

Sisseton Wahpeton Oyate Hemp Economic Feasibility Study Phase II Interim Report 5 March 2021



SWO Hemp Economic Feasibility Study

Phase II Interim Report

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Executive Summary

Phase I of the SWO hemp feasibility study identified three directions for potential economic development with fiber hemp: agricultural production, processing and product development. Phase II of the study focused on agricultural production. We increased hemp fiber production from a 3-acre demonstration plot in 2018 to a 40-acre commercial scale in 2019. We also collected feral hemp germplasm within the boundaries of the Lake Traverse Reservation to secure local genetic resources as a potential source of planting seed for SWO. Tribal leaders were consulted about seed sharing traditions and the possibility of protecting SWO sovereign indigenous hemp with a Plant Variety Patent.

- Hemp varieties Anka and USO31 were planted on 40-acres of tribal land near Havana, North Dakota on 18 July 2020. The harvest on September 18 yielded 88 bales of which 72 were sold to BastCore Inc. The total weight of 35 tons amounted to a yield of 1.1 tons per acre. At the sale price of \$250/ton, SWO is owed \$8,690 less 50% of shipping costs to Omaha, Nebraska. The cost of production included planting seed (\$6,400), lease forfeiture (\$7,000) and maintenance (\$6,700) for a total cost of \$20,100.
- We estimated that yield could increase to 2.8 tons/acre if hemp were planted earlier, at the same time as corn. Seed prices could also be reduced by SWO developing a sovereign source of planting seed from indigenous feral hemp. Increased yield together with a reduced seed price could make fiber hemp production marginally profitable.
- Fiber harvesting was demonstrated at an SWO Hemp Field Day on September 18, 2019. Attendees included representatives from Flandreau Santee Sioux Nation, White Earth Nation, North Dakota State Legislature, South Dakota State Legislature, BastCore Inc., Dakota Nation Industries, North Dakota Department of Agriculture, South Dakota Bureau of Indian Affairs, USDA Natural Resources Conservation Service-Sisseton and SWO tribal members.
- We located feral hemp populations on heavily grazed pasture near Agency Village in 2019 but we were unable to collect samples under South Dakota law at the time. In 2020, after obtaining permission from the USDA to collect within the boundaries of the Lake Traverse Reservation, we searched Tribal Trust land for feral hemp but

none could be located. We contacted ranchers with feral hemp on their land. With verbal permission, we collected 70 lb. of planting seed. This is, to our knowledge, the largest collection of sovereign indigenous hemp germplasm in North America.

- We tested 110 SWO feral hemp plants for THC. Most feral plants were CBD-type with less than 0.3% THC but 38 plants were of mixed THC:CBD-type and five were pure THC-type with ~1.0% THC. The high frequency of THC-type genetics in SWO feral hemp requires traditional breeding to produce a legally compliant source of sovereign planting seed for SWO.
- A breeding program has been initiated at the University of Minnesota to produce pure, low-THC planting seed from SWO feral hemp. We are also breeding to eliminate seed dormancy, another undesirable trait for agricultural production. At least 125 SWO plants are currently growing in the greenhouse of the Minnesota Agricultural Experiment Station.
- We recommend that SWO register “Dakota Hemp” as a trademark for an exclusive brand of sovereign, indigenous fiber hemp. The breeding effort has potential for seed sharing among tribal members, reduced planting costs, and the marketing of a new, commercial seed variety to hemp growers.
- We propose to extend phase II of the study to (1) demonstrate how SWO sovereign hemp performs as a crop at the SWO Farm, (2) purify and improve SWO hemp genetic resources at UMN, and (3) seek Plant Variety Protection for Dakota Hemp as a trademarked brand for SWO.
- With recent changes in North Dakota and South Dakota legislation, SWO may wish to consider other opportunities for cannabis economic development. State laws for medical and recreational cannabis could offer new market opportunities but also bring potential for confusion with industrial hemp fiber production. Tribal entrepreneurs seeking to produce medical and/or recreational cannabis will require regulation and taxation. If the UMN team were to consult on these matters, it would be necessary to clearly separate the activity from the current SWO Hemp Economic Feasibility Study which remains focused on fiber hemp production, processing and product development.

Rationale

The Sisseton Wahpeton Oyate (SWO) aims to bring new economic development to its agricultural land and develop a hemp industry around products with substantial value-added market opportunities. The tribe is particularly interested in hemp as a crop alternative to sustain environmental quality and support a healthy community.

Project History

The Native American Business Development Initiative (NABDI) supported a hemp economic feasibility study initiated by the SWO Planning Division in 2017. The University of Minnesota (UMN) partnered with SWO Planning, SWO Natural Resources Division, and Dakota Nation Industries in 2018 to demonstrate the cultivation of fiber hemp on SWO land, to identify markets for hemp fiber, and to recommend value-added hemp product options. Work performed under this \$50,000 award is described in the phase I final report (Weiblen et al. 2019). This report included recommendations for a second phase of the study to address three major needs: (1) increasing SWO hemp production, (2) identifying potential markets for SWO hemp, and (3) developing a business plan for SWO hemp. The estimated cost of addressing these needs was \$178,000 (see Phase I Final Report).

Under the direction of Sonny Hill, SWO Planning Director, a second grant proposal was submitted in June of 2019 to NABDI for \$80,000 to meet the first of these recommendations, concerning hemp production. Market research and business planning were not included in the proposal because their cost exceeded the total budget allowed by NABDI. According to Vivien Tateyuskanskan, who handled the submission on behalf of SWO, the proposal was declined by NABDI in 2019 without comment or rationale. In the meantime, SWO tribal council under the leadership of chairman Donovan White, awarded the University of Minnesota a \$65,000 contract from the SWO operating budget to initiate the second phase of the study (Appendix A). This report describes the work performed under that award.

Project Team

Principal investigator George Weiblen (UMN) oversaw the project team and coordinated effort with co-principal investigator Professor Sheri Breen (University of Minnesota Morris). Research Associate Jonathan Wenger (UMN) managed the project and PhD student Clemon Dabney (UMN), and Research Technician Nick Talmo (UMN) provided assistance. Charlene Miller, SWO Natural Resource Manager, registered with the North Dakota Industrial Hemp Program for a license to cultivate industrial hemp on tribal trust land in the state of North Dakota. The SWO Natural Resource Division produced the hemp crop. In the SWO Planning Department, Harold "Sonny" Hill, Michael Roberts, Matthew Thomson, Crystal Owen, Vivienne Tateyuskanskan, and Barbara Joseph accommodated the UMN team and provided project oversight.

Background

The goal of the study was to identify how industrial hemp can contribute to healthy and sustainable job creation on the reservation. There is great interest in products

derived from industrial hemp (*Cannabis*). Much recent interest is with the therapeutic potential of cannabidiol (CBD) from hemp. However, this study focused instead on fiber derived from hemp because of the environmental benefits and economic potential that it offers the SWO. Industrial hemp is not a drug and should not be confused with marijuana, CBD, or THC, the intoxicating chemical produced by *Cannabis*. In South Dakota, North Dakota and Minnesota, *Cannabis* containing less than 0.3% THC is legal industrial hemp.

Industrial hemp agriculture can improve land stewardship through reduced use of pesticides and herbicides. The market for hemp fiber is small at present but it could grow as industry weans itself from fossil fuels and unsustainable agricultural practices. Hemp fiber could enable SWO to shift its manufacturing business away from fossil fuel-derived plastics toward renewable, locally grown bio-materials. Value-added products manufactured locally from SWO hemp have the potential to bring greater economic benefits to SWO than leasing land for commodity crop production.

Phase I of the study produced high-quality fiber hemp on SWO land in North Dakota. The Oyate sold 1.7 tons of hemp fiber to a contracted buyer, estimated costs of production, and investigated hemp processing and product opportunities. A Dakota Hemp logo was developed in consultation with graphic designers Tammy Decoteau and Leslie Neconish at the SWO Tribal College. We recommended that SWO trademark the name and logo to secure future marketing and branding opportunities.

Phase I included a demonstration of how industrial hemp could be used to produce bioplastic for a wide variety of applications. Travel mugs made from hemp-plastic composite with stainless steel liners were piloted by c2renew, a small company based in Fargo, North Dakota. Approximately 50 mugs were distributed at the all tribal meeting in July 2019 but technical problems caused c2renew to discontinue this product. According to Corey Kratcha of c2renew, funds paid by UMN for the original order of 600 mugs were redirected toward research and development of hemp-plastic resin to demonstrate the manufacture of compostable, hemp garbage bags by Dakota Western Industries.



Figure 1. Dakota Hemp logo and a travel mug manufactured from hemp-plastic composite and engraved with the logo by c2renew (Fargo, North Dakota).

Study Objectives & Results

The three objectives included: **(1) increasing SWO hemp cultivation from 3 to 40 acres, (2) initiating a hemp breeding program with indigenous genetic resources, and (3) investigating paths toward a sovereign seed source for SWO.** This work focused on producing hemp and developing capacity for SWO to protect and market a unique brand of hemp planting seed in the future. **Additional and equally important needs that are not addressed in this study include identifying potential customers, identifying fiber processing costs, building a business case for entering the hemp marketplace, and ultimately manufacturing hemp plastics at SWO.**

Fiber Hemp Production-Scale Demonstration

We demonstrated how hemp is cultivated at a production-scale and what it looks like in the field for several reasons. First, social stigma and questions about illegality arise from the close relationship of hemp to its sister plant, marijuana. The 40-acre demonstration was intended to show that hemp can be grown legally in the state of North Dakota, that it is not marijuana and that it does not attract the attention of drug users. Second, it was necessary to demonstrate the feasibility of hemp production on SWO land for tribal members and stakeholders. Thirdly, the demonstration crop provided raw materials (bast fiber and hurd) for future study of hemp-composite materials and markets.

Dr. Jonathan Wenger coordinated with SWO, Canadian-certified seed suppliers, the North Dakota Department of Agriculture, hemp processors, product developers, and academic researchers to demonstrate fiber hemp at a production-scale. Dr. George Weiblen, Dr. Sheri Breen, and PhD candidate Clemon Dabney participated in fieldwork, data analysis, and an educational event organized by the SWO Planning Department at the time of harvest.

A license to participate in the North Dakota Industrial Hemp Pilot Program was issued by the North Dakota Department of Agriculture to Charlene Miller in the SWO Natural Resources Division. SWO Real Estate provided access to the same Tribal Trust land near Havana, North Dakota as was used in 2018. This location

adjacent to the Coteau des Prairies Lodge provided a convenient venue for working meetings.

Planting seed was purchased from Uniseed Inc. in Canada (Appendix B) and shipment from Ontario was received at Coteau des Prairies Lodge on July 11 and loaded into a secured box trailer by SWO Natural Resources. The planting seed for varieties USO31 and Anka were produced in France and Canada, respectively. Most of the site had been planted with corn the previous year except for five acres that had been reserved for the 2018 hemp demonstration. Three of the 40 acres at the site was occupied by access lanes such that the total area under cultivation was 37 acres. Nitrogen was applied at 120 lb. per acre prior to planting and there were no additional fertilizer applications afterward. The site was treated with broad-spectrum herbicide (glyphosate) and vertical-tilled prior to planting. Unfortunately, as was also the case in 2018, delays with permits, importation and rain resulted in a very late planting date.

