

THE COLORADO 'GREEN BUFFALO' ASSOCIATION
(CGBA)

The Purpose of this document is to raise money for a Colorado Hemp Farm that includes a 'Cannabidiol (CBD) Concentrate' Processing Lab, and a Hemp Food & Fiber Processing Plant:

Due to the lack of infrastructure, as well as the lack of processing facilities, the commercial hemp market in the United States makes projections extremely speculative. However, according to the 'Midlands Naturalist', as well as 2013 wholesale prices, an acre of hemp produces:

Quantity	Unit Size	?	Total Per Acre	Equals
1	Acre	Hemp Field	8000 Seeds	300 Gallons Hemp Seed Oil
			300 Gallons @ \$30 per	\$9,000 Hemp Seed Oil per Acre
8000	Seeds	Hemp Oil Byproduct	6000 Pounds @ \$2 per	<u>\$12,000</u> Hemp Flour per Acre
				\$21,000 JUST FROM SEEDS

Quantity	Unit Size	?	Total Per Acre	Equals
1	Acre	Hemp Field	Raw Bails of Stalk	<u>31</u> Tons of Raw Stalk
			31 Tons @ \$75 per	\$2,300 Raw Stalk per Acre
or (more equipment and labor needed for value added separation)				
1	Acre	Hemp Field	Bast Fiber	6 Tons of Bast Fiber
			6 Tons @ \$1000 per	\$6,000 Bast Fiber per Acre
1	Acre	Hemp Field	Hurds	25 Tons of Hurds
			25 Tons @ \$300 per	<u>\$7,500</u> Hurds per Acre
				\$12,500 JUST FROM STALKS

U.S. Industrial Hemp Production

Currently, the Controlled Substance Act makes it illegal to raise industrial hemp (Cannabis Sativa) commercially without a permit from the Drug Enforcement Agency (DEA). However, numerous state and national initiatives are working to return industrial hemp production to the United States.

In fact, the 2014 Farm Bill includes a provision that allows institutions of higher education to grow or cultivate industrial hemp. This provision allows universities to study industrial hemp for its possible future use as a commercial product. The federal provision also allows states (which have legalized hemp) to legally transport it across state lines.

Currently, American Hemp Farmers must compete with substantial production subsidies in the European Union (approximately half the value of the crop) and in parts of Eastern Europe. Labor costs for both harvesting and processing are significantly lower in many regions outside of the United States. And it is important to remember that harvested hemp is very bulky, and that minimizing transport distance between processing centers (at least first stage) is advantageous.

Colorado Industrial Hemp Production

(CRS § 25-18.7-101 to 105) Colorado now permits the growing of industrial hemp. The Colorado Department of Agriculture's regulatory role with Industrial Hemp is limited to registration of cultivators and inspection of crops. The State of Colorado has no jurisdiction over many other factors that producers are faced with. The following issues arise during the cultivation of industrial hemp in the state of Colorado:

- Seed Procurement/Seed Quality - Random sampling of hemp fields will be conducted. Plant samples testing at levels higher than 0.3% THC will be in violation of the Colorado Industrial Hemp Registration and Production Act (and a THC level over 1% is forbidden).
- Federal farm programs such as crop insurance, farm loans, and conservation reserve; may be jeopardized if industrial hemp is planted (these programs are managed by the USDA).
- Processing - Industrial hemp must be processed prior to shipment out of Colorado. It is unknown at this time how many processing facilities will be available during harvest.
- Registration deadline - is May 1 of each year, beginning in 2014.

Canadian Industrial Hemp Production

Detailed market information for hemp seed isn't readily available. One report compiled by Alberta Agriculture and Rural Development estimates gross revenue for Canadian hemp seed production at around \$35 million.

Canada has allowed the commercial production of industrial hemp for seed and for fiber since 1998. More than 100 Canadian farmers are currently taking advantage of the market for hemp and are growing the crop (Agriculture & Agri-Food Canada).

According to the Canadian Hemp Trade Alliance (CHTA), Canadian farmers planted nearly 39,000 acres of hemp in 2011. Canadian farmers are reporting net profits of \$200 to \$250 per acre. In 2010, exports of Canadian hemp seed and hemp products were valued at more than \$10 million. Most Canadian hemp exports go to the United States.

