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MDCCCLIX

Wheat Production and Quality research in Norway

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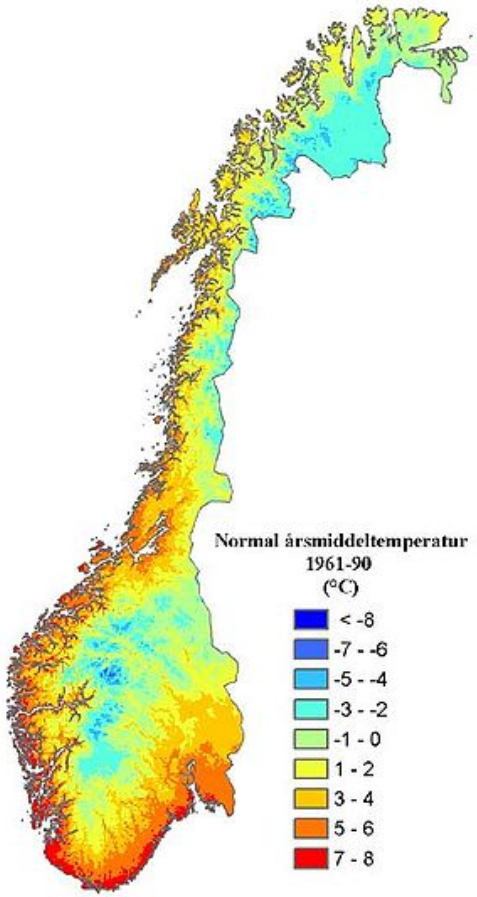
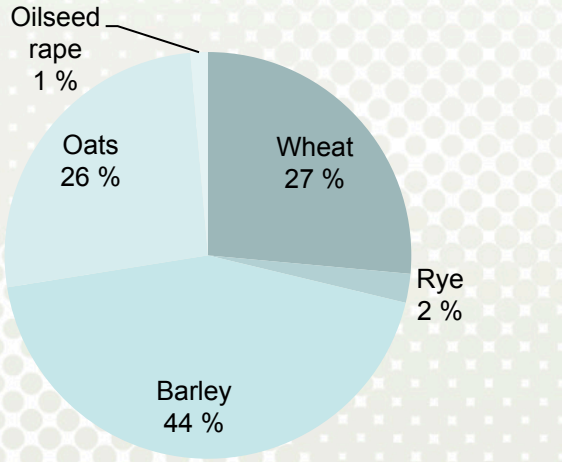
Cereal Production in Norway – key numbers



Area of agricultural land: 1 mill ha
64% grassland
31% cereals and oilseed rape
Agriculture contributes to 2,3 % of employment
0,5 % of BNP