Seed was planted on 12 July 2019 by Mike and Wayne Hemminger with a grain drill at ½ inch depth and 6-inch row spacing. The seed was reported to have a 83% germination rate such that a seeding rate of 60 pounds per acre was used to achieve approximately 50 pounds per acre of germinable seed. Seedling emergence was patchy in the wetter, lower southwest corner of the field that was also the location of the hemp demonstration during 2018. Weed pressure was intense in this section but no weeding or additional herbicide treatment was conducted. The section that had been under corn the previous year required manual removal of abundant volunteer corn that had survived the pre-planting glyphosate treatment.

Stand density was estimated by walking rows and counting plants above 36 inches tall at 34 days after planting (DAP). The average density of USO31 was 8.8 plants/foot². Mean (standard deviation) height of USO31 at 34 DAP and 68 DAP in 2019 was 38.2 (7.7) and 57.5 (6.6) inches, respectively. The average growth rate of USO31 was 1.12 inches/day from 0-34 DAP and slowed to 0.55 inches/day from 34-69 DAP.

Growth conditions in 2019 were remarkably similar to those of 2018. In both years, rainy spring weather contributed to the crops being planted on July 12 and the effective seeding rate was equivalent. Growth rates over the first 34 DAP were nearly identical at 1.12 inches/day and 1.06 inches/day in 2018 and 2019, respectively. Estimated stand densities at 34 DAP were also remarkably similar at 8.8 plants/ft² in 2019 and 8.3 plants/ft² in 2018. However, during the next 34 days, the 2019 rate of growth of 0.55 inches/day was half that of the 2018 rate of 1.11 inches/day. While there were some weather differences in the second half of the two growing seasons between years, conditions were rather similar. Given

similarities in crop density and conditions, it is possible that the difference in height at harvest (Figure 2) was due to genetic differences between the Carmagnola variety planted in 2018 and USO31 planted in 2019.

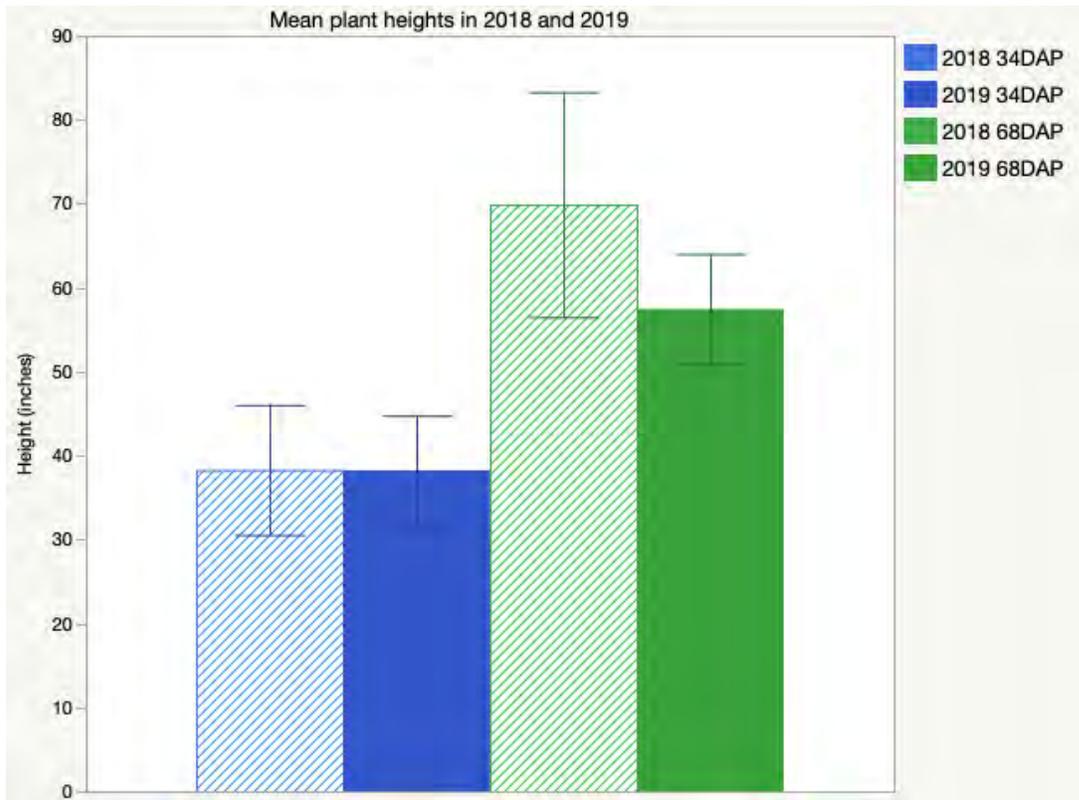


Figure 2. Average (\pm standard deviation) stand height (inches) at 34 and 68 days after planting (DAP) of 2018 demonstration-scale and 2019 production-scale fiber hemp. Cultivars Carmagnola and USO31 were planted on 12 July 2018 and 2019, respectively.

Carmagnola is a traditional fiber hemp variety attaining heights of 7 to 12 ft after 68 days whereas USO31 is a dual-use fiber and grain variety of shorter stature (~5 ft after 68 days). A likely explanation for these differences is the day-length sensitivity of varieties adapted to different latitudes. Flowering of cannabis plants from the temperate zone is sensitive to photoperiod (Small 2016). As day lengths grow shorter after the summer solstice, temperate varieties are induced to develop flowers and inflorescences with short internodes instead of leafy shoots with long internodes. Varieties adapted to higher latitudes, such as USO31 from Ukraine (48 N°), tend to flower earlier and attain less height than more southerly varieties such as Carmagnola from Italy (41 N°). The observed height difference between varieties grown at the same location near Havana, North Dakota (46° N) suggests that taller, more southerly adapted varieties are better suited to fiber hemp production at SWO.

On 23 September 2020, the crop was harvested as in 2018 using a sickle bar mower to cut plants at approximately 4 inches above the ground. Harvested plants were left in the field for 17 days to initiate a natural process of microbial degradation called retting. Retting of hemp stalks in the field influences subsequent separation of the outer layer of hemp fiber (hurd) from the inner pithy core (bast). If retting is insufficient, mechanical separation may be difficult and result in hemp fiber of inferior quality.

After raking the retted stalks in the field, round baling produced a total of 88 bales. However, 14 bales from the southwest corner of the field contained abundant weedy biomass such that only 72 bales of higher purity were transported to the contracted buyer, BastCore (Appendix C). BastCore paid for the cost of transportation of the bales from the site to a new company location in Alabama. According to the contract the cost of transportation between North Dakota and the former company location in Omaha, Nebraska was to be shared equally by both parties. However, as of the date of this report, BastCore has yet to deliver payment for the 2019 bales and is in breach of contract.

We estimated a total production cost of \$20,100 based on lease forfeiture (\$7,000 at \$175/acre), seed price (\$6,365 for 1,600 lb.), and field work including planting, roguing, harvesting and baling (\$6,705).

Comparing the yield of baled hemp straw from the 2019 production-scale to the 2018 small-scale demonstration provides some notable insights. In 2018, a total of 5.5 tons of baled straw were produced on the 3.3 acre plot resulting in a yield rate of 1.7 tons/acre. The larger scale production in 2019 amounted to a total of 44 tons harvested from 37 planted acres or 1.12 tons/acre. Given the high similarity of many factors in 2018 and 2019 discussed above (planting date, seeding rate, mid-season growth rate & plant density), possible explanations for the somewhat lower yield in 2019 can be posited. First, as noted above, plant height in 2019 was less than in 2018. Since hemp plants grown at field density produce almost no lateral branches, the average plant primary stem length (i.e. height) at harvest directly affects yield. The 25% difference in average harvested plant height in 2018 (76 inches) compared to 2019 (57 inches) predicts an approximately 25% reduction in yield from 1.7 tons/acre to 1.28 tons/acre, a difference of 0.42 tons per acre. The actual 34% yield difference of 0.58 tons/acre is 9% greater than could be explained by height alone. Considering that USO 31 is a dual-use, grain and fiber variety, it is possible that resources otherwise invested in stalk biomass might have been allocated to seed production in the denser, more energy-intensive flowering heads. Additionally, while estimated plant densities at mid-season were similar in 2018 and 2019, open unplanted rows comprising roughly 2% of the field in 2019 were not accounted for in the density estimate.

Even though we did not plant fiber hemp at SWO in 2020, we were able to estimate the yield potential supposing an earlier planting date. This was possible because, in May of 2020, volunteer fiber hemp germinated between rows of the corn rotation that followed the 2019 hemp crop. Volunteer plants descended from last season's crop emerged at approximately the corn planting date and competed with the corn such that the height of the hemp equaled or exceeded that of the corn at the end of the season. Measurements of volunteer stalk height and diameter ($n = 20$) were converted to stalk volume and divided by total stalk biomass to estimate yield per plant. We accounted for differences in height and basal area between 2019 and 2020 by dividing the greater stalk volume per plant of the 2020 volunteer hemp by the lesser volume of the 2019 hemp crop. We then multiplied 2020 biomass by 2019 plant density to estimate fiber yield (tons/acre).

We figure that if seed were to be planted in mid-May, around the same time as corn, the expected fiber yield would increase to 2.8 tons/acre. If seed prices could be reduced by SWO developing a sovereign source of planting seed from indigenous feral hemp. Increased yield together with a reduced seed price might make fiber hemp production marginally profitable.

Preserving Sovereign Indigenous SWO Hemp

This aim of this objective was to position SWO among the first Tribal Nations to preserve wild hemp genetic resources, exercising tribal sovereignty for future development of hemp agriculture and industry. We collected seed from feral hemp ("ditch weed") and initiated a seed breeding program on behalf of SWO.

In coordination with SWO Natural Resources and SWO Real Estate, our team sought to identify locations of feral hemp within the boundary of the Lake Traverse Reservation in North Dakota and South Dakota. We have extensive experience locating and sampling feral populations in Minnesota (Wenger et al. 2020). Differences between North and South Dakota in laws governing cannabis focused the search during 2019 on the small area of the Reservation located in North Dakota. We used plat maps and a gazetteer provided by SWO Planning to locate Tribal Trust land in North Dakota. None of the properties on the North Dakota side of the border that we examined contained suitable habitat for feral hemp, being rather low in elevation and too swampy or saturated with moisture to support hemp.

SWO member John Heminger led our team to a location in Agency Village, South Dakota to the south SWO Headquarters where we observed an extremely dense and extensive population of feral hemp on private, intensively grazed pasture. No samples were collected from this location because South Dakota had not yet

passed industrial hemp legislation at the time. Nor could hemp plants be located on adjacent Tribal Trust land managed by SWO Natural Resources, not even along the fence line. The team resolved to await changes in legislation to try again in 2020.

We did manage to locate and sample two populations of feral hemp in North Dakota outside of the Lake Traverse Reservation boundary. Staff at Prairie des Coteau Lodge directed the team to a farm in nearby Moran Township, North Dakota where ranchers had reported observing feral hemp. Members of the Strege family led us to an intensively grazed pasture where cattle had recently trampled a stand of feral plants. Plants were sampled at this location and at another location along Highway 11 in Waldo Township, North Dakota. Both of these locations had well-drained, loamy soils. We collected a total of 53 samples consisting of flowering heads and seeds. By arrangement between the North Dakota and Minnesota Department of Agriculture, we transported the samples in an official vehicle to the Weiblen Lab for further study. These samples provided an opportunity to demonstrate a proof-of-concept for future work with SWO sovereign hemp from within the reservation boundary.

