Growing high-quality wheat

influencing factors and opportunities

Estonian Chamber of Agriculture and Commerce - Grain Forum 2026

Põltsamaa Castle, Magnus Hall

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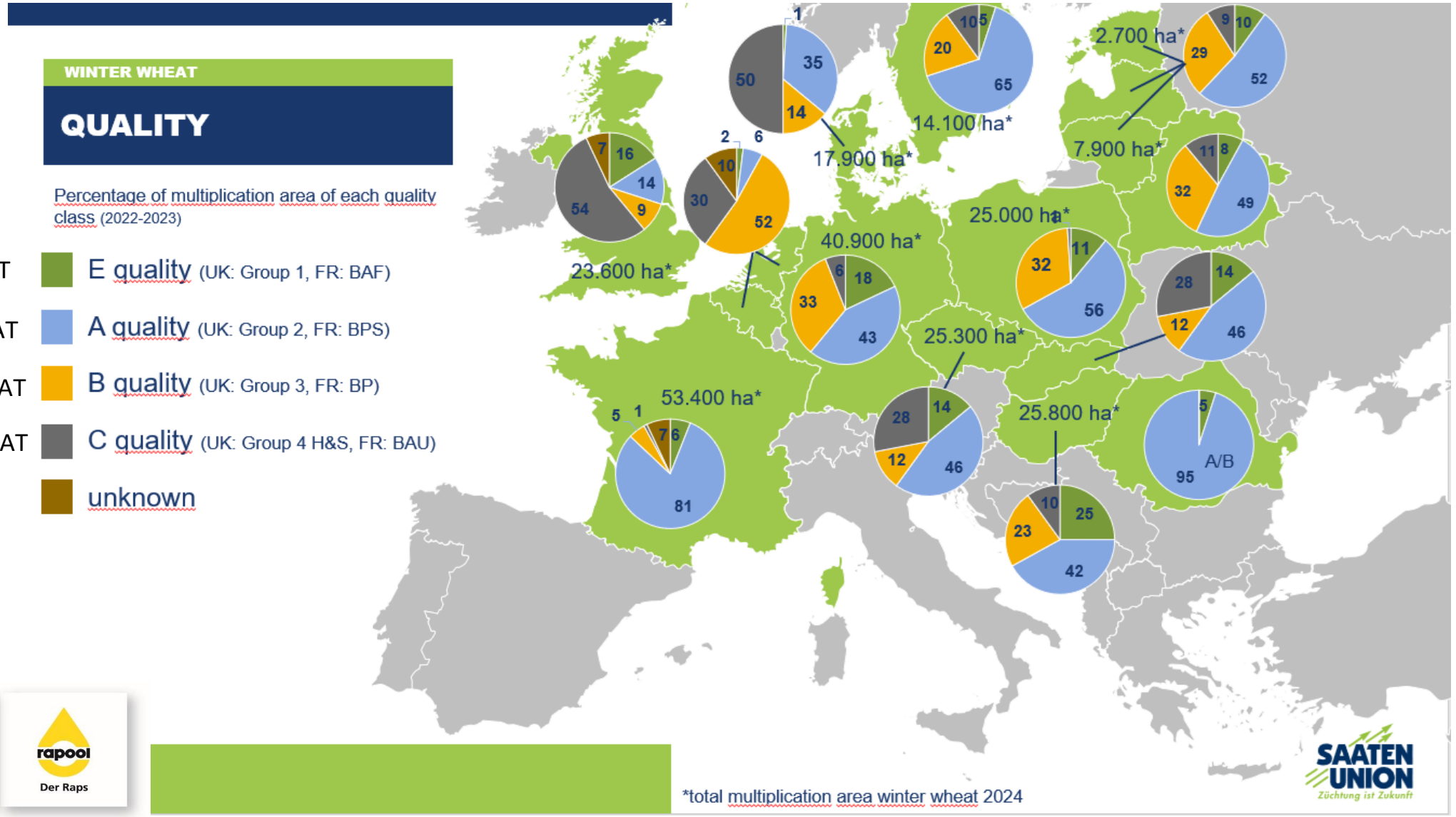
