, so pesticides must be used to avoid pest assaults and boost overall soybean seed oil production yield.

Fertilizer (SDG 15)

Fertilizers are used to help crops grow faster. To optimal production, soybeans require fertilizer. Soybeans, on the other hand, do not respond well to direct fertilizations in comparison to other crops, and must be fertilized when planted or ploughed into the soil.

Food supply (SDG 2 AND SDG 3)

Energy can be obtained from soybean seed oil. It also possesses one of the largest food reserves in the world. 85.00 kilocalories per person per day are provided by soybean seed oil. As a result, it makes a significant contribution to poverty reduction and improved health and well-being.

Protein supply quantity (SDG 2 AND SDG 3)

Protein is either absent or present in small amounts in oils. Even when they do make a contribution, it is negligible. Linseed oil is the vegetable oil that contains good protein when compared to most of the other vegetable oils. Linseed oil provides 20.59 g of protein per capita per day, contributing to the Zero Hunger goal.

Productivity (SDG 7; SDG 12 AND SDG 15)

According to our study and to [2-14] linseed oil has the lower productivity in converting to biodiesel when compared to other vegetable oils. Linseed oil yields 478.00 gallons per hectare worldwide, making a little contribution to reaching SDG targets for clean and affordable energy, responsible use and production, and guaranteeing a sustainable life on land.

Water footprint (SDG 6)

Linseed production is one of the most water-intensive crops. Blue water leaves a significantly larger footprint. Linseed is one of the most water-intensive crops since it requires a lot of water to grow. Linseed has one of the highest average water footprints in the world, at 9,415 m^3 ton.

Pesticides (SDG 15)

Insect attacks are a big problem in agriculture since they can harm crops and reduce overall yield. Pesticides are essential to deal with flax flea beetles in the case of linseed to prevent damage.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. During times of moisture stress, phosphorus has been found to help linseed develop and flourish. Furthermore, potassium enhances the efficacy of nitrogen fertilization, necessitating the use of fertilizers for this crop.

Food supply (SDG 2 AND SDG 3)

Linseed oil is a renewable source of energy that may be used anywhere on the planet. It also holds one of the world's big food reserves. Linseed oil has a daily calorie value of 18.00 calories per person. As a result, it contributes moderately to poverty reduction as well as better health and well-being.

Saturated fats/fatty acids (SDG 2)

Sunflower Seed oil has a lower saturated fat level than most other vegetable oils in its class, at 8.99 g per 100 g. It may be farmed and used to earn a living while also helping to combat world hunger.

Polyunsaturated fats/fatty acids (SDG 2)

Sunflower seed oil has a moderate amount of 20.70 of polyunsaturated fats per 100 g, compared to other vegetable oils in its category. It can still be grown and utilized to offer nutrition to people while also allowing farmers to earn a livelihood, which can help to reduce the global hunger rate.

Land use (SDG 12 AND SDG 15)

The less land that is needed to produce one kg products, the better for the environment. Sunflower seed oil production is the highest worldwide lands employing vegetable oil among all the other vegetable oils in discussion, in contrast to the vast majority of key agricultural crops, which have remained reasonably stable in terms of output land. The global land consumption per kg (m^2 per kg) for sunflower seed oil is 17.66.

Greenhouse gas emissions (SDG 12, SDG 13 AND SDG 15)

Sunflower seed oil emits around 3.60 kg of CO_2 equivalent per kg product worldwide, which is more than some other vegetable oils but lower than non-renewable resources and many vegetable oils. As a result, sunflower seed oil contributes to ethical consumption and production goals while also promoting long-term global health.

Contribution to GDP (SDG 1)

Sunflower oil production accounts for 3.17 percent of Ukraine's GDP, demonstrating how important these oils are in strengthening these countries' economy, reducing poverty, and providing wonderful jobs and economic prosperity for their populations.

Productivity (SDG 7; SDG 12 AND SDG 15)

When compared to other vegetable oils, sunflower seed oil converts to biodiesel with an average productivity, according to our study and to [2-14] sunflower seed oil produces 952.00 litre per hectare globally, helping to meet the SDGs for clean and affordable energy, ethical use and production, and promoting a sustainable way of living on land.

Water footprint (SDG 6)

Sunflower seed production is one of the most water-intensive crops. Blue water leaves a significantly larger footprint. Sunflower seeds are one of the most water-intensive foods since they need a lot of it to grow. With a global average water footprint of 6,792 m^3, sunflower Seed is one of the most water-intensive crops.

Pesticides (SDG 15)

Pest attacks have a significant impact on the agriculture sector, as they diminish yield and damage production. Sunflower seeds are sensitive during growth and periods of high wetness; thus, insecticides are required.

Fertilizer (SDG 15)

Fertilizers are used to help crops grow faster. When it comes to sunflower seed cultivation, fertilizers have been shown to boost oil content in seeds when compared to unfertilized seeds.

Food supply (SDG 2 AND SDG 3)

Sunflower seed oil is a renewable energy source that may be used anywhere on the land. It also possesses one of the largest food reserves in the world. Sunflower seed oil has a daily caloric value of 39.00 kcal per person. As a result, it makes a significant contribution to poverty reduction and improved health and well-being.

MELON SEED

Protein supply (SDG 2 AND SDG 3)

In oils, protein is either missing or present in trace levels. Even when they do contribute, it is insignificant. When compared to other oils, melon seed oil is the vegetable oil that contains good protein when compared to most of the other vegetable oils. Melon Seed oil contributes to the Zero Hunger target by providing 21.80 g of protein per capita per day.

Saturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, melon Seed oil contains around 20.18 g of saturated fats per 100 g, making it a good supply of saturated fats per 100 g. It can be widely farmed, allowing farmers to make a lot of money while simultaneously contributing to world scarcity relief.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils in its category, Melon Seed has a high polyunsaturated fat content (57.40 per 100 g). It is recommended to farmed and utilized to feed people while also providing a source of income for farmers, so contributing to the reduction of global hunger.

Water footprint (SDG 6)

Melon seed cultivation uses very little water. Blue water has a very small imprint. Melon Seed consumes the least amount of water of any crop, which is good news for the environment. Melon Seed has a 5,184 m^3 global average water footprint (m^3 tonne).

Pesticides (SDG 15)

Pest infestations have a huge impact on agriculture, as they reduce yield and cause production loss. Melon seeds are susceptible to a variety of insect pests, necessitating the use of pesticides to avoid production loss. This must be done while the melon is not in bloom, however, to safeguard bees, which are essential for crop pollination.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. To avoid stunted melon growth, nitrogen fertilizer is required. Phosphorus fertilizer, which is not abundant in the soil, is also a crucial requirement for the plant.

Food supply (SDG 2 AND SDG 3)

Melon Seed its Oil is a sustainable form of energy that may be used anywhere on the planet. It also holds one of the world's largest food reserves. The daily caloric content of Melon Seed oil is 34.00 kcal per person. As a result, it contributes significantly to poverty reduction as well as increased health and well-being.

TUNG NUT

Protein supply (SDG 2 AND SDG 3)

Protein is either absent or present in extremely small amounts in oils. Even when they do make a contribution, it is minor. Tung Nut oil has the highest protein content when compared to other oils. Tung Nut oil provides 47.00 g of protein per capita per day globally, significantly contributing to the Zero Hunger goal.

Saturated fats/fatty acids (SDG 2)

Tung Nut oil contains roughly 20.17 g of saturated fats per 100 g, making it a good source of saturated fats per 100 g when compared to other vegetable oils in its category. It can be widely grown, allowing farmers to make a lot of money while also helping to alleviate global starvation.

Polyunsaturated fats/fatty acids (SDG 2)

When compared to other vegetable oils, tung nut oil has the highest quantity of polyunsaturated fats (41.37 per 100 g), making it a good source. It is recommended to cultivate and utilized this vegetable oil to feed people while also helping farmers make a living, so helping to end world hunger.

Productivity (SDG 7; SDG 12 AND SDG 15)

According to our study and to [2-14] tung nut oil converts to biodiesel with an average productivity when compared to other vegetable oils. Tung Nut oil yields 940.00 litre per hectare globally, contributing to the SDGs for clean and affordable energy, ethical usage and production, and encouraging a sustainable way of life on land.

Water footprint (SDG 6)

Tung Nut has a large water footprint because the tung tree is a voracious water consumer, and a lot of water is used in the cultivation of tung Nut.

Pesticides (SDG 15)

Tung Nut are one of the few pest-resistant vegetable seeds, therefore they don't need insecticides or pesticides to keep them safe. Tung trees, on the other hand, are naturally resistant to disease and insects and do not require the use of fungicides or pesticides.

Fertilizer (SDG 15)

Fertilizers are used to speed up the growth of crops. Tung oil trees have grown significantly in response to NPK fertilizers.

JOJOBA SEED

Jojoba Seed oil is similar to most of the other vegetable oils that we have discussed earlier some of the indicators are discussed below.

Productivity (SDG 7; SDG 12 AND SDG 15).

In compared to other vegetable oils, jojoba seed oil converts to biodiesel at the fourth highest rate, while shea nut oil converts at the lowest rate. Globally, jojoba seed oil yields 1,818.00 litre per hectare, meaning that it makes a major contribution to achieving SDG targets for clean and affordable energy, responsible consumption and production, and ensuring a sustainable living on land.

Water footprint (SDG 6)

The jojoba seed oil has the smallest water footprint since it uses very little water in its growth, consuming only 5,000,000 m^3 of water per year and accounting for only 0.0001% of global agricultural water usage.

Pesticides (SDG 15)

The Jojoba seed plant does not necessitate the use of insecticides in large quantities. There are no severe diseases or insect pests that affect the jojoba seed crops.

Fertilizer (SDG 15)

The growth of the jojoba seed plant is aided by the use of a liquid fertilizer containing zinc, potassium, and/or ascorbic acid. Marginal fertility, on the other hand, is required.

PROPOSED INDICATORS AND SDGS

Vegetable oils are agricultural commodities related to many Sustainable Development Goals (SDGs) due to their linkages to food security and nutrition, health, education, rural development, and the environment. The twenty-four indicators below are linked to these SDGs and assist in measurement of completion of these Goals. It may be seen here how and whether various types of vegetable oils can assist to the achievement of the SDGs.

SDG 1: NO POVERTY

Palm oil is an important commodity that contributes to many people' lives, government GDP, and the fulfilment of various SDGs, such as no poverty, zero hunger, decent work, and economic growth. The Environmental Justice Atlas and peer-reviewed literature were used to assess the direct (socioeconomic) and indirect (through ecosystem services) impacts of palm oil trade (EJA). According to our findings, the majority of the 57 case studies were undertaken in Indonesia and Malaysia, which account for 85 percent of worldwide palm oil production [15].

The indicators that are covered in SDG Goal 1 (no poverty) are:

- Gross Production Value (current million SLC)
- Gross Production Value (current million US$)
- Contribution to GDP (%)
- Contribution of Commodity to Economy
- Total number of Jobs Created.
- Total number of Smallholder Farmers.

GROSS PRODUCTION VALUE (CURRENT MILLION SLC)

As mentioned earlier that vegetable oils are a key aspect which can assist in reducing poverty, increasing income, and improving food security for 80 percent of the world's poor. Agricultural development is one of the most powerful strategies for ending extreme poverty, increasing shared prosperity, and feeding the 9.7 billion people estimated to exist by 2050.

CONTRIBUTION TO GDP (%)

The GDP is the indicator for measurement of the Poverty Ratio of a country. It monitors the poverty ratio, as if the GDP percentage of a country is low then there are more people under the poverty line in that country and if the percentage of GDP is higher than it shows that more people are above the poverty line of that country.

The monetary worth of final goods and services purchased by the ultimate user generated in an economic territory country during a certain period is measured by GDP.

In the short and long run, economic growth and institutions have beneficial benefits on per household consumption, according to our study and to [2-14]. This meant that as institutions and economic progress grew, so did per-household consumption, but poverty decreased [16].

In the near run, economic expansion served as a substitute for poverty reduction. In the long run, however, the interaction effect of economic growth on per household consumption was positive, resulting in an increase in household spending and a decrease in household poverty. This demonstrated that economic progress and poverty reduction in Nigeria were mutually beneficial in the long run. Strong institutions and healthy economic growth, according to our study, are critical in eradicating poverty [16].

Rapid and sustained growth is the single most significant approach to eliminate poverty, according to research that examines the experiences of a wide range of emerging countries. According to the findings of these cross-country research, a ten percent rise in a country's average income reduces poverty by 20 to 30 percent. 10 economic expansions also lead to more work opportunities and, as a result, higher demand for labour, the poor's primary and often lone asset. As a result, boosting employment has been critical to achieving faster growth [17].

CONTRIBUTION OF COMMODITY TO ECONOMY.

Emerging economies, particularly those that rely heavily on commodity exports, are prone to extremely volatile economic cycles. The economy is divided into two sectors, one of which produces commodities with exogenous international price fluctuations. Higher commodity prices are connected with reduced spreads between the country's borrowing rate and international interest rates, affecting both the economy's competitiveness and borrowing conditions. Commodity price hikes have a large positive impact on GDP when both impacts are combined [18].

On the influence of oil palm expansion on Indonesian rural farmers' economic well-being, we discovered that many smallholders have reaped significant benefits from oil palm's better yields on land and labour. Indonesia's oil palm development is expected to continue. This expansion could be done to the considerable benefit of a large number of rural smallholders provided environmental standards can be enhanced and policy interventions targeted at the broader social

implications of land development [19]. This clears that the innovation and focus on vegetable oils will help to improve the lives of poor people and will decrease the poverty ratio.

TOTAL NUMBER OF JOBS CREATED.

The link between employment and poverty alleviation has been proven in several research around the world. In a variety of ways, employment can aid in the alleviation or reduction of poverty. At its most fundamental level, the relationship between poverty and employment is defined by the extent to which earnings from labour enable employees and their dependents to obtain the products and services they require to meet their basic requirements. Advancements in vegetable oil production and utilization will open the door to several new ways to generate jobs for unemployed people in multiple sectors from farming to industries and consumption departments.

TOTAL NUMBER OF SMALLHOLDER FARMERS.

The explosion of smallholder plantations in the last ten years necessitates a greater focus on the conditions that allow these farms to thrive and grow into profitable models. This concept could be a viable alternative to Indonesia's current private-estate development pattern, which is raising concern among local communities, national and international NGOs, as well as fat corporations and supermarkets in industrialized countries [20].

The smallest oil palm plantation size for viability with minimal inputs is roughly 1.8 hectares. This will result in a total household income of roughly IDR 7.18 million per year (around UDS xxx). This money is primarily used to meet basic needs (just above poverty line). Under this limit, households face destitution, resulting in rapid asset loss and the termination of their oil palm farming operations. The minimal farm size to accomplish economic reproduction is 2.34 ha, and the total income generated is roughly IDR 9.62 million per month (around UDS 668 per month). This level of income is sufficient to cover smallholders' basic requirements, maintenance costs, and the cost of replanting oil palms (investment cost) [20].

The distribution of agricultural households in the sample survey reveals that one-fourth of the farmers are now in a socioeconomic state that prevents them from developing. However, the status of more than 35 percent of the sample households who are already above the socioeconomic reproduction criterion demonstrates the potential of oil palm agriculture as a development engine [20]. This research depicts that investing in vegetable oil such as palm oil and others will boost the living standards of smallholder famers to meet their expenses and will decrease the poverty line affectively.

SDG 2: ZERO HUNGER

Industrial agriculture threatens fundamental ecosystem processes that support food production globally, while 815 million people are undernourished and many more are malnourished. Zero Hunger is the Goal 2 of the SDGs, which aims to solve global environmental sustainability and food security issues at the same time. The United Nations is a huge and complicated organization. It has also initiated or supported findings from IAASTD, the Special rapporteur of United Nations on the Right to Food, Nourishment for Cities, the Committee on Global Food Security, and the Global Board on Food and Agriculture Systems for Nutrition, the majority of which are initiatives that include civil society perspectives as well as powerful private and state actors, in addition to promoting the SDGs [21].

The Zero Hunger Goal is at the heart of the United Nations Sustainable Development Goals, which must be met by 2030. The world will not reach Zero Hunger by 2030. Despite modest gains, the majority of metrics are still falling short of global nutrition standards. The report portrays a bleak picture, claiming that the most vulnerable population groups' food security and nutritional quality are projected to worsen further as a result of the current pandemic's health and socio-economic effects, among other things.

The intensity of hunger, also known as the intensity of food deprivation, refers to how far people who are hungry fall lack of their minimal food requirements and standards of food energy. The food deficit is assessed in kilocalories per person per day by comparing the average amount of dietary energy obtained from the foods consumed by undernourished persons with the minimum amount of dietary energy required to maintain body weight and engage in light activity. When hunger becomes less than 200 kilocalories per individual per day, it is moderate, and when it is more than 300 kilocalories per individual per day, it is excessive. GDP is predicted to rise as a result of increased agricultural production and other sectors of the economy. An economic expansion and increase in GDP raise per capita income, which should lead to an increase in per capita food intake and, as a result, in average dietary energy consumption (ADEC), which is measured in kilocalories per person per day.

The indicators that are used to measure the SDG Goal 2 (zero hunger) are:

- Food Supply (kcal/capita/day) and polyunsaturated fatty acids per 100g.
- Protein supply quantity (g/capita/day), saturated fatty acids per 100g, polyunsaturated fatty acids per 100g, monounsaturated fatty acids per 100g.
- Contribution to GDP (%)

FOOD SUPPLY (KCAL/CAPITA/DAY) SATURATED FATTY ACIDS PER 100G, AND POLYUNSATURATED FATTY ACIDS PER 100G.

Nutrition is an important factor to reduce the hunger and improves the sustainability of economy. Vegetable oils, which are obtained from plant sources, are essential for nutrition. Some of these oils contain omega-3 fatty acids, which are important fatty acids that the body cannot produce. The omega-3 fatty acid is essential for maintaining a healthy heart, cognitive function, and regular body development and growth.

With high daily average incomes, hunger eradication, food security, and enhanced nutritional food, the level of daily average income of oil palm smallholders is also directly linked to SDG 2. With a smaller daily average income, it is more feasible. As a result, because Peninsular Malaysia's average daily income is considered substantial, SDG 2 is likely to be achieved by 2030 [22]. Hunger alleviation can also lead to a large number of healthy families, whose members can work on the oil palm cultivation as family and non-family labour, so increasing both productivity and income in the family and the region as a whole. Hunger reduction and alleviating poverty are mutually beneficial and must be undertaken at the same time [22].

