EMERGING OPPORTUNITIES IN APPALACHIAN AGRICULTURE

September 5, 2019

Dr. Tyler Mark, Associate Professor, University of Kentucky
Joe Bilby, General Counsel, KY Department of Agriculture
Blake Butler, Executive Director, NC Industrial Hemp Association
HEMP AS A POTENTIAL DEVELOPMENT TOOL IN APPALACHIA

Tyler B. Mark
Hemp – 3 Different Crops

Grain

Fiber

CBD
Source: multihemp.eu

**Seeds**
- Dehulled seeds: Feed (7%)
- Dehulled seeds: Food (3.5%)
- Oil: Food (15.5%)
- Oil: Feed (0.5%)
- Oil: Cosmetics/Health Care (0.5%)
- Whole seed: Food (5%)
- Whole seed: Feed (0.5%)
- Total: 9,000 metric tonnes

**Fibre**
- Insulation material (36%)
- Moulding (automotive) (34%)
- Others: mulch & cress growing fleece and other technical textile (5%)
- Pulp & paper (55%)
- Total: 26,000 metric tonnes

**Shivs**
- Bedding material: Horse and others (43%)
- Construction (33%)
- Other (22%)
- Total: 44,000 metric tonnes

**Leaves**
- Feed
- Pharmaceutical
- Tea & Infusions
- Products currently being researched within Multihemp
- Other products to be developed:
  - Phytosterols and waxes (from fibre processing dust)
  - Liquid biofuels (from hemp residual biomass)

Three Primary Markets

1. Seeds and Grain
2. Fiber
3. Plant Extracts, Phytocannabinoids
Grain Products

- Protein Powder
- Hulled Grain
- Seed Oil
- Cosmetics

Baking
Hemp Fiber Crop Production

Hemp fiber is derived from the bast and hurd fibers of the plant.
Fiber Products

Composite Materials

Nonwoven Mats

Animal Bedding

Construction

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Floral material extracts (primarily CBD, cannabidiol) are utilized in dietary supplements. This component of the plant is the source of much debate.
Hemp Extract Products

CBD and other extracts are increasingly used as a food ingredient or additive.

Vape Juice  Tinctures  Capsules
What can hemp be used for?

“You can barbecue it, boil it, broil it, bake it, sauté it. There's uh, hemp-kabobs, hemp creole, hemp gumbo. Pan fried, deep fried, stir-fried. There's pineapple hemp, lemon hemp, coconut hemp, pepper hemp, hemp soup, hemp stew, hemp salad, hemp and potatoes, hemp burger, hemp sandwich. That- that's about it.“

Paraphrase of Pvt. Benjamin Buford 'Bubba' Blue in the Movie “Forrest Gump”
Where is this market going?

Industrial Hemp Market To Reach USD 13.03 Billion By 2026


The global industrial hemp market is projected to grow from USD 4.6 billion in 2019 to USD 26.6 billion by 2025, recording a CAGR of 34%.
Hemp Acreages...

- 78,176 Acres of hemp grown in 23 states
- 40 Universities conducted research
- 3,546 State licenses issued

Industrial hemp planted in the US

Data: USDA | *In August of each year

Hearing from @hempbizjournal this morning, 483,000 acres of hemp licensed in 2019. More than triple from last year. #hemp
What? You said the price is...

PanXchange vs. Hemp Benchmarks

Per %CBD/lb

April May June July

Year

PanxColorado PanxKentucky PanxOregon HempBench 0-25K

Universities of Kentucky
Department of Agricultural Economics
Current Feeling
University of Kentucky-Hemp Enterprise Budgets

• 6 tools
  – Hemp Grain
  – Hemp Fiber
  – CBD-Tobacco Model
  – CBD-Plasticulture Model
  – CBD-Row Crop with Grain Harvested
  – CBD-Row Crop no Grain Harvested
Is this real?

