

# COOPERATION OF THE DANISH SEED INDUSTRY AND THE AARHUS UNIVERSITY

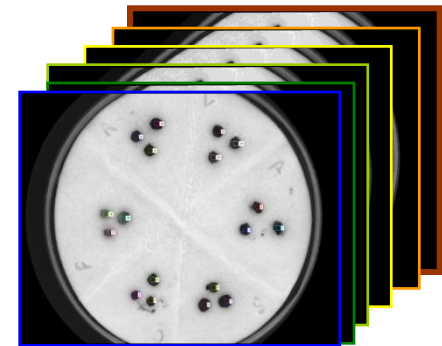
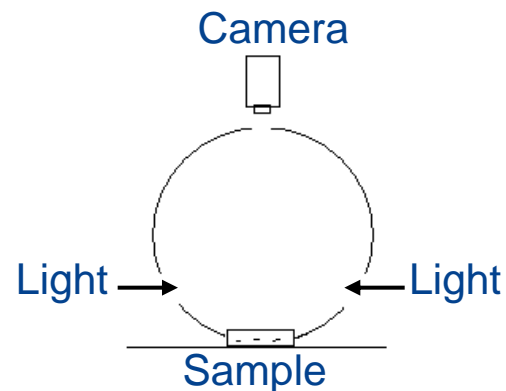
- › Ph.d. project
- › Multispectral imaging - seed health
- › Near infrared spectroscopy – prediction of seed germination

# MULTISPECTRAL IMAGING

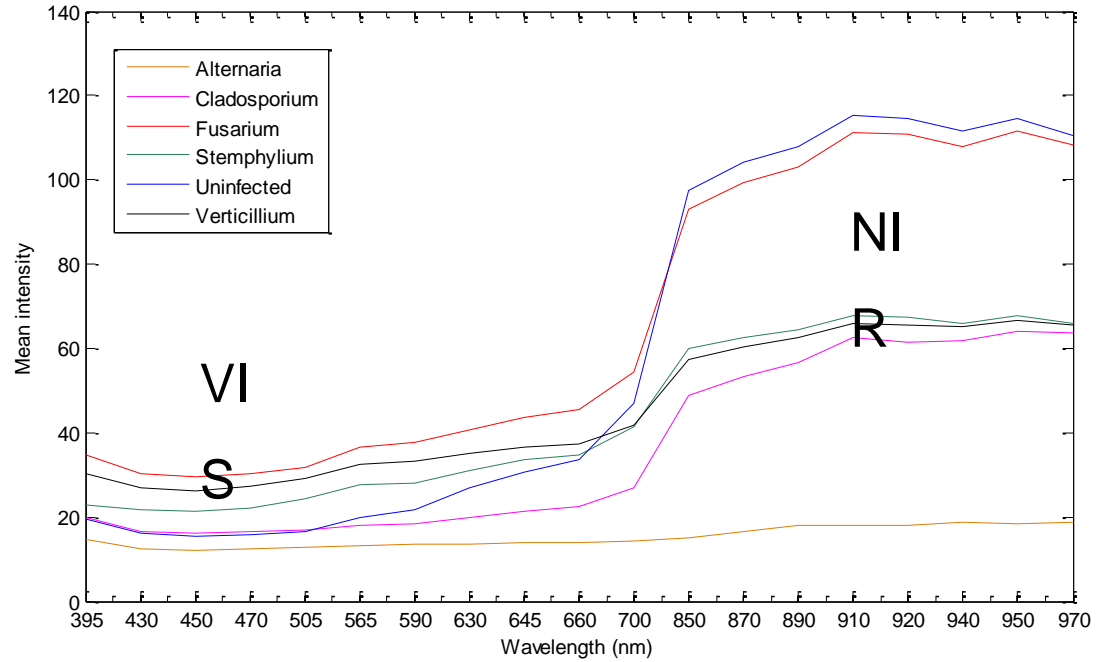


VideometerLab

- 19 light emitting diodes with specific wavelength ranging from 395- 970 nm.
- 19 images of 1280 x 960 pixels within 10 sec.
- Measurement of non uniform colour, texture and chemical substance on the surface of the seed.