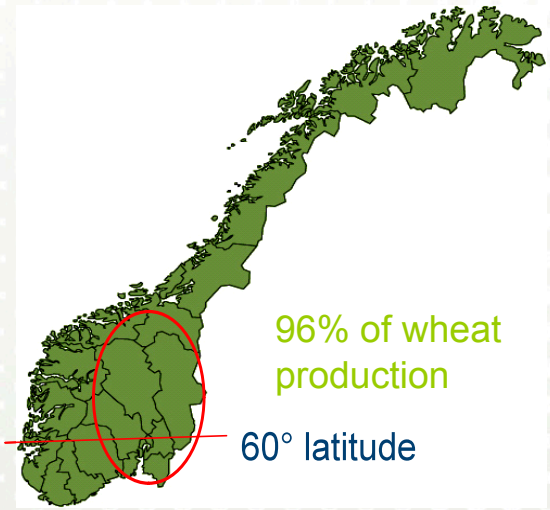


Area of cereals and oilseed crops 2009

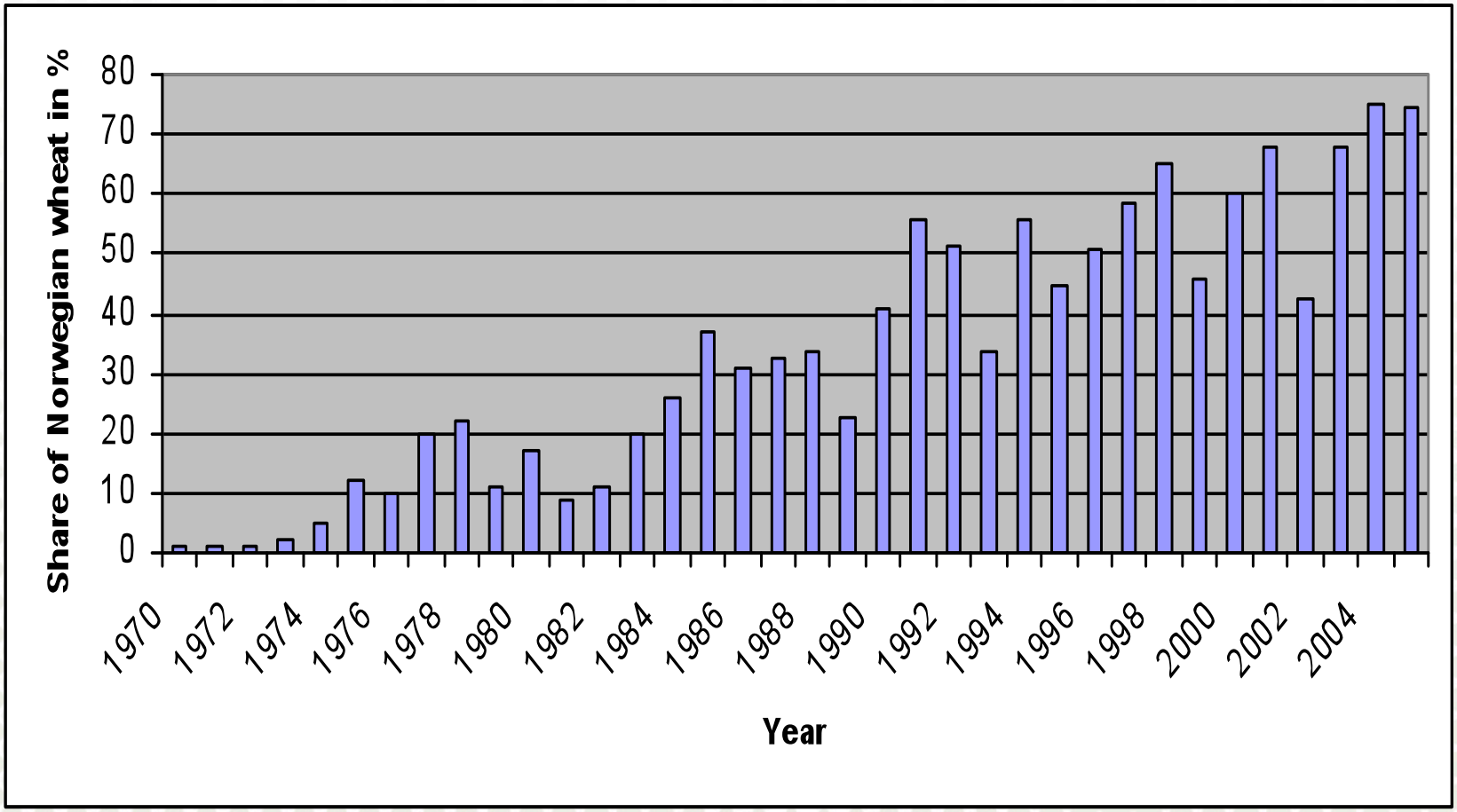
Norwegian wheat production

- Norwegian wheat production ~ 460 000 ton
- Closed marked – all wheat passing food grade will be used
- From 100% import to

  ~70% Norwegian wheat in bread flour
- Challenge:
  - variable quality from year to year
  - variable quality between batches within year



Share of Norwegian wheat in the domestic consumption of wheat flour



From almost solely use of imported wheat to a large part Norwegian!

Main quality challenges in wheat

- Pre-harvest sprouting
- Gluten quality
- Physical grain quality
  - Schrivelled grains and low test weight
- Fungal diseases
  - Fusarium species, mycotoxins
  - Others: Mildew, septoria-species

Quality requirements for bread wheat

- more than 9.7 % protein
- falling number > 200
- high test weight, well-developed grains, low amount of shrunken kernels, high flour yield
- no mould accepted
- < 2% of other cereal species

Wheat - classes

Strong protein quality class 1	Strong protein quality class 2	Strong protein quality class 3	Strong protein quality class 4	Weak protein quality
Bastian (SW)	Bjarne (SW)	Zebra (SW)	Bjørke (WW)	Mjølner (WW)
	Berserk (SW)	Demonstrant (SW)	Magnifik (WW)	Finans (WW)
			Olivin (WW)	

