HEMP MATERIALS SUPPLY CHAIN **ROADMAP**

Fall 2024

prepared by

fountainworks

FACILITATION • MANAGEMENT CONSULTING

Key Insights

Scalability is an important challenge that the hemp industry must continue to address

Industrial hemp is versatile and offers an excellent opportunity for production of biobased products

The hemp industry must identify and leverage **diverse funding streams**

There is an immediate need for the development of **consistent and standardized hemp fiber specifications**

The hemp industry should **prioritize cross-sector partnerships and collaborations**

Roadmap Recommendations

Develop Standards for End Use

Establish Hemp Raw Materials Suppliers & End User Database

Foster Rapid Growth of "Next Generation" Building Industry

Add Value to Raw Materials On or Near Farms

Identify and Leverage Diverse Funding Streams

Create A Supply Chain Map

Scale the Sale of Hemp Insulation

Develop "Business in a Box" for Rural Communities

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CONFERENCE SCHEDULE

HEMP MATERIALS SUPPLY CHAIN WORKSHOP

EVENT SCHEDULE

Wed. 14 Aug.	**7:30 AM**	Registration Opens, Breakfast Begins
	9:00 AM	Welcome & Orientation
	11:00 AM	Keynote Speech *Senior Advisor Gregory Jaffe*
	12:00 PM	Lunch
	1:00 PM	Current State of the Industry • *Building Materials: Sergiy Kovelenkov* • *Paper & Packaging: Phil Harding* • *Activated Carbon: Ajit Sarmah* • *Plastics & Biocomposites: Gregg Baumbaugh* • *Facilitated Reflections*
	4:15 PM	Reflections & Closing
	5:00 PM	Adjourn
	following	Reception & Dinner
Thur. 15 Aug.	**8:00 AM**	Breakfast Begins
	9:00 AM	Welcome & Orientation
	9:50 AM	Breakout Activities by Sector • *Building Materials* • *Paper & Packaging*
	12:00 PM	Lunch
	1:00 PM	Breakout Activities by Sector, *cont'd* • *Activated Carbon* • *Plastics & Biocomposites*
	3:45 PM	Full Group & Closing
	5:00 PM	Adjourn
	following	Dinner
Fri. 16 Aug.	**8:00 AM**	Breakfast Begins
	9:00 AM	Welcome & Opening
	9:50 AM	Group Discussion & Prioritization
	12:30 PM	Adjourn
	following	Lunch

Please note: Times shown are Pacific Daylight Time; agenda details are subject to change.

Introduction

Background

There is a growing need for resilient and renewable materials to aid society in achieving global sustainability goals. In particular, the hemp plant has been identified as an emerging industrial crop that will play an important role in building the bioeconomy and advancing sustainability objectives. However, because this emerging industry has received an influx of research and development activity in recent years, various methods and practices have been generated globally. This increased and diverse activity challenges the repeatability of results, research advancement, standards development, and sustainability assessment.

Collaborations and coordination across the hemp industry are ongoing to address these gaps. One recent example of such efforts was the November 2022 National Hemp Industry Research Needs Workshop, co-organized by Oregon State University's Global Hemp Innovation Center (GHIC) and the United States Department of Agriculture (USDA). This workshop brought together leaders from academia, industry, and government to identify the significant gaps, challenges, and opportunities for research to support the development of a globally competitive U.S. hemp industry.

Process

Building upon this momentum, hemp industry leaders convened once again in August 2024 for the Hemp Industrial Materials Supply Chain Workshop, a hybrid event held at Oregon State University that focused on the following challenge question:

What would it take for the established building materials, paper/packaging, activated carbon, and plastics/biocomposites sectors to use industrial hemp in the manufacture of their products?

Workshop participants tackled this challenge question, along with other pressing questions facing the hemp industry faces worked together to develop strategies for integrating hemp into the agricultural and business today, and landscape across the United States, New Zealand, and beyond. The workshop was co-hosted by GHIC, the New Zealand Hemp Industries Association (NZHIA), and the New Zealand Product Accelerator (NZPA). USDA also played a key role in planning and convening the workshop.

