

Industrial hemp – the potential for cash cropping for a better environment in the Taranaki region



Plants for the Future..

Acknowledgements



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Hemp

- Hemp (*Cannabis sativa* L.)

Population type (wild / natural)

Plant use (fibre / seed / dual-purpose)

Flowering time (early / mid / late)

Gender (dioecious/monoecious)

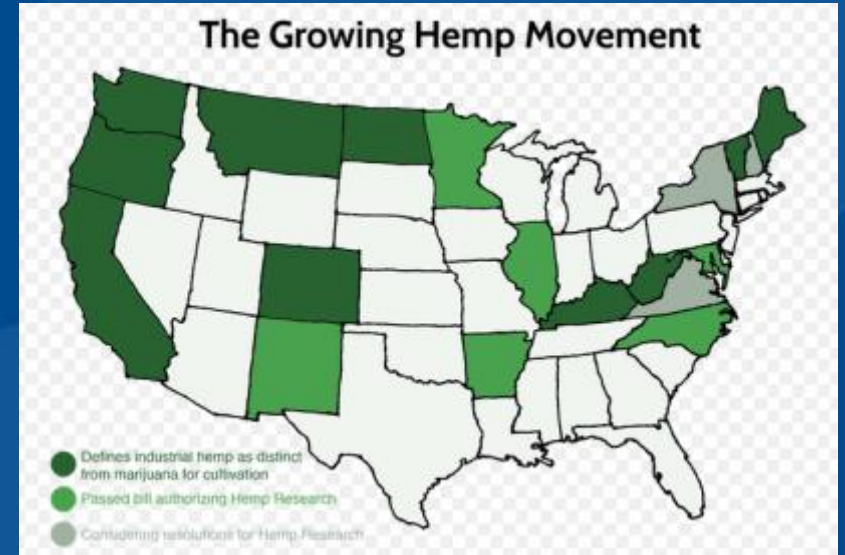
- Cannabis sativa / Cannabis indica

- THC (delta-9-tetrahydrocannabinol)

industrial hemp (ihemp): THC <0.3% (NZ)

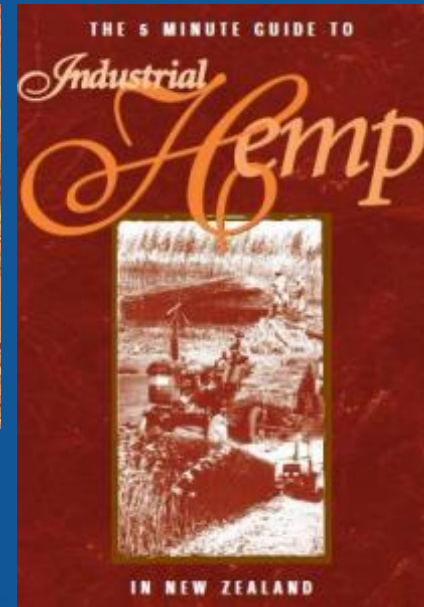
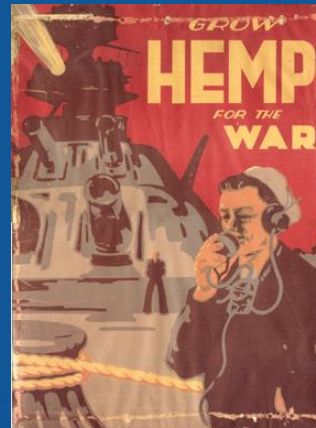
drug type (marijuana) varieties: THC 3-40%





