Title:
California Industrial Hemp Seed Stock Development

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Format:
Agricultural Research Institute (ARI) Pre-Grant Proposal

Date:
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I. Project Director (Principal Investigator CV)

Dr. Scott Steinmaus
Department Head
Cal Poly -- SLO, Dept. of Horticulture & Crop Science

II. Project Info
    A. Member Campus

Cal Poly -- San Luis Obispo

    B. Title

California Industrial Hemp Pilot Program

    C. Funding Type

Campus

    D. Duration

Three Years

    E. Primary Focus Area, Research Category

California Industrial Hemp Seed Stock Development

    F. Secondary Focus Area, Research Category

Industrial Hemp Market Research
Sustainable/Regenerative Agriculture
Water, Soil and Air Quality Impact
Industrial hemp (*Cannabis sativa L.*) has been grown in America since used as drafting paper for the Declaration of Independence. A century later, California hosted some of the country’s largest hemp fields, made into cordage and sails.¹ The crop’s history stretches all the way back to the early millennia of agriculture in Siberia, and also throughout Eurasia, India and China.² Hemp’s many industrial applications bridge the gap between heightened consumer demands for local food supplies, alternative fuel sources and sustainable systems.

Today, the United States is one of few industrialized nations where hemp agriculture remains restricted, through a lack of differentiation between industrial hemp and marijuana. The Farm Bill of 2014 permitted research opportunities in conjunction with universities and state agriculture departments, in states that have already legalized hemp farming, as did California in 2013 with the passage of SB 566.³ In 2014, the Hemp Industries Association estimated U.S. sales of hemp products exceeded $620 million, a large portion of which was generated by the food and body care markets.⁴ Within the U.S., a majority of hemp companies call California home, including the largest importers of hemp seed, oil and processed fiber.⁵

In order to gauge the future role of hemp in California agribusiness, a series of fundamental research questions regarding cultivars, water demands and soil impact must be considered in conjunction with industrial applications. It has been suggested that the deep taproot and nutrient-rich biomass increase yields of crops planted in rotation with hemp.⁶ Other studies have established industrial hemp as a top-performing phytoremediator, capable of extracting heavy metals from soil and sequestering carbon from air.⁷ Yet, hemp’s water and nitrogen requirements are still a matter of debate.⁸ With limited research into hemp farming in California, variety trials and detailed yield reports become first priority to unlock potential markets for state farmers, business owners and entrepreneurs.⁹

The adoption of hemp into California agribusiness would propel cross-industry investments into local food production, textile sourcing, biofuels and feedstock, crop diversification, water conservation, phytoremediation, chemical reduction, carbon sequestration, green building, and regenerative agriculture. Such systems would promote economic independence of the rural

⁷ “Recent Findings on the Phytoremediation of Soils Contaminated with Environmentally Toxic Heavy Metals and Metalloids such as Zinc, Cadmium, Lead and Arsenic”, VoteHemp.com. 2004.
⁸ “The Effect of N and P Fertilization on Growth, Seed Yield and Quality of Industrial Hemp in the Parkland Region of Saskatchewan”, AIC.ca. 2004.
⁹ “Global Agribusiness Investment: Attractive Long-Term Outlook Generates Interest…”, LEK.com, April 2014.
farmer and sustainable startup alike. Currently, hemp pilot programs are in Year 2 in Kentucky and Colorado. Now, the State of California has a unique opportunity to return to the forefront of industrial hemp agriculture and manufacturing.

III. Project Personnel (Sustainable Agricultural Project Team and Roles)

Project Director
Dr. Scott Steinmaus
Department Head
Cal Poly -- SLO, Dept. of Horticulture & Crop Science

Site #1 Manager
Dr. David Headrick
Director, Cal Poly Organic Farm
Cal Poly -- SLO, Dept. of Horticulture & Crop Science

Site #2 Manager
Dr. Brian Dietterick
Director, Swanton Pacific Ranch
Cal Poly -- SLO, Natural Resources Management & Environmental Sciences

Research Coordinator
Matt McClain
PhD Candidate, Pacifica Graduate Institute
Co-Founder & Dir. of Operations, Recreator Hemp Apparel