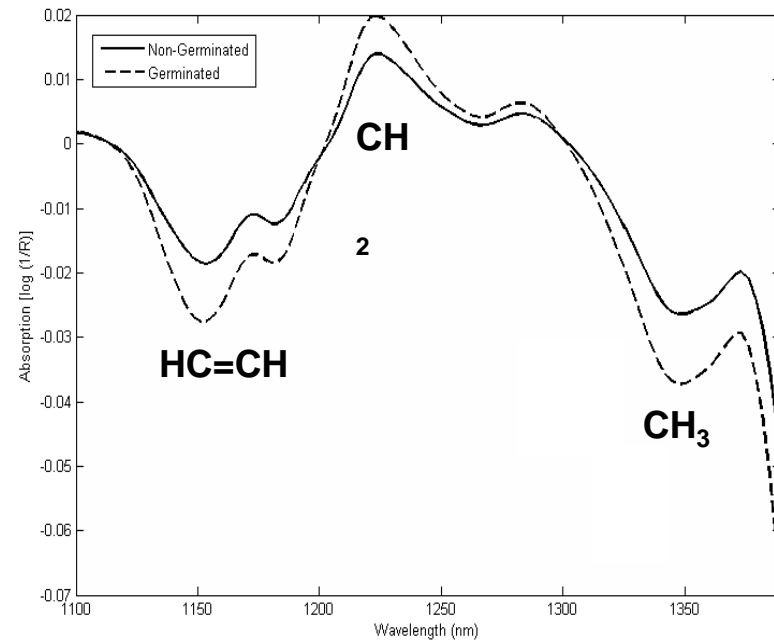
# Seed health



# NEAR INFRARED SPECTROSCOPY

## -PREDICTION OF SEED GERMINATION

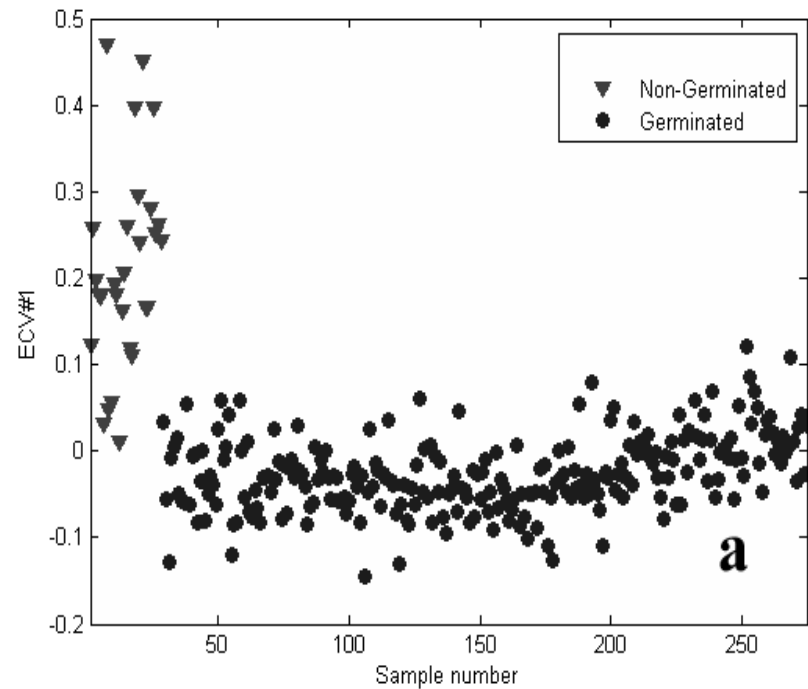
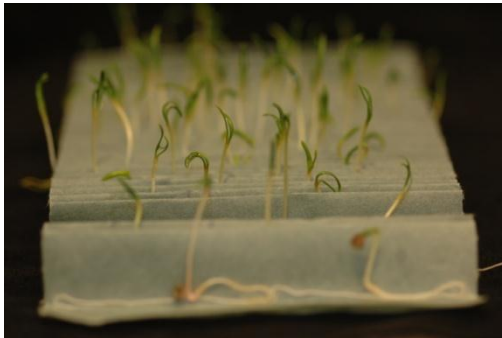
NIR spectra can be assigned to biochemical compounds such as water, lipids, carbohydrates and proteins.



Single seed NIR

# CLASSIFICATION

Only 2-6% were misclassified using a Extended canonical variance analysis on data obtained from seed measure by single seed NIR and germinated at 15°C



M. H. Olesen, N. Shetty, R. Gislum and B. Boelt, "Classification of viable and non-viable spinach (*Spinacia oleracea* L.) seeds by single seed NIR spectroscopy and Extended Canonical Variates Analysis (ECVA)", *Journal of Near Infrared Spectroscopy* **19**, 171-180 (2011).

# 2011 International Spinach Conference

## 3.- 4. October 2011 in Amsterdam

Can Denmark keep the position as the biggest spinach seed producer in the World?