Rapeseed oil is the most environmentally friendly alternative to diesel fuel. Surfactant, heat, and oleochemical manufacturing, as well as lubricant use, are among its many industrial applications. It has the best surface qualities in terms of physics, and it has a variety of saturated, unsaturated, and polyunsaturated fatty acids in terms of chemistry. It is not edible for human consumption due to its chemical composition. It is, however, employed as fish feed in aquatic cultures due to its high lipid content. The production of human-edible genetically engineered rapeseed will aid in the eradication of world hunger [23].

According to the Report of Fisheries FAO in 2017, to maintain food supply security and access to appropriate health and nutrition, the present plan to eradicate hunger and malnutrition by 2030 focuses primarily on the development of sustainable agricultural and food systems [24].

Soy is an excellent and abundant source of energy all around the planet. Soy supplies 532 Kcal/capita/day inside the United States, trailed by Brazil (308 Kcal/capita/day), China (98 Kcal/capita/day), and Argentina (65 Kcal/capita/day), for a total of 96 Kcal/capita/day worldwide. Soybean oil was produced in roughly 62 million tons (56 million metric tons) over the world between 2018 and 2019, making it one of the most widely used cooking oils. Polyunsaturated fatty acids, which make up the majority of this oil, are a heart-healthy form of fat related to a reduced risk of heart disease. It aids in the promotion of skin health, the reduction of cholesterol levels, the prevention of bone loss, and the provision of essential omega-3 fatty acids. It also has a huge smoke point and a neutral flavour, making it simple to include in a range of recipes as part of a balanced diet.

Each of these oils, in addition to providing the above said health benefits of providing a particular number of calories per day to the population, produce rural employment on plantation sectors and processing units, ensuring sufficient facilities and wages for the poor, and thus contributing

to the two key goals of Zero Hunger and Good Health and Well-Being. The overall goal of many United Nations-supported projects is to eliminate hunger and provide adequate nutrition. This indication depicts the nutrients in various oils, which vary depending on the individual's needs.

PROTEIN SUPPLY QUANTITY (G/CAPITA/DAY), SATURATED FATTY ACIDS PER 100G, POLYUNSATURATED FATTY ACIDS PER 100G, MONOUNSATURATED FATTY ACIDS PER 100G.

Soy oil, palm oil, rapeseed oil, and sun oil are the most common vegetable oils. Within the most typical applications, these oils can be substituted. Market trends show a move from rapeseed oil to palm oil as the marginal vegetable oil around the year 2000, when palm oil becomes the most competitive oil. Palm oil and its dependent co-product palm kernel oil are indicated as marginal vegetable oils. The demand for 1 kg palm oil necessitates 4.49 kg FFB (oil palm fruit) and the displacement of 0.035 kg soybeans (marginal source of fodder protein) and 0.066 kg barley, according to the product system analysis (marginal source of fodder energy) [25].

It is vital to highlight that millions of people around the world, particularly small children, are deficient in protein owing to food insecurity, which is often the main cause. Protein shortage and malnutrition have a wide range of consequences, ranging from growth failure and muscle mass loss to lowered immunity, heart and respiratory system weakness, and death [14]. Protein is either absent or present in extremely small quantities in most oils.

Oils do not provide a large amount of protein. Even when they do contribute, it is insignificant. The only oil that contains a considerable amount of protein is soy. For every person in a day, this indicator provides the total protein (in g) delivered by the various types of oils.

CONTRIBUTION TO GDP (%).

India constructed a ten years plan when the Tenth Plan (covering the period 2002-03 to 2006-07) was formulated, but it was assumed that the poor performance of agriculture was due to temporary factors such as poor monsoons and depressed agricultural commodity prices in world markets following the East Asian meltdown. The Tenth Plan therefore adopted the same targets of 8 percent growth in GDP and 4 percent growth in agriculture. Experience in the first three years of the Tenth Plan period has sounded some alarm bells. GDP growth has averaged about 6.5 percent, but agricultural GDP in these years (2002-03 to 2004-05) has grown by only 1.1 percent per year. The loss of dynamism in agriculture explains most of the shortfall in aggregate GDP growth [26].

They contribute to economic growth and support a huge number of agricultural families by providing food and other basic necessities, thereby alleviating hunger among the poor.

The monetary worth of final goods and services, those purchased by the final user, generated in an economic territory country in a particular period is measured by Gross Domestic Product (GDP). Within the section of agricultural production, oil crops are among the most important factors of an agriculture - based economy, second only to cereals.

SDG 3: GOOD HEALTH AND WELL-BEING.

SDG 3 is dedicated to good health and well-being, and health contributes to practically all of the other goals. Universal health coverage (UHC), for example, can assist to alleviate poverty (SDG 1) by safeguarding individuals from a key source of financial hardship, while excellent health can promote higher employment and economic growth. In May 2018, the World Health Organization's (WHO) Member States accepted the organization's new General Program for 2019–2023. The initiative is based on the Sustainable Development Goals and is intended to assist nations in meeting SDG 3 and other wellbeing targets [27]. One of the key aspects to improve good health and well-being of people comes with an improvement in nutriment and food quality and supply to people.

The indicators that are covered in the SDG Goal 3 (good health and well-being) are:

- Food supply (kcal/capita/day)
- Protein supply quantity (g/capita/day)

FOOD SUPPLY (KCAL/CAPITA/DAY)

A global agricultural revolution is underway, with far-reaching ramifications for human health, livelihoods, and the environment. In developing countries, population growth, urbanization, and income growth are fuelling a tremendous surge in demand for animal-based foods. Changes in billions of people's diets could have a substantial impact on the well-being of many rural poor. Governments and business must prepare for this ongoing transformation by implementing long-term policies and investments that will meet consumer demand, enhance nutrition, direct income growth possibilities to those who need it most, and reduce environmental and public health risks. Livestock also provides fertilizer and draught power to the impoverished. A chance to profit from a common situation create collateral, and grazing lands Diversify your income by putting money aside and diversifying your savings. The It is possible that a cattle revolution will occur. Been a major source of relief in the next 20 years, poverty will be a thing of the past. Increased consumption of even little amounts of meat and milk can give the poor with the same amount of nutrients, protein, and calories as a wide and diversified variety of vegetables and grains [28].

The total kilocalories delivered for each individual in a day for various vegetable oil kinds are shown in this indicator. Vegetable oils and fats are an important part of a well-balanced and nutritious diet because they supply critical nutrients that help our bodies function properly. They are recognized to play a key part in cell division and growth, as well as being a component of cell membranes, hormones, and neurotransmitters, among other things.

PROTEIN SUPPLY QUANTITY (G/CAPITA/DAY)

Reduced-fat frankfurters can be made using commercially available vegetable oils such olive, corn, canola, and soybean oils, as well as rice bran fibre. In the samples manufactured with vegetable oil and rice bran fibre, the pH and cooking yields of reduced-fat frankfurters were higher (P 0.05) than the controls. Because they include less total fat, energy, cholesterol, and saturated fatty acids, reduced-fat frankfurters might be helpful to one's health. The fatty acid composition was altered by the type of vegetable oil used. The general acceptability of reduced-fat frankfurters made with vegetable oil and rice bran fibre was comparable to that of regular-fat frankfurters. As a result, the combination of different vegetable oils and rice bran fibre can help to generate reduced-fat frankfurters with desirable quality attributes [29].

Furthermore, batters containing vegetable oil and rice bran fibre showed lower cooking loss and improved emulsion stability. In comparison to the standard fat control, limited fat meat batters with decreased pork fat content (10%) and 10% vegetable oil + rice bran fibre showed better features [30]. Reducing the fat frankfurters with utilization of vegetable oil and rice bran fibre can help reducing the Fat contents and can help improve the health and well-being of people.

SDG 6: CLEAN WATER AND SANITATION

The (SDG 6) demands for "affordable and sustainable management of water and sanitation for all" through providing "availability and sustainable management of water and sanitation for everyone." It examines, among other things, improving water quality by reducing the amount of wastewater that is not treated and increasing recycling and safe reuse around the world. This will result in increased access to clean water for all purposes, as well as significant advancements in sanitation and wastewater management [31].

This goal unmistakably demonstrates the intimate link between clean water, sanitation, and wastewater management, emphasizing the importance of these two last factors. No administration can provide clean water without also addressing sanitation and wastewater management, regardless of the size of the human settlement, whether it is a massive city, a mid-size city, or a smaller or larger village. If wastewater is not collected, processed, and disposed of appropriately for the intended uses, clean water is not and will never be achievable [31].

The Orange Country Groundwater Replenishment System is California's most well-known potable reuse project. The district's long-term approach to provide clean water for expanding human and

environmental requirements has been indirect potable reuse. For 850,000 people, the system provides potable reused water. Recycled water is utilized to recharge the groundwater basin and keep it safe from marine incursion. The region will be able to continue conserving the groundwater basin and delivering clean water to its rising population thanks to a final extension project that will boost the system's treatment capacity. The facility serves as a model and benchmark for future water reuse projects in Texas, El Paso, California's West Basin Water Recycling Plant, and Arizona's Scottsdale Water Campus [31].

In terms of SDG 6, "Clean Water and Sanitation," the findings show that collecting rainwater and using it for garden irrigation, as well as flushing toilets and recycling grey water for grass irrigation, are the least fostered green practices, despite previous studies indicating their importance in saving water in the hospitality industry. Atana Sova, Dalmau, Comas, Poche, Rodriguez-Roda, and Buttinger found that grey water recycling and reuse, along with rainwater collection and utilization, are advanced techniques that could result in more sustainable water use and cost savings for hotels. As a result, hoteliers should think about these practices while developing an environmentally sustainable plan for their establishment [32].

The indicators that are covered in Clean Water and Sanitation Sustainable Development Goal are.

- Litre of freshwater per kg
- Global average water footprint (m^3 per ton)

LITRE OF FRESHWATER PER KG

According to the United Nations World Water Development Report 2018, clean water scarcity will affect approximately 6 billion people by 2050. As a result of substantial population and economic growth, there is an increase in water demand, a decline in water supplies, and an increase in water pollution. The consequences of the three causes of water scarcity and unequal growth, accessibility, and needs are undervalued, thus this number may be understated, and the scarcity of clean water by 2050 may be worse [33].

The global average freshwater withdrawals per kg of oil are referred to as this. The amount of freshwater used per kg of food is measured in litre. One out of every five people on the planet does not have access to safe and inexpensive drinking water, and 50% of the world's population does not have access to sanitation.

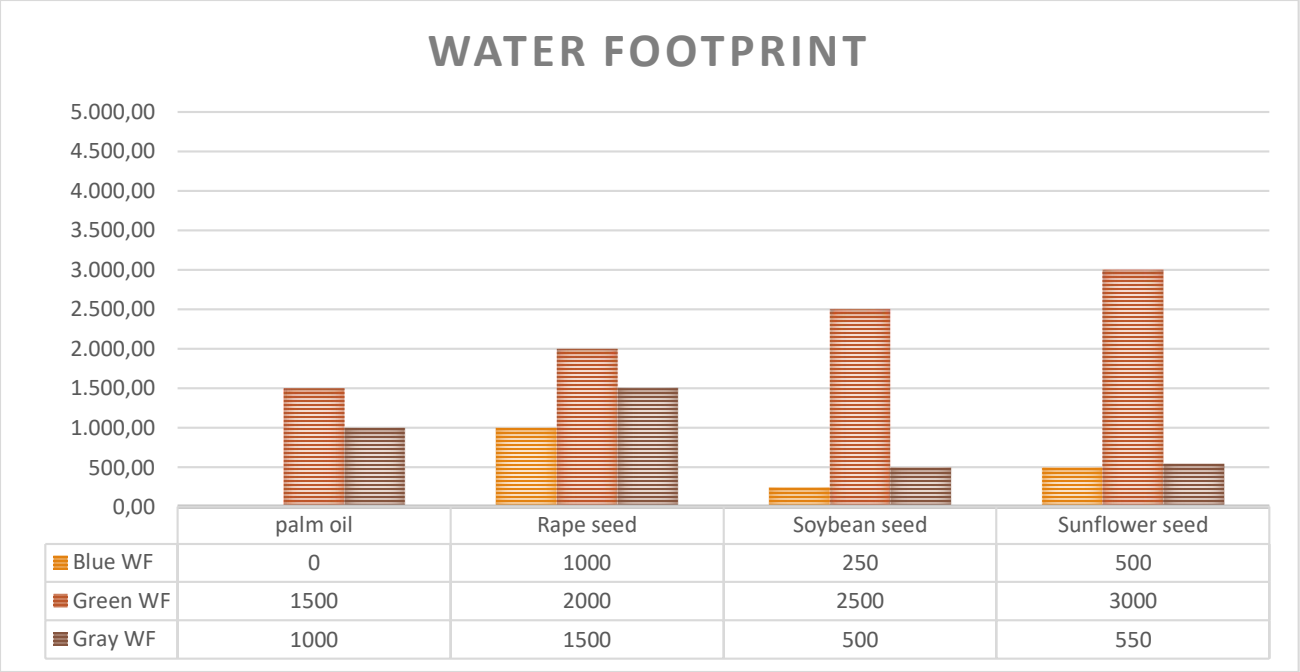
Food and water demands are colliding since agriculture accounts for up to 70% of total water consumption globally, 52, 53, 54, 55, with substantially greater levels in arid and semi-arid countries. There is a constant struggle to determine how much water withdrawal is necessary and sustainable [33].

Water is an essential source of irrigation and cultivation of various Vegetables. The Vegetable oil seed production demands several litres of freshwater per kg. It varies depending on the type of vegetable oil that is cultivated. Palm oil utilizes the least amount of water, which requires only 6 litre water for each kg of oil produced, followed by rapeseed requires 238 litre water, soy requires 415 litre water, and sunflower oil requires 1,008 litre water [34].

GLOBAL AVERAGE WATER FOOTPRINT (M^3 TON−1)

The Water Footprint (WF) is an indicator that accounts for a consumer's or producer's direct (household water usage) and indirect (water used to make agricultural and industrial products) water use. The Water Footprint of agriculture outcomes contributes by far the highest fraction of the total Water Footprint. which is accounting for 91 percent of the total WF (prod) and 89 percent of the total WF (cons). Traditional water use data, public awareness campaigns, and legislation have long emphasized increasing home and industrial water efficiency. However, by eliminating food waste, substantially more water may be conserved in agricultural production operations [35].

Water from precipitation held in the soil's root zone that is evaporated, transpired, or absorbed by plants is referred to as the green water footprint. Water supplied from surface or groundwater resources that is evaporated, absorbed into a product, or withdrawn from one body of water and returned to another, or returned at a later time, is referred to as Bluewater. The amount of freshwater necessary to assimilate pollutants to achieve specified water quality criteria is referred to as the grey water footprint. The grey water footprint considers point-source pollution that is released directly into a freshwater resource through a pipe or indirectly through runoff or leaching from the soil, impermeable surfaces, or other diffuse sources. There are some vegetable oils that are discussed in order to overview the Water Footprint of Vegetable oils.



	palm oil	Rape seed	Soybean seed	Sunflower seed
Blue WF	0	1000	250	500
Green WF	1500	2000	2500	3000
Gray WF	1000	1500	500	550

Figure 2: Water footprint of some selected vegetable oils

As it is visualized in these charts that the palm oil has the lowest Water Footprint of all other vegetable oils used in as reference.

SDG 7: AFFORDABLE AND CLEAN ENERGY

Goal 7 of the UN Sustainable Development Goals (UNSDGs) is "Affordable and Clean Energy," which focuses on universal access to energy, increased energy efficiency, and increased use of renewable energy through new economic and job opportunities by ensuring access to affordable, reliable, sustainable, and modern energy. Although fossil fuels continue to dominate the energy market, renewable energy investment has been on the rise, rising from 45 billion USD in 2004 to 270 billion USD in 2014. Wind (onshore and offshore) received over 56 percent of funding, solar energy received around 24 percent, and biomass, trash, and biofuels received 15.2 percent.

The three pillars of sustainability can be used to evaluate the benefits of microgrids: social, environmental, and economic. Microgrids, as a localized electrification option, can bring electricity to rural locations, improve energy security, and prevent blackouts, all of which have societal advantages. the environmental performance of renewable energy microgrids, with studies implying that using natural renewable resources can help to minimize pollution. exploring about the availability of affordable energy, Microgrids can improve economic efficiency by reducing costs like as transmission loss, interruption cost, fuel cost, and pollution cost, all of which can be reduced with effective planning and management [36].

The indicator that covers SDG-7 (Affordable and Clean Energy) is

- Production oil yield as biodiesel feedstock

PRODUCTION OIL YIELD AS BIODIESEL FEEDSTOCK

Since the SDGs were inaugurated in 2015, they have drawn a large number of researchers from all across the world. The pursuit of SDGs is aided by Waste Cooking Oil (WCO)-based biodiesel manufacturing research. Waste Cooking Oil (WCO)-based biodiesel manufacturing can minimize carbon emissions, develop renewable resource approaches, and allow Waste Cooking Oil (WCO) to be reused. All of these factors meet the demand for low-cost, environmentally friendly energy (SDG 7) [37].

Biodiesel is made primarily from renewable lipid feedstocks such as waste cooking oil, palm oil, soybean oil, microalgae, and rapeseed oil, and is an environmentally benign renewable energy source. Biodiesel production research based on Waste Cooking Oil (WCO) standards helps to address the worldwide dilemma of limited energy supplies with the goals of lowering greenhouse gas emissions and boosting long-term economic prosperity [37].

Biodiesel, according to a UN assessment, is the single greatest renewable energy source today, accounting for 10% of the country's primary energy supply [38]. As a result, biodiesel will benefit from having a high yield. Palm oil yields 4736 litre per hectare, followed by rapeseed at 1190 litre per hectare, sunflower at 952 litre per hectare, and soy at 552 litre per hectare, according to the data [39].

SDG 8: DECENT WORK AND ECONOMIC GROWTH

SDG 8 encourages "continued, inclusive, and sustainable economic growth, full and productive employment, and decent work for everyone." While emphasizing the importance of workers' rights for all, it also underlines certain fundamental contradictions. We should stress, for example, that, despite many criticisms of limited economic growth measurements, the focus here is on GDP and per capita growth [40]. As previously stated for improving the economy, farmers in developing nations are severely impacted and are unable to live peacefully, but by constructing an ecosystem of economic growth through the use of vegetable oils as a food, renewable resource, poor people's lives will be improved and the economy will expand.

The following indicators are covered under SDG 8 (Decent Work and Economic Growth)

- Gross production value (current million SLC)
- Gross production value (current million US$)
- Contribution of the commodity to economy
- Total number of jobs created
- Total number of smallholder farmers

GROSS PRODUCTION VALUE (CURRENT MILLION SLC)

Gross production value is calculated by multiplying gross production in physical terms by farm gate output prices. As a result, the value of production at the farm gate quantifies production in monetary terms. The local currency is utilized as a reference in this indication. The contribution of various types of vegetable oils to gross production value has been observed. The production of these oils boosts the economy and creates jobs on farms and in processing plants. Palm oil contributes significantly to Indonesia's Gross Production Value, which is higher than any other oil produced anywhere else in the world. In countries like Argentina, Brazil, China, and the United States of America, soy contributes significantly to gross output value [41].