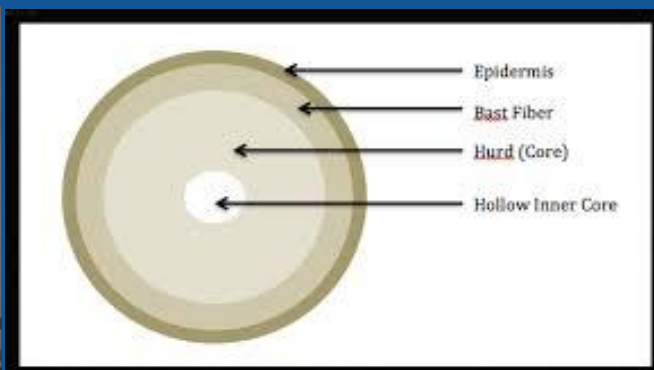
NZ Hemp history

- Flourished in the 1800's
- First imported in 1892
- Decreasing hemp trend
 - Cheaper imports and cotton industry development
 - Marijuana tax Act 1937 – uneconomical
 - 1941 DSIR first trials (1ha) North Island
 - 1945 banned in U.S - political influence
 - 1961 Misuse of Drugs Act outlawed hemp in NZ
- Renewed interest in hemp in 1990's due to global environmental concerns – opportunity for hemp
 - 1991 Ministry of Health (MoH) cultivation trials
- 2001 strict licencing laws to grow industrial hemp
 - administered by MoH: NZ National Approved List
 - 8 cultivars gazetted and approved
- 2006 new regulations enabled cultivation and distribution



Product use

- **Fibre & hurd** (woody core) applications from hemp stalk:
textiles, paper, building materials, industrial products, etc
- **Nut/oil** applications from the hemp seed:
foods, personal care, biofuel, etc.



Product use

Modern Uses for the Cannabis Plant





THE VERY USEFUL INDUSTRIAL HEMP

Hemp cultivation requires no chemicals, pesticides or herbicides.

with over
50,000
different uses...

HEMP SEEDS

◀..... Harvest▶

HULLING

PRESSING / CRUSHING

◀..... Intermediate processing▶

◀..... Further processing▶

HEMP MEAT

Food



HEMP SHELL

Flour



HEMP OIL

Personal Care Products



Cooking Oil



Fuel / Paint



HEMP CAKE

Food Beer



Feed



HEMP is a RESOURCE

20 vs **4**
years for trees to mature
months for hemp

Hemp can yield 3-8 dry tons of fiber per acre, FOUR times what an average forest can yield.



Paper, fertilizers, soil nutrients and animal bedding can be made from leftover waste when processing hemp.

This means all parts of the plant are being used, or put back into the earth.

Hemp seeds contains nutritious, Polyunsaturated Fatty Acids (PUFAs) 80% the highest amount found within the plant kingdom. Highly nutritious of humans and animals.

HEMP STALKS

DECORTICATING

HEMP FIBER



Hacking

PRIMARY (Lime) Fiber

Fabric
Insulation
Carpeting
Paneling



Anything made out of cotton, timber or petroleum can be made out of hemp

Hacking

SECONDARY

Cordage
Pulp
Recycling
Additive

Scutching

TOW

Cordage
Bagging
Fiber Board



Hemp fiber is the strongest natural fiber in the world

HEMP HURDS



Scutching

Fiber board

Compost

Mortar

Paper filler

Absorbent bedding

Chemical feedstocks
- Plastics / Paint / Sealant



Hemp hurds can be cleanly Converted into Gasoline!



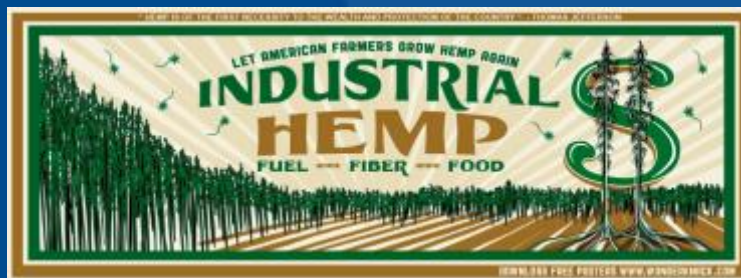
Through a Heat Process called **PYROLYSIS** Hemp Biomass can also make Ethanol, Methanol & Methane Gas



SAVE THE FOREST PLANT A HEMP FARM

FOOD | FUEL | FABRIC | PAPER | WHATEVER YOU CAN IMAGINE

HEMP
IS NATURE'S ANSWER FOR:
FUEL, PAPER, HOUSING,
NUTRITION, TEXTILES,
OIL & FOOD!



