

## 2023 S1084 meeting minutes

Chair Heather Darby opened up with a welcome and overview of agenda for the day.

- Thanks to organizers John McKay, Larry Smart
- Special approach this year from industry speakers
- Guidance and discussion on renewal process (proposal due Mar 15)

John McKay (host) greeted the group and discussed logistics for the next day's tours to the USDA National Germplasm Repository on CSU campus and Charlotte's web facility.

### NIFA Update: John Erickson

- John provided an update on the status of NIFA staffing and operations:
- 85% of employees out of Kansas City
- virtual panels for all programs in FY23, hoping to get back to in-person
- Provided overview of Plant Systems- Production division and current status of administration. Hoping to get permanent NIFA director announcement soon.
- FY22 admin priorities:
  - Climate Change via Climate-Smart Ag & Forestry
  - Advancing Racial Justice, Equity and Opportunity
  - Creating more & better market opportunities
  - Tackling food and nutrition insecurity
  - White house EO on Advancing Bioeconomy- <https://www.whitehouse.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/>
  - Foundational and Applied Science RFA released. Increased budget sizes \$650K total for standard grants. New partnership opportunities- additional \$150K in budget for MSAs small-mid-sized, EPSCoR, Int'l
  - New investigator seed grants available to all institutions. >30% funding rate expected
  - Supplemental Alternative Crops include Hemp.
  - NIFA grants modernization- updating systems for managing grants
  - Questions- Any plans to name hemp as Specialty crop? John was unaware of any effort for doing that.

### Industry Panel- Moderated by Larry Smart

Representatives from the hemp industry were asked to provide some background about their company or organization followed by some discussion of what they see as research needs and opportunities. This discussion will help frame the S1084 renewal.

New West Genetics- Rich Fletcher- Been in over half of states in US, establishing some international presence. Working on both maximizing traits of interest through breeding, but also have agronomists running trials in Eastern CO. In addition to direct crosses and marker assisted breeding, mutation breeding also being done, which has been a proven method in other crops. What they see as the opportunities: hybrids (proven in corn to significantly increase yields). Breeding hybrid hemp under

brand “Amplify” 90%+ females; early in evaluation but seeing vigor, uniformity, stand establishment and yield improvements.

Areas of needed research: pest management and scouting- what is emerging and how economically important is the damage; when do chemical or genetic options become economically viable.

Agronomics: planting and establishment variability, though may change with hybrid availability. Fertility: as yields increase, what supplementation will be required in cropping systems? Canola hybrids equaled about 30% increases in nutrient supplementation.

Hunter Buffington- element6 Dynamics and Hemp Feed Coalition, CO HIA

Demand for animal Feed- nearly 284 M tons consumed by domestic livestock. A variety of trials being conducted on different ingredients (from hemp), potential deleterious components (heavy metals, etc) and species. State regulations are all over the place and everyone is looking for help on how to proceed in regulating hemp products in feed. Generally Recognized as Safe (GRAS) designation in Kentucky for poultry & horses but requires THC levels on labels, whereas Texas does not. Current feed additive petition from AAFCO to FDA. Works closely with ASTM on standards; current ASTM D8440-22 standard

Recommendations to advance the industry- help fund additional research. Feed trials are expensive and long. Look into additional feed projects (forage hemp), cannabinoid transference. Though FDA approves the feed, USDA has to approve the animal products. Need analytical method validation and establishment of non-detectable limit of THC for products. Also should be considered a commodity Crop as well as specialty crop.

Corbet Hefner- Formation Ag (Global Fiber). Company develops decortication and harvesting equipment. Equipment same as Barley/ Wheat. Opportunities- better data on value to soil health to provide potential producers. A bit of a gap between decortication and spinnable fiber. Micronizing is a challenge for things like semiconductor and carbonization applications. Selling finished goods for plastics, animal bedding, building supplies, injections molding, automotive parts, structural building components, heat molding products. Also doing product development- some yarn (non cottonized) and industrial fiber applications (non-chemically treated fibers attractive from a sustainability standpoint); foundational masonry (not hempcrete; working toward cinder block); nonwovens- advantages over paper mesh for food packaging (potatoes). Need to study link between lignin content and color.