GROSS PRODUCTION VALUE (CURRENT MILLION US$)

In the last 20 years, global consumption of 17 oils and fats has more than doubled, rising from 92.9 million t in 1995 to 204.3 million t in 2015. The vast majority of the increase was for edible purposes, mainly in Asia and Africa, as a result of continued rapid population expansion and increased per capita consumption (on account of changed diets and rising income levels). Since 2004, the annual increase in overall consumption of all vegetable oils and fats has quickened, thanks to an almost 29 million t increase in biodiesel production. Government targets for increased biodiesel consumption in Indonesia, the United States, Brazil, and other countries in the coming years may result in more or less significant price increases in vegetable and animal oils and fats due to resource constraints (arable land and water), unless major breakthroughs in oilseed and palm oil yields are achieved [42].

CONTRIBUTION OF THE COMMODITY TO ECONOMY

Palm oil contributes to the economies of Indonesia and Malaysia in terms of US million dollars, while soybean oil is a vegetable oil that contributes significantly to the economies of Argentina, Brazil, China, and the United States of America [43].

The commodity sector's long-term management has the potential to propel global economic growth while also giving chances for respectable employment, corporate development, and improved tax revenues. Smallholder-centred policies can alleviate hunger, malnutrition, and

poverty while also ensuring a decent living in commodity-dependent developing countries. A number of countries have adopted a "reduce, reuse, and recycle" approach to resource efficiency in their policies. This is the foundation for the Group of Seven Alliance on Resource Efficiency, which was founded in 2015 as a knowledge-sharing platform. Each country can establish a wide range of operations based on the reduce, reuse, and recycle philosophy, resulting in a unified vision of commodities management from "cradle to grave." 41 Commodity-dependent developing countries should play a larger role in the worldwide implementation of this strategy [43].

TOTAL NUMBER OF JOBS CREATED

Economic growth is positively associated with employment creation, according to empirical studies. The increased number of efficient employments produced resulted in more spending power in people's hands, allowing them to live comfortably. Palm oil has been credited for helping to create a huge number of jobs in Indonesia and Malaysia, as it is a key source of income for many people. These countries export vegetable oils, which increases vegetable oil cultivation and, as a result, a greater number of people are employed to meet the demand.

TOTAL NUMBER OF SMALLHOLDER FARMERS

Supporting smallholder farmers has been found in several studies to have a higher impact on food production and natural resource conservation. It's one of the quickest methods to lift more than a billion people out of poverty and feed a burgeoning global population. Smallholder farmers should expect a better life and improved living conditions when more productive and efficient regulations are implemented. The presence of such groups supports the construction of essentials such as clinics, schools, and other pathways that lead to a good life, particularly for people who live on farms. The majority of the 1.4 billion people living on less than US$1.25 a day live in rural regions and rely heavily on agriculture for survival. In comparison, an estimated 2.5 billion people work in smallholder agriculture full- or part-time.

These smallholders manage roughly 500 million small farms and provide over 80% of the food consumed in major portions of the developing world, helping to provide food security and alleviate poverty. Sugarcane cultivation is the main source of income for smallholder sugarcane farmers in Mumians sub-County, and their livelihoods are marked by low capacities and high levels of food insecurity. In the pursuit of livelihood options such as food security, livelihood assets are understood to characterize the options available to households as well as the limits they face. This means that improving smallholders' access to social, physical, financial, natural, and human assets can help them broaden their livelihood alternatives and make better use of their assets in order to increase sugarcane output and food security [44].

SDG 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Sustainable consumption and production entails increasing resource and energy efficiency, building long-term infrastructure, and ensuring that everyone has access to essential services, green and good jobs, and a higher quality of life. Its implementation aids in the achievement of overall development goals, as well as the reduction of future economic, environmental, and social costs, as well as the strengthening of economic competitiveness and the reduction of poverty. SDG 12 asks for responsible consumption and production, basically divorcing economic growth from unsustainable resource use and emissions while also addressing hazardous material and waste management. It specifically calls for the 10-Year Framework of Programmed on Sustainable Consumption and Production (SCP) to be implemented, as well as the efficient use of natural resources, the reduction of food and other waste, the responsible management of chemicals, sustainable public procurement, and the adoption of more sustainable practices by businesses.

There is a need for further study and innovation in consumer food waste strategies. There is also a need to scale up consumer awareness campaigns and expand the number of countries participating, which may necessitate research into the most effective methods of persuading customers to minimize their waste. Food redistribution, which involves giving away food that might otherwise be lost or wasted, is one practical example of a technique to reduce food waste [45].

This can be done at the production, manufacturing, and distribution stages of the food supply chain, but there are important questions to consider, such as the logistics of getting the food to the right place at the right time, the legal implications if the food is no longer safe to eat, and who pays for the redistribution [45].

The indicators that are covered in this SDG are

- Supply chain certification
- Total Losses in tonnes
- Land use per kg
- Greenhouse gas emissions per kg
- Production oil yield as biodiesel feedstock

SUPPLY CHAIN CERTIFICATION

Several industry activities are aimed at ensuring long-term sustainability in the palm oil supply chain. The following are three significant efforts that focus on palm oil producer certification:

- The Roundtable on Sustainable Palm Oil (RSPO) is a non-profit organization that promotes the use of sustainable palm oil. Smallholders, producer firms, processors and traders, consumer products corporations, and retailers make up the RSPO's membership, which addresses environmental and social issues along the supply chain.

- ISPO (Indonesian Sustainable Palm Oil) is a necessary accreditation for palm oil farmers and mills in Indonesia.

- MSPO (Malaysian Sustainable Palm Oil) is a voluntary certification programmed for palm oil farmers and mills in Malaysia.

The RSPO is the largest industry organization dedicated to ensuring that palm oil is produced in a sustainable manner and traded in a transparent manner. For various players in the palm oil supply chain, the RSPO has established certification schemes. RSPO has also built processes and institutional infrastructure to facilitate RSPO standards-based continual improvement and innovation. Producers (growers and millers) are accredited based on how well they follow the RSPO's eight principles and criteria.

The current industry standard for sustainable palm oil is the RSPO accreditation. Legality is a core need of the RSPO, which also contains a voluntary framework for adding essential social and environmental standards beyond legal requirements, as well as a system for third-party certification against those criteria [46]. Palm oil has a higher number of key sustainability certifications than the other vegetable oils considered in the study. In the case of palm oil, three of the seven sustainability supply certifications available were created exclusively for the palm oil business. Only two of the five sustainability supply certifications available in the case of soy were created expressly for the soy sector.

In the case of rapeseed, the only current sustainability supply certification (International Sustainability & Carbon Certification) was not even native to the rapeseed. Simultaneously, the two existing sustainability supply certifications for sunflower are standard schemes that have not been designed specifically for sunflower. Moreover, as demonstrated by the analysis, a clear link has been discovered between the SDGs as well as the palm oil sustainability supply certification method. For example, the Roundtable on Sustainable Palm Oil (RSPO) demonstrates how a certification scheme can help achieve numerous SDGs (including SDG 2, SDG 6, SDG 8, SDG 12, SDG 13, and SDG 15).

The combined accounting of the three main certification schemes, namely the International Sustainability & Carbon Certification (ISCC), the Round Table on Responsible Soy (RTRS), and the

Proterra Standard, in the global market in 2013 was only 2-3 percent, indicating that soy certification is less likely than palm oil certification. At the same time, RTRS is rapidly expanding, with 160 members and greater availability of Fairtrade (standards specified by Fairtrade International) and organic soy [47]. However, because deforestation is recognized as a problem in South America (which is understandable), and the same does not apply to US growers, certification of US producers is unlikely. All of these programmed have deforestation-related special criteria, with the exception of Fairtrade, which has its own set of conditions. More generic rules are added in Fairtrade in order to avoid any detrimental effects on regions with high conservation value and those who are protected.

In a study released by the German Development Institute (DIE), the University of Amsterdam (UvA), the European University Institute (EUI), the International Trade Centre (ITC), and the (UNCTAD) UN Conference on Trade and Development, there was a "significant overlap" between the voluntary sustainability standards (VSS) and the SDGs. The use of VSS, according to the paper, might help firms meet their SDG targets.

The report 'Linking Voluntary Standards (VSS) to SDGs' used data from ITC's Standards Map database to track the extent to which SDG targets were linked with VSS-promoted sustainable behaviours. The goal of the VSS standards, which go beyond the government's minimum legal requirements, is to react to a variety of consumer and stakeholder expectations while reducing the negative social and environmental consequences of economic activity. The advocates of VSS, according to the report, see the voluntary standards as a tool that business leaders and politicians may use to achieve Sustainable Development Goals through trade. According to the report, there are over 270 VSS across 600 product groupings, 180 countries, and 15 sectors. VSS covers the majority of the agriculture industry, followed by clothing and textiles, consumer goods, and processed foods. According to the research, at least 200 VSS are linked to SDG 12 (responsible production and consumption), SDG 11 (sustainable communities and cities), SDG 8 (economic growth and decent labour), and SDG 2 (sustainable development) (zero hunger). Even though these SDGs overlap extensively with VSS, their coverage varies by region and country. In the Middle East and Africa, for example, SDG 8 has very few VSS associated with it. On the other hand, a large number of VSS (222) are linked to the SDG 8 aim across Western Europe, North America, and parts of Asia and South America. Brazil, the United States, India, Mexico, and Indonesia have the most SDG 8 relevant VSS.

VSS has demonstrated significant connections to SDG 6 (sanitation and clean water), SDG 4 (excellent education), SDG 3 (good health and general well-being), and United nations Sustainable Development Goals 1 in the report (absence of poverty). For example, more than 100 VSS cover each of the five SDG 1 targets, indicating that private governance contributions can address all aspects of poverty as defined in SDG 1. 60 VSS, on the other hand, are tied to objective 4.3, which deals with equal availability and affordability and high-quality vocational, technical, and postsecondary education. In addition, 191 VSS are linked to objective 4.4, which deals with boosting skill development; however, only two of SDG 4's seven aims are addressed by VSS.

In the paper, it is noted that relatively few VSS exist for the concerns addressed in these three Goals, and that they were created in a state-centric manner, leaving limited room for private governance action. When it comes to SDG 14, for example, very few VSS address issues connected to SDG targets and fisheries, despite the fact that the fishery industry has various standards relevant to this SDG that are mostly voluntary. SDGs may be reached, according to the paper, through a better governance ecosystem, which can be aided by VSS. Several important VSS can be adopted by policymakers to help contribute to efforts to construct more resilient business ecosystems, create greener jobs, and enable the adoption of greener technology practicable for micro, small, and medium-sized firms in order to meet the SDGs (MSMEs). At the same time, the paper warns that in the discussion about the success of VSS, it is critical to look at how the measures are conceived and implemented at the ground level by the private sector. Furthermore, as the research points out, VSS might have unexpected implications, such as putting underrepresented players at a disadvantage. In some countries and industries, there may be some adverse competition as a result of transaction costs, trade obstacles, and producer assistance programmed. VSS may effectively contribute to the various SDGs, according to the research, through various strategies such as demand for political change and improving consumer awareness.

The report recommended that governments develop a regulatory framework and sustainability strategy by integrating issues related to sustainability into various trade and sectoral/national production strategies, thereby creating an ecosystem where businesses can produce and trade sustainably; and engage with the private sector to better understand the challenges they face during production and sustainable trade. The paper also includes recommendations for businesses, support organizations, and standards bodies.

TOTAL LOSSES IN TONNES

Food waste must be reduced in order to achieve economic growth and long-term development. It is critical that we lessen our environmental footprint by changing the way we manufacture and use commodities.

Rational food management in the production, processing, and usage processes, aided by logistical operations that combine them, helps to the food sector's long-term viability. Food waste has been regarded as one of the key roadblocks to the sector's long-term development. To minimize food losses, it is critical not to exceed expiration dates and to keep products fit for consumption when it comes to food management. Food that has beyond its expiration date can result in losses in primary production and processing (overproduction and market collapse), as well as retail and wholesale (overestimation of an order) [48].

One-third of all food produced worldwide goes to waste each year, with losses sustained by the whole food chain from "farm to fork." Food losses and waste have an economic, social, and environmental impact on the long-term viability of food systems. Excessive consumption of

natural resources, as well as irrational food use, pose a hazard to the environment and contribute to unfulfilled nutritional needs in populations [48].

LAND USE PER KG

This is expressed as m^2 per kg (meters squared per kg). In the context of global environmental change, land is an important factor. For decades, the land change research community has focused on the increasing strain on the Earth's limited land resources caused by contemporary trends such as globalization, economic affluence, climate change, and population growth [49].

In terms of sustainable development, the less land used to create a kg product, the better for the environment overall. Palm oil production is one of the few global lands uses that has grown in importance in recent years, as opposed to the bulk of important crops, which have stayed surprisingly steady in terms of output acreage. Palm oil uses 2.42 kg of land per kg, rapeseed 10.63 kg, soy 10.52 kg, and sunflower 17.66 kg.

GREENHOUSE GAS EMISSIONS PER KG

Greenhouse gases are gases that have a detrimental influence on the atmosphere and are the primary source of environmental disruption, as well as global temperature and climate change. GHG emissions from vegetable oils are quantified in kg of CO^2-equivalents per kg product (kg CO^2 eq. per kg product). Palm oil has a GHG emission of 7.32 kg CO^2 eq. per kg product, rapeseed 3.77 kg CO^2 eq. per kg product, soy 6.32 kg CO^2 eq. per kg product, and sunflower 3.6 kg CO^2 eq. per kg product.

PRODUCTION OIL YIELD AS BIODIESEL FEEDSTOCK

Biodiesel manufacturing is a very modern and technological sector because of the importance that it is gaining every day as a result of the rise in petroleum prices and the environmental benefits. Biodiesel is now made primarily from traditionally farmed edible oils including rapeseed, soybean, sunflower, and palm, which helps to solve the food versus fuel problem. In 2007, biodiesel production consumed about 7% of worldwide vegetable oil resources. In developing nations, widespread consumption of edible oils may result in other serious issues, such as famine. Because of the enormous need for edible oils as food, and because they are far too expensive to be used as fuel at the moment, the usage of non-edible plant oils in comparison to edible oils is highly significant in developing nations.

When compared to other vegetable oils, Balat claims that palm oil has the highest productivity (litre/ha) as a biodiesel feedstock. Palm oil productivity is 4736 litre/ha, rapeseed productivity is 1190 litre/ha, soybean productivity is 552 litre/ha, and sunflower productivity is 952 litre/ha [39].

SDG 13: CLIMATE ACTION

The COVID-19 crisis could be a watershed moment in climate change development. Global greenhouse gas (GHG) emissions will be lower this year than they have ever been. To reach net-zero emissions by 2050, the percentage declines expected in 2020 would have to be duplicated year after year. Instead, unless governments interfere, emissions will soar once mobility limitations are repealed and economies recover.

The COVID-19 problem has thrown the world economy into disarray, affecting climate change efforts in a variety of ways. Fiscal recovery packages, as well as prospective power transfers inside and between national and international institutions, are the most important drivers of long-term climate effect. Green fiscal recovery packages can help decouple economic growth from GHG emissions and alleviate current welfare gaps, which will be worsened in the near term by the pandemic and in the long term by climate change. Lockdown-induced short-term reductions in GHG emissions will have negligible long-term consequences unless they facilitate deeper and longer-term human, corporate, and institutional improvements. Urgent rescue packages had to be focusing on maintaining liquidity, solvency, and livelihoods, but they are unlikely to have a positive climate impact [50]. With the approval of the Paris Agreement in 2015, the global response to the threat posed by climate change was targeted to be intensified, with the goal of guaranteeing that global temperatures would not climb more than two degrees Celsius in this century compared to pre-industrial levels. The agreement aims to boost the countries' ability to deal with climate change-related impacts by providing a new technology framework, suitable financial flow, and a framework for greater capacity building [50].

The indicator that covers this SDG 13 (Climate Change).

- Greenhouse gas emissions per kg

GREENHOUSE GAS EMISSIONS PER KG

The global average GHG emissions per kg of oil are measured by this indicator. This is expressed as CO_2-equivalent kilos per kg of product. In the case of sunflower and soy, GHG emissions per kg were found to be the same and lowest. Furthermore, palm oil produces the most GHG emissions per kg, while rapeseed produces the least. Because it is associated with a significant number of uncertainties, indirect land-use change is a direct driver of high GHG emissions. Furthermore, the computations made no mention of the land's provenance. If there had been a

forest on that piece of land before, the loss in carbon stock would have been larger, resulting in higher emissions.

SDG 15: LIFE ON LAND

SDG 15 calls for the preservation of life on land and supports goals outlined by international conventions and agreements. Nature is critical to our survival because it provides critical oxygen for our survival, regulates weather patterns, pollinates crops, and creates food, fibre, and feed. However, it is currently under tremendous strain. Human activity has impacted approximately 75% of the earth's surface, causing nature and wildlife to be pushed and squeezed into a very narrow region on this globe. Extinction threatens around one million plant and animal species, according to the 2019 Global Assessment Report on Biodiversity and Ecosystem Service. The report calls for radical measures to conserve and restore nature. All species, including humans, rely largely on the health of the ecosystem, which has been progressively deteriorating at a rate considerably greater than ever before, threatening the basic foundations of our livelihoods, economies, health, food security, and quality of life around the world.

Deforestation and desertification have been driven by climate change and different human activities, creating huge development concerns that are affecting the livelihoods and lives of millions of people around the world. Forests are critical in combating the negative consequences of climate change in order to keep life on Earth afloat. It is critical to invest in the restoration of the land in order to improve livelihoods, reduce economy-related hazards, and reduce vulnerabilities.

The indicators that are covered in this SDG 15 (Life on Land) are

- Land use per kg
- Greenhouse gas emissions per kg
- Production oil yield as biodiesel feedstock

LAND USE PER KG

In comparison to the other vegetable oils chosen, oil palm required the least amount of land, owing to the large yield produced. At the same time, it was discovered that sunflower required the greatest land, while soy and rapeseed required about similar amounts and so on. In the case of rapeseed and soy, the emission of greenhouse gas (GHG) per kg was similarly equal (10.63 m^2 per kg). Furthermore, GHG emissions per kg were lowest in palm oil (2.42 m^2 per kg), whereas they were highest in sunflower (17.66 m^2 per kg). In the case of palm oil, the high degree of uncertainty entrenched in indirect land-use change was the main reason of this high rate of emission. Furthermore, the origin of land has remained a mystery. Where the land was once a forest, emissions would be higher due to carbon stock losses.

