Brian Tomasik - Summer 2001-Summer 2002

Note: I don't know if I now endorse industrial hemp – it depends on the net balance of the crop for wild-animal suffering (http://www.utilitarian-essays.com/crop-cultivation-and-wild-animals.html) compared against counterfactual alternatives. If hemp reduces deforestation to produce fiber, this might ***increase*** *wild-animal suffering by preserving those forests. --BT, 1 Jan. 2014*

Industrial hemp, a variety of the plant *Cannabis sativa* and a member of the mulberry family, has been grown for thousands of years, produces some of the longest and most durable fibers in nature, and has over 25,000 uses. Even though there are hundreds of varieties of the plant, all are classified as belonging to the same species. *Cannabis sativa* contains several substances called cannabinoids, the two most prevalent being cannabidiol (CBD) and delta 9 tetrahydrocannabinol (THC), which is the primary psychoactive substance in marijuana. Industrial hemp is a variety of *Cannabis sativa* that has been bred so that it produces a maximum fiber content, while only containing .05-1 percent THC, as opposed to the 5-20 percent THC found in marijuana. Industrial hemp contains such a negligible amount of THC that smoking an entire field would only give the smoker a headache, not a "high". In addition, the cannabinoid CBD, which actually reverses the psychoactive effects of THC, is present in large quantities in industrial hemp. Industrial hemp usually contains over .5 percent CBD, generally creating a ratio of CBD to THC of around 5: 1. In contrast, marijuana usually has less than .5 percent CBD, resulting in a ratio of CBD to THC that ranges from 1: 2.3 to 1: 7.4. Industrial hemp, because of its low THC and high CBD content, has even been used to aid marijuana addicts in breaking their smoking habits. William M. Pierce Jr., Ph.D., Associate Professor of Pharmacology at the University of Louisville School of Medicine wrote in a 1997 letter that "Industrial hemp does in fact contain a psychoactive substance, tetrahydrocannabinol (THC) and thus the question [of its potential use as a drug] appears at first reading to be a reasonable one. Upon closer consideration, however, using the most fundamental principles of pharmacology, it can be shown that it is absurd, in practical terms, to consider industrial hemp useful as a drug." Despite the essential differences between the two types of *Cannabis*, the United States Drug Enforcement Administration (DEA) classifies all varieties of hemp as marijuana, and therefore prohibits its cultivation in the United States.

Despite the many promising possibilities presented by the plant, industrial hemp was largely ignored by much of the world during the last few decades; however, in recent years, the plant has experienced a renaissance. Renewed interest in the plant is increasing its cultivation and use. Over 30 countries have legalized industrial hemp, including Ukraine, Thailand, Switzerland, Russia, Romania, Portugal, Poland, Philippines, Pakistan, the Netherlands, Nepal, Korea, Italy, Ireland, India, Jamaica, Hungary, Germany, France, England, El Salvador, Chili, China, Canada, Belgium, Austria, and Australia, even though many of them still ban marijuana. The United States currently permits the importation of products made from hemp from such countries, but US farmers are prohibited from growing the plant. The augmented cost caused by importation and the possibility of seizures at the border have discouraged many US companies from investing in the crop. Recently, the DEA has issued a permit to grow a test plot of industrial hemp in Hawaii, but the agency demands a chain-link fence with razor wire on top and a 24-hour infrared security system around the plants. Such unnecessary measures, if required for all industrial hemp cultivation, would prevent the crop from becoming commercially viable in the US because of the extra cost of security.

Any trained person can easily distinguish marijuana from industrial hemp. The DEA claims that if industrial hemp were legalized, farmers could hide marijuana in their fields; however, the countries that have already legalized industrial hemp have experienced no problems of the sort. In 1996, more than 300 of Germany's hemp fields (over 50 percent of them) were inspected for the presence of marijuana, and none of the fields were found to contain the drug variety of the plant. Also, industrial hemp is harvested five to six weeks before a marijuana grower would harvest his crop. Marijuana plants require copious room to grow to maximize their leaves (there are usually one to two plants per square meter), but industrial hemp stalks are grown very close to each other (with 300 to 500 plants per square meter), to maximize the growth of the stalk. Such an overt difference is easily visible from

above a hemp field, and if anyone traveled inside the hemp field to reach hidden marijuana, their path would also be conspicuous because of the thick density of industrial hemp stalks. Even if marijuana plants were present in industrial hemp fields, the two varieties would exchange pollen. The pollen of the industrial hemp would lower the THC content of a resulting marijuana plant, but the THC content of a resulting industrial hemp plant would not increase. A marijuana grower would not be likely to plant their marijuana near an industrial hemp field, because, according to a Russian study, the pollen of industrial hemp spreads over approximately a 12-mile radius. Additionally, all countries that currently allow the cultivation of industrial hemp use a system of permits, which includes requirements that farmers notify police as to which fields are used for industrial hemp. It is unlikely that a marijuana grower would hide their plants in a field that is under heavy surveillance by law enforcement personnel.

In addition to the claim that marijuana could be hidden in industrial hemp fields, critics of industrial hemp legalization have asserted that THC could be extracted from the plant and concentrated into high doses of THC. However, the task would be rendered futile because of the enormous amounts of time, effort, and money required; it would be easier to simply find marijuana. If one "cooked down" industrial hemp in an attempt to concentrate the THC, the CBD would also be highly concentrated, making the technique ineffective. Robert C. Clarke, a botanist and expert on hemp, wrote that "Although industrial hemp does contain trace amounts of THC, it is of no practical significance. There is also a minor percentage of precious gold dissolved in sea water, but it is no more economically feasible to extract than THC from [industrial] hemp."