Several regulatory changes occurred in late 2019 and early 2020 making it possible for our team to return to Agency Village and collect feral hemp during the COVID pandemic. The USDA issued a national industrial hemp policy and the SWO legal department submitted to USDA a draft Industrial Hemp Code. USDA accepted the SWO plan but, subsequently, the plan was recalled by SWO for further review. In the meantime, a bill legalizing industrial hemp was signed into law by the South Dakota legislature in early 2020. Charlene Miller also received written approval from the USDA program coordinate for the team to collect feral hemp within the boundaries of the reservation.

Returning to Agency Village in August 2020, Dr. Weiblen contacted Truman Nelson, the owner of the pasture on which extensive feral hemp had been located in 2019. At first Mr. Nelson seemed amenable to granting permission for the UMN team to collect samples on his property. However, upon learning that the research was being conducted on behalf of SWO, Mr. Nelson refused to cooperate. As for his reasons, he stated, "I'm over 80 years old, my grandfather settled this land, and our family worked hard all these years to make it productive. I don't trust Indians. They have done nothing for me. You could kind of get your point across to the older generation and they would listen. But this current generation, all they've ever done is take, take, take."

Mr. Nelson was unwilling to consider a second appeal from Dr. Weiblen and so the team redoubled its effort to locate other populations of feral hemp in the vicinity. We observed that feral hemp was either absent or exceedingly scarce on Tribal Trust

land managed by SWO Natural Resources while hemp was found nearby at heavily disturbed locations in proximity to cattle barns and feedlots. We concluded that good soil conservation and land management practices are unfavorable for feral hemp whereas feedlots and heavily grazed pasture were favorable. Intensive cattle grazing of prairie grasses and native forbs creates opportunity for competitive weeds to invade and feral hemp competes especially well in situations where manure provides abundant nitrogen.

We spoke with private landowners at three additional properties in the vicinity of Agency Village where feral hemp was visible from the road. Respecting privacy, names and specific locations are not disclosed in this report. We obtained verbal permission from landowners prior to walking the properties and collecting samples. Two of the three properties yielded small samples of less than ten plants each but the third encompassed several large pastures in which feral hemp was the dominant vegetation. On 23 September 2020, we collected hundreds of mature female plants totalling approximately one ton of feral hemp biomass. The purpose of this large collection was to obtain wild seed hemp located within the bounds of the Reservation for future breeding and demonstration planting next season.

Fresh hemp biomass was transported by box trailer to the Breker Farm near Havana, North Dakota, where it was immediately transferred to a 40' diameter, ventilated grain dryer. Transpiration and decomposition begins immediately upon harvest and so it is extremely important to ventilate and dry the biomass within hours or elevated temperature can kill the seed or result in mold.

After twelve days of drying, seed heads were hand-separated from the hemp stalks by stripping the main branches and lateral branches. Seed heads totaling 248 lbs. dry weight were separated from an estimated 195 lbs. of dry stems. Fifteen bags of seed heads and 65 lb. of stalks were transported to the Minnesota Agricultural Experiment Station in Saint Paul. Seed heads were sieved to remove coarse stems and debris before threshing and cleaning with a Wintersteiger aspirator. A total of 70 lbs. of cleaned seed, comprising approximately 15% of the total dry plant biomass was obtained.

Samples of the 2019 North Dakota collection and the 2020 SWO collection were submitted to the National Laboratory for Natural Products at the University of Mississippi for cannabinoid testing. We performed cannabinoid testing on 54 individual plants from North Dakota and 108 plants from SWO in order to estimate the frequency of non-compliant plants (>0.3% THC) in feral populations. Although we believe feral hemp to be descended from the historic introduction of fiber hemp to the region for production of canvas and cordage during the late 19th century and up to the Second World War, we have found that Minnesota feral populations are not pure hemp-type (Wenger et al. 2020).

Just as in Minnesota feral hemp, populations in North Dakota and SWO also contained three types of plants: CBD-type plants with more CBD than THC, intermediate-type plants with similar amounts of CBD and THC, and THC-type plants with more THC than CBD. Both intermediate-type and THC-type plants can exceed >0.3% THC, the legal definition of industrial hemp but only THC-type plants are potentially intoxicating because CBD seems to counteract the intoxicating effect of THC. Cannabinoid test results are summarized in Table 3. **We found that one out of every ten plants from North Dakota and two out of five plants from SWO had >0.3% THC. The SWO feral population contains the highest frequency of THC-type genetics (40%) among six regional populations that we have studied so far (Wenger et al. 2020 & unpublished data). These findings demonstrated that breeding will be necessary to purify SWO feral hemp so that sovereign planting seed is compliant with the law.**

Table 3. Cannabinoid profiles of North Dakota feral hemp harvested in 2019 and SWO feral hemp harvested in 2020. Cannabinoid content, including total cannabinoid content (TCC) is reported as the mean percentage of inflorescence dry mass \pm standard error (SE).

	N	f	%THC (SE)	%CBD (SE)	%TCC (SE)
ND feral					
CBD-type	48	0.91	0.08 (0.01)	1.89 (0.18)	2.10 (0.19)
Intermediate	4	0.08	0.77 (0.40)	0.77 (0.31)	1.71 (0.79)
THC-type	1	0.02	1.26 (NA)	0.04 (NA)	1.54 (NA)
SWO feral					
CBD-type	65	0.61	0.10 (0.04)	1.80 (0.84)	1.99 (0.91)
Intermediate	38	0.35	0.69 (0.31)	1.03 (0.55)	1.85 (0.80)
THC-type	5	0.04	1.27 (0.19)	0.11 (0.02)	1.55 (0.21)

As a proof of concept for breeding sovereign indigenous SWO hemp, a selective breeding experiment was initiated in the laboratory during the winter of 2020 using germplasm from the 2019 North Dakota collection. We selected seeds from CBD-type plants in Table 3 for germination. Feral hemp seed does not germinate readily. After at least 70 generations of local adaptation to cold winter climate, feral seeds remain dormant for a period of time. Dormancy may be overcome to some extent by incubating the seed in a refrigerator at 4° C for 2-3 weeks. We used this technique to obtain 175 early-germinating seedlings that were transplanted in a greenhouse at the UMN Plant Growth Facility.

Next, we used a DNA test previously developed with Minnesota hemp (Wenger et al. 2020) to identify CBD-type seedlings. Even though only CBD-type female plants were used as seed sources, we predicted that at least some of the offspring could have a THC-type gene if the pollen was donated by a THC-type male parent. Among the 175 seedlings we tested, 19 plants (10%) were intermediate-type with one gene copy from a THC-type father and the other copy from the CBD-type mother. Intermediates were culled from the greenhouse prior to flowering in order to eliminate the THC-type gene from future generations.

Among the remaining 156 CBD-type plants, 75 eventually produced male flowers and 81 produced female flowers. Sex expression and growth are summarized in Table 4. Plants were open-pollinated within the greenhouse, and maintained through full maturation at which point seed head samples were collected from each of the 81 females and a total of 1.2 lb of purified seed was collected. We predict that this seed, derived from impure, feral North Dakota hemp, has been improved in two ways: reducing dormancy and eliminating the THC-type genes. Planting and testing this seed in the laboratory will complete our proof-of-concept for selectively breeding and purifying SWO feral hemp as an indigenous, sovereign seed source.

Table 4. Average (\pm SD) plant height and internode length at maturity in inches of North Dakota feral hemp under greenhouse conditions at the Minnesota Agricultural Experiment Station. Seed obtained from populations at the Strege Farm (Richland County, Moran Township) and along North Dakota Highway 11 (Richland County, Waldo Township). The sex ratio of the Strege Farm population is distorted because male plants were culled prior to maturity.

	sex	plant height (inches)	internode length	N
Highway 11	female	74.9 (17.8)	5.3 (0.8)	11
	male	66.0 (11.0)	3.6 (1.2)	10
Strege Farm	female	63.8 (11.2)	4.2 (1.1)	62
	male	81.4 (10.7)	4.6 (1.0)	9

Experiments using SWO 2020 feral seed were initiated along the same lines as with the 2019 North Dakota seed. Bulk seed was cold-incubated and propagated in the greenhouse during the winter. DNA testing of 125 early-germinating seedlings yielded, 47 CBD-type, nine intermediate-type and six THC-type plants. This observation agrees with the results from North Dakota feral offspring in that the

presence of THC-type pollen at SWO requires measures to develop and maintain a pure sovereign seed source.

The bulk of the 2020 SWO seed collection is being overwintered in preparation for a demonstration plot at the SWO Tribal Farm in 2021. With improvements to seed germination and THC-levels already underway, we are especially interested in documenting the quantity and quality of hemp fiber derived from a sovereign seed source. Feral hemp in the wild exhibits a very different growth pattern than the industrial hemp as cultivated by SWO in 2018 and 2019. Feral plants typically have long, lateral branches and a Christmas tree-like, pyramidal architecture whereas industrial hemp plants in a crop production setting have few or no lateral branches (Small 2016). Architecture is strongly influenced by density (plants/ft²) with intense intraspecific competition for light yielding tall, unbranched plants. However, we do not know the extent to which feral adaptation might also have altered the genetics of plant architecture. With a 2021 sovereign hemp demonstration at the SWO Farm, we have the opportunity to evaluate this possibility and also compare fiber yields of sovereign hemp to imported varieties.

Previously, we quantified the relative allocation of growth to stalks, foliage, inflorescences, and seeds in naturally occurring stands of Minnesota feral hemp (Table 5). The fraction of total biomass devoted to stalks (55-66%) is not dissimilar to the SWO 2020 feral collection (44% stalks). We predict that SWO sovereign hemp grown in a field setting will allocate proportionally more biomass to stalks than in a naturalized setting.

Table 5. Average (\pm SE) whole-plant harvest fraction mass (grams) of Minnesota feral Cannabis plants collected in 2015 at two locations, Bruce Vento Nature Sanctuary (Ramsey County) and Bdote (Hennepin County).

	Bruce Vento (n=10)		Bdote (n=10)	
	dry mass (grams)	fraction of mass	dry mass (grams)	fraction of mass
stalks	60.6 (22.4)	66%	176.8 (38.0)	55%
leaves & flowers	28.3 (9.9)	31%	102.0 (18.3)	32%
seed	2.3 (4.4)	3%	39.7 (8.3)	13%

SWO Hemp Seed Sovereignty

As a source of information to the SWO working group on hemp seed sovereignty, Dr. Breen will conduct research and share information on national and international laws on intellectual property and hemp seeds, collect and share information about seed sovereignty projects underway in other Native American Nations, assist the working group in identifying and evaluating potential legal avenues, and communicate regularly with working group members as the SWO project identifies its goals and lays out its decision-making process. Through interviews, working group meetings, and community meetings, Dr. Breen will gather SWO community and stakeholder input on cultural, community, and tribal values to help inform the establishment and preservation of tribal seed sovereignty as SWO seeks sustainable sources of fiber hemp planting seed. Dr. Breen will document the perspectives and expectations of SWO concerning the project and communicate these to the UMN-team effort to re-domesticate a fiber hemp variety derived from feral Cannabis present on SWO trust lands.

Seed Varieties

A locally developed seed variety controlled by SWO can reduce the cost of production and offer additional income through sales to other Tribal Nations interested in hemp production. Investigation of this market opportunity moved on two tracks during Phase II: (1) Plant-breeding research and (2) research and education on intellectual property (IP) protection of any new varieties that will be developed.

