

**SUBMISSION TO THE STANDING COMMITTEE ON ENVIRONMENT,
RESOURCES AND DEVELOPMENT– TASMANIAN HEMP INDUSTRY
INQUIRY**

The Secretary,
Environment, Resources and Development Committee
Parliament House
Hobart TAS 7000

April 22nd, 2012

Dear Mr Casimaty,

Please find below our submission to the Standing Committee.

As **background** to our submission we would like to outline our involvement in Tasmania's hemp industry to date.

Under the umbrella of the University of Tasmania, we pioneered licensed fibre hemp trials in Australia in 1990. We initially submitted a pulp mill expression of interest to the Tasmanian government based on fibre hemp in 1989, including other industry possibilities under the name of the Hemp for Paper Consortium, written by Patsy Harmsen. This led to "Hemp for Paper" workshops being set up with relevant stakeholders under both state Labor and Liberal governments of 1990 and 1991. One of the conclusions of both workshops was that a hempseed oil industry could definitely be considered as a niche industry in Tasmania. As the Tasmanian Hemp Company, we subsequently produced Australia's first hempseed oil in 1996. Ten years later, we travelled to Europe to source a hempseed oil press, choosing a German Oekotec Komet CA 59 G 3 oil expeller for high-quality cold pressing of hemp seed which we bought and imported in 2008. We have been unable to proceed with our hempseed oil production since then. Reasons for this are included in **(b)** below. Even if had we been able to purchase the seed, we would not have been allowed to sell it for human food consumption due to the Australian Federal Government's non-acceptance of the decision of Australia New Zealand Food Standards (**ANZFA**). Australia's food regulators, first **ANZFA** (Australian and New Zealand Food Authority) and now **FSANZ** (Food Standards Australia and New Zealand) have concluded that scientific examination of hempseed and its oil show them safe and beneficial foods for human consumption (see attached scientific articles sent in following email). This recommendation was rejected by the Federal and State Liberal Government 's Ministerial Council in 2010 stating that it "sent the wrong message to the youth of Australia". Now this year Labor's Ministerial Council has been responsible for delaying meetings for the past 12 months on the decision to allow hemp seed and hemp oil as a food until December 2012.

(a) any matters impacting upon the production and value adding of industrial hemp in Tasmania

From our decade of growing industrial hemp crops in Tasmania , we have observed few problems growing the crop.As such it is an excellent rotational food crop. Where

we have compared parts of the crop fertilised with NPK, with parts having no chemical input, there has been no significant difference in growth. Irrigation is only needed in the initial emergence of the plant and a neighbouring crop needing irrigation often can provide that. In the case of the seed crop, irrigation is important also at the formation of the seed. More information, including remediation of industrial sites can be found in the attachment (P.Harmsen Hemp essay), a hard copy of which can also be provided.

(b) identification of any commercial impediments, as well as any regulatory impediments at local, state or federal government level impacting upon the establishment, appropriate development and maintenance of a wider industrial hemp industry;

The main regulatory impediment is the refusal of government health authorities to allow this emerging food industry to gain acceptance by ignoring the vital evidence of scientists within these food authorities, as outlined in our preamble/introduction. At the First Industrial Hemp Forum in Tasmania, August 2000 (see P. Harmsen essay attached), the need for cooperation between all industry players was listed as necessary by P. Simmul, Chairman. Our company had requested purchase of 100kg of fresh Tasmanian -grown hempseed in from that year onwards, from Phil Warner and Brandt Teale who were contracting Tasmanian farmers to grow seed. This seed has never been provided to us as promised. It was not until a meeting of farmers in Bishopsbourne in June, 2011, that we learnt that they had been sending all Tasmanian grown seed for oil production to Victoria to be processed by a Victorian company. Frits had learnt how to expel oil from this same company in 1996 when they came to Tasmania to press The Tasmanian Hemp Company's first seed crop.

Such lack of cooperation between all players has become a factor in Tasmania, which we believe hinders the development of a successful hemp industry. This cannot be classed under regulatory or commercial impediments for the industry as a whole. However such lack of cooperation should be seen as a major impediment to any smaller-scale commercial operations such as our Tasmanian Hemp Company. We could easily have been providing a regional small -business approach in Tasmania which we feel is very necessary in this state. The 2008 arrival of our imported German hemp expeller was made clear to the public and to these new hemp industry players in Tasmania.