By Henning van Veldhuizen



# Can Denmark keep the position as the biggest spinach seed producer in the World?

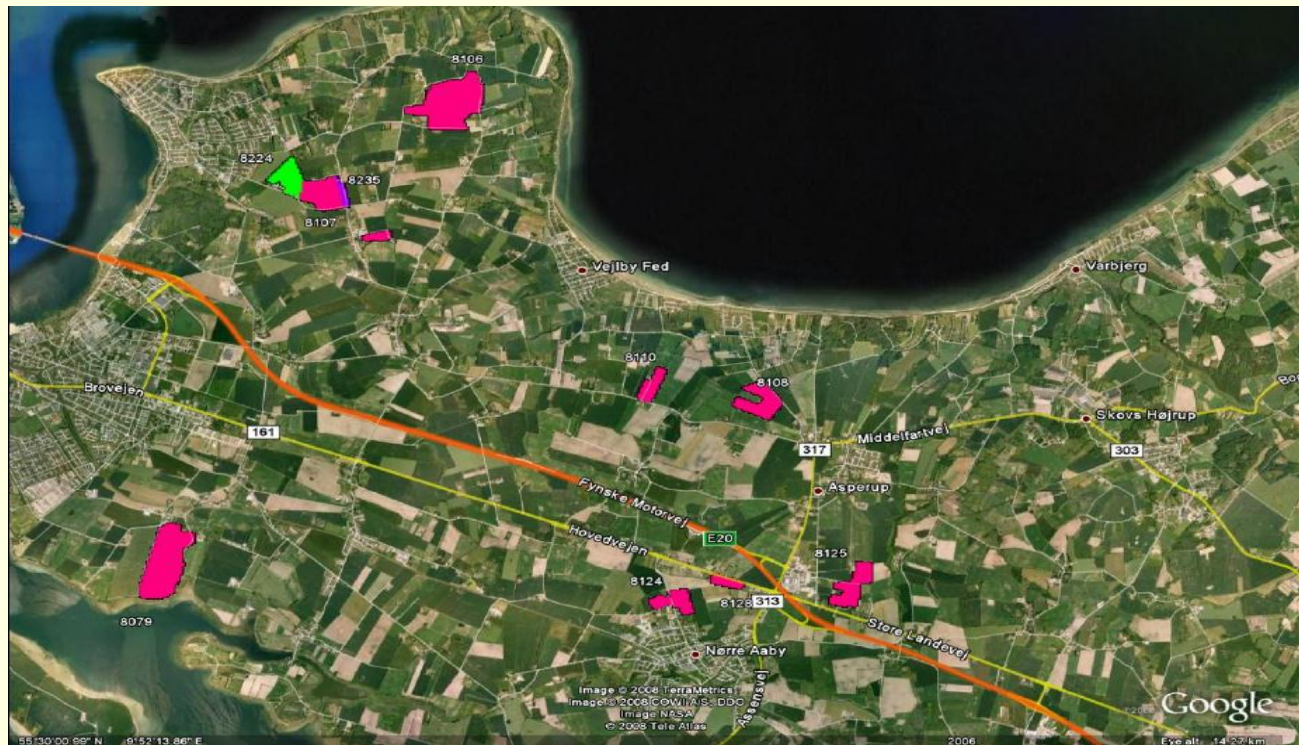
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- Spinach seeds have to be produced in the part of the World that has the best growing conditions, quality, yield and safety against a reasonable price. Here has Denmark a very strong position.
- It has been proven through the past 40 years that Denmark is a very important partner for spinach breeding companies to perform contract seed production of hybrid spinach.
- Many consumers, growers and seed companies are dependent on the Danish production of quality seeds. We are known for it and we are proud of it.
- We have to be open for new quality items like new seed disinfection techniques to reduce spreading of pathogens – starting with the stock seed!



# Can Denmark keep the position as the biggest spinach seed producer in the World?

1. In Denmark we have 450-500 spinach seed growers available.
2. We have a good system to control the isolations – Google Earth





# Can Denmark keep the position as the biggest spinach seed producer in the World?

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3. The income per ha for a farmer with spinach seed must be 75% till 100% higher compared to the growing of wheat and barley
4. Spinach seed production needs a special climate.
5. Which companies in Denmark can offer spinach seed production?
6. Who is breeding in spinach in Denmark?