GREENHOUSE GAS EMISSIONS PER KG

Soy and sunflower had the lowest greenhouse gas (GHG) emissions per kg, according to the findings. Furthermore, the data suggest that rapeseed has the lowest GHG emissions per kg, whereas palm oil has the most. The emission is high due to indirect land-use changes, which are fraught with uncertainty. Furthermore, the calculation did not reveal the land's origin. If the land came from a forest, the emission would be considerable owing to carbon stock losses.

PRODUCTION OIL YIELD AS BIODIESEL FEEDSTOCK

Because of the enormous need for edible oils as food, and because they are far too expensive to be used as fuel at the moment, the usage of non-edible plant oils in comparison to edible oils is highly significant in developing nations. Biodiesel manufacturing from various non-edible oilseed crops has been intensively researched in recent years [39]. When compared to other selected vegetable oils, palm oil has the highest productivity (four times that of rapeseed, which has the second-highest productivity), while soy has the lowest output.

SDG 17: Partnerships to achieve the Goal

SDG 17 encourages collaborations between high-income countries (HIC) and low- and middle-income countries (LMIC) for global development that is both sustainable and equitable. Given the significant differences in financial and overall research capacity between HIC and LMIC researchers, as well as the greater vulnerability of LMIC communities when serving as research sites, a focus on the nature of such global health research partnerships in the perspective of the SDGs is appealing. This is to guarantee that the relationships are meaningful and mutually useful, addressing local health challenges while also adding long-term value to the communities involved.

COVID-19 transcends national lines, necessitating worldwide partnerships and collaborations in the development and evaluation of technologies, including as vaccines and medicines, needed to limit this and other health concerns, thereby benefiting global health and the economy. The 17 Sustainable Development Goals (SDGs), which provide the framework for supporting sustainable and equitable development, including global health research, for the next 15 years (2015–2030), have highlighted the need of such partnerships in this era of globalization. The international community knows that the Sustainable Development Goals can only be accomplished through strong global partnerships and cooperation[32]. In order to achieve all other 9 SDGs, we discussed earlier it’s important to have a mutual global partnership between government and private sectors on investing in vegetable oils and built a financially strong structure that can support the health and climate as well as can meet the demands of economy and power. Researching and exploring vegetable oils and collaboration between stats and other sectors can be one of the main sources to achieve a sustainable and develop framework.

RANKING

RANKING METHODOLOGY

Based on the proposed indicators we rank the contribution of each selected vegetable oils into the SDGs. The ranking is based on combined percentage of the contribution of vegetable oil into the related SDG proposed indicators.

RANKING LIMITATIONS

It should be noted that this ranking and research involved several limitations. These limitations can be summarised as follow:

1. Data availability
2. The high variation of data between the countries and regions
3. Rapid changes in technology
4. Completeness of the data
5. The high uncertainty of the data
6. Reliability of the data

Due to these limitations, the provided ranking or contribution, within this report, can be changed significantly. In other words, the provided ranking or contribution is not final, and it have fluctuating over time or when the data availability increase.

OVERALL RANKING

In accordance to the Research and Technical analyses of vegetable oil to achieve the Sustainable Development Goals (SDGs), it is observed that the most essential vegetable oil that comes on the top of the list is Palm Oil. Palm Oil is the most effective vegetable oil in order to achieve the SDGs as this oil is strongly effective on reducing the poverty, improving the hunger ratio as well as creating job opportunity. As the Palm Oil is responsible for Indonesian 3.5 percent growth of GDP as well as creating 7.5 million jobs in Indonesia. This great impact of Palm Oil extremely reduces the poverty, improves the employment ratio as well as decrease the hunger as more and more people are able to feed themselves.

After palm oil comes coconut oil which has a huge amount of biodiesel productivity Ratio as it delivers 2,689.00 litres per hector of biodiesel globally as well as it has very low greenhouse gas emission rate which is of about 0.41 kg this makes coconut one of the best vegetable oil for affordable and clean energy production and from which it is clearly visible that great opportunities of new industries will immerse and through which later on will generate jobs and employment ratio will be improved which will not only make the economy stable and sustainable but as well as reduce the health problems and making environment clean to live.

Then comes rapeseed oil in the list as this oil not only provides biodiesel by 1,190.00 litres per hectare globally it also improves the Canada GDP by 0.50 percent and generates 250,000 jobs in Canada which comprehend its importance in achieving the Sustainable Development Goals.

Further in list comes mustard seed as mustard seed has the lowest water foot print among all the vegetable oils. The water footprint of mustard seed oil is 2809 m^3 per ton. Mustard seed oil also provide biodiesel productivity as well as contributes in Canada's GDP by and noticeable percentage of about 21.8 percent helping to make economy sustainable and achieving the SDGs.

Then comes Sesame seed oil with good saturated fats and polyunsaturated fats percentage helping in reducing the hunger and making the economy stable.

Olives comes next with good biodiesel productivity and low greenhouse gas emission making it good renewable energy resource to be utilize.

Groundnut comes next in the list with having lower than Sesame but good saturated and polyunsaturated fats supply as well as shows an average biodiesel productivity.

Then comes linseed oil by providing good polyunsaturated fats supply an average food supply ratio and a low biodiesel productivity.

Then further comes soybean, tung nut, poppy seed, sunflower seed, safflower seed, shea nut, hemp seed, caster seed, melon seed, jojoba seed respectively.

At the least effective vegetable oil in achieving the Sustainable Development Goals comes the kapok fruit seed oil with one of the lowest biodiesel productivity ratios as well as high water footprint.

SDG 1: NO POVERTY

The most effective way to reduce the poverty is increasing the employment ratio of the nation and make people able to earn their living. Employment is a valuable resource that should be examined because it can lead to communal issues. Current mechanisms aimed at upskilling informal miners and the larger community need to be improved in order to assist locals in improving their ability to find gainful work and so establish more resilient livelihoods. According to the findings, these should be found both within and outside of the mining industry. The involvement of tertiary institutions and other educational organizations is critical in increasing both education and work opportunities, and hence in helping to alleviate poverty. The ranking of contribution of each selected vegetable oils into SDG 1 is shown in figure 3.

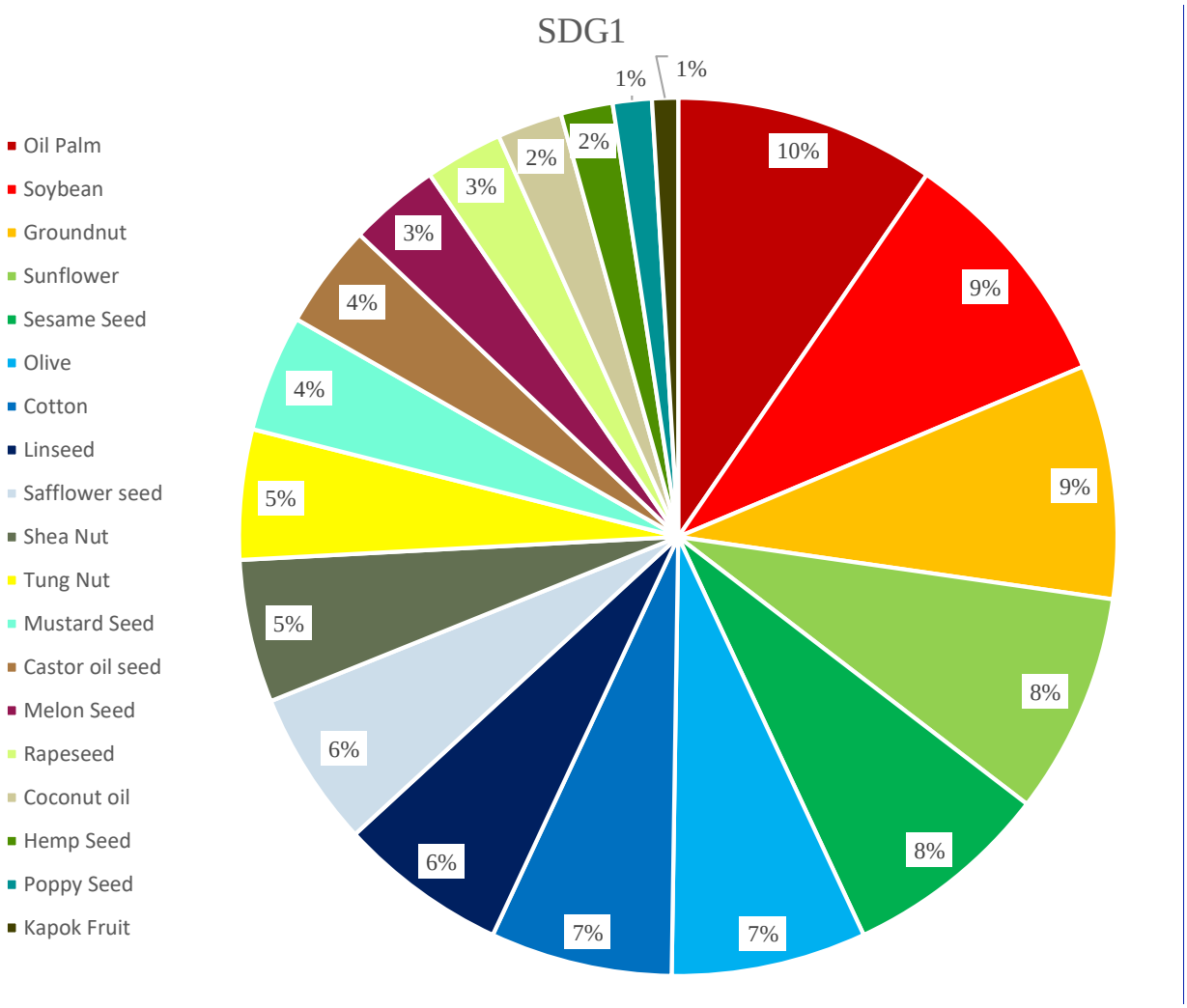


Figure 3: Contribution of vegetable oils into the SDG 1

In observation to the poverty crises in developing countries around the globe the best vegetable oil that comes forward in regard to reducing the poverty is palm oil. The palm oil is the best vegetable oil in order to reduce the poverty as it has the most job creation ratio among all the other vegetable oils. The palm oil generates 7.500.000 jobs annually in Indonesia which shows the importance of cultivation of palm oil. The increase in job opportunities increases the overall employment ratio and if more people are employed in a nation, then more the people are able to buy their essentials. All the employed people will be capable of living their lives happily and the poverty ratio will drop down. Palm oil can be a great asset to achieve the Sustainable Development Goal number 1 “No Poverty”.

Coming up next to the list is soybean as we all know that soybean is one of the great vegetable oils in regards to contribution in GDP and the smallholders such as farmers that cultivate this vegetable oil. As we know that the GDP of Brazil increases by 21.9 percent as well as it is an earning resource of 216,000 small-scale farmers [51]. It proves that this vegetable oil is capable of boosting the economy and by said that if the economy of a nation is improved in decreases

the inflation and when the inflation drops it reduces the poverty ratio rapidly as more essentials are now in reach of poor people utilize them.

After soybean seed comes the Groundnut. The Biodiesel production capability of Groundnut is very good which makes an essential back in supply of energy which will increase the industries and eventually better job opportunities will be generated through this and poverty ratio will decline by increase in employment ratio. Then comes sunflower seed next in list the sunflower seed increases the Ukraine's GDP by 3.17 percent and improves the economy and decreases the inflation which directly reduce the poverty ratio of the country. Up comes the sesame seed because Sesame Seed oil has the largest amount of polyunsaturated fats (41.70 per 100 g) which helps reduce the hunger and improve economy. Rise in economy eventually reduces the poverty ratio all around the Globe.

Up comes olives in the list. Olive is one of the good biodiesel productive source as it can produce 1,212.00 litre per hectare globally which is good in order to generate energy and this energy can be utilized in several industries even access supply of energy to create new industries so that it generates jobs and will improve the employment ratio and decrease the poverty eventually.

Then comes cotton seed as one of the vegetable oils that having high polyunsaturated fat content in it. It provides 51.9 fat content per 100 g which are good and is a source reduce the global hunger and as well as provides good income to the farmers those cultivate this vegetable oil. Reduction in hunger means more people are able to get to feed and live their lives healthily and as a source of income which can reduce the poverty ratio. Then comes linseed, linseed provides good protein ratio of 20.59 g per day and besides that it provides a Biodiesel Productivity of 478 gallons per hector which contributes in more industries and production. Which will generate more jobs and increase the employment ratio which improves the poverty and help achieve the Sustainable Development Goal number 1 “no poverty”. Next comes safflower seed oil as it has a Biodiesel productivity of 779.0 litre per hector which can be a good renewable energy resource and can improve the employment ratio hence reducing the poverty ratio.

Shea nut comes after safflower oil in the list. Shea nut provides good saturated fat content of 46.60 g per day and a moderate biodiesel productive ratio of 50 litre per hector. A good saturated fat content supply reduces the hunger and more people are able to live normal lives and the biodiesel productive ratio creates new job and increase employment and improve the poverty ratio all over the Globe. Then in the list comes tung nut having a productive ratio of 940 litre per hector which helps in decreasing the poverty ratio. Then comes mustard seed oil is the seed oil that contribute 21.8 percent in Canada GDP and improves the economy by which it improves the poverty ratio. Then comes caster seed oil. Bioidiesel productive ratio of caster seed oil is 1413 litre per hector and helps in reducing the poverty ratio. Then comes the melon seed oil as it has good food supplies and provides 34 kilo calories per person per day which will improve the poverty ratio. Then comes the rapeseed oil which contributes 0.5 percent in Canada GDP and it is also a source of 250,000 jobs creation in Canada. This plays a great role in improving the poverty ratio.

After rapeseed comes coconut oil that contributes in Philiphines' GDPby 9.3 percent. Which improves the economy in Philippine and increment in economy improves the poverty globally. Then comes hemp seed with good saturated fat contents after hemp seed comes poppy seed and kapok fruit is the least in the list as it plays a minor role in improvement of poverty.

SDG 2: ZERO HUNGER

The agricultural growth of food, fibre, fuel, and industry is the backbone of society and the foundation of self-sufficiency. However, environmental consequences, a lack of educational infrastructure, and disparities in resource management and distribution have all weakened self-sufficiency in many non-industrialized countries. The vegetable oil that is most beneficial in reducing the hunger is rapeseed. Rapeseed is the vegetable oil with a lot of benefits that directly and in directly improves the hunger ratio such as it has 7.3 g saturated fat contents in 100 g and 28.19 g of polyunsaturated fat contents per 100 g that makes it a good source and helps in reducing the hunger globally as well as it contributes in GDP of Canada and creates jobs of about 250,000. Which decreases the poverty ratio improves the economy and more people can buy food to feed themselves so it also reducing the hunger ratio.

The rapeseed is the vegetable oil that is one of the low land uses per kg vegetable oil as it requires only 10.63-meter square per kg that shows that it can be cultivated in bulk amount on a limited land. A good supply will always be beneficial keeping in view of the benefits of rapeseed oil we discussed earlier. Then comes palm oil as it is one of the highest saturated fat content supplies oils. Palm oil provides about 49.30 g of saturated fats per 100 g which make it a good source of saturated fat and can play an essential role in good health and hunger reduction all over the globe. As well as it improves the Indonesian GDP by 3.5 percent and improves the economy the better the economy the lower the inflation and which mean more people can be able to buy the essentials and food to live their lives.

After palm oil comes the soybean seed oil as this vegetable oil is good source for saturated fats as well as polyunsaturated fats. The soybean vegetable oil provides about 14.29 g of saturated fats per 100 g and polyunsaturated fat content are (57.60 per 100 g) which make soybean a good energy source and can play an essential part in reducing the hunger all over the globe. On the other hand, the soybean seed oil contributes 21.9 percent in Brazil's GDP which improves the economy and by increasing the economy the inflation decreases and this makes the food and other essentials to be in reach of poor people to buy and live their lives. Then comes Groundnut provides 16.90 g of saturated fat per 100 g and also provides 32.00 g polyunsaturated fats per 100 g, which is a considerable amount of supply that can improve the hunger ratio globally as well as Groundnut provides the daily calorie content of 14.00 calories per person. Which can also assist in reducing the hunger ratio. Further in list comes cotton seed, cotton seed also is a good saturated and polyunsaturated fat content supply. The cotton seed provides 25.90 g of saturated fats per 100 g and also provides 51.90 g polyunsaturated fat content per 100 g as well as a 13 calories per person food supply ability which makes cotton seed an important vegetable oil in reducing the hunger.

Next in list comes the sesame seed with the saturated fat and polyunsaturated fat content in sesame seed are 14.20 g of saturated fat contents per 100 g and 41.70 g of polyunsaturated fat content per 100 g making sesame seed a moderate candidate in reducing the hunger all over the coconut oil as the vegetable oil that has the greatest saturated fat content supplies of about 82.50 g of saturated fats per 100 g which makes it a good food energy supply and can help in achieving the Sustainable Development Goal number 2 “zero hunger”.

Then comes the sunflower oil as the next vegetable oil. Sunflower oil is a moderate supplier of saturated and polyunsaturated fat as it provides about 20.70 g of polyunsaturated fats per 100 g as well as 8.99 g of saturated fat per 100 g which makes sunflower a moderate vegetable oil in order to reduce the hunger and achieve the SDG 2. After sunflower comes the olives, the olives provide 13.81 g of saturated fats per 100 g and 10.52 g of polyunsaturated fats per 100 g making it down in the list from sunflower but still a moderate supply for reducing the hunger ratio.

Then comes the poppy seed in the list. The poppy seed has good polyunsaturated fat amount but has moderate saturated fat amount as it has 62.40 g of polyunsaturated fats content per 100 g and 13.50 g of saturated fat content per 100 g making it a moderate source in reducing the hunger in the world. Then comes mustard seed oil which contains both the saturated fat content as well as polyunsaturated fat content of a moderate level mustard seed provides 11.58 g of saturated fats per 100 g and 21.23 polyunsaturated fats per 100 g which makes a moderate reduction in hunger and improves the health of the people. After mustard seeds comes the safflower seed the safflower seed oil contain below average amount of saturated and polyunsaturated fat content in it as safflower seed oil provides 7.54 g of saturated fat contents per 100 g and 12.82 g of polyunsaturated fat contents per 100 g its lower than mustard seed but still can help in alleviation of hunger globally.

Below the safflower seed comes the linseed the linseed doesn’t shows any promising data on saturated or polyunsaturated fats but still it is a good protein source linseed oil provides 20.59 g of protein per capita per day which is a good effort in reducing the hunger ratio and improving the health of people. below the linseed comes the shea nut has a great saturated fat contents but lacks in polyunsaturated fat contents as it provides 46.60 g of saturated fat contents per 100-g but only 5.20 g of polyunsaturated fat contents per 100 g which makes it down in the list of reducing hunger as it plays minor role in alleviation of hunger all around the globe.

