Welcome!
Welcome

Opening Session
Opening Comments

Shannon Schlecht
• Executive Director, AURI

Tamara Nelsen
• Executive Director, AgriGrowth

Thom Peterson
• Commissioner, Minnesota Department of Agriculture
Dan Skogen

- Planning and Government Relations Director, AURI
The State of Industrial Hemp
Harold Stanislawski
• Project Development Director, AURI

Riley Gordon
• Engineer, AURI
Building an Industrial Hemp Industry in Minnesota

AURI Initiative
“Value Chain Analysis For Industrial Hemp in Minnesota”

Harold Stanislawski, AURI Project Development Director, Deputy Biobased Systems
Riley Gordon, AURI Engineer
Hemp Initiative

Objectives:

- Focus on developing a hemp value-chain for Minnesota and the Midwest.

1. Work closely with producers and processors identifying industry needs.

2. Analysis of CBD oil, hemp seed meal, hemp flower and hemp fiber for quality control and identification of new uses (fuel, feed, fiber).

3. Identification of hemp based markets.

4. Identify state-of-the-industry for processing and coproduct approval for feed.

5. Release public report with findings of opportunities and hurdles for the hemp industry in MN.
AURI Focus Areas

Food
Grain: oils, powders, hemp hearts

Biobased Products
Stalks: various fiber and hurd applications

Coproduts
Several byproducts resulting from processing hemp

Renewable Energy
Hemp Biofuels
# Milestones of Minnesota Journey in Hemp

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Farm Bill (section 7606) allows research pilot industrial hemp by state approval</td>
</tr>
<tr>
<td>2015</td>
<td>MN Industrial Development Act became law</td>
</tr>
<tr>
<td>2016</td>
<td>Grows first industrial hemp crop</td>
</tr>
<tr>
<td>2018</td>
<td>Farm Bill passes allowing industrial hemp production nationwide</td>
</tr>
<tr>
<td>2019</td>
<td>MN hemp infrastructure continues to emerge at rapid rate</td>
</tr>
</tbody>
</table>

- CBD oil extraction processing/Value Chain
- Food grade industrial hemp oil and protein plant
- Fiber Shed development research and studies
- Feed characterization (future animal feed approval pending)
- Seed production and processing interest
2019 U.S. Hemp License Report

511,442
Acres of hemp licensed nationally

34
States licensed hemp cultivation

16,877
State growers licenses issued
Chart 3: Direct and Indirect Impacts of 2018 Farm Bill on Hemp Cultivators’ Top Challenges

Direct & Indirect Impacts of 2018 Farm Bill on Hemp Cultivators’ Top Challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Direct</th>
<th>Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding Processors</td>
<td>47.4%</td>
<td></td>
</tr>
<tr>
<td>Lack of Banking Services</td>
<td>28.9%</td>
<td></td>
</tr>
<tr>
<td>Finding Harvesting Equipment</td>
<td>26.3%</td>
<td></td>
</tr>
<tr>
<td>Finding Seeds or Clones</td>
<td>23.7%</td>
<td></td>
</tr>
<tr>
<td>Managing Growth/Scalability</td>
<td>23.7%</td>
<td></td>
</tr>
<tr>
<td>Federal Laws/ intervention</td>
<td>21.1%</td>
<td></td>
</tr>
<tr>
<td>Pest/Weed Pressure</td>
<td>15.8%</td>
<td></td>
</tr>
<tr>
<td>Finding Qualified Labor</td>
<td>13.2%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Hemp Industry Factbook
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY—Circular No. 57.
R. T. GALLOWAY, Chief of Bureau.

THE CULTIVATION OF HEMP IN THE
UNITED STATES.

BY
LYSTER H. DEWEY,
Botanist in Charge of Fiber Investigations.
HEMP AS A FOOD PRODUCT

Hemp-derived ingredients such as seeds, hearts (the shelled seeds of the industrial hemp plant) and oils are appearing with more frequency in global food markets, including Europe and North America. In conjunction with the signing of the U.S. Farm Bill, former Food and Drug Administration (FDA) Commissioner Scott Gottlieb stated that these three ingredients have been classified as “Generally Recognized as Safe” (GRAS) for use in as food products, thus additional approvals are not required if manufacturers do not make claims that they treat diseases. A fourth hemp-derived ingredient, cannabidiol (CBD), is gaining popularity as a wellness product and/or food ingredient, though the FDA has clearly communicated that CBD is not a legal food product as of mid-2019.