Research Collaborators
Justin Petty         Outreach Coordinator    Recreator Hemp Apparel, IN HIA
Jean Johnson        Funding Liaison          Retired Telecomm, Hemp Advocate
Alec Dixon          Cannabis Researcher      SC Laboratories
Zach Wright         Soil Ecologist            Living Soil Compost Laboratory

Consultants
Ryan Loflin         Hemp Farmer              Rocky Mountain Hemp, RMHA
Mike Lewis           Hemp Farmer              Growing Warriors Project, KY HIA
Dani Fontaine       Hemp Farmer              Colorado Hemp Project

Ron Turco           Hemp Program Coord.      Purdue Univ, College of Agriculture
David Williams      Hemp Agronomist          Univ. of Kentucky, College of Ag
Marshall Chrostowski Farm Manager          Pacifica Organic Market Garden

Patrick Goggin      General Counsel         Vote Hemp
Anndrea Hermann     Hemp Agronomist          President of HIA
Jamie Campbell Petty Industry Liaison      State Chapter Coordinator, HIA
IV. Funding Request

$100,000 per year for Three (3) years = $300,000

V. External Match (Stakeholder Involvement)

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<thead>
<tr>
<th>Possible Matching--Corporate</th>
<th>Possible Matching--Philanthropic</th>
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<tr>
<td>Nutiva</td>
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<td>Dr. Bronner’s Magic Soaps</td>
<td>UC Div. of Agriculture and Nat Resources</td>
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<td>Manitoba Harvest</td>
<td>Pacifica Graduate Institute</td>
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<td>Toms</td>
<td>T. Boone Pickens</td>
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<td>Mike Greene, California State Grange</td>
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<td>Costco</td>
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<td>Center for Global Energy Policy</td>
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<td>American Farm Bureau, California</td>
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US Dept of Food and Agriculture Grants
PESD - Stanford
The Green Initiative Fund - Berkeley
Pacific Institute
Urban Land Institute
Earth Policy Institute
1% For the Planet
Natural Resources Defense Council
Green America
Forest Stewardship Council
The Nature Conservancy
Friends of Earth
California Assoc of Enviro Professionals
California Sustainability Alliance
Californians Against Waste
Center for Ecoliteracy
The Ojai Foundation
Cool California
Ecology Action
Environment California
Global Green USA
Land Conservancy of SLO County
TreePeople
Water Education Foundation
VI. Anticipated Outcomes (List of Objectives)

Feasibility of growing industrial hemp in current climate in California, in regards to:

1. **Cultivars**
   a. Application for Seed from DEA
   b. Number and Names of Cultivars, Countries of Origin
   c. Variety Trials and Yields: Fiber, Seed and Dual Crop
   d. Size of Test Plots per Cultivar for Study = 300" x 30"
   e. Total Land Use and Risk of Cross-Pollination
   f. CA Needs: Food, Fiber and Fuel
   g. For Seed/Oil: Comparison to Soy, Olive, Almond, Avocado
   h. For Fiber: Comparison to Cotton, Organic Cotton
   i. For Fuel: Comparison to Corn, Sugar Cane, other Biofuels

2. **Water needs**
   a. Selective Water Needs for particular Plants, Cultivars
   b. Determination of Drought-Tolerance or Drought-Resistance
   c. Comparison to Water Needs for common CA crops
   d. Suggested areas w/ irrigation in effect: Imperial or Central Valley
   e. Measuring Water retention in Root System, Soil

3. **Soil impact**
   a. Nitrogen Levels
   b. Humin levels, Humic Acid, Fulvic Acid
   c. Carbons, Salts, pH levels
   d. Potential for Phytoremediation: Sulphur, Mercury, other heavy metals
   e. What other quantifiable data indicates soil quality?
   f. Effects of self-mulching on topsoil. Composting material.
   g. Potential Benefits of Hemp in Crop Rotation: Soybeans, Corn, Wheat
   h. Length of Root impact
   i. Need for any pesticides or fertilizers?

