




INTERNATIONAL POLICE EXECUTIVE SYMPOSIUM

GENEVA CENTRE FOR THE DEMOCRATIC CONTROL OF ARMED FORCES

COGINTA - FOR POLICE REFORMS AND COMMUNITY SAFETY

WORKING PAPER No 38

# Fibre hemp and marihuana: assessing the differences between distinct varieties

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SEPTEMBER 2011

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Working Paper No 38, September 2011
www.IPES.info
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## ABSTRACT

The cultivation of industrial hemp has nothing to do with the cultivation of cannabis plants for the production of cannabis as an intoxicant. The former is legally regulated, and offers many advantages in the agricultural, economic and ecological field. To police staff, the distinction between (legal) industrial hemp and illegal cannabis plantations is not always clear, and at times this causes confusion on site. This article provides an overview of the background and characteristics of industrial hemp cultivation and the applicable regulations, and provides guidelines for assessing plantations on site.

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# Fibre hemp and marihuana: assessing the differences between distinct varieties[1]

*Tom Decorte*

## Hemp and 'kemp': a centuries-long history

Hemp (*Cannabis sativa L.*) is an ancient crop. We know with certainty that hemp was already used during the sixteenth century BC. The ancient Egyptians used the plant to produce rope and cosmetics. In the 5th century BC Herodotus described the use of hemp by the Greeks in high quality textiles. In China, 4,500 years ago, hemp was already cultivated as a textile fibre: they carefully monitored the growth, harvest and processing, which enabled them to improve the techniques. The fibres were used for paper and textiles, and the seeds as food and for medicinal use. From there it probably spread via nomadic people to the Middle East, the Mediterranean and further into Europe (Mercuri *et al.,* 2002). Long before our era the crop was grown worldwide. From 600 AD onwards the Germanic-, Frankish people and the Vikings produced rope, canvas and clothing using hemp fibre. During the following centuries the seeds and their extracted oil were used widespread across Europe for the treatment of skin and respiratory diseases, jaundice and colic (Bouby, 2002).

In the Middle Ages the cultivation spread throughout most of Europe: each farm harvested enough '*kemp'* itself for the turning of rope and reins, 'kemp' oil was also a much sought after product, whilst the 'kemp cuttings' were very useful if one had to make fire or produce light. Many farms owned a '*kemp'* shed. In those days most people walked on hemp sandals. The first ships that sailed across the oceans were equipped with sails and rope made from woven and braided hemp fibre. The word *canvas*, derived from the French 'chanvre', meaning cannabis, dates from the 16th century, when hemp first found widespread application.

[1] The author expresses his sincere gratitude to Charlien Kiekens, for supporting the research work for this contribution, to Kristel De Keersmaker and Gilbert Crauwels of the Agency for Agriculture and Fisheries, for the useful figures, and to Pascal Tuteleers and Guy Buysse for their valuable advice and comments on earlier versions of this article.

The Golden Age of the Low Countries was also the golden age of hemp. The Dutch East India Company (VOC) was only too happy to promote the cultivation of hemp plants, because in those days hemp, besides wood, constituted the most important shipbuilding material. The merchant fleet required large quantities of hemp: every part of the ship not made out of wood, consisted of hemp. Hemp sails and hemp rope are extremely strong and withstand the influence of salt water and mildew. Even maps, logbooks, bibles and directions were printed on hemp paper, which is a hundred times stronger than the hitherto used papyrus preparations. Historians reckon that up until 1883 75% to 90% of all paper was made from hemp fibre, and prior to the emergence of the petrochemical industry hemp oil formed the basis for paints, oils, varnishes and adhesives.

The first immigrants on the American continent brought the hemp plants with them from Europe, and hemp cultivation became one of the driving forces of the 'young' America. Jeans made from hemp were worn by cowboys who also used hemp lassos. The fibres were not only used for textiles and rope. In the timber mills they were ground into a pulp and made into paper. In 1935 some 55 million kilos of hemp seed were imported into America. Around 1900, Rudolf Diesel used hemp oil to run the prototype of his engine. Around 1920, Henry Ford presented a car of which 70% of the body contained hemp fibre, sisal and straw (West, 1995).