Plant Breeding Research

Intellectual property protection: During Phase II, Sheri Breen worked with SWO Planning Director Michael Roberts, Crystal Owen, Planning Department staff, and the Tribal Council to investigate the possibilities of IP protection for newly developed seed varieties. In addition to meeting with SWO leaders and the UMN team during the harvest demonstration on September 19, 2019, Breen shared her initial report on the relationship between IP protection and indigenous sovereignty issues and consulted with Roberts and the Planning Department staff through fall 2019. She made a presentation to the SWO Tribal Council on November 13, 2019 that included a survey of the initial report, a review of the reasons to pursue IP protection and the potential drawbacks, and an extended Q&A session with Council members. The next steps in the educational component of the project were planned for summer 2020, including one or more appearances on an SWO radio program hosted by Owens, open meetings with SWO members in each of the districts, and continued consultation with the Planning Department. Restraints on personal contact and other delays due to COVID-19 forced a pause in those efforts, however. Virtual messaging cannot replace the personal communication that this part of the

project requires with Tribal members and we plan to resume these efforts as soon as safety permits.

Recommendations

Based on study results and conditions at present we recommend several next steps for hemp economic development at SWO. We believe that these actionable steps comprise a partial roadmap toward environmental and economic sustainability in Indian Country.

- Extend scope of the phase II project
 - Register “Dakota Hemp” and logo as trademarks of SWO
 - Resolve the of contract by BastCore breach concerning 2019 bales
 - Limit acreage and minimize risk associated with hemp production until after a business plan has been developed
 - Develop and file a Plant Variety Patent (PVP) application with the U.S. Patent Office to protect sovereign indigenous hemp as exclusive intellectual property of SWO
- Identify potential markets for hemp bio-plastics in partnership with Dakota Western Industries
- Study SWO fiber hemp decortication in partnership with the Agricultural Utilization Research Institute in Waseca, Minnesota before investing in a business plan for an SWO decortication facility

Legal Considerations

In 2020, South Dakota passed industrial hemp legislation and governor Kristi Noem signed a bill into law this year, but SWO did not plant hemp due to Covid-19. At the same time, SWO developed an Industrial Hemp Code that was approved by the USDA but was later redacted by the tribe owing to the need for more internal review. We recognize that tribal members are eager to develop private enterprises with hemp. However, the cost of developing and enforcing sovereign regulations for

industrial hemp could likely exceed potential revenue from either enterprise or taxation in the short term. Given current volatility and uncertainty in the cannabis marketplace, we recommend the continued study of fiber hemp feasibility as a separate activity from other cannabis enterprises especially CBD, medical and recreational cannabis.

Proposed Project Amendment

The University of Minnesota aims to assist the Sisseton Wahpeton Oyate (SWO) with breeding indigenous Dakota hemp derived from generations of natural adaptation to sovereign tribal land. The project will strengthen the native tradition of seed saving and exercise tribal sovereignty to chart a course toward a healthy and sustainable economy.

Proposed Objectives

Phase I (\$50,000) of the hemp study yielded the first demonstration-scale fiber hemp crop grown in Indian Country positioning SWO as a leader among Tribal nations. Phase II (\$65,266) expanded fiber hemp to production-scale and launched the first breeding program to domesticate sovereign fiber hemp seed while discerning Tribal cultural values and economic goals. We propose to extend phase II of the study with a \$100,000 additional investment to improve SWO sovereign hemp seed, demonstrate hemp cultivation from sovereign seed, and process fiber locally.

Aim 1: Breeding of indigenous SWO hemp derived from generations of natural adaptation on lands within original Tribal boundaries. Hemp seed collected in 2020 near SWO headquarters will be cleaned and multiplied on behalf of the Tribe during the 2020-2021 winter season at the UMN greenhouses.

Aim 2: The first experimental indigenous fiber hemp plots will be planted at the SWO Farm in spring 2021 to select and obtain seed free from wild dormancy. Planting indigenous fiber hemp on Tribal Trust Land will demonstrate the potential for SWO to produce fiber and sovereign planting seed for the future. Breeder seed will be further selected in subsequent seasons to improve fiber traits and regulatory compliance.

Aim 3: Harvested fiber will be processed by the UMN team and developed into a potential feedstock for manufacturing. Locally processed fiber aims to accelerate the transition of the plastic bag factory, Dakota Western Industries, away from fossil fuels and biotechnology as feedstock for their compostable plastic bag business.

Proposed Budget

UMN Costs	
Research associate salary & fringe	\$41,000
Technician salary & fringe	\$35,100
Greenhouse fees	\$1,500
Field planting costs	\$1,500
Laboratory supplies	\$2,500
Plant propagation supplies	\$500
UMN travel	\$2,500
Printing services	\$2,500
SWO Costs	
Publicity and field days	\$2,000
Field plot materials & labor	\$1,000
Fiber processing & shipping	\$10,000
Total Costs	\$100,000

Acknowledgements

We gratefully acknowledge the many contributors to this project including. At the SWO Planning Department, Matthew Thomson, Crystal Owen, William Fish, Vivienne Tateyuskanskan, Barbara Joseph, Harold "Sonny" Hill and Michael Roberts provided valuable support over the course of the project. The Natural Resources Division of SWO contributed above and beyond, including Charlene Miller, Wayne Heminger, Lana Rencountre, Lona Miller, and Brett Price. SWO Chairman Donovan Whhite provided leadership and encouragement during the project. Photographer John Heminger (Sota tribal news), Tammy Decoteau and Leslie Neconish contributed images and graphic design. Jerry Eastman at SWO Realty identified tribal land for situating the demonstration plot.

Joe Breker, at Coteau des Prairies Lodge, and Weston Quinn at Dakota Magic Casino were gracious in accommodating our hemp team. Robert Huff at Dakota

Western Corp. demonstrated hemp-bioplastic compostable bags at the 2019 SWO Hemp Field Day. Lastly, we acknowledge the University of Minnesota team for contributing to diverse aspects of the project including George Weiblen and Jonathan ("JP") Wenger (Department of Plant & Microbial Biology), and Clemon Dabney III (Graduate Program in Plant & Microbial Biology). Arnie Frishman (University of Minnesota General Counsel) assisted with the development of the sponsored project agreement between the tribe and the University of Minnesota.

References

- Small, E. 2016. *Cannabis: A Complete Guide*. CRC Press, Boca Raton, Florida.
- Weiblen, G. D., J. P. Wenger, E. Singaas, C. Dabney, and D. Current. 2019. Sisseton Wahpeton Oyate Hemp Economic Feasibility Study Phase I Final Report. University of Minnesota Printing Services, Minneapolis, Minnesota.
- Wenger, J. P., C. Dabney, C. Chandra, M. Radwan, C. G. Majumdar, M. A. ElSohly, and G. D. Weiblen. 2020. Validating a predictive model of cannabinoid inheritance with feral, clinical and industrial *Cannabis sativa* L. *American Journal of Botany* 107:1423-1432.

Project Expenses

Sponsored Project Activity by Project Period	Report Run Date:Wednesday,2/17/2021		
	Data as of Wednesday,02/17/2021 02:30 AM		
Through Period:	FEBRUARY 2021		
Sponsored Project:	00081334 - SWO Hemp Economic Feasibility		
Indirect Cost Recovery: 0%			
Sponsor:	SISSETON WAHPETON OYATE		
Award:	CON00000082290		
Department:	10876 - CBS Plant & Microbial Biology		
Project Start Date:	9/1/2019		
Project End Date:	12/31/2020		
Principal Investigator:	Weiblen,George D		
Account	Account Description	A Project Period Budget	B Project Period Expenses
700200	Salaries-P/A/Police-FinBdgOnly	24,964.00	28,305.74
700400	Salaries-UG/Pro-in-Tmg-FinBdg	1,090.00	0.00
700500	Salaries-Civil Service-Fin Bdg	5,000.00	6,009.03
710200	Fringe-P/A/Police-FinBdgOnly	8,987.00	10,212.87
710500	Fringe-Civil Service-Fin Bdg	1,590.00	1,910.90
720200	Lab/Med Supplies-FinBdg Only	5,000.00	3,537.55
720300	Gen Oper Services-Fin Bdg Only	400.00	0.00
720400	Lab/Medical Svcs-FinBdg Only	2,760.00	319.40
720600	Travel/Mileage/Mov-FinBdg Only	6,334.87	5,830.38
730200	Professional Svcs-FinBdg Only	500.00	500.00
UM-Morris subaward	UM Morris-Sheri Breen	8,640.13	8,640.13
Project Total		65,266.00	65,266.00