This international convening assembled more than 70 in-person and 30 virtual participants from continental North America, New Zealand, and beyond. Invited attendees included a diverse array of participants from industry, government, academia, and other private organizations. While the primary purpose of the industry-oriented listening session was to address the core challenge question, the workshop also served as a rich intercultural exchange that included business representatives from Native American and Aotearoa Māori communities.

In the leadup to the workshop, an organizing committee representing various organizations and institutions held a series of in-depth workshop planning meetings to design the workshop's structure. The committee worked with facilitators from Fountainworks–a consulting firm with

expertise in partnership management and stakeholder convenings–to craft a workshop that maximized collaboration across sectoral and cultural boundaries.

The workshop incorporated traditional full-group presentation-style knowledge sharing and included small-group breakout discussions by sector to enable participants to more deeply engage with the subject matter and each other. The structure of this roadmap mirrors this approach, as overarching key takeaways are followed by sector-specific insights.

Key Parties Convening the Workshop

The workshop assembled key parties from across the industrial hemp industry. Below is a brief description of each of these parties.

Organization	Description
Global Hemp Innovation Center at Oregon State University	The Global Hemp Innovation Center (GHIC) is the most comprehensive center of its kind in the United States dedicated to the study of hemp. It brings together more than 75 faculty members across disciplines including plant science, food innovation, pharmacy, public health, public policy, business, and engineering. GHIC is recognized by the USDA as a designated Center of Excellence.
New Zealand Hemp Industries Association	A nonprofit whose mission is to support the growth and development of all aspects of the industrial hemp industry in New Zealand.
New Zealand Product Accelerator	Research institute headquartered in Auckland, New Zealand connects industry with research university expertise, solves industry identified problems, builds productivity, and supports the transformation of the economy through diversification and knowledge transfer.
University of Auckland	New Zealand's largest university. Creates globally transformative impacts through distinctive strengths in world-leading research, scholarship, teaching and collaborative partnerships.
National Industrial Hemp Council of America	An industry association headquartered in Washington, D.C. dedicated to educating businesses and consumers on the benefits of hemp. Advises upon a legislative framework for the industrial hemp industry nationwide.

Purpose

The purpose of this workshop was to outline industry priorities and guidelines to advance the commercial use of hemp in the manufacture of industrial materials and products. This report serves a two-fold purpose:

- Assess the current state of the use of industrial hemp in product manufacturing for the building materials, paper and packaging, activated carbon, and biobased plastics and biocomposites sectors; and,
- Define the necessary research and development for incorporating hemp in biobased manufacturing

Business representatives from several sovereign Native American nations and Aotearoa Māori also attended the 2024 Hemp Materials Supply Chain workshop, sharing their perspectives to shape this report from an Indigenous peoples perspective. Their insights, rooted in deep stewardship of the land, contributed to the vision for an informed hemp industry.

This report provides stakeholders with a scientific and business understanding of the biobased manufacturing landscape to facilitate the manufacture of biobased materials and products and their introduction into markets.

Key Takeaways: At A Glance

The following **five overarching key takeaways** which emerged from the workshop serve as the foundation of this report. The takeaways affirm that the industrial hemp industry is well-positioned to increase its market penetration through cross-sector partnerships and collaborations that focus on developing standards, leveraging diverse funding streams, and building robust and resilient supply chains at scale.

1. **Industrial hemp is versatile** and offers an excellent opportunity to produce biobased products that compete with (and can even outperform) their product counterparts across a variety of sectors.
2. There is an immediate need for the development of **consistent and standardized hemp fiber and materials specifications** to facilitate market penetration by hemp.
3. **Scalability is an important challenge that the hemp industry must continue to address** to ensure robust supply chains that can deliver necessary volumes of materials to key markets.
4. The hemp industry must **identify and leverage diverse funding streams** to enable more widespread adoption of hemp programs and projects.
5. To grow and thrive, the hemp industry should **prioritize cross-sector partnerships and collaborations** that harness the collective knowledge and influence of those seeking to advance the industrial hemp industry.

