

**Testimony of Brandy E. Phipps, Ph.D. to the Biotechnology, Horticulture, and Research Subcommittee of the United States House Committee on Agriculture**

***An Examination of the USDA's Hemp Production Program***

July 28, 2022

Chairperson Plaskett, thank you for the invitation and opportunity to speak to the Biotechnology, Horticulture, and Research Subcommittee of the House Committee on Agriculture. Central State University (CSU), where I am faculty, is in Ohio District 10, represented by Congressperson Mike Turner. CSU is a public Historically Black College/University (HBCU) and an 1890 Land-Grant Institution. I want to acknowledge the two Ohio representatives on this subcommittee, Representatives Brown and Balderson and Chairperson Scott of the House Committee on Agriculture who has been a consistent champion for the 1890 Land-Grant Institutions.

I am an Assistant Professor in the Department of Agricultural and Life Sciences and a researcher in the Food, Nutrition, and Health project of the Agriculture Research and Development Program at Central State University. My background is in Biomedical and Nutrition Sciences, so my work with hemp has primarily focused on its nutritional and nutraceutical value for humans. This includes an ongoing \$1.3 million contract with the U.S. Food and Drug Administration (FDA) with Dr. Craig Schluttenhofer evaluating the chemical constituents of smoked and vaped hemp products and serving as Project Director for a \$10 million, five-year Sustainable Agricultural Systems project, funded by the U.S. Department of Agriculture's National Institutes of Food and Agriculture and referred to as the SUSHI project (Sustainable Use of a Safe Hemp Ingredient). The SUSHI project investigates the use of hemp as an animal feed ingredient to improve human health and economic prosperity – promoting the production of sustainable, safe, affordable, and accessible sources of high-value, nutrient-dense foods – focusing on rural, low-income, and underrepresented minorities (URM). This project has team members from all three types of Land-Grant Institutions:

- Central State University, Lead Institution (1890 Land-Grant Institution):
  - Brandy E. Phipps, Ph.D. – Biomedical and Nutrition Sciences and Community-Centered Food Sovereignty
  - Craig Schluttenhofer, Ph.D. – Agronomy, Biochemistry, Breeding, Genetics, and Processing of Hemp
  - KrishnaKumar Nedunuri, Ph.D. – Water Resources Management and Environmental Engineering
- Kentucky State University (1890 Land-Grant Institution):
  - Waldemar Rossi, Ph.D. – Fish Nutrition and Aquaculture
- College of Menominee Nation (1994 Land-Grant Institution):
  - Brian Kowalkowski, M.S. – Community Data Analysis, Cooperative Extension/Outreach, and Tribal Government Liaison and Grant Management
- University of Kentucky (1862 Land-Grant Institution):
  - Tyler Mark, Ph.D. – Agriculture Production Economics and Hemp Economics
- University of Delaware (1862 Land-Grant Institution):

- Brandon McFadden, Ph.D. – Applied Economics and Statistics and Consumer Demand and Preferences for Hemp
- Mississippi State University (1862 Land-Grant Institution):
  - Seong Yun, Ph.D. – Resource and Environmental Economics



**Figure 1.** Project summary graphic representing inputs and long-term outcomes

While currently in the early stages, the SUSHI project is expected to (1) support the use of hemp as a safe feed ingredient, leading to approval as an economically and environmentally sustainable fish feedstuff; (2) expand domestic markets for hemp and trout; (3) increase workforce diversity in agriculture; and (4) improve economics and public health of Menominee Nation through increased local production of fish and produce. The project’s extension and education products will serve as models enhancing intertribal research and extension relationships and impacting the national health and economic stability of Native Americans and other URM. Overall, the project outcomes will contribute to the USDA goal of transforming the food and agricultural system to increase domestic agricultural production by 50% and reduce environmental footprint by 40% by 2050 while improving the lives of rural, low-income, and URM.

The Scientific Report of the 2020 Dietary Guidelines Advisory Committee (2020 Committee) reported that 6 in 10 Americans have diet-related chronic conditions (CC), with 4 in 10 having two or more CC [1]. In 2016, cardiovascular disease (CVD) and type 2 diabetes (T2D) cost America \$555B and \$327B, respectively, with costs expected to more than double by 2035 [2,3]. Lower-income and URM households are disproportionately affected by CC and food insecurity [4,5], highlighting the importance of targeted research and outreach. One strategy for decreasing the risk of CVD, T2D, and some cancers includes replacing saturated fats with polyunsaturated fatty acids (PUFA), often referred to as “heart-healthy fats” [6-12]. **Strategies to increase the intake of heart-healthy foods – such as hemp grain and fish – are critical to slow the rise of chronic disease in the U.S.** Furthermore, targeted nutrition outreach is needed to ensure that the most vulnerable populations have equitable access to healthy, nutrient-dense foods.

