

An overview of hemp research in Kentucky and at Kentucky State University.

Photo: S. Lucas



SHAWN T. LUCAS

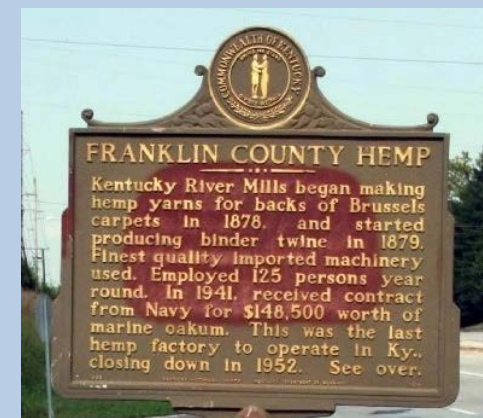
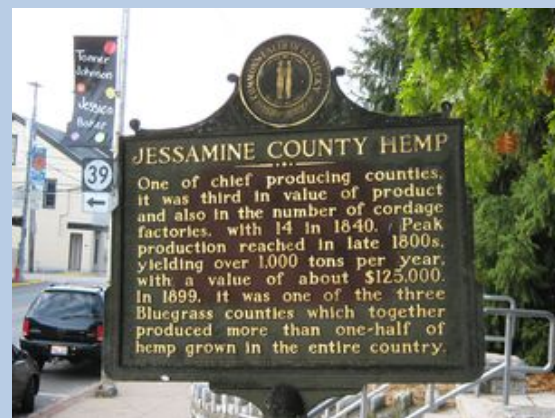
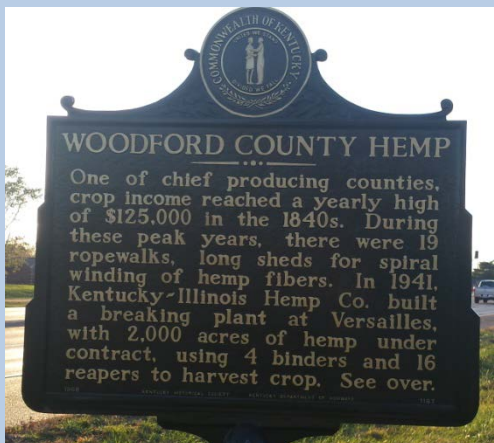
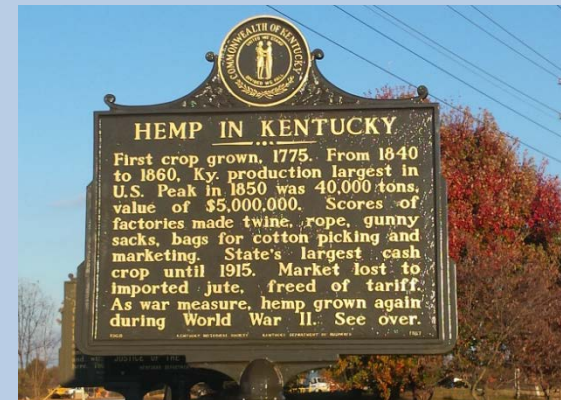
College of Agriculture, Food Science, and Sustainable Systems, Environmental Education and Research Center, Kentucky State University, Frankfort, KY 40601.



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Food Science, and
Sustainable Systems

Hemp History in Kentucky

- First crop 1775 – Boyle County
- Leading hemp producing state by 1850
 - 40,000 tons
 - Rope
 - Twine
 - Oakum – loose fiber used in caulking wooden ships



Hemp History in Kentucky

Hemp fiber production was the primary driver of the slave trade in Kentucky.



Photo: <http://www.gutenberg.org>

KY Industrial Hemp Pilot Program – Research Opportunities

Statewide Acreage authorized for planting

(Academic and Civilian)

- 2014 – 33 acres
- 2015 – 1500 acres
- 2016 – 4500 acres
- 2017 – 12, 800 acres
- 2018 – about 15, 000 acres



Academic Research

- University of Kentucky – multiple studies
- Kentucky State University - multiple studies
- Murray State University – variety trials
- Eastern Kentucky University – variety trials
- University of Louisville – pollution study
- Western Kentucky University – variety trials
- Morehead State University – variety trials
- Berea College
- St. Catharine College – fiber & soil study