- Wide range of contracts
- Seed vs. Feminized Seed vs. Clones
- Labor Access
  - Hand weeding and harvest
- Drying
- Extreme sensitivity to price
  - $2-3 decrease watch what happens
- Financing
- Crop Insurance

<table>
<thead>
<tr>
<th></th>
<th>CBD Tobacco Model</th>
<th>CBD Plasticulture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quant</td>
<td>Price</td>
</tr>
<tr>
<td><strong>Gross Returns Per Acre</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBD%</td>
<td>6.00%</td>
<td>-</td>
</tr>
<tr>
<td>Price Per %</td>
<td>$5.00</td>
<td>-</td>
</tr>
<tr>
<td>Total Yield (lbs)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dry Matter Yield (lbs)</td>
<td>1,000</td>
<td>$30</td>
</tr>
<tr>
<td>Hemp Grain (lbs)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hemp Fiber (lbs)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>$30,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Variable Costs Per Acre</strong></td>
<td>$15,363*</td>
<td></td>
</tr>
<tr>
<td><strong>Return Above Variable Cost Per Acre</strong></td>
<td>$14,637*</td>
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</tbody>
</table>

*state license application cost of $400 not accounted for

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College of Agriculture,
Food and Environment

Cooperative Extension Service
## 50% Reduction in Price

<table>
<thead>
<tr>
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<th>CBD Tobacco Model</th>
<th></th>
<th>CBD Plasticulture</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quant</td>
<td>Price</td>
<td>Total</td>
<td>Quant</td>
</tr>
<tr>
<td><strong>Gross Returns Per Acre</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBD%</td>
<td>6.00%</td>
<td>-</td>
<td>-</td>
<td>6.00%</td>
</tr>
<tr>
<td>Price Per %</td>
<td>$2.50</td>
<td>-</td>
<td>-</td>
<td>$2.50</td>
</tr>
<tr>
<td>Total Yield (lbs)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dry Matter Yield (lbs)</td>
<td>1,000</td>
<td>$15</td>
<td>$15,000</td>
<td>1,200</td>
</tr>
<tr>
<td>Hemp Grain (lbs)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hemp Fiber (lbs)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td></td>
<td></td>
<td>$15,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Variable Costs Per Acre</strong></td>
<td></td>
<td>$15,363 *</td>
<td></td>
<td>$10,071*</td>
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<tr>
<td><strong>Return Above Variable Cost Per Acre</strong></td>
<td>($363)*</td>
<td></td>
<td>$7,929*</td>
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</table>

*state license application cost of $400 not accounted for
Additional Thoughts

- More unknowns than knowns
- State and Federal Regulations are still changing
- Interplay between Industrial Hemp & Marijuana
- # of producers with little to no ag background
- Varying production costs and practices by region
- International Markets
- Lack of signaling in the market
- Contracted acres
- Standardization within sampling, THC testing, fees, etc.
Considerations for Development

• Understand your states rules and regulations
• Farmers need to understand risks of industry and their willingness to accept
• Access to processors and end markets
• Financing of the processors
• Do your homework
References

  – [http://www.uky.edu/Ag/AgEcon/pubs/extbluesheetMar1920.pdf](http://www.uky.edu/Ag/AgEcon/pubs/extbluesheetMar1920.pdf)

  – [http://www.uky.edu/Ag/AgEcon/pubs/extbluesheetFeb1940.pdf](http://www.uky.edu/Ag/AgEcon/pubs/extbluesheetFeb1940.pdf)

• Shepherd, J.D. and T.B. Mark. Industrial Hemp Budgets 2019.
  – [http://www.uky.edu/Ag/AgEcon/extbudgets.php](http://www.uky.edu/Ag/AgEcon/extbudgets.php)

• University of Kentucky Industrial Hemp
  – [https://hemp.ca.uky.edu/](https://hemp.ca.uky.edu/)

• Kentucky Department of Agriculture

• Hemp Benchmarks

• University of Tennessee
  – [https://ag.tennessee.edu/arec/Pages/budgets.aspx](https://ag.tennessee.edu/arec/Pages/budgets.aspx)

• Agriculture Resource Marketing Center
Thank You!