Opportunities

Hemp-derived ingredients are becoming more common in food products. The United States imports the majority of hemp products from Canada. As such, U.S. companies are beginning to work with hemp as a processed food ingredient given the public interest in hemp.

Because of hemp’s relatively high protein content (~30%), it is a viable alternative to other high protein, emerging plant-based sources. Hemp protein concentrates and isolates are available and can be used to fortify products such as bars or cereals. Hemp-based protein beverages are another possibility, though the solubility of the protein may limit the amount that can be incorporated.

Dietary fiber supplementation in snack products is another opportunity for hemp. Hemp seed contains both soluble and insoluble fiber making it a good option for fiber fortification.

Finally, hemp oil presents another opportunity to take advantage of the nutritional benefits of the plant. The fatty acid profile of Hemp oil is 60% more bioavailable than the

Hurdles

Hurdles to the use of hemp-based ingredients include functionality shortfalls, market competition from a multitude of other plant protein options, lack of food grade processing capabilities, and lack of local sourcing for the raw ingredients. Regarding functionality, limited research has resulted in unfavorable comparisons to other, more established plant-based proteins such as soy. However, additional research into processing methods combined with breeding and genetic efforts, such as those at the University of Minnesota Plant Protein Innovation Center, should improve our understanding of hemp’s perceived shortcomings and result in higher usage in food products.

With the introduction of the Minnesota Department of Agriculture’s Hemp Pilot Program starting in 2016, Minnesota has seen a steady increase in the total acreage of Industrial hemp. While the total acreage has increased over the past three years, the processing capabilities required to transform hemp into a food ingredient are currently underdeveloped.
### III. Hemp as an Ingredient.

Industrial Hemp is typically used in these forms as an ingredient in retail food products:

<table>
<thead>
<tr>
<th>Hulled Hemp Seed / Hemp Hearts</th>
<th>Toasted Whole Hemp Seed</th>
<th>Hemp Protein Powder</th>
<th>Hemp Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Size: 30 g Fat: 13 g 2.5 g omega-3, 8 g omega-6 Fiber: 3 g Protein: 10 g</td>
<td>Serving Size: 30 g Fat: 10 g 2 g omega-3, 6 g omega-6 Fiber: 8.5 g Protein: 8.5 g</td>
<td>Available in fractions of 20, 23, 33, 43 and 50 % protein Non-allergenic</td>
<td>Serving Size: 1 T (15 mL) 5 g of omega-3 and omega-6 0 g trans fat 0 mg cholesterol</td>
</tr>
</tbody>
</table>

MN Hemp Farms ([www.mnhempfarms.com](http://www.mnhempfarms.com)); Hastings, MN

Hemp Production Services ([www.hempproductionservices.com](http://www.hempproductionservices.com)); Saskatoon, Saskatchewan, Canada

Hemp Oil Canada ([www.hempoilcan.com](http://www.hempoilcan.com)); Ste. Agathe, Manitoba, Canada
Health Benefits of Hemp

Hempfyl

Living Harvest Hempmilk

Aurora Agricultural Utilization Research Institute
Hemp Food Landscape

I. Hemp Market Overview

Figure 1. US Hemp-based Product Sales in 2017 ($795 mil)
Source: Hemp Business Journal

Figure 2. US Hemp-based Food Sales in 2017 ($112 mil)
Source: Hemp Business Journal
Yields around 1000lb/acre
Can grow large acreage and retrofit existing farming equipment for planting/harvesting
Conventional - $0.40/lb
Organic - $1.00/lb
Drying and Cleaning are two biggest concerns
Dry to 9%; clean to 99.95% purity
Food Raw Products/Processing

- Cleaning equipment: Indent Graders, Air Screeners, Gravity Tables, Color Sorter
- Cold Pressed Oils - Cleaned hemp seeds
- Protein powders - Press meal
- Hemp hearts - dehulling hemp seeds
- Hemp Milk - using hemp hearts
- Hemp Beer - Hemp flower and/or seeds
Hemp Feed Value and Supply Chain
Forecasted Projections for Minnesota

OPPORTUNITY FOR HEMP IN FEED AND PET FOOD

The livestock and poultry industries continue to be a growing market domestically and internationally. With this growth comes the opportunity and challenges to provide high-quality and energy-dense feedstuffs to these animals. Protein and energy are the main requirements for these diets. Identifying new feedstuffs that can supply these required nutrients at an economical cost continue to provide an on-going opportunity. Hemp coproducts such as hemp cake, hemp hulls, and the high-protein hemp flower and hemp seed can provide an excellent source of protein and energy to help support the growing livestock industry.

