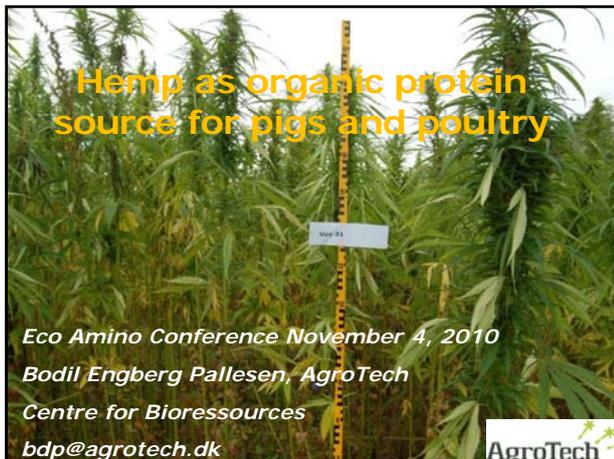


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The project is funded by the Danish Fund for Organic Agriculture.



Hemp as organic protein source for pigs and poultry

Eco Amino Conference November 4, 2010
 Bodil Engberg Pallesen, AgroTech
 Centre for Bioresources
 bdp@agrotech.dk

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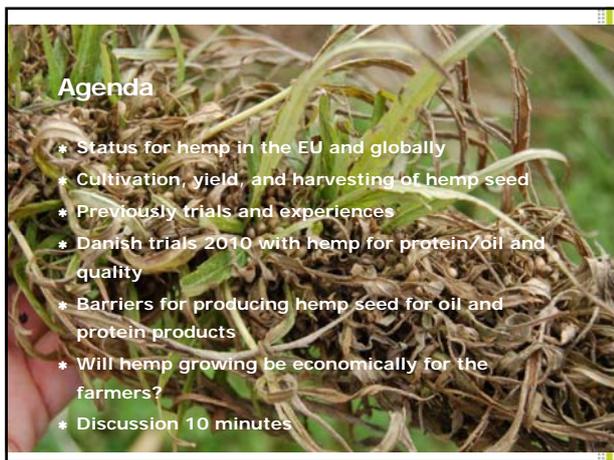
- > Working in AgroTech, Center for Bio Resources
- > 20 years of experience with in plant fibers

Working with:

- > Product Development and Innovation in cooperation with companies
- > Added value from the field to the market
- > Building up new markets
- > Inventor of the the product patent: Plant fiber mats



All Photos: by Bodil Pallesen, AgroTech, except when other source is mentioned



Agenda

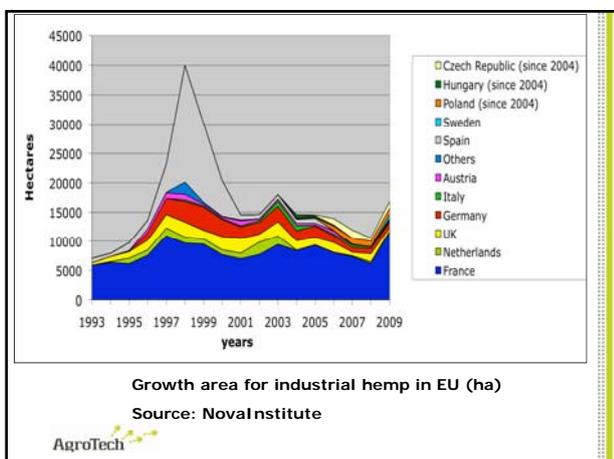
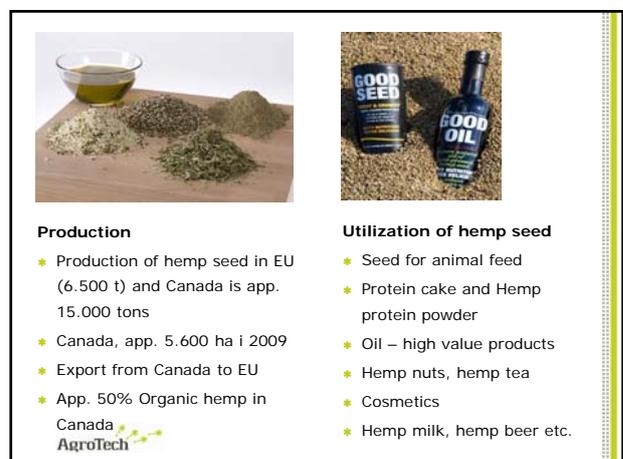
- * Status for hemp in the EU and globally
- * Cultivation, yield, and harvesting of hemp seed
- * Previously trials and experiences
- * Danish trials 2010 with hemp for protein/oil and quality
- * Barriers for producing hemp seed for oil and protein products
- * Will hemp growing be economically for the farmers?
- * Discussion 10 minutes



Focus on Industrial Hemp as a protein source

- * The goal is to find alternatives to protein sources in organic pig and poultry production
- * Can we grow hemp seed in DK?
- * Is the quality OK?
- * Which barriers do we have to overcome?
- * Is it economically for the farmers?