710501 - Fringe - Civil Service	FBT1264648	01/13/21	141.15	Talmo,Nick	Fringe - Civil ServiceFringe Expense
710501 - Fringe - Civil Service	RTD1269896	02/08/21	-108.65	Talmo,Nick	8012924-120720-122020Salary / Fringe Adjustment
710501 - Fringe - Civil Service	RTD1269896	02/08/21	-97.78	Talmo,Nick	8012924-122120-010321Salary / Fringe Adjustment
720206 - Field Supplies	EAC1245845	10/08/20	35.50	Weiblen,George D	FLEET FARM 700 3006-10876-00081334
720206 - Field Supplies	EAC1254625	11/17/20	17.97	Weiblen,George D	THE HOME DEPOT #2807 3006-10876-00081334-
720299 - Other Lab-Medical Supplies	ACC1215288	06/19/20	113.94	SO-RAININ INSTRUME	SO-RAININ INSTRUMENT LLC Accounts Payable 0001942076GPS-LTS-
720299 - Other Lab-Medical Supplies	ACC1215291	06/22/20	59.88	SO-UMARKET STOCK	SO-UMARKET STOCK Accounts Payable 0001942095GLOVE EXAM
720299 - Other Lab-Medical Supplies	ACC1215291	06/22/20	60.30	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001942147TK42001181T
720299 - Other Lab-Medical Supplies	ACC1215291	06/22/20	52.80	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001942147TK42001262T
720299 - Other Lab-Medical Supplies	ACC1215291	06/22/20	86.40	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001942147TK42001169T
720299 - Other Lab-Medical Supplies	ACC1215291	06/22/20	14.66	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001942147TK42001209T
720299 - Other Lab-Medical Supplies	EAC1227338	07/14/20	253.41	Noren,Katherine D	TUPPERWARE/INTERNET Lab supplies for hemp breeding experiments
720299 - Other Lab-Medical Supplies	EAC1227004	07/16/20	19.07	Noren,Katherine D	AMZN MKTP US*MS6515A90 Lab supplies for hemp breeding
720299 - Other Lab-Medical Supplies	EAC1227004	07/16/20	22.49	Noren,Katherine D	AMZN MKTP US*MS8GE1XX1 Lab supplies for hemp breeding
720299 - Other Lab-Medical Supplies	EAC1227004	07/16/20	359.96	Noren,Katherine D	AMZN MKTP US*MS9RC6H11 Lab supplies for hemp breeding
720299 - Other Lab-Medical Supplies	ACC1227746	07/21/20	240.80	SO-SIGMA ALDRICH IN	SO-SIGMA ALDRICH INC Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1227746	07/21/20	369.25	SO-LIFE TECHNOLOGI	SO-LIFE TECHNOLOGIES CORPORATION Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	107.58	SO-FISHER SCIENTIFI	SO-FISHER SCIENTIFIC COMPANY LLC Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	222.59	SO-FISHER SCIENTIFI	SO-FISHER SCIENTIFIC COMPANY LLC Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	98.40	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001959789TK43366855T
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	76.00	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001959789TK43366824T
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	40.00	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001959789TK43366784T
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	176.40	SO-TAKARA BIO USA	SO-TAKARA BIO USA Accounts Payable 0001959599TaKaRa Ex
720299 - Other Lab-Medical Supplies	ACC1231660	08/06/20	57.79	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001959789TK43366766T
720299 - Other Lab-Medical Supplies	ACC1232028	08/07/20	24.00	SO-WW GRAINGER INC	SO-WW GRAINGER INC Accounts Payable 0001959789TK43366784T
720299 - Other Lab-Medical Supplies	BIO1233252	08/13/20	-17.41		5053375 TUPPERWARE U.S., INCU of M
720299 - Other Lab-Medical Supplies	EAC1239623	09/10/20	89.77	Noren,Katherine D	IN *HERBARIUM SUPPLY Glassine envelopes purchased from
720299 - Other Lab-Medical Supplies	ACC1242671	09/25/20	22.68	SO-UMARKET STOCK	SO-UMARKET STOCK Accounts Payable 0001975779ETHYL
720299 - Other Lab-Medical Supplies	EAC1245154	10/06/20	54.27	Noren,Katherine D	AMZ*1000BULBS, INC. 3 Fluorescent bulbs purchased through
720299 - Other Lab-Medical Supplies	EAC1245154	10/06/20	-3.73	Noren,Katherine D	AMZ*1000BULBS, INC. Tax reimbursement of 3.73USD for purchase of
720299 - Other Lab-Medical Supplies	ACC1252479	11/09/20	116.36	SO-NETA SCIENTIFIC	SO-NETA SCIENTIFIC INCORPORATED Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1253033	11/11/20	232.00	SO-SIGMA ALDRICH IN	SO-SIGMA ALDRICH INC Accounts Payable 0002001316ESOLID-GLASS
720299 - Other Lab-Medical Supplies	ACC1253304	11/12/20	85.70	SO-UMARKET STOCK	SO-UMARKET STOCK Accounts Payable 0002001317GLOVE EXAM
720299 - Other Lab-Medical Supplies	EAC1257708	12/04/20	109.95	Noren,Katherine D	CBIE'ENDNOTE Reference management software package for use by
720299 - Other Lab-Medical Supplies	EAC1257708	12/04/20	109.95	Noren,Katherine D	CBIE'ENDNOTE Reference management software package for use by
720299 - Other Lab-Medical Supplies	EAC1257708	12/04/20	-109.95	Noren,Katherine D	CBIE'ENDNOTE Return of reference management software package for
720299 - Other Lab-Medical Supplies	ACC1258577	12/10/20	73.20	SO-INNOVATIVE OFFI	SO-INNOVATIVE OFFICE SOLUTIONS LLC Accounts Payable
720299 - Other Lab-Medical Supplies	ACC1259376	12/14/20	113.94	SO-RAININ INSTRUME	SO-RAININ INSTRUMENT LLC Accounts Payable 0002011161GPS-LTS-
720299 - Other Lab-Medical Supplies	EAC1264677	01/12/21	104.58	Noren,Katherine D	TUPPERWARE/INTERNET 4 tupperware bins with lids for storing plant
720299 - Other Lab-Medical Supplies	EAC1264677	01/12/21	54.23	Noren,Katherine D	1000BULBS.COM Fluorescent bulbs for genetic analysis for fiber hemp
720299 - Other Lab-Medical Supplies	EAC1264677	01/12/21	3.73	Noren,Katherine D	1000BULBS.COM TAX of Fluorescent bulbs for genetic analysis for fiber
720299 - Other Lab-Medical Supplies	EAC1264677	01/12/21	-3.73	Noren,Katherine D	1000BULBS.COM TAX REFUND: Fluorescent bulbs for genetic analysis
720299 - Other Lab-Medical Supplies	EAC1264677	01/12/21	-7.18	Noren,Katherine D	TUPPERWARE/INTERNET RETURN of TAX: 4 tupperware bins with lids
720499 - Other Lab Medical Services	ACC1256089	11/30/20	157.08	GREENHOUSES	GREENHOUSES Accounts PayableNov 20 GH:Wenger-PI Bio
720499 - Other Lab Medical Services	ACC1261570	12/28/20	162.32	GREENHOUSES	GREENHOUSES Accounts PayableDec 20 GH:Wenger-PI Bio
720601 - Travel in Minnesota	ACC1192085	03/17/20	82.50	Wenger,Jonathan P	CR ID: 010040729124 Wenger,Jonathan P 1527753
720601 - Travel in Minnesota	ACC1192085	03/17/20	101.53	Wenger,Jonathan P	CR ID: 010040727719 Wenger,Jonathan P 1527753
720601 - Travel in Minnesota	ACC1193817	03/25/20	191.52	FLEET SERVICES	FLEET SERVICES Accounts PayableFleet Leasing and Rental
720601 - Travel in Minnesota	ACC1236415	08/28/20	530.58	FLEET SERVICES	FLEET SERVICES Accounts PayableFleet Leasing and Rental
720601 - Travel in Minnesota	ACC1243651	09/30/20	456.22	FLEET SERVICES	FLEET SERVICES Accounts PayableFleet Leasing and Rental
720601 - Travel in Minnesota	ACC1250525	10/30/20	612.12	FLEET SERVICES	FLEET SERVICES Accounts PayableFleet Leasing and Rental
720602 - Travel Domestic	ACC1171881	12/20/19	73.53	Breen,Sheryl D	CR ID: 010038724584 Breen,Sheryl D 0818902 Mileage for SWO hemp
720602 - Travel Domestic	ACC1171881	12/20/19	111.23	Breen,Sheryl D	CR ID: 010038724584 Breen,Sheryl D 0818902 Mileage for SWO hemp
720602 - Travel Domestic	ACC1171881	12/20/19	73.53	Breen,Sheryl D	CR ID: 010038724584 Breen,Sheryl D 0818902 Mileage for SWO hemp
720602 - Travel Domestic	ACC1171881	12/20/19	93.07	Breen,Sheryl D	CR ID: 010038724584 Breen,Sheryl D 0818902 Mileage for SWO hemp
720602 - Travel Domestic	ACC1161197	11/05/19	162.00	Wenger,Jonathan P	CR ID: 010037236478 Wenger,Jonathan P 1527753 SWO hemp
720602 - Travel Domestic	ACC1161197	11/05/19	162.00	Wenger,Jonathan P	CR ID: 010037236478 Wenger,Jonathan P 1527753 SWO hemp
720602 - Travel Domestic	ACC1161197	11/05/19	162.00	Wenger,Jonathan P	CR ID: 010037236478 Wenger,Jonathan P 1527753 SWO hemp
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720602 - Travel Domestic	ACC1240867	09/17/20	27.60	Wenger,Jonathan P	CR ID: 010042798692 Wenger,Jonathan P 1527753 SWO_August_trip
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720602 - Travel Domestic	ACC1246137	10/09/20	21.66	Weiblen,George D	CR ID: 010043064827 Weiblen,George D 1395464 Expenses on
720602 - Travel Domestic	EAC1251429	11/03/20	504.00	Weiblen,George D	SO *COTEAU DES PRAI 3006-10876-00081334
720602 - Travel Domestic	EAC1254090	11/16/20	504.00	Weiblen,George D	SO *COTEAU DES PRAI 1-night accommodation, 10/8/2020, for project
720602 - Travel Domestic	ACC1259100	12/14/20	56.89	Wenger,Jonathan P	CR ID: 010043859926 Wenger,Jonathan P 1527753
720611 - Conf Regist - Spon Prj Only	ACC1192085	03/17/20	80.00	Wenger,Jonathan P	CR ID: 010040728675 Wenger,Jonathan P 1527753
720611 - Conf Regist - Spon Prj Only	ACC1192085	03/17/20	120.00	Wenger,Jonathan P	CR ID: 010040728675 Wenger,Jonathan P 1527753
720611 - Conf Regist - Spon Prj Only	ACC1192085	03/17/20	187.03	Wenger,Jonathan P	CR ID: 010040727719 Wenger,Jonathan P 1527753
720611 - Conf Regist - Spon Prj Only	EAC1197110	04/06/20	120.00	Weiblen,George D	BOSS EXPOS LLC (DBA REGIS conference registration fee for
730213 - Field Services	ACC1258844	12/09/20	500.00	SPV018 COLLEGE OF	SPV018 COLLEGE OF BIOLOGICAL SCIENCES Accounts
TOTAL EXPENDITURES			65,266.00		

Appendices

Appendix A: Project Agreement

LETTER OF UNDERSTANDING
between
SISSETON-WAHPETON OYATE (Sponsor)
and the
REGENTS OF THE UNIVERSITY OF MINNESOTA (University)

Sponsor is pleased to offer funding under the terms of this Letter of Understanding for the following project as described in the attached incorporated documents, Appendices A-D:

Project Title: Sisseton-Wahpeton Oyate Hemp Economic Feasibility Study Phase II ("Project")

Principal Investigator: George D. Weiblen PhD, Science Director/Plant and Microbial Biology Professor, an employee of the University

Project Period: September 1, 2019 – August 31, 2020.
May be continued with or without additional funds only by written amendment to this Letter of Understanding.

Award Amount: \$65,266

Payment Schedule: The Award Amount shall be paid in accordance with the following schedule:

- Upon execution of the Letter of Understanding, and no later than thirty (30) working days, the Sponsor shall provide advance payment for allowable costs of \$32,633 to cover costs of the first three months of the Project. University shall submit an Invoice detailing activity for billing purposes.
- Upon completion of the Interim Technical Report and submission of detailed Invoice, the Sponsor shall provide payment for allowable costs totaling \$26,106 due no later than thirty (30) working days, and
- Upon receipt of the Final Technical Report and submission of detailed Invoice, the Sponsor shall provide final payment of \$6,527 due upon receipt of a final report no later than thirty (30) working days.

Deliverables: A final report from the Principal Investigator is due within 30 days of the end of the Project Period.

Confidentiality: For purposes of this Agreement, "Confidential Information" means written or tangible information disclosed by either party to the other, which at the time of disclosure is clearly and conspicuously labeled "Confidential" or "Proprietary". Confidential Information shall also include oral and visual disclosures which are identified as confidential at the time of such disclosures by the disclosing party. The parties agree to maintain confidentiality of the Confidential Information during the term of this Agreement, including any renewal periods, and for a period of three (3) years from the effective termination or expiration date of this Agreement. Neither party shall use said Confidential Information for any purpose other than those purposes specified in this Agreement. The parties may disclose Confidential Information to employees requiring access thereto for the purposes of this Agreement provided, however, that prior to making any such disclosures each such employee shall be apprised of the duty and obligation to maintain



Confidential Information in confidence and not to use such information for any purpose other than in accordance with the terms and conditions of this Agreement. Neither party will be held financially liable for any inadvertent disclosure, but each will agree to use its reasonable efforts not to disclose any Confidential Information. Any inadvertent disclosures will be communicated to the other party within a reasonable time after disclosure.

