The impacts of a local plant breeding program
– barley yields in Trøndelag

Morten Lillemo, Lars Reitan and Åsmund Bjørnstad
Increasing impact of plant breeding on barley yields in central Norway from 1946 to 2008

M. Lillemo¹, L. Reitan²,³ and Å. Bjørnstad¹

¹Department of Plant and Environmental Sciences, Norwegian University of Life Sciences, PO Box 5003, NO-1432 Ås, Norway, E-mail: morten.lillemo@umb.no; ²Grainor AS, Hommelstadvegen 60, NO-2322 Ridabu, Norway; ³Grainor branch Holthe: Volhaugvegen 97, NO-7650 Verdal, Norway

With 4 figures and 4 tables

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- A study sponsored by the Norwegian Council of Genetic Resources
- Based on
  - Annual statistics on yield and acreage from Statistics Norway
  - Official variety trials
  - Local knowledge

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Barley yields in Trøndelag
Barley production in Trøndelag

- Northernmost barley production area in Norway
- 63-65°N
- 45 000 ha
- Average yield 3-4 t/ha

- Spring barley
- Both 2-row and 6-row
- Utilized for animal feed
Major production constraints

- Short growing season and rather low temperature during mid-summer
- High humidity – good conditions for foliar fungi
- Lodging problems
- Difficult harvest conditions – 20 days with rain in September
Major barley production trends 1946-2008

Yield increase of 70%

Barley area has tripled
Major barley production trends 1946-2008

Yield increase of 70%

Fertilizer consumption
Three eras of barley production

1946-1960: "The self-binder era"
Few new varieties and little yield increase

1960-1980: "The first combine era"
Difficult harvest conditions and unstable yields

1980-2008: "The modern varieties era"
New and better adapted varieties
Relative yields of varieties

Local varieties

- Edel
- Tiril
- R² = 0.94
- y = 0.79x - 1442.31
- R² = 0.85
- y = 0.25x - 374.36

Year of release

Maskin
- Varde
- Herse
- Herta
- Mari
- Birgitta
- Gunilla
- Yrjar
- Arve
- Tunga
- Olsok
- Gaute
- Tiril
- Lavrans

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How much of the yield progress is genetic?

1946-1960: "The self-binder era"  29%

1960-1980: "The first combine era"  43%

1980-2008: "The modern varieties era"  78%
General characteristics of the local six-row varieties from Trøndelag

- Earliness
- High yield potential
- Straw stiffness
- Sprouting resistance
- Disease resistance
  - *Rhynchosporium secalis*
  - *Drechslera teres*
  - *Ramularia collo-cygni*
- Wide adaptation
  - South-eastern Norway, Finland, Estonia, Iceland
Economic impact

- Genetic yield improvements amount to an extra producer surplus of 13 million NOK per year.
- Breeding expenditures of 6-8 mill NOK profitable even after adjusting for reduced barley prices and time lag of 10-15 years (Romstad & Stokstad, 2005).
- The actual expenditures has been estimated to 1.5 mill NOK per year.
Summary

- Barley yields increased by 70% from 1946 to 2008
  - Improvements in farming practices important in the beginning of the time period
  - Genetic improvements most important from the 1980s
- Introduction of the combine harvester in the 1950s required adapted varieties
- Intensified breeding efforts from the 1970s has paid off
  - Early six-row varieties with high yield potential and good disease resistance
  - Secured barley production as a reliable option for farmers in Trøndelag

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