### Table 1. Energy and crude protein comparison to main livestock feedstuffs.

<table>
<thead>
<tr>
<th>Product</th>
<th>TDN</th>
<th>Crude Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemp Cake</td>
<td>81%</td>
<td>33%</td>
</tr>
<tr>
<td>Hemp Flower</td>
<td>60%</td>
<td>25%</td>
</tr>
<tr>
<td>Hemp Seed Hulls</td>
<td>52%</td>
<td>14%</td>
</tr>
<tr>
<td>Corn</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>SBM</td>
<td>64%</td>
<td>44%</td>
</tr>
<tr>
<td>Alfalfa Hay</td>
<td>56%</td>
<td>17%</td>
</tr>
</tbody>
</table>

The table below provides an estimated market value for the various hemp coproducts samples at two different corn seed oil and alfalfa hay prices. These base sets of values provide a wide window for these potential assets based on variability of commodity prices. Potential feed value may vary based on the livestock species it would be intended for.

When evaluating the feed value of each feedstuff, samples were compared to #2 shell corn, which is the primary source of energy; 44% protein soybean meal, which is the main source of protein in most North American livestock diets; and lastly alfalfa hay as a key protein and energy source for small ruminants. Estimated values do not consider variability and nutrient requirements for individual ruminants or ruminants balanced for amino acid levels. Least cost livestock ration formulation software may apply slightly different feed values based on protein and energy sources available within specific livestock ration.
Feed value at a glance

Ex. Assuming 1000lb/acre yield of grain, with 30% oil content and 90% extraction efficiency = 730lb of hempseed cake/acre ($81/acre @ $3.50/bu corn, etc...)
The Association of American Feed Control Officials (AAFCO) is a voluntary membership association of local, state and federal agencies charged by law to regulate the sale and distribution of animal feeds and animal drug remedies.
Recent Hemp Feed Studies

Effect of feeding hemp seed and hemp seed oil on laying hen performance and egg yolk fatty acid content: Evidence of their safety and efficacy for laying hen diets

N. Gakhar,* E. Goldberg,† M. Jing,* R. Gibson,‡ and J. D. House*†

*Department of Animal Science and †Department of Human Nutritional Sciences, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada; and ‡Department of Nutrition and Functional Food Science, University of Adelaide, 5004 Australia

EFFECT OF FEEDING HEMP SEED MEAL TO LAYING HENS

F.G. Silversides1,2, K.L. Budgell2, and M.R. Lefrançois3
Agriculture and Agri-Food Canada1, Nova Scotia Agricultural College2, and Université Laval3

Hempseed cake as a protein feed for growing cattle

Hampfrökaka som proteinfodermedel till växande ungnöt
Industrial Hemp for Silage Trial

Site Information:
Location: Dauphin, Manitoba
Cooperator: Robert Baker
Seeded: May 28, 2001
Harvested: Throughout Season

Evaluating the Quality of Protein from Hemp Seed (Cannabis sativa L.) Products Through the use of the Protein Digestibility-Corrected Amino Acid Score Method

James D. House, Jason Neufeld, and Gero Leson

1Department of Human Nutritional Sciences, and 2Department of Animal Science, University of Manitoba, Winnipeg, MB, R3T 2N3, Canada, and Leson & Associates, 440 Michigan Avenue, Berkeley, California 94707, United States

The nutritive value of hemp meal for ruminants

A. F. Mustafa, J. J. McKinnon, and D. A. Christensen
Department of Animal and Poultry Science, University of Saskatchewan
72 Campus Drive, Saskatoon, Canada S7N 5B5. Received 24 March 1999, accepted 23 December 1998.
Colorado Department of Agriculture Reveals its Hemp in Animal Feed Study

WE ARE CURRENTLY WORKING ON THE FIRST SUBMISSION OF A HEMP INGREDIENT DEFINITION APPLICATION TO THE ASSOCIATION OF AMERICAN FEED CONTROL OFFICIALS FOR 2019!
NCSU Researchers Wrap-Up Initial Hemp in Animal Feed Trial

goo.gl/nPLqSe
Hemp Fiber

A modified graphic from: North Dakota State Source: Industrial Hemp as an Alternative Crop in North Dakota, NDSU, 1998
Fibonacci cuts ribbon on $5.8M HempWood manufacturing plant in Calloway County