Below shea nut comes the caster seed oil which has minor saturated fat as well as polyunsaturated fat contents in it of just 2.0 of saturated fats per 100 g and 9.0 of polyunsaturated fats per 100 g that is why the caster seed oil minorly improves the hunger. Then comes hemp seed it has good polyunsaturated fat contents of 38.10 g of polyunsaturated fat contents per 100 g but has high water footprint as well that’s why it is lower in the list of vegetable oils and their role in alleviation of hunger.

Tung nut comes next, as it provides good saturated and polyunsaturated fat contents but unfortunately its food supply is insignificant which makes it below the ranking list for SDG 2 “zero hunger”. After it comes melon seed and then kapok fruit. The kapok fruit has a moderate presence of saturated fat contents but as it is water intensive oil and doesn’t have much food

supply, it is the least of all vegetable oil in order to improve the hunger. Figure 4 shows on the ranking of contribution of each selected into SDG 2 vegetable oils based on the obtained results.

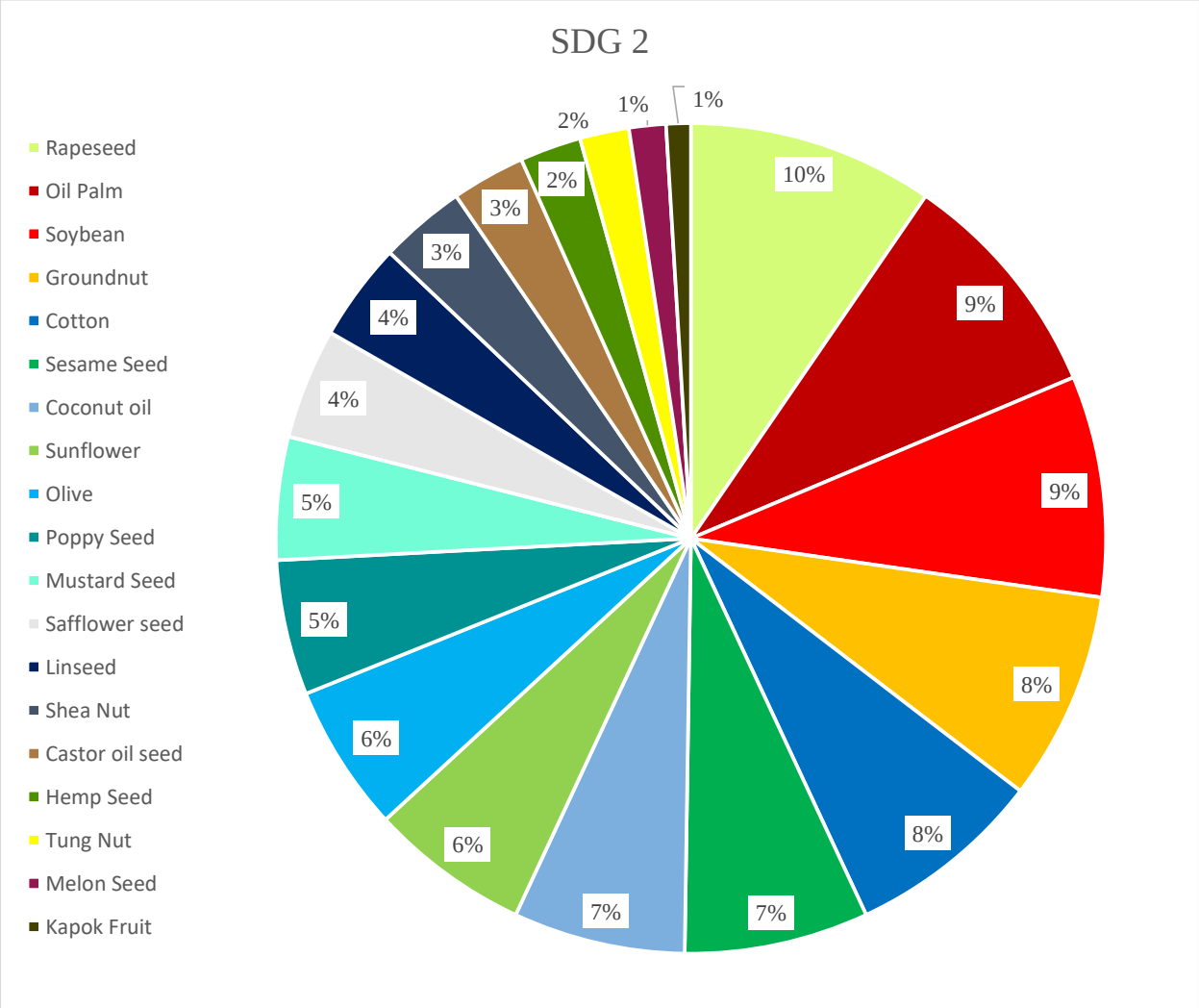


Figure 4: Contribution of vegetable oils into the SDG 2

The good health and well-being are an essential Sustainable Development Goal and in sight if vegetable oils and their roles in achieving good health and well-being. Different oils are ranked from best to least according to their role in achieving the Sustainable Development Goal number 3 “Good health and Well-being”.

The good health is strongly connected to the world, the atmosphere where we are living, and in this era of innovation industries and automobiles the pollution of air and water or any type is one of the leading factors that effects the human health and give rise to different types of diseases, such as ozone depletion casing skin burns even skin cancer and many other disastrous effects, such as acid rains and many others. Figure 5 shows ranking of contribution of each selected vegetable oils into SDG 3.

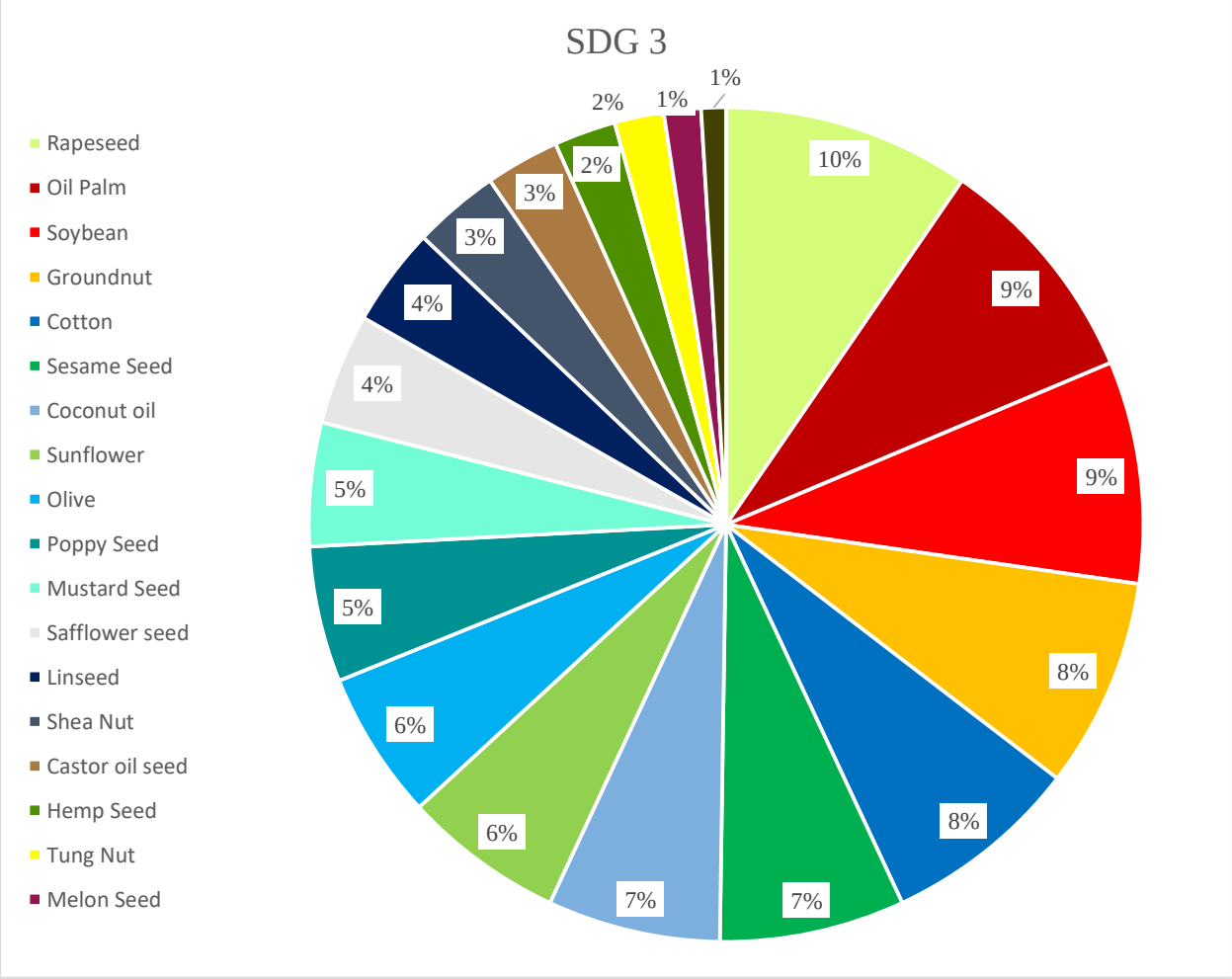


Figure 5: Contribution of vegetable oils into the SDG 3

In order to achieve the well-being of people and taking care of good health we have to make sure to reduce all type of pollutions and the sources from which it cases. One of the major cases of air pollution in global warming as well as greenhouse gases emission through our industries and other equipment's, such as diesel engines and power plants using non-renewable energy resources. The rapeseed is a vegetable oil that can be one of the most effective change and a key to reduce the air pollution as in utilizing this vegetable oil only around 3.77 kg of greenhouse gases emits globally which is way lower than through other non-renewable energy resources as well as the rapeseed has a capability to provide 13 calories per person per day which is significant for a healthy living as well as has a low water foot print. This makes rapeseed one of an ideal candidate in order to achieve the good health and well-being globally.

Palm oils are next in the list as the greenhouse gas emission as palm oil produces roughly 7.32 kg globally. The calories that palm oil provides 61.00 kilocalories per person per day that makes palm oil on second of the list and improve the health as well as well-being of people all over the world. Up next to palm oil comes the soybean oil as soybean has the largest food supply among all the vegetable oils of about 85.00 kilocalories per person per day and the greenhouse gas emission of soybean is 6.32 kg globally which makes soybean one of the great sources in order to achieve good health and well-being of the people.

At number four comes Groundnut. The Groundnut has a capability of food supply of about 14.00 calories per person and a greenhouse gas emission rate of about 7.54 kg of greenhouse gases globally making it lower in rank to soybean but still an essential vegetable oil in order to achieve good health and well-being of people.

Cotton seed comes in number five to the ranking. This vegetable oil is one of the lowest greenhouse gasses emitting vegetable oil as the cotton seed emits around 1.80 kg of greenhouse gases globally and provides 13 calories per person per day. This shows that cotton seed is an important vegetable oil in order to achieve the sustainable development goal number 3 good health and well-being of people. Up next at number 6 comes the sesame seed. The sesame seed emits 4.20 kg of greenhouse emissions per ton and has a food supply of 3.00 calories per person which helps in betterment of health and well-being of people.

At number seven comes the coconut oil which has the world's lowest greenhouse gas emission among all other vegetable oils in discussion of about 0.41 kg globally. As compared to food supply, 5.00 kilocalories per person per day are provided by coconut oil which makes coconut oil on seventh in the ranking of achieving the Sustainable Development Goal number 3 "good health and well-being" of the people.

Up at number 8 in achieving good health and well-being comes sunflower oil having a greenhouse gas emission rate of about 3.60 kg of greenhouse gases worldwide and a food supply of 39.00 kcal per person per day, but this vegetable oil is one of the greatest land consuming plants. The global land consumption per kg (m^2 per kg) for sunflower seed oil is 17.66.

At number 9 in achieving good health and well-being of people comes olives that emits around 5.40 kg of greenhouse gases globally which is lesser than other non-renewable energy sources,

and a food supply of daily calorie value of 9.00 calories per person which helps in improving the health of people.

At number 10 in achieving the good health and well-being of people comes poppy seed as poppy seed has a highest polyunsaturated fat content supply and a food supply of 0.88 calories per person per day which makes poppy seed's moderate contribution in achieving good health and well-being of people. Then comes mustard seed which has a greenhouse gas emissions per kg which is 2.9 globally and a food supply of 0.88 kilocalories per person per day. Up next come safflower oil the safflower seed oil emits about 2.40 kg of greenhouse gases and according to the food supply the daily calorie load of safflower seed oil is 0.88 calories per person.

Then comes linseed that supplies 18.00 calories per person per day which help in achieving the well-being and good health of people. Up next in achieving good health and well-being comes shea nut with a greenhouse gas emission of 3.14 kg per ton and a food supply of 0.88 calories per person per day. Next in achieving the SDG 3 good health and well-being is castor seed oil with having a Greenhouse gas emissions per kg of around 3.2 globally and food supply of castor seed oil gives 12.0 Kcal per capita per day, but having the highest water footprint makes castor seed oil a low contribution in good health and well-being.

After castor seed in achieving SDG 3 good health and wellbeing of people comes the hemp seed. Hemp seed oil has a calorie load of 10.00 per person per day which contributes a little in achieving SDG 3. After hemp seed comes the tung nut. The tung nut role is achieving SDG 3 is just as it has good saturated fats contents and polyunsaturated fats contents which makes tung nut a minor contributor in achieving the SDG 3. Then comes melon seed and at the last comes kapok fruit which has insignificant role in achieving the SDG 3.

SDG 6: CLEAN WATER AND SANITATION

The industry's environmental implications linked with the use of water and energy resources are among the most serious issues, necessitating the deployment of new solutions in line with Sustainable Development Goal 6 - Clean Water and Sanitation. Converting natural resources into development prospects while also meeting the requirements of future generations is currently a challenge. This is particularly true when it comes to the use of non-renewable resources to implement policies that promote the efficient use of both renewable and non-renewable energy sources. From the results we were able to obtain the ranking of contribution of each selected vegetable oils into SDG 6 that is shown in figure 6.

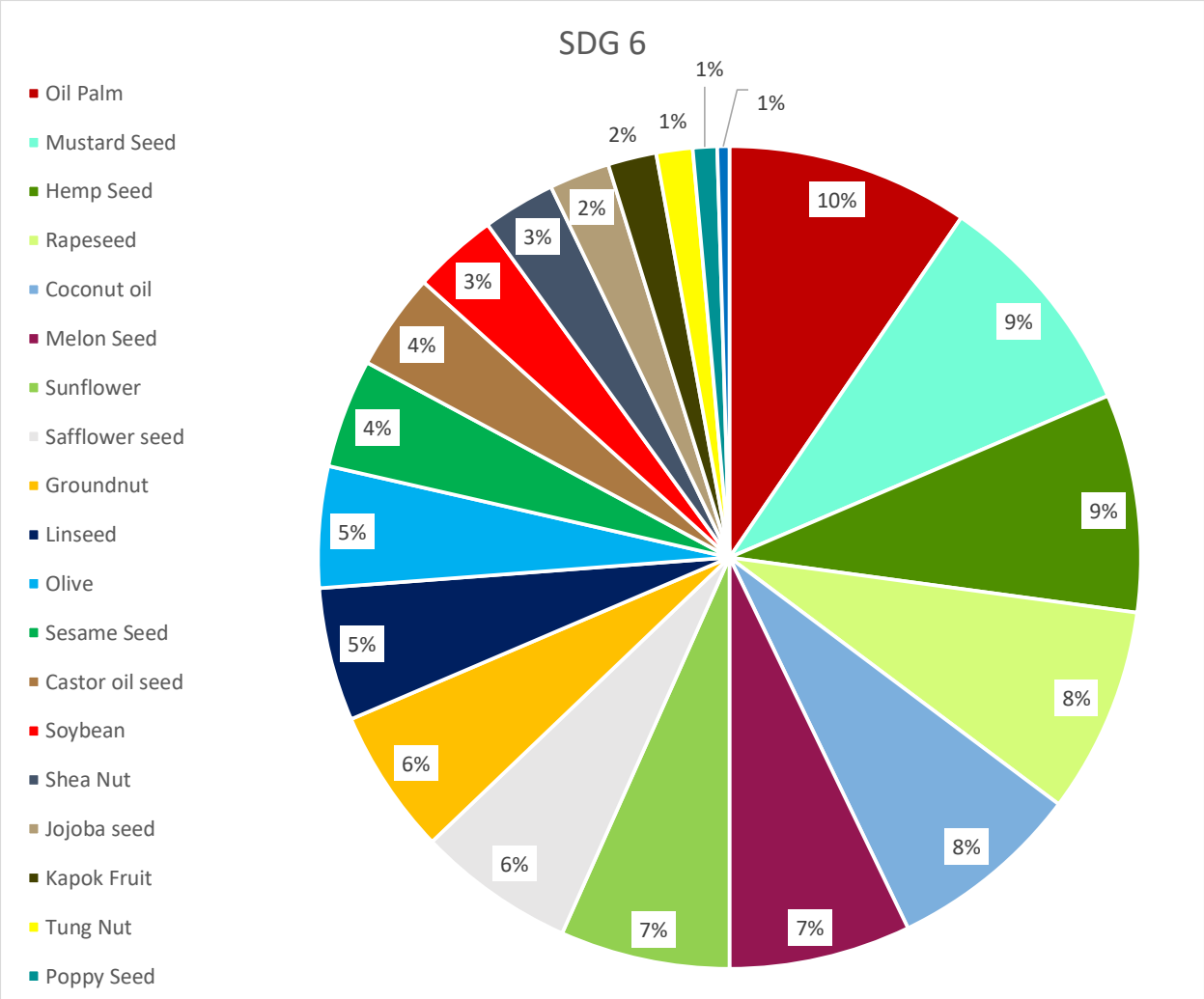


Figure 6: Contribution of vegetable oils into the SDG 6

One of the renewable energy resources are vegetable oils, and the most effective vegetable oil in regard to sustainable development goal number 6 clean water and sanitization is poppy seed. The water footprint shows the water requirement for a crop to be cultivated and in case of poppy seed it is the world's lowest water utilizing vegetable oil among the other vegetable oils in discussion.

Palm oil ranks number 1 in terms of meeting the sixth Sustainable Development Goal, clean water and sanitation, because it is one of the low-water-consuming plants with a low water footprint. palm oil has one of the world's smallest average water footprints. As a result, less fresh water is required to cultivate this vegetable oil, allowing more fresh water to be stored and available for human use. As a result, it contributes significantly to ensuring the supply of clean and fresh water, as well as sanitation.