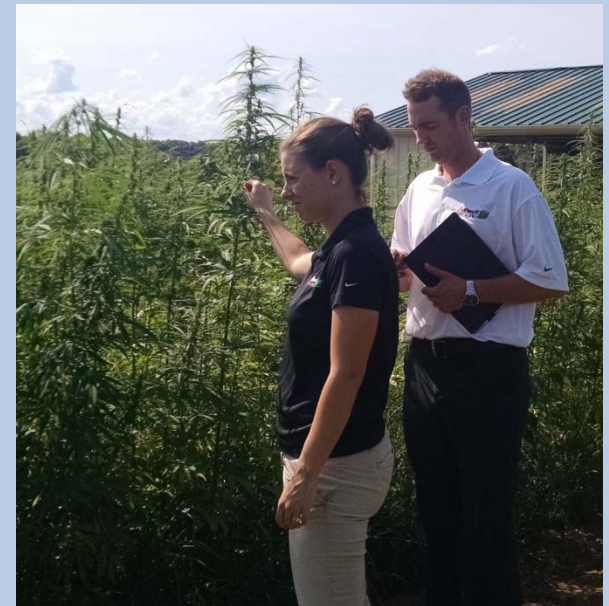
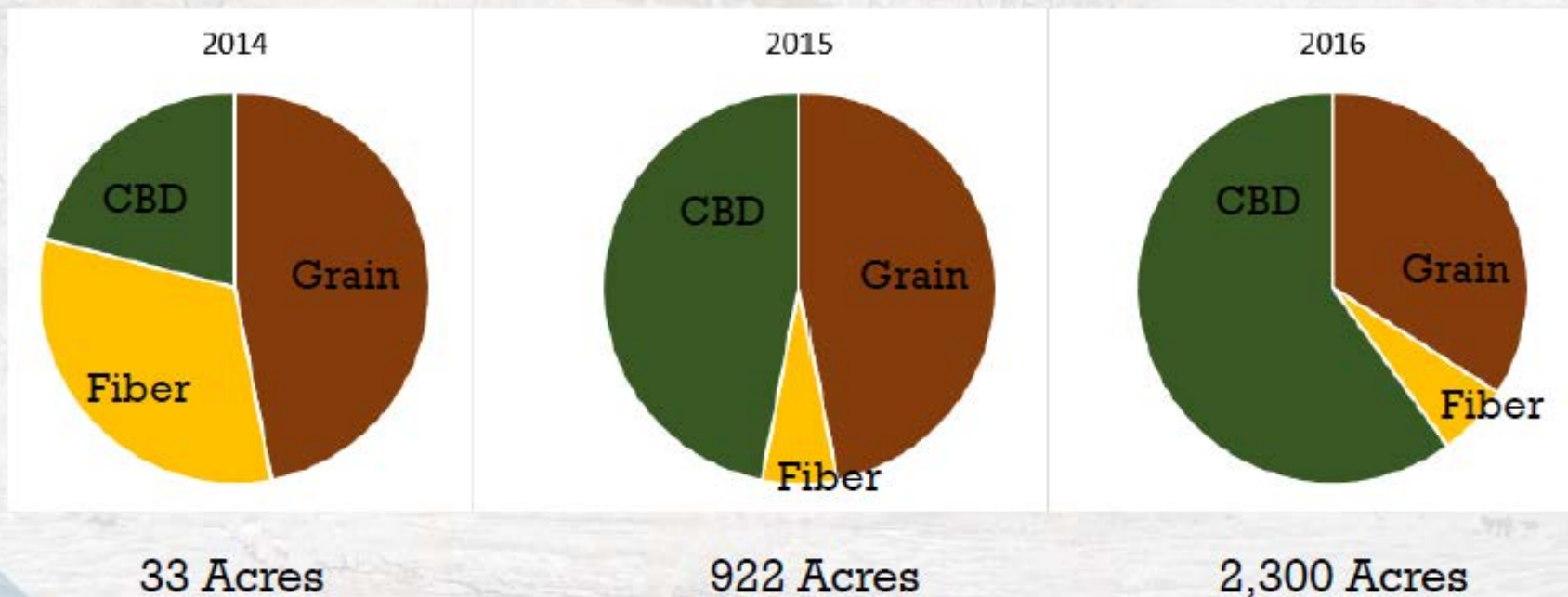