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Hemp as an Economic Development Opportunity: Kentucky’s Experience

Joe Bilby
General Counsel
Kentucky Department of Agriculture

Appalachian Regional Commission – September 5, 2019
KENTUCKY’S RECORD ON HEMP: GROWTH IN INDUSTRY

<table>
<thead>
<tr>
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<th>2018</th>
<th>2019</th>
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<tbody>
<tr>
<td>Acres Approved</td>
<td>16,000</td>
<td>50,000+</td>
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<tr>
<td>Grower Applications Approved</td>
<td>210</td>
<td>1,047</td>
</tr>
<tr>
<td>Processor Applications Approved</td>
<td>72</td>
<td>110+</td>
</tr>
<tr>
<td>Category</td>
<td>2017</td>
<td>2018</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Paid to Growers</td>
<td>$7.5 M</td>
<td>$17.5 M</td>
</tr>
<tr>
<td>Jobs Created</td>
<td>81</td>
<td>281</td>
</tr>
<tr>
<td>Gross Product Sales</td>
<td>$16.7 M</td>
<td>$57.75 M</td>
</tr>
<tr>
<td>Capital Improvements</td>
<td>$25.6 M</td>
<td>$23.4 M</td>
</tr>
</tbody>
</table>
History

• 1645: Hemp is introduced in North America
  – Spreads from New England into Mid-Atlantic States

• 1775: Hemp is brought to KY by VA settlers

• 1840-1860: Hemp flourishes in KY, MO, IL

• 1915: 8,400 acres produced nationally

• 1917: 41,200 acres produced nationally
History

- 1937: Congress enacts Marihuana Tax Act
- 1943: 146,200 acres produced nationally
- 1953: Not enough produced to be recorded
- 1958: Limited hemp fiber industry in WI
- 1970: Congress enacts the Controlled Substances Act
Harvestable Components as a Percentage of the Annual Crop

- **Grain**
- **CBD**
- **Fiber**

**2014**
- CBD: 33 Acres
- Grain: 922 Acres
- Fiber: 2,300 Acres

*Based on Planting Reports. Varies slightly from end-of-year Production Reports.*
Crop Production in Appalachia

Table 1: Burley Tobacco Production in Appalachia (1997)

<table>
<thead>
<tr>
<th>State</th>
<th>ARC Counties Producing Burley</th>
<th>Distressed Counties Producing Burley</th>
<th>Total State Production (pounds)</th>
<th>Total ARC County Production (pounds)</th>
<th>State Total as % of U.S. Production</th>
<th>% of State Production in ARC Counties</th>
<th>% of State Production in Distressed Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>1</td>
<td>0</td>
<td>33,893</td>
<td>33,893</td>
<td>-</td>
<td>100%</td>
<td>-</td>
</tr>
<tr>
<td>GA</td>
<td>4</td>
<td>0</td>
<td>128,852</td>
<td>128,852</td>
<td>-</td>
<td>100%</td>
<td>-</td>
</tr>
<tr>
<td>KY</td>
<td>45</td>
<td>36</td>
<td>556,733,824</td>
<td>186,311,902</td>
<td>63%</td>
<td>33%</td>
<td>18%</td>
</tr>
<tr>
<td>NC</td>
<td>23</td>
<td>2</td>
<td>37,243,567</td>
<td>37,241,189</td>
<td>4%</td>
<td>100%</td>
<td>3%</td>
</tr>
<tr>
<td>OH</td>
<td>16</td>
<td>9</td>
<td>29,994,040</td>
<td>29,886,886</td>
<td>3%</td>
<td>99%</td>
<td>42%</td>
</tr>
<tr>
<td>TN</td>
<td>49</td>
<td>10</td>
<td>177,374,903</td>
<td>129,491,787</td>
<td>20%</td>
<td>73%</td>
<td>12%</td>
</tr>
<tr>
<td>VA</td>
<td>15</td>
<td>5</td>
<td>39,690,800</td>
<td>38,990,052</td>
<td>6%</td>
<td>98%</td>
<td>36%</td>
</tr>
<tr>
<td>WV</td>
<td>20</td>
<td>9</td>
<td>7,772,634</td>
<td>7,772,634</td>
<td>1%</td>
<td>100%</td>
<td>52%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>173</td>
<td>71</td>
<td>848,972,513</td>
<td>429,857,195</td>
<td>97%</td>
<td>51%</td>
<td>19%</td>
</tr>
</tbody>
</table>

Tobacco production is based on 1997 USDA data. Percentages have been rounded.