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Production

- * Production of hemp seed in EU (6.500 t) and Canada is app. 15.000 tons
- * Canada, app. 5.600 ha i 2009
- * Export from Canada to EU
- * App. 50% Organic hemp in Canada

Utilization of hemp seed

- * Seed for animal feed
- * Protein cake and Hemp protein powder
- * Oil – high value products
- * Hemp nuts, hemp tea
- * Cosmetics
- * Hemp milk, hemp beer etc.

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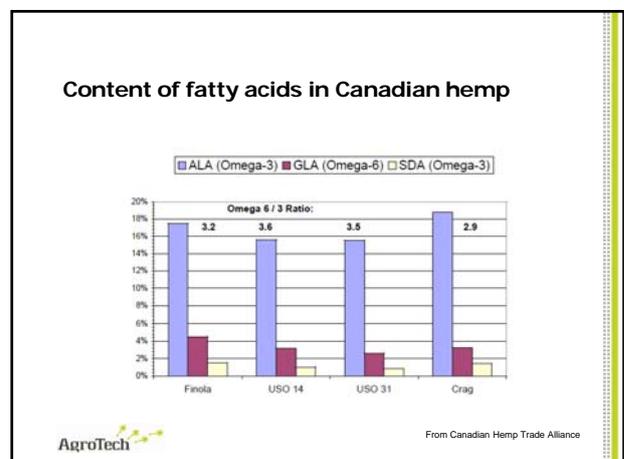
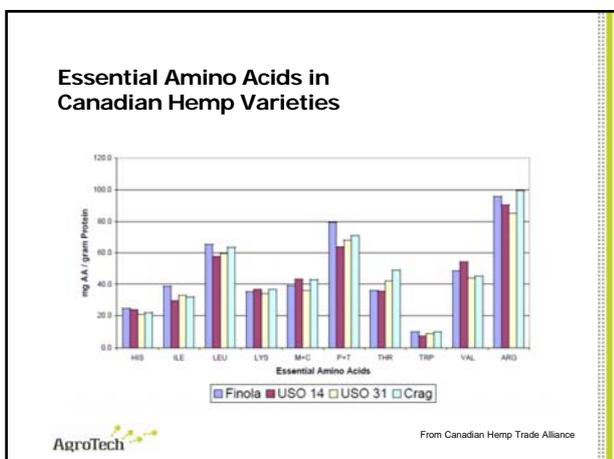
This infographic is titled "Hemp Seeds and Hemp Oil as Food" and is part of "The European Hemp Association 2010". It features a green header and a central image of a bowl of hemp seeds. Below the title, it states "Hemp Seed is a Nutritional Powerhouse". A quote from Dr. Chris Lewis is included: "Hemp seed is an excellent source of several critical mineral nutrients and vitamins. In addition, hemp seed contains a very high concentration of protein in balanced and easily digestible form. Hemp seed protein is a very good source of essential amino acids and is very rich in lysine with several major amino acids." The infographic also includes small images of hemp-based products and the AgroTech logo at the bottom left. A link to "Read more on www.eiha.org" is at the bottom right.



Hemp in North America

- Short seed varieties (Finola, Crag) and dual purposes (USO-14) account for >95% of acreage.
- Seed yields have increased - average now ~670 kg/ha clean (600 lbs/acre). Typical yields with Finola on irrigated land: 1800 kg/ha, clean.
- Seed production currently required to supply market demand: ~ 8000 MT/year (produced in Canada)

The AgroTech logo is at the bottom left.



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Why hemp?

- > Hemp has a large yield potential for biomass, but how about seed?
- > Valuable properties: High quality protein and valuable fatty acids
- > Besides this: high strength, isolating, absorbing properties in the fiber
- > The essence of a "green product", can easily be grown organic
- > Innumerable applications: protein, oil, human nutrients, cosmetics etc.
- > The byproduct from the stem can be high valuable as well (insulation composites, bedding, etc.)



Development steps for Industrial Hemp

Maj Juni Juli August Sept.



Harvest for fiber production: Laying in swaths from medium August

Separation of fibers and core DMC% ca. 82-85



Development steps for Industrial Hemp II

Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. April



Harvest for seed production: Laying in swaths from medium Sept. or harvest directly end September to mid October in DK.