Mustard oil as has one of the low-water-consuming plants, its water footprint is also low. Mustard seed has one of the lowest worldwide average water footprints (m^3 ton-1) at 2809 which

shows that this vegetable oil requires less amount of fresh water to be cultivated and more fresh water can be saved, and will be available for humans to consume. So, it significantly contributes in achieving the availability of clean and fresh water and sanitization.

Hemp seed oil is ranked third in terms of accomplishing the sustainable development objective number six, clean water and sanitization, because it is one of the low-water-consuming plants with a low water footprint. Hemp seed has one of the smallest average water footprints in the world, at 3,685 m^3 ton. Therefore, this vegetable oil takes less fresh water to cultivate, allowing for more fresh water to be preserved and available for human consumption. As a result, it makes a substantial contribution to ensuring the supply of clean and fresh water as well as sanitization.

Rapeseed oil is ranked 4th in terms of fulfilling the sustainable development objective number six, clean water and sanitization, because it is one of the low-water-consuming plants with a low water footprint. Rapeseed has one of the smallest average water footprints in the world, at 4,301 m^3 ton. As a result, this vegetable oil takes less fresh water to cultivate, allowing for more fresh water to be preserved and available for human consumption. As a result, it makes a major contribution to guaranteeing the availability of clean and fresh water along with sanitization.

As it is one of the low-water-consuming plants with a low water footprint, coconut oil is placed fifth in terms of achieving sustainable development objective number six, clean water and sanitization. With a water footprint of 4,490 m^3 ton, coconut oil has one of the smallest in the world. As a result, cultivating this vegetable oil requires less fresh water, allowing more fresh water to be conserved and available for human consumption. As a result, it contributes significantly to ensuring the availability of safe, fresh water as well as sanitization.

As it is one of the moderate-water-consuming plants with a low water footprint, melon seed oil ranks 6th in terms of accomplishing the sixth Sustainable Development Goal, clean water and sanitation. Melon seed oil has a moderate average water footprint of 5,184 m^3 ton. As a result, only moderate amounts of fresh water are required to cultivate this vegetable oil, allowing for more fresh water to be saved and made available for human consumption. As a result, it makes a substantial contribution to assuring the availability of clean and fresh water, as well as sanitation.

Sunflower seed oil ranks 7th in terms of achieving the sixth Sustainable Development Goal, clean water and sanitation, because it is one of the moderate-water-consuming plants with a moderate water footprint. The average water footprint of sunflower seed oil is 6,792 m^3 ton. As a result, cultivating this vegetable oil requires only moderate amounts of fresh water, enabling for more fresh water to be preserved and made accessible for human consumption. As a result, it contributes significantly to ensuring the supply of clean and fresh water, as well as sanitation.

Safflower seed oil ranks 8th in terms of achieving the sixth Sustainable Development Goal, clean water and sanitation, because it is one of the low-water-using plants with a low water footprint. The average water footprint of safflower seed oil is 7,221 m^3 ton. As a result, cultivating this vegetable oil requires only moderate amounts of fresh water, enabling for more fresh water to be preserved and made accessible for human consumption. As a result, it contributes significantly to the provision of safe and fresh water, as well as sanitation.

As it is one of the high-water-using plants with a slightly high-water footprint, Groundnut oil ranks 9th in terms of meeting the sixth Sustainable Development Goal, clean water and sanitation. Groundnut oil has an average water footprint of 7,529 m^3 ton. As a result, cultivating this vegetable oil necessitates a greater than average amount of fresh water, allowing for the preservation and accessibility of a modest amount of fresh water for human consumption. As a result, it typically contributes to the supply of safe, fresh water and sanitation.

Linseed oil ranks 10th in terms of reaching the sixth Sustainable Development Goal, clean water and sanitation, because it is one of the high-water-using plants with a slightly high-water footprint. Linseed oil has a large water footprint, at 9,415 m^3 ton. As a result, cultivating this vegetable oil requires more fresh water than usual, allowing for the preservation and accessibility of a modest amount of fresh water for human consumption. As a result, it contributes marginally to the provision of safe, fresh water and sanitation.

Since olive oil is one of the high-water-using plants with a slightly high-water footprint, it ranks 11 in terms of achieving the sixth Sustainable Development Goal, clean water and sanitation. With a water footprint of 14,726 m^3 ton, olive oil has a substantial environmental impact. As a result, growing this vegetable oil necessitates more fresh water than typical, allowing for the preservation and accessibility of a limited amount of fresh water for human consumption. As a result, it makes only a minor contribution to the provision of safe, clean water and sanitation.

Since it is one of the high-water-using plants with a high-water footprint, sesame seed oil ranks 12 in terms of achieving the sixth Sustainable Development Goal, clean water and sanitation. With a water footprint of 21,793 m^3 ton, sesame seed oil has a considerable environmental impact. As a result, growing this vegetable oil necessitates a large amount of fresh water. As a result, it makes only a minor contribution to the provision of safe, clean water and sanitation.

Castor seed oil has a huge water footprint, at 24,740 m^3 ton. Castor seed oil ranks 13 in terms of achieving the sixth Sustainable Development Goal, clean water and sanitation. As a result, growing this vegetable oil necessitates a large amount of fresh water. As a result, it makes a negligible contribution to the supply of safe, clean water and sanitation.

Other remaining vegetable soybean, shea nut, jojoba seed, kapok fruit, poppy seed are has high impact in achieving SDG 6 and tung nut has the one of highest water footprint. Moreover, the results shows that, the cotton seed oil has one of highest water footprint, around 233 billion cubic metres per year [10]

SDG 7: AFFORDABLE AND CLEAN ENERGY

SDG 7 Affordable and Clean Energy assures access to affordable, dependable, and sustainable energy, which is critical for accomplishing several of the SDGs – from poverty eradication to climate change mitigation through breakthroughs in health, education, water supply, and industrialization. Vegetable oil can play an essential role in achieving this sustainable development goal as these are renewable energy resources and can be used as bio diesel and they also have low greenhouse gas emission than non-renewable energy resources.

The most promising vegetable oil in this regard is palm oil as the palm oil has a great biodiesel productivity ratio of 4,736.00 litre per hectare globally and greenhouse gases emission rate of palm oil is 7.32 kg of greenhouse gas emissions globally, which makes it an ideal candidate to be used as a substitute to the conventional diesel as it has such high bio diesel productivity ratio and low greenhouse gas emission, which in the end supplies an affordable as it is a renewable energy resource and clean energy. The ranking of contribution of each selected vegetable oils into SDG 7 is shown in figure 7.

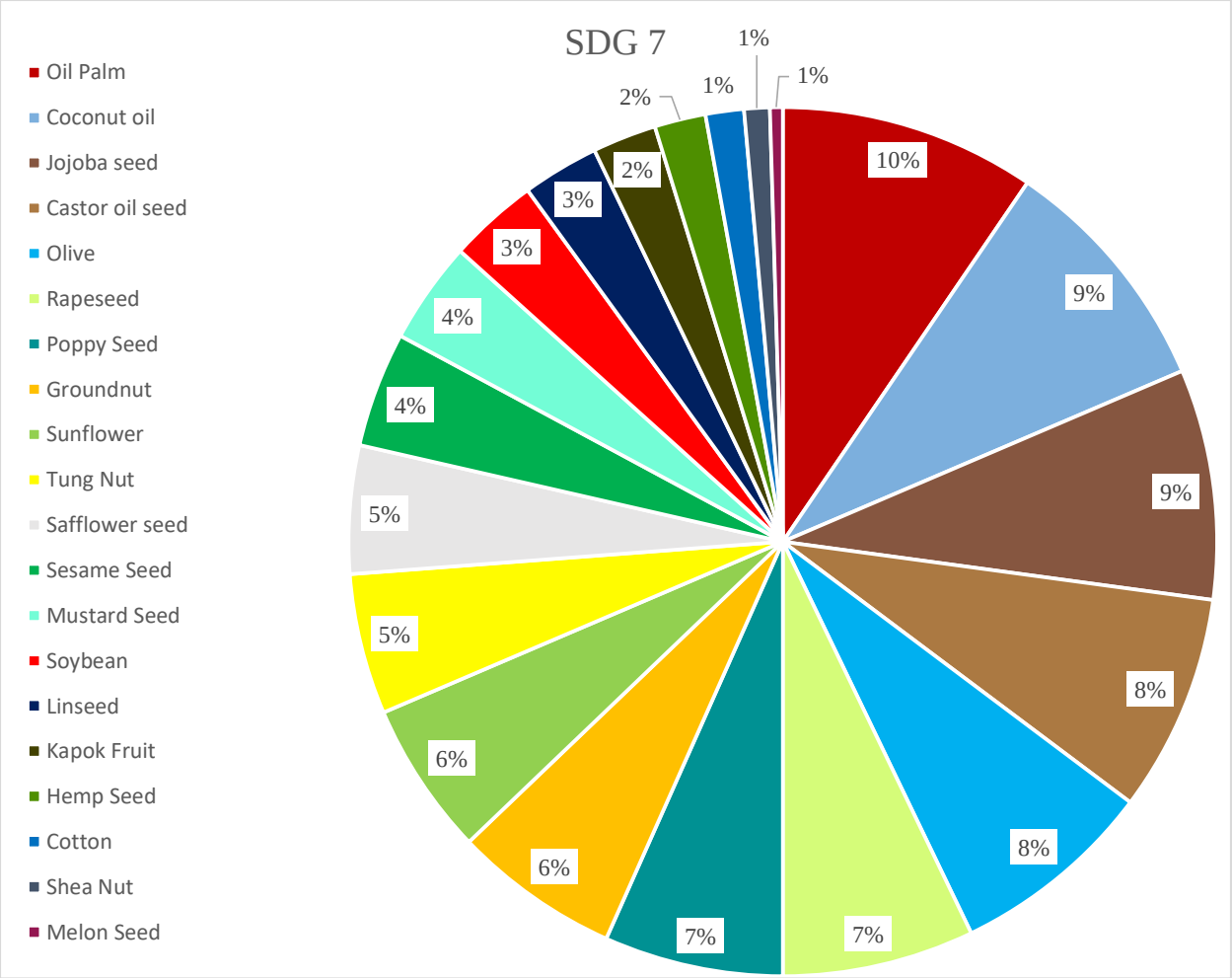


Figure 7: Contribution of vegetable oils into the SDG 7

Coconut oil ranks second in achieving SDG 7 because it has a high biodiesel productivity ratio of 2,689.00 litre per hectare globally and a low greenhouse gas emission rate of 0.41 kg of greenhouse gas emissions globally, making it an ideal candidate to be used as a substitute for conventional diesel because it has such a high biodiesel productivity ratio and low greenhouse gas emission rate, which helps in having a low environmental impact.

The jojoba seed oil has a good biodiesel productivity ratio of 1,818.00 litre per hectare globally, which makes it a good candidate to be used as a substitute for conventional diesel as it has such a high bio diesel productivity ratio, which helps in having affordable as it is a renewable energy resource and clean energy. Jojoba seed oil ranks third in achieving the affordable and clean energy SDG 7.

Castor seed oil ranks 4 in achieving SDG 7 because it has a high biodiesel productivity ratio of 1,413.00 litre per hectare globally and a low greenhouse gas emission rate of 3.2 kg of greenhouse gas emissions globally, making it important candidate to be used as a substitute for

conventional diesel because of its high biodiesel productivity ratio and low greenhouse gas emission rate, which helps in having a low environmental impact.

Olive oil ranks 5 in achieving SDG 7 because it has a high biodiesel productivity ratio of 1,212.00 litre per hectare globally and a low greenhouse gas emission rate of 5.40 kg of greenhouse gas emissions globally, making it a good source to be used as a substitute for conventional diesel because of its high biodiesel productivity ratio and low greenhouse gas emission rate, which helps to have a low environmental influence.

Rapeseed oil is ranked 6 in terms of achieving SDG 7. because it has a high biodiesel productivity ratio of 1,190.00 litre per hectare globally and a low greenhouse gas emission rate of 3.77 kg, making it a good candidate to be used as a substitute for conventional diesel because of its high biodiesel productivity ratio and low greenhouse gas emission rate, which contributes to a low environmental impact.

Poppy seed oil ranks 7 in terms of fulfilling SDG 7 (affordable and clean energy). Poppy seed oil has a good biodiesel productivity ratio of 1,163.00 litre per hectare globally, making it a good candidate to be utilized as a substitute for conventional diesel. As a renewable energy resource and clean energy, it contributes to affordability.

Since it has a high biodiesel productivity ratio of 1,059.00 litre per hectare globally and a low greenhouse gas emission rate of 3.60 kg, Groundnut oil is ranked 8 in terms of attaining SDG 7. because of its high biodiesel productivity ratio and low greenhouse gas emission rate, it has a low environmental impact.

Sunflower oil is ranked 9 in terms of achieving SDG 7 because it has a high biodiesel productivity ratio of 952.00 litre per hectare globally and a low greenhouse gas emission rate of 7.54 kg. It has a low environmental impact due to its high biodiesel productivity ratio and low greenhouse gas emission rate.

Tung nut oil ranks tenth in terms of meeting SDG 7 (Affordable and clean energy). Tung nut oil has a moderate biodiesel productivity ratio of 940.00 litre per hectare worldwide, making it an average option for use as a substitute for conventional diesel. It contributes to affordability as a renewable energy resource and clean energy.

As it has a moderate biodiesel productivity ratio of 779.00 litre per hectare globally and a low greenhouse gas emission rate of 2.40 kg, safflower seed oil is ranked 11 in terms of attaining SDG 7 because of its moderate biodiesel productivity ratio and low greenhouse gas emission rate. It has a low environmental impact.

Sesame seed oil is ranked 12 in terms of achieving SDG 7 because it has a moderate biodiesel productivity ratio of 696.00 litre per hectare globally and a low greenhouse gas emission rate of 4.20 kg. It has a modest environmental impact due to its moderate biodiesel productivity ratio and low greenhouse gas emission rate.

Mustard seed oil is ranked 13 in terms of achieving SDG 7 because it has a moderate biodiesel productivity ratio of 572.0 litre per hectare globally and a low greenhouse gas emission rate of 2.9 kg. It has a low environmental impact due to its low biodiesel productivity ratio and low greenhouse gas emission rate.

Even though it has a moderate biodiesel productivity ratio of 552.00 litre per hectare globally and a low greenhouse gas emission rate of 6.32 kg, soybean oil is ranked 14 in terms of attaining SDG 7. Due to its low biodiesel productivity ratio and low greenhouse gas emission rate, it has a minimal environmental impact.

Linseed oil comes in 15th place in ranking when it comes to achieving SDG 7 (Affordable and clean energy). Linseed oil has a low global biodiesel productivity ratio of 478.00 litre per hectare, making it a minor choice for use as a diesel alternative. As a renewable energy resource and clean energy, it contributes to affordability.

In terms of meeting SDG 7, kapok fruit oil is ranked 16th (Affordable and clean energy). Kapok fruit oil has a low global biodiesel productivity ratio of 450 litre per hectare, making it a marginal choice for usage as a diesel alternative. As a renewable energy resource and clean energy, it contributes to affordability.

In terms of satisfying SDG 7, hemp seed oil ranks 17th (Affordable and clean energy). Hemp seed oil has a poor biodiesel productivity ratio of 363.00 litre per acre worldwide, making it a small alternative to conventional diesel. As a renewable energy resource and clean energy, it contributes to affordability.

Despite having a moderate worldwide biodiesel production ratio of 325.00 litre per hectare and a low greenhouse gas emission rate of 1.80 kg, cotton oil is placed 18th in terms of meeting SDG 7. Shea nut ranked 19th as it has low bio diesel productive ratio of about 50 litre per hector and a low greenhouse gas emission of 3.14 kg globally. Melon seed ranks last at 20th position because it has negligible biodiesel productive ratio.

Conventional economic development analysis has thus far focused on the conditions and forces those emerging economies are unable to meet. As a result, analysis of such factors in the context of least developed or emerging countries will frequently be incomplete and, in some cases, detrimental. Despite the fact that the laws of classical and developing economies appear to be broken in the least developed and developing economies. Lessons from neoclassical economics to improve development in their own way success using such an approach necessitates a more in-depth examination of socioeconomic issues. The percentage of the support of each selected vegetable oils into SDG 8 is shown in figure 8. The results shows that the jojoba seed could play a major role in achieving the SDG 8, whereby it ranked has number one in our ranking.

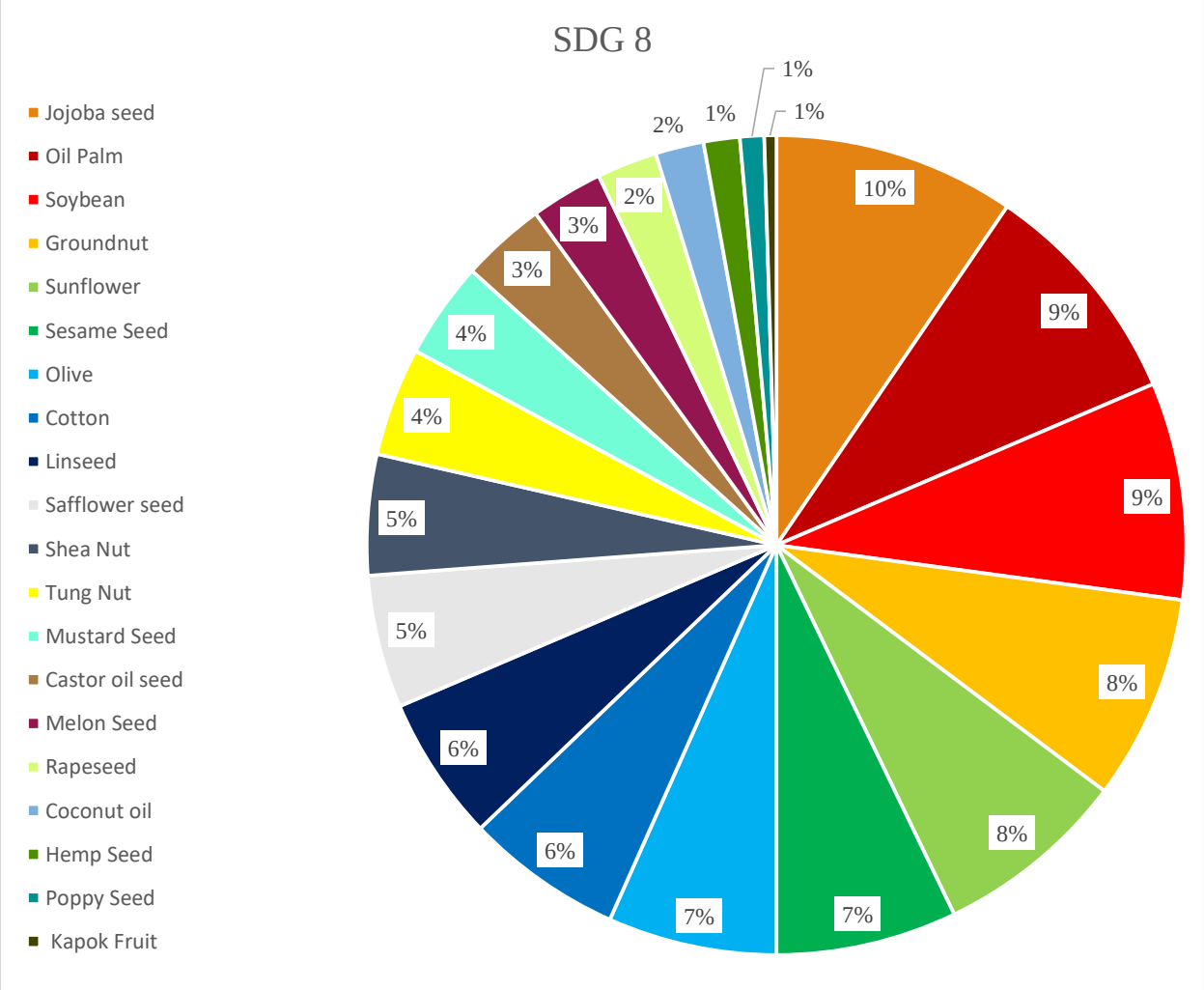


Figure 8: Contribution of vegetable oils into the SDG 9

In sight of vegetable oils, the most iconic vegetable oil that plays a vital role in order to achieve sustainable development goal number 8 “Decent Work and Economic Growth” is palm oil. Palm oil is the vegetable oil that creates about 750,000 jobs in Indonesia due to its high biodiesel productivity more industries are interested to invest and utilize this renewable energy resource as a fuel. Apart from that, palm oil is also important for smallholder. It provides support to 2,600,000 smallholder farmers in Indonesia. By great biodiesel productivity and high jobs creation ratio, Indonesia's GDP climbed by 3.5 percent which improves the economy. Palm oil is one of the stable sources to achieve the sustainable development goal number 8 which is decent work and economic growth.