Photo: K. Pomper

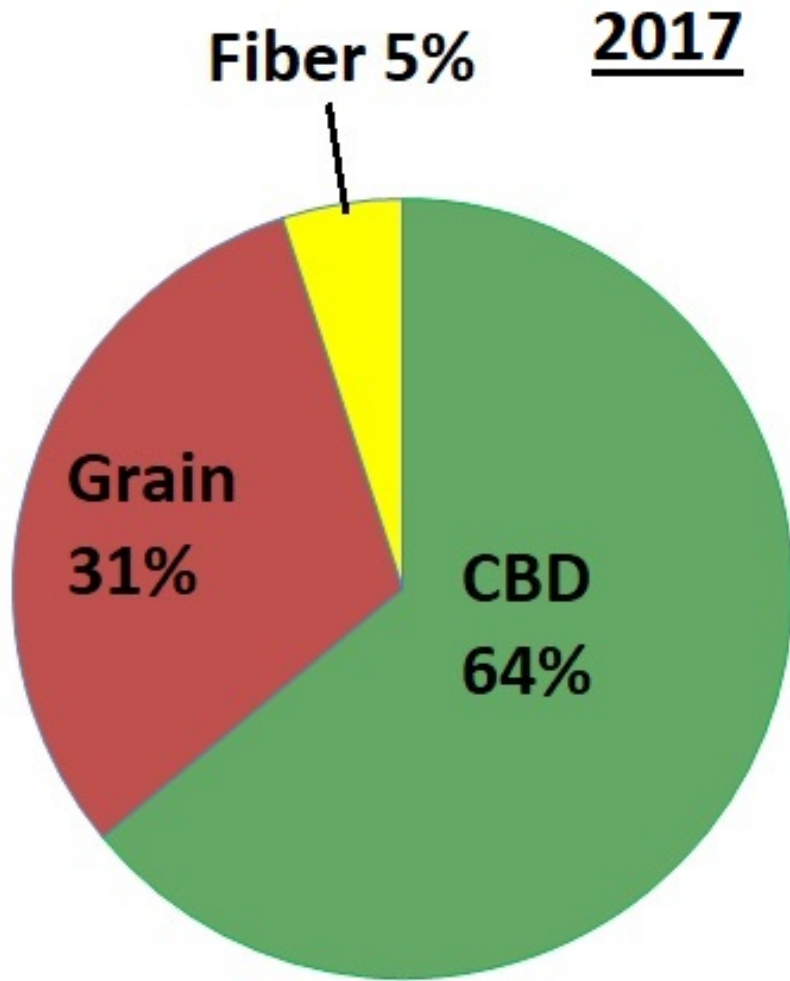
Producer Intended Products



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



Producer Intended Product 2017



**Approximate Acreage
Planted: 3000ac**





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Kentucky State University Hemp Projects 2016 - present



FIBERSHED

Three studies

- Biofertilizer impacts on Grain yield and Biomass
 - Collaboration with Alltech Crop Science
- Impacts of Dew-Retting on Soil Quality
 - Collaboration with Fibershed
- Cannabinoid and Terpenoid profiles in aquaponic hemp



Photo: S. Lucas



Alltech Biofertilizers



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- Testing biofertilization products

- Soil Set® - bacterial metabolites
 - Designed to promote nutrient availability and healthy root systems
 - OMRI Listed
- Grain Set® - micronutrients and fermentation products
 - Designed specifically for grain production
 - Promote nutrient uptake, nutritional value, and overall crop quality
 - approved for organic research by KDA



Alltech Biofertilizers

- Objective – test effects of Alltech products on hemp grain and biomass production
- Experiments in 2016 and 2017
 - Test effects of Combination of Soil Set[®] and Grain Set[®]
 - Based on results of 2015 study