Details from Key Takeaways

This section explains each key takeaway above in more detail. The lessons learned from these key takeaways are incorporated into the overarching recommendations found in the next section.

1. **Industrial hemp is versatile** and offers an excellent opportunity for production of biobased products that compete with (and can even outperform) their product counterparts across a variety of sectors.

    - A wide range of high-quality product applications have emerged across sectors including hempcrete, load-bearing block, insulation, hempwood, hemp batteries, bioasphalt, corrugated board, and container board. These products have emerged because industrial hemp has many attractive qualities such as its anti-static, anti-microbial, anti-bacterial, and anti-fungicidal properties.
    - Other advantages of industrial hemp that add to its versatility are its flame-retardant, frost-resistant, pest-resistant, and non-toxic properties.
        - Example. The use of industrial hemp in the construction of residential homes provides an array of benefits that many product counterparts cannot offer. These benefits include foundation cost savings due to the low density of the material, complete protection from rot when hemp insulation is applied, and superior acoustic characteristics due to the high porosity of the material.

2. There is an immediate need for the development of **consistent and standardized hemp fiber specifications** to facilitate market penetration of hemp.

    - Workshop participants expressed a strong desire to develop a standardized hemp fiber measurement and specification system that includes testing methods. Along with continued research that addresses specific questions that are blocking progress, the development of standardized specifications will create a common industry language among suppliers that will establish global industry practices, thereby increasing the potential for industrial hemp's market penetration.
    - Workshop participants shared the following quotes related to standardization:
        - Knowing what the standards are and what they could be is important. We need to focus on a handful of high-quality specifications. We do better together than organizing by ourselves.
        - Some specifications do not scale. That is why standards are important.
        - Developing standardized specifications is a tall order, but industry leaders should not "let perfect be the enemy of good. We need to start somewhere.

3. **Scalability is an important challenge that the hemp industry must continue to address** to ensure robust supply chains that can deliver necessary volume in key markets.

    - Variation in hemp strains and required handling prior to pulping are two key barriers affecting the scalability of industrial hemp. Relatedly, the consolidation of bulk material for shipping (i.e., dry tons per truck) is difficult to achieve and hinders scalability.

- Decortication capabilities represent a pinch point in the supply chain due to the insufficient proliferation of decortication facilities. For example, in the American industrial hemp building market, there are only 25 decorticators scattered around the country.
- Other important issues that affect scalability include high energy consumption during processing, high prices for the final product, and expensive logistics for shipping and delivering the product.

4. The hemp industry must **identify and leverage diverse funding streams** to enable more widespread adoption of hemp programs and projects.

- Hemp industry leaders must look outside the traditional funding ecosystem and develop a multi-pronged funding strategy that includes public, private, and philanthropic partnerships to leverage alternative funding sources.
- Examples of these diverse funding streams include (but are not limited to) international joint initiatives, large philanthropic organizations, and architectural firms.
- A corresponding effort that will attract investment from a larger pool of sources is the development of an action plan with a strong and compelling value proposition for hemp-based products that dispels misconceptions about industrial hemp.
- The following quotes were shared by workshop participants regarding funding:
    - Lots of people in D.C. do not know we exist and still link us with marijuana. Limited funding comes because of that.
    - Create a pull for hemp into the market, and entrepreneurs will jump into it."

5. To grow and thrive, the hemp industry should **prioritize cross-sector partnerships and collaborations** that harness the collective knowledge and influence of those seeking to advance the industrial hemp industry.

- Hemp industry leaders should apply the triple helix model of innovation that brings together the knowledge, expertise, and skill of academia, industry, and government to creatively solve the industry's most pressing problems.
- One example of such collaboration is the creation of a hemp raw materials suppliers and end-user database to develop an innovation ecosystem. Data experts, farmers, suppliers, end users, and government agencies would all contribute to the establishment and maintenance of this database in various ways.
- Workshop participants shared the following quotes related to collaboration:
    - Universities need to more permanently partner with industries to cultivate conversations.
    - We need to have more collaboration. Standardization will happen through collaboration.
    - A comprehensive approach needs to happen so that more parts are utilized in harmony and in synchrony.

