



## **Industrial Hemp as a National Security Crop:**

### **Producing Sustainable Aviation Fuel with the Hemp BioRefinery**

a division of Community BioRefineries, LLC

<b>Introduction</b>	<b>Page 1</b>
<b>Overview</b>	
<b>The Role of Hemp BioRefineries</b>	
<b>Producing Sustainable Aviation Fuels (SAF) with Hemp BioRefineries</b>	
<b>Benefits to National Security</b>	
<b>Energy Independence</b>	
<b>Resource Diversification</b>	
<b>Environmental Sustainability</b>	

**SECTION I – Leveraging Biorefining Technologies**

**Page 2**

<b>Economic Resilience</b>	
<b>Diverse Revenue Streams</b>	
<b>Job Creation</b>	
<b>Market Development</b>	
<b>Energy Independence</b>	
<b>Biofuel Production</b>	
<b>Green Energy</b>	
<b>Environmental Sustainability</b>	
<b>Resource Efficiency</b>	
<b>Carbon Sequestration</b>	
<b>Soil Health</b>	

**Page 3**

**SECTION II – INDUSTRIAL HEMP**

<b>Significant Aspects</b>	
<b>Versatility and Historical Context</b>	
<b>Diverse Applications</b>	
<b>Benefits for National Security</b>	
<b>Economic Diversification</b>	
<b>Resource Sustainability</b>	
<b>Environmental Stewardship</b>	

**Page 4**

<b>Highlighting the Versatility and Historical Significance</b>	
<b>Energy Security</b>	
<b>Diversifying Energy Sources</b>	
<b>Climate Change Mitigation</b>	
<b>Carbon Sequestration</b>	
<b>Renewable Resources</b>	
<b>Economic Resilience</b>	
<b>Job Creation</b>	
<b>Market Development</b>	
<b>Environmental Sustainability</b>	
<b>Resource Efficiency</b>	

**Page 5**

## **Environmental Stewardship**

### **SECTION III – Hemp-BioRefineries**

**Page 5**

#### **Key Functions**

**Component Extraction**

**Biofuel Production**

**Water Recycling**

#### **Benefits of Hemp-BioRefineries for National Security**

**Energy Independence**

**Resource Diversification**

**Job Creation**

**Environmental Sustainability**

**Page 6**

#### **Specialized Division of Community BioRefineries (CBR)**

**Focus on Hemp Biomass**

**High value Product Outputs**

#### **Innovative Processing Techniques**

**Heat/Chemical Free Extraction**

**Zero Waste/Zero Pollution**

### **SECTION IV - USDA Report Findings and Future Outlook for Hemp**

#### **USDA Findings:**

**Growing Market Potential**

**Need for Supportive Regulations and infrastructure**

#### **USDA's Future Outlook for Hemp**

**Page 7**

**Optimistic Outlook**

**Focus on Research and Innovation**

**Market Development Regulatory Clarity**

**Stakeholder Engagement**

# Industrial Hemp as a National Security Crop: Producing Sustainable Aviation Fuel (SAF) with Hemp BioRefineries

Industrial hemp, with its diverse applications and economic potential, has emerged as a significant asset for national security in the United States. One in area particular where hemp holds great promise is in the production of Sustainable Aviation Fuel (SAF) - *true* bio-jet fuel and *true* bio-avgas - through innovative approaches like Hemp BioRefineries. NOTE: True biofuels contain no petroleum.

This report explores the potential of industrial hemp as a national security crop and its role in producing SAF with no petroleum, utilizing advanced biorefining technologies.

**Overview:** Industrial hemp, a versatile crop with a long history of cultivation, offers numerous benefits for national security, including economic diversification, resource sustainability, and environmental stewardship. Hemp's ability to grow in diverse climates and its minimal input requirements make it an attractive option for sustainable agriculture.

**The Role of Hemp BioRefineries:** Hemp BioRefineries (HBR) represent a specialized division of Community Bio-Refineries, LLC (CBR) focused exclusively on processing hemp biomass into high-value products, including food, biofuels, bioplastics, and biochemicals.

Unlike traditional biorefineries, HBRs utilize CBR's advanced technologies to efficiently extract and isolate fiber, protein, oil, and sugars from hemp biomass without the use of heat or chemicals. This innovative process results in zero waste and zero pollution, making every molecule of hemp biomass utilized for a useful purpose.

