

Additional Objectives for the UF/IFAS Industrial Hemp Pilot Project: Propagation, Production and Processing of High-CBD Hemp and Livestock Feed

Strong industry and stakeholder support for the University of Florida (UF) Institute of Food and Agricultural Sciences (IFAS) Industrial Hemp Pilot Project encouraged the development of an expanded set of research objectives to complement initially funded activities. This proposal defines the capacity of the UF/IFAS Industrial Hemp Pilot Project to expand the scope of the research program and details a plan to incorporate additional sites and objectives. The overall objective of the program is to help develop and support a profitable and sustainable hemp industry in Florida by addressing critical agronomic, economic, and environmental challenges. The program is committed to a collaborative approach to the establishment of a viable hemp industry in Florida. Any data, results, and outcomes of the project will be made publicly available through workshops, educational materials, and publications.

The UF/IFAS Industrial Hemp Pilot Project was authorized and initially funded in 2018 for a two-year period expected to formally begin spring 2019. The objectives of the funded project are to identify hemp varieties suitable for planting in Florida's various environments, develop potential hemp management practices and cropping systems suitable for Florida, and assess hemp invasion risk in Florida's natural and built environments. This work is to be completed at three production locations (Quincy, Hague, Homestead) and one environmental assessment location (Gainesville). The production locations will conduct variety and cropping system trials on 7-10 acres and initially will be focused primarily on fiber and grain varieties. Following the two-year project, UF is mandated to provide a report to the Florida legislature that describes the best preliminary understanding of cultivation and expectation for commercialization. Any additional funding support in association with this proposal will expand the scope of research conducted by the UF/IFAS Industrial Hemp Pilot Project and enhance the information available to establish a hemp industry in Florida.

Additional Objectives Overview

The UF/IFAS Industrial Hemp Pilot Project seeks support for the following additional research objectives and activities. Expansion of the program is planned in a modular fashion through the support of multiple industry sponsors. We will establish the Florida Industrial Hemp Endowment Fund hosted by the UF Foundation where Project Sponsors can donate directly to the spendable balance of the fund. Each objective will commence immediately once the spendable balance in the fund reaches the cumulative fundraising goal for each subsequent objective. Additional program objectives in order of priority include:

- Variety trial of high-CBD hemp from seed and transplant
- Plant propagation and production in greenhouse and nursery settings
- Public communications research and program administration
- Processing and product development of hemp products from raw plant materials

- Expansion of variety trial and cropping system assessment to additional sites
- Efficacy testing of hemp production and processing for animal feed

Variety Trial of High-CBD Hemp from Seed and Transplant

Location: All production sites
Fundraising goal: \$250,000

The extraction and isolation of CBD from industrial hemp is a leading motivation for the production and processing of hemp in Florida. High-CBD varieties were not included in the original plan for the UF Industrial Hemp Pilot Project with the exception of Otto II and BaOx from seed. High-CBD varieties were not included because of concerns for cost, verifiable access, and transportation. In response to the overwhelming motivation from the industry, trialing additional high-CBD varieties and cropping systems is first priority for expanding our work.

We will identify sources for high-CBD seed and plant materials in the US. Sources must be committed to donating their materials to the program or to cooperating with our research goals. The access to high-CBD varieties is easier to establish through a Material Transfer Agreement as opposed to a purchase of plant material. We acknowledge that some payment for plant material may be necessary. We will arrange clear guidelines for all sources regarding material use, IP and transportation. High-CBD seeds and plants acquired will be distributed evenly among the production sites and included in a variety trial specifically designed for high-CBD plant material. Site coordinators may include a high-CBD cropping system at their location for investigation of techniques and technologies to optimize the quality and quantity of floral material for CBD extraction. Estimated costs include variety purchasing and licensing, freight and program transportation, and genetic sequencing and phenotyping of varieties.

Plant Propagation and Production in Greenhouse and Nursery Settings

Location: Apopka, Gainesville, and production sites
Fundraising goal: \$750,000

The successful propagation of clonal high-CBD plant material is critical to the overall quality and economic returns of high-CBD hemp cropping systems. An understanding of the substrate, nutrient, water, and light requirements must be demonstrated for Florida with clear opportunities for optimization and innovation of techniques and technologies. Greenhouse and nursery facilities may also be effective in the production of hemp floral materials for CBD extraction. Indoor production requires similar understanding of the management and maintenance of the plant growth and production as determined by substrate, nutrient, water, and light requirements.