## The demise of hemp

The production of hemp fibre was a difficult and laborious process. The lack of mechanisation and the rise of alternatives, such as jute and wood pulp, reduced the importance of hemp cultivation in the 18$^{th}$ century. By the early 20$^{th}$ century, partly because of the emerging slavery, hemp was displaced by cheaper imported fibres such as cotton and later on by synthetic fibres (nylon). In the 1930's – especially by the U.S. *Federal Bureau of Narcotics* - an intensifying campaign was launched against *marihuana*, a drug linked with crime, violent behaviour and insanity ("reefer madness"), and ascribed to Mexican immigrants. Simultaneously the economic competitors of hemp fibres lobbied intensively against the hemp cultivation. One of the most important being the chemical company DuPont, which in 1937 brought artificial fibre on the market and received a patent for

nylon. Both the demonization of the 'Mexican' drug marihuana and the lobbying campaign by economic competitors, ultimately lead to the Marihuana Tax Act of 1937. This law did not comprise a total ban, but imposed strict regulations on the producers and distributors, as well as putting on high taxes. The industrial varieties of Cannabis sativa L. were increasingly lumped together with the marihuana plants, and the reputation as "a drug plant" brought the hemp industry to ruin (West, 1995).

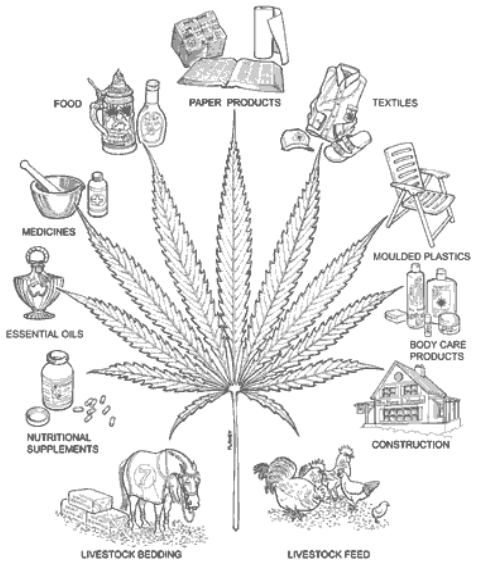
During World War II hemp was briefly reinstated, the strong fibre was highly welcomed by the war industry. Canvas was extremely well suited for uniforms, parachutes, awnings and tarpaulins. Furthermore, the import of cotton, sisal and jute from the former colonies more or less ground to a halt. As the global hemp market threatened to collapse due to the Japanese conquests in Asia, the American farmers were urged to cultivate hemp by using a propaganda campaign (Kolosov, 2009).

After the war, hemp was banned in the United States, in favour of the petrochemical industry, the cheap textile trade and the timber lobby. In many countries, to this day, a farming ban exists (Vibe, 2008), which originated from the fight against drugs. It wasn't until 1992 that European regulations once again gave the green light to industrial hemp cultivation.

## The hemp revival: environmentally friendly and versatile crop

For several years now industrial hemp farming has regained a lot of interest, because of its environmentally friendly production and its great versatility (Danckaert et al., 2006). From an agricultural and biological perspective, hemp is very interesting, as it is easy to keep the hemp plot weed-free due to the rapid growth of the crop. The deep root system is beneficial to the soil and makes cultivation possible under relatively dry conditions. The cultivation requires only limited fertilisation and has adapted to many climates. Apart from birds, which eat the sowing seeds, pests and disease are virtually absent (Snauwaert & Ghekiere, 2010).

**Figure 1: Most important applications of industrial hemp**




The fibre, shives, hemp-dust and seed have innumerable applications. Hemp fibres can be used in processing textiles. The fibre is stronger than cotton, produces better insulation, is more wear-proof, is not affected by insects or mite and is biodegradable. Hemp fibre is also better at absorbing moisture, such as sweat, which provides greater comfort. Hemp fibres have always been used to make different types of paper (bible paper, cigarette paper, bank notes, etc.) or as reinforcement for recycled paper (Institut du Chanvre, 2010). To this day, the paper industry is still the largest market for hemp (Baudoin, 2004). In addition, hemp fibres can also be used in technical applications: for the production of insulation wool, thermal blankets, non-woven mats or felt fabrics, geotextiles and fibre reinforcing composites (Bouloc, 2006; Munoz, 2007). In the car sector hemp is increasingly used for moulded parts produced via injection moulding: door panels, dashboards, …

The woody material around the pith of the stem is called hemp shives. Hemp shives have a very low density as well as good sound and thermal insulating properties. Shives are used for the production of hempcrete - a concrete mix of lime and hemp - and plywood (Interreg IIIA-project Euroregio Rijn-Waal, 2007). The shives are already used as high quality bedding for small pets and horses, especially for those with an allergy to other types of straw. Hemp shives are also suitable as bedding for chickens due to the high absorption capacity, thus

reducing the odour nuisance. Thanks to the strong absorption of hemp shives they are ideal as a groundcover in the garden, vineyard, orchard, vegetable plot, etc.