THE ENGINE
OF THE **NEW**
NEW ZEALAND



Hemp markets

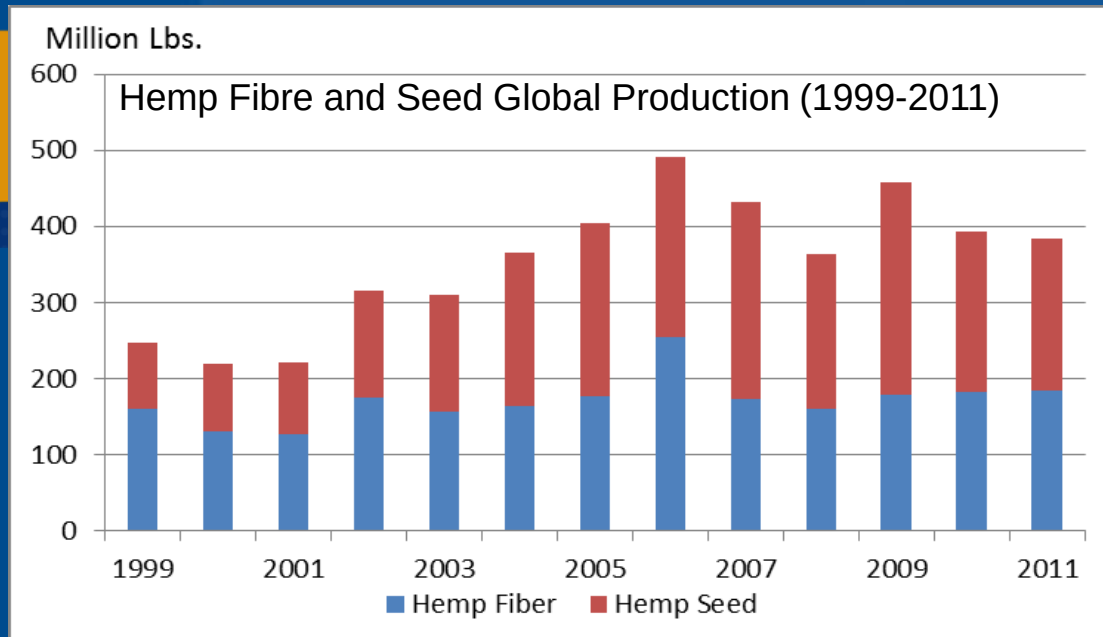
Main producers:

China	65,000 ha
Canada	15,720 ha
EU	13,344 ha

NZ:

Seed (oil) production in Canterbury supported by processing industry (ca 60 ha – MoH licenced; Midlands Seeds)

Fibre market in NZ remains undeveloped



Agronomy

- Herbaceous annual
- deep tap-root / single woody stem
- **Well drained soils / range of climates**
- 15-27C, frost-sensitive; 250-300mm, pH 6
- Short-day plant
- 1900-2000 GDD (fibre maturity),
 ca 120 day crop (mid Oct – Feb/April)
- 2700-3000 GDD (seed production)
- 30-70 plants/m² (seed); 250 plants/m² (fibre)
- **No weed control needed, p&d resistant**
- Dry stem yield 8-15t/ha (grain 1t/ha)
- GM: \$2450-2940 minus \$800-1200 (costs)
- Since 2001 several hemp evaluation trials (hemp oil)
 sowing dates/seed density/fertiliser etc