Hemp hardwoods, bioplastics expand crop use beyond CBD

By United Press International - October 3, 2019
Oak is out, hemp is in - HempWood factory opens in Kentucky
Sunstrand - Kentucky
Natural Coreboard Applications

• Cabinetry
• Wall partitions
• Lightweight moldings
• Decorative panels
• Furniture
• Doors
• Millwork
• Displays and more
Hemp Inc. Industrial Hemp Manufacturing - North Carolina
Bastcore Decorticator - Nebraska
D-8 Hemp Decorticator - New Zealand
Powerzone Ag Decorticator - Colorado
Low cost Chinese decorticator
America's first 'HempTrain' is coming to central Pa.: Here's what it is and why it matters
AURI Decorticator set for Waseca Lab
Hemp - Automobile Composites

High-end car manufacturers use hemp-based composites and plastics for interior door paneling, dashboards, body molding and interior textiles. Aircraft manufacturers are looking to the advantages of hemp materials.
Hemp Products Made in Fargo, ND!

C2renew Inc

Hemp guitar picks

golf tee

Sunglasses

Toothbrush

Spool of hemp filament

Travel mug
Textiles
Hemp - Nanomaterials

**Industrial hemp derived graphene** exhibit excellent electrochemical performance at a significantly lower cost than industry standard materials.

Data show supercapacitors offer an affordable next generation hemp-based material for rechargeable batteries.
Canadian research shows supercapacitors with electrodes made from hemp-based carbon nanosheets outperform standard supercapacitors by nearly 200%.

“This characteristics favorably place the best power-energy characteristics ever reported for an electrochemical capacitor.”

-Prof. David Mitlin, U of Alberta
Just Bio Fiber - Hempcrete Blocks

- Reinforced Structural building block made from hemp hurd, lime, natural minerals and water
- Strong vertical load bearing strength
- Highly fire resistant - 2 hr rating
- High R-value
- Sequesters carbon throughout life cycle
- Contributes to LEED and/or WELL credits
- Naturally regulates internal temperature and humidity (very breathable) while retaining heat due to high thermal mass.
- Performed a variety of product tests to meet building codes
MN Fiber Processing & Market Opportunities

- None currently exists
- Small scale and Mobile deorticating may be a good option in the near term to get smaller acreages processed and to do testing
- Central processing facility to accommodate MN acres will be the goal once feasibility of markets are identified
- Team up with other surrounding states (ND, WI?)
- Currently an opportunity to become a processor of state acreages
- Carriage before the horse (end markets vs processing)
- MN interests are conducting feasibility studies in the fiber space to identify viable markets.
OVERVIEW: CBD OIL

Cannabinoids (CB) is a non-intoxicating chemical compound derived from the cannabis sativa plant. It is one of the hundreds of chemical compounds known as cannabinoids found in the cannabis or marijuana plant. The main cannabinoid in marijuana is tetrahydrocannabinol (THC), which is highly psychoactive and does not produce a high, whereas CBD has fewer psychoactive effects, and is non-psychoactive. Although CBD does not have a high, it does have psychoactive effects. CBD lacks the high or mind-altering effects associated with THC.

Although CBD is both literally legal as a result of the Farm Bill passed December 2018, the legal marijuana industry has been faced with a challenge of how to verify the origin of its products. Reports of fake or highly-processed products are common, and consumers are becoming more aware of the need for further regulation in the CBD industry. The FAA’s Airplane Safety in the Next Century Act of 2006 requires that all products be labeled clearly and accurately.

CHALLENGES/FUTURE ISSUES

CBD products may be mislabeled, making it difficult to determine the concentration of CBD. CBD products may be mislabeled with other cannabinoids, such as THC, which can cause unwanted psychoactive effects. CBD products may be contaminated with pesticides, heavy metals, or other contaminants, which can pose health risks. CBD products may be formulated with other ingredients, such as fillers or carrier oils, which can affect their effectiveness.

REGULATORY ISSUES

CBD products are subject to regulation by multiple federal and state agencies. The Food and Drug Administration (FDA) is responsible for regulating CBD products for safety and effectiveness, while the Consumer Product Safety Commission (CPSC) is responsible for ensuring product safety. The United States Department of Agriculture (USDA) is responsible for ensuring that CBD is produced from hemp, which is subject to different regulations than marijuana.