The main impediment to all growers in Tasmania is Federal Government disregard of scientific evidence provided by its own food standards authorities.

(c) any other issues incidental thereto.

Hemp seed and oil is legal in over 35 countries worldwide including Canada, Great Britain, Germany and France. It is legal to import and eat the product in the USA, but not to grow it. Hemp seed oil has been permitted in NZ since 2002 under the New Zealand Food (Safety) Regulations

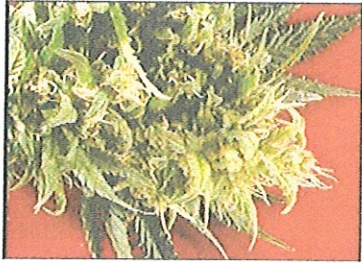
It could well be advisable for Tasmania to follow New Zealand's example by have our own Food(Safety) Regulations if this would clear the impasse with Federal Ministerial Councils.

Yours,

Frits and Patsy Harmsen
Tasmanian Hemp Company,
PO Box 102
Blackmans Bay Tas 7052.
(03) 6229 2109

Please refer to the relevant websites below and articles attached.

- (1) Drugs, Poisons and Controlled Substances Act 1981 No. 9719 of 1981
<http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubLawToday.nsf/95c43dd4eac71a68ca256dde00056e7b/8e9a09b0863d373aca257569001253e4!OpenDocument> pp. 22
- (2) Food Standard Australia New Zealand, 2010, Application A1039
<http://www.foodstandards.gov.au/_srcfiles/A1039%20Low%20THC%20Hemp%20AAR%20FINAL.pdf>
- (3) Statistics Canada, May 2008 Agriculture and Agri-Food Canada Industrial Hemp Statistics <<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1174495716187&lang=eng>>
- (4) TSAN, The Hon. HENRY Hemp Industry Bill 2008 (House of Representatives)
<http://www.parliament.nsw.gov.au/prod/PARLMENT/hansArt.nsf/V3Key/LC20080625056>
- (5) Food Standard Australia New Zealand, 2010, Application A360
<http://www.foodstandards.gov.au/_srcfiles/A360_Final%20AR.pdf> pp. 19
- (6) New Zealand Food Safety Authority, Sale of hemp seed oil as food
<<http://www.nzfsa.govt.nz/consumers/chemicals-nutrients-additives-and-toxins/hemp-seed-oil-as-food/>>
- (7)<http://www.foodstandards.gov.au/scienceandeducation/factsheets/factsheets/hempasafoodmarch2012.cfm>



SCHOOL OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

KGE513, KGE813 ECOSYSTEMS

Supervisor: Dr Peter McQuillan

Essay Topic: Discuss how an understanding of ecological factors has informed the debate or outcomes of a topical environmental issue.

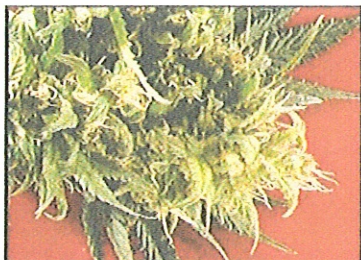
Essay title: *Cannabis* Hemp: Ecoplant?

Date submitted: April 30, 2001

Patsy Harmsen, BA (Hons), DipEd, TTC

Student Number: 732639

Title page printed on paper made from hemp and cereal crop fibres



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CANNABIS HEMP: ECO-PLANT?

• Introduction

The aim of this essay is to discuss how an understanding of ecology has revived interest in the cultivation of an exceptionally versatile plant, *Cannabis* hemp (*Cannabis sativa* L.). As a drug, *Cannabis* hemp is frequently discussed, whilst its value as a useful plant in agricultural ecology is commonly ignored. There are widespread claims that *cannabis* hemp is compatible with the environment and biodiversity (Robinson 1996, Montford & Small, 1999). The author's personal experience in growing the crop further suggests that *Cannabis* hemp could be considered an ecologically friendly plant or 'eco-plant'.