The cultivation of industrial hemp is fairly simple, and the plant requires only three to four months (70 to 110 days) until it is ready for harvest. The crop, which is an annual, grows well in many different soil and climactic conditions, although optimal growth occurs in a mild, humid climate with temperatures between 60 and 80 degrees Fahrenheit and rainfall ranging from 25 to 30 inches annually. Industrial hemp can resist sudden weather changes better than most other flora; small seedlings and mature plants can endure minor frosts for a short period without much damage, and industrial hemp is less likely to be harmed by frost than oats or corn. The stalks grow from ten to twelve feet (three to three and two-thirds meters) high, and 400 to 2500 pounds (180 to 1130 kilograms) of hemp are produced per acre; in good conditions, an average of 1000 pounds (450 kilograms) per acre are yielded. After hemp is harvested, a process called retting is used to separate the long bast fibers from the woody core of the stalk, allowing the fiber to be more easily removed later. During dew retting, the stalks are left out in fields through freezing and thawing and they are exposed to the decomposing action of bacteria; this retting method is most frequently employed.

Industrial hemp, unlike most plants, leaves the soil in good condition, often better than before it was planted; if it is retted on the field, up to two-thirds of its organic matter can be returned to the soil. According the *1913 Yearbook of the United States Department of Agriculture*: "An abundant supply of plant food is required by hemp, but most of it is merely borrowed during development and returned to the soil at the close of the season." The Yearbook also explains:

> "Hemp cultivated for the production of fiber, cut before the seeds are formed and retted on the land where it has been grown, tends to improve rather than injure the soil. It improves its physical condition, destroys weeds [by crowding them out and shading the ground], and does not exhaust its fertility….Hemp loosens the soil and makes it more mellow. The soil is shaded by hemp more than by any other crop [which cools the ground and doesn't kill decomposers that might otherwise be eliminated by the heat]. The foliage at the top of the growing plants makes a dense shade and, in addition, all of the leaves below the top fall off, forming a mulch on the ground, so that the surface of the soil remains moist and in better condition for the action of soil bacteria. The rather coarse taproots,…penetrating deeply and bringing up food from the subsoil, decay quickly after the crop is harvested and tend to loosen the soil more than do fibrous roots of wheat, oats, and similar broadcast crops. Land is more easily plowed after hemp than after corn or small grain."

By breaking up the soil, the deep roots allow more air into the soil and the increased oxygen helps to expedite the decomposition of the nutrient-rich leaves. Because it improves the soil and eliminates weeds, industrial hemp is a beneficial crop to use in rotation, such

as with wheat and potatoes. It has been reported that a crop of industrial hemp has been able to completely eliminate Canadian thistle and substantially restrict the growth of quack grass. Some farmers have witnessed a ten percent increase in the yield of their winter wheat after planting hemp on the same land. Industrial hemp requires copious nitrogen, so it is best planted after a crop that fixes nitrogen, such as alfalfa.

Industrial hemp has thousands of uses and is one of the most versatile plants on earth. The seeds of industrial hemp, which are one-eighth to one-fourth of an inch (six to thirteen millimeters) in diameter, can be used to make a variety of food products. The hemp seed itself contains no THC, although, during processing, some of the THC from the rest of the plant attaches to the seed; however, such a small amount of THC is completely innocuous. Most workplace drug tests for people who consumed unrealistically high quantities of hemp seed products are not positive for THC. In rare cases, THC has been detected, but such tests have also been able to detect harmless amounts of opium in subjects who had consumed poppy seeds. Industrial hemp food products are about as likely to be used as a drug as poppy seed bagels or fruit juices, which contain trace amounts of alcohol. To demonstrate the low levels of THC present in hemp foods, the Canadian Triathlete Harry Barnes consumed inordinate amounts of HEMPOLA Cold Pressed Hempseed Oil during his peak training period. He ate up to six ounces of HEMPOLA daily, which is twelve times the amount normally consumed, and, in addition, the athlete explained: "I'm also eating three cups of hempseed flour per week and two cups of HEMPOLA pancakes per week. Plus I wash and shower using Hempola soap three or four times a day." After having his urine analyzed for the presence of cannabinoids on February 27, 2002, Harry Barnes discovered on March 5 that the results had come back negative.

The seed of the hemp plant is very nutritious and contains plentiful amounts of protein, calcium, magnesium, potassium, phosphorus, vitamin A, and vitamin E. Twenty-nine to 34 percent of the weight of a hempseed is its oil. After the oil is crushed out of the seed, the remaining meal is about 25 percent protein and is an excellent feed for pets, cows, chickens, and other animals. Sterilized hemp seed is contained in most birdseed sold in the US. The seed, which tastes better and is more digestible by the human body than soy, can be used to make hummus, non-dairy milk, cheese, ice cream, butter, flour, pasta, bread, chips, nutrition bars, cakes, cereals, and cookies. Recently, the hemp foods industry in the US has expanded from under $1 million to over $5 million. If industrial hemp were legalized in the US, seeds purchased by American consumers would be fresher and would retain greater amounts of nutrients because they wouldn't have to be transported as far and wouldn't undergo sterilization, a process which causes the seeds to become rancid sooner. Because sterilization would be precluded, the price of the seeds would also be reduced.