The CBD industry is facing challenges in navigating the regulatory landscape. Increased regulatory scrutiny and potential enforcement actions may lead to financial losses for businesses, and could result in potential legal and reputational risks. The industry is working to address these challenges through self-regulation and advocacy efforts, but the path forward is uncertain.

Forecasted Projections for Micro vistas
EXHIBIT 2: CBD Sales Outlook

Sales (Billion Dollars)

2019 2020 2021 2022

Statista  Hemp Biz Journal  New Frontier Data
VoteHemp  Nielson

$22 Billion
Brightfield Group

Note: Dotted lines represent linear interpolations between project points given by the data source.

Sources: Statista, Hemp Business Journal, New Frontier Data, Vote Hemp, Brightfield Group and Nielsen.

Credit: Industrial Hemp: Overview of Opportunities and Risks (CoBank)
Current CBD Economics

$1-$3/seed

Labor intensive crop

$5 - $75 per pound of CBD flower, depending on CBD content ($3-$5 per percentage point of CBD)

About 2000lb of dry flower per acre is an average reported yield, which at 10% CBD would equate to $60,000 to $100,000 per acre

Yields vary greatly depending on seed genetics, harvesting techniques, post harvest handling, extraction efficiencies, etc.
**Hemp Fuel Value and Supply Chain**

### Opportunity for Hemp Hurd as Fuel

Minnesota has been at the forefront of renewable energy for several years. Supports given to ethanol and bio-diesel production in Minnesota are examples of the commitment this state has made to promote renewable energy.

The opportunity Minnesota has to offer for biomass crops and renewable energy is evident through various programs that support the use of renewable fuels along with industries within the state that are utilizing solid biomass fuel resources to power their industries. This analysis focused on renewable energy opportunities that exist focusing on the hemp industry. Hemp co-products such as the hurd extracted flower and sawdust have high heating values. The hemp seed oil can also serve as a feedstock to make biodiesel, with the end product competing with the properties of soy-based biodiesel. Utilizing hemp co-products as fuel sources is a potential opportunity; however, the materials will likely have higher values in other states and there are a few hurdles that will be faced including meeting pellet fuel standards as well as having a competitive market price with other leading fuel sources.

### Table 1

<table>
<thead>
<tr>
<th>Natural Gas $/therm</th>
<th>Propane $/gal</th>
<th>Wood $/ton</th>
<th>Shell Corn $/bushel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemp Hurd</td>
<td>$99</td>
<td>$1.25</td>
<td>$180</td>
</tr>
<tr>
<td>Comparative Value</td>
<td>$89</td>
<td>$1.70</td>
<td>$129</td>
</tr>
</tbody>
</table>

The values in the table above were calculated by taking into account the fuel value of each commodity and combustion efficiency variations to compare fuel sources based on an equivalent cost per energy unit.

As seen in Table 1 above, if you can source any of the hemp ingredients for less than the competitive value column, hemp hurd may offer a competitive alternative to use as a fuel source. Note: Capital cost of biomass heating systems and potential pellitizing cost of around $100/ton is not taken into account in the projections. Hemp oil can also be competitive with soybean oil for biodiesel production, providing another opportunity here in the state with existing biodiesel plants.

Hemp flower and hemp cake both have high energy contents which would serve as a good fuel source. However, high protein and energy feed values show that these co-products will likely capture a greater value as a livestock and poultry feed.
# Hemp Related Projects to Date

<table>
<thead>
<tr>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hempcrete Research</td>
</tr>
<tr>
<td>Seed Cleaning and Processing Equipment Selection &amp; Testing</td>
</tr>
<tr>
<td>Cannabinoid Testing</td>
</tr>
<tr>
<td>Pelleting of Flower and Leaf Material Pre/Post-Extraction</td>
</tr>
<tr>
<td>Hemp Twine &amp; Rope Study</td>
</tr>
<tr>
<td>CBD Hemp Drying/Curing Space Design</td>
</tr>
<tr>
<td>Fiber Market Feasibility Studies</td>
</tr>
</tbody>
</table>
One processor goes online, second is planned in New York State

CNY Hemp Processing, Canastota, New York, recently went online and will produce hemp oil, fuel pellets and animal bedding, according to company president Stephen Halton.

The company also is taking fiber waste from CBD producers and turning it into bedding material for farm animals.