**Producing Sustainable Aviation Fuel (SAF) with Hemp BioRefineries:** One of the most promising applications of Hemp BioRefineries is the production of Sustainable Aviation Fuel (SAF) with no petroleum. SAF derived from hemp biomass offers a renewable and sustainable alternative to conventional aviation fuels, reducing greenhouse gas emissions and mitigating climate change.

By leveraging advanced biorefining technologies and techniques, Hemp BioRefineries can efficiently convert hemp biomass into SAF, meeting the stringent quality and performance requirements of the aviation industry.

**Benefits to National Security:** The production of SAF from industrial hemp through Hemp BioRefineries offers several key benefits for national security:

- Energy Independence: SAF derived from hemp biomass reduces dependence on imported fossil fuels, enhancing energy security and resilience. By producing SAF domestically, the United States can mitigate the risks associated with fluctuations in global oil prices and geopolitical tensions.
- Resource Diversification: Hemp cultivation diversifies the agricultural sector, reducing reliance on monoculture crops and enhancing resilience against pests, diseases, and climate variability. SAF production from hemp biomass further diversifies the energy sector, reducing vulnerability to supply disruptions and enhancing national resilience.
- Environmental Sustainability: SAF derived from hemp biomass offers environmental benefits, including carbon sequestration, soil restoration, and biodiversity conservation. By promoting

sustainable aviation practices and reducing emissions, SAF contributes to long-term national security and environmental sustainability.

**Conclusion:** Industrial hemp, processed through Hemp BioRefineries, has the potential to become a cornerstone of national security in the United States by producing Sustainable Aviation Fuel (SAF) with no petroleum. By harnessing hemp's economic, environmental, and social benefits, policymakers, researchers, and industry stakeholders can promote sustainable development, enhance energy independence, and strengthen resilience against emerging challenges.

Through strategic investments in hemp cultivation, biorefining technologies, and supportive policies, the United States can lead the way towards a more secure and sustainable future

## **I - Leveraging Biorefining Technologies**

By leveraging advanced biorefining technologies, hemp can contribute to economic resilience, energy independence, and environmental sustainability, thereby strengthening national security and promoting sustainable development. The following provides a detailed explanation of how these factors interplay:

### **1. Economic Resilience:**

- **Diverse Revenue Streams:** Hemp offers multiple revenue streams through its various components such as fibers, seeds, cannabinoids, and biomass. By utilizing biorefining technologies, these components can be efficiently extracted and processed into high-value products for industries like textiles, food and beverages, pharmaceuticals, biofuels, and bioplastics. This diversification of revenue sources makes hemp cultivation financially resilient against market fluctuations and external shocks.
- **Job Creation:** The establishment of hemp biorefineries creates job opportunities across the value chain, from cultivation and harvesting to processing and manufacturing. This job creation stimulates local economies, particularly in rural areas where hemp cultivation may provide an alternative income source for farmers and support small-scale industries.
- **Market Development:** Biorefining technologies enable the production of a wide range of hemp-derived products, facilitating the development of new markets and industries. By fostering innovation and entrepreneurship in the hemp sector, these technologies drive economic growth, attract investment, and enhance competitiveness in domestic and international markets.

### **2. Energy Independence:**

- **Biofuel Production:** Hemp biomass can be converted into biofuels, such as biodiesel, bioethanol, and bio-butanol, through advanced biorefining processes. These biofuels offer renewable alternatives to fossil fuels, reducing dependency on imported oil and enhancing energy security. By investing in hemp-based biofuel production, countries can mitigate the risks associated with fluctuations in global oil prices and geopolitical tensions.
- **Green Energy:** Hemp-derived biofuels are considered environmentally friendly because they are derived from renewable sources and produce lower greenhouse gas emissions compared to fossil fuels. By transitioning towards hemp-based biofuels, countries can reduce their carbon footprint, combat climate change, and promote sustainable energy practices.