Nothing contained herein will in any way restrict or impair either party's right to use, disclose, or otherwise deal with any Confidential Information which:

At the time of its receipt, is generally available in the public domain, or thereafter becomes available to the public through no act of the receiving party;

Was independently known prior to receipt thereof, or made available to such receiving party as a matter of lawful right by a third party;

Is received without obligation of confidentiality from a third party; or

Is required by law and/or regulation or court order to be disclosed. In the event that Confidential Information is required to be disclosed pursuant to this subsection, the party required to make disclosure shall notify the other to allow that party to assert whatever exclusions or exemptions may be available to it under law.

Publications:

Sponsor recognizes that under University policy the results of the Project must be publishable and agrees that researchers engaged in Project shall be permitted to present at symposia, national or regional professional meetings and to publish in journals, theses or dissertations, or otherwise of their own choosing, methods and results of Project. University shall have the final authority to determine the scope and content of any publication; provided, however, that University shall provide copies of any proposed publication at least thirty (30) days in advance of the publication or presentation to Sponsor to review and object to such publication or presentation because such draft either contains information deemed to be Confidential Information under the provisions of Article 5 of this Agreement, or reveals information that if published within thirty (30) days would have an adverse effect on a patent application in which Sponsor owns full or part interest. In the event that Sponsor notifies the University in writing that the proposed publication or presentation contains Sponsor's Confidential Information, the University shall remove any Sponsor Confidential Information from the draft prior to such publication or presentation. In the event Sponsor requests in writing a delay in publication to file for patent protection, the University and the Researcher shall refrain from making such publication or presentation for a maximum of ninety (90) days from the receipt of such objection, and Sponsor shall indicate with specificity to what manner and degree University may disclose said information during the ninety (90) day period.

Publication or presentation by either party to this Agreement shall give proper credit to the other party for the cooperative character of the investigation. University grants Sponsor a royalty free non-exclusive license with right to sublicense to use the data in such publication or presentation for internal and commercial purposes.



No commercial brands or trade names shall appear in the publication of the results except as such brand or trade name is essential in the description of the research.

Developments: In accordance with Appendix A, the Industrial Hemp Economic Feasibility Study may create rights and title to the potential developments under this Project. Ownership of developments will follow inventorship and inventorship will be determined under U.S. Patent Law. Each party will have the right to negotiate a license to the other party's interest in developments by notifying the other party in writing within 180 days after receipt of notice from the other party that a development has been made. The Parties agree that any license agreement covering such development will be in accordance with terms and conditions to be mutually agreed upon, which shall be negotiated in good faith

Miscellaneous: University makes no warranties with respect to the outcome of research to be conducted. The Parties agree that this Agreement is executed and performed within the Sisseton-Wahpeton Oyate Lake Traverse Reservation. Irrespective of any language to the contrary in the Agreement or elsewhere, no right of arbitration shall exist. University acknowledges that the sovereign immunity of the Tribe is not waived through this Agreement.

Please indicate your agreement with the above terms and conditions. This Letter of Understanding shall not be valid until fully executed by all parties.

Sisseton-Wahpeton Oyate
Federally Recognized Indian Tribe



Print Name: Donovan White

Print Title: Tribal Chairman

Date: **AUG 30 2019**

Authorized Official
Sponsored Projects Administration
Regents of the University of Minnesota

By: 

Print Name: Derek Krogstad

Print Title: Interim Principal Grant Administrator

Date: 8/23/2019



APPENDIX A. Scope of Work

Sisseton-Wahpeton-Oyate (SWO) Hemp Economic Feasibility Study Phase II

Principal Investigator

George Weiblen, Professor of Plant & Microbial Biology

Summary

A University of Minnesota (UMN) team proposes to continue the economic feasibility study concerning industrial hemp (*Cannabis*) on behalf of Sisseton-Wahpeton-Oyate (SWO). Phase II of the SWO hemp economic feasibility study will (a) increase SWO hemp cultivation from 3 to 40 acres, (b) start a fiber hemp breeding program, and (c) investigate seed sovereignty. This work will position phase III to gather “voice of the customer information” to build a business case for entering the hemp marketplace and identify costs for decorticating hemp and manufacturing hemp-based plastics at SWO. Principal investigator George Weiblen will oversee project coordination. Research associate Jonathan Wenger will conduct parts (a) and (b) in collaboration with Charlene Miller, SWO Natural Resources Department. Professor Sheri Breen will conduct part (c) in collaboration with the SWO Planning Department. Payments detailed in Appendix B.

Proposed Activities

Dr. Wenger will coordinate the expansion of SWO hemp production to 40 acres production and sovereign seed collection to initiate fiber seed breeding. Dr. Breen will conduct the seed sovereignty investigation.

(a) SWO 40-Acre Production Trial

Dr. Wenger will coordinate logistics among SWO, Canadian certified seed suppliers, North Dakota Department of Agriculture, hemp processors product developers, and academic researchers. He will also participate in outreach through field days and direct communication, and lead the writing of scientific papers detailing experimental results when appropriate. Dr. Wenger will continue the 40-acre project coordination including mid-season growth evaluation at approximately 35 days after planting (DAP) and harvest anticipated at approximately 77 DAP. Raking and baling of the harvested crop for shipment to a third-party processor is anticipated during early October 2019. Dr. Wenger will also assist in planning a field day event on fiber hemp production sponsored by SWO Planning Department anticipated to take place during the second or third week of September 2019, prior to harvest.

(b) Feral Seed Collection to Initiate Sovereign Seed Breeding

In coordination with SWO Natural Resources, Dr. Wenger will identify and verify locations of feral *Cannabis* within the boundary of the Lake Traverse Reservation in South Dakota and North Dakota. Seed from locations in North Dakota on SWO trust lands will be collected in compliance with the 2014 Farm Bill and the North Dakota Department of Agriculture Industrial Hemp Program. Known feral stand locations in South Dakota will be documented and verified in the field for future sovereign seed collection. During September 2019 at sites within North Dakota, ~40 mature seed heads will be collected by hand from height-recorded plants along with site GPS coordinates and digital photographs. Samples will be secured in an official vehicle for transport to the Weiblen Lab at UMN under Minnesota Department of Agriculture Industrial Hemp Pilot Program license. During October 2019 through July 2020, SWO feral collection samples will be tested for cannabinoid profile and genotype to ensure hemp regulatory compliance. Seed from compliant collections will be germinated and propagated at the UMN Plant Growth Facility to produce a population of breeding lines for subsequent selection for fiber domestication. Further propagation and multiplication of candidate fiber breeding lines from this work will be proposed for continuation in Phase III beginning in August of 2020 to be conducted at the Minnesota Agricultural Experiment Station, Research and Outreach Centers, and on SWO trust lands.



(C) Seed Sovereignty Investigation

As a source of information to the SWO working group on hemp seed sovereignty, Dr. Breen will conduct research and share information on national and international laws on intellectual property and hemp seeds, collect and share information about seed sovereignty projects underway in other Native American Nations, assist the working group in identifying and evaluating potential legal avenues, and communicate regularly with working group members as the SWO project identifies its goals and lays out its decision-making process. Through interviews, working group meetings, and community meetings, Dr. Breen will gather SWO community and stakeholder input on cultural, community, and tribal values to help inform the establishment and preservation of tribal seed sovereignty as SWO seeks sustainable sources of fiber hemp planting seed. Dr. Breen will document the perspectives and expectations of SWO concerning the project and communicate these to the UMN-team effort to re-domesticate a fiber hemp variety derived from feral Cannabis present on SWO trust lands.



APPENDIX B. Budget Justification

Salaries:

One-month salary at 100% effort for Sheri Breen, Associate Professor of Political Science and affiliated faculty in the Environmental Studies Program (base salary \$6,083 per month). Six-month salary at 100% effort for post-doctoral research associate Jonathan Wenger (base salary \$49,927) of \$24,964 in year one.

Fringe Benefits:

Benefits for the associate professor and postdoctoral research associate are 36.0% of salary per University of Minnesota negotiated rates.

Half-time undergraduate assistant for feral breeding plant growth and genotyping work at UMN during November 2019 through July 2020 (32 weeks x 20 hours/week x \$12/hour) of \$7,680.

Services:

Automated DNA genotyping at the University of Minnesota Genomics Center (UMGC) to assure regulatory compliance are \$1,500 (two (2) multi-plexed marker plates x \$750/plate)

Greenhouse space (150 sq. ft) in the Plant Growth Facility of the Minnesota Agricultural Experiment Station (UMN) is required for ten months (October 2019 through July 2020) at \$0.84 per sq. ft/month totaling \$1,260.

Supplies:

Feral stand collection supplies include sample bags (\$500). Laboratory supplies for sample screening include molecular biology reagents (\$2,000), laboratory disposables (\$1,500), hydroponic media and nutrients (\$1,000)

Shipping:

Postage (USPS Registered Mail) and packing materials to ship feral field and lab grown offspring samples for gas chromatographic analysis of cannabinoid profile at the University of Mississippi (\$900).

Travel:

Round trip travel cost for the 40-acre hemp production trial site for project coordinator Wenger from St. Paul, MN to Tewaukon, ND to observe and assist with agronomic events includes three trips (planting, mid-season growth evaluation, harvest mowing): mileage reimbursement \$907 (521 mi/trip x \$0.58/mi x 3 trips), lodging \$564 (\$94/night x 2 nights/trip x 3 trips), M&IE \$413 (\$137.5 (\$55/full day + \$41.25/first day + \$41.25/last day)/trip x 3 trips). Round trip travel cost for field day from St. Paul, MN to Tewaukon, ND for project coordinator Wenger & principal investigator Weiblen from St. Paul, MN to Tewaukon, ND: mileage reimbursement \$302 (521 mi/trip x \$0.58/mi), lodging \$376 (\$94/night x 2 nights x 2 persons), M&IE \$275 (\$137.5 (\$55/full day + \$41.25/first day + \$41.25/last day)/trip x 2 persons). (\$2,837 total for 40-acre production site travel).

Round trip travel cost for co-investigator Breen from Morris, MN to Agency Village, SD to conduct seed sovereignty discussions with tribal members and officials (6 trips): mileage reimbursement \$432 (124 mi/trip x \$0.58/mi x 6 trips), lodging \$1,128 (\$94/night x 2 nights/trip x 6 trips), M&IE \$660 (\$55/full day x 2 days x 6 trips).

Round trip travel cost for feral hemp site reconnaissance for project coordinator Wenger from St. Paul, MN, to Lake Traverse Reservation in North Dakota (Sargent Co. & Richland Co.): mileage reimbursement \$334 (575 mi/trip x \$0.58/mi), lodging \$188 (\$94/night x 2 nights), M&IE \$138 (\$55/full day + \$41.25/first day + \$41.25/last day)/trip). Round trip travel cost for feral hemp site collecting for



project coordinator Wenger & principal investigator Weiblen from St. Paul, MN, to Lake Traverse Reservation in North Dakota (Sargent Co. & Richland Co.): mileage reimbursement \$334 (575 mi/trip x \$0.58/mi), lodging \$376 (\$94/night x 2 nights x 2 persons), M&IE \$275 (\$137.5 (\$55/full day + \$41.25/first day + \$41.25/last day) x two persons). (\$1,645 total for feral travel).