Meanwhile, Canada’s Canopy Growth Corp. announced this week it will build its first American-based production facility after it was granted a hemp license in New York.

GenCanna Global USA Expands with Facility in Graves County, Kentucky
# Waseca Coproducts Lab

## Equipment
- Pellet Mill
- Decorticator
- Fluid Bed Dryer
- Hammer Mills
- Cold Oil Press
- Oil Filter
- Aspirator
- Mixers

## Coproduct Opportunities
- Animal Feed
- Hempcrete
- Paper
- Animal Bedding
- Mulch
- Absorbents
- Fuel Source
- Others?

## Hemp Coproducts
- Press Meal
- Hemp Seed Hulls
- Spent Flower
- Stalks
- Hurd
AURI Analytical Capabilities of Hemp Analysis

• MDA Industrial Hemp Pilot Program Certificate
  • Certificate for growing and processing/testing industrial hemp
  • Processing at Waseca and Marshall Labs

▶ Hemp seed analysis
  ▶ Oil extraction
  ▶ Oil Filtering
  ▶ Protein
  ▶ Fatty acids of the oil

▶ Cannabinoid analysis (HPLC)
  ▶ Cannabidiol (CBD & CBDA)
  ▶ Tetrahydrocannabinol (THC & THCA)
  ▶ Cannabinol (CBN)
  ▶ Cannabigerol (CBG)
It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that ain’t so.

Mark Twain [The Big Short]
Questions, concerns or ideas regarding Hemp in Minnesota are welcome.

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Beyond the Hype: Value Added Opportunities in Hemp
Panel
Value Added Opportunities in Hemp

Charlie Levine
• Owner, Hemp Acres; President, Hemp Association

John Strohfus
• Founder and CEO MN Hemp Farms, Inc.

Sara Kietzer
• Owner-Grower, Journey Organics LLC

John Lupien
• Founder, Hemp Fast Forward

Moderator: Harold Stanislawski, AURI
Charlie Levine
• Owner, Hemp Acres
• President, Hemp Association
John Strohfus
• Founder and CEO MN Hemp Farms, Inc.
Company Overview & The Future of Hemp
About Us - Prior to Hemp...

- Strohfus Stock Farm, LLC (www.strohfusstockfarm.com)
- Our location is southeast of St. Paul/Minneapolis in Hastings MN.
- 45+ Years of Commercial Horse Boarding
- Hay & Forage Production, Corn & Soybeans
- Direct to Consumer Beef Operation
- 19 Year IT Career off-farm until 2017
About Us - Since Hemp...

- Minnesota passed legislation allowing Hemp in December 2015.
- First to grow hemp in Minnesota since 1950.
- Contracting Organic and Conventional Acres in Minnesota, North Dakota and Wisconsin
- New Company Minnesota Hemp Farms, Inc formed in 2016 with production and bulk wholesale focus. (www.mnhempfarms.com)
- Field Theory™ brand created in 2016 with retail focus. (www.fieldtheoryhemp.com)
- Largest USA vertically integrated bulk hemp foods company.
- US Grown Strategy Implementation, Retail / Private Label Opportunities

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Why Hemp?

"Plant-based Proteins Key Mega Trend"

Google Chairman Eric Schmidt named the number one “game-changing” trend of the future as the consumption of plant-based proteins.

Schmidt has dedicated his career to identifying worldwide technology trends, and discussed plant-based foods as one of the six upcoming technologies that will significantly improve society and the quality of life.
Why Hemp?

- USA is the largest hemp importing country...since the 1990’s
- Ground floor opportunity for US Production and Marketing
- Great Challenges often equal great rewards
- US is largest consumer base but Hemp still has little market penetration < 1%. That is huge upside opportunity especially in US with deregulation being a marketing spring-board to exponential growth. #FarmBill2018 #GameChanger
- Versatility. “over 20,000 uses of hemp” is an over used and misleading phrase but just in the FOOD sector the product is versatile (hulled hempseed, oil, powder, blending...). Good for innovators, brand leaders and market makers. #LeadNotFollow
- CBD - Helping People Have Healthier Lives!
Why Hemp?