Growing of hemp - Conventional as well as organic

- * Approval as a hemp grower
- * A good seedbed
- * Adding of organic manure
- * No plant protection
- * Eventually laying in swaths
- * Harvesting seeds
- * Cutting the retted stems and pressed in big bales





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Guidance to grow organic hemp

Dansk Landbrugsrådgivning

Indledning

Beskrivelse

Plantning

Opfølgning

Harvest

Udførsel

Økonomi

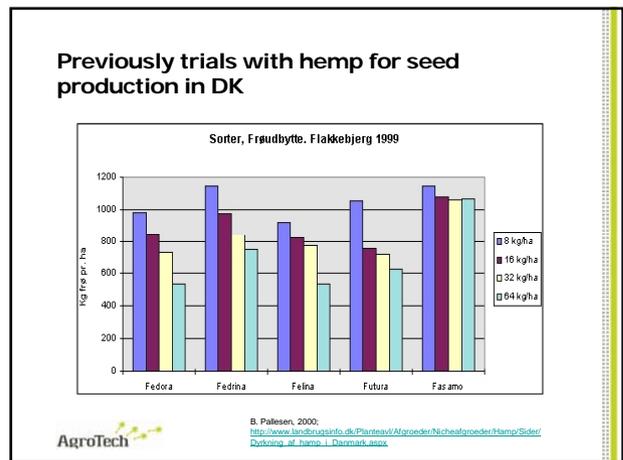
Andre relevante links

Forfatter

Revideret

Revideret dato

B. Palleesen, 2010.
http://agtech.landsbrugsraadgivning.dk/Dyrkning/Forms/Main.aspx?Page=Vedledning%20D_132



Danish and foreign trials 2010 with organic hemp for protein (amino-acids) and fat (fatty acids)

- Two trials carried out under Nordic Field Trials
 - 1. Trial
 - Felina 32, Uso 31 and Finola
 - 2. Trial (Finola)
 - 50 kg N, 80 kg N and 120 kg N
 - 10 kg/hectare and 30 kg/hectare

www.nfts.dk

1. Trial with varieties of organic hemp

2. Trial with organic hemp with varying N-supply and varying levels of seed

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Eco Amino Conference

November 4, 2010

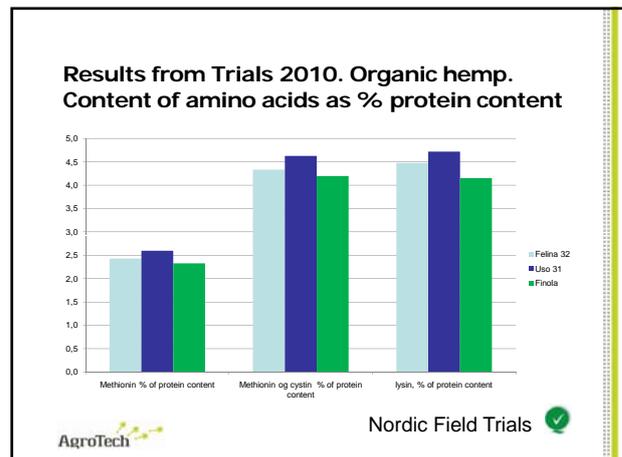
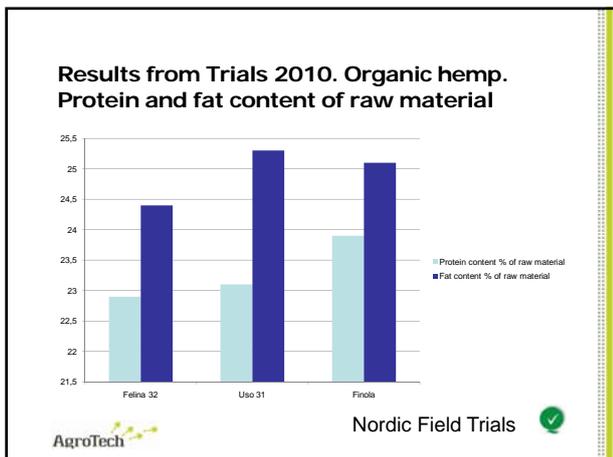
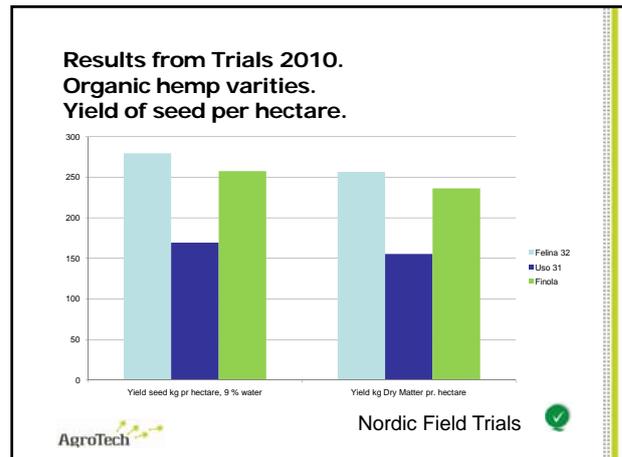
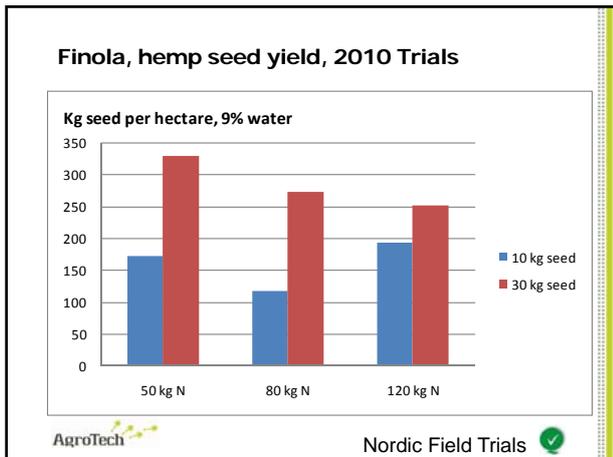
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Results compared to previously data