# Can Denmark keep the position as the biggest spinach seed producer in the World?

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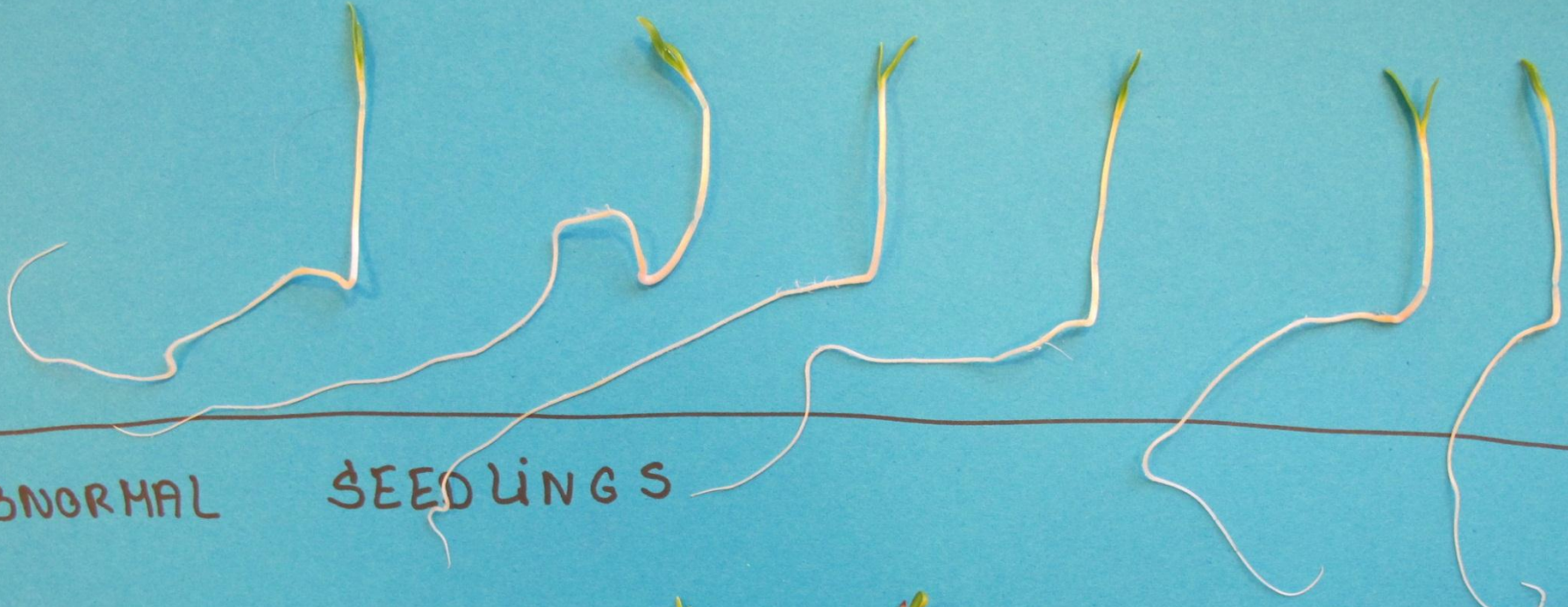
7. Contract seed production only for export

8. In Denmark we use modern technology

- communication (email, SMS, homepage)
- surveillance during the drying process both at the farmers property and at the seed company
- RFID-chips
- traceability
- in the field, on the drying floor and during seed processing

All this helps us to produce spinach seed with a physical purity of 99,99%, germination above 85% and a high genetic purity.

NORMAL SEEDLINGS



ABNORMAL SEEDLINGS



# Jensen Seeds A/S

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HOME

PROFILE

PRODUCTS

WAREHOUSE

PROCESSING

CONDITIONS

CONTACT

GET BROCHURE

SITEMAP



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Login Avlere

Login Customers

Velkommen/Welcome

Alle oplysninger er fortrolige!





