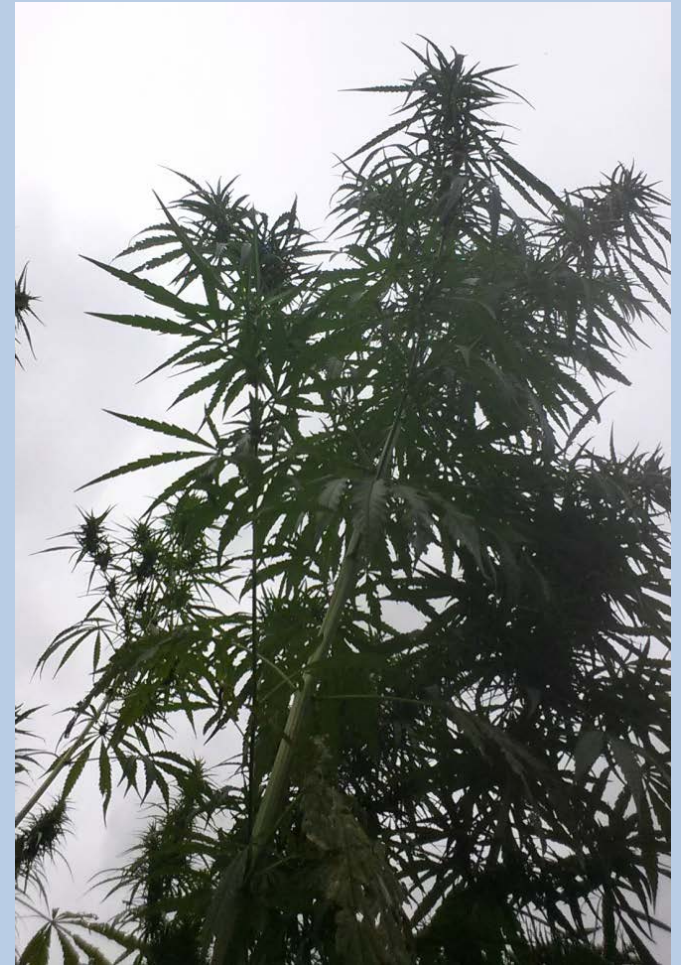


Photo: S. Lucas

Methods

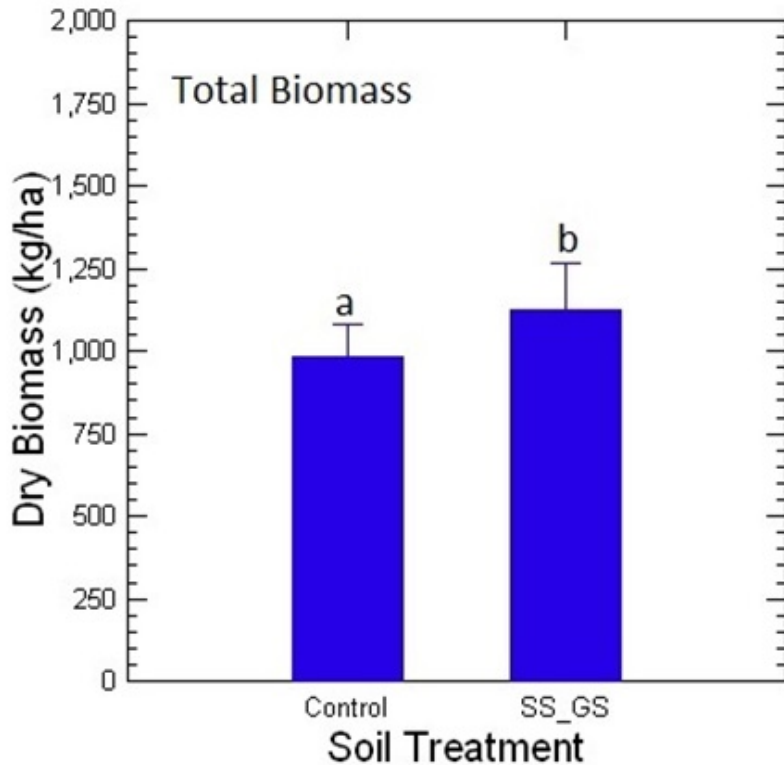
- Experiments set up as randomized complete block design
- Experiment components
 - 4 Blocks
 - 2 Treatments
 - Control
 - SS (1.2 L / ha at seeding) + GS (0.6 L / ha during early vegetative growth)