The oil of hemp is very healthy and can be used in salad dressing and other food products. Eighty-one percent of hemp oil is polyunsaturated essential fatty acids, the highest percentage in any known food source. Essential fatty acids (EFAs) are beneficial to the body, yet the body cannot produce them on its own and must obtain them from outside sources. Hemp oil is also high in a few essential amino acids. The oil contains only eight percent saturated fat, which is sticky and can cause blood clotting. Flax is also a good source of essential fatty acids, but it doesn't contain as many as industrial hemp seed oil. Many people don't like the taste of flax oil; most people prefer the taste of hemp oil. Fifty-four to 60 percent of hempseed oil is linoleic acid (LA), which is an omega-6 unsaturated fat. It is converted into prostaglandin E1, which regulates several metabolic functions. LA helps to decrease blood clotting, inflammatory cholesterol, and helps to stabilize blood sugar. Industrial hemp seed oil also contains 15 to 20 percent linolenic acid (LNA), an omega-3 fatty acid that 90 percent of Americans do not receive enough of in their diets. The ratio of LA to LNA in hemp seed oil is 3 : 1. The World Health Organization (WHO), Health Canada, and scientists in Sweden and Japan have recommended that humans consume those two fatty acids in a ratio of 4 : 1, and the ratio in hemp oil is closer to this 4 : 1 ratio than in any other naturally occurring oil. In flax, that ratio is almost inverted, with only 14 percent LA and 58 percent LNA. Essential fatty acids form longer chain fats such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are also found in some cold-water fish. The omega-3 fatty acids in these chain fats reduce blood clotting and lower cholesterol, thereby reducing the risk of a

heart attack. They have also been shown to lessen arthritis and autoimmune disorders because they have an anti-inflammatory effect. Hemp seed oil also contains the rare fat, steridonic acid (SDA), as well as one to four percent gamma-linolenic acid (GLA), a rare omega-6 fatty acid also present in black currant, primrose oil, borage, and mother's milk. GLA may be involved with the growth of hair and nails, and it is important in regulating T-lymphocyte functions as part of the body's immune system; this fatty acid is also involved with the growth and metabolism of cells. GLA reduces the risk of coronary heart disease and decreases blood clotting, cholesterol, triglycerides, and inflammations in joints. It has been able to alleviate diabetes, acne, hyperactivity, alcoholism, pre-menstrual tension (PMT), and several other disorders. Given hemp oil's superior nutritional content, it is little wonder that Dr. Udo Erasmus, a nutritional expert on fats and oils, has written in his book *Fats that Heal – Fats that Kill*: "Hemp seed oil may be nature's most perfectly balanced oil."

Industrial hemp oil can also be used for soap, lotions, massage oil, shampoo, conditioner, moisturizer, lip balm, and other body-care products. The essential fatty acids of the oil made from the hemp seed are easily absorbed into the skin and help to moisten it. When mixed with herbs, salves made from hemp oil can treat skin irritation, small cuts, and insect bites. Hemp oil and oil produced from flax (*Linum usitatissimum L.*) blends easily with other substances, making it ideal for nontoxic and biodegradable varnishes, shellacs, resins, paints, and inks. The oil in hemp paints soaks into the wood and helps to preserve it. Inks, such as those made from hemp, can also be produced from soybeans, but because industrial hemp contains higher levels of linoleic acids, the ink requires less processing.

About 70 percent of the hemp stalk is short core fiber (called hurds), which is ideal for packaging and can be used as bedding for animals, including horses and rabbits. Cat litter containing hemp hurds is currently sold in Germany, France, and England. Industrial hemp hurds are preferred for bedding over cheaper materials because they absorb more moisture, so the animals are less likely to become infected with diseases. It is up to twice as absorbent as wood chips or straw and also lasts longer and decomposes more rapidly.

The fiber of industrial hemp can be used for strong ropes and sails as well as many textiles. Hemp fiber can produce blankets, backpacks, carpeting, bedspreads, drapes, mattresses, sheets, tents, and upholstery. The absorbing quality of the plant makes it ideal for towels and the like. The fiber is longer and stronger than cotton, but a "cottonization" process can be used to convert long, thick fibers into cotton-like bundles allowing the fiber to be processed on existing cotton equipment and to produce clothing that feels like cotton. Fabrics with the quality of linen can be produced from industrial hemp. The textiles can endure harsh conditions, are more absorbent and more resistant to mildew than cotton, and are better insulators than most fabrics, keeping the wearer cool in the summer and warm in the winter. Also, according to the Chinese Academy of Sciences, fabrics made from at least 50 percent industrial hemp fiber block the sun's ultraviolet rays better than normal fabrics.

Hemp, as well as other plants such as corn, can be converted into ethanol, which can be used in cars instead of gasoline and releases less pollution. However, the burning of ethanol destroys the nutrients that were in the plant, it causes extra farmland to be used, which creates more space where native species are replaced, and is a completely renewable source, unlike oil, so its use might lessen the urgency for completely environmentally benign automobiles. Better alternatives exist, such as hydrogen-powered cars, which contain hydrogen fuel cells. These cars harness the energy released when hydrogen is exposed to oxygen, and instead of releasing exhaust, the car releases water formed by this reaction. The hydrogen could be potentially created with clean energy, such as from the sun or wind. Hydrogen-powered cars are very powerful yet very quiet and get excellent fuel mileage. In addition, if all vehicles ran on hydrogen, engineer Amory Lovins estimates that these hydrogen-powered vehicles could produce enough excess electricity (which could be sold back to the power grid) that they would replace all existing power plants by five to ten times.