4. **MicroClimate effects**
   a. Precipitation Rate or Water Supply
   b. Duration and Frequency of Growing Season
   c. Saline content in Water, Air
   d. Soil Content
   e. Latitude and Longitude
   f. Altitude

5. **Processing, Applications and Investments**
   a. Seeds: Seed stock, CBD’s, De-hulling or Cold-pressing for Consumption
   b. Stalk: Decortication of Fiber from Bast Core (Hurds)
      i. Fiber: Insulation, Car Door Panels, Graphene, Textiles
      ii. Hurd: Building Material, Biochar, Torrefaction, Gasification
VII. Narrative (Summary)
   A. Approach to the Problem/Issue
   B. Statement of Methodology
   C. Dissemination Plan
   D. Evidence of Economic Impact (Relevance to Agricultural Sustainability)
   E. Staffing
   F. Budget Narrative
   G. Outcomes Evaluation Plan

A. Approach to the Problem

Problem: Little working knowledge of industrial hemp agriculture in United States, besides historical accounts. No industrial hemp growing in California. Hemp research could be pertinent to California agribusiness and environmental issues, such as but not limited to the current drought, carbon sequestering, water and land usage, as well as providing local sources for alternative fuel, organic food and sustainable textiles.

When a farmer, politician or entrepreneur searches for data on hemp agriculture in California, most accounts are pre-dating the 1915 prohibition against cannabis in the state. 12 Now that universities can pursue hemp agricultural and market research under an amendment to the Agricultural Act of 2014, industrial hemp can be properly evaluated for its propensity in California soil and climates, which are two significant factors to optimal growing conditions for a variety of hemp cultivars. 13

In the world of heightened environmental and personal health concerns, especially pertaining to food and industrial materials, crops that offer sustainable product solutions are “hot commodities” in the U.S. marketplace, to venture capitalists and end-users alike. The rapid expansion of organic grocery chains, such as Whole Foods and Trader Joe’s, into diverse regional markets is a clear indicator of the shift in consumer wants. Alternatives make for more product choices that are not only higher quality, but also of greater transparency regarding social and environmental impacts of businesses today. The divestiture of fossil fuels taking place across American Universities and hedge funds is the best example of sustainable industries gaining momentum, often of the mantra: People, Planet, Profits. 14

The more immediate state in California sees thousands of farmers facing the economic risks associated with the ensuing drought, the state’s worst in recorded history. 15 The potential for less water-intensive and more drought-resilient crops to grow in California would prove to be a progressive economic model that carries more relevance by the day. With Canadian and Chinese hemp farmers seeing so much success in a variety of climates with a variety of  

cultivars, the time has come for U.S. private citizens and public institutions to unite in spurring the industrial hemp market in America. We could go from being the largest importer of industrial hemp to its largest exporter in a few growing seasons with the proper capital, research and development.

In our present situation where land use and water efficiency are becoming some of the largest issues to farmers and local municipalities, the danger of a crop monoculture and its relevant runoff becomes more accentuated. Crop diversification should take into account crops that naturally phytoremediate and work well in rotation, even if they are members of the *Cannabaceae* family, which also happens to include hops.

Farmers are up-to-date on the market and its possibilities. Agricultural commissioners, the CA Farm Bureau and Assemblymen, such as Jim Wood, have spoken up to the environmental concerns of large-scale marijuana cultivation and its impact on the watershed. Mike Greene of the California State Grange understands that such a pressing political and ecological issue as the 2016 recreational marijuana ballot initiative will require legislation that refers to industrial hemp farming as well.

Many of the environmental concerns being associated with commercial marijuana grows in the northern parts of the state can be addressed, if not rectified, by industrial hemp agriculture in Southern California. The U.S. Government distinguishes marijuana from industrial hemp in the quantity of THC being equal to or less than 0.3% for industrial hemp. The key point to be considered here is this: rarely does industrial hemp make the news in this state, partly because it makes up less than 1% of cannabis growing in California, while the industrial hemp pilot programs in Kentucky and Colorado continue to gain ground and investments for new processing facilities. It is due time that the positive agricultural, economic and environmental impacts of industrial hemp share the spotlight with, if not overshadow, its highly-publicized cousin, marijuana, here in California.