Underlying the discussion is the realisation that the cultivation of *Cannabis* hemp within an agricultural crop rotation system is quite unlike the typical monocultural agricultural systems of Australia. Indeed, large monocrops dominate the world's efforts to feed an ever-increasing human population. Several writers have commented on the environmental unfriendliness of such highly domesticated monocrops due to their reliance on heavy inputs of energy and agrochemicals. (Kirkpatrick, 1999; Montford and Small, 1999).

A recent analysis by the UN-affiliated International Food Policy Research Institute (IFPRI) has estimated that nearly 40% of farmland worldwide is seriously degraded through human use. Much of the world's previous and potential agricultural land is now unusable through erosion, hardening of soil, chemical penetration, nutrient depletion and excessive salinity (AP, 2000). The alliance formed on May 14, 2000 between the National Farmers Federation and the Australian Conservation Foundation demanded urgent action on problems such as erosion, structural decline in soils, salinity, water quality problems and loss of habitat (Crabb, 2000). The potential of *cannabis* hemp cultivation to help solve some of Australia's most significant

environmental problems will be examined.

- **Botanical classification of *Cannabis* hemp**

Almost all *Cannabis* hemp found in the worldwide is classified as *Cannabis sativa* L. It belongs to the Moraceae or mulberry family and has evolved into two basic races. Plants grown for drug content are commonly called 'marijuana' or 'drug *Cannabis*'. Those grown for fibre and seed are called '*Cannabis* hemp'. *Cannabis* hemp is an herbaceous annual producing approximately equal numbers of male and female plants. Whilst naturally dioecious, monoecious varieties have been bred in Europe.

- **History of *Cannabis* hemp**

The original source of wild stock of *Cannabis* hemp is assumed to be central Asia (Mediavilla et al., 1999). *Cannabis* was possibly cultivated independently in more than one place across Asia (Robinson, 1996). Many authors speculate that the cultivation of *cannabis* hemp may well have led to the invention of agriculture and thereby to civilisation (Sagan, 1977, Moorcroft 1980). According to Roulac (1996), some historians estimate *cannabis sativa* has existed for more than 10,000 years. Its seeds, rope and cloth are in the world's earliest tombs (Moorcroft, 1980) and our earliest medical texts attest to its importance in medicine (Moorcroft, 1980, Jones, 1995).

The first written record is in books of the Yang-Shao culture of northern China about five to six thousand years ago (Moorcroft, 1980). Instructions to cultivate the plant can be traced to the twenty-eighth century BC (Smith, 1969 in Jones, 1995). *Cannabis* hemp seeds and the knowledge of their use spread from Asia to the Mediterranean to Europe. From the sixteenth to the eighteenth century, Hemp (*Cannabis sativa*) and flax (*Linum usitatissimum*) were the major fibre crops in Russia and North America. The crops also grew well in Van Dieman's Land from their introduction in 1816 where the tough fibres were an asset to the Royal Navy for ropes and sails (Morgan, 1992).

4. Resurgence of interest in *Cannabis* hemp today

Debate on hemp continues throughout the world today, as it does in Australia. In Tasmania, Patsy and Frits Harmsen, the directors of The Tasmanian Hemp Company revived the debate on hemp and pioneered the reintroduction of hemp growing in Australia (Lisson and Mendham, 1995). A temperate climate such as that of Tasmania is well suited to *Cannabis* growing (Van der Werf, 1994).

The nova-Institute of Frankfurt organised three international symposia on hemp in Germany in 1995, 1997 and 2000, presenting work of the world's major hemp researchers, including Australians. The third international scientific-technical symposium "Bioresource Hemp and other fibre crops 2000" took place in Wolfsburg in September 2000. A letter dated 27 December 2000 from Michael Kaurus, Managing Director of nova-Institute revealed that more than 300 participants and speakers from 28 countries attended. The Australian Institute of Agricultural Science and the Rural Industries Research and Development Corporation (RIRDC) jointly convened Australia's first industrial hemp conference in Melbourne, December 1995 (Field, 1995).

The first Tasmanian Hemp Industry Seminar was held on August 6, 2000 at Campbell Town chaired by Peter Simmul, Senior Horticulturist and hemp advisor with the Tasmanian Department of Primary Industries, Water and Environment. Issues identified for a successful hemp industry included increased finances for research and access to Tasmanian machinery, especially a decorticator and oil press, and establishment of value-adding infrastructure to provide some products for test marketing. Another important need revealed was the development of a cooperative environment between all hemp industry proponents (Simmul, 2000).