### **3. Environmental Sustainability:**

- **Resource Efficiency:** Biorefining technologies maximize the utilization of hemp biomass by extracting valuable components such as fibers, proteins, oils, and sugars. This process minimizes waste and enhances resource efficiency, reducing the environmental impact of hemp cultivation and processing.
- **Carbon Sequestration:** Hemp plants have a high carbon sequestration capacity, meaning they absorb large amounts of carbon dioxide from the atmosphere during growth. By expanding hemp cultivation, countries can sequester more carbon in plant biomass and soil, helping to mitigate climate change and enhance environmental sustainability.
- **Soil Health:** Hemp cultivation can improve soil health by reducing soil erosion, increasing soil organic matter, and promoting microbial diversity. Additionally, hemp has phytoremediation properties, meaning it can absorb and detoxify contaminants from soil and water, making it a valuable tool for land remediation and environmental restoration efforts.

These technologies enable the efficient utilization of hemp biomass to produce a wide range of high-value products, including biofuels, bioplastics, and biochemicals, while also mitigating the environmental impacts of traditional industries. As countries continue to explore the potential of hemp as a strategic crop, investments in research, infrastructure, and policy support for biorefining technologies will be crucial for realizing its full economic, energy, and environmental benefits.

## II - INDUSTRIAL HEMP

Industrial hemp, a versatile crop with a long history of cultivation, offers numerous benefits for national security, including economic diversification, resource sustainability, and environmental stewardship. This introduction sets the stage for understanding the significance of industrial hemp as a national security asset by highlighting its historical context, versatility, and the array of benefits it offers.

### **Significant Aspects:**

#### 1. Versatility and Historical Context:

- **Long History of Cultivation:** Industrial hemp has been cultivated for thousands of years, with evidence of its use dating back to ancient civilizations.
- **Throughout history,** hemp has been valued for its fibers, seeds, and other valuable components, making it one of the oldest crops cultivated by humans.
- **Diverse Applications:** Hemp is a remarkably versatile crop with a wide range of applications across various industries. Its fibers are strong, durable, and suitable for use in textiles, ropes, paper, construction materials, and automotive components. Hemp seeds are rich in protein, essential fatty acids, vitamins, and minerals, making them valuable for food, supplements, and animal feed. Additionally, hemp contains cannabinoids like CBD, which have gained popularity for their potential health and wellness benefits.

#### 2. Benefits for National Security:

- **Economic Diversification:** Industrial hemp offers opportunities for economic diversification, particularly in rural and agricultural communities. By providing farmers with an alternative crop to traditional commodities, hemp cultivation reduces reliance on single industries and enhances economic resilience against market fluctuations and external shocks.

- **Resource Sustainability:** Hemp cultivation promotes resource sustainability by requiring minimal inputs such as water, pesticides, and fertilizers. Compared to conventional crops, hemp is more environmentally friendly, with a lower environmental footprint and fewer negative impacts on soil health, water quality, and biodiversity.
- **Environmental Stewardship:** Industrial hemp contributes to environmental stewardship by offering various ecological benefits. Hemp plants have a high carbon sequestration capacity, meaning they absorb large amounts of carbon dioxide from the atmosphere during growth, helping to mitigate climate change. Additionally, hemp has phytoremediation properties, meaning it can absorb and detoxify contaminants from soil and water, making it useful for land remediation and environmental restoration efforts.

3. **By highlighting the versatility, historical significance,** and numerous benefits of industrial hemp, the introduction establishes a compelling case for considering hemp as a valuable asset for national security. Industrial hemp's potential to promote economic diversification, resource sustainability, and environmental stewardship underscores its importance in supporting resilient, sustainable, and secure societies

As the United States seeks to address emerging challenges such as energy security, climate change, and economic resilience, harnessing the potential of hemp through innovative approaches like Hemp-BioRefineries becomes increasingly important. The statement emphasizes the importance of harnessing the potential of hemp, particularly through innovative approaches like Hemp-BioRefineries, to address key challenges facing the United States. Here's a detailed explanation of each aspect:

- **Energy Security:** Reducing Dependency on Fossil Fuels: Hemp-based biofuels produced through Hemp-BioRefineries offer a renewable alternative to fossil fuels for transportation, heating, and electricity generation. By investing in hemp biofuel production, the United States can reduce its dependency on imported oil and enhance energy security.
  - **Diversifying Energy Sources:** Hemp biofuels diversify the country's energy sources, reducing vulnerability to disruptions in global oil markets, geopolitical tensions, and supply chain vulnerabilities. By incorporating hemp-based biofuels into the energy mix, the United States can build a more resilient and sustainable energy system.
- **Climate Change Mitigation:**
  - **Carbon Sequestration:** Hemp cultivation contributes to carbon sequestration by absorbing large amounts of carbon dioxide from the atmosphere during growth. By expanding hemp cultivation, the United States can mitigate climate change by sequestering carbon in plant biomass and soil, helping to reduce greenhouse gas emissions and combat global warming.
  - **Renewable Resources:** Hemp-based biofuels are derived from renewable resources, such as hemp biomass, which helps reduce reliance on fossil fuels and mitigate the environmental impacts associated with their extraction, production, and combustion. By transitioning towards hemp-based biofuels, the United States can promote sustainable energy practices and reduce its carbon footprint.
- **Economic Resilience:**
  - **Job Creation and Economic Growth:** Hemp-BioRefineries create job opportunities across the value chain, from cultivation and harvesting to processing and manufacturing. By investing in hemp biorefining technologies, the United States can stimulate economic growth, attract investment, and support rural economies, particularly in agricultural regions where hemp cultivation may provide an alternative income source for farmers.

- Market Development: Hemp-based products produced through Hemp-BioRefineries, such as fibers, protein isolates, oils, sugars, and biofuels, facilitate the development of new markets and industries. By fostering innovation and entrepreneurship in the hemp sector, the United States can diversify its economy, create new revenue streams, and enhance competitiveness in domestic and international markets.
- **Environmental Sustainability:**
  - Resource Efficiency: Hemp-BioRefineries maximize the utilization of hemp biomass by extracting valuable components such as fibers, proteins, oils, and sugars. This process minimizes waste and enhances resource efficiency, reducing the environmental impact of hemp cultivation and processing.
  - Environmental Stewardship: By promoting hemp cultivation and biorefining, the United States can advance environmental stewardship by reducing soil erosion, improving soil health, and promoting biodiversity conservation. Additionally, hemp-based products offer eco-friendly alternatives to conventional materials, such as plastics and textiles, contributing to sustainable development and environmental protection.

Harnessing the potential of hemp through innovative approaches like Hemp-BioRefineries is crucial for addressing emerging challenges such as energy security, climate change, and economic resilience in the United States. By investing in hemp cultivation, biorefining technologies, and supportive policies, the United States can unlock the economic, environmental, and social benefits of hemp, while also promoting sustainable development and enhancing national security

### **III - Hemp-BioRefineries**

Hemp-BioRefineries (HBR) represent a specialized division of Community Bio-Refineries (CBR), focused exclusively on processing hemp biomass into high-value products, including food, biofuels, bioplastics, and biochemicals. Unlike traditional biorefineries, HBRs utilize advanced technologies to efficiently extract and isolate fiber, protein, oil, and sugars from hemp biomass without the use of heat or chemicals. This innovative process results in zero waste and zero pollution, making every molecule of hemp biomass utilized for a useful purpose.

#### **Key Functions of Hemp-BioRefineries:**

- Component Extraction: HBRs efficiently break down hemp plants into their component elements, including fiber, protein, oil, and sugars, while preserving their integrity and quality. This process allows for the extraction of multiple valuable materials from a single feedstock.
- Biofuel Production: HBRs utilize the remaining "waste stream" from hemp processing to produce bio-butanol, a next-generation biofuel. By recovering natural biochemicals and combining them with leftover fibers, HBRs also produce biodegradable plastics, further enhancing their sustainability.
- Water Recycling: HBRs prioritize water recycling to minimize water consumption and environmental impact. Hyper-pure water recovered during the refining process is recycled back into the system, ensuring efficient use of resources.

#### **Benefits of Hemp-BioRefineries for National Security:**

- Energy Independence: By producing biofuels from hemp biomass, HBRs reduce dependence on imported fossil fuels, enhancing energy security and resilience.
- Resource Diversification: Hemp cultivation diversifies the agricultural sector, reducing reliance on monoculture crops and enhancing resilience against pests, diseases, and climate variability.

- **Job Creation and Economic Development:** The establishment of HBRs creates jobs and stimulates economic growth in rural communities, contributing to poverty alleviation and community resilience.
- **Environmental Sustainability:** Hemp cultivation and biorefining offer environmental benefits, including carbon sequestration, soil restoration, and biodiversity conservation, contributing to long-term national security and sustainability.