Recommendations

This section outlines recommendations for incorporating industrial hemp into the manufacture of products across all four sectors. These recommendations reflect the priorities that emerged from the workshop industry experts, and many are interconnected. Progress on a given recommendation can build momentum and facilitate progress on other recommendations. Please see the Appendix document for additional recommendations.

1. Develop Standards for End Use
2. Foster Rapid Growth of 'Next Generation' Building Industry
3. Identify and Leverage Diverse Funding Streams
4. Scale the Sale of Hemp Insulation
5. Establish Hemp Raw Materials Suppliers and End-User Database
6. Add Value to Raw Materials On- or Near-Farms
7. Create a Supply Chain Map
8. Develop 'Business in a Box' for Rural Communities

1. Develop Standards for End Use

Recommendation: Establish labeling standards for hemp-based products' unique properties. By matching material properties with their specific functions, create a common industry language and establish global industry practices. The effort will require collaboration with standards entities and funding to develop test methods that account for hemp's distinct characteristics.

Why is this important?

Agreed-upon terminology will help move the industry forward, offering the ability to match properties to materials' functionality and the capacity to communicate these in a common global language.

Who might the key players be?

- Building Materials
- Biocomposites
- Paper/Packaging
- Activated Carbon
- Textiles (non-woven/woven)
- USDA
- ASTM Biobased Committees and Sub committees

What resources might be needed?

- Articulate unique properties in hemp, making them different from other bast fiber
- Different standards expanded to hemp
- Determine how samples will be handled based on other materials and fields
- Establish relationships with standards body (*Note: ASAB has shown interest)*
- Funding for creating test methods

Examples where this has been done:

- ASTM - Hemp Fiber
- ISO - Bio Carbon, Activated Carbon, Biochar (all in different categories of ISO)
- USDA – materials and products classification and grading research grant

2. Foster Rapid Growth of 'Next Generation' Building Industry

Recommendation: Provide demonstrations of healthy, affordable, sustainable, and durable homes to showcase the benefits of hemp-based products.

Why is this important?

Hemp-based products can better penetrate the market if key players and consumers better understand the benefits of these products.

Who might the key players be?

- Architects
- Engineers
- Builders
- Building Research Association of New Zealand
- Building Officials Institute of New Zealand
- U.S. Green Building Council
- Universities

What resources might be needed?

- Funding for product testing
- Hubs for show homes

Examples where this has been done:

- Australia – 2024 Hemp Home Exposition

3. Identify and Leverage Diverse Funding Streams

Recommendation: Locate and secure alternative funding sources for hemp programs and projects outside the traditional ecosystem in both New Zealand and the U.S.

Why is this important?

Traditional funding streams are not sufficient to grow the hemp industry at scale. Diverse and alternative funding sources are needed.

Who might the key players be?

- Philanthropy organizations
- Architectural firms

What resources might be needed?

- Development of an action plan with a strong and compelling value proposition for hemp-based products
- Create U.S./New Zealand joint initiatives such as joint proposals to more effectively leverage and secure capital
- Form a collaborative consortium to enhance sharing of knowledge and best practices

4. Scale the Sale of Hemp Insulation

Recommendation: Leverage third-party verification, product comparisons, and industry standards to increase the sale of hemp insulation.

Why is this important?

Successfully selling hemp insulation at scale will establish an important foothold in the market that can serve as a model for future efforts.

Who might the key players be?

- Architects
- Developers
- Testing labs
- Government agencies such as USDA
- Farmers
- Investors

What resources might be needed?

- Grants
- University partnerships
- Develop and adopt common codes

5. Establish Raw Materials Suppliers and End-User Database

Recommendation: Create a comprehensive database of hemp information for raw materials suppliers and users to access.

Why is this important?

By building strategic partnerships among suppliers, research institutions, and producers, the project will ensure the consistency, quality, and reliability of raw materials, thereby increasing end-user confidence in meeting market demands and complying with industry standards.

Who might the key players be?

- Farmers
- Suppliers
- Universities and research institutions
- End users
- Funding agencies
- Regulatory agencies
- Architects
- Builders

What resources might be needed?