Wendy Mosher- New West Genetics. Market observations include: Increased demand for plant protein but Omega-3 market increasing faster. Demand for US based manufacturing on the textile and industrial materials increasing also. Carbon markets talked about a lot, but not much use yet; need the data to back up the argument. Processing capacity increased recently but processors need more acreage. Hemp is competing with well-established crop supply chains. They are seeing farmer adoption challenges which contributes to an unstable supply chain. Large companies could adjust their pricing to influence production practices. Production costs are increasing faster than traditional commodity prices. Farmers like the soil/environmental benefits and versatility, the increasing yields in following rotations and minimal water requirements. Barriers to adoption: competition with commodities, crop insurance issues, lack of weed management tools, lack of animal feed market, time away from proven crops with tight margins. Freight and manufacturing distance is a barrier for many. Potential solutions: Have to exceed commodity ROIs (Companies have to pay more for it). Removal of regulatory burden, increases in yields, data for rotational value and carbon impacts (and regulatory of industry acknowledgement of

the value of the C) Risk management- weed management options (IR-4), Feed market approval, improve crop insurance model.

Proposing language for the Farm Bill to facilitate faster processing of FDA approvals.

Julie Vernor PanXchange- This is a commodity trading digital brokerage in cannabinoids, grain and fiber. Monthly benchmark reports, market analysis Carbon farm economics consulting. The Carbon program is a farmer-friendly carbon credit program. The modeling shows hemp rotations improving C based revenue 3-4 times over traditional crops using their program. Life cycle assessment research needed to show that products can permanently store C. Acreage dropped considerably in '21-'22; Cannabinoids short in supply this year for the first time in a while. Agrees that the acreage isn't supporting the processing but expect 60K acres increase in fiber over 5 years. Grains demand also.

Chad Rosen- Victory Hemp foods- focused on hempseed use as an oilseed and for protein; have a hemp protein powder with little taste; can be used as a drop-in replacement for pea, soy, egg, whey but limited by cost. Processing technologies are mature and available. They will offer researchers 4 oz. hemp heart protein pouches. Hybridization and other breeding will be key to the sustainability of the hemp grain market for human food. Would love hempseed product research as a focus. Process technology is mature and available. Commercial companies spending LOTS of R&D on alternative protein product development (Impossible Foods, etc). Need to work on the increase of return per acre: well-adapted genetics (consistency, environment benefits, increased yields) and best agronomic practices all geared toward lowering input costs, ensuring safety and creating carbon markets for producers. Think they need 3000 lb/A for yields and cost of grain at about \$0.40/lb to be competitive.

#### Panel Discussion:

Will hybrid hemp (Amplify) NWG is developing be mostly for grain, fiber or both? Answer: both (increase yield for seed and uniformity of fiber), but they are less certain what the outcomes will actually be for fiber.

There is a thought that there will be a tradeoffs between yield and resiliency in the hybrids. There is also a tradeoff between food protein increases and nitrogen inputs. Believe at first the goal will be to get some uniformity in performance over more localized adaptation.

Why better stands from hybrids? Seems to be better vigor, but mechanism not clear.

Only real aptitude for making hemp allowable as feed seems to be at the state level but the in-state limitations are \$250K to get FDA application put together plus whatever else FDA wants (like analytical method validation). Environmental impact of hemp as feed is another aspect to be investigated.

Panel was asked if the regulatory environment really necessitates a truly zero THC variety. Might cause morphological changes not desirable but would potentially simplify the ability to meet the standard for hemp. Needs to be an agreement of what "zero THC" variety means (undetectable, undetectable in certain parts, etc.) But Hunter says it's chasing our tails because the real issue is probably best addressed at a reasonable allowable level. What about CRISPR editing for THC suppression? May not be more important than other traits, but gene editing may be a viable option.

