

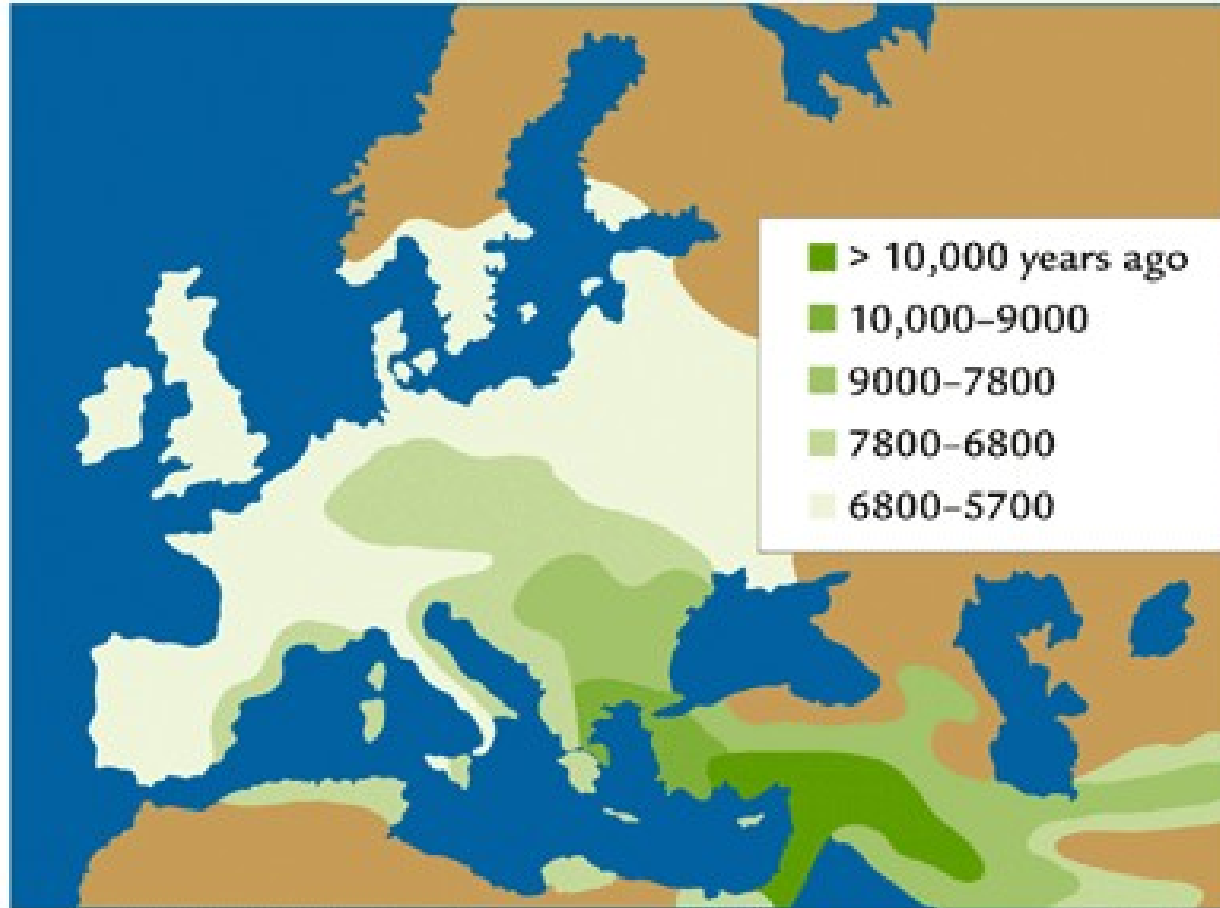
Organic plant breeding



“Farmers get away day”
20-21st February, 2025
Anders Borgen

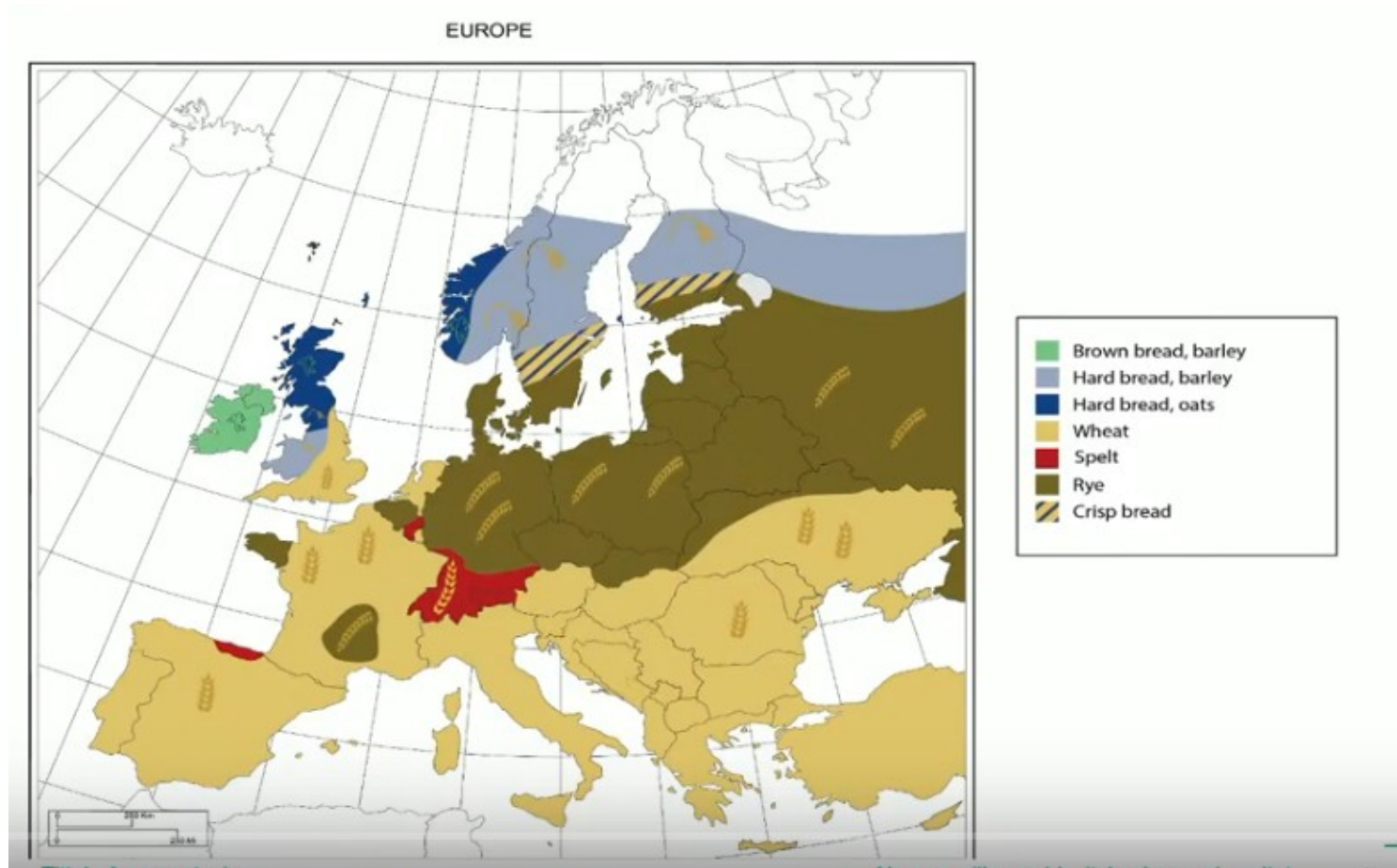
Do heritage grain really thrive and adapt?

Natural adaptation





The rye belt of Europe



- Seed crops naturally adapt and increase grain yield when changed into a new environment.
 - However, it may take millennia, but plant breeding can speed up the process

Adaptation processes of rye

- Rye is cross pollinating
- Annually increasing plant height
- Annually decreasing seed size