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## Reports

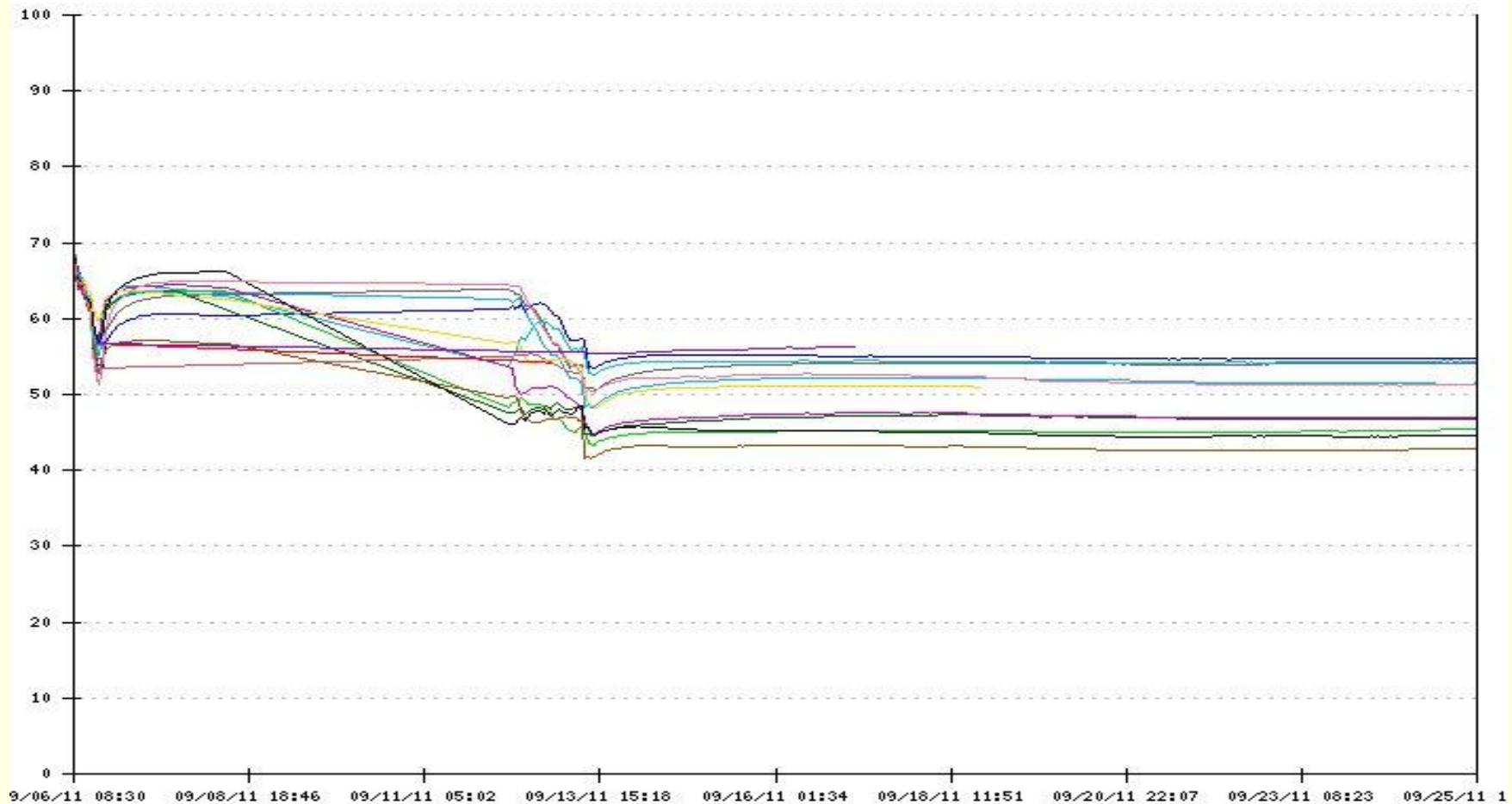
-  [CropPurity\\_2006.pdf](#)
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Logoff



# Can Denmark keep the position as the biggest spinach seed producer in the World?

“SensSeed” Relative humidity control online at farmers location



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## Pesticides:

- Who wants to go in the field with a hand cultivator?
- As long as we have our off-label system and dispensations for the use of proper plant protection products, then Denmark's future for spinach growing is secured
- Signum WG (Pyraclostrobin + Boscalid) – off-label  
Asulox (Asulam) - dispensation – removed from annex (1) 01.01.12  
Betanal (Phenmedipham) – off-label
- Command CS (Clomazon) – off-label
- The Danish Agriculture & Food Council in Copenhagen
- Faculty of Agricultural Sciences, Research Centre Flakkebjerg