All products made from industrial hemp, including plastic, are biodegradable. Industrial hemp plastics can be made new or combined with recycled plastics. The short core fibers of the plant can be utilized in the production of cellophane for packaging, as well as a biodegradable Styrofoam-like substance. Industrial hemp's long fiber can be used to create a biodegradable replacement for

fiberglass; this substance is of a superior quality to fiberglass produced from flax. Regular fiberglass breaks down only if it is broken into small pieces, which are dangerous if inhaled. Many wind power generators are currently constructed partially from fiberglass, but they could have less of an environmental impact if they instead used industrial hemp fiberglass. Industrial hemp plastic can create car bodies that are lighter yet stronger than steel and that will not rust; they also insulate well against cold or heat and sound. In the 1940's, Henry Ford experimented with using hemp plastic for fenders and car doors. Ford explained his desire "to grow automobiles from the soil." His car, which was produced partially from and fueled by industrial hemp, was able to withstand impacts ten times as great as normal automobiles, yet it's weight was only two-thirds as much as normal.

One of the most important uses for industrial hemp is for making paper, primarily because no trees are required. The plant's longer fibers are used for books, stationary, and magazines, while the shorter fibers are better for tissues, packaging materials, and newspaper. Paper made from hemp can be recycled more times than paper made from trees. Hemp paper lasts longer than wood-based paper and doesn't yellow, making it especially preferable for printing Bibles and other such books. The world's paper use has burgeoned in the last century from 14 million tons in 1913 to over 250 million tons in the 1990's, over a 1600 percent increase. The proliferation of the use of paper has accelerated in recent years; from 1985 to 1996, production of paper products worldwide has risen from 193.3 to 284 million tons, an average increase of 7.5 million tons every year. Worldwide demand for fiber is enormous; in the US, the need for fiber is greater than the demand for steel and plastic combined. In the fall of 1994, two paper companies, International Paper and Champion International, faced such shortages that they were forced to declare weeklong moratoriums on new orders of paper. As a result of the world's ravenous demand for fiber, forests all over the world have been cut down and only four percent of the old growth forests in the US remain today. Trees are needed to provide habitats for many plants and animals, to improve the quality of water in watersheds that are near forests, for recreation, to prevent soil erosion, to produce oxygen and sequester carbon dioxide, as well as myriad other reasons. Industrial hemp yields 3 to 8 tons of dry fiber per acre, which is four times what an average forest can yield per acre. Although industrial hemp can't completely prevent the use of forests, it could drastically reduce our dependence on trees if it were grown on a large scale.

Paper made from industrial hemp is processed with fewer chemicals. Tree fibers contain at least 25 percent of the plant glue, lignin. Plants such as kenaf, wheat, corn, and hemp have lignin contents of less than 10 percent. This reduced lignin content entails the use of fewer chemicals and could reduce the energy used by paper mills. Industrial hemp paper is naturally brighter than wood-based paper and therefore can be more easily bleached without the use of chlorine, a chemical process that produces dioxin. The US Environmental Protection Agency (EPA) has stated that even minute amounts of dioxin can cause cancer and birth defects. Dioxins disrupt the human endocrine system, which causes endometriosis, diabetes, and immune suppression, among other problems, and they can also cause behavioral and learning disorders, sperm loss, decreased testosterone, metabolic changes, liver damage, and a skin disease called chloracne. Dioxins bioaccumulate in the food chain and 90 percent of the human exposure to them is from meat and fish. The burning of chlorinated wastes, such as plastic, produces 95 percent of dioxin, but a substantial amount does come from the bleaching of paper. Therefore, the use of industrial hemp for paper could help to reduce the creation of this dangerous chemical pollutant.

The use of industrial hemp and other non-wood plants could also help to address a significant disadvantage experienced by many poor countries which lack abundant forest resources. In the report "Cannabis as a Licit Crop: Recent Developments in Europe", G. Mignoni describes this problem: "Countries with large forestry resources by force of circumstance monopolize the market to the detriment of those countries completely lacking in that form of natural resource. It should also be borne in mind that pulp—or finished paper products—are paid for in hard currency and are therefore subject not only to varying market price trends but also to variations in exchange rates for the dollar. The negative impact of these factors affects poorer developing countries where the product paper = culture and knowledge = development." If, however, fiber crops like industrial hemp were grown and processed to produce

paper, the report further explains that "Raw material would most probably be more abundant and no longer need to be imported but could instead be produced in their own national or regional territories."

In addition to decreasing the use of trees for paper, industrial hemp can help to reduce the use of trees for building materials. This plant can be used in the creation of medium-density fiberboard, oriented strand board, studs, posts, beams, trusses, and paneling, and it can be substituted for wood into existing composite mills without many machinery changes. A test by Washington State University's Wood Composite Laboratory found that medium-density fiberboard produced with industrial hemp is twice as strong as fiberboard made from wood. The lab director of that study, Tom Maloney, concluded that "The use of hemp fiber in multidensity fiberboard and other composites looks very promising." Industrial hemp can be used for insulation, and has an average R-value of 3.5 per inch of thickness. It can replace fiberglass insulation, and it is safer and easier to install. The French firm La Chanvriere de l`Aube makes hemp hurds into a fiber insulation that can be blown or placed into walls. Hemp hurds can be mixed with lime to form a cement-like plaster, used for the walls and floors of a house, that is stronger yet five times lighter than concrete. It insulates well, is fire-retardant, less brittle than concrete, waterproof, resistant to mold and insects, easy to work with, and can sometimes save the builders money compared with using conventional materials. It is also more flexible than concrete, so as to give the house in which it is used a slightly better chance of standing through an earthquake.