Itemized Budget

item	amount
1 mo. salary & fringe for co-investigator Breen	\$ 8,273
6 mo. salary & fringe for project coordinator Wenger	\$ 33,951
8 mo. undergraduate half-time assistant	\$ 7,680
professional services: DNA automated genotyping	\$ 1,500
professional services: greenhouse space	\$ 1,260
supplies and materials	\$ 5,000
shipping costs	\$ 900
travel UMN/SWO for project meetings & field work	\$ 6,702
Total	\$65,266



APPENDIX C: North Dakota Department of Agriculture Industrial Hemp Program License issued to Sisseton Wahpeton Oyate



HEMP GROWER LICENSE
NORTH DAKOTA DEPARTMENT OF AGRICULTURE
PLANT INDUSTRIES DIVISION
SFN 61567 (2-2019)

North Dakota Department of Agriculture
600 E Boulevard Ave., Dept 602 Bismarck,
ND 58505-0020

Individual Name of Hemp Grower CHARLENE MILLER		
Address PO BOX 509		
City AGENCY VILLAGE	State SD	Zip Code 57262

The Agriculture Commissioner grants and issues your license pursuant to North Dakota Century Code 4.1-18.1 from the date issued to December 31, 2019.

This license is not transferable.

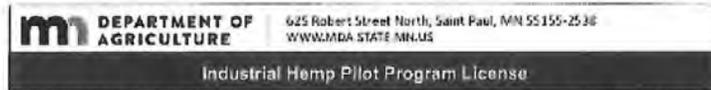
Date Issued July 02, 2019

License Number 2019 - 066


Doug Goehring, Agriculture Commissioner



APPENDIX D: Minnesota Department of Agriculture Industrial Hemp Pilot Program License issued to University of Minnesota



Minnesota Statute 18A.09 The Minnesota Industrial Hemp Development Act, authorizes the Minnesota Department of Agriculture (MDA) to administer a pilot program to study the growth, cultivation, or marketing of industrial hemp.

License Number: **2018B471**

UNIVERSITY OF MINNESOTA
DEPARTMENT OF PLANT & MICROBIAL BIOLOGY
1479 GORTNER AVE
149 GORTNER LAB B
SAINT PAUL MN 55108

The above license holder is authorized by the MDA to grow and handle industrial hemp. The license holder is bound to the terms and conditions stated in the license holder's signed Memorandum of Understanding.

Effective Date: 04/26/2019

Expiration Date: 12/31/2019

Physical Locations:

This license must be kept on file and presented when requested by MDA inspectors or law enforcement officials. This license must be present in the vehicle during any industrial hemp transport. This license is non-transferable and does not automatically renew. License holders must re-apply to the program to renew the license prior the date of expiration listed on this document.

Law enforcement officials or individuals with questions should contact:

DOUGLAS SPANIER, MDA Attorney, (651) 201-6166, Douglas.Spanier@state.mn.us
ANTHONY CORTILET, Noxious Weed and Industrial Hemp Program Supervisor, (651) 201-6536, Anthony.Cortilet@state.mn.us
MARGARET WIATROWSKI, Industrial Hemp Program Coordinator, (651) 201-6123, Margaret.Wiatrowski@state.mn.us

Consistent with the Americans with Disabilities Act, this document is available in alternate formats upon request by calling (651) 201-6100. TTY users may call (651) 201-6100. For more information, contact (651) 201-6100. This MDA license is not valid until the date of issuance.



Appendix B: UniSeed Contract



18374 Highway 17, Cobden, ON K0J1K0

613.646.9737

admin@uniseeds.ca

GENERAL TERMS AND CONDITIONS OF SALE

I. General

A. Purpose

The general terms and conditions described hereinafter specify the rights and obligations of UniSeeds Inc. and of its customer for the sale of certified industrial hemp seeds ("Seed"). Any service provided by UniSeeds Inc. thus implies the purchaser's unreserved adherence to these general terms and conditions of sale.

B. Obligations

The purchaser hereby agrees:

- to remain at all times in compliance with the Canadian Controlled Drugs and Substances Act and Industrial Hemp Regulations and all parts pursuant to the licensing and activities permitted and restricted by this legislation or its equivalent in the country in which cultivation will take place
- to use Seed solely for planting a single crop and not to save any crop produced from Seed for planting in a subsequent season
- not to transfer, supply or sell any Seed, whether purchased or produced, to any other person or entity for planting
- not to harvest any volunteer crops from fields planted the previous year with Seed

II. Goods

A. Varieties

Varieties are provided from the available stock of UniSeeds Inc., taking account of customer wishes. If advance orders exceed availability, quantities will be prorated between the orders and other varieties will be proposed to replace any quantities not provided. For 2019-20, available varieties are: Anka, USO 31, Férimon, and other varieties as may be sourced through Hemp-It, France.

B. Seed treatment

Industrial hemp seeds sold in Canada and the United States are currently not treated with any seed treatment product.

III. Pricing

A. Price

The prices of Seed sold are those applicable on the day the order is placed. They are denominated in Canadian dollars. Transport costs and any applicable taxes are in addition to the cost of Seed. Administrative costs of \$50.00, excluding tax, will be invoiced for any order less than 50 lbs. The minimum packaging is 500 grams. UniSeeds Inc. reserves the right to change its prices at any time. However, it makes every effort to maintain the prices applicable when the order is placed.

B. Discounts & Returns

No discounts will be granted in the case of advance payment. UniSeeds Inc. will not reimburse for seed that has had Canadian Seed Growers Association (CSGA) seed tags removed or if the seed bag is damaged and/or unsealed.

C. Methods of payment

Orders are payable by email money transfer to admin@uniseeds.ca, by cheque made payable to UniSeeds Inc., by wire transfer or in cash. The full balance must be paid prior to the shipment or collection of the Seed.

D. Late payment

In the event of non-payment in part or in full of goods delivered on the day of receipt, the purchaser must pay UniSeeds Inc. a penalty equal to 5% of the invoice amount, and 2% per month thereafter, calculated monthly on the 1st of each month.

IV. Delivery

The vendor will specify the period appointed for deliveries and notify the purchaser. Said period may be extended if public holidays or weather disturbances complicate transport logistics. Deliveries are made either by sending a pick up notice to the purchaser, by the direct delivery of the goods to the purchaser, or by delivery to an alternate location agreed to between the purchaser and the vendor. Delivery may be made subject to reasonable time after receipt of the balance of payment. Overruns of delivery times may not give rise either to damages or to withholding or to cancellation of open orders.

V. Jurisdiction

Any dispute in connection with the interpretation and/or performance of these terms is subject to the laws of the Province of Ontario.

VI. Retention of title

Transfer of title to the goods is suspended until the price has been paid in full; however, risks are transferred to the purchaser. The vendor reserves the right at any time to make a joint inventory of the goods delivered and the purchaser undertakes to allow the vendor free access to its premises. Goods delivered and not paid may be claimed even in the case of court ordered administration or liquidation in accordance with the conditions provided for under current applicable law. The guarantee of retention of title of goods not paid is carried over to all goods in stock owned by the vendor.

By signing below, the purchaser hereby acknowledges that they have read, understood and agree to the terms and conditions stated above.

Signed: _____

Date: _____

Witness: _____

Date: _____



GENERAL TERMS AND CONDITIONS OF SALE

I. General

A. Purpose

The general terms and conditions described hereinafter specify the rights and obligations of UniSeeds Inc. and of its customer for the sale of certified industrial hemp seeds ("Seed"). Any service provided by UniSeeds Inc. thus implies the purchaser's unreserved adherence to these general terms and conditions of sale.

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- to use Seed solely for planting a single crop and not to save any crop produced from Seed for planting in a subsequent season
- not to transfer, supply or sell any Seed, whether purchased or produced, to any other person or entity for planting
- not to harvest any volunteer crops from fields planted the previous year with Seed

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By signing below, the purchaser hereby acknowledges that they have read, understood and agree to the terms and conditions stated above.

Signed: _____

Date: _____

Witness: _____

Date: _____

Appendix C: BastCore Contract

DocuSign Envelope ID: 8026AEA0-3EF4-4F18-852F-DAFBD99A28EE

LICENSED HEMP FIBER GROWER CONTRACT: SWO

Buyer:	BastCore Inc.	Grower:	Sisseton Wahpeton Oyate
Address:	203 E. Wiles Road	Address:	PO Box 509
City, State Zip	Plattsmouth, NE 68048	City, State Zip	Agency Village, SD 57262
Contact:	205-886-5600	Contact	605-698-3911

In consideration of this agreement between BastCore and Grower, BastCore agrees to purchase hemp from Grower, and Grower agrees to sell to BastCore hemp, suitable for use by BastCore in its business, all in the quantity, at the price per the specifications, and subject to the terms and conditions set forth in this contract, to be valid only for the 2019 growing season:

COMMODITY:	HEMP as per the set forth Quality Standards.
VARIETY:	Anka or similar dual-use variety
EXPECTED YIELD:	160 tons
PRICE:	\$250.00 per ton
PRE-YIELD PAYMENT:	Initial payment of \$75/acre to be made for clean germination of the crop as determined by the BastCore Agriculture Department. In the case where the seeds have been purchased before June 21, 2019 and the hemp is planted later than July 15, pre-yield payments do not apply.
CONVEYANCE:	Grower's Farm Site. BastCore and SWO to each pay 50% of shipping costs from site of production to BastCore processing facility.

DELIVERY TIME:	Dependent on harvesting; less than 90 days from the date crop was baled.
SEED:	Provided by Grower
QUALITY STANDARDS:	At delivery point, BastCore to work with Grower to verify quality standards.
WEIGHTS:	To be determined at delivery, by BastCore, and approved by deliverer. A receipt of the transaction, containing weight and any applicable discount related to the set forth quality standards will be signed by both parties at delivery point.
PRODUCTION:	Grower will provide for the costs of equipment, fertilizer and all planting/spraying/harvest cost in crop production. The crop shall be produced by Grower on land owned, leased, or rented by Grower.
APPROXIMATE ACREAGE:	40 acres

PRODUCTION PRACTICES: BastCore may inspect the Subject Land at any time during the Growing Season to monitor the harvest. Grower shall, unless otherwise agreed to in writing with BastCore, adhere to the following:

1. Grow crop on land which has been in regular production (e.g. not in pasture), preferably following a cover crop. This rule is mandatory, although a onetime exemption may be made; the Grower must perform the soil prep (e.g. vertical cultivation) very aggressively.
2. Apply nitrogen in addition to any other deficiencies that may be required for land. Grower may use organic fertilizer.
3. Sow with a standard seed drill, set to a depth of no less than 0.5". Row spacing should be 8in to 16in. Seeding rate for hemp is specified at ~60lb/acre.
4. SWO and University of MN consulting team will provide

direction on the assessment of plant maturity.

5. Cut stalks with a sickle bar mower at the midpoint of plant flowering, defined as approximately 50% of all plants.
6. Mow and bale according to the following options:

Sickle Bar Mower: Grower may use a sickle bar type mower. Expect stalks greater than 12 feet tall. Rake with a rotary rake 1-3 times during the process to ensure that drying is even. Bastcore requests baling in large round bales.

7. Target 10-12% bale moisture content but not greater than 14%. Grower will ensure dry storage (covered or tarped) until loading. If bale moisture exceeds 14%, the discount as described in the Quality Standards table will be applied on a per pound basis.

QUALITY STANDARDS		
	<u>RECEPTION LIMITS</u>	<u>DISCOUNTS</u>
AVERAGE MOISTURE CONTENT:	MAX 18.0%	5.0% PER POINT ABOVE 14.0%
WEED CONTENT:	BARELY VISIBLE	MAY BEREJECTED

PAYMENT: Payment for crop purchases shall be made by check or bank draft payable to Grower, within 30 days from the close of the month after delivery to BastCore. Grower represents and warrants that all consents of claimholders necessary to permit Grower's sale of crop to BastCore hereunder have been obtained or will be obtained prior to the harvest. Grower agrees that BastCore has clear title to same, free and clear of any and all liens, claims and encumbrances of any kind. Bastcore's payment for the crop may be conditioned upon its receipt of appropriate lien or claim releases from any actual or potential claimholders.