Distressed county status is based upon ARC fiscal year 1999 distressed county status.

Source: Lawrence E. Wood, *The Economic Impact of Tobacco Production in Appalachia*, ARC November 1998
Crop Production in Appalachia

<table>
<thead>
<tr>
<th>County</th>
<th>Pounds</th>
<th>Gross Earnings</th>
<th>Farms Growing Tobacco</th>
<th>% of Crop Receipts</th>
<th>Tobacco Earnings Per Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lincoln, KY</td>
<td>8,861,644</td>
<td>$13,150,000</td>
<td>1,088</td>
<td>80%</td>
<td>$12,086</td>
</tr>
<tr>
<td>Casey, KY</td>
<td>8,346,341</td>
<td>$9,858,000</td>
<td>1,133</td>
<td>82%</td>
<td>$8,701</td>
</tr>
<tr>
<td>Bath, KY</td>
<td>8,086,475</td>
<td>$12,742,000</td>
<td>714</td>
<td>90%</td>
<td>$17,846</td>
</tr>
<tr>
<td>Adams, OH</td>
<td>7,623,029</td>
<td>$8,594,000</td>
<td>976</td>
<td>64%</td>
<td>$8,805</td>
</tr>
<tr>
<td>Lee, VA</td>
<td>7,256,522</td>
<td>$7,761,000</td>
<td>970</td>
<td>91%</td>
<td>$8,001</td>
</tr>
<tr>
<td>Lewis, KY</td>
<td>6,497,420</td>
<td>$8,329,000</td>
<td>792</td>
<td>88%</td>
<td>$10,516</td>
</tr>
<tr>
<td>Russell, VA</td>
<td>6,113,927</td>
<td>$6,604,000</td>
<td>792</td>
<td>94%</td>
<td>$8,338</td>
</tr>
<tr>
<td>Morgan, KY</td>
<td>5,350,363</td>
<td>$6,594,000</td>
<td>676</td>
<td>93%</td>
<td>$9,754</td>
</tr>
<tr>
<td>Carter, KY</td>
<td>5,098,715</td>
<td>$6,283,000</td>
<td>749</td>
<td>90%</td>
<td>$8,389</td>
</tr>
<tr>
<td>Monroe, KY</td>
<td>4,808,901</td>
<td>$6,779,000</td>
<td>715</td>
<td>81%</td>
<td>$9,481</td>
</tr>
<tr>
<td>Rockcastle, KY</td>
<td>4,578,721</td>
<td>$5,369,000</td>
<td>655</td>
<td>89%</td>
<td>$8,197</td>
</tr>
<tr>
<td>Russell, KY</td>
<td>4,564,992</td>
<td>$6,116,000</td>
<td>796</td>
<td>77%</td>
<td>$7,683</td>
</tr>
<tr>
<td>Hancock, TN</td>
<td>4,525,757</td>
<td>$4,688,000</td>
<td>605</td>
<td>94%</td>
<td>$7,749</td>
</tr>
<tr>
<td>Jackson, KY</td>
<td>4,372,407</td>
<td>$5,456,000</td>
<td>661</td>
<td>84%</td>
<td>$8,254</td>
</tr>
<tr>
<td>Johnson, TN</td>
<td>4,369,967</td>
<td>$3,808,000</td>
<td>692</td>
<td>84%</td>
<td>$5,503</td>
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<tr>
<td>Cocke, TN</td>
<td>4,353,956</td>
<td>$4,640,000</td>
<td>654</td>
<td>63%</td>
<td>$7,095</td>
</tr>
<tr>
<td>Wayne, KY</td>
<td>3,985,062</td>
<td>$5,094,000</td>
<td>635</td>
<td>67%</td>
<td>$8,022</td>
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<tr>
<td>Clay, KY</td>
<td>3,686,629</td>
<td>$3,955,000</td>
<td>450</td>
<td>88%</td>
<td>$7,740</td>
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<tr>
<td>Gallia, OH</td>
<td>3,442,597</td>
<td>$4,092,000</td>
<td>425</td>
<td>73%</td>
<td>$9,628</td>
</tr>
</tbody>
</table>

Table 2: Burley Tobacco Production in Distressed Counties

More than 99 percent of the tobacco grown in the following distressed counties is burley tobacco.