**Solution: California Industrial Hemp Pilot Program**

Evidence indicates that abandoned mining lands can benefit from a couple rotations of hemp, a proposed application in California, which has over 24,000 such public sites. Phytoremediation was the catalyst to hemp legalization in Colorado, while the possibility of charring such biomass and then using it as a soil conditioner should also be considered. As a rotational crop,

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16 “Environmental Risks and Opportunities in Cannabis Cultivation”, [WA.gov](http://WA.gov), June 2013.
industrial hemp can generate more revenue per acre than many others, plus it is fairly low-input in regards pesticides, herbicides and in some cases, water.  

In Canada, farmers are making $200-250 per acre according to the Agricultural Marketing Research Center report on industrial hemp. It is a crop that can be grown organically in a variety of climates, which increases interest among California consumers, known for purchasing organic goods en masse. According to the Hemp Industries Association (HIA), the hemp retail market earned over $620 million in 2014, up almost 7% from the previous year. Given the prevalence of several small-scale, yet highly-profitable, niche markets for a wide array of industrial hemp applications and retail products already established in the U.S., hemp-oriented businesses could reduce costs of goods by purchasing raw hemp materials from local farmers, thus providing a local, sustainable farming and processing model based on the use of industrial hemp as an alternative crop.

American companies like Nutiva, Dr. Bronner’s Magic Soaps, Flexform Technologies, Patriot Bioenergy, American Lime Technologies, Patagonia and Recreator Hemp Apparel are actively looking for raw hemp producers inside the United States. In an ironic twist, early research support pursuant to the Farm Bill may catalyze the re-scheduling of industrial hemp from Schedule I to II, thus causing an additional influx of investment into cannabis research and processing facilities. In the midst of severe drought, it’s up to California’s academic institutions to provide knowledge-based leadership to farmers looking for profitable alternatives.

One key characteristic of hemp is in its ability to increase water retention in soil, majorly due to the plant’s deep and strong root system. Another of the most promising market placements for hemp, especially in its early growth stage, is as a rotational crop. This would allow farmers to gain experience working with the crop, using the plant’s nutrient-rich biomass to prepare the soil for the next season’s planting. And, if the market indicates profits, California farmers have the option to produce two, perhaps even three, harvests a year, which come in at around 120 days for most applications.

As traditional agricultural and medical models are continually challenged by alternatives in food, in medicine and in lifestyle, the 25,000 uses of industrial hemp will also gain publicity as the prime example of a holistic and sustainable economic model. With so many areas of potential development, and the interest of technologists and farmers alike, it makes little sense to go forward in the dark. If we can produce textiles, biofuels, cleaner coal, green building materials, natural composites, organic body care products, healthy foodstuffs, and more from just one plant, then the public can only benefit by exploring its deeper facets.

25 “Industrial Hemp Production and Management”, Gov.mb.ca.
B. Statement of Methodology

The rush to fit hemp cultivars with the right growing conditions is underway, led by farmers and scientists in Kentucky and Colorado over the last year. The researchers are essentially testing and breeding seed stock, while they use the resulting biomass to such ends as CBD medicines, animal bedding and paper production. California has such a range of soil types and climates that it must work diligently in the initial stages testing a wide variety of cultivars. Water use, maturation rates, soil content and small-scale processing technology must undergo rigorous scientific experimentation before the industry can expect to be fully developed and vetted in California.

Starting at the level of *tabla rasa* for industrial hemp in California, some general metrics must first be determined and then tested in the field. Once productive cultivars are selected at the end of a growing cycle, prospective industrial applications and supplemental investments into processing facilities can be pursued. Collection of data regarding hemp’s input needs, growth cycles, genetics and farming practices can be published for the benefit of California’s future hemp farmers. The data should provide insight regarding the potential for hemp as a vertically-integrated crop in the production of food, fuel and fiber in California.

To begin research, various cultivars must be selected based on how they have grown in relative conditions to the desired planting area in regards latitude, precipitation, soil content, salinity and humidity. Initial grows should begin with as many cultivars as can be collected.

Secondary applications should be considered based upon yields from initial harvests. One challenge to seed selection is gaining access to legal seed markets. Even after the entanglement with the State of Kentucky and the DEA, Purdue University (of Indiana) and the Tennessee Department of Agriculture have experienced delays.27 However, with Purdue’s recent approval and TN Dept. of Agriculture’s semi-truck size shipment of certified seed being successfully delivered, the process with the DEA is ironing out.28 In California, the CDFA has conceded to let the universities pursue seed importation and subsequent industrial hemp research under their own supervision.