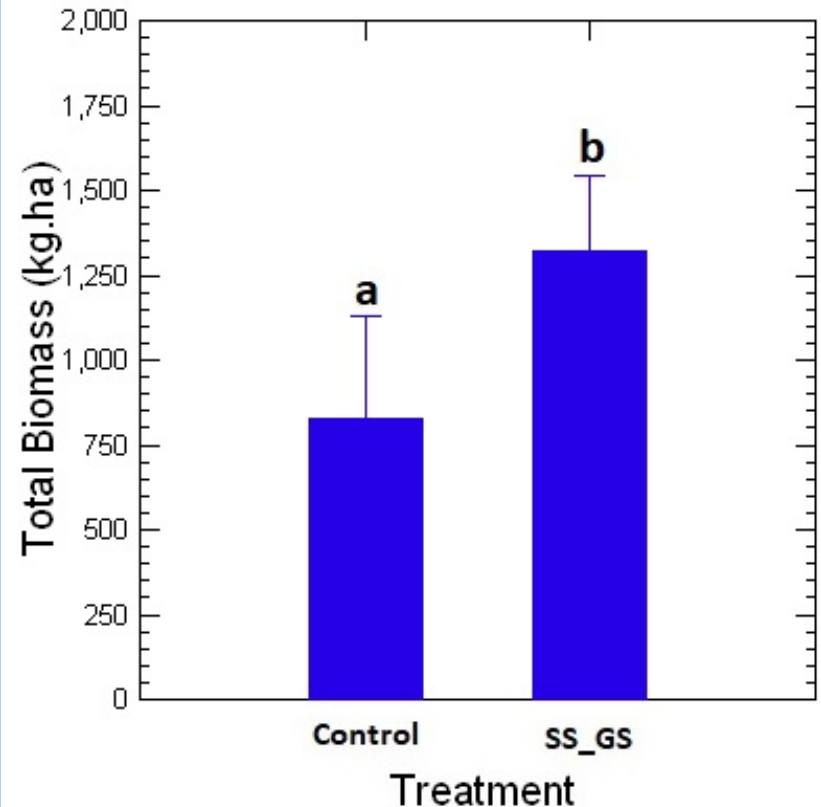
Photo: R. Johnson

Alltech Biofertilizers

2016 Biomass Yields – Fedora 17

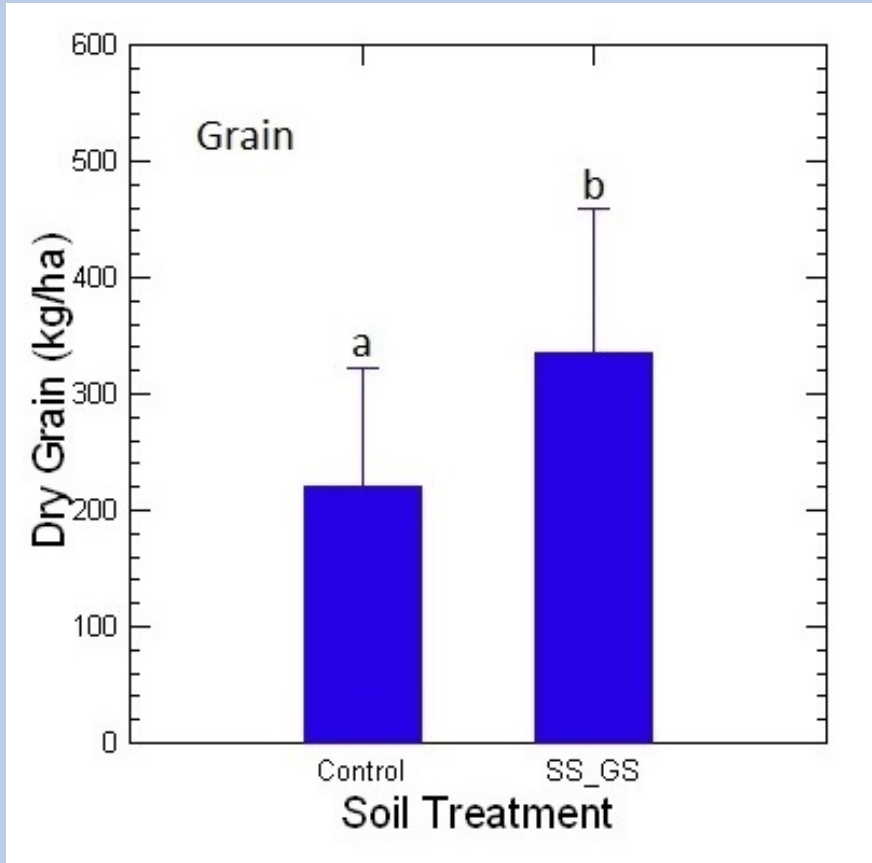


2017 Biomass Yields – Futura 75

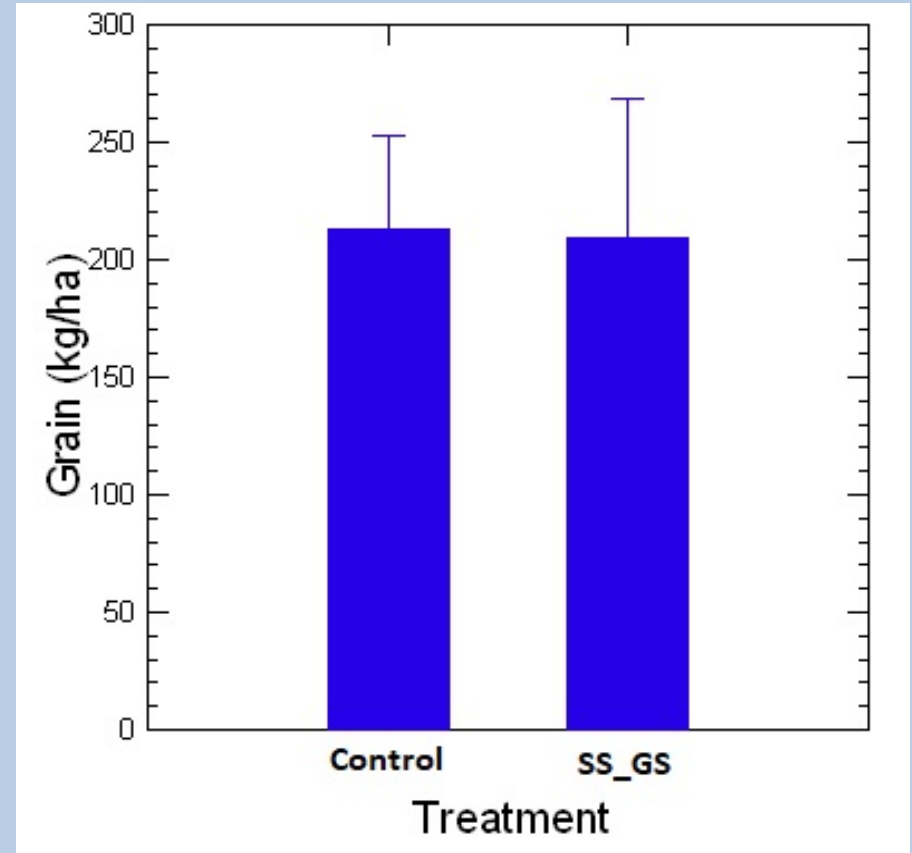


Alltech Biofertilizers

2016 Grain Yields – **Fedora 17**



2017 Grain Yields – **Futura 75**



No significant differences in results in grain of Experiment in 2017 – Does Futura 75 have different shatter characteristics?

Conclusions

- The combination of Soil Set[®] and Grain Set[®] enhances hemp yields
- Enhancement may be due to enhanced soil enzyme activity and associated nutrient cycling
- The Soil Set[®] & Grain Set[®] combination needs more study in hemp crops and other crops under organic management



Would biofertilizers help in Cannabinoid production operations? (Photo: S. Lucas)



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Retting Study at Kentucky State U.



FIBERSHED

- Dew Retting - Soil Quality Study
 - Studying effects of dew retting (in the field) on soil organic matter, soil quality, and soil microbial ecology



Photo by Rose Johnson



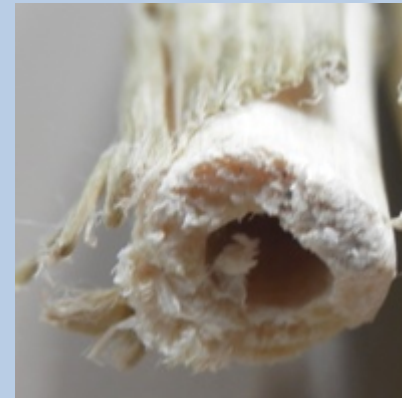
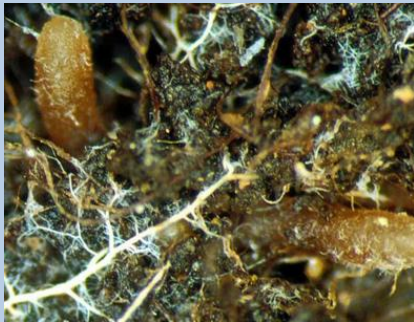
Photo by Shawn Lucas