**Figure 2: Freshly cut hemp stalks**

Source: http://www.coolhemp.com/en_home_harvest.htm

Traditionally, whole hemp seed is used as bird food and fishing bait. In that case it is usually called 'kemp seed' (Institut du Chanvre, 2010). However, the healthy highly nutritious seed is also fit for human consumption: it contains all the essential amino acids and fatty acids needed for a balanced diet. Shelled hemp seed can be used as a basis for all kinds of foods such as bread, pastry, pasta, milk, etc. The oil in the seed is claimed to improve the blood circulation and has low cholesterol content. The protein-rich seeds or press cake can also be used to feed livestock. Due to its dry matter yield and extremely fast growth, hemp is suitable as energy crop (biomass). In some circumstances, hemp is deliberately chosen for cultivation, without loss of return, on contaminated soils, as it can easily grow there and purify it by absorbing heavy metals. This causes no health risks and all parts of the plant can still be used, except in heavily polluted soil, where the fibres for textiles may exceed the permitted values (Angelova *et.al.*, 2004).

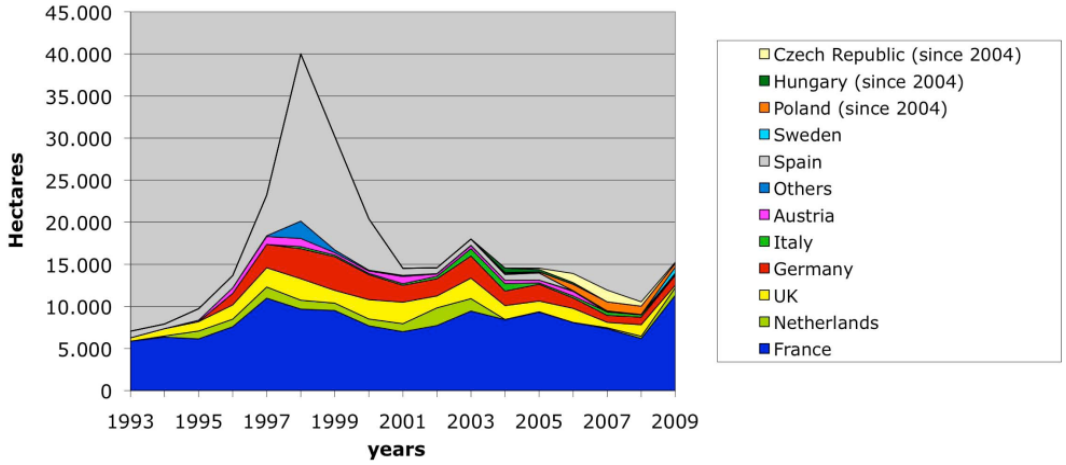
## Industrial hemp expressed in figures

The various parts of the plant are harvested and processed throughout the world. But where in Europe the focus tends to lie on the production of hemp straw (especially for the production of technical fibres) with the seed as a mere by-product, in Canada the crop is primarily cultivated for its seed and the oil extracted from it (Karus & Vogt, 2004). Most applications in the textile sector one finds in Asia (China). In the U.S., the cultivation of industrial hemp is still prohibited, though heavy lobbying is taking place to lift this ban. In Canada the

cultivation is legal and their largest market is the U.S.A. An increasing interest in hemp currently exists in many industrialised countries.

In several European countries, approximately 15-16,000 hectares of industrial hemp is cultivated, of which 9,000 ha in France, 1,000 ha in The Netherlands, 1,800 ha in the UK, 1,200 ha in Germany, 800 ha in Spain and 500 ha in Italy (see figure 3).

**Figure 3: Areas of industrial hemp in the EU (in hectares)**




## Legislation regarding industrial cannabis cultivation

The *United Nations Single Convention on Narcotic Drugs* of 1961 explicitly states that the international treaty on drug control does not apply to the cultivation of cannabis for industrial purposes (seed and fibre) (Article 28, §2).