- Marketing
- Education and training
- Database developers
- Communications team to build awareness among community and stakeholders

6. Add Value to Raw Materials On or Near Farms

Recommendation: Utilize new technologies, processes, and local infrastructure to enhance regional development and create more valuable and transportable feedstock.

Why is this important?

The creation of more valuable and transportable feedstock will maximize returns to farms.

Who might the key players be?

- Farmers
- Co-operatives
- Downstream users

What resources might be needed?

- Processing infrastructure
- First leaders and market brokers

Examples where this has been done:

- Microbrewing facilities
- In-forest essential oil production
- Dairy co-operatives
- Micro-scale abattoir operations

7. Create a Supply Chain Map

Recommendation: Develop a functional, searchable, public database of vetted and trusted organizations within the hemp industry supply chain.

Why is this important?

This tool will create visibility to facilitate meaningful networking, and it will also provide succinct identifiers of supply chain members which will streamline matching funds and identify supply chain gaps.

Who might the key players be?

- Database developers
- Database contributors (State Departments of Agriculture, associations, customers)

What resources might be needed?

- Technology to house database
- Quality administrative team
- Funds (avoid "pay to play")

Examples where this has been done:

- Material bank

8. Develop 'Business in a Box' for Rural Communities

Recommendation: Create a standardized business enterprise template for use in rural communities.

Why is this important?

The template will lower barriers to entry for rural businesses and set enterprises up for efficient and sustainable hemp-focused operation.

Who might the key players be?

- Government agencies
- Universities
- Trade associations
- Standards agencies
- Training facilities
- Indigenous nations and trusts
- Industry leadership

What resources might be needed?

- Capital markets
- Communications plan
- Business plan
- Standards and Input materials
- Growers and Buyers
- Training
- Research and development

Moving Our Sectors Forward

Below are additional details on the greatest challenges and opportunities identified by experts from each industry sector.

Building Materials

Greatest Challenge

The greatest challenge facing the building materials sector of the industrial hemp industry is **decortication capacity**.

- There are approximately 25 decortication facilities across the United States, which is not nearly enough facilities to scale up the sector at a meaningful pace.
- To scale up the sector in the U.S., about 500 decortication facilities (~10 per state) would be required.
- There are approximately 164 contractors performing construction projects that utilize industrial hemp building materials. These contractors are navigating an array of challenges including hesitation from insurance companies and banks along with administrative hurdles such as inconsistent building codes across jurisdictions and difficulties with obtaining building permits.

> *"Right now, decortication facilities are the bottleneck of the entire hemp processing system and the market itself."*

Greatest Opportunity

The greatest opportunity for the building materials sector of the industrial hemp industry is the **durability, quality, and health benefits** of industrial hemp as compared to its more traditional counterpart materials.

- Research has demonstrated that industrial hemp is more durable than traditional materials such as drywall and rock wall insulation and will therefore last longer in residential homes and commercial buildings.
- Further research to quantify the health benefits of using industrial hemp coupled with education and outreach to the construction industry about these benefits will support greater proliferation of hemp into the building materials marketplace.
- Hemp performs very well in different climates, and there are many different methods of application such as spraying, load-bearing block, and prefabricated panels that allow for the use of hemp in both new construction and renovation of existing structures.

Additionally, participants noted that U.S. Indigenous tribes can adapt building codes due to their sovereignty. This presents a significant opportunity for integrating hemp-based materials into tribal housing, which might face fewer regulatory hurdles compared to other jurisdictions.

Paper and Packaging

Greatest Challenge

The greatest challenge in the paper and packaging sector of the industrial hemp industry is **shipping and handling bottlenecks** in the supply chain.

- The current supply chain is complicated and involves extensive involvement from many parties including biomass brokers, alternative fiber pulp mills, pulp merchants, paper mills, and paper merchants. Shipping industrial hemp across these varying supply chain stages has been difficult.
- There are intermediate supply chain parties including paper mills and pulp merchants that are reluctant to incorporate hemp fiber into their processes, citing hemp's differing pulp grade as a major barrier to more widespread adoption.
- Bulk material consolidation is a persistent supply chain challenge, and industrial hemp's high densification presents shipping challenges that lead to complex logistics and higher costs.