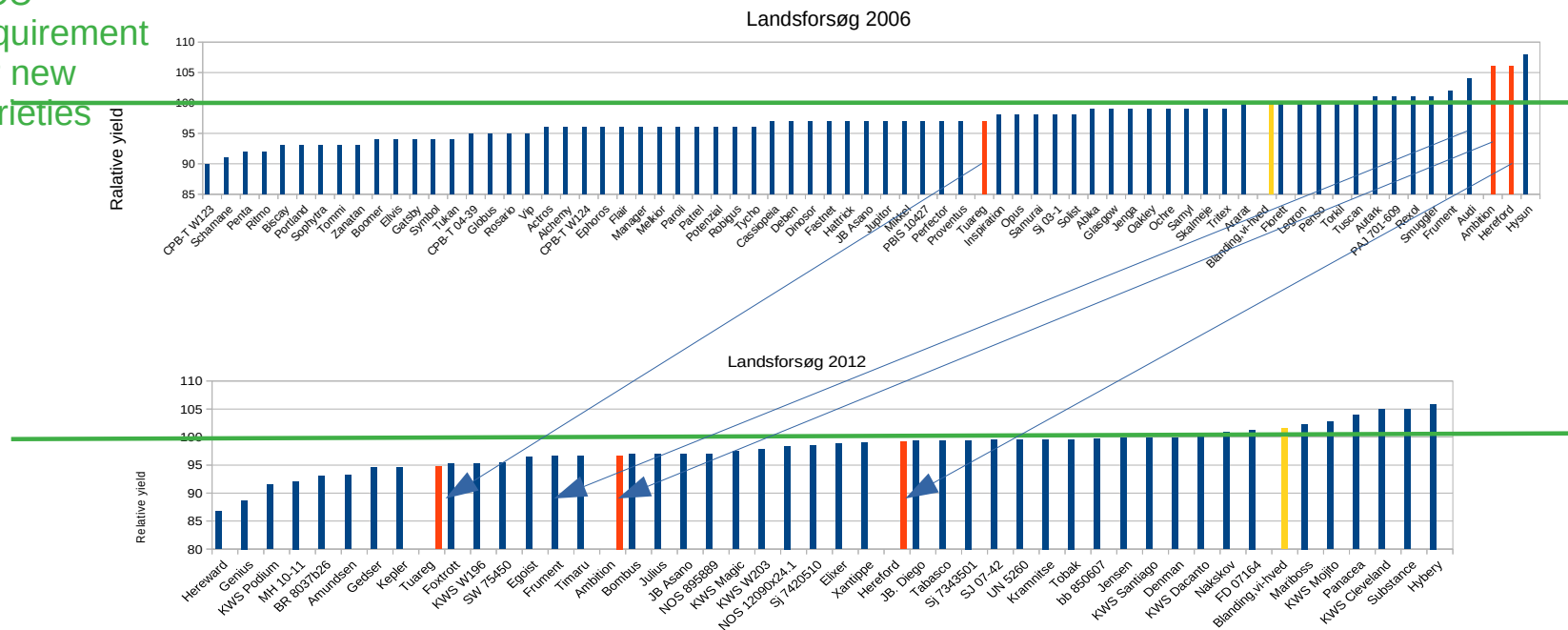
- Populations and cross pollinating varieties adapt/evolve
- Pure line varieties do (almost) not

How old are heritage grain?

- Squarehead wheat from 1868
- Chevalier barley came to Denmark in 1920. Is it alien or heritage?
- First translocations in 1930'ties
- 'Norin 10' with dwarfing genes from 1939