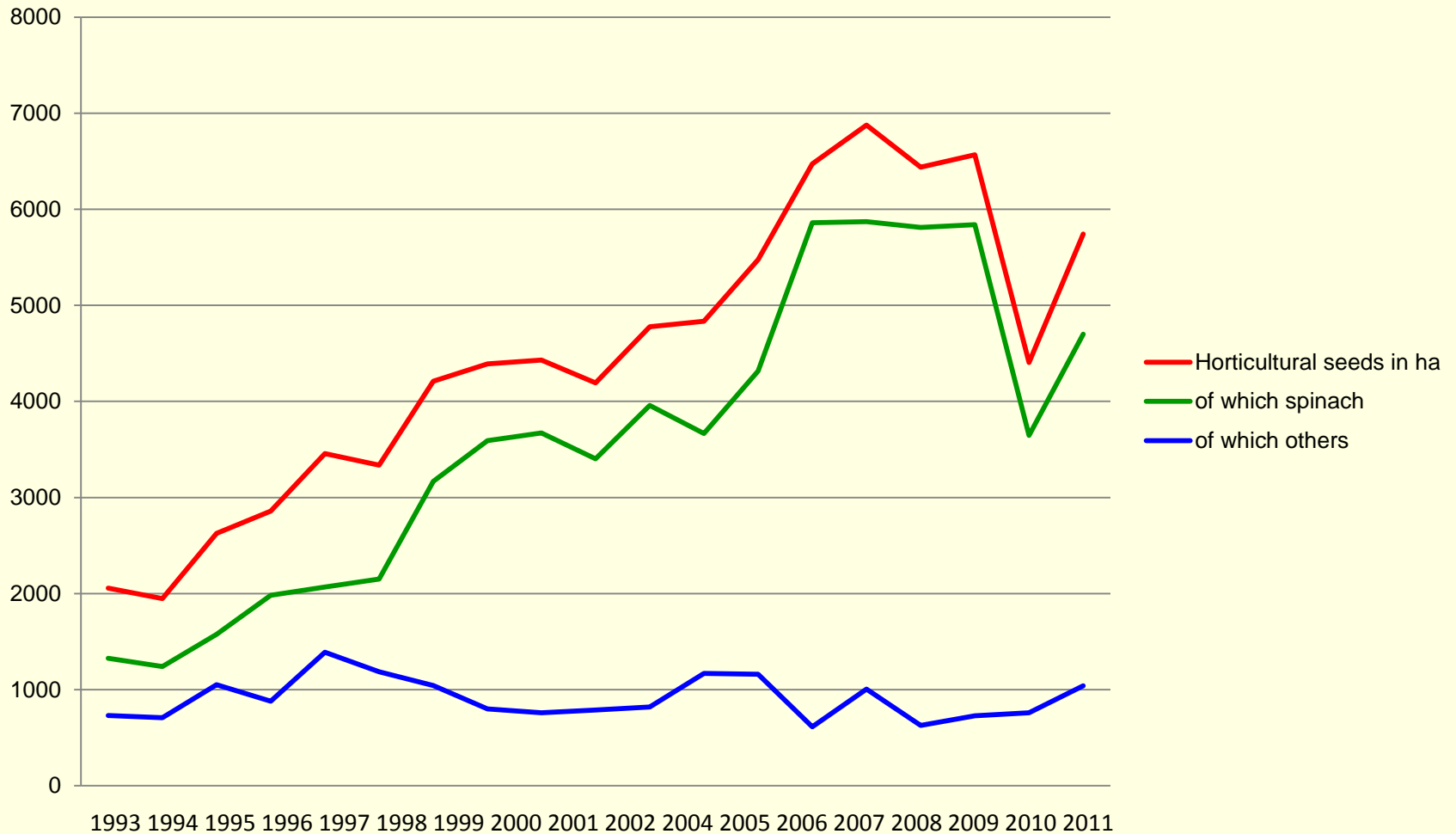
# Can Denmark keep the position as the biggest spinach seed producer in the World?

Soil map for Denmark



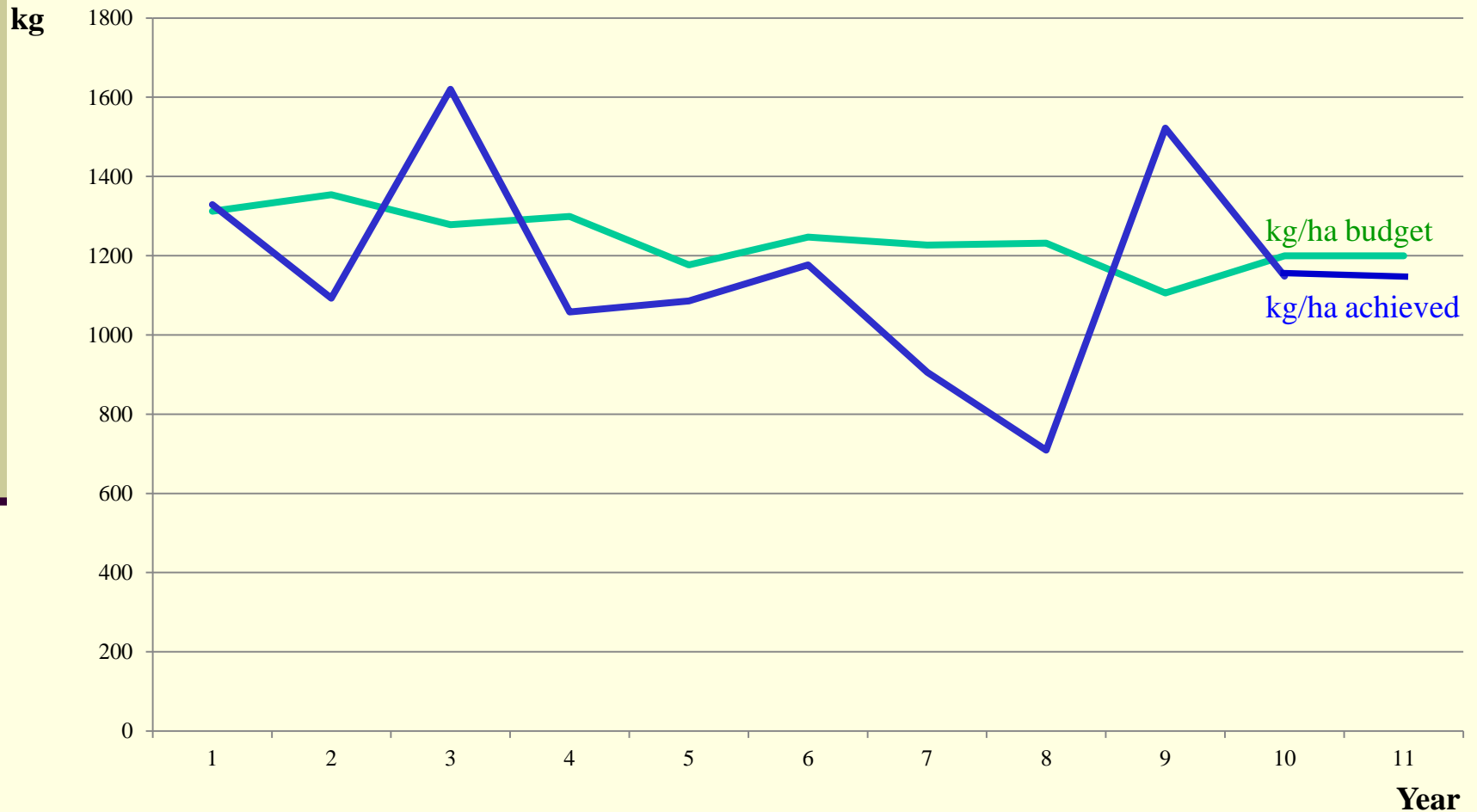
# Can Denmark keep the position as the biggest spinach seed producer in the World?