Increasing numbers of farmers witnessing the exodus of their children from family farms are seeking help to grow hemp. This is most evident in those areas of Tasmania where deforestation is taking place and tree plantations are replacing rural farms. One such group applied for a Department of Premier and Cabinet grant (unsuccessfully) through the Women's Support Network (Duncan, 2000).

5. *Cannabis* hemp as an ecologically friendly agricultural rotation crop

5.1 Reduction in chemical input

Most Australian agricultural ecosystems are monocultural systems needing large amounts of fertilisers, pesticides and herbicides to maximise production of a single crop over a large area (Kirkpatrick 1999). The potential health hazards that toxic agricultural chemicals present are well documented for example pesticides in the cotton and corn industries.

In the Netherlands, an example of extensive use of chemicals causing great damage to the environment is reported by the Agricultural Research Department (DLO-NL, 1992). The traditional Dutch arable crop rotation of potatoes, cereals and sugar beets required substantial chemical input for crop protection. In 1980, a group of potato farmers from the northeastern region of the Netherlands initiated the search for a profitable 'fourth crop' to remedy this situation (De Groot et al.1989; De Groot 1998). In 1991, The Ministry for Agriculture and farmers' organisations made a ten-year plan to halve the use of pesticides in Dutch agri-business by the year 2000 (Agricultural Research Department, 1992). In a telephone conversation, B de Groot (2001, 6 Jan) said they also agreed to use chemicals more effectively to ensure a 75% reduction in loss of chemicals to the environment. This included chemicals to protect crops from disease, insects, and weather, or for any other reason. The 50% reduction in pesticides has not been achieved, although the Dutch are still working on it without setting a new time goal.

The fibre hemp crop regained interest as the possible ideal fourth crop to help achieve this aim. *Cannabis* hemp had been grown previously in Holland for fibre and seed-oil purposes, and for windbreaks and prevention of cross-pollination between adjacent crops. Tasmanian beekeepers could well try hemp as a pollen insulator, since other researchers also claim that hemp is a superlative hedge against unwanted pollination (Robinson, 1996). Promising early results with hemp research persuaded the regional and national governments to start the Dutch Hemp Programme in 1990 at the

internationally renowned Wageningen Agricultural University and a number of agricultural research institutes. Europe's leading pulp and paper companies did not take up the Dutch Agricultural Research Department's consideration of hemp fibres as a prospective raw material for pulp and paper production. Two main technical reasons advanced for this are first, the lack of an existing pulp and paper mill to handle semi-chemical pulping, and secondly, lack of storage space for the harvested hemp in an overcrowded country (de Groot, B 2001, pers. comm., 6 Jan).

Robinson (1996) also writes that as a companion plant, *Cannabis* protects against the white cabbage butterfly, guards potatoes from late blight by *Phytophthora infestans*, protects peas from pea aphids, sugar beet from turnip fleas and beans from brown spot. Unless the United States of America re-allows cultivation of industrial *Cannabis*, research such as the benefits of hemp growing on cotton growing in Australia (identified below by Yorkston, 2000) is unlikely to be seriously pursued in the USA.

Fibre and seed *Cannabis* crops need relatively less in the way of chemical input than most major annual monocrops. Their need for nitrogen can be satisfied with preceding green manure crops or farmyard manure, which is environmentally sound where there is an excess of manure. Another example of the potential use of *Cannabis* hemp as a beneficial rotation crop is in breaking down the pest burden for cotton growers. Cotton-growers John and Kim Tompson of Pasadena, Queensland, in their attempt to diversify but also to grow 'environmentally friendly' cotton, are introducing *Cannabis* hemp and kenaf as part of an integrated pest management strategy (Yorkston 2000). The crops' hosting of predator insects would reduce the use of "hard" chemicals. *Cannabis* hemp and kenaf are good hosts for parasitic wasps and lady beetles (see Plate 1.), with hemp having the added advantage of not appearing to host the cotton aphid. Whilst introduced sunflowers did not appear to lower the *Heliothis* pressure on cotton, it seems that both the hemp and kenaf would break the flight pattern of the moth (Yorkston 2000).