Total Pounds of Tobacco Grown in Distressed Counties (1997): 157,081,350
Earnings from Tobacco in Distressed Counties (Gross - 1992): $181,829,000
Farms Growing Tobacco in Distressed Counties (1992): 19,820
Average Tobacco Earnings Per Farm in Distressed Counties (Gross - 1992): $9,174

Source: Lawrence E. Wood, *The Economic Impact of Tobacco Production in Appalachia*, ARC November 1998
Kentucky’s Industrial Hemp Research Pilot Program

• 2014 Farm Bill: Section 7606 ("Legitimacy of Industrial Hemp Research") allowing the first legal hemp production in decades.

• Kentucky Department of Agriculture started Research Pilot Program in 2014.
2014: Congress Opens the Door

- Congress authorizes industrial hemp research under the auspices of an agricultural pilot program
  - “to study the growth, cultivation, or marketing of industrial hemp”

- Key constraints within Section 7606:
  - Only State Departments of Agriculture (SDA) and Universities can do it
  - Growing sites must be registered with a SDA
  - CSA’s broad cannabis prohibitions are “not-withstood” only with respect to materials having a delta-9 THC content ≤ 0.3%
Congress’s First Definition (2014)

“The term ‘industrial hemp’ means the plant *Cannabis sativa L.* and any part of such plant, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.”
Commissioner Ryan Quarles’s Strategy for Industrial Hemp

• 2016 - “Our strategy is to use KDA’s research pilot program to encourage the industrial hemp industry to expand and prosper in Kentucky.”

• 2019 - “With the passage of the 2018 Farm Bill, we believe Kentucky is ready to lead as the nation begins the process of transitioning to commercialization of a crop that connects our past to our future.”
2018: A Year of Big Changes at the Federal Level

April 2018: McConnell’s Bill Announced
Congress’s First Definition (2014)

“The term ‘industrial hemp’ means the plant *Cannabis sativa L.* and any part of such plant, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.”
“The term ‘hemp’ means the plant *Cannabis sativa* L. and any part of that plant, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.”
2018 Farm Bill: Key Changes

• Removed Hemp from Controlled Substance List
• Allows for state regulation with a USDA approved “State Plan”
• Expands the definition of “Hemp” to include the plant extracts with a delta-9 THC concentration of not more than 0.3% on a dry weight basis.
• All food, cosmetics or topical products are still regulated by the FDA
• Still requires that the crop be regulated under a USDA-approved “State Plan”
2018 Farm Bill: What has changed?

- States cannot interfere with interstate shipments of hemp material
- Funding eligibility under USDA programs
  - Supplemental and Alternative Crops program
  - Critical Agricultural Materials program
- Eligible for inclusion in federal crop insurance programs
- FDA’s jurisdiction over food and drug products continues
### Kentucky Hemp Program Highlights

#### KDA Industrial Hemp Research Pilot Program

**Annual Overview**

<table>
<thead>
<tr>
<th>Production Year</th>
<th># University Projects</th>
<th>Approved Processors</th>
<th>KY Counties with Hemp</th>
<th>Approved Acres</th>
<th>Planted Acres</th>
<th>Harvested Acres</th>
<th>% Grain or Seeds</th>
<th>% Fiber</th>
<th>% CBD</th>
<th>% Grain &amp; CBD</th>
<th>% Grain &amp; Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>7</td>
<td>9</td>
<td>20</td>
<td>14</td>
<td>-</td>
<td>33</td>
<td>-</td>
<td>47%</td>
<td>32%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>8</td>
<td>29</td>
<td>99</td>
<td>41</td>
<td>1,742</td>
<td>922</td>
<td>500</td>
<td>47%</td>
<td>6%</td>
<td>47%</td>
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</tr>
<tr>
<td>2016</td>
<td>17</td>
<td>45</td>
<td>137</td>
<td>60</td>
<td>4,600</td>
<td>2,300</td>
<td>2,000</td>
<td>34%</td>
<td>6%</td>
<td>60%</td>
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</tr>
<tr>
<td>2017</td>
<td>17</td>
<td>49</td>
<td>204</td>
<td>71</td>
<td>12,800</td>
<td>3,200</td>
<td>2,300</td>
<td>36%</td>
<td>5%</td>
<td>27%</td>
<td>32%</td>
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<td>72</td>
<td>210</td>
<td>73</td>
<td>16,100</td>
<td>6,700</td>
<td>6,000</td>
<td>18%</td>
<td>4%</td>
<td>61.5%</td>
<td>14%</td>
</tr>
<tr>
<td>6/3/2019</td>
<td>12</td>
<td>130</td>
<td>978</td>
<td>99</td>
<td>58,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Kentucky Department of Agriculture Hemp Program