At European level, many regulations exist regarding legal hemp cultivation. On the one hand they regulate European subsidies for producers and processors of fibre-hemp: to support the cultivation and promote its application, Europe pays up to € 300 per hectare. The processor receives € 90 per tonne of hemp fibre. On the other hand, European regulations govern the mandatory monitoring of fibre hemp:

- Council Regulation (EC) No 1672/2000 of 27 July 2000 amending Regulation (EC) No 1251/1999 establishing a support system for producers of certain arable crops, to include flax and hemp grown for fibre.
- Council Regulation (EC) No 1673/2000 of 27 July 2000 on the common organisation of the markets in flax and hemp grown for fibre.

- Commission Regulation (EC) No 245/2001 of 5 February 2001 laying down detailed rules for the application of Council Regulation (EC) No 1673/2000 on the common organisation of the markets in flax and hemp grown for fibre.
- Commission Regulation (EC) No 651/2002 of 16 April 2002 amending Council Regulation (EC) No 1673/2000 and Regulation (EC) No 245/2001 as regards the Combined Nomenclature codes for hemp seed for sowing.
- Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and amending Regulations (EEC) No 2019/93, (EC) No 1452/2001, (EC) No 1453/2001, (EC) No 1454/2001, (EC) 1868/94, (EC) No 1251/1999, (EC) No 1254/1999, (EC) No 1673/2000, (EEC) No 2358/71 and (EC) No 2529/2001.
- Commission Regulation (EC) No 796/2004 of 21 April 2004 laying down detailed rules for the implementation of cross-compliance, modulation and the integrated administration and control system provided for in of Council Regulation (EC) No 1782/2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers.
- Council Regulation (EC) No 393/2004 of 24 February 2004 amending Regulation (EC) No 1673/2000 on the common organisation of the markets in flax and hemp grown for fibre.
- Commission Regulation (EC) No 489/2006 of 24 March 2006 amending Regulation (EC) No 796/2004, as regards varieties of hemp grown for fibre eligible for direct payments.
- Council Regulation (EC) No 953/2006 of 19 June 2006 amending Regulation (EC) No 1673/2000, as regards the processing aid for flax and hemp grown for fibre, and Regulation (EC) No 1782/2003, as regards hemp eligible for the single payment scheme.

According to European regulations, industrial hemp may contain no more than 0.3% THC (tetrahydrocannabinol). In several European countries (e.g. Belgium and the Netherlands), a maximum THC content of 0.2% is allowed. Under the European regulations, only the following varieties (see table 1) are allowed.

**Table 1: Permitted varieties in the EU**

| | | | |
|---|---|---|---|
| Armanca | Asso | Beniko | Bialobrzeskie |
| Cannakomp | Carma | Carmagnola | Chamaeleon |
| Codimono | CS | Delta-405 | Delta-llosa |
| Denise | Dioica 88 | Epsilon 68 | Fedora 17 |
| Fédrina 74 | Felina 32 | Félina 34 | Ferimon – Férimon |
| Férimon 12 | Fibranova | Fibrimor | Fibrol |
| Finola | Futura 75 | Futura 77 | KC Dora |
| Kompolti | Kompolti hibrid TC | Lipko | Lovrin 110 |
| Monoica | Red petiole | Santhica 23 | Santhica 27 |
| Santhica 70 | Silesia | Silvana | Szarvasi |
| Tiborszallasi | Tisza | Tygra | Uniko B |
| Uso-31 | Wielkopski | Zenit | |

Source: Europese Rassenlijst (de 29ste volledige uitgave Gemeenschappelijke rassenlijst voor landbouwgewassen van 14 december 2010, onlangs gewijzigd bij de 2de aanvulling van 4 maart 2011)

## Industrial hemp versus marihuana as an intoxicant

To the untrained eye, industrial hemp and marihuana look rather similar, and in the past a few legal hemp plantations were mistakenly taken for illegal marihuana, e.g. in The Netherlands. Police were already clearing the hemp when the owners of the fields arrived with the appropriate permits. The farmers (in one case it concerned experimental fields of Wageningen University) considered recovering the damage. This shows the importance of pointing out a few important differences, to enable the police on site to properly assess the nature of the plantation.