Parasitic soil nematodes, a problem for farmers in many countries including central Canada and Australia, destroy the root structure of their host. Because most

nematodes do not attack hemp roots, planting hemp in rotation helps to suppress these pests, thus improving the quality of the soil for subsequent non-hemp crops (McPartland, 1997). Crops affected in Tasmania include potatoes (by the “eel worm” potato nematode), carrots, onions and narcissus bulbs. One nematode that has not been detected in Tasmania, but appears in most Australian states is the potato cyst nematode (Simmul, Peter 2000, pers. comm., 4 May).

In Tasmania, the outstanding ability of fibre hemp to smother weeds could be used to good advantage if rotated with potatoes to overcome the problem of the notorious ‘groundkeeper’ weed. It could also serve to minimise or even eliminate the need to spray these as currently practised (Simmul, Peter 2000, *ibid*). Those authors (Herer 1991, Conrad 1994, Rosenthal 1994) who claimed that *Cannabis* is problem-free have probably never grown the crop. Although not pest-free, it is pest-tolerant. Whilst *Cannabis* in Europe has over 100 diseases, less than a dozen are serious (McPartland 1996) and in Tasmania, very few have been found. The 1997-1998 hemp grown by the Tasmanian Hemp Company showed no insect attack (Tasmanian Hemp Company 1998). In the 1998-1999 season the main insect pest was native budworm (*Helicoverpa punctigera*), and stinkbug eggs. Minor attacks of *Sclerotinia sclerotiorum* were observed on lower stem parts, causing some plants to become non-productive by senescing prematurely (Harmsen, P & F, 1999). *Cannabis* hemp’s lack of dependence on pesticides, insecticides, and herbicides leads the way to the possibility of organic farming. Amongst three crops currently being grown by The Tasmanian Hemp Company, two with NPK fertiliser and the third without any fertiliser, the latter crop is making the best progress (Harmsen, FJ 2001, pers.comm., 8 March).

Other potential benefits *Cannabis* hemp may provide to organic farming are the facts that it helps in preventing soil erosion, and that its deep root structure prevents nitrogen wash-out (Lohmeyer, 1997). Hemp grown in rotation after nitrogen fixing legumes, was the scenario envisaged by Wageningen Agricultural University in Holland, and followed by the Tasmanian Hemp Company here from 1991 onwards. Such a crop rotation is also the practice used in the wheat-sheep belt in Australia, and illustrates another departure from typical monocultural agricultural cultivation (Kirkpatrick, J 1999).

Despite claims made by hemp proponents about the reduction in problems with hemp growing, it is nonetheless important to continue researching the ecological consequences of fertilisers used in hemp cultivation. For example, 1996 field experiments in Lower Saxony, Germany were carried out growing fibre hemp using nitrogen fertiliser followed by field retting (partial rotting of hemp stalks to separate the outer bast fibres from the inner hurd fibres). The trials suggested that growing fibre hemp in water catchment areas might cause problems with nitrate content of water wells (Hendrischke et al. 1998). Hence cropping fibre hemp, as silage without field retting must be tested as an alternative method there in future. On the positive side environmentally, high nitrogen uptake led to low surplus of hemp nitrogen balance. Fortunately, field retting is not used in Tasmania, since machine separation of the hemp fibres is a better option in our climate.

5.2 Benefits to soil structure; prevention of erosion

When the *Cannabis* plant is grown for its stem material, the nutrient rich flowers and leaves are returned to the soil. They represent the major portion (two thirds) of the plant's nutrients previously taken from the soil. The fallen foliage forms mulch, preserving moisture and bacteria in the soil. Because the hemp does not need digging up, its strong, deep taproots remain in the soil, benefiting soil structure by loosening compacted layers and allowing oxygen and bacteria into the soil horizons. In Romania, wheat farmers find *Cannabis* grown thickly for its stem, attractive as a superb cleansing crop because its thick growth smothers all weeds without needing herbicides. This fact, combined with its reputation as a natural agricultural plough, led Romanian farmers (Walston 1990) and French farmers (Malyon 1980) to praise *Cannabis* as the best entry for a winter wheat crop.