Hemp Cultivation

Industrial hemp has the capacity to grow in a multitude of different climates, altitudes, soils and weather conditions. Hemp is sown during April or May and typically planted densely in rows (at least 150 plants per square meter to maximize fiber production; and about one-fifth that density if grown for seed production). Drilling is recommended for uniformity, using a standard grain drill or a modified alfalfa seeder. It is also recommended that the ground be non-compacted and well-drained, using only light cultivation. Small amounts of herbicides may be required, although pesticide use would probably not be necessary, and nitrogen fertilizer should be applied in the spring, with similar application rates to that of corn.

Very little else is required until harvest (with the exception of irrigation if precipitation is less than 200mm over the course of the growing period). Most fiber varieties reach 10 to 12 feet tall in 3 to 4 months time (with a full range of 6-16 feet), with very little foliage produced. In late summer the plants are harvested and the foliage is returned to the soil.

And the hemp 'deep tap-root' draws up subsoil nutrients and then, when the leaves fall from the plant to the ground, they return these nutrients to the topsoil for the next crop rotation (hemp should be one of the three annual crop rotations, per farming field, to produce the best results).

Seed Cost Estimates

Certified seed, the most expensive production cost item, imported into Canada costs about \$2000 per ton, of which roughly half is transportation costs from Europe (viable seeds are not currently available in Canada or the United States), and most certified seed containing 0.3% THC or less comes from France. It is reasonable to assume that this cost estimate would also apply to American producers. Further, since no varieties have been specifically adapted to North American production, yields may be slightly less than average, particularly during early years of commercial production.

Hemp Processing

Industrial hemp is grown for its *fiber* (outer bark), *hurds* (woody inner core of the stalk), *seeds* (primarily for hemp oil), and Cannabidiol (CBD) Concentrate (from the residual flowers after seed extraction). The fiber length and cellulose and lignin content are key quality parameters as well.

Concentrate: After the seeds are extracted, the residual flowers produce a valuable medicine. This medicine is called 'the Cannabidiol (CBD) Concentrate'. The cannabidiol concentrate has extremely low levels of THC (less than .03%) and high levels of CBD's (up to 40% cannabidiols in the plant resin). Cannabidiol (CBD) is a class of diverse cannabinoid compounds that act on cannabinoid receptors throughout the body and mind. CBD's display no psychoactivity (users don't 'get high').

And the Cannabidiol Concentrate has been shown to exhibit several biological actions including: anticonvulsive, sedative, hypnotic, antipsychotic, anti-inflammatory, and neuroprotective properties (and is in high demand for epilepsy patients; with over 22,000 patients on one farmer's waiting list). Current wholesale prices for the concentrate are approximately \$16,000 per pound.

Fiber: Hemp stalk averages around 20-30% bast fiber (the strong woody fiber obtained chiefly from the phloem of plants). The basic markets for bast fibers include specialty textiles, papers (including specialty and recycled papers) and cordage (such as rope and canvas). And one acre of hemp can produce six to ten tons per acre of hemp bast fiber.

Hurds: Approximately 70-80% of the stalk is composed of hurds (the woody inner portion). Essentially, hurds are the by-products resulting from the extraction of the bast fibers from the stalk. Hurds are 50 - 70% cellulose (lending itself to paper, particleboard, biodegradable plastics, composite building materials, and animal bedding). And one acre of hemp can produce twenty-five tons of hemp hurd fiber.

Paper Pulp: Industrial hemp fibers cannot be easily separated into pulp fibers of consistent quality without specialized machinery. Pulping hemp fibers can be accomplished by either traditional mechanical pulping techniques, or traditional chemical pulping techniques, or a combination therein. The latest Dutch research shows that a chemi-mechanical pulping process may prove to be the most cost-effective for hemp pulp. And according to the Dutch Institute for Agrotechnological Endeavors, the average hemp pulp and paper mill produces about 5,000 tons per year, compared to a minimum of 250,000 tons for a wood fiber pulp mill.