Once cultivar choices and clear channels of import have been established, university officials, in conjunction with stakeholders, should chart expectations in data collection and pertinent hypotheses for expected plant growth. Following basic scientific methods, the faculty and student research team will test initial soil and air contents to develop a holistic crop profile: nitrogen, humic acid, water content, salts, metals, soil compaction, pH, etc.

In addition to measuring the crop’s immediate ecosystem before and after planting, it would be beneficial to answer one continual point of debate within hemp farming, that being water usage. Kentucky and Colorado industrial hemp pilot programs have both indicated that hemp is a

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27 “DEA Allows Kentucky Farmers to Sow Hemp Seeds”, [PBS.org](http://pbs.org), May 2014.
“drought-tolerant” crop requiring approximately 10” of rainfall or irrigated water per harvest. Thus, tiered watering ratios within the study will provide scientists and farmers with field-tested choices in ideal cultivars for particular regions and microclimates, low water-using varieties being an obvious choice from the onset. Organic farming methods should also be implemented, as this is a key purchasing point in the hemp market, especially with food or body care applications.

When the crop is close to harvest, plants must be tested for cannabinoid content. THC is the psychoactive compound in marijuana, of which hemp has very little to none, depending how and when it is measured. The international standard for industrial hemp is less than or equal to 0.3% THC, so any cultivar exceeding that would have to be destroyed on site. If the school desires to learn the medicinal CBD content of flowers after harvest, this can be accomplished to establish market value, but must be conducted at the location of harvest. After collecting seeds for future stock and removing any parts of the crop destined for processing, the remaining plant matter (cut-off stalks and roots) should be self-mulched to measure how the retained biomass impacts soil content and future yields.

The final and most productive part of the industrial hemp pilot program lies in sourcing the hemp raw materials for processing at the end of each seasonal harvest. Market research is a key component in evaluating the quality and value of the subsequent yields. The seed stock can be priced for its potential distribution, as well as for food or cosmetic applications. After retting, the stalk can be broken down by a decorticator into fibers for insulation, automobile panels or textile spinning yarn. Additionally, the hurd can be mixed with lime to produce hempcrete or torrefied for hemp biochar. By negotiating with the potential customer base for hemp raw materials, we are conducting research into the market value and demand for industrial hemp that California farmers will soon supply.

C. Dissemination Plan

We are in the process of forming a stakeholder association in California particularly for the dissemination of industrial hemp pilot program findings. The parent organization, titled the California Hemp Coalition (CHC), is made up of industry liaisons, university professors, legislative aides, state officials, journalists and interested public parties. The mission of the California Hemp Coalition is focused on the fundraising and promotion of industrial hemp pilot programs in the state of California, in addition to the publication of such research.

Publications associated with Cal Poly and the California Dept. of Food and Agriculture are the best places to start for outward exposure. Gaining traction with core constituency and posting press releases (PRNewsWire) with agricultural (AgriNews) and traditional media outlets, such as local TV and Radio are fundamental to large-scale exposure. Quality media demographics

30 “Hemp as an Agricultural Commodity”, FAS.org, Feb. 2015.
31 “FAQ”, ProjectCBD.org, 2015
include sustainable agriculture, environmental groups, cannabis culture, Millennials and relevant media interested in California growing hemp.

The investor board partnerships developed for this project will be sourced to assist in the dissemination of any data collected, with the research university being forefront in any publication or press conference. Recreator has collaborated with the California State Grange in the past, the state’s strongest connections to grassroots agrarian activism and industrial hemp. Moreover, the Hemp Industries Association (HIA), Vote Hemp and Hemp History Week are adamantly supportive channels for releasing the research to a national audience.

A backroom proponent in the national hemp movement is the American Farm Bureau, a group Recreator has worked with in the past to push state and federal hemp legislation. They introduced and passed an amendment at the 2014 National Conference allowing industrial hemp to become a formal part of their legislative strategy moving forward. No other organization boasts such an influence on American farming policy and practices.