The Danish ha with vegetable, herb and flower seeds



# Can Denmark keep the position as the biggest spinach seed producer in the World?

## Hybrid spinach (kg/ha)



# Can Denmark keep the position as the biggest spinach seed producer in the World?

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Where do we grow spinach seeds in Europe?

- **Holland:** 750 ha in 2010?
- **France:** 581 ha i 2009 and 471 ha in 2010
- **Italy:** 385 ha in 2009 and 710 ha in 2010.
- **Germany:** 269 ha in 2009, 217 ha in 2010 and 299 ha in 2011
- **Sweden:** 400 ha?
- **Poland** 100 ha?
- **Denmark:** 5841 ha i 2009, 3647 ha in 2010 and 4701 ha in 2011.
  
- Production prices are on the same level in France, Germany, Holland, Sweden and Denmark.  
The prices are higher in USA, Chile, New Zealand and lower in Italy and China.

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Facts that we have no influence on:

- Wheat and barley prices
- Weather
- Prices for land
- Currency exchange market
- Interest

# Can Denmark keep the position as the biggest spinach seed producer in the World?

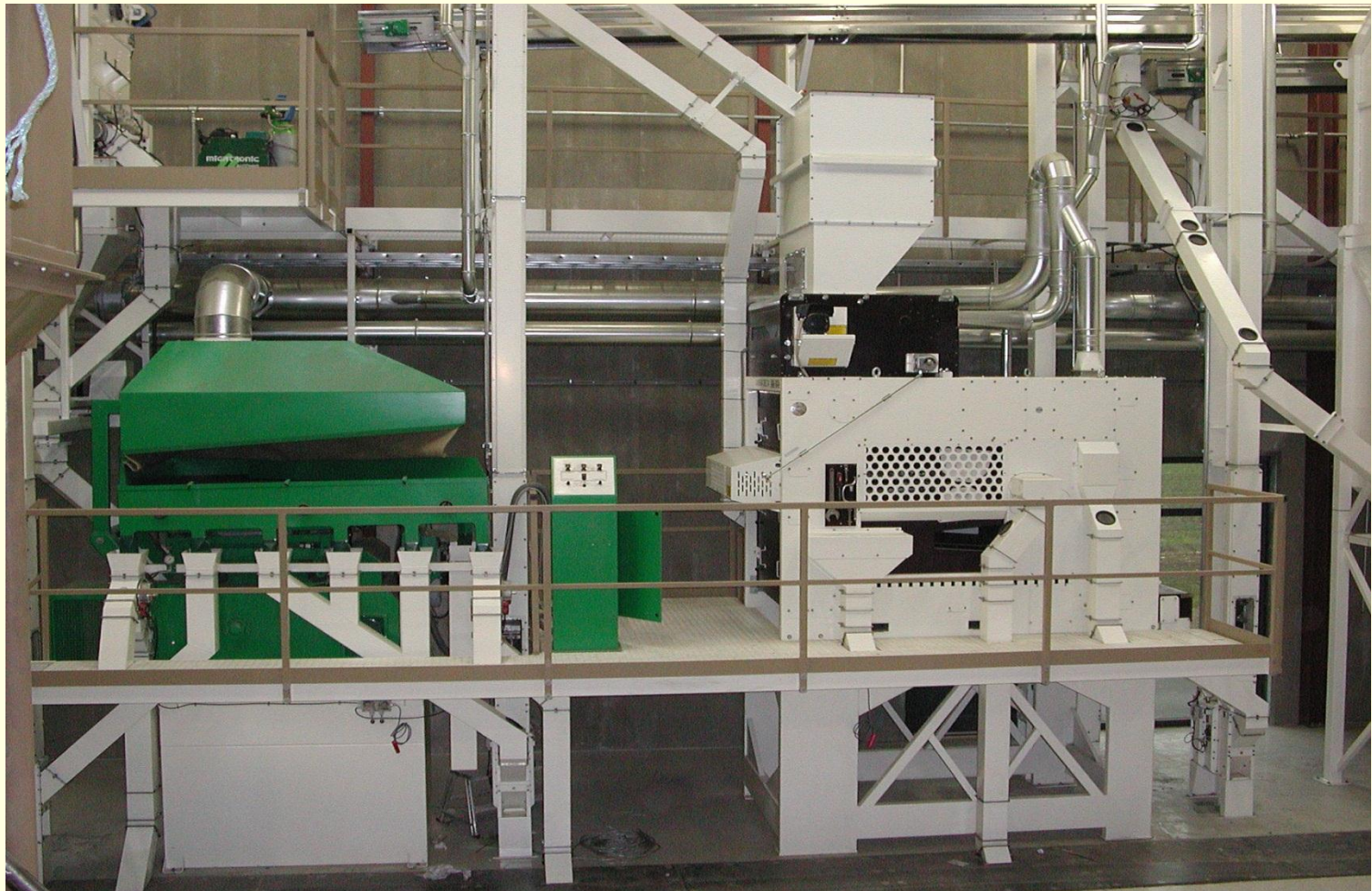
Seed processing can do a lot, but ...