5.3 Rehabilitation of soils polluted by heavy metals

A literature review by Patsy Harmsen in 1991 found that *Cannabis* hemp was once grown in heavily polluted industrial areas of Italy. Recent Polish research was conducted in the safety buffer zone of the copper smelter in Glógow, using *Cannabis*

hemp amongst other industrial plants including flax and rape (Baraniecki 1997). Results showed that the accumulation of heavy metal by industrial crops could be used for soil rehabilitation. The hemp and flax fibre produced proved applicable to the production of yarns, paper, fuel, and composite materials. Conclusions were that the use of biomass obtained from annual, fibrous plants as an alternative raw material for different kinds of industry, would have a positive effect on the natural environment, exclude heavy metals from the human nutritive chain, limit exploitation of forests and other non-renewable resources, and stimulate solutions to current agricultural problems.

5.4 Provision of own energy sources

The maintenance of Australia's monocultural agricultural systems by extensive use of chemicals to maximise the production of a single crop over a large area uses vast amounts of energy from fossil fuels. Wastes of farm crops are sometimes used to provide this energy, such as bagasse from sugar cane production (Kirkpatrick 1999). Biomass from the stalk of the hemp crop can be converted to biofuel and hemp seed oil can be converted to diesel fuel. Thus both the stalk and the seed can be used as energy sources.

5.5 Comparison with tree forests/plantations

Deforestation is a serious environmental problem. One of the largest contributions of hemp to the world's ecology could well be as part of a return to plant-based papers. *Cannabis* hemp will produce an equal or greater quantity of fibre per ha/year as the most highly fertilised and irrigated tree plantations (plantation yields provided by Fitzpatrick 1991). It can also produce paper, paper products and construction materials of all kinds. The saving of at least part of our virgin rainforests is an important role in allowing native ecosystems to survive. Pine plantations currently being planted en masse in Tasmania are causing an imbalance in ecological systems, especially in native invertebrate populations and the pH of soils.

Farmers throughout Tasmania met throughout the year 2000 to focus on the impact of monoculture plantations such as *Pinus radiata* or *Eucalyptus spp.* A public meeting held at Huonville (9 Jun 2000) was one of many held around the state. Public concerns include: slow-release herbicides polluting groundwater supplies, 1080 poisoning killing wildlife, chemicals threatening organic farming and aerial spraying of insecticides polluting streams and disrupting natural food chains (*Saturday Mercury*, 13 May, 2000 p.12).

The director of the previous Australian Pulp and Paper Manufacturers (APPM) remarked that one benefit derived from hemp also applied to trees, such as the deep taproot improving soil structure and stability (Bills, David 1991, pers. comm., 26 March).

However, one thing is definitely not the same. Food is not recovered from those trees commonly used to provide fibre for paper. Hempseed, its oil and its meal by-product have been a source of high nutritional and high protein human and animal food throughout civilization (Jones 1995). The seed contains 30% crude protein and has no psychoactive properties. Hemp seed and its oil also contain the optimum 3:1 balance of the essential fatty acids (*alpha-linolenic acid* and *linoleic acid*) for human health as well as some *gamma-linolenic acid* (Erasmus, 1993, Deferne and Pate, 1996). Most of the world permits this important use. Meanwhile, the Australia New Zealand Food Authority, (ANZFA) has been delaying the use of hemp seed and oil from licenced hemp-seed crops for food and food products since the Tasmanian Hemp Company first produced it in 1996.

According to Ismail Serageldin, chairman of the United Nation's consultative group on International Agricultural Research, the first complete satellite mapping of the globe raises concerns about the world's ability to feed itself (Associated Press 2000). The greatest contribution of *Cannabis* hemp may well be its ability to help feed the starving peoples of the world, where few, if any, protein-rich foods grow. The feed for livestock alone would be of enormous benefit.

5.6 Environmentally friendly products

The fibre market has two products, the higher quality bast and the lower quality hurd fibres. The bast fibres, from the outer layer of the hemp plant, are used to make insulation, carpeting, yarn, batting material, specialised paper, automotive composites, blankets, and textile fabric clothes.