SUBCONTRACTOR: Grower may lease fields to grow hemp, and subcontract with the landowner to provide services in connection with growing and harvesting hemp, subject to the consent and overall supervision and management of BastCore. Grower may not subcontract with farmers or other parties, absent express approval by BastCore.

FORCE MAJEURE: Neither party will have any liability to the other for any failure or delay in performing any obligation under this Agreement due to acts of God or nature, fires, floods, strikes, civil disturbances, vandalism, terrorism, or power, communications, satellite or network failures (individually and collectively "Force Majeure Event"). Grower's performance hereunder shall be excused, provided that the Grower notifies BastCore in writing promptly upon the occurrence of any act of God affecting Grower's ability to perform hereunder and provides BastCore with Farm Services Administration (formerly A.S.C.A.) certificates and/or other documentation satisfactory to BastCore evidencing the crop losses arising out of such act of God.

NOTICES:

Verbal notice required:

Grower shall provide notice to: B. Coleman Beale,
coleman@bastcore.com

Written notice required:

Grower shall provide notice to: B. Coleman Beale,
coleman@bastcore.com

ARBITRATION:

Except as otherwise expressly provided herein, should any controversy arise between the parties concerning the Hemp Straw sold under this contract, or the rights and duties of either party, the controversy shall be settled by arbitration in the following manner: Each party shall select and appoint one arbitrator. The two arbitrators appointed shall appoint a third arbitrator who possesses equivalent qualifications. The decision in writing of any two of the arbitrators shall be binding and conclusive on both parties. Should either party fail to appoint an arbitrator as required by this Paragraph within thirty (30) days after receiving written notice from the other party to so do, the arbitrator appointed by the other party shall act for both parties and that arbitrator's decision in writing shall be binding and conclusive on both parties. The cost, expenses, and fees of the arbitrators shall be borne by the parties equally or may be assessed by the arbitrators, in whole or in part, against either party to this contract. BastCore and Grower acknowledge that this sale affects interstate commerce and that this arbitration provision is to be entered into under the Federal Arbitration Act. Any arbitration conducted pursuant to this paragraph shall be conducted in compliance with the Commercial Arbitration Rules of the American Arbitration Association.

BREACH OF CONTRACT: This Agreement may be voided in the following circumstances:

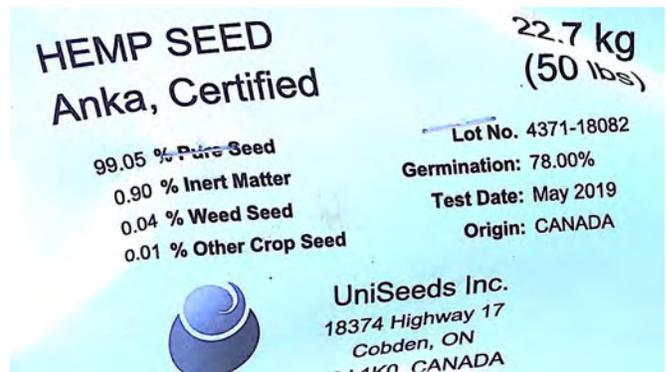
- a) Location and size of plots shall be mutually agreed upon by Grower and BastCore, subject to meeting other provisions. It is the Grower's obligation to carry out the protocol, and failure to do so will allow BastCore to void the contract at its discretion;
- b) If replanting is necessary, or production is inadequate as determined by BastCore, the contract may be voided by BastCore at its discretion;

CONFIDENTIALITY: All knowledge and information, not already available to the public, which you acquire, have acquired, or will acquire in the course of your engagement with the BastCore team with respect to BastCore's business, work methods, or pending regulatory matters, or other Company matters that are treated by BastCore as confidential, shall be regarded by you as trade secrets, whether or not they are classifiable legally as trade secrets, and shall be treated by you as strictly confidential. Such knowledge and information shall not either directly or indirectly be used, disclosed, or made accessible to anyone by you for any purpose, except in the ordinary course of BastCore's business under circumstances in which you are authorized to use or disclose such information. No disclosures of such confidential information shall be made outside of those you are authorized to make in the regular and ordinary course of your duties unless and until you receive prior written permission from BastCore. SWO retains right to disclose agronomic methods and data collected during production including yield (quantity) of dried hemp straw, fiber, and hurd.

RISK OF LOSS OR DAMAGE: The risk of loss and/or damage shall remain with the Grower until the crop has been conveyed to BastCore at the designated point of conveyance. Grower and BastCore otherwise mutually assume all risks of damage to or loss of the crop from any cause.

INDEMNITY: Grower shall indemnify and hold BastCore harmless from any and all claims, in any way connected directly or indirectly with Grower's operations pursuant to this agreement including Grower's use of herbicides and insecticides. Grower shall carry adequate public liability and property damage insurance. BastCore shall not be liable for Grower's violations of the applicable laws and regulations.

Photo Gallery



Certified planting seed label for industrial hemp varieties USO31 and Anka (upper left & right). Planting with a grain drill on 12 July 2019 (lower left). Rows of seedlings after 10 days showed patchy emergence compared to 2018 (lower right).



40-acre production-scale demonstration of fiber hemp at 68 days after planting (19 September 2019).



Harvesting the 40-acre plot of industrial hemp with a sickle bar mower on 19 September 2019. Stalks are left on the ground in the field for a period of weeks to allow a microbial process to aid in separating hemp fiber (retting).



John Mortenson, Industrial Hemp Program Coordinator (North Dakota Department of Agriculture) collecting SWO hemp samples for THC compliance testing (September 19, 2019).



Baling of industrial hemp stalks on 9 October 2019. The 40-acre plot produced 90 round bales of which 74 were sold to BastCore Inc.



Professor George Weiblen with BastCore engineer Michael Smith, PhD student Clemon Dabney, project manager JP Wenger and BastCore engineer Joe Guelden (19 September 2019).



SWO hemp field day at Coteau des Prairie Lodge (19 September 2019). Attendees included representatives from Flandreau Santee Sioux Nation, White Earth Nation, North Dakota State Legislature, South Dakota State Legislature, BastCore Inc., Dakota Nation Industries, North Dakota Department of Agriculture, South Dakota Bureau of Indian Affairs, USDA Natural Resources Conservation Service-Sisseton and SWO tribal members.



Professor of Political Science Sheri Breen, University of Minnesota- Morris, (above), Professor George Weiblen and SWO Chairman Donovan White at the SWO hemp plot (below). 19 September 2019



SWO project field site in 2020 with a corn rotation following the 2019 hemp demonstration (above). Occasional volunteer hemp descended from the 2019 crop grew between the corn rows, averaging seven feet tall (below). Volunteers at 95 days after planting (18 August 2020). Measurements provided a yield estimate based on a May 15th corn planting date



SWO Planning Department visits the Weiblen laboratory on the Saint Paul Campus of the University of Minnesota (left-to-right from upper left: Gabrielle Tateyuskanskan, Vivienne Tateyuskanskan, Barbara Joseph and Professor Weiblen. JP Wenger describes plant growth chambers for propagating hemp during the winter season (upper right). Feral hemp grown from seed collected near Havana, North Dakota and cultivated under hydroponic conditions with artificial light (lower left). JP Wenger explains how conventional breeding techniques are used in the lab. (23 February 2020).



SWO-UMN delegation at the 2020 Central US Hemp Growers Conference and Expo in Bloomington, Minnesota (left to right: Don June, Crystal Owen, JP Wegner, Michael Roberts, Barabara Joseph, George Weiblen and Angelic Vaughn. Vendors of CBD extract describe products to SWO members (left) and Amish farmers (right). 24 February 2020



Winona LaDuke of White Earth Nation and Winona's Hemp Heritage Farm toured the Weiblen laboratory on 4 February 2020. Pictured behind Winona and Professor Weiblen is a half-bale of 2018 SWO hemp that was retained for demonstration and analysis of hemp fiber and bast quality.



Sota photographer John Hemminger led the project team to a stand of feral hemp at Agency Village, South Dakota in 2019 (upper left). At least 10,000 plants were located in a heavily grazed pasture on private land adjacent to Tribal Trust Land. Samples were not collected owing to South Dakota law at the time. Narrow leaves and small seeds of hemp (upper right).



Strege homestead near Havana, North Dakota (20 September 2019). A small population of feral hemp (~20 plants) was located in heavily grazed pasture. Mr. Strege permitted the UMN team to collect samples from their property. Laboratory analysis of the samples provided preliminary data on THC levels in Dakota “ditch weed”.



Project technician Nick Talmo and 12-foot tall plant of SWO feral hemp in a roadside ditch. Prolifically shedding pollen from male flowers on 18 August 2020 (above). "Make America Grow Again" cap made of 100% hemp fiber (upper right). SWO Planning Officer William Fish and Professor Weiblen with feral hemp in a cattle feed lot near Agency Village (21 September 2020).





Highly branched, feral hemp plants were abundant on abandoned piles of manure on over-grazed and degraded land where cattle are over-wintered near Agency Village (upper). Shallow root systems suggest abundant nitrogen leaching from the manure (lower). 21 September 2020



Charlene Miller, SWO Natural Resources Division, with approximately one ton of feral hemp harvested near Agency Village, South Dakota (above). Harvested plants were transported to a location near Havana, North Dakota for drying (below). (22 September 2020)



Ventilating the trailer was necessary to avoid excessive temperature and humidity, preventing degradation of feral seed (22 September 2020).



Feral plants were spread across the floor of a fan-ventilate grain dryer and maintained at constant temperature until moisture content had reached 15% (23 September 2020).





Hand-stripping seed heads of feral hemp after 12 days of drying in a fan-ventilated grain bin on 5 October 2020 (above). Feral hemp seed swept from the floor of the grain bin (below).



Hemp stalks after seed heads were hand-stripped (above). After drying, the full trailer load of fresh biomass was reduced to two large bundles of stalks and 15 bags of seed heads. One bundle (below) and the bagged material were transported to the Minnesota Agricultural Experiment Station for weighing and processing. 5 October 2020



Sota newspaper editor Chuck Floro and Professor Weiblen pictured with the front-page article by William Fish describing the SWO feral hemp harvest (above). JP Wenger, William Fish, Clemon Dabney, Sheri Breen and Nick Talmo discuss project results at Couteau des Prairie Lodge on 5 October 2020 (below).



Seed head processing at the Agronomy Seed House of the Minnesota Agricultural Experiment Station involved break down with a Wintersteiger thresher, followed by hand-sieving to remove coarse stems (above), followed by cleaning aspirator to separate the chaff from the seed (below). 7 October 2020



Project technician Nick Talmo sieves dried inflorescences for cleaning in an aspirator (above). Bagging cleaned feral SWO planting seed (below). 7 October 2020



Cleaned SWO feral hemp planting seed is bagged and stored for winter at the Minnesota Agricultural Experiment Station in Saint Paul (above). The 70 pounds of cleaned material included seeds, flower bracts and small fragments of leaves and stems. 7 October 2020.



Feral hemp chaff awaiting disposal after mechanized removal of seed. (7 October 2020)