Taranaki region



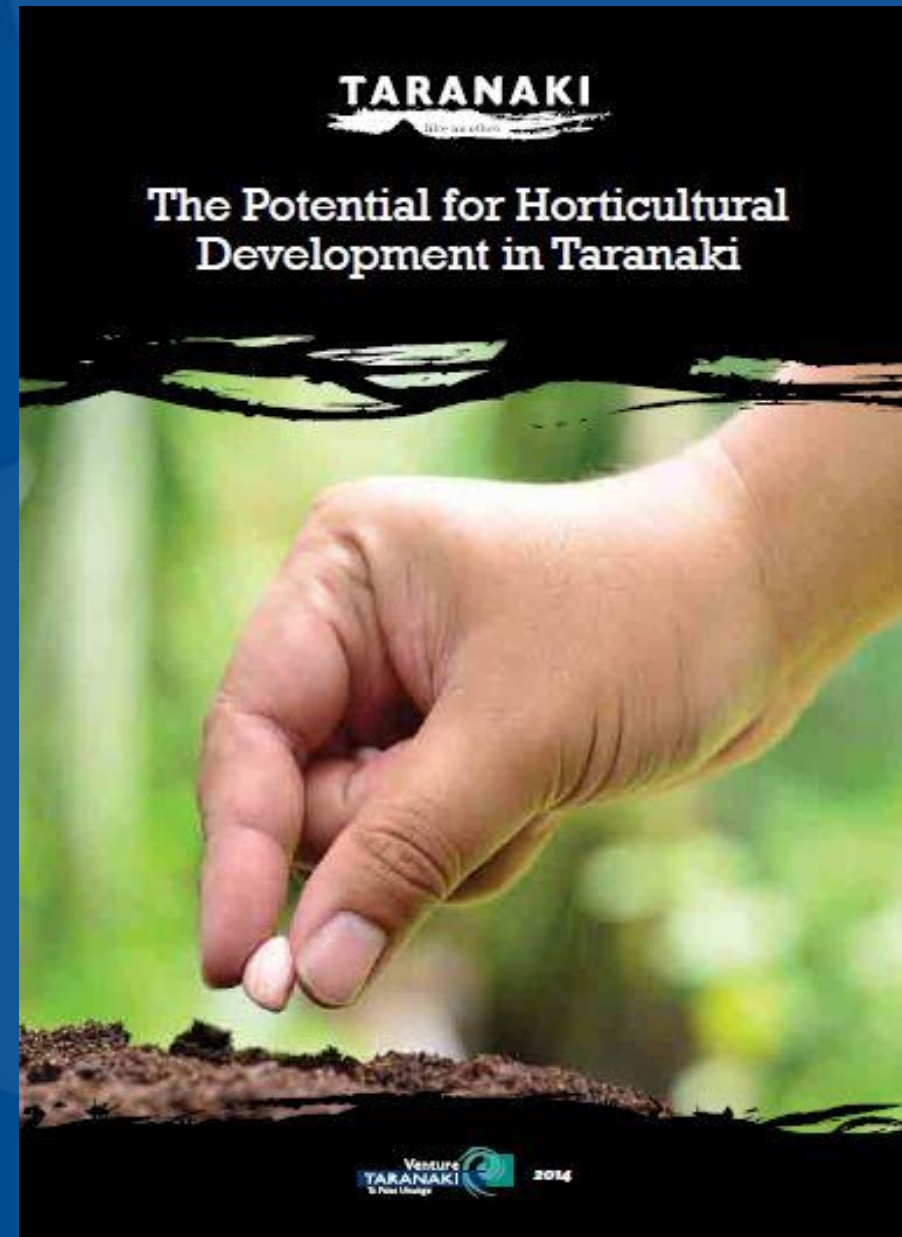
Dairy -fourth largest region in NZ
Oil & gas industry -worth \$2.8b



Taranaki region

Need for **diversification**
Growing conditions for **industrial hemp** in
Taranaki are excellent due to ideal local
soil/climate

If successful, the industrial hemp industry in Taranaki will provide a high-returning sustainable diversification option for Taranaki growers, as well as green employment in the processing sector.