Apart from being extremely versatile, industrial hemp provides numerous environmental benefits. Industrial hemp grows closer together than most other crops and yields more fiber per acre than most crops (about 2.5 times as much fiber per acre as cotton and about 6 times as much fiber per acre as flax) so it requires less water and uses up less land for farming that would otherwise contain native species. The many products made from hemp are biodegradable and more environmentally benign than most synthetic products.

Industrial hemp also requires very few, if any, chemicals to grow, apart from some fertilizer that might be added. No pesticides are needed for hemp because it is naturally pest-resistant, and the shade from the leaves and the tight spacing of the stalks kills all weeds, obviating the need for herbicides. The plant can become infected with over 100 diseases, but less than a dozen are serious, and fungicides are rarely, if ever, employed. Industrial hemp could significantly reduce or even potentially eliminate the need to grow cotton, a plant that often uses enormous quantities of chemicals which are detrimental to farm workers, consumers, and the environment. In the US, cotton is grown on less than one percent of the farmland, but 25 percent of the pesticides are used on the crop. According to the June 1994 issue of *National Geographic*, California in one year uses 6,000 tons of defoliants and pesticides on cotton. *The Wall Street Journal* has reported that some cotton farmers in Asia apply seven times the recommended dose of pesticides to their fields. A 1996 report by Agricola Partners of Davis, California, entitled "Pesticide Use in Cotton Growing" stated:

> "These chemicals account for more than 50 percent of the total cost of cotton production in much of the world….
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> In 1992, a total of 71.5 million pounds of pesticides were applied to 11.1 million cotton acres in the United States. That indicates a national average of 6.43 pounds of pesticides applied per cotton acre. In California, an average of 12.8 pounds of pesticides per acre were applied to cotton in 1993 and 1994.
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> It is widely documented that pesticides can affect the nervous, endocrine, immune, and reproductive systems, and that they pose heightened threats to infants, children, the unborn, and other subpopulations especially susceptible to toxic pollutants. The best documented and most visible environmental impact of pesticide use has been from toxic effects on wildlife, especially birds, fish, and other aquatic organisms. Aerial drift, runoff from treated fields, application error, food-chain contamination, and industrial accidents are the principal means by which pesticides end up damaging wildlife populations. Numerous studies have documented these effects….

Due to historically high pesticide use, insect resistance to commonly used pesticides is widespread in cotton. This means that pesticides are progressively less effective in controlling cotton pests. Cotton growers must then increase the amount and/or combinations of pesticides to get the same results."

The legalization of industrial hemp in the US may be able to succor farmers financially, help diversify farming, and possibly bring more people back into the realm of agriculture. It would present farmers with more to grow than simply food, and, as Erwin Sholts, the chairman of the North American Industrial Hemp Council (NAIHC) points out: "You aren't going to solve the corn-, soybean-, and wheat-price problems so long as we're producing far beyond our needs and the needs of the world. What this country deeply needs – in terms of agricultural development and price stabilization – is an alternative crop of significant acreage that works well in the rotation, which industrial hemp does." The crop would also return larger revenues to the farmers than most other crops. In 1999, the Institute for Local Self Reliance reported that industrial hemp yields an average of 800 pounds (17 to 22 bushels of grain) per acre, which results in a gross product of $308-410 per acre. This is considerably greater than the revenue generated by wheat and canola, which average a gross of $103-137 per acre. A 1998 estimate reported that if industrial hemp were cultivated in North Dakota, it would return an average of $74 per acre to the farmer, compared with an average of $38 per acre for corn or a meager $.86 per acre for sunflowers. Industrial hemp fiber is bulky and hard to transport long distances, so it is easiest processed locally; apart from conserving oil because of less long-distance transportation, this would hopefully help to stimulate local businesses within communities, rather than large corporations that extend all across the country. If growing, processing, and manufacturing of industrial hemp were all performed locally, it would create many good-paying jobs within the community and circulate money locally. Many Native American groups, such as the Navajo Nation, are interested in growing industrial hemp, as are many others throughout the United States.

Hemp is by no means a new crop. It is thought to be one of the first crops ever grown by man. Sand pottery dating back to around 10,000 BC has marks on its surface created by hemp cords, and near this pottery, archaeologists have discovered a rod shaped stone utilized for pounding the hemp and separating its fibers. Materials made from hemp have been found in tombs dating from 7000 to 8000 BC, and a piece of hemp cloth from Mesopotamia is 10,000 years old. The plant was originally cultivated in China around 4000 to 3000 BC, and findings of hemp used for fiber and textiles date back to 1500 to 1000 BC. The oldest known paper ever found, which was created in China in the first century BC, was made of hemp fiber. A writing from the Han dynasty, *Si Min Yue Ling,* by Cui Shi Han provides detailed explanations of cultivation techniques for hemp. *Xia Xiao Zheng*, the oldest Chinese treatise about agriculture, which was written by Guy Shi Xian within the time period of the Northern Wei dynasty (AD 386-534), describes hemp as one of China's primary agricultural crops. From China, hemp spread to Korea in the third century BC and then traveled to Japan. It later traveled from Asia, through the Mediterranean, and into Europe, probably traveling with Scythians moving from the northern regions of the Black Sea. The Etruscans played an important role in introducing the crop to Italy in the sixth and fifth centuries BC, and the Roman Empire helped spread hemp throughout Europe. Near Stuttgart, Germany, hemp fabric and rope have been discovered that date back to 400 BC. Hemp was discussed by the Greek historian Herodotus (484-408 BC) when he wrote about the expeditions of Dario I in Thrace (which is present-day Bulgaria), and in the first century BC, Pliny mentioned hemp used for cordage and hunting nets. The Egyptians used hemp rope in the construction of their enormous pyramids. Hemp and flax constituted the major fiber crops in Asia, Europe, and North America from the 1500's until the 1700's, and hemp was Russia's primary trading crop in the 18th and 19th century.