Photo: KY Historical Society

Traditional field Retting

- Partial decomposition of stalks
 - Enables separation of fibers from woody core
 - Dependent on soil microorganisms
 - **Byproducts become SOM and microbe food**
 - **Can we measure this impact?**



We tested four retting treatments

- Experimental Control – No Hemp, No retting (CON)
- Hemp production, No Retting (HNR)
- Hemp production, Low density Retting (HLR)
 - 2270 kg / ha (2025 lbs / ac)
- Hemp production, High density Retting (HHR)
 - 4540 kg / ha (4050 lbs /ac)



Photo by Shawn Lucas

Retting – 22 days 2015, 30 days 2016, 25 days 2017

-Stalks flipped about halfway through duration



Photo by Shawn Lucas

-Soil samples collected immediately after retting.

Soil Tests

- Total organic Carbon
- Labile organic Carbon (Permanganate Oxidizable C - POXC)
- Microbiological measurements
 - Signature Fatty Acid Biomarkers



Photo: USDA-SARE

Retting Study Results – Soil Carbon

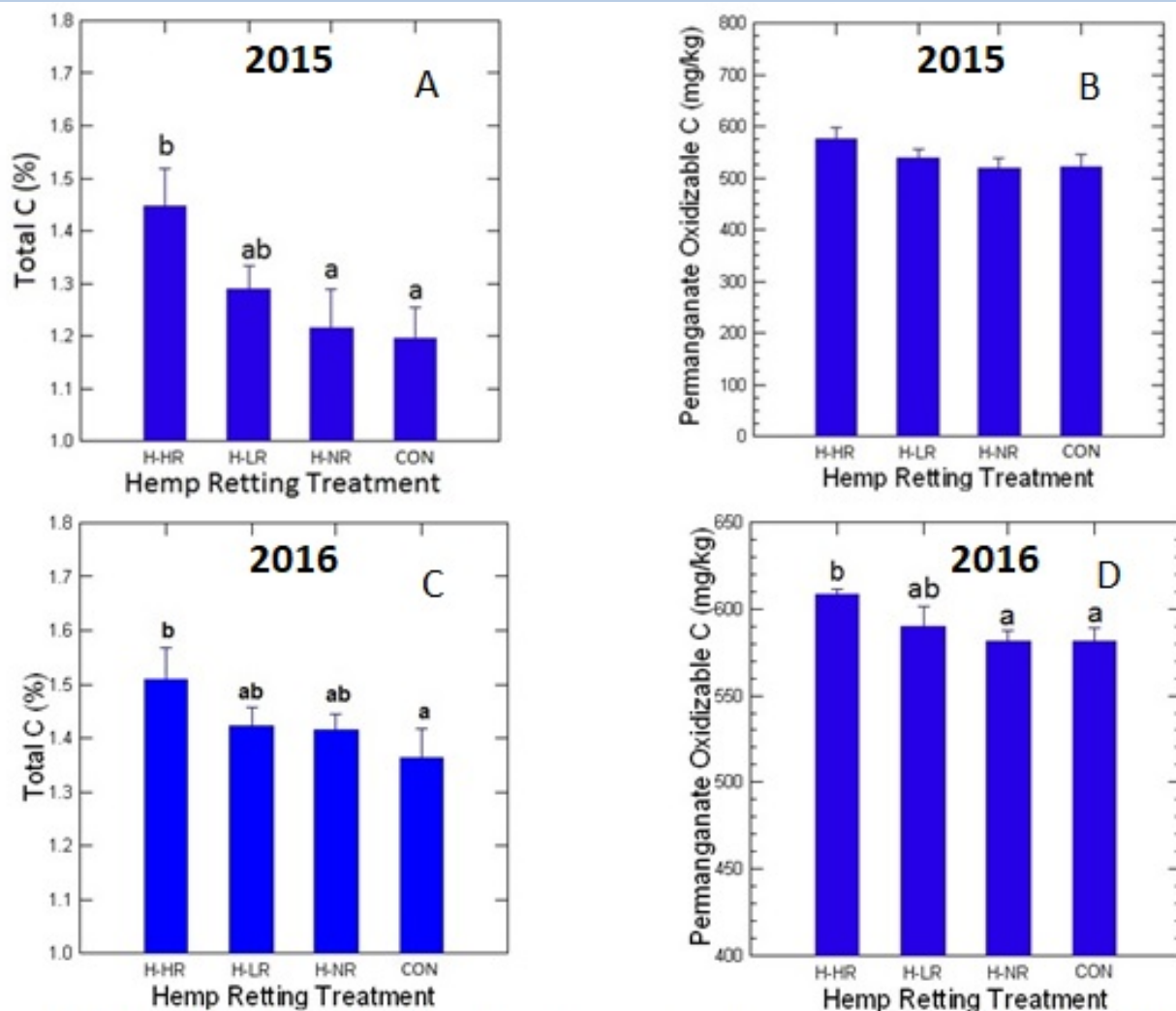


Figure 3. Effects due to retting treatment seen in soil carbon parameters. A: TOC in 2015; B: POXC in 2015; C: TOC in 2016; D: POXC in 2016. Different letters over bars in the graph indicate significant differences at $\alpha = 0.05$.