Cannabis hemp textile, historically used in sails and cordage because of its resistance to water and saline damage as well as its resistance to abrasion, is regaining in popularity. Environmentally, the durability of the fabric is advantageous and in its manufacture is comparable as a source of pollution and energy consumption to the manufacture of other vegetable fabrics. However, with textile manufacture being a risky enterprise, the following hemp products seem less speculative.

In the building industry, hemp fibre can replace conventional building materials such as bricks and cement, and medium density fibreboard. The use of hemp fibre as insulation material in building applications provides an important way to reduce energy consumption, natural fibres being particularly energy efficient. With the resurgence of interest in earth building, hemp is being used as fibre for making hurd-lime walls and floors and hemp-bale homes.

The hurd, or woody core fibre of the hemp stalk, is also used for biodegradable animal bedding and cat litter. The use of the hemp hurd as an industrial absorbent has generated interest in Alberta, Canada for use in land reclamation in the oil and gas industry (Ward 2000).

Hempseed may be a more efficient producer of the popular nutritional supplement *gamma*-linolenic acid than presently grown sources such as evening primrose, borage and blackcurrant seeds. Hempseed oil is not just a valuable nutritional supplement, but its more industrial grades substitute for non-renewable petrochemicals in many applications such as paints, varnishes, printing inks and diesel fuel. The hemp fibre remaining after seed harvest can then be used for the biodiversity-friendly building applications mentioned above.

Conclusion

Cannabis hemp has reappeared in debate worldwide, offering ecological solutions to some of our most serious environmental problems. It could reclaim deforested, marginal and abused land such as heavy-metal contaminated soil. *Cannabis* hemp remains a plant providing a vast range of high quality environmentally friendly bioresources from its fibre and seed. Many of these products help to reduce energy consumption. Furthermore, the seed, its oil and meal provide a highly nutritious food for all animals, including humans, birds, fish, and livestock.

Bearing in mind that virtually all cropping impacts negatively on natural biodiversity, *Cannabis* hemp as a rotation crop attracting few pests and diseases, and enhanced possibilities for organic farming, shows less damage to biodiversity than typical monocultural Australian agriculture. This lends credibility to its consideration as an 'eco-plant or 'ecological plant'.

References

- Agricultural Research Department (DLO-NL) Partners in Excellence, undated publication, Wageningen, The Netherlands, in possession of P. Harmsen, Hobart.
- AP (Associated Press) 2000, Food alarm over ravaged Earth, *Mercury*, 24 May, 2000, p.14
- Baraniecki, Przemyslaw 1997, Industrial Plants in Clean-up of Heavy Metal Polluted Soils, *Proceedings of the Symposium Bioresource Hemp 97*, nova-Institute (Eds), Hurth, September 1997 pp. 277-28.
- Crabb, Annabel and AAP 2000, Demand for \$60b to save environment, *Mercury*, 16 May 2000, p.4.
- Deferne, J. and Pate, D.W.1996, Hemp Seed oil: A source of valuable essential fatty acids, *Journal of the International Association*, Vol.3, No.1, pp.1, 4-7.
- De Groot, Birgitte, 1998, *Alkaline Hemp Woody Core Pulping*, Doctoral thesis, University of Wageningen, The Netherlands.