Discussed accounting of Carbon in soil- how is PanXchange accounting for it- 2 accepted COMET (another?) models used by USDA- what are you planting, acreage and location, practices being used are taken into account. Like to start with a soil sample, establish a baseline and then do remote sensing to extrapolate the overall C amount. Regrow Ag is one of the companies that does the sampling.

Shattering still a potential issue, but more shatter tolerant varieties can be difficult to harvest as well.

One feed use authorization has been approved for chickens; need a feed use authorization in cattle so that hemp finished animals don't end in landfills.

#### ARS update:

Jourdan Lakes with Forage Animal Production Research Unit in Lexington, KY: Research programs include evaluations of mycotoxin from fungal pathogens, antimicrobial properties of secondary metabolites and immuno-modulatory effects of metabolites. With partners at University of Kentucky, looking at agronomic issues, pest and disease control, and animal work in potential feed value, metabolic impacts of cannabinoids, terpenes, isoflavones and potential for metabolites to end up in meat.

Hannah Rivondal with the Forage Seed and Cereal Research Unit in Corvallis, OR: They are working on hiring a data scientist to work in hemp. Pathology work includes sampling in PNW for potential viral disease incidence. Had PCR confirmation of Beet Curley Top Virus. Found to be spread throughout region. Also looking at strain specific PCR found Worland-like strains. Loss of other undiagnosed virus-like symptoms. Also reporting root-lesion nematodes. Continuing to survey for disease and updating guidance.

Chris Delhom with the Cotton Structure and Quality Unit in New Orleans, LA. Interested in postharvest fiber quality. Full materials testing lab for fiber and other materials. Underpins the classifications of quality for cotton; looking at potential standard for hemp. Many automated methods don't work for hemp so have to go back to manual. Also have textile processing capabilities. 10% effort is on hemp but funding has come from other sources. The lack of consistency in quality and classifications is limiting more textiles going into hemp. What to measure? Length, fineness, strength. Color? What will the industry expect and what is the economic value of the color. Believes that clothing is not the market; most likely in composites and industrial materials, but less sure about the properties that are important. Packaging for transport is another area of optimization- need to define a single-stalk-to-fiber system. Phenotyping needed for breeding; need standardized retting and decortication.

Zach Stansell and Tyler Gordon with the Plant Genetic Resources Unit in Geneva, NY. Oversees the hemp repository. Documents, preserves and distributes hemp genetic resources. Also evaluates for traits of interest and develops novel tools. About 300 accessions; happy to have more. Deep phenotyping efforts ongoing and developing a phenotyping handbook to standardize efforts. Phenotyped >100 accessions. 37 available for order. <https://npgsweb.ars-grin.gov/gringlobal/search>

Phenotypic evaluations include: architecture, secondary metabolites, fiber, seed, diseases. Let them know if there are other traits that would be of interest. Looking at transplants, direct seeded as well as multiple environments. Hoping to genotype the entire collection and develop relationship matrices. Looking to publicly share both genotypes and germplasm, as well as develop new germplasm that would be distributed.

Craig Beil and Tim Parson from Breeding Insight: Provide services for USDA; USDA-ARS funded initiative located at Cornell- Service and tech transfer model. Work across multiple species. Single location for high-capacity bioinformatics support for genetic improvements. Database management, phenotyping tools, genotyping and bioinformatics, working on commons tools that are not species specific. DeltaBreed software- trying to make as plug and play as possible for end users. Training is available for their tools and services <https://breedinginsight.org> > Learning Hub

#### Breakout Groups-

In person attendees broke out into small groups by broad topic:

- Economic Viability
- Product Quality and Market Development
- Breeding/Genetics/Genomics
- Agronomy/Sustainability
- Crop Protection

Additional stakeholders were invited to join the breakout. Breakout leaders were given a set of prompts to lead discussion on priorities for the next 5 year S1084 proposal. Following the breakout discussion, the business meeting adjourned for the day and the group reconvened the following morning for tours of the USDA National Germplasm Repository on CSU's campus and the Charlotte's Web facility.