> *"We need to crack the nut on pulping and get the cost down. We don't want to reinvent papermaking."*

Greatest Opportunity

The greatest opportunity for industrial hemp in the paper and packaging sector is the **identification of market niches** where hemp can act as a **disruptor and differentiator**.

- Sector leaders are continuing to identify paper and packaging grades where hemp plays best, such as corrugated cardboard. Building upon these efforts will increase market penetration of industrial hemp.
- The "rolled up" cost of paper and packaging products that use hemp fiber is becoming competitive with material counterparts and has the potential to be reduced when shipping and handling bottlenecks are addressed.

Additionally, the Indigenous principle of land stewardship highlights the need to protect native forests by replacing softwood with hemp in the paper and packaging industry.

Plastics and Biocomposites

Greatest Challenge

The greatest challenge facing the plastics and biocomposites sector of the industrial hemp industry is the **lack of consistency** in fiber types and materials, leading to bottlenecks and confusion across different stages of the supply chain.

- The best example of this lack of consistency is the differing definitions of fiber that exist across the sector. There are currently no natural fiber specifications for industrial hemp, which means that there is no common language to orient supply chain parties.

- The current natural fiber composites supply chain in the U.S. is also overdependent on material from overseas. The quality of this material can be inconsistent, and its traceability is a challenge.
- Creating demand and market pull is also difficult, especially because profit margins are generally low for various products across the sector.

"I go to bed at night worrying that I am one tsunami away from my whole supply chain getting wiped out."

Greatest Opportunity

The greatest opportunity for the plastics and biocomposites sector of the industrial hemp industry is the potential for hemp to integrate itself into **existing natural fiber markets** and act as a **complementary source** for manufacturing of biobased products.

- Sector leaders should focus their efforts on identifying and prioritizing higher profit margin markets where their products can make inroads into the natural fiber marketplace. An example of this practice would be mixing industrial hemp fiber with other natural fibers in product manufacturing, which would lead to the capacity to supply products at higher volume, thus creating economies of scale and ultimately driving the cost structure down.
- To address the concern of traceability, sector leaders should create a database of hemp materials to provide information to manufacturers. This database would include relevant insights for supply chain parties such as information on where the original plant was grown and information on carbon footprint reduction as compared to petroleum-based epoxy.

Biochar Carbon

Greatest Challenge

The greatest challenge for hemp activated carbon is ensuring **resilience of systems** in the manufacturing process.

- There are currently very few in-situ systems for activated carbon production, which means that producing activated carbon from hemp is hard work and extremely energy-intensive. Possible disruptions such as plant disease also have the potential to eradicate the supply chain altogether.
- To be used in activated carbon markets, hemp must meet highly-specific qualities and standards which in most cases are more stringent than general standardization. Qualities and characteristics specifically relevant to the activated carbon sector include surface area, pore size, carbon content, density, absorption performance, cellulose content, and lignin content.
- The possible applications for activated hemp carbon are not yet fully known, and research and development literature are not always clear on these possibilities and applications.

"Before we even begin developing hemp-based activated carbon, we need to ask, 'Is this biobased system resilient enough to stand the test of time?'."

Greatest Opportunity

The greatest opportunity for the hemp activated carbon sector is **capacity building** through greater collaboration between public and private players to form an organized consortium.

- At the core of this consortium is research and development, business strategy, and market access. An example of a research priority is further study of the qualities of biochar to potentially create a designer carbon.
- Other key areas of focus for the consortium should include an emphasis on land availability, cultivation, processing, product development, manufacturing, sales and marketing, and transport, and distribution.

Conclusion

The development of a resilient hemp industry creates an opportunity to strengthen economies through innovative materials and cross-sector partnerships. As demonstrated throughout this roadmap, the versatility of hemp offers vast potential across sectors, from building materials to activated carbon. However, this potential can only be fully realized by addressing key challenges such as the need for standardization, scalability, and diversified funding streams.