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## Grading and sizing



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Blending of a lot after processing to get a homogeneous seed quality





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## Seed drying



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Packing in tri-wall boxes and PP/PE bags



MC% 7,8 or RH % 35 with packing in plastic



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## Hybrid spinach in Germany



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## Hybrid spinach in New Zealand





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Hybrid spinach – late variety – Denmark





# Can Denmark keep the position as the biggest spinach seed producer in the World?

Hybrid Spinach – oriental type - Denmark



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Monoecious male parent  
with high male sex  
expression = good





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Field inspection by our customer...



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Hybrid spinach – Germany – male line removed





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When you can not row cultivate you can use 2 herbicides in one proces. Asulox and Basta in spinach





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## Effect of fungicide control



# Can Denmark keep the position as the biggest spinach seed producer in the World?

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How do we control pathogenes?

- Crop rotation – 5 years minimum
- Soil sample control
- Proper seed treatment of the stockseed
- Use of the correct fungicides during growth (triazoles and strobilines)
  - 1. with pollen release
  - 2. main flowering
  - 3. end of flowering
- Seed disinfection by the customer
- Hot water, steam, washing
- Seed treatment

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What kind of diseases can be found in Denmark?

- Fusarium oxysporum
- Verticillium dahliae
- Cladosporium spp.
- Stemphyllium spp.
- Rhizoctonia solani
- Phytium spp.
- Colletotrichum spp.
- Downy Mildew (*Peronospora farinosa* f. sp. *Spinaciae*)
- Nematodes



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Hybrid spinach – off types





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Hybrid spinach – quality control





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Baby leaf production in Denmark 2011





# Can Denmark keep the position as the biggest spinach seed producer in the World?

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## Baby leaf production in Denmark 2011





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It is not only spinach that color's the land scape in Denmark. We also have Chrysanthemum and Calendula!



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## Economy

- The Danish vegetable seed companies work nearly only with contract seed production with an export value between 20-40 million Euro.
- Gross price per ha for a farmer must be minimum 2.800 Euro.
- Yields can have a variation of 50%
- Prices will follow the level of the wheat and barley market x 2

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Who are involved in contract seed production and breeding of spinach in Denmark

- L. Dæhmfeldt/Maribo Seed = Syngenta – Switzerland
- Vikima Seeds A/S – Japan
- Jensen Seeds A/S – Denmark
- AdvanSeed – Denmark (breeding activities)



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Which are the main contract countries for the Danish spinach seeds?

Approx. 100% export

- Holland
- USA
- Japan
- France
- Korea

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Conclusion on the topic:

1. **Yes**, if Denmark is allowed to use proper herbicides and fungicides.
2. **Yes**, because Denmark has good climatical growing conditions for spinach - good soil, sufficient rain and *long days*
3. **Yes**, because Danish farmers are high skilled and has top mechanization
4. **Yes**, because Danish seed companies have very good processing facilities
5. **Yes**, because Denmark has a very good infrastructure

**Can Denmark keep the position as the biggest spinach seed producer in the World?**

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**And because Denmark  
will fight for it!**



Thank you for your interest!

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Jensen Seeds A/S - *Henning van Veldhuizen*