**USES FOR HEMP**

**INDUSTRIAL TEXTILES**
- Twine & Rope
- Nets
- Canvas & Tarps
- Caulk
- Carpets
- Brake/clutch Linings
- Argo-fiber Composite & Molded Parts
- Geo-textiles

**PAPER**
- Printing Paper
- Fine/Specialty Paper
- Filter Paper
- Newsprint
- Cardboard/ Packaging

**BUILDING MATERIALS**
- Fiberboard
- Insulation
- Fiberglass Substitute
- Cement
- Stucco & Mortar

**FOODS (OILS)**
- Salad Oil
- Margarine
- Food Supplements (Vitamins)
- Cooking Oils

**INDUSTRIAL PRODUCTS**
- Car Parts
- Bio-Plastics
- Scooters
- Semiconductors
- Oil Paints & Varnishes
- Printing Inks
- Fuel
- Solvents
- Lubricants
- Putty
- Coatings

**CONSUMER TEXTILES**
- Apparel
- Diapers
- Fabrics
- Denim
- Fine Fabrics
- Handbags
- Shoes

**BAST FIBERS**
- Animal Bedding
- Mulch & Compost

**HURDS (PULP)**
- Oils
- Isolates
- Distillates

**EXTRACTS**
- Hempseed Oil

**HEMPSEED OIL**
- Animal Feed
- Protein-rich
- Fiber

**PERSONAL HYGIENE**
- Soap
- Shampoo
- Bath Gels
- Cosmetics
- Lotions
- Balms

© 2018 New Frontier Data | Source: Hemp Business Journal

©2019 Minnesota Hemp Farms, Inc
Retail Products
Retail Products - Hemp Extract (CBD)
FARMING
(“Hemp” x 3)
Growing For Grain

Planting was LATE (June 17, 2016). The first in the State of Minnesota since approximately 1950.

PRO TIP: 7.5" Row Spacing at 1/2 - 3/4 inch depth. Plant down to moisture at a rate of 25# per acre up to 30# per acre if Organic or higher than average weed pressure.

Landoll Grain Drill - Courtesy Value Implement - Ellsworth, WI

©2019 Minnesota Hemp Farms, Inc
Growing For Grain

- Good emergence just 4.5 days after planting!
- 2” root to crown just 4.5 days after planting!
Growing For Grain

12 Days!

22 Days!
Growing For Grain

Good Establishment

Compaction
Growing For Grain

Corn vs. Hemp

May vs. June

August
Growing For Grain

July vs. August

Limited Pests

2017 Season

©2019 Minnesota Hemp Farms, Inc
The Fun Stuff! - Growing For Grain

- Harvesting Grain (90-105 Days)
Growing For Grain

High Moisture 25%
Growing For Grain (cleaning)

Market Value

$1.25/lb Organic

$.40/lb Conventional

44# per Bu
1,000#-1500# per acre
Growing For Fiber

Market Value
$100 - $200 per ton
Growing For “CBD” (aka Flower / Biomass)

Greenhouse Starts

$1.00 per Seed!

$3.00 per Plant!

NO Certified Seed!
Growing For “CBD” (aka Flower / Biomass)

800 Plants Per Acre Shown

Typically 5’x5’ Spacing and 2,000 Plants Per Acre
Growing For “CBD” (aka Flower / Biomass)

Market Value
$20-$200 per plant!
Growing For “CBD” (aka Flower / Biomass)

Must Have Good Labor!

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Market Outlook

- Higher US Consumption in 2019. 2018 Farm Bill is a game changer!
- Lower cost Canadian and Chinese Hemp Production will continue to commoditize grain prices.
- Organic Hemp will be most in demand (following consumer trends...)
- Food sector growth will come from Protein Isolates (like peas)
- 100+% year on year growth to continue with largest segment being Hemp Extract (CBD) products in the near term.
- Fiber Markets will come...eventually.
- SPECULATION: Northern States (Montana, North Dakota, Minnesota and Wisconsin) will eventually produce the most hemp. Colorado and Kentucky have a jump start but it is mostly Hemp Extract (CBD) Focused
Market Outlook

FOR IMMEDIATE RELEASE
Contact: Eric Steenstra - (202) 681-4589
09/05/2019

VOTE HEMP RELEASES 2019 U.S. HEMP GROWER LICENSE REPORT DOCUMENTING PLANNED HEMP CULTIVATION IN THE U.S.

LICENSED HEMP ACREAGE QUADRUPLES OVER 2018

• The number of acres of hemp licensed across 34 states totaled 511,442 in 2019—more than quadruple the number of acres licensed from the previous year.