Hemp was a commonly used plant, particularly for textiles, ropes, cables, and sails. The fiber was preferred for marine cordage because of its strength and durability and because it resisted corrosion in salt water better than other natural fibers. Many maps and Bibles, including the first Bible printed by Johannes Gutenberg in the 1400's, were printed on hemp paper, and hemp oil was used to grease some machines and as fuel for lamps. Artists, including Rembrandt and van Gogh, painted on canvas made from

hemp, using paints that contained hemp oil. The Spanish required that a certain amount of hemp be grown throughout their colonies in "New Spain", unless climactic conditions were prohibitive. Britain also required American and later Australian colonists to cultivate the plant. In 1640, the governor of Connecticut ordered everyone to grow hemp, to provide enough fiber for marine cordage. The colony of Maryland in 1671, in order to increase its production of hemp as well as lessen imports, rewarded a pound of tobacco to anyone who could produce a pound of hemp that had not been imported. In some areas, hemp was used as a substitute for money, both to promote the expansion of the crop and to compensate for the shortage of printed money. George Washington and Thomas Jefferson both grew hemp, and Ben Franklin owned a mill that produced hemp paper. The first two drafts of the Declaration of Independence were written on paper made from hemp. Betsy Ross supposedly sewed the first American flag from hemp thread. Abraham Lincoln supported the cultivation of hemp in the US. Dozens of American towns have been named after hemp, including Hemphill, Texas, and Hempstead, New York. Hemp sailcloth was used to produce the original Levi's jean that were manufactured for people involved in the gold rush in Sierra Nevada. Most of the Conestoga wagons that traveled west before 1860 were covered with hemp canvas, and, in fact, the word canvas originates from the Arabic word for hemp.

Hemp production in the United States flourished for many years, particularly in Kentucky, but several factors caused it to decline, particularly in the latter part of the 19th and early 20th centuries. The cotton gin allowed cotton to be processed much more quickly, while, at the time, there was no machine that would harvest or process hemp with the same speed and efficiency. Approximately 80 percent of the hemp that was still used in the US in the 1800's was imported, largely from Russia. The serfs there were paid such low wages that it was often cheaper to import the hemp than it was to grow it domestically. Also, domestic hemp was produced with dew-retting while Russian hemp was water-retted, which creates a superior quality fiber, and after the Civil War, hemp production in the US became even harder because slave labor was no longer available. The increased use of trains (and later cars) reduced the use of ships for transportation, thereby limiting the use of hemp for marine cordage. Several chemical companies began at this time, and their synthetic fibers, such as Rayon (which was invented in 1884 in France), sometimes replaced hemp fiber for ropes and textiles. In 1917, George W. Schliten presented a patented decorticating machine for hemp, meaning it would separate the fibers. Before this invention, only about 25 percent of the hemp stalk was usable, and the remaining inner hurds of the plant were often burned in the fields because they were unusable. The decorticating machine allowed for the use of about 95 percent of the stalk, in addition to greatly reducing labor costs, but, unfortunately, hemp was not widely produced at this time, and the machine had little impact.

During the 1930's, hemp acquired a very negative image. The film *Reefer Madness* demonized marijuana, and many newspapers, particularly those owned by William Randolph Hearst, published propaganda about violent acts committed under the influence of the drug, with titles such as "Killer Weed, Marijuana, the Greatest Menace to Society Ever Known". In August of 1930, the Federal Bureau of Narcotics (FBN), which was the precursor of the DEA, was formed with the help of the Treasury Department. Andrew Mellon was the Secretary of the Treasury and was also a banker for large chemical companies, such as DuPont, and several timber companies. He appointed his son-in-law, Harry J. Anslinger, commissioner of the FBN. In 1937, Congress passed an act that placed a high tax on "marihuana" (the old spelling of marijuana), possibly, in part, to target blacks and Hispanics, who were usually more associated with marijuana. In addition, after the end of Prohibition in 1933, government agencies and workers who had previously enforced the ban on alcohol may have needed another drug ban to enforce. These factors may have been influential in the decision to pass the Marihuana Tax Act of 1937, which placed large taxes on the cultivation of "marihuana". It passed with a large majority and was signed into law by Franklin D. Roosevelt on August 2, 1937. The members of Congress never intended for the law to affect industrial hemp; in fact, before the act passed, Anslinger assured the Senate Committee that industrial hemp farmers "are not only amply protected under this act, but they can go ahead and raise hemp just as they have always done it." However, after the law was passed, Anslinger unexpectedly included industrial hemp in the same category as marijuana, thereby creating so much

bureaucratic red tape that the cultivation of industrial hemp was rendered impossible. It is theorized that William Randolf Hearst may have conspired with Anslinger in the hopes of eliminating industrial hemp as a competitor. Hearst owned large amounts of forest land and probably hoped to eliminate hemp as a competitor with timber. Anslinger was related to Mellon, who had ties with chemical and logging companies. DuPont in particular would have been adversely affected if hemp had not been prohibited, as the company had patents on nylon and plastic and made chemicals like pesticides. Nylon would have been in competition with hemp fabric and hemp grows well without any pesticides, herbicides, or fungicides. Hemp can also be made into a plant-based plastic, which could have been in competition with DuPont's plastic. The steel and oil companies may also have opposed industrial hemp because it can be used to make ethanol (a replacement for oil), and hemp plastic is lighter and stronger than steel.