Yield of Danish wheat varieties

VCU
requirement
for new
varieties

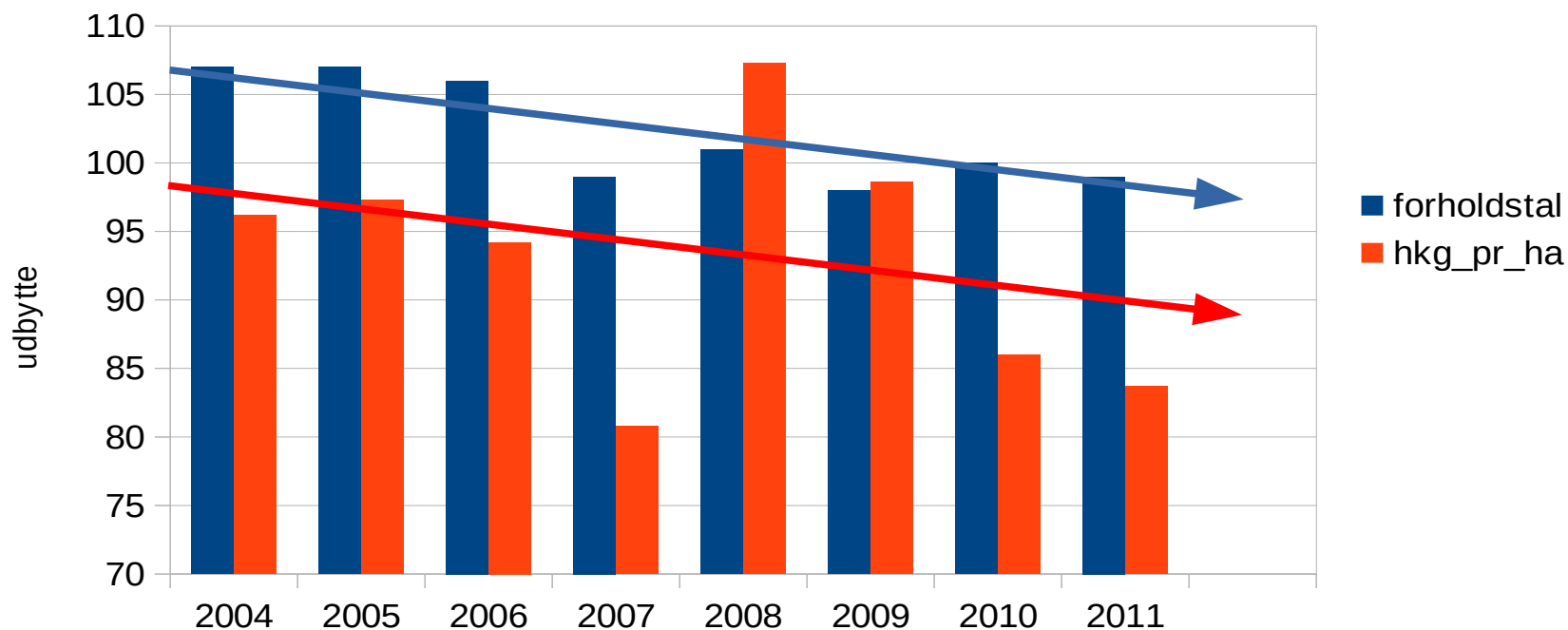


Conclusion: Huge differences in yield in the Danish