Intention: Stable flour of desired qualities

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SW= Spring wheat
WW=Winter wheat

Research on wheat quality in Norway

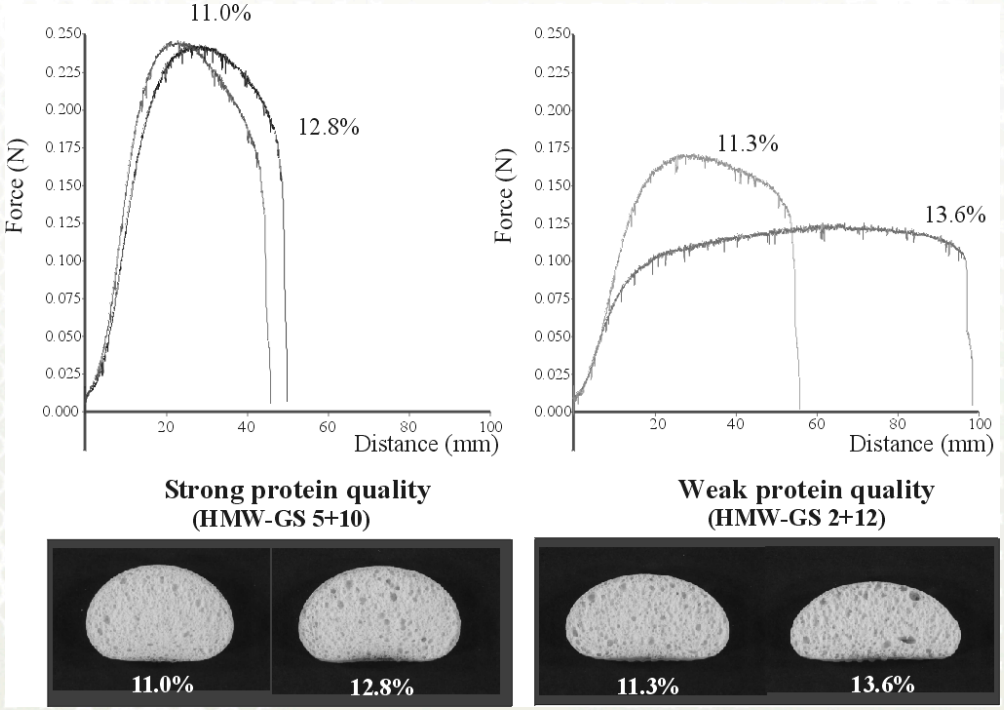
- Gluten quality genes – improvements of baking quality in cultivars
  - Composition of gluten proteins
    - High-molecular weight glutenin subunits
    - Low-molecular-weight glutenin subunits
- Gluten structure and analysis
  - Rheological analyses (large and small deformation rheology)
  - Polymerisation and size distributuon
- Environmental effects on gluten quality
  - Fertilisation (N and S)
  - Effects of variation in weather parameters during grain filling
- Endosperm hardness – mutation in the puroindolins espressing hard and soft wheat

Gluten quality of Norwegian cultivars introduces in the periode 1900 - 2000.

(Færgestad unpublished)