Although US industrial hemp production virtually ended after the Marihuana Tax Act of 1937, it experienced a brief resurgence a few years later. During World War II, imports of the fiber plant, abaca, from Japan were halted and hemp exports from Russia and Italy abated; exports of abaca from the Philippines were terminated after Japan gained control of the area in 1942. The US needed industrial hemp the most at this time for blankets, parachutes, ropes, sails, and various other equipment. Consequently, the United States Department of Agriculture (USDA) and US Army initiated a "Hemp for Victory" campaign in 1942, which encouraged farmers to grow large amounts of the plant. Germany printed a book urging its farmers to do the same. The USDA gave out 400,000 pounds of hemp seeds, and by 1943, 100,000 acres of industrial hemp were grown domestically in the US. Cultivation of industrial hemp peaked from 1943 to 1944. After the war ended in 1945, however, the US government cancelled almost all permits to grow industrial hemp and the remaining plants were destroyed.

In 1945, Virginia Congressman A. Willis Roberts introduced HR 2348 which dealt with the "Coverage of Certain Drugs Under the Federal Narcotics Laws". It gave the treasury secretary the power to decide if new drugs should be considered opiates and regarded the same way as cocaine and morphine. Senator Robert La Follette of Wisconsin urged that an amendment be added to the bill that would protect industrial hemp. He said that "[hemp is] not [a] large [industry] but [a] very essential industry….I feel that it is important for the country to preserve the hemp industry." The amendment was passed, but hemp production continued to decline.

In 1961, the Senate ratified and adopted the United Nations Single Convention on Narcotic Drugs, which attempted to organize the international efforts to control narcotics, including marijuana. The US acted in accordance with most of the treaty by reorganizing some of its drug laws and transferring enforcement from the Treasury Department to the Justice Department. However, one of the provisions of the treaty stated that "this Convention shall not apply to the cultivation of the Cannabis plant exclusively for industrial purposes (fiber and seed)". The US still disregards this provision by continuing to prohibit the domestic cultivation of industrial hemp.

The current drug-control law, the Comprehensive Drug Abuse Prevention and Control Act (CDAPCA) was passed in 1970. It replaced the Federal Bureau of Narcotics with the Drug Enforcement Agency and stated that drugs "will be controlled in conformity with the treaty or other international agreement obligations" of the US. It also repealed the Marihuana Tax Act of 1937, but retained that act's definition of marijuana.

The president requires the DEA to report any large drug-producing countries to Congress, so that economic sanctions may be imposed on the country. Even though the DEA classifies industrial hemp as marijuana, it hasn't reported England, Australia, China, or any other countries that have legalized industrial hemp as large producers of marijuana.

To this day, the cultivation of industrial hemp remains illegal in the US. Any American president has the power to write an executive order that would allow the USDA (not the DEA) to arrange regulations for licensing hemp farmers. The public misunderstanding, however, might cause some politicians who support its legalization to be labeled "soft on drugs". Also, continued eradication of hemp by drug enforcement authorities helps to maintain large budgets in those areas, especially since over 90 percent of the hemp plants destroyed in the US are wild industrial hemp plants, called "ditch weed", which often contain very low levels of THC.

American farmers may not yet be able to cultivate industrial hemp, but support in the US is growing. Legislation involving industrial hemp has been introduced into several states, and Hawaii has begun test plots. Sales of industrial hemp products totaled $25 million in 2000, a dramatic increase from sales around $1 million in the early 1990's. A 1995 University of Kentucky poll found that 77 percent of the Kentucky citizens interviewed wanted hemp farmers to be licensed. After a 1996 bill involving industrial hemp in Vermont, the University of Vermont conducted a poll of 770 random Vermont citizens and reported that 37 percent would pay more for hemp jeans than for cotton jeans, 54 percent would pay more for hemp jeans if the two kinds of jeans were close in price, 69 percent would pay more for hemp-based paper if it weren't too expensive, and 67 percent would pay from 2.5 to 10 percent more money for writing paper made from hemp. It is likely that support will continue to intensify as more and more citizens become informed about the issue.

Legalizing industrial hemp would be a step in the right direction towards sustainability. The plant's thousands of uses, long history, and environmental and economic benefits, including a decrease in the consumption of forests, lowered petrochemical use, greater amounts of biodegradable materials, and possible expansion of local businesses, ensure that the crop will only become more widespread. Many of the seeds, processing procedures, and much of the equipment used to grow and harvest the crop are old and obsolete, because the plant had been neglected and ignored for so long by much of the world, but as industrial hemp burgeons, better-adapted seeds and processes will be developed. The legalization of industrial hemp in the US would almost certainly accelerate this process as well as further the crop's use. It would increase the availability, reduce long-distance transportation costs, and lower the price of hemp products in the US, thereby enabling the many benefits of industrial hemp to be further expanded and explored.