variety list of winter wheat
Yield seems to decrease over time

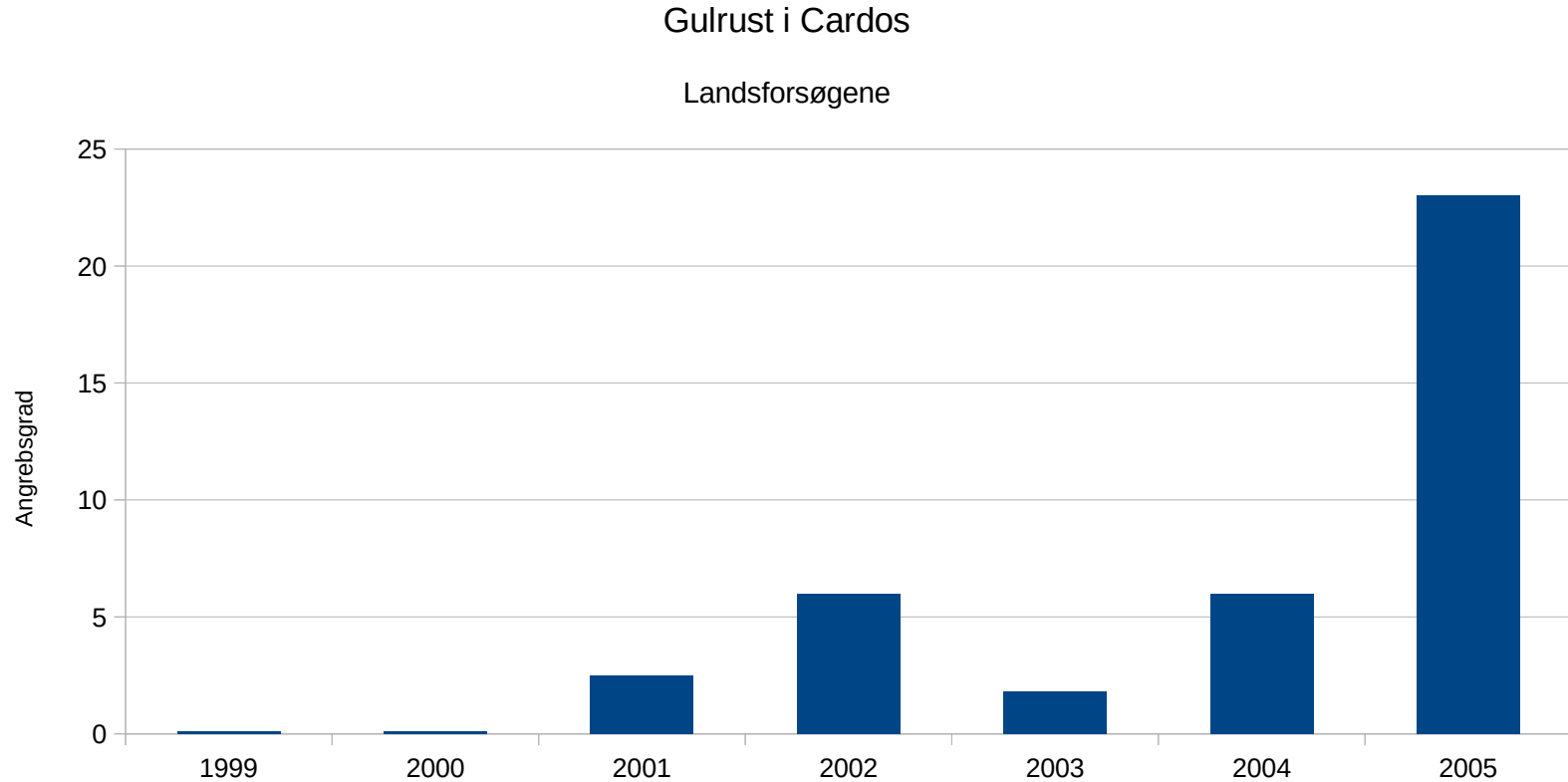
Adaptation (yield development) in winter wheat 'Ambition'