Retting Study - Conclusions

- Traditional field retting probably contributes to soil carbon sequestration.
- May mitigate C losses due to residue removal.
- May also maintain or increase microbial biodiversity and activity.
- More work needs to be done.



Analysis of Cannabinoids and Terpenoids in Aquaponic Hemp

- Project in early phases – pilot study completed



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New Directions



United States Department of Agriculture
Agricultural Marketing Service
National Organic Program

1400 Independence Avenue SW
Room 2648-South Building
Washington, DC 20250

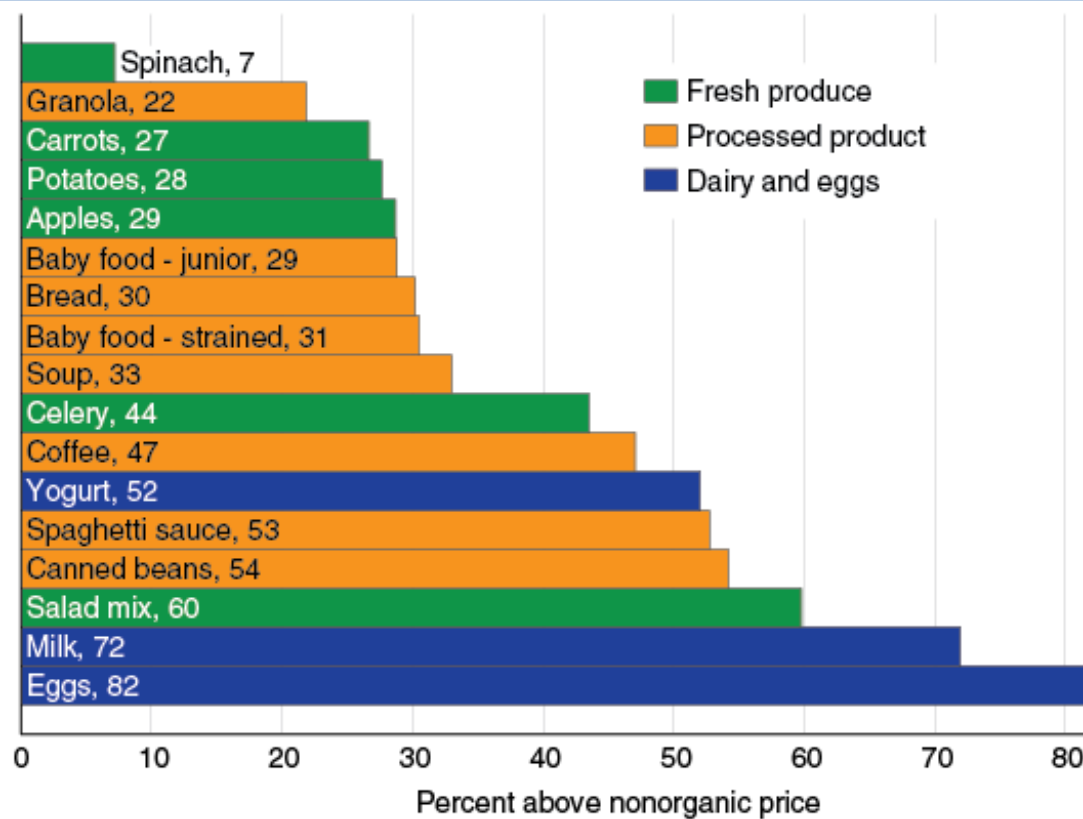
NOP 2040
Effective Date: August 23, 2016
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Instruction

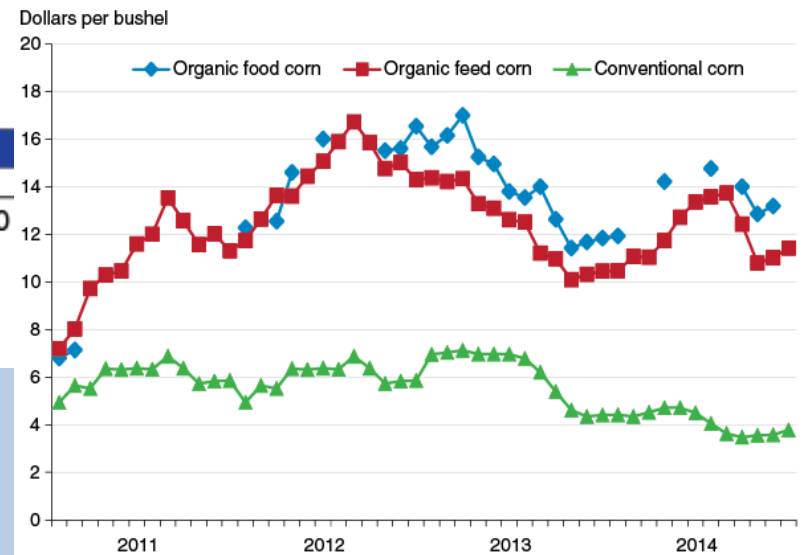
Organic Certification of Industrial Hemp Production

- NOP 2040 – August 2016 Instruction from USDA states:
 - “industrial hemp produced in accordance with the 2014 farm bill ... may be certified as organic, if produced in accordance with USDA organic regulations.”