- De Groot, B., van Zuilichem, R.P. van der Zwan, 1989, Paper out of hemp: illusion or reality. (Dutch) *i-Procestechnologie* 5 (6/7) 33-38 (translated in English by F.J.Harmsen, Hemp for paper Consortium, Tasmania, 1991).
- Duncan, R, Beck-Swindale, T, & Thompson, C 2000, The Hemp Co-operative, Application to Department of Premier and Cabinet Women's Development Grants 2000-2001.
- Erasmus, U, 1993, *Fats that Heal, Fats that Kill*, Alive Books, Vancouver.
- Field, Simon (ed.) 1995 The Australian Institute of Agricultural Science and the Rural Research and Development Corporation Industrial Hemp, Kingston ACT.
- Fitzpatrick, Anthony, Forestry Commission, Tasmania, Unpublished paper submitted to the 'Hemp for Paper' Working Group 15 May 1991.
- Harmsen, Patsy, 1991, Expression of Interest to Develop a Pulp and Paper Mill based on an Industrial Hemp Industry, Unpublished paper presented to the Government of Tasmania, Hobart, 5 February, 1991.
- Harmsen, Patsy & Frits, 1999, Hemp Growing in Tasmania 1998-1999, *Journal of the International Hemp Association*, vol. 6, no.2, pp. 99-100.
- Hendrischke, K, Lickfett, T & von Buttlar, H.B. 1998, Hemp: a ground water protecting crop? Yields and nitrogen dynamics in plant and soil, *Journal of the International Hemp Association*, vol. 5, no.1, pp. 24-28.
- Jones, Kenneth 1995, *Nutritional and Medicinal Guide to Hemp Seed*, Rainforest Botanical Laboratory, Gibsons, BC.
- Kirkpatrick, Jamie 1999, *A Continent Transformed – Human Impact on the Natural Vegetation of Australia*, 2nd edn, Taines, Carla (ed.) Oxford University Press, Melbourne, pp.40-44
- Lohmeyer, Daïke, 1997, Hanf im Ökologischen Landbau, *Proceedings of the Symposium Bioresource Hemp*, Frankfurt Am Main, nova Institut (eds), Hurth, September, 1997, pp.236-243.
- Lisson, S & Mendham, N 1995, Hemp (*Cannabis sativa*)- a Potential Multi-Purpose Crop for Tasmania, *Australian New Crops Newsletter*, Issue 4, July 1995.
- McPartland, John M. 1996, A review of *Cannabis* diseases, *Journal of the International Hemp Association*, vol.3, no.1, pp.19-23.
- McPartland, John 1997, Diseases and Pests of *Cannabis*, *Proceedings of the Symposium Bioresource Hemp* Frankfurt am Main, 28 February 1997, nova

- Institute (eds), Hurth, September, 1997, pp.284-290.
- Malyon, T & Henman, A, 1980, 'No Marihuana: plenty of hemp', *New Scientist*, 13 November 1980, pp. 433-435.
- Mediavilla, V, Bassetti, P, Leupin, M & Mosimann, E 1999, Agronomic characteristics of some hemp genotypes, *Journal of the International Hemp Association*, vol. 6, no.2, pp. 45, 48-53.
- Morgan, Sharon 1992, *Land Settlement in Early Tasmania: Creating an Antipodean England*, Cambridge University Press, Cambridge, p.86.
- Moorcroft, C 1980, The Magic Weed, *The Ecologist*, vol.10, no.8-9, pp. 290-293.
- Montford, S. and Small, E 1999, A comparison of the biodiversity friendliness of crops with special reference to hemp (*Cannabis sativa* L.) *Journal of the International Hemp Association* 6 (2) pp.53-63.
- Nova Institute (ed.) 1997, *Bioresource hemp - Proceedings of the Symposium*, (Frankfurt am Main, Germany, Feb.27th- March 2, 1997. First Edition, Hurth, September 1997.
- Robinson, R 1996, *The Great Book of Hemp*, Park Street Press, Vermont, pp.18-39
- Roulach, JW (ed.) 1996, *Industrial Hemp: Practical Products- Paper to Fabric to Cosmetics*, Hemptech, Ojai, California.
- Sagan, Carl, 1977, *The Dragons of Eden*, H & S, London.
- Simmul, Peter, 2000, Tasmanian Hemp Industry Seminar, 6 August 2000 at Campbell Town, unpublished paper, DPIWE, October 2000.
- Saturday Mercury*, Huon group re-emerges to tackle plantations, 13 May 2000, p.12.
- Tasmanian Hemp Company 1998, Hemp Project Report 1997-1998, submitted to the Poppy Advisory and Control Board, 6 August 1998.
- Van der Werf, Hayo 1994, *Crop physiology of fibre hemp (Cannabis sativa L.)*, Doctoral thesis, Wageningen Agricultural University, Wageningen, The Netherlands.
- Walston, Oliver, 1996, Walston in Romania, *Farmers Weekly*, 113(6) 10 August 1996.
- Ward, Jeff, 2000, Oct, Where is the hemp market now?
<http://www.agric.gov.ab.ca/economic/market/hemparticle.pdf> (accessed 25 April 2001).
- Yorkston, Lisa 2000, Crop diversity breaks down pest burden, *Queensland Country Life*, 20 April 2000 p.27.