- **Approved Acres**
- **Planted Acres**
- **Harvested Acres**

Yearly data from 2014 to 2019:
- 2014: Low
- 2015: Low
- 2016: Increase
- 2017: Moderate increase
- 2018: Moderate increase
- 2019: Significant increase
Kentucky Department of Agriculture Hemp Program
Number of License Holders per Year

- Approved Processors
- Approved Growers
Hemp Program Operation

- Only legal hemp production in Kentucky is within the Industrial Hemp Research Pilot Program
- Annual Application Period
- Annual Background Check
- Evaluation and Approval
- 3 Types of Licenses
Hemp Program Operation

1) Grower License
   • Live plants
   • Fields
   • Greenhouses
   • Storage
   • Dry, Chop, Grind
   • Market Crop

2) Processor/Handler License
   • NO live plants
   • Process harvested crop into products
   • Possess, handle, store, market Hemp
   • Brokers, labs, seed cleaners

3) Universities and colleges
   • Any necessary research procedures
Hemp Program Operation

• Grower Applications
• Evaluations Complete
• Mandatory Orientation & Licenses Issued
• All GPS Coordinates Sent to Law Enforcement
• Seeds/Planting Materials Pre-approved and Received by KDA
• Site Modification Requests – Required to change/add locations
Hemp Program Operation

- Grower Planting Report
- Grower Harvest/Destruction Reports
- Inspection, Sampling, & THC Testing
- Notification of Test Results & Compliance
- End-of-year Production Reports for Growers and Processors
- All Program Regulations, Forms, etc. found on our website: www.kyagr.com/hemp
Hemp Program Operation

- Fees necessary to sustain the program
- Cooperation with law enforcement is critical.
- THC Analysis: Delta-9 THC measurement of field samples
- Every field and greenhouse is inspected and sampled
THC testing is critical

Only THC analysis can separate hemp from illegal cannabis.
Understanding THC Analysis

• Cannabis plants only produce THCa (tetrahydrocannabinolic acid)
• THCa converts to delta-9 THC, the intoxicant through a process called decarboxylation
• Decarboxylation will happen naturally over time when exposed to air OR immediately in high heat conditions (if ignited)
• The combined, or decarboxylated THC, is often referred to as total THC
Understanding THC Analysis

• Federal law requires testing for total THC
• This has been the method used by KDA from the beginning
• If an analysis gives THCa and delta-9 THC or THC, it must be combined mathematically
• THC + (THCa x 0.877) = Total THC
Understanding THC Analysis

Was the owner attempting to sell it as hemp? **YES**

Is this hemp, by definition? **NO – 0.42% THC**
Understanding THC Analysis

Labs will sometimes attempt to disguise the THCa, while advertising boldly the CBDa. Deceptive!

Decarboxylated $\Delta 9$-THC (Total THC) = \( \frac{(0.6068 \times 0.877)}{\text{THCa}} \)
THC Analysis and Compliance

• THC Analysis disregarding THCa could mistakenly label high-grade marijuana (22% THC) as “hemp”
• Delta-9 THC measured after decarboxylation gives accurate measurement of intoxication potential
• Actual sample below: Pre-decarboxylation THC = 0.28%, Post-decarboxylation THC = 22.27% (after heating or igniting).

Actual lab test of flower material courtesy of CDA.