Capturing the Price Premium



The monthly average price received for organic feed-grade corn was \$6.82 higher than for conventional corn during 2011-2014



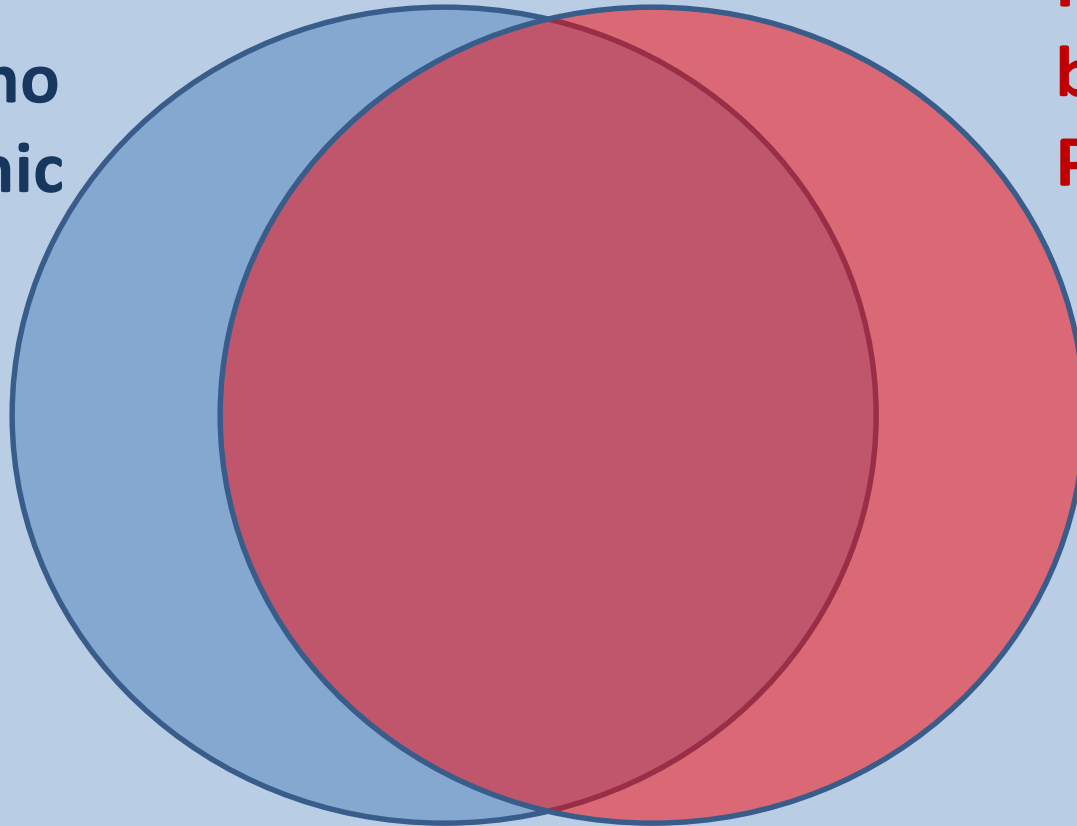
Source: USDA, Economic Research Service calculations from USDA, Agricultural Marketing Service organic price data and USDA, National Agricultural Statistics Service conventional price data.

Source: USDA, Economic Research Service using 2010 Nielsen Homescan data.

Organic products are 22 to 35 percent more profitable for farmers than conventional products (PNAS, Crowder and Reaganold, 2015)

Demographic overlap

People who
buy Organic



People who
buy Hemp
Products

- Who: Urbanites, “foodies”, middle to upper middle class, younger
- Where: Specialty grocers, farmers markets

Opportunity



- SeedCX – electronic marketplace that tracks emerging commodities
 - 2016 Analysis: Organic Hemp Potential in the United States
 - called organic hemp an emerging commodity
- Study noted: “Colorado, Kentucky, and Tennessee currently have the most well established hemp programs and thus will be able to take advantage of this recent change in organic certification the soonest.”



New Directions at KSU

- Evaluation of organic hemp agronomics
 - Where does it fit in rotation
 - Spacing & Seed Rate
 - Weed Control
- Economics of organic hemp production
 - Production costs, labor analysis, etc.
- Varieties
 - Grain
 - Fiber
 - CBD



Photo: S. Lucas
8/21/2017

2018 Hemp – A challenging season (so far)



Acknowledgements & Questions?

- The Berry Farming Program, St. Catharine College
- Fibershed, Alltech
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- The Land Grant Program, Kentucky State University
- Doris Hamilton & Kentucky Dept. of Agriculture



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