Hemp-BioRefineries (HBR) play a crucial role in processing hemp biomass into high-value products while ensuring sustainability, economic growth, and national security. The following addresses how HBRs function and their benefits for national security:

### **1. Specialized Division of Community Bio-Refineries (CBR):**

- **Focused on Hemp Biomass:** HBRs are specialized divisions within Community Bio-Refineries dedicated exclusively to processing hemp biomass. This specialization allows HBRs to leverage advanced technologies tailored to the unique properties of hemp, maximizing efficiency and product quality.
- **High-Value Product Outputs:** HBRs are capable of extracting various valuable components from hemp biomass, including fiber, protein, oil, and sugars. These components serve as raw materials for a wide range of high-value products, including food, biofuels, bioplastics, and biochemicals.

### **2. Innovative Processing Techniques:**

- **Heat/Chemical-Free Extraction:** Unlike traditional biorefineries, HBRs utilize advanced technologies that enable heat-free and chemical-free extraction of hemp components. This innovative approach ensures the purity and integrity of the extracted materials while minimizing environmental impact.
- **Zero Waste, Zero Pollution:** HBRs are designed to achieve zero waste and zero pollution throughout the refining process. Every molecule of hemp biomass is utilized for a useful purpose, and the production process is designed to minimize emissions and environmental footprint.

Hemp-BioRefineries play a vital role in processing hemp biomass into high-value products while promoting sustainability, economic growth, and national security. Through innovative processing techniques and a focus on environmental stewardship, HBRs contribute to energy independence, resource diversification, job creation, and environmental sustainability, ultimately strengthening the nation's security and resilience.

## **IV - USDA Report Findings and Future Outlook for Hemp**

The USDA report highlights the growing market potential for industrial hemp products and emphasizes the need for supportive regulations, infrastructure, and investment to foster industry growth. The agency's future outlook for hemp is optimistic, focusing on research, innovation, market development, regulatory clarity, and stakeholder engagement to realize the full potential of hemp cultivation.

USDA report findings and future outlook for hemp provide valuable insights into the potential of industrial hemp as a key component of national security in the United States. Let's examine these aspects in detail:

### **1. USDA Report Findings:**

- **Growing Market Potential:** The USDA report highlights the increasing market potential for industrial hemp products, including fibers, seeds, and cannabinoids like CBD. This indicates a growing demand for hemp-derived products among consumers, presenting significant economic opportunities for the industry.

- **Need for Supportive Regulations and Infrastructure:** The report emphasizes the importance of supportive regulations, infrastructure, and investment to foster the growth of the hemp industry. Clear and consistent regulations, along with adequate infrastructure and investment, are essential for enabling the expansion of hemp cultivation and processing operations.

## **2. USDA's Future Outlook for Hemp:**

- **Optimistic Outlook:** The USDA's future outlook for hemp is optimistic, recognizing the significant economic, environmental, and social potential of industrial hemp. The agency aims to support the growth of the hemp industry through research, innovation, market development, regulatory clarity, and stakeholder engagement.
- **Focus on Research and Innovation:** The USDA plans to invest in research and innovation to enhance the productivity, quality, and sustainability of hemp cultivation. This includes breeding programs, agronomic research, and technology development to optimize production practices and value-added product development.
- **Market Development and Regulatory Clarity:** The USDA will work to facilitate market development for hemp products by providing market intelligence, promoting domestic and international trade, and ensuring regulatory clarity for hemp producers, processors, and stakeholders. Clear and consistent regulations are crucial for fostering investor confidence and market growth.
- **Stakeholder Engagement:** The USDA recognizes the importance of engaging stakeholders, including farmers, industry associations, researchers, and policymakers, to ensure that policies and programs meet the needs of the hemp industry. Stakeholder input and collaboration are essential for designing effective policies and initiatives to support industry growth.

Industrial hemp, processed through Hemp-BioRefineries, has the potential to become a cornerstone of national security in the United States. By harnessing hemp's economic, environmental, and social benefits, policymakers, researchers, and industry stakeholders can promote sustainable development, enhance energy independence, and strengthen resilience against emerging challenges. Strategic investments in hemp cultivation, biorefining technologies, and supportive policies are crucial for realizing the full potential of hemp and leading the way towards a more secure and sustainable future for the nation.

**This document was compiled by Dr. Vincent James, Chief Technology Officer of Community BioRefineries, LLC, and the Director of the Hemp-BioRefinery Division.**