This roadmap report provides a strategic framework for tackling these challenges and will serve as a living document that will evolve along with the industrial hemp industry. By fostering collaboration across borders, sectors, and cultures, the hemp industry can continue to grow into existing and emerging markets. The work laid out in this report serves as a call to action for stakeholders to build on momentum generated by the 2024 Hemp Materials Supply Chain Workshop, helping ensure hemp becomes a cornerstone of the U.S. biobased economy.

The workshop was supported by USDA National Institute of Food and Agriculture award no. 2024-67019-42130. Also, by contributions from Oregon State University's Global Hemp Innovation Center, OSU College of Agricultural Sciences, OSU College of Forestry, OSU Office of the Vice President for Institutional Diversity, the National Industrial Hemp Council of America, Poutama Trust, New Zealand Hemp Industry Association, New Zealand Product Accelerator, and University of Auckland.

Appendix

Focus Group Takeaways

The following section captures key takeaways from participants and observers of sector-specific focus groups. Focus groups took place at the 2024 Hemp Materials Supply Chain Workshop.

Paper and Packaging

Key Takeaways:

- There is a need to align hemp-generated products with industry specifications and standards for downstream products.
- The hemp industry must adapt to existing standards, but the agility of hemp offers opportunities to reshape how products like paper and packaging are made.
- There is a debate over whether hemp should follow existing specifications or embrace its variability to innovate in product design.
- Improving the recyclability of packaging materials, including hemp and other fibers, is essential.
- Focusing on high-quality, specialized hemp products could position the industry as a serious player, avoiding generic competition with other materials.
- Hemp has unique, underappreciated qualities, such as UV penetration, which may have niche applications.
- The decline in hemp acreage highlights the need for greater industry support to reach its potential.

Building Materials

Key Takeaways:

- Sustainability and green initiatives may not appeal widely but framing them around health benefits could be more effective.
- There is skepticism toward government, but deep respect for the land, which can be a key entry point for building technologies.
- Native territories have more flexibility in adapting building codes due to their sovereignty, but strong collaboration and trustworthy information are needed to support changes.
- Testing and compliance for hemp-based materials are global challenges, not limited to the U.S.
- A standardized matrix for testing and compliance is needed across regions.
- Outreach and education from influential figures in the construction industry could drive adoption of hemp-based materials.
- Architecture schools should incorporate education on hemp-based construction for future architects.

Biochar Carbon

Key Takeaways:

- Understanding the specific application of hemp products is critical to develop accurate and useful specifications and standards.
- There is growing confidence in identifying where to begin within the hemp industry, despite its vast possibilities.
- Activated carbon is a significant industry with potential applications across multiple sectors, but it requires extensive research and development.
- It's important to connect with growers to ensure the right type of hemp hurd is produced for conversion into activated carbon.
- The goal is to develop a customized, hemp-based activated carbon product.

Biobased Plastics and Biocomposites

Key Takeaways:

- There is a need for a common language and specifications for hemp.
- Hemp should be positioned as a disruptor and differentiator, with an opportunity to expand into adjacent markets by thinking innovatively, like the advanced technology industry's approach.
- Focus on R&D and characterization of hemp, particularly in bioplastics and composites, using research facilities and universities.
- Disseminating research in accessible ways can help potential users understand and adopt hemp-based products.

Overarching Recommendations

This section outlines additional recommendations for incorporating industrial hemp into the manufacture of products across all four sectors that were identified during the 2024 Hemp Materials Supply Chain Workshop but were not designated as top priorities.

Cost Reduction Strategies: Technoeconomic Modeling for Whole Plant Utilization

Recommendation: Minimize cost to manufacturers and consumers by utilizing the full hemp crop. Establishing decortication facilities at or near processing facilities would allow components to be separated and transported to manufacturers more efficiently.

Why is this important?

All end-product markets are price sensitive. When a manufactured product uses just one part of the hemp plant, the costs end up being much higher. If growers can get more value for their crop, the costs will come down for producers that use one component of the plant, and these cost-reductions are passed onto consumers. One key strategy is to allow for decortication processing to occur at or near so components can be separated out and shipped to manufacturers at lower costs.