Relation dough rheology – baking quality

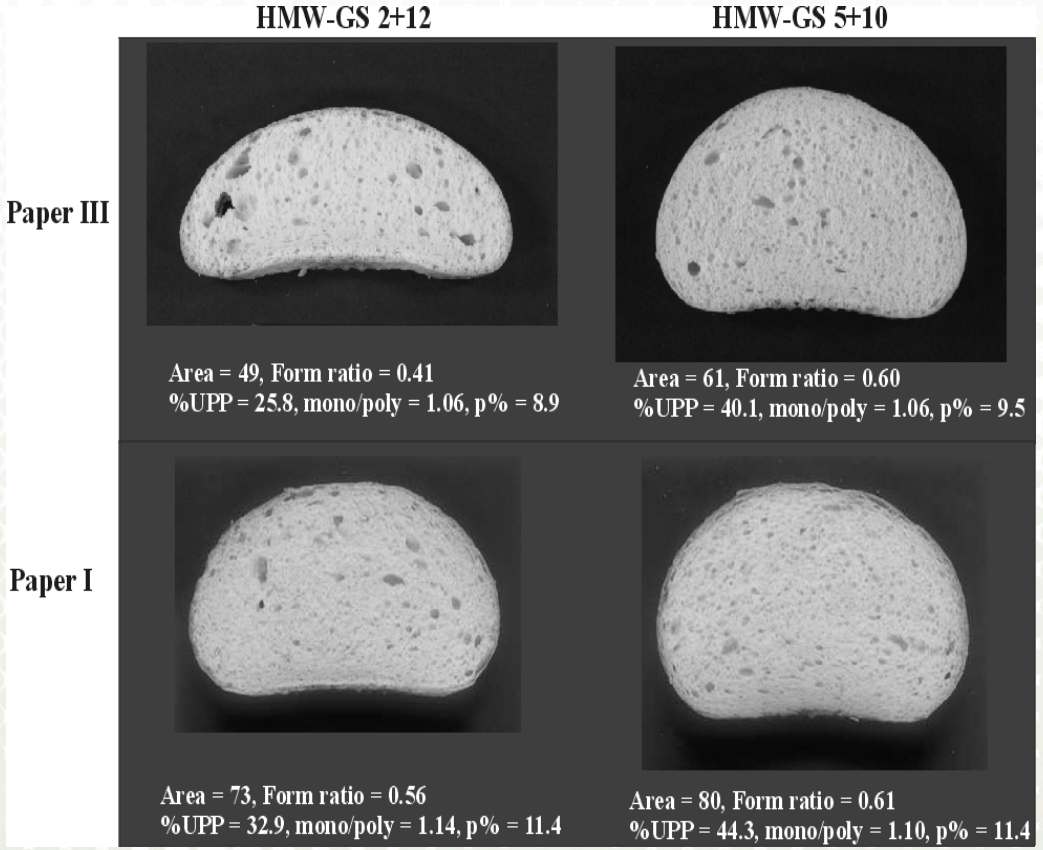
- Kieffer dough and gluten extensibility rig
- Extensibility (Ext)
  - Expansion
- Resistance to extension (Rmax)
  - Keep shape
  - Hinder rupture of gas cell membrane



(Aamodt 2004)

Effect of protein quality

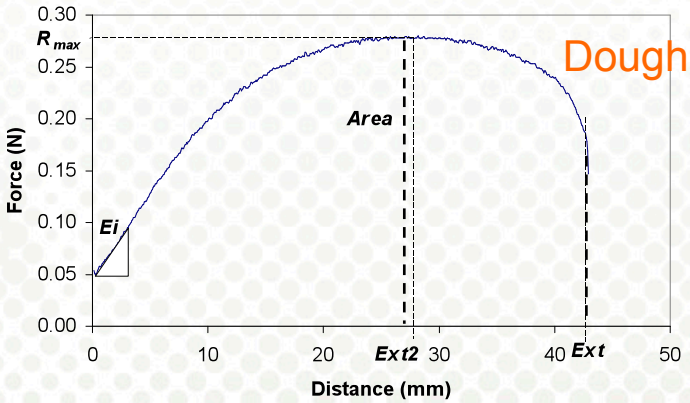
- Wheat flour with HMW-GS 5+10 higher %UPP
- Hearth bread baked from flour with HMW-GS 5+10 larger area, volume and form ratio

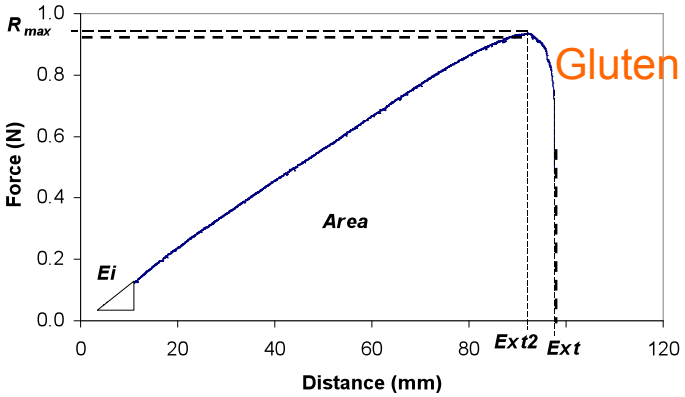


(Aamodt 2004)

Load extension meters

Kieffer-rig





Maximum resistance to extension = Rmax
Extensibility = Ext
Initial slope = Ei (Kieffer-rig)

(Tronsmo et al 2003)

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