Soybean is ranked at number 3 in achieving the sustainable development goal number 8 “Decent Work and Economic Growth” because it is the vegetable oil that is responsible of significant 21.9 percent growth to Brazil's GDP, which improves the economy and decrease the inflation and increment in GDP improves the employment ratio more jobs are created and soybean supports 216,000 small-scale farmers. By which, it is significantly contributing in the 8th SDG that is Decent Work and Economic Growth.

Groundnut is ranked at number 4 in achieving the sustainable development goal number 8 “Decent Work and Economic Growth” as this vegetable oil has a great bio diesel productivity ratio of about 1,059.00 litre per hectare globally. Good renewable energy resource for bio diesel will replace the diesel in diesel engines and diesel power houses in different industries which will increase the production ratio that will increase the economy as well as more production, will put a demand for more employment hence achieving the SDG 8 decent work and economic growth.

Sunflower oil is placed fourth in terms of attaining the eighth Sustainable Development Goal, "Decent Work and Economic Growth." Sunflower oil has a strong bio diesel productivity ratio of roughly 952.00 litre per acre globally, contributing 3.17 percent of Ukraine's GDP and helping the economy. In several industries, a good renewable energy supply for bio diesel will replace diesel in engines and power plants. As a result, the output ratio will rise, boosting the economy and creating more jobs. As a result, SDG 8 (Decent Work and Economic Growth) will be achieved.

Sesame seed oil is placed 6th in accomplishing Goal 8 of the Sustainable Development Goals, "Decent Work and Economic Growth." Sesame seed oil has a high bio diesel productivity ratio of 696.00 litre per acre over the world. In several industries, a good renewable energy supply for bio diesel will replace diesel in diesel engines and diesel power plants. This will raise the production ratio, hence increasing the economy, as more production will result in a desire for more jobs. As a result, the SDG 8 goal of decent work and economic growth will be met.

In achieving Goal 8 of the Sustainable Development Goals, "Decent Work and Economic Growth," olive oil ranks 7th. Over the world, olive oil has a high bio diesel productivity ratio of 1,212.00 litre per hectare. A good renewable energy supply for bio diesel will replace diesel in diesel engines and diesel power plants in various industries. This will increase the production ratio, and thus the economy, because increased production will lead to a desire for additional jobs. As a result, the aim of decent work and economic growth set forth in SDG 8 will be achieved.

Cotton seed oil ranks 8th in the Sustainable Development Goals' "Decent Work and Economic Growth" category. Cotton seed oil has a world-leading bio diesel production ratio of 325.00 litre per acre. Bio diesel will replace diesel in diesel engines and diesel power plants in various industries with a little renewable energy supply. Cotton seed oil contains a high percentage of saturated and polyunsaturated fats, allowing farmers to earn money and work independently. This will increase the production ratio and, as a result, the economy, because increased production will lead to a desire for additional jobs. The SDG 8 target of decent work and economic growth will be achieved as a result.

Linseed oil is ranked number 9th in the Sustainable Development Goals' "Decent Work and Economic Growth" category. Over the world, linseed oil has a high bio diesel productivity ratio of 478.00 litre per acre. A modest renewable energy supply for bio diesel will replace diesel in diesel engines and diesel power plants in numerous industries. Linseed oil has an 18.00 calorie per person daily calorie value. This will increase the production ratio, and thus the economy, because increased production will lead to a desire for additional jobs. As a result, the aim of decent work and economic growth set forth in SDG 8 will be achieved.

Goal 8 of the Sustainable Development Goals, "Decent Work and Economic Growth," is where safflower seed oil comes in at number 10th. Around the world, safflower seed oil has a high bio diesel productivity ratio of 779.00 litre per acre. Bio diesel will replace diesel in diesel engines and diesel power plants in various industries with a little renewable energy supply. Safflower Seed has a high ratio of saturated and polyunsaturated fats, allowing farmers to earn money and be self-sufficient. This will increase the production ratio and, as a result, the economy, because increased production will lead to a desire for additional jobs. The SDG 8 target of decent work and economic growth will be achieved as a result.

Goal 8 of the Sustainable Development Goals, "Decent Work and Economic Growth," is where shea nut oil comes in at number 11. Farmers can earn money and operate independently because shea nuts have a high amount of saturated fats. This will increase the production ratio, and thus the economy, because increased production will lead to a desire for additional jobs. As a result, the aim of decent work and economic growth set forth in SDG 8 will be achieved.

Goal 8 of the Sustainable Development Goals, "Decent Work and Economic Growth," is where tung nut oil comes in at number 12. Tung Nut has a high percentage of saturated fats (20.17 g per 100 g) and the highest amount of polyunsaturated fats (41.37 per 100 g), which allows farmers to earn money and work autonomously. This will increase the production ratio, and thus the economy, because increased production will lead to a desire for additional jobs. As a result, the aim of decent work and economic growth set forth in SDG 8 will be achieved.

Then comes mustard seed at 13th having fewer fat contents, then castor seed oil at 13th with low saturated and polyunsaturated fat contents then mustard seed then comes melon seed at 14th, rapeseed at 15th, coconut seed at 16th, hemp seed at 17th, poppy seed at 18th, and the least to participate in achieving the SDG 8 is Kapok fruit.

The SDG 12 represent the consumption of production purposed resource as in over report are vegetable oil and in order to achieve this SDG. The highest ranked vegetable oil in our list is rapeseed. The greenhouse gas emission of just 3.77 kg globally makes the rapeseed. A biodiesel productivity ratio of rapeseed is about 1,190.00 litre per hectare globally. Which makes rapeseed a best vegetable oil to be cultivated and consume on the other hand rapeseed oil has a global land usage per kg (m^2 per kg) of 10.63. All these properties make a significant contribution in achieving the SDG number 12 Responsible consumption and production. The ranking of the contribution of each selected vegetable oils into SDG 12 is shown in figure 9.

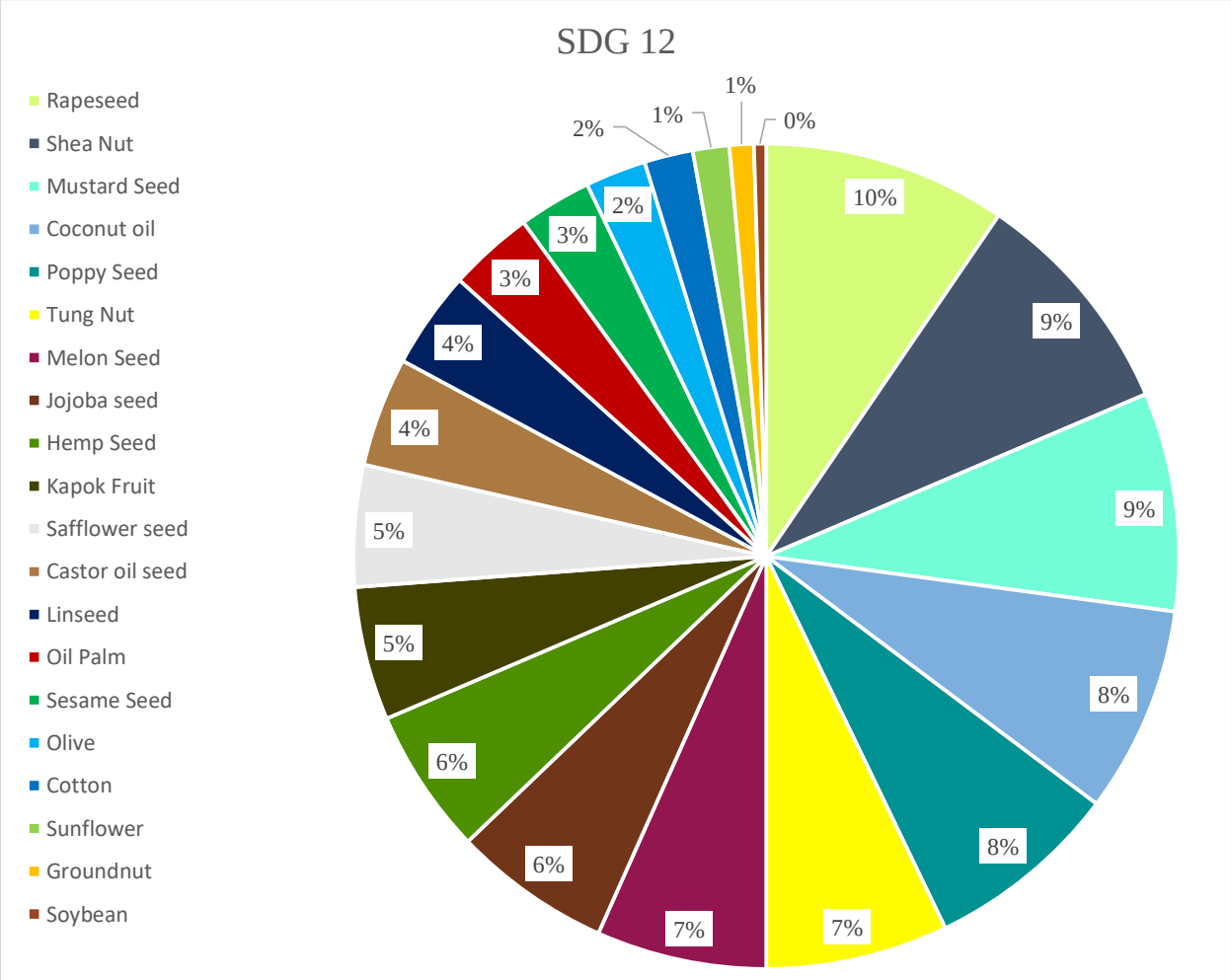


Figure 9: Contribution of vegetable oils into the SDG 12

Shea nut comes in second place in terms of accomplishing SDG 12. Shea nut is a simple to use, environmentally friendly renewable energy supply because it emits just 3.14 kg of greenhouse gases globally. Shea nut biodiesel productivity ratio is around 50.00 litre per acre globally, with high saturated fat content. As a result, the Shea nut is the greatest vegetable oil to cultivate. All

of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

In accomplishing SDG 12, mustard seed is rated third. Mustard seed is a simple and environmentally friendly consumable renewable energy resource because it emits only 2.9 kg of greenhouse gas globally. Mustard seed has a global biodiesel productivity ratio of around 572.0 litre per hectare and contains both saturated and polyunsaturated fats. As a result, mustard seed is one of the greatest vegetable oils to grow. All of these characteristics help to achieve SDG 12: Responsible Consumption and Production.

In terms of accomplishing SDG 12, coconut oil rated fourth. The coconut oil is an easy to utilize, environmentally benign renewable energy resource because it emits only 0.41 kg of greenhouse gases globally. The global biodiesel productivity ratio of mustard seed is roughly 2,689.00 litre per hectare, with high saturated content. As a result, coconut oil is the greatest vegetable oil to plant. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

In terms of accomplishing SDG 12, Poppy seed is rated fifth. The poppy Seed is a simple to utilize, environmentally acceptable renewable energy resource because it emits only minimal amounts of greenhouse gases globally. Poppy seed has a global biodiesel productivity ratio of roughly 1,163.00 litre per hectare and contains both saturated and polyunsaturated fats. As a result, Poppy seed is the good vegetable oil to cultivate. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

Tung Nut is ranked 6th in the world in terms of accomplishing SDG 12. The Tung Nut is an easy to use, environmentally friendly renewable energy resource because it emits just minimal amounts of greenhouse gases globally. Mustard seed has a global biodiesel productivity ratio of roughly 940.00 litre per hectare and contains both saturated and polyunsaturated fats. As a result, Tung Nut is a good vegetable oil to cultivate. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

Melon Seed Oil is in seventh place in terms of achieving SDG 12. Melon Seed oil has a daily calorie content of 34.00 kcal per person and the existence of healthy saturated and polyunsaturated fats. As a result, Melon Seed oil is a wonderful vegetable oil to grow and consume. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

In terms of attaining SDG 12, jojoba seed oil is rated 8^{th}. The global biodiesel production ratio of jojoba seed is around 1,818.00 litre which makes jojoba seed oil a good vegetable oil to be cultivate and consume. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible Consumption and Production.

In terms of reaching SDG 12, hemp seed oil is rated 9th. Hemp seed has a global biodiesel productivity ratio of around 363.00 litre and contains a healthy amount of saturated and polyunsaturated fat. As a result, hemp seed oil is an excellent vegetable oil to grow and consume. All of these characteristics contribute significantly to the achievement of SDG 12: Responsible

Consumption and Production. Then comes kapok fruit at 10th safflower seed at 11th ,castor oil at 12th, linseed at 13th, palm oil at 14th, sesame seed at 15th, olive at 16th,cotton seed at 17th, sunflower seed at 18th, Groundnut seed at 19th, and the least important seed in achieving the SDG 12 Responsible consumption and production is soybean seed.

SDG 13: CLIMATE ACTION

The SDG 13 is linked to greenhouse gas emissions and climate change caused by many sorts of pollutants that harm the air and environment. Air pollution and climatic disruption are caused by the usage of non-renewable energy resources. Using vegetable oils as a sustainable energy source could help to reduce air pollution and avoid climate change. From the results figure 10 shows ranking of the contribution of each selected vegetable oils into SDG 11.

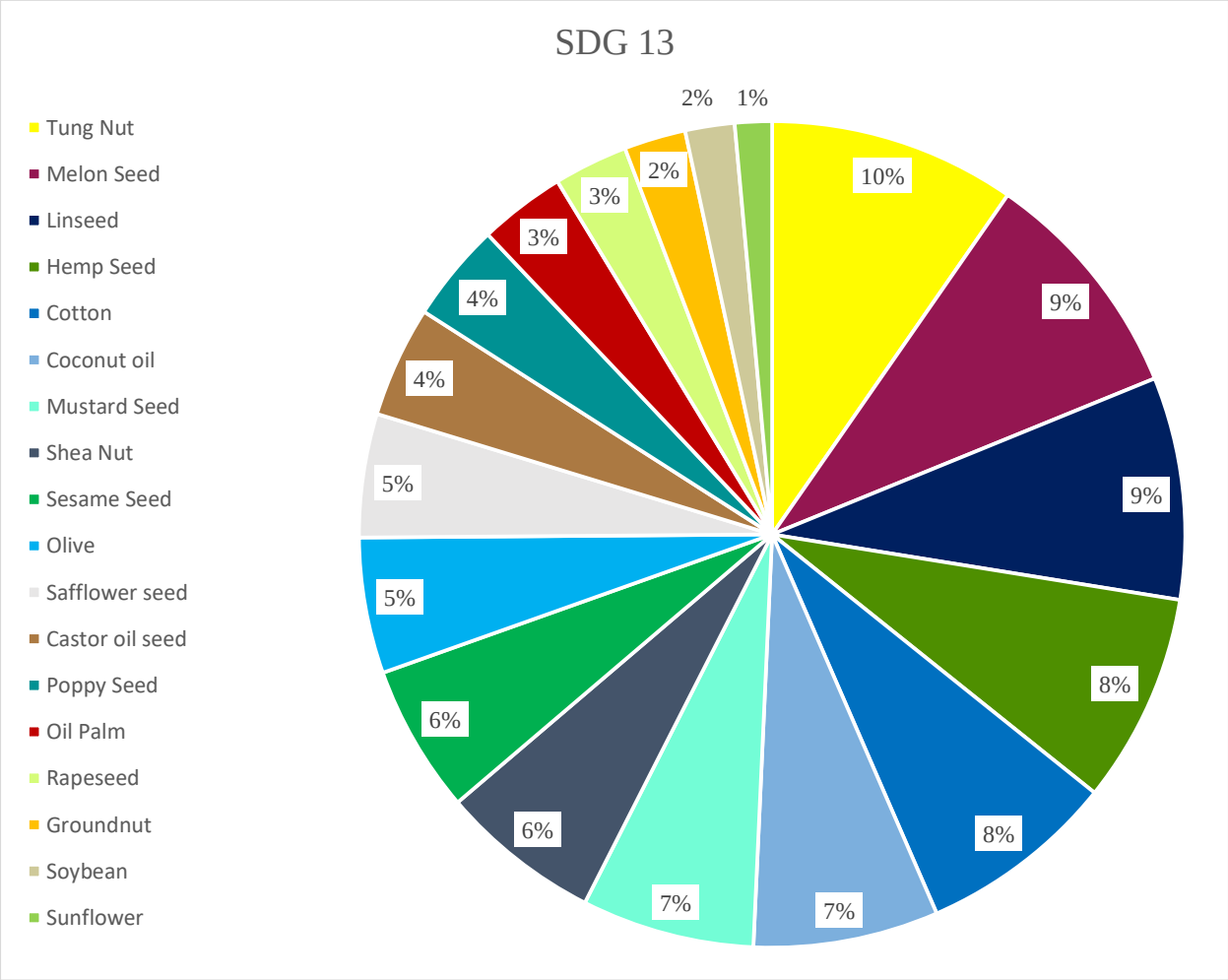


Figure 10: Contribution of vegetable oils into the SDG 13

The vegetable oil that contributes most in the climate action is tung nut as this vegetable oil emits almost insignificant amount of greenhouse gases which plays a vital role in preventing the atmosphere to

get polluted and tung nut oil converts to biodiesel with an average productivity. Tung Nut oil yields 940.00 litre per hectare globally. Hence, tung nut is an ideal renewable energy resource that can be utilize in order to achieve the Sustainable Development Goal number 13 and prevent the climatic disturbances.