Ambition, vinterhvede

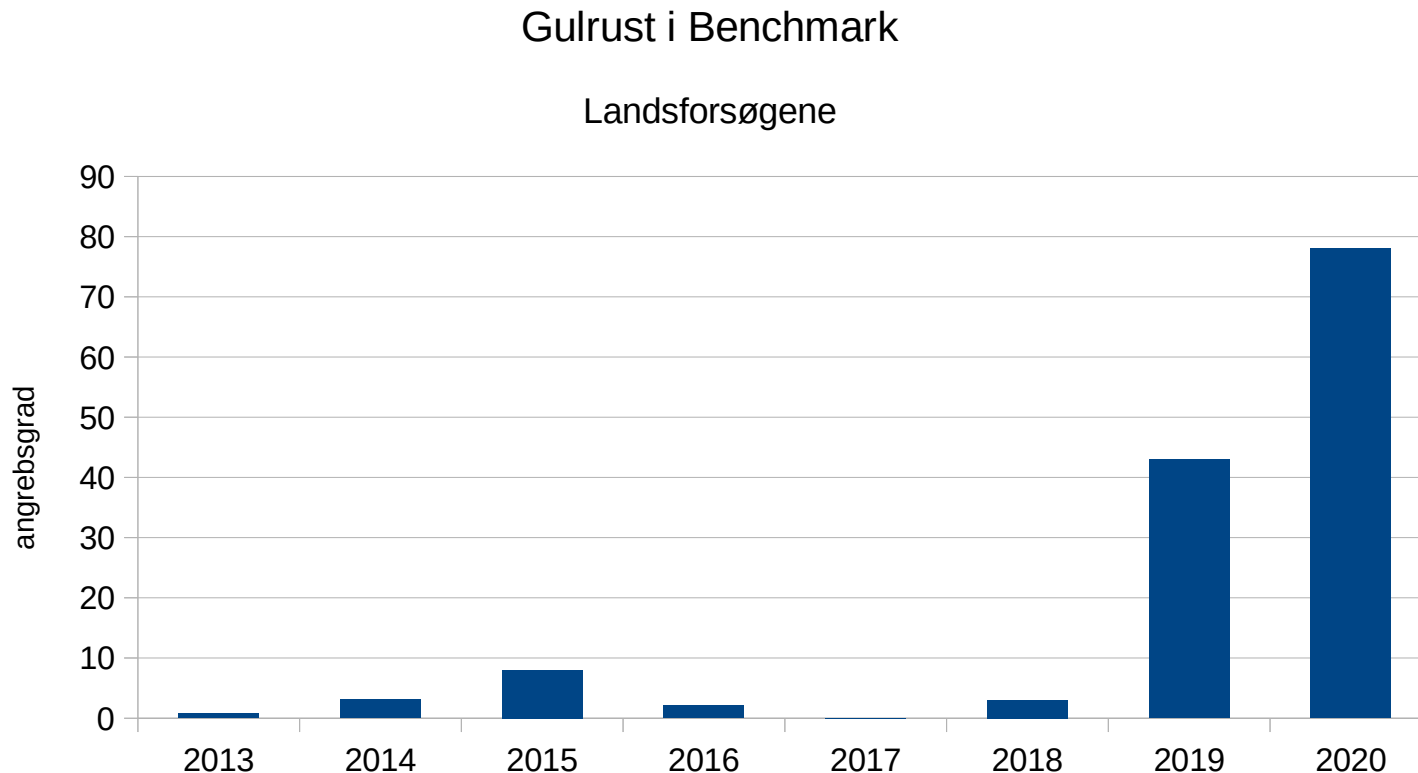
Landsforsøgene



Stripe rust in winter wheat 'Cardos'



Stripe rust in winter wheat 'Benchmark'



Plant pathology lesson 1A



Monogenic
resistance is a
lock that can
be unlocked

Plant pathology lesson 1A



Monogenic
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Virulent
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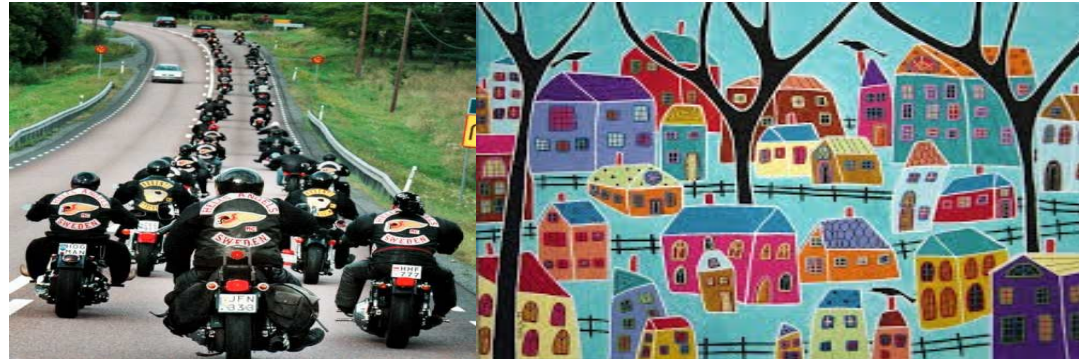
Plant pathology lesson 1A