Seeds and Oil: Similar to soybeans, pressed hemp seeds are comprised of seed oil and seed cake (or meal). The seed is approximately 30-35% oil by weight and can be used for food. The seed cake contains 25% protein (as well as essential vitamins and minerals) and can be used as a supplement to wheat flour. However, due to the high content of polyunsaturated oils, hemp seed oil is fairly unstable and becomes rancid rather quickly unless preserved.

In fact, an acre of hemp can produce 8,000 pounds of hemp seed. And when that hemp seed is cold-pressed, the 8,000 pounds of hemp seeds yield over 300 gallons of hemp seed oil, as well as 6,000 pounds of high protein hemp flour (seed cake). Hemp seed produces three times more oil per acre than the next most productive seed oil crops, over 300 gallons per acre, with a byproduct of 3 tons of food per acre. Hemp seed oil is also far more nutritious and beneficial to our health than any other seed oil crop.

Hemp Nutrition

The hemp seed is one of the most balanced sources of omega-3 and omega-6 essential fatty acids (EFAs) around. Studies link many common ailments to an imbalance and deficiency of EFAs in the typical Western diet: too much omega-6, and not enough omega-3.

Fish and fish oils are typically recommended because they provide the omega-3 derivatives, but consumers are concerned about mercury/radioactive contamination of fish (which has led the FDA to warn pregnant women and nursing mothers to restrict their fish intake).

Hemp's omega profile is a good alternative to fish. The seeds also provide other phytonutrients, including phyto-sterols and carotenes, as well as vitamin E, calcium, magnesium, and potassium. Hemp oil is the richest known source of polyunsaturated essential fatty acids, and is also rich in gamma linoleic acid (GLA), a rare nutrient also found in coconut oil and mother's milk.

Modern Hemp

A Colorado company is using hemp to fight the spread of staph infections in hospitals. Various chemicals found in *hemp fabric* possess antibacterial and antifungal properties. Traditional cotton and polyester fabrics help bacteria survive for months at a time.

Insulation made from hemp is quickly becoming a popular eco-friendly alternative to traditional insulation materials like mineral wool. Hemp is also carbon-negative (absorbs more greenhouse gases than emitted during the production process). Hemp has also found its way into concrete mixes. *Hempcrete* can be used for a variety of construction needs, from walling to roof insulation to flooring. On top of being carbon-negative, *hempcrete* is said to be easier to work with and has natural insulating and moisture regulating properties. Hemp bricks also lack the brittleness of traditional concrete and thus do not require expansion joints.

Hemp composite can be found in nearly all mass production automobiles. And that's because biocomposite made from hemp fiber is just as strong as fiberglass, but incredibly lightweight. With fuel economy becoming a primary focus of all carmakers, hemp composite will only become more common in cars. And graphene is often touted as the future of nanotechnology, and the thinnest, strongest, and lightest material ever made; and earlier this year, chemical engineers from the University of Alberta turned hemp fiber into a nanomaterial with similar properties as graphene, but at a much lower price.

What's more, when it comes to making energy storage devices like *batteries and supercapacitors*, the hemp nanomaterial showed "superior electrochemical storage properties" compared to graphene. Research is still in its early stages, but if the results hold, hemp could eventually be used for a wide range of nanotechnology applications, from flashlights to solar cells.

Medical Cannabis Science

Medical cannabis research has moved forward over the years, but the breakthroughs made in 2013 were truly significant:

Evidence that cannabidiols (CBD's) can help in a wide range of Epileptic conditions dates back to the seventies; and there are even more recent studies proving that cannabis helps in pediatric epilepsy.

Scientists provide first clinical evidence that cannabidiols (CBD's) helps in Crohn's disease. The cannabidiols helped patients wean themselves from dependency on steroid-based medications and improved their appetite and sleep, with no significant side effects.

Scientists provide first clinical evidence that cannabidiols (CBD's) help in Parkinson's disease. The results showed clear improvements in symptoms of tremor, rigidity and bradykinesia. Patients also reported a dramatic reduction in pain, which led to improvements in sleep.