We will study the propagation of high-CBD plant material with two methods at the Mid-Florida Research and Education Center (MREC, Apopka): rooted cuttings in vermiculite and perlite substrates with various combinations of rooting hormones, and tissue culture in various growth media. Propagation for practical purposes will be completed at multiple locations to establish rooted cuttings for transplanting at the outdoor production sites. Indoor production systems and economics will be investigated at MREC including trials for substrate, fertilization,

day length control, CO2 and light wavelength enrichment. This objective will also include an investigation of basic plant physiology including stress response to variable light and water conditions. Estimated cost includes personnel, travel and transportation, establishment of propagation infrastructure, and indoor production facilities equipment, materials and supplies.

Public Communications Research and Program Administration

Location: State-wide
Fundraising goal: \$250,000

Effective communication with stakeholders and the public is critical to the community and industry development for hemp in Florida. A clear understanding of the public perception of industrial hemp and the process necessary to commercialize the industry will guide an effective communication strategy. A dedicated communications specialist is also necessary to correspond effectively with stakeholders and the public on behalf of the UF/IFAS Industrial Hemp Pilot Project. In addition, the UF/IFAS Center for Public Issues Education in Agriculture and Natural Resources (PIE Center) will conduct research on public and industry members' knowledge and perceptions related to industrial hemp in Florida. This work will assist in the development of research outcomes and extension programming that effectively delivers the research outcomes and information.

The PIE Center will establish a public perception survey, moderate a series of public perception focus groups, moderate a series of industry member focus groups, and make a report of the array of perceptions related to industrial hemp in Florida. The PIE Center will also prepare a summary of their findings through issue guides that use simple visual representations to communicate key messages. Estimated cost includes personnel, travel, survey preparation and facilitation, focus group facilitation, and educational materials preparation and production.

Processing and product development of hemp products from raw plant materials

Location: UF-Private Partners incubator and research facility
Fundraising goal: \$1,500,000

Processing and product development are critical for the establishment of a viable hemp industry. Farmers rely on the processing industry to purchase the raw plant materials they produce and to develop hemp products for sale. Raw plant material from the production trials will be provided to the processing facility for quality testing and product development. Processing trials will be conducted for the diversity of hemp products from fiber, grain, and plant extracts.

This objective will be executed at a conveniently located neutral research facility cohabitated by university and industry partners. The estimated cost includes the lease of the processing facility, purchase of equipment and consumables, and the hiring of administrative and research personnel to organize research activities and conduct quality control and economic assessments.

Expansion of variety trial and cropping system assessment to additional sites

Location: Belle Glade, Jay, Ona
Cost: \$1,500,000 (\$500,000 each site)

The assessment of hemp varieties and cropping systems in Florida is limited by the locations currently identified for the research program. Our first locations (Quincy, Hague, Homestead) represent the broad range of environments, climates, and farming regions of Florida, but additional locations would greatly expand the scope and relevance of our work. The planned locations are Everglades REC in Belle Glade, West Florida REC in Jay, and Range Cattle REC in Ona, which contribute to the range of environmental and agricultural characteristics that set the context for the variety trials and cropping system evaluation for the research program.

Each site can be sponsored independently. The FDACS planting permits are obtained for each location, so the two-year pilot period for each additional site will begin upon funding and site preparation. The estimated cost for each site includes site preparation, materials and supplies for the variety trial and cropping system evaluation, travel and transportation, and the hiring of personnel for research and technical support.

Efficacy testing of hemp production and processing for animal feed

Location: Ona
Cost: \$500,000

Animal feed is a potential novel use for raw hemp plant material and viable secondary product drawn from the waste stream of other processing activities. Cattle production is among the largest agriculture industries in Florida and may benefit greatly from access to an alternate feed, including the opportunity to finish cattle in Florida instead of the common practice of finishing cattle out of state. The investigation will include cropping system development specifically for forage, processing of feed materials for cattle, and efficacy and health assessments when hemp materials are fed to livestock.

This objective will be executed at RCREC in Ona. The estimated cost for each site includes site preparation, materials and supplies for the variety trial and cropping system evaluation, and the hiring of personnel for research and technical support.