Monogenic resistance is a lock that can be unlocked



Virulent pathogens multiply if there is a selection pressure



Plant pathology lesson 1A

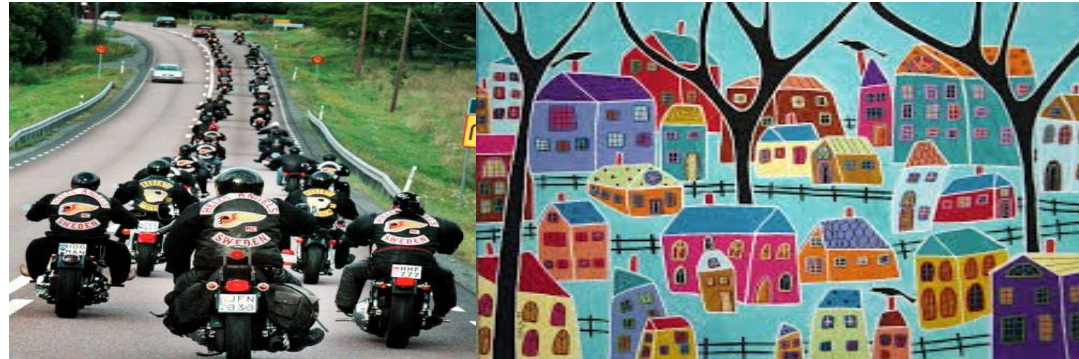


Monogenic resistance is a lock that can be unlocked

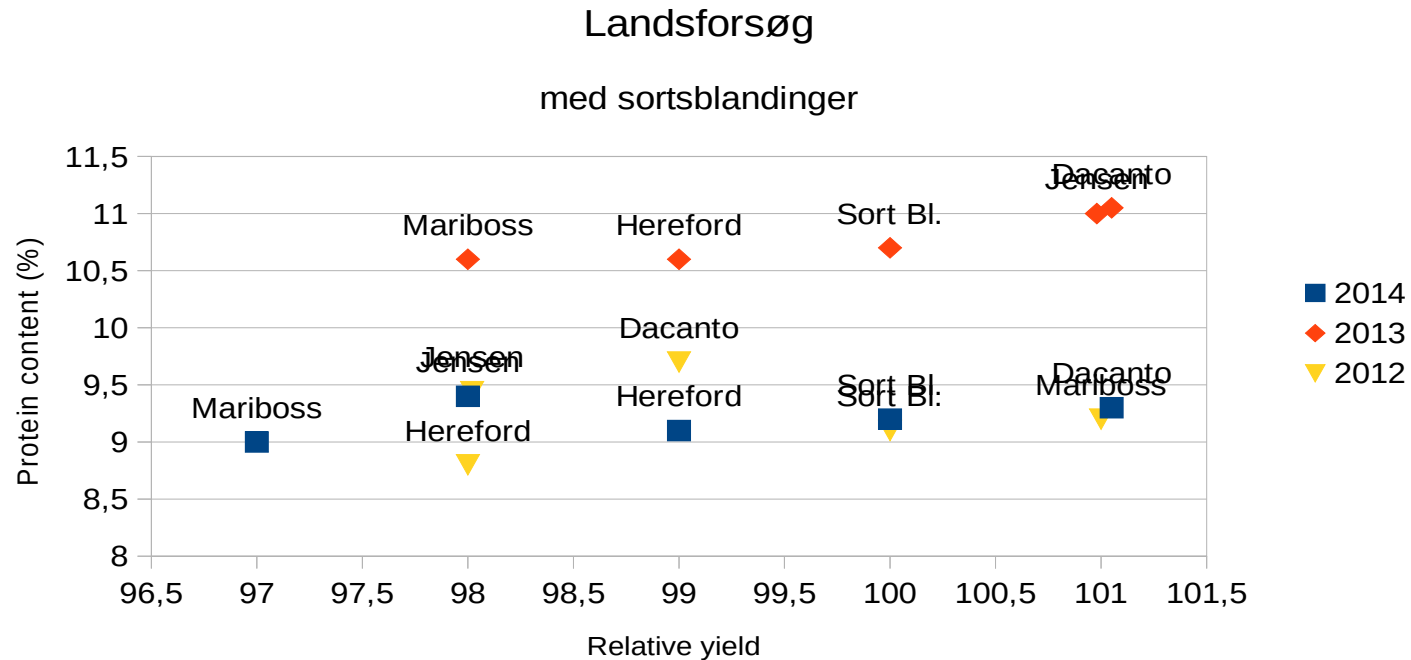
If all computers in a company uses the same password, you will end up in trouble. It is elementary dear Watson!



Virulent pathogens multiply if there is a selection pressure



Varieties and variety mixtures



Conclusion: You never know which variety will be the best,
but the variety mixture is always second best, and better than the mean of the pure lines

Why do we not have organic plant breeding?

- Flat rate administration cost is favouring large scale markets. Volume based costs favours market diversity.
- Post payment systems (royalty based) is favouring large scale markets. The bigger, the more profitable.
 - No variety protection on OHM and conservation varieties
- Pre-payment (project based) can be targeted desired specific problems, such as organic farming.

Is alternative seed systems legal?

- EU seed legislation
 - All seed shall be certified (almost all)
- Plant treaty (ITPGRFA)
 - It is mandatory for national authorities to give room for *in situ* conservation
- UNDROP (Human rights over-rules other legislations)
 - Farmers have the right to sell their own seed and maintain their seed systems

Conclusion: Alternative seed systems are not only legal, but actually mandatory in all countries

Challenges for Fielden

- No legal problems. All can be solved within closed circles.
- Problems regarding maintaining varieties free from other species and seed borne diseases often surprises

Seed borne diseases

- Barley
 - Loose smut
 - Stripe disease and net-blotch
- Rye
 - Stem smut (*Urocystis oculta*)
 - Ergot
- Wheat/spelt/emmer
 - Common bunt





Tank you for your attention

Potential whisky crops

- Malting barley
- Non GN barley
- Naked barley
- Wheat
- Spelt
- Emmer
- Einkorn
- Makha
- Foxtail millet
- Proso millet
- Oat
- Lopsided black oat
- “*Avoid food waste whisky*” (bran, bread)