As you know, the passage of the Agriculture Improvement Act of 2018 removed hemp [*Cannabis sativa* with <0.3% Δ9-tetrahydrocannabinol (THC)] from the list of controlled substances. Hemp is used for fiber, food, and medicine [13,14]. Hemp grain is an excellent source of protein and PUFA [15] for human consumption. In 2019, 94% of U.S. growers produced metabolite hemp; only 10% and 11% grew for grain and fiber, respectively (values exceed 100% due to producers with multiple crop types) [16]. In 2020, there were ~16,000 acres of hemp grain production in the U.S. [17]. **To become a stable component of the agricultural economy, the nascent U.S. hemp market needs diversification and a robust establishment of the grain sector.**

Hemp seed/grain has the potential to be an excellent domestic feed ingredient for many types of livestock. It is nutrient-dense, with roughly 25% protein, 35% oil, 25% carbohydrates, 10%

moisture, and 5% minerals [15,18]. Seeds are consumed whole or dehulled (hearts). Hearts have a healthy balance of omega-6 to omega-3 fatty acids (2.5:1) [15,19] and easily digestible protein [19-23] with sufficient essential amino acid levels [15]. In Europe, hemp grain is used in animal feeds. A 2011 European Food Safety Authority study evaluated the use of hemp grain, seed cake, seed oil, and whole plant flour in animal feeds [24]. Most THC localizes to the seed coat (hull), with seeds containing less than 12 mg/kg [24] and hearts 0.5 mg/kg [25]. Cannabidiol (CBD) and other cannabinoids are likely restricted to the seed coat. Cleaning and removal of hulls provide a product with low levels of cannabinoids. The committee concluded that hemp seed products with  $\leq 10$  mg THC/kg were safe based on risks. One potential concern of hemp in feed is consumer ingestion of cannabinoid residual in the animal tissues. Estimated daily tolerance intake for THC is 0.0004 mg/kg body weight (0.024 mg for a 60kg adult) [24]. Other countries allow up to 0.0007 mg THC/kg body weight (up to 0.042 mg for a 60 kg adult) per day. In 2018, the Food and Drug Administration (FDA) approved hemp hearts (H.H.), hemp seed oil (HSO), and hemp protein (H.P.) with  $\leq 10$  mg THC/kg as Generally Recognized as Safe (GRAS) [26]. Based on expected maximum consumption, with a content of 0.3 mg/kg, 0.6 mg/kg, and 6 mg/kg of THC in H.H., H.P., and HSO, respectively, the cumulative expected daily intake was 62.3  $\mu$ g of THC for persons aged two and older. **Establishing hemp as a safe feed ingredient could provide new grain markets for the hemp sector and an economical and environmentally sustainable feed to produce heart-healthy foods.**

How much cannabinoid residue from hemp grain and derived products (H.H., HSO, and H.P.) transfers to feeds and animals remains unclear. Uncertainty leads to safety concerns and hinders the approval for use in feeds. The SUSHI project is conducting i) feeding trials using hemp grain ingredients in trout and ii) nutrient and cannabinoid analyses of hemp grain, hemp feed ingredients, fish feed, and the edible portions of fish fed hemp-containing feed to determine the safety and efficacy of using hemp feed ingredients in a trout aquaculture system. In addition, the SUSHI economics team is performing market research, production economic assessments, and valuation of socio-environmental net benefits for the sustainability of the suggested system. To increase diversity in the agricultural workforce, our extension/education team is i) developing certificate programs in hemp production and aquaponics, ii) scholarships to Native Americans to complete bachelor's degrees in Agri-STEM, and iii) providing start-up funds for new aquaponics producers. The project also provides outreach and education about hemp, aquaponics, and nutrition to consumers to increase consumption of healthy, nutrient-dense foods, including hemp grain, fish, and produce.

The long-term objectives of the SUSHI project are to:

1. Provide a sustainable source of fish livestock with an enhanced nutritional value - contributing to the nation's health, especially URM.
2. Create niche markets for hemp and aquaculture, increase production opportunities for farmers, create jobs, and enhance the economy - increasing agriculture profitability in economically and environmentally sustainable ways.
3. Develop a pipeline of Black and Indigenous and lay workforce with the appropriate technical and professional skills to fulfill employment needs in STEM, nutrition, water resource management, and sustainable agriculture.

The SUSHI project is comprehensive, integrative, and transdisciplinary in addressing concerns in the hemp, aquaculture, nutrition, and agricultural workforce sectors. Strategic relationships have been established across industries to ensure that the outputs are relevant and adapt to changing needs. Continued efforts to impact the hemp grain and fiber sectors should consider similar approaches to what is described here to promote sustainable growth of the domestic hemp market.