Recreator will also be a large voice for what’s happening on the farm, offering special publicity opportunities like blog articles, photo and video content. Our in-house production team of writers, photographers and cinematographers can turn out relevant and timely content, highly shareable on social media. A downtown Los Angeles clothing line can bring a certain amount of youthful enthusiasm to the project, especially amongst the student body. The company has press affiliates at the LA Times, Cannabis Now Magazine and the Huffington Post.

Any research from industrial hemp pilot programs is welcome to be presented at the annual conferences of the National Hemp Association and the Hemp Industries Association. The Ecological Farming Association (EcoFarm) and the National Bioneers Conference are ideal audiences to hear about this research, as well. Additionally, our friends at Fibershed would be very interested in collaborating on media content, research and distribution of the work. Organic farming and sustainable organizations, such as The Ojai Foundation, can provide grassroots support in local markets throughout the state.

After a few harvests, the CHC will begin to assemble a California hemp growing guide for farmers, similar to the material created by the Hemp Industries Association, but specific to the state’s variant microclimates and soil structures. This guide will boost confidence, success rates and yields of those new to the hemp industry. For farmers, it will illustrate an excellent opportunity to diversify crops and grow hemp for the booming industries of organic food, alternative fuel and sustainable textiles.

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D. Evidence of Economic Impact

Market
The HIA estimates the retail hemp market to exceed $600 million in value, growing at a median rate of 10% over the last 5 years. The largest components of this market are the businesses headquartered in the state of California. Amplify these figures with the continuous upward growth of the hemp food and body care markets, and it’s easy to see why farmers are eager to learn more about the crop. In 2014, the organic food market in the U.S. boasted growth above 11%, generating a retail value of almost $40 billion.

A Congressional Research Service report claims hemp production is on the rise in Canada, the primary North American source for raw materials. Markets, media and grassroots conversations show that seed stock, cannabinol (CBD) oil, hemp oil, hurd and fiber are the primary markets that farmers can source for revenue right now. Challenges include seed importation and state certifications for cultivars before joining the open market. Farmers and agricultural groups are looking for leadership in genetics, growing technology, agronomy and entrepreneurship, not to mention ongoing requests for legal advice on state and federal laws pertaining to the planting and sale of hemp.

Sustainability
More than one instance of hemp-based building has been able to recreate carbon-neutral construction, with likely applications for various other models due to hemp’s ability to sequester carbon from the air. Beyond being a high-quality industrial crop with many end uses, hemp represents a highly efficient land use model, based largely upon attractive yields per acre. In the case of textiles, one can yield over twice the tonnage of fiber from an acre of hemp compared to an acre of cotton, often with far less water and fewer pesticides. In the case of paper production, hemp produces three to four times the yield of hardwood trees.

In terms of alternative food oil and plant-based dairy substitutes, hemp seeds could offer farms a better option as they plan for seeding. Hemp requires less water than almond trees and cattle for beef or dairy production, while producing equivalent levels of protein and EFA’s per serving. A short water supply throughout the state necessitates timely research into specialty crops that require little maintenance and show promise for drought-tolerance compared to conventional options. Pair the above with hemp’s potential as a cover crop and cellulose-rich

36 “2014 Retail Sales for Hemp Products”, HIA.org, March 2015.
39 “Hemp as an Agricultural Commodity”, FAS.org, Feb. 2015.
feedstock, then one begins to understand why so many are curious about industrial hemp farming in California, especially those already growing crops organically.\textsuperscript{44}

\textbf{E. Staffing}

TBD upon Meeting with University Officials.

\textbf{F. Budget Narrative}

TBD upon Meeting with University Officials. See Section VIII Below.

\textbf{G. Outcomes Evaluation Plan}

TBD upon Meeting with University Officials.

VIII. Budget Sheets

TBD upon Meeting with University Officials. Rough sketch or notes below.

Sec. A & B -- Salary

2 PD’s on a 18 month project: (1) 100% (12 months), (1) 50% (6 months)
No more than $600/day for salaries if working full-time on project.

Rationale:
Provide a brief descriptive narrative of the duties assigned to each position where salary funds are requested.

For these salaries to be allowable as a direct charge to the award, a justification of how that person will be directly involved in the project must be included. General administrative duties such as answering telephones, filing, typing, or accounting duties are not considered acceptable. The duties must be directly related to the project plan.