"The oldest cultivated fiber plant, one for which the conditions in the United States are as favorable as anywhere in the world, one which properly handled improves the land, and which yields one of the strongest and most durable fibers of commerce, is hemp."

-Lyster H. Dewey from the 1913 Yearbook of the United States Department of Agriculture

"…American agriculture [at this time] faces enormous challenges and opportunities. New crops will be vital to the profitability and sustainability of America's land resources, and the cultivation and utilization of industrial hemp could yield substantial benefits to American farmers, manufacturers, and consumers…If we are to build a hemp industry, there is much ground to be made up. A growing number of agricultural, manufacturing, academic, financial, and environmental leaders are urging that we move to commercialize this potentially valuable crop…"

-Erwin A. Sholts, Economist, director of Agricultural Development and Diversication, part of the Wisconsin Department of Agriculture for Trade and Consumer Protection, and chairman of the North American Industrial Hemp Council

"In recent years, industrial hemp has been viewed worldwide as a versatile and environmentally friendly plant that has many industrial applications. Although it is currently grown in many European and Asian countries and even in Canada, industrial hemp is still prohibited from being grown in the United States.

This situation exists even though the current consumer and business environment in the United States may make industrial hemp cultivation and processing commercially feasible. Many consumers are starting to prefer products made from natural materials. The industrial hemp plant is a good source of natural raw materials for a number of products and is a superior source in some cases. Moreover, many farmers in Kentucky and throughout the nation are looking to alternative crops to replace their current crops, and some have touted hemp as an excellent rotation crop with much potential for agriculture."

-From a July 1998 report entitled "Economic Impact of Industrial Hemp in Kentucky"

"We must have diversity and crops like hemp that grow without pesticides."

-Jeff Gain, Chairman of the board of the USDA's Alternative Agricultural Research and Commercialization Corp.

"The trend in consumer demand for natural products that are environmentally and economically sustainable favors opportunity for industrial hemp. The durability of industrial hemp is complemented by its biodegradability and recycling properties….[The] production and processing of industrial hemp has the potential to be a viable industry in the United States."

-From a July 23, 1998 study entitled "Industrial Hemp as an Alternative Crop in North Dakota"

"Why use up the forests, which were centuries in the making and the mines which required ages to lay down, if we can get the equivalent of forests and mineral products in the annual growth of the fields?"

-Henry Ford

"Hemp, the strongest of vegetable fibers, gives the greatest production per acre and requires the least attention. It not only requires no weeding, but also kills off all the weeds, and leaves the soil in splendid condition for the following crop. This, irrespective of its own monetary value, makes it a desirable crop to grow….When markets have been developed with the products now being wasted…hemp will prove both to the farmer and to the public, it is the most profitable and desirable crop that can be grown and one that can make American mills independent of imports."

-George Lower, from an article entitled "Flax and Hemp, From the Seed to the Loom", which appeared in the February 1938 issue of *Mechanical Engineering*

"In an age increasingly interested in sustainable agriculture and crop diversification, hemp offers attractive possibilities. It is exceptionally disease- and herbivore-resistant, can be easily grown in a wide range of agricultural systems, and is an excellent rotation crop that eliminates weeds."

-Agriculture and Agri-food Canada's December 16, 1994 Bi-weekly Bulletin (which is printed on hemp paper)

"United States hemp-growing restrictions were set aside to meet material shortages during World War II. They should now at least be modified to meet pending shortages of fiber, energy, and environmental quality. Tradition, if not federal law, is on the side of hemp."

-Jim Young, technical editor of *Pulp and Paper*, in a June 1991 editorial titled "It's Time to Reconsider Hemp"

"American farmers are promised a new cash crop, all because a machine has been invented that solves a problem more than six thousand years old. The machine which makes this possible is designed for removing the fiber from the rest of the stalk, making hemp fiber available for use without a prohibitive amount of human labor. Hemp is the standard fiber of the world. It has great tensile strength and durability. It is used to produce more than five thousand textile products ranging from rope to fine laces, and the woody 'hurds' remaining after the fibers have been removed can be used to produce more than 25,000 products, ranging from dynamite to cellophane. It can be grown in any state of the Union."

-From a 1938 Popular Mechanics article entitled "New Billion Dollar Crop"

"For at least 12,000 years, hemp has been grown for fiber and food….Although hemp is taxonomically classified under the same name as marijuana, *Cannabis sativa*, industrial hemp has less than one percent THC….Hemp's versatility and the fact that almost the entire plant can be used has made it a thriving crop throughout the world….Hemp fiber is considered useful for many products, ranging from car parts to rope to alternatives to gasoline….Decriminalizing industrial hemp is the way of the future."

-Winona LaDuke, Green Party Vice-Presidential Candidate for the year 2000

"Industrial hemp is one of the longest and strongest natural fibers in the plant kingdom. It is also one of the most versatile plants, with approximately 25,000 uses – ranging from paper to textiles to cosmetics….Industrial hemp is not a drug. The DEA's intrusion into the realm of agriculture is preventing American farmers from growing a crop that has the potential to help address the global depletion of forest resources, the harmful effects of petrochemicals, the excessive use of pesticides for fiber crops, and the economic depression of farming communities."

-Ralph Nader, Green Party Presidential Candidate for the year 2000

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