The SUSHI project has established partnerships with all stakeholder groups impacted by our work. We meet regularly with an external stakeholder advisory board. Their feedback and guidance ensure that our work remains relevant to stakeholder needs. As a result of these connections, we are aware of some of the significant concerns within the hemp grain sector. The concerns listed here do not necessarily reflect the views of me, the SUSHI team, or Central State University. Expressed stakeholder concerns include but are not limited to:

- *Access to capital to build the supply chain.* For example, one entity that processes hemp grain into multiple food and other products was unable to apply for the USDA Food Supply Chain Guaranteed Loan Program because a percentage of the products were used in applications in addition to the food supply (e.g., oils are food and can be used in cosmetics; sweeteners are food and used in industrial applications). Narrow definitions for these programs currently hinder access to capital for grain processors. This prevents the expansion of infrastructure needed to increase the production of grain products necessary to meet market demands. **Strategies to increase access to capital for grain and fiber processors are required.**
- *The burden of THC-testing for non-metabolite hemp crops.* Currently, the rules and regulations for THC-testing and compliance treat fiber and grain (industrial hemp) the same way as cannabinoid/floral/metabolite hemp. The hemp industry wants hemp grain and fiber crops to be regulated like other commodities (e.g., soy, corn, and wheat), as hemp will likely be integrated into rotations with row crops. Hemp grain must be tested for mycotoxins, heavy metals, allergens, etc., like all grains used for food. Still, farmers have the additional burden of testing the non-grain parts of hemp to ensure THC compliance when it has little relevance to the GRAS-approved grain product. **A review of current THC-testing rules for grain and fiber hemp crops is needed.**
- *Cost and unwieldiness of the feed approval process.* Currently, each ingredient produced from hemp grain must be individually approved for each animal species and class. For example, if hemp grain protein is approved for use in Growing/Starter Layers (chicken), another application must be submitted for Finisher Layers, Laying Layers, and Breeder Layers. Hemp seed oil or whole hemp hearts would need additional applications for each group [27]. Industry representatives have expressed that hemp grain for animal feed should have been approved at the same time that it was approved as GRAS for human consumption. Others have expressed that the regulations are more burdensome for hemp grain products than other feed ingredients because non-metabolite hemp is treated as a drug unlike other grains. Approving hemp grain as a feed ingredient would open new markets and expand current markets by providing an outlet for hemp grain grown for human consumption that does not meet food grade standards. **An infusion of money into**

**the feed approval system (FDA-CVM, AAFCO) is needed to improve the process for hemp grain feed approval.**

- *Lack of consumer awareness regarding the nutrient benefits of hemp grain and products.* A long prohibition and association with marijuana have instilled a deep and lasting confusion about hemp within the mind of U.S. consumers. Engagement with the public demonstrates that a portion of the U.S. population still fails to understand the difference between hemp and marijuana. Some of those familiar with the crop lack information about the positive benefits of hemp grain and products. Such association restricts market opportunities [28]. **U.S. consumers need supplemental education about the nutritional benefits of hemp grain and products.**
- *Lack of incentives for hemp growers to partner with domestic processors/producers.* Hemp growers continue to struggle to find buyers for their crops. While there are a limited number of clearinghouses for hemp processors and growers, representatives from both groups have noted that more work is needed in this area. **Developing systems to connect prospective growers with processors would reduce this barrier.**
- *Lack of incentives to develop hemp cultivars adapted to production in the U.S.* Based on U.S. variety trials conducted across the U.S., only certain parts of the country can successfully utilize high-yielding cultivars developed internationally. For example, Canadian hemp varieties often perform well in northern states but typically underperform in Midwest or South. The lack of varieties developed for various regions hinders specific sectors of the country from expanding the grain and fiber hemp industries. Crops adapted to produce higher overall yields, and higher quantities of certain nutrients (e.g., specific fatty acids or amino acids) would further expand market options and lower overall production costs. A challenge for breeding regionally adapted crops is THC limits. THC levels of important lines may exceed legal limits during the breeding scheme, thereby restricting the development of those genetics. Being allowed to handle germplasm containing higher levels of THC (e.g., 1%) would mitigate legal compliance concerns while breeding to include new traits. The final variety released could still be required to meet a lower THC threshold (e.g., 0.3%) for sale to hemp growers. **Allowing hemp breeders to work with germplasm having higher THC levels would enable the development of elite varieties adapted for specific regions.**

There is a need to stimulate the nascent domestic hemp production to make it a sustainable part of the U.S. agricultural economy. An increase in hemp grain production could positively impact various sectors, including hemp, livestock, manufacturing, and human nutrition and health.

Through personal experiences, research knowledge, and stakeholder engagement, the SUSHI project team recognizes the complex challenges facing the hemp industry and is confronting those challenges to provide solutions to move the industry forward through this project and others in which the team members hold positions. For this testimony, project team members, Drs. Mark, McFadden, and Schluttenhofer provided valuable insights into the U.S. hemp industry's challenges while identifying robust and lasting solutions. Limitations faced by the hemp industry can be reduced by i) increasing access to capital for processors, ii) reviewing current THC-testing rules, iii) infusing money into the feed approval system, iv) educating consumers about the nutritional benefits of hemp grain and products, v) developing systems to connect current and potential

growers with processors and vi) allowing hemp breeders to work with higher THC-containing germplasm. Considering and implementing these proposed solutions would enhance the industry's short- and long-term success. I, and my SUSHI team, look forward to continuing to support this committee with the information necessary to make the hemp industry a lasting pillar of the U.S. agricultural economy.

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