• State licenses to cultivate hemp were issued to 16,877 farmers and researchers, a 476% increase over 2018.

• Minnesota 2019 - 300+ Growers Est. 8,000 Acres
Tactical Challenges

- CBD - FDA is the new DEA? You’re messing up the Food markets too!
- Will USDA Rules be helpful or make it worse? We will find out soon, maybe, possibly? The Farm Bill 2018...USDA got run over by an iceberg.
- Banking, Lending and Credit Card Processing - Please stop the madness! Regulators listen to Congress’ intent!
- Interstate Commerce - Federal vs. States. Food Products and CBD Flower Materials in Jeopardy
- The hold out states...Idaho and South Dakota...are you for real? SD Gov. Noem just says “No”??
- Pesticides and Herbicide Use (Canada has it but we don’t).
- Livestock Feed - Please, someone, anyone do this!
- CBD Genetics - Terrible, not enough of it and too costly! Scammers Exist!
- Crop Insurance - Will it ever be truly available AND affordable?
RESOURCES
Resources - Planting Seed

- Grain/Fiber Seed Costs in 2019 were $4/lb FOB Hastings, MN
- Grain Seeding Rate 30 lb/acre ($120/acre) **Organic Recommend 35#
- Fiber Seeding Rate 35-40 lb/acre

GRAIN CERTIFIED VARIETIES (Genetics are very important!)

  - CRS-1 - Tallest, viable for grain or fiber.
  - CFX-2 - Medium Stature. High Yielding

***MHF is a distributor
Resources - General

- Canadian Hemp Trade Alliance

- Minnesota Department of Ag Hemp Program
  - [https://www.mda.state.mn.us/plants/hemp](https://www.mda.state.mn.us/plants/hemp)

- Minnesota Hemp Farms, Inc.
  - [www.mnhempfarms.com](http://www.mnhempfarms.com)
  - [www.facebook.com/mnhempfarms](http://www.facebook.com/mnhempfarms)

- Hemp Genetics International

- Hemp Industries Association [https://thehia.org/](https://thehia.org/)

- National Hemp Association [https://nationalhempassociation.org/](https://nationalhempassociation.org/)

- NoCo Hemp Expo [https://nocohempexpo.com/](https://nocohempexpo.com/)
Resources - General

- “Hemp For Victory” (USDA Propaganda Film 1942)

https://youtu.be/blxFhYVv_Gk

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Sara Kietzer
• Owner-Grower, Journey Organics LLC
John Lupien
• Founder, Hemp Fast Forward
Farm to Processor

Hemp

- Little to no branching
- Cut 8” off ground
- Baled at 12% moisture content
- Large Square Bales 4’x4’/3’x8’ or Large Rounds

Pricing

- Based on fiber content and harvest time
- Dual CBD/Grain and Fiber 18-36 lb/ac seeding = $100-150 ton
- Dedicated Fiber 40-60 lbs/ac seeding and harvested at male flowering = $250 ton
RAPID INSTALL - FUTURE INNOVATION

FIBER: XXXXXXXXXXX
WOOD: XXXXX

PROJECTED THROUGHPUT
2 tons per hour = 4-5 bales per hour

PROJECTED OUTPUT
Tfiber = 400 lbs (after wet process)
Mcore = 2,600 lbs (after micronizing)
• Group Discussion
• Q&A
Innovators in Minnesota’s Hemp Industry
Chat
Innovators in Minnesota’s Hemp Industry

Joe Radinovich
• President, Minnesota Hemp Association

David Ladd
• Minnesota Industrial Hemp Association

Chat Host: Dan Skogen, AURI
• Discussion
• Q&A

Chat
Innovators in MN Hemp
Critical Industry Supports
Whitney Place
- Assistant Commissioner, MDA

Cody Wiberg
- Exec. Director, MN Board of Pharmacy

Mark Kaster
- Partner, Dorsey and Whitney

Steve Peterson (Moderator)
- Owner and Manager, Peterson Farms
• Group Discussion
• Q&A
Lessons Learned
Tony Cortilet
  • Plant Protection, MDA

Margaret Wiatrowski
  • Industrial Hemp Program Coordinator, MDA

Dr. George Weiblen
  • Professor, University of Minnesota-
    Department of Biological Sciences

Moderator: Dr. Michael Stutelberg, AURI
• Group Discussion
• Q&A
Closing Comments
Shannon Schlecht
• Executive Director, AURI
Thanks for attending!