**Figure 5: Industrial hemp field, seen from the harvesting machine**

Source: http://www.coolhemp.com/en_home_harvest.htm

Both industrial hemp and marihuana are classified as *Cannabis sativa*, a plant species with hundreds of varieties. Cannabis plants contain more than 400 molecules, and about 70 of these are exclusively found in *Cannabis sativa*, the so-called cannabinoids. The two most important cannabinoids are delta9-tetrahydrocannabinol (THC), a psychoactive component, and cannabidiol (CBD), an anti-psychoactive ingredient. Industrial hemp species are cultivated ensuring maximum production of fibre, seed and/or oil, while marihuana plants need to contain especially high levels of delta9-tetrahydrocannabinol (THC), the main psychoactive component of the plant.

Industrial hemp varieties have a low THC content (between 0.05 and 1%) and a high cannabidiol (CBD) content. The ratio of CBD to THC is greater than one. Marihuana has a THC content from 3 to 20%. The ratio of CBD compared to THC is less than one (West, 1998).

That means, amongst other things, that industrial hemp cannot be smoked as an intoxicant: the THC content is too low, and the high content of CBD, an anti-psychoactive ingredient, blocks any "high". One might merely end up with a terrible headache. For this reason, industrial hemp is sometimes referred to as 'anti-marihuana'. Most experienced cannabis users are aware of this. It is also practically impossible to extract THC from industrial hemp in order to produce a "drug": the procedures for this are so expensive, dangerous and time consuming that no user would attempt it.

**Figure 6: Cross-section of stems of the fibre-plant (left) and marihuana plant (right).**

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

To the untrained eye, industrial hemp and marihuana look rather similar, but there are differences. Industrial hemp is planted close together, for maximum yield. Moreover, these varieties are generally harvested before they come into flower and produce seed. Marihuana growers are primarily interested in the flower heads of their plants, and so harvesting usually takes place at a later stage. Incidentally marihuana generates more branches and flowers when the plants are grown further apart. These plants therefore need more light and space. Marihuana plants can have as many branches as a Christmas tree, while industrial hemp plants have only a few. Fibre plants have a hollower stem at the inter-nodes, because they put more energy into the production of fibres (figure 6).

Another characteristic to help differentiate between the two varieties, is the fact that the flower heads of industrial hemp are not sticky and do not contain THC-

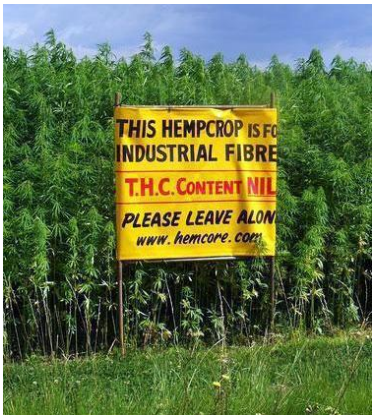
crystals. These THC-crystals are visible with the naked eye or with use of a weak magnifying glass (10x).

**Figure 7: Differences between tall fibre plants (left) and a marihuana plant (in this case "Panama Gold") (right)**

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

**Figure 8: THC-crystals on the flower heads of marihuana**

**Figure 9: Industrial hemp field: warning thieves**




Source: http://3hourspast.blogspot.com/2011/01/hemp-for-sewing-not-smoking.html

It is very unlikely that industrial hemp fields are used for hiding marihuana plants. Not only do they require different planting (see above), they can also cross-pollinate, which would entail negative consequences for both the farmer and the marihuana grower. If hemp is grown for seed then the purity of the breed is extremely important. Seed producers seek to avoid, at all cost, the different genotypes mixing. Cross-pollination of marihuana with industrial hemp can also have a negative effect on the THC content of marihuana plants, and that does not go down well with the cannabis users.

At first glance it may seem suspicious to find an industrial hemp field surrounded by cornfields, but it need not be. Cornfields can consciously be used as a shield to prevent pollen from one field inadvertently end up on another.

Finally, it should be noted that each plot of industrial hemp should be registered with the government (see above), and be monitored. It is unlikely that marihuana growers will hide their plants in a field that is likely to be checked out.

Lastly we note that nowadays in many countries (especially European countries) large-scale open air marihuana plantations rarely occur: professional criminal entrepreneurs, engaged in the cultivation of illegal cannabis, tend to set up indoor plantations, as large plantations in nature would easily be detected (by police and thieves). Amateur hobby growers do sometimes have plants in their garden or conservatory (outdoor), but in such cases it invariably concerns very small quantities.

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