Fringe Benefits - Show the total of allowable fringe benefits. Provide the rate(s) being used in the budget narrative.

Sec. C. -- Equipment

-Items equal to or more than $5k. Less than that list under Materials.
  +type, use for objectives, etc.
Consider phases of seeding, care, harvest and processing....although processing can be done by a private organization who purchases the raw materials.

1 Acre Model
  +Minimal equipment necessary as most will be done by hand. Harvesting requires machetes or simple hand-cutting tools. Small budget.

5-10 Acre Model
  +Add an automatic blade adaptor to basic tractor setup or combine. Collect by hand.

20 Acre Model
  +Add an automatic blade adaptor to basic tractor setup. Best if using combine adaptor. Can collect by hand, combine more efficient.

50 Acre Model
  +Combine adaptor, automatic collection.

Brief Rationale for Equipment
Sec. D -- Foreign/Domestic Travel

Kentucky...Roger Ford, Harvest, HIA?
Colorado...Loflin Harvest, NHA, investors
California Grange Meeting

Sustainable Ag Conferences?

Info: Number of travelers? Method of travel? Destination? Lodging?

Local
Personal vehicle
Travel to Fields
Mileage? Lodging? Meals?

Sow the Seeds Promotional Tour

Sec. E

TBD upon Meeting with University Officials.

Sec. F -- Other Direct Costs

1. Materials and Supplies
   seeds, garden tools, software, educational or field supplies, lab supplies
2. Publication Costs
   journals, farming guides, etc.
3. Reasonable Consultant Fees
   name, organization, statement of work/role, and a budget breakdown of their services (days of service, rate of pay, travel, per diem, lodging)
   cannot exceed $600/day
4. Computer (ADP) Services
   computer network costs
5. Sub-Awards/Consortium/Contractual Costs
   portion of the work completed by outside sources, like processing
   need a letter or intent signed by sub-contractors submitted w/ proposal along with their own subcontract budget
   no more than $600/day
6. Equipment/Facility/Rental Fees
   a. Equipment Rental
      type, rationale, time needed, rental rate
   b. Facility
      non-org rental fees for office space, seed storage, processing
c. Land-Use Charges
   if there is a land-use charge, provide ownership info, cost/acre, acreage

d. User Fees
   type of service being charged, relation to project, cost analysis

7. Alterations/Renovations
   in case space needs to be altered or renovated for project

8. Other
   communications (stamps, express mail, etc.), photocopying, service or
   maintenance contracts to equipment, conferences/meetings as host,
   speaker/trainer fees, honorariums, fabrication of equipment, misc.

Sec. G

TBD upon Meeting with University Officials.

Sec. H

10% Indirect Costs...sounds complicated but good to have as things come up. Not too certain of
this process, might have more to do with organization protocol.

Sec. J

https://wsaregrants.usu.edu/grants/docs/AppendG.pdf
http://ucanr.edu/sites/anrstaff/files/174697.pdf
IX. Timeline

Action, Actor, Date In, Date Out

TBD upon Meeting with University Officials.
X. Bibliography

https://fas.org/sgp/crs/misc/RL32725.pdf

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https://www.hort.purdue.edu/newcrop/ncnu02/v5-284.html

SEI-International: Ecological Footprint and Water Analysis of Cotton, Hemp and Polyester (2005)
http://www.sei-international.org/publications?pid=1694


2013 Annual Retail Sales of Hemp Products in the U.S. (2014)

Industrial Hemp in Kentucky (2014)
http://www.uky.edu/Ag/CCD/introsheets/hempproduction.pdf

Economic Considerations for Growing Hemp in Kentucky (2013)
http://www2.ca.uky.edu/cmspubsclass/files/economicconsiderationsforgrowingindustrialhemp.pdf


Illegally Green: Environmental Costs of Hemp Prohibition (2008)
http://reason.org/files/1030ae0323a3140ecf531bd473632b57.pdf

Hemp Agronomy
http://www.hempoilcan.com/company/agronomy/
http://hemp.ca.uky.edu/sites/hemp.ca.uky.edu/files/general/2015_hemp_article.pdf