	Soybean		Canola		Hemp seed			
	Literatur*)	Info Pig	Literatur*)	Info Pig	Literatur*)	Analysis 2008/2009 Felina	Analysis 2010, Finola	Analysis 2010, Felina
Raw protein, %	32	37,2	23	17,9	25	23,8	26	25,5
Rawprotein, gram	32	37,2	23	17,9	25	23,8	26	25,5
lysine	1,73	2,26	1,49	1,07	1,03	0,85	0,91	0,94
methionine	0,53	0,49	0,46	0,36	0,58	0,54	0,51	0,51
cystine	0,54	0,52	0,39	0,43	0,41	0,39	0,41	0,4
treonine	1,35	1,43	1,13	0,79	0,88	0,8	0,8	0,84
tryptofan	0,41	0,5	0,31	0,22	0,2			
leucin	2,58	2,85	1,8	1,23	1,72	1,51		

*) J.C. Callaway, Department of Pharmaceutical Chemistry, University of Kuopio, FIN - 70211 Kuopio, Finland, and from Hempseed as a nutritional resource: an overview, Euphytica 140: 65 - 72, 2004, 2004 Kluwer Academic Publishers.

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Conclusions from the hemp seed trials 2010 (1)

- Low yields. The season has been far more cold and wet than normal.
- Too few plants germinated and weed was a big problem
- Harvested (30th of Sept.) at app. 30 % water
- Maturity of the seeds were delayed, but Finola matured best.
- In the combined trial (with Finola): 30 kg sown per hectare was better than 10 kg/ha, and 50 kg N gave the highest yield 329 kg

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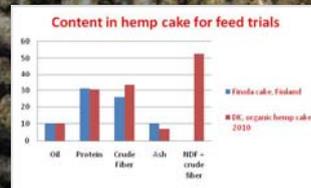
The project is funded by the Danish Fund for Organic Agriculture.

Conclusions from the hemp seed trials 2010 (II)

- Seed yield was best in Felina (280 kg/ha) at 9% water, (Std. quality)
- The oil content was lower (25%) than normal (33 %) due to early harvest.
- Protein content: Finola had the highest (24%)
- Amino acid content was best in Uso: Methionin 2,8 % and Lysine 4,7 %, Methionin and Cystine % 4,7% of the protein content.



Organic Hemp cake for feeding trials for pigs in 2010 in the organic project with the Center of Knowledge



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Barriers or challenges for producing hemp for protein purposes

- We need to address the whole plant: seed purposes and utilization of the stem
- The seed market need to be build up for:
 - Protein for fodder
 - Oil for consumption or?
- The prices need to be competitive to other protein sources (between 1 – 2 US dollars pr. kg?)
- We need to build up capacity to process the seeds – if the demands for seed increase!



Processing of seeds for oil and hemp protein cake

- Drying and cleaning the seeds
- Pressing the seeds
- Storage of the protein cake
- Packaging of the oil-products
- Certificates and approval for producing organic products
- Certificates and approval for producing organic products for human purposes etc.



Harvesting the stem of hemp after seed harvest

- We need to build up capacity to harvest seeds as well as collecting the stem.
- Is this economically?
- The hemp stem need to be retted, and then cut, depending on the utilization
- Expecting from 3 tons – 8 tons per hectare



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Is hemp growing economical???
That depends on the yield and quality, demands for seed and straw and the prices!

Organic hemp	2010	2010
Income	DKK	Euro
Seed, 500 kg	5000	667
Hemp Straw, 6 tons à 1,5 DKK	9000	1200
Income total	14000	1867
Costs		
Seed and fertilizer app.	-2181	-291
Gross margin per hectare	11819	1576
Machinery and labor costs		0
Cultivation and harvest	-6000	-800
Gross margin after machinery and labor costs	5819	776

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