Who might the key players be?

- State and local government
- Opportunity Zones" in rural communities
- Growers
- Manufacturers
- Processing facilities
- Workforce development organizations for building and manufacturing and processing and growing, universities and high school programs geared towards engineers/architects

What resources might be needed?

- Capital to invest in these projects
- Private and public investment
- Establish processing much, much closer to growers so that it is primarily value-added products being shipped, not only raw materials

Examples where this has been done:

- "Setting up manufacturing facilities near raw stock (I-35 ""concrete interstate"" with major lime raw materials and major manufacturing facilities)
- The infrastructure for Industrial Hemp existed in Poland in the 1960-1970s but disappeared over time
- ZILA sources hemp from a hemp hub in Alberta
- Petroleum Industry processes crude oil near feedstock supplies before moving to other locations"

Funding to Develop Hemp Based Products and Markets

Recommendation: To grow the hemp industry, there is a need to develop a strong working relationship with companies by creating and promoting market-driven hemp-based product development.

Why is this important?

There are many hemp associations working on different priorities and initiatives. Consolidating organizations would allow for clear industry goals to be set and could lead initiatives such as renaming hemp.

Who might the key players be?

- Government
- University
- Private Investors
- Foundations
- Venture Capital
- Private Equity
- Impact Investors
- Corporations
- Co-ops

What resources might be needed?

- Grant writers
- Event sponsors
- Networking workshops

Examples where this has been done:

- University-hosted events
- Nanotech, biotech, and renewable energy industries

Consolidation of Hemp Organizations

Recommendation: Reduce redundancy and create alignment and actionable goals by consolidating the various hemp organizations.

Why is this important?

There are many hemp associations working on different priorities and initiatives. Consolidating organizations would allow for clear industry goals to be set, and could lead initiatives such as renaming hemp.

Who might the key players be?

- Hemp industry associations (e.g., NZ Hemp Industries Association, National Hemp Association, National Industrial Hemp Association of America)
- Universities and departments (e.g., OSU Hemp Innovation Center)

What resources might be needed?

- Umbrella organization

Examples where this has been done:

- American Soybean Association
- 4H
- FFA

Life Cycle Analysis to Track Carbon

Recommendation: Maintain accurate information on carbon levels in different parts of the soil and hemp plant, across various manufacturing processes, and in hemp-based products in order for producers, manufacturers, and consumers to make informed decisions.

Why is this important?

A primary value proposition of the Bioeconomy is to reduce the carbon footprint for a variety of materials, and without geographically-specific data, this is all speculation.

When producers, manufacturers, consumers, public sector, etc. are trying to reduce carbon footprints, this information is crucial.

Who might the key players be?

- Primarily Universities (e.g., University of Alberta, OSU, Argon National Laboratory)
- Government Agencies (e.g., USDA, DOE Labs, SBIR programs across agencies)
- Industry partners
- NGOs

What resources might be needed?

- Funding for research
- Geographically-specific data (farmers, producers) to provide soils, samples, etc.
- Resources to connect industry

Examples where this has been done:

- Beam Calculator tool online for carbon accounting, specifically for the materials that go into buildings (steel, concrete, wood, etc.).
- Carbon Leadership Forum - University of Washington - an open-source carbon tracking tool for the built environment.
- Vertue Lab (vertuelab.org) of Oregon has been supporting development of these grants for a variety of innovative products
- Sima Pro - ISO-certified LCA calculation tool
- Just Bio Fiber (JBF) - conducted a LCA on their hemp blocks (internal product, could potentially be shared)"

Hemp Reading Group

Recommendation: Allow those in the industry to better collaborate by establishing a reading group that reaches across different hemp sectors.

Why is this important?

There is a need to connect people across the industries to develop new collaborations, ask questions, share research, and build communities. If successful, this could lead to an information database.

Who might the key players be?

- University/other lead partners

What resources might be needed?

- Coordinator
- Connection platform

Examples where this has been done:

- ICR Seminar platform
- SASI team meetings