**CANNABINOID PROFILE**

<table>
<thead>
<tr>
<th>CANNABINOID</th>
<th>%(w/w)</th>
<th>mg/g</th>
</tr>
</thead>
<tbody>
<tr>
<td>THC</td>
<td>0.28%</td>
<td>2.8</td>
</tr>
<tr>
<td>THC-A</td>
<td>25.07%</td>
<td>250.7</td>
</tr>
<tr>
<td>CBD</td>
<td>0.00%</td>
<td>0.0</td>
</tr>
<tr>
<td>CBD-A</td>
<td>0.92%</td>
<td>9.2</td>
</tr>
<tr>
<td>CBN</td>
<td>0.00%</td>
<td>0.0</td>
</tr>
<tr>
<td>CBG</td>
<td>0.09%</td>
<td>0.9</td>
</tr>
<tr>
<td>TOTAL CANNABINODS</td>
<td>26.36%</td>
<td>263.6</td>
</tr>
</tbody>
</table>

THC-A converts to THC at a rate of 87.7%, resulting in a change in molecular weight.
# Sampling and THC Testing

## Table 1: Post-Testing Action Summary

<table>
<thead>
<tr>
<th>Pre-Harvest Test Results</th>
<th>Material allowed to market</th>
<th>Material not allowed to move – triggers Post-Harvest Sampling and testing or verification of leaf and floral destruction</th>
<th>Material Destroyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0.399% (1, below)</td>
<td>≥ 0.400%– 0.999% (2, below)</td>
<td>≥ 1.0% (3, below)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Harvest Test Results</th>
<th>Material Allowed to Market</th>
<th>Material Destroyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0.300%, compliant (4, below)</td>
<td>≤ 0.399% (5, below)</td>
<td>≥ 0.400% (6, below)</td>
</tr>
</tbody>
</table>
Summary of Varieties List

- Summary of Varieties List helps to ensure THC compliance and allows for removal of non-compliant strains/varieties.
- More than 100 different hemp varieties, named strains have been grown and tested in the Kentucky Industrial Hemp Research Pilot Program
- Eight (8) are designated Prohibited Varieties
- 41 are designated as Varieties of Concern
  - Varieties of Concern should be utilized with caution as they are at a higher risk of exceeding the THC limit and potentially resulting in the ordered destruction of the crop.
- 53 Other varieties testing without cause for concern
Lessons Learned in Kentucky

- Your state’s legal & regulatory structure
- Public engagement and education
- Star performers are essential
Kentucky’s Hemp Program Staff

• Doris Hamilton, Hemp Program Manager
• Melissa Bourne, Hemp Program Specialist
• Kim Sullivan, Hemp Program Specialist
• Edmond Thompson, Hemp Program Specialist
• Inspector Team
Interagency Partnerships

• State and Local Law Enforcement Agencies

• State Economic Development Agencies

• Elected Officials in Cities and Counties
Proceed With Caution

• There are no guarantees!
• This is a new industry, new companies, new production techniques.
• The price model is not well developed and some companies have had trouble making payments.
Contact KDA
Industrial Hemp Program

Kentucky Department of Agriculture
Industrial Hemp Research Pilot Program
111 Corporate Drive, Frankfort, KY 40601
Mainline: (502) 573-0282

Doris Hamilton, Hemp Program Manager
Doris.Hamilton@ky.gov

Joe Bilby, General Counsel
Joe.Bilby@ky.gov
Hemp as an Economic Development Opportunity: North Carolina’s Experience

Blake Butler
Executive Director
NC Industrial Hemp Association
NCIHA – a 501c(6) trade organization representing stakeholders in the NC hemp industry.
WHAT’S NEXT FOR NC?

“DEMAND FOR HEMP TEXTILES IS GROWING BUT NOWHERE TO SOURCE”

The United States imported $1.9 million worth of hemp textiles in 2017 and 312 tons of hemp yarn, valued at $2.7 million, according to data from the U.S. Department of Commerce's Office of Textiles and Apparel. Retail sales of hemp textiles in 2016 were about $96.3 million.
WHAT’S NEEDED IN NORTH CAROLINA?

- Support for hemp from NC legislators
- Monies for Research and Development
- Capital Investment in Tier One opportunity zones
- Expansion of community college curriculum
- Guidance from the USDA and the FDA
Blake Butler
Executive Director
blake@ncindhemp.org