The melon seed ranks 2nd in achieving the sustainable development goal number 13 “Climate Action” as the melon seed after tung nut emits the lowest greenhouse gases, and as well as the bio diesel productive ratio of melon seed is also good. Therefore, it is one of the best vegetable oils that prevent the atmospheric pollution and as well as climatic disturbances.

The linseed is ranked 3rd in terms of accomplishing Sustainable Development Goal 13: "Climate Action." Linseed, after melon seed, produces the least amount of greenhouse gases, and its bio diesel productive ratio is 478.00 gallons per hectare, making this a good vegetable oil for preventing pollution and climatic disruptions.

The hemp seed is ranked 4th in terms of meeting Sustainable Development Goal 13: "Climate Action." Hemp seed, after linseed, produces the least amount of greenhouse gases, and its bio diesel productive ratio is 363.00 litre per hectare, making it an excellent vegetable oil for preventing pollution and climatic disruptions.

In terms of addressing Sustainable Development Goal 13: "Climate Action," the cotton seed is placed 5th. Cotton seed produces the least quantity of greenhouse gases (1.80 kg) globally, and its bio diesel productivity ratio is 325.00 litre per hectare, making it an ideal vegetable oil for reducing pollution and climatic disruptions.

In terms of achieving Sustainable Development Goal 13: "Climate Action," coconut oil is placed 6th. With a global average of 0.41, coconut oil produces the least amount of greenhouse emissions, and its bio diesel productive ratio is 2,689.00 litre per hectare, making it an outstanding vegetable oil for reducing pollution and climatic disruptions.

The Mustard seed is ranked 7th in terms of achieving Sustainable Development Goal 13: "Climate Action." Mustard seed emits the fewest greenhouse emissions, averaging 2.9 kg per hectare, and has a bio diesel productive ratio of 572.0 litre per hectare, making it an excellent vegetable oil for decreasing pollution and climate disruption.

The Shea Nut ranks 8th in terms of achieving Sustainable Development Goal 13: "Climate Action." Shea Nut produces the least amount of greenhouse emissions (3.14 kg per hectare on average) and has a bio diesel productive ratio of 50.00 litre per hectare, making it a moderate vegetable oil for decreasing pollution and climate disruption. After shea nut the vegetable oil that contributes in achieving SDG 13 are sesame seed, olives, safflower seed, castor oil seed, poppy seed, palm oil, rapeseed, groundnut, soybean and sunflower the least contributing vegetable oil is sunflower oil respectively.

The life on land component of Sustainable Development Goal 15 is concerned with the quality of life that living beings experience and how to improve it. Examining the vegetable oils and how they are capable of achieving this SDG 15 is discussed further. The most important vegetable oil in achieving this sustainable development goal number 15 is jojoba seed oil as jojoba seed oil contributes in economy by a good biodiesel productive ratio of about 1,818.00 litre per hectare, which means that boosting the economy the inflation rate will drop and by low inflation the poverty will reduce and the life of a normal person will be improved. Hence, it plays an essential role in improving the life on land.

Tung nut oil came in second place in terms of achieving the 15th Sustainable Development Goal. Tung nut oil contributes to the economy by producing a high amount of biodiesel (about 940.00 litre per acre), which means that by growing the economy, the inflation rate will fall, and low inflation will reduce poverty and enhance the lives of ordinary people. As a result, it is critical to increase the quality of life on land.

Linseed oil came in third place in terms of achieving the 15th Sustainable Development Goal. Linseed oil contributes to the economy by producing 478.00 gallons of biodiesel per hectare, which means that by growing the economy, the inflation rate will fall, and low inflation will reduce poverty and enhance the lives of ordinary people. As a result, it is critical to increase the quality of life on land.

In terms of reaching the 15th Sustainable Development Goal, hemp seed oil came in 4^{th}. Hemp seed oil produces 363.00 gallons of biodiesel per hectare, which helps the economy. That is, when the economy grows, the inflation rate falls, and low inflation reduces poverty and improves the lives of regular people. As a result, improving the quality of life on land is vital.

Cotton seed oil came in 5^{th} in terms of achieving the 15th Sustainable Development Goal. Cotton seed oil yields 325.00 gallons of biodiesel per hectare, which is beneficial to the economy. That is, as the economy increases, so does the rate of inflation, and low inflation reduces poverty and improves people's lives. As a result, it is critical to improve the quality of life on land.

In terms of reaching the 15th Sustainable Development Goal, coconut oil came in 6^{th}. Coconut oil produces 2,689.00 gallons of biodiesel per hectare, which is economically helpful. That is, as the economy grows, so does the rate of inflation, and low inflation helps individuals live better lives. As a result, improving the quality of life on land is vital.

Mustard seed oil came ranked 7^{th} in terms of achieving the 15th Sustainable Development Goal. Mustard seed yields 572.0 gallons of biodiesel per hectare, making it a cost-effective option. In other words, as the economy increases, so does inflation, and low inflation allows people to enjoy better lives. As a result, it is critical to improve the quality of life on land.

In terms of reaching the 15th Sustainable Development Goal, shea nut oil came in 8^{th}. Shea Nut produces 50.00 litre of biodiesel per acre, making it an economical choice. inflation rises in

tandem with the economy, and low inflation allows individuals to live better lives. As a result, improving the quality of life on land is vital. Next in list comes sesame seed, olives, safflower seed, castor oil seed, poppy seed, palm oil, rapeseed, groundnut, and soybean the least effective vegetable oil in achieving the sustainable development goal number 15 “life on land” is sunflower respectively. The ranking of the contribution of each selected vegetable oils into SDG 15 is shown in figure 11.

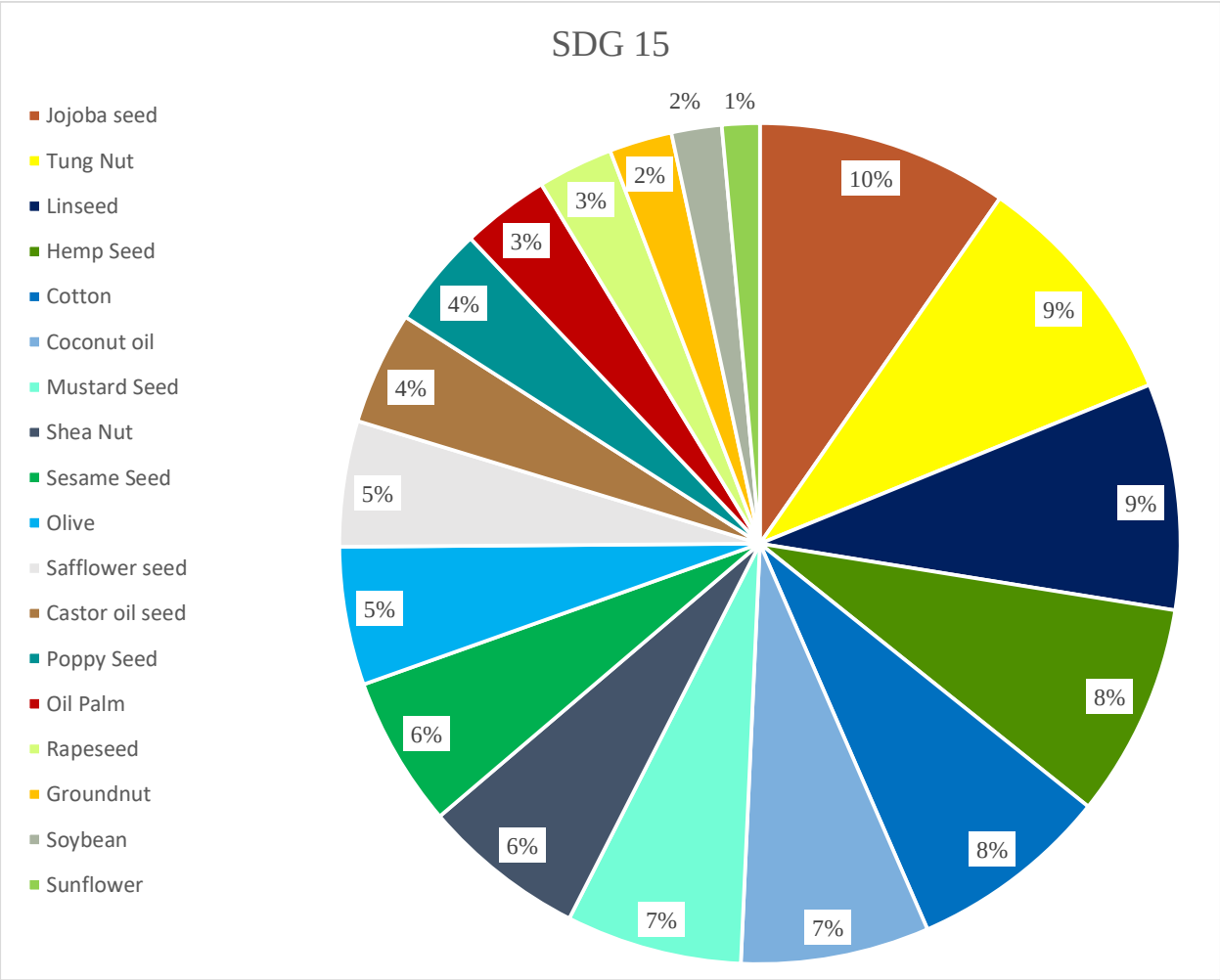


Figure 11: Contribution of vegetable oils into the SDG 15

CONCLUSION

Vegetable oils can play an important role in providing biodiesel, good protein and polyunsaturated fats supply, as well as reducing greenhouse gas emissions, creating new jobs, and increasing GDP. In addition, the vegetable oils could play a major role in achieving the Sustainable Development Goals (SDGs). In this report a list of indicators was proposed and used to measure the contribution of the vegetable oil into the SDGs. The results of this measurement are shown in the below table. While the results show that the palm oil to be the best vegetable oil for achieving practically all of the SDGS, as well as the indicators to back it up. This does not mean that oil palm has higher contribution all SDGs because, as shown within this report, the contribution is different between SDGs.

This report started by presenting the individual role of the selected vegetable oils into the SDGs then the report uses proposed indicators to measure this role. Then, the report by providing a ranking of the selected vegetable oils into the SDGs using the proposed. Finally, the report ends up with proposing recommendations to improve the contribution into the vegetable oils into the SDGs.

Contribution of vegetable oils into the SDGs

Ranking	SDG 1	SDG 2	SDG 3	SDG 6	SDG 7
1	Oil Palm	Rapeseed	Rapeseed	Oil Palm	Oil Palm
2	Soybean	Oil Palm	Oil Palm	Mustard Seed	Coconut oil
3	Groundnut	Soybean	Soybean	Hemp Seed	Jojoba seed
4	Sunflower	Groundnut	Groundnut	Rapeseed	Castor oil seed
5	Sesame Seed	Cotton	Cotton	Coconut oil	Olive
6	Olive	Sesame Seed	Sesame Seed	Melon Seed	Rapeseed
7	Cotton	Coconut oil	Coconut oil	Sunflower	Poppy Seed
8	Linseed	Sunflower	Sunflower	Safflower seed	Groundnut
9	Safflower seed	Olive	Olive	Groundnut	Sunflower
10	Shea Nut	Poppy Seed	Poppy Seed	Linseed	Tung Nut
11	Tung Nut	Mustard Seed	Mustard Seed	Olive	Safflower seed
12	Mustard Seed	Safflower seed	Safflower seed	Sesame Seed	Sesame Seed
13	Castor oil seed	Linseed	Linseed	Castor oil seed	Mustard Seed
14	Melon Seed	Shea Nut	Shea Nut	Soybean	Soybean
15	Rapeseed	Castor oil seed	Castor oil seed	Shea Nut	Linseed
16	Coconut oil	Hemp Seed	Hemp Seed	Jojoba seed	Kapok Fruit

17	Hemp Seed	Tung Nut	Tung Nut	Kapok Fruit	Hemp Seed
18	Poppy Seed	Melon Seed	Melon Seed	Tung Nut	Cotton
19	Kapok Fruit	Kapok Fruit	Kapok Fruit	Poppy Seed	Shea Nut
20	Jojoba seed, data is not available	Jojoba seed, data is not available	Jojoba seed, data is not available	Cotton	Melon Seed
Ranking	SDG 8	SDG 12	SDG 13	SDG 15	Overall contribution
1	Jojoba seed	Rapeseed	Tung Nut	Jojoba seed	Oil Palm
2	Oil Palm	Shea Nut	Melon Seed	Tung Nut	Coconut oil
3	Soybean	Mustard Seed	Linseed	Linseed	Cotton
4	Groundnut	Coconut oil	Hemp Seed	Hemp Seed	Rapeseed
5	Sunflower	Poppy Seed	Cotton	Cotton	Mustard Seed
6	Sesame Seed	Tung Nut	Coconut oil	Coconut oil	Sesame Seed
7	Olive	Melon Seed	Mustard Seed	Mustard Seed	Olive
8	Cotton	Jojoba seed	Shea Nut	Shea Nut	Groundnut
9	Linseed	Hemp Seed	Sesame Seed	Sesame Seed	Linseed
10	Safflower seed	Kapok Fruit	Olive	Olive	Soybean
11	Shea Nut	Safflower seed	Safflower seed	Safflower seed	Tung Nut
12	Tung Nut	Castor oil seed	Castor oil seed	Castor oil seed	Poppy Seed
13	Mustard Seed	Linseed	Poppy Seed	Poppy Seed	Sunflower
14	Castor oil seed	Oil Palm	Oil Palm	Oil Palm	Safflower seed
15	Melon Seed	Sesame Seed	Rapeseed	Rapeseed	Shea Nut
16	Rapeseed	Olive	Groundnut	Groundnut	Hemp Seed
17	Coconut oil	Cotton	Soybean	Soybean	Castor oil seed
18	Hemp Seed	Sunflower	Sunflower	Sunflower	Melon Seed
19	Poppy Seed	Groundnut	Jojoba seed, data is not available	Kapok Fruit, data is not available	Jojoba seed
20	Kapok Fruit	Soybean	Kapok Fruit, data is not available	Melon Seed, data is not available	Kapok Fruit

RECOMMENDATIONS

Based on the analysis provided in this report, the following recommendation proposed to increase the contribution of the vegetable oil into the SDGs and into the three pillars of sustainable development

- **Promoting policy making process on sustainability based on international agreed framework, particularly the 2030 Agenda for Sustainable Development and its SDGs.**
  - This report has shown that vegetable oils play a significant role in achieving SDGs. Considering the inevitable growth of vegetable oils demand, it becomes our common responsibility to ensure sustainable production and supply of vegetable oils to the world market. As such, productivity level of each type vegetable oils and the land required for its production becomes crucial as we need to safeguard global land bank areas for the production of vegetable oils. The core issue of safeguarding our global land bank while maintaining productivity of vegetable oils should be the concern of all countries involved and therefore requires a sustainability framework that is internationally agreed upon.

- **Encouraging a balanced and holistic approach in sustainability by focusing on three dimensions of sustainable development, namely social, economic and environment.**
  - This report has shown that each vegetable oils have their own strength where some have contributed significantly in the economic and social aspect through food and protein supply and job creation. On the other hand, there are other vegetable oils that have contributed significantly in the environmental aspect through water use efficiency and greenhouse gas emission. Therefore, assessing sustainability through SDGs will provide a balanced and holistic approach where sustainable vegetable oils is not merely seen from a one-sided environmental aspect, but also include social and economic dimensions into the equation, such as poverty eradication, creation of jobs and decent work especially for smallholder farmers, as well as contribution to global food supply and production.

- **Promoting inclusivity in developing sustainability framework of vegetable oils for both consumers and producers.**
  - This report has shown that consumption of vegetable oils has been increasing steadily from 2012/13 to 2020/21. Further, looking at the trend of the growing number of global populations, it is predicted that the trend will reach another peak point in 2030 where vegetable oils demand could increase in the range of 60 mn tons between now and 2030. On the other hand, the data also shows that the production of vegetable oils has benefited many people through job creation and for smallholder farmers. Therefore, both the consumers and producers share the same concern to ensure the sustainability of the production of vegetable oils. In this light, developing sustainability framework must be inclusive and take all stakeholders into account.

- **Strengthening partnership to advance sustainable vegetable oils, including but not limited to capacity building, transfer of technology, and transfer of knowledge in developing and producing the sustainable vegetable oils and its entire global value chain.**
    - The report has shown that various stakeholders benefited from the production of vegetable oils, such as the retailers and consumers because of its versatile use in many consumer products, and the smallholders for it provides them a source of income. However, although having gone through comprehensive review, this report did not find enough data for partnership from the governments or other bodies for each vegetable oils, which supposedly should be the indicator for SDGs no 17. Therefore, taking into account that vegetable oil industry involves many stakeholders, we should utilize this through strengthening partnership so each vegetable oils can ensure sustainable production. Moreover, it could provide support for smallholder farmers to obtain internationally recognized certification and have a premium price for their product.

- **Enhancing international cooperation for research and development on sustainable vegetable oils.**
    - This report has found out that there are still many unavailable and inadequate data, such as data on gender equality (SDG 5), partnerships for the goals (SDG 17) and supply chain certification. Furthermore, there is still limited studies on sustainable vegetable oils other than palm oil. Against this backdrop, we should enhance international cooperation through dialogue, exchange of knowledge and data, joint publication, and best practices on the production and management of sustainable vegetable oils among international scientists, academicians and other relevant stakeholders. This cooperation should bring a more data driven and evidence-based approach when assessing sustainable vegetable oils, including on gender equality and partnerships for the goals.

- **Establishing an internationally agreed standardization for sustainable vegetable oil based on the SDGs at the regional and/or multilateral level**
    - This report has shown that there is a urgency to develop a sustainable framework for vegetable oils to answer the growing issue of ensuring supply of vegetable oils while safeguarding the global land bank. The sustainable framework should be in a form of a internationally negotiated and agreed standardization on sustainable vegetable oils at the regional or multilateral level.

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APPENDIX

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