Field trials

Growing interest in hemp



Hemp Technologies Ltd

Two Taranaki farms are licenced to grow hemp; 1200 ha foreseen.
Processing plant planned to handle 250 ha, contracted from local growers

Hempcrete

Hemp (hurd) mixed with lime as sustainable building material (“Hempcrete”)



Hemp Cross Section



Hempcrete
Hemp + lime
Designed to build not to smoke



Construction
Carbon negative material



Hemp houses

House made of hemp as
the industry awakens

First two houses have been built in New Plymouth
20 houses planned within the Taranaki district



Matt Low



Land farming

Process of soil **bio-remediation** after spreading hydro-carbon containing drilling wastes from the oil onto land

Waste is incorporated into the soil, and areas are re-sown with a pasture crop to facilitate natural process which **biodegrade**, **transform** and **assimilate** the waste





Landfarming & bioremediation?



Landfarmed soils can not be utilised for future dairy activities as dairy processors in 2014 stopped collection milk from retired land farms in response to public concerns about health & safety of **hydrocarbon contamination** potentially entering the food chain

Scientists dispute Government report on land farming

stuff.co.nz

Oil drilling waste real issue for New Zealand

Report on the Targeted Surveillance of Milk from Animals Potentially Exposed to Petrochemical Mining Wastes

Hemp : **phyto-remediator** on these landfarmed soils?

Significant potential using hemp due to high biomass production

Higher absorbency properties (Linger et al, 2002)

Potential 'mop crop' (Cole and Zurbo, 2008)



Controlled trials



MANATŪ HAUORA

LICENCE FOR INDUSTRIAL HEMP

(Issued pursuant to the Misuse of Drugs (Industrial Hemp) Regulations 2006)

GENERAL LICENCE

Licence No 2014/IHG79



Greenhouse pot trial (2015)

hemp and **rye grass** were grown on a landfarm impacted soil, with the non-contaminated soil used as a control



Summary

- Considerable synergies for using industrial hemp for **sustainable source of fibre (and oil)** as a promising new cropping opportunity to diversify production systems for the Taranaki region (and beyond).
- Hemp can be grown as a **sustainable non-food application** (e.g. building material) on **local landfarms**.
- No evidence that hemp actively accumulates heavy metals



Where to next?

Linking with stakeholder from other districts, Hawke's Bay, East Coast, others

Developing a PhD project (Sharon Mechta)

Shaping the hemp supply chain for a low-carbon economy

Hemp (*Cannabis sativa*) is one of the oldest cultivated bast fiber and seed crops grown and is of interest as a renewable industrial material (Struik, *et al.*, 2000; Salentijn, *et al.*, 2015). Hemp is high yielding, versatile, grows in a range of agro-ecological conditions, and is attractive for use in low-carbon manufacturing. To diversify land-use, Venture Taranaki and Massey University highlighted hemp as a cash crop and are currently working with industry to develop this sub-sector (Venture Taranaki Trust, 2014). In construction, it offers technical building performance value and sustainable development. As a biocomposite, it lends itself to a variety of uses in nanotechnology. Moreover, hemp seed as food offers superior nutrition and crop diversification. These three products are mentioned to have the highest future growth potential according to hemp processing companies in Europe (Carus, *et al* 2013).

Economic trends in Canada suggest seed and oil to be the most profitable due to lack of efficient fibre processing technologies and market development (Serecon Management Consulting, 2012). It is now a net importer of hemp fibre as their focus was very much on seed and oil. Even though hemp cultivation is illegal in the US, the Hemp Industrial Association estimates the total value of hemp products sold to be \$USD 581 million in 2013 (Hansen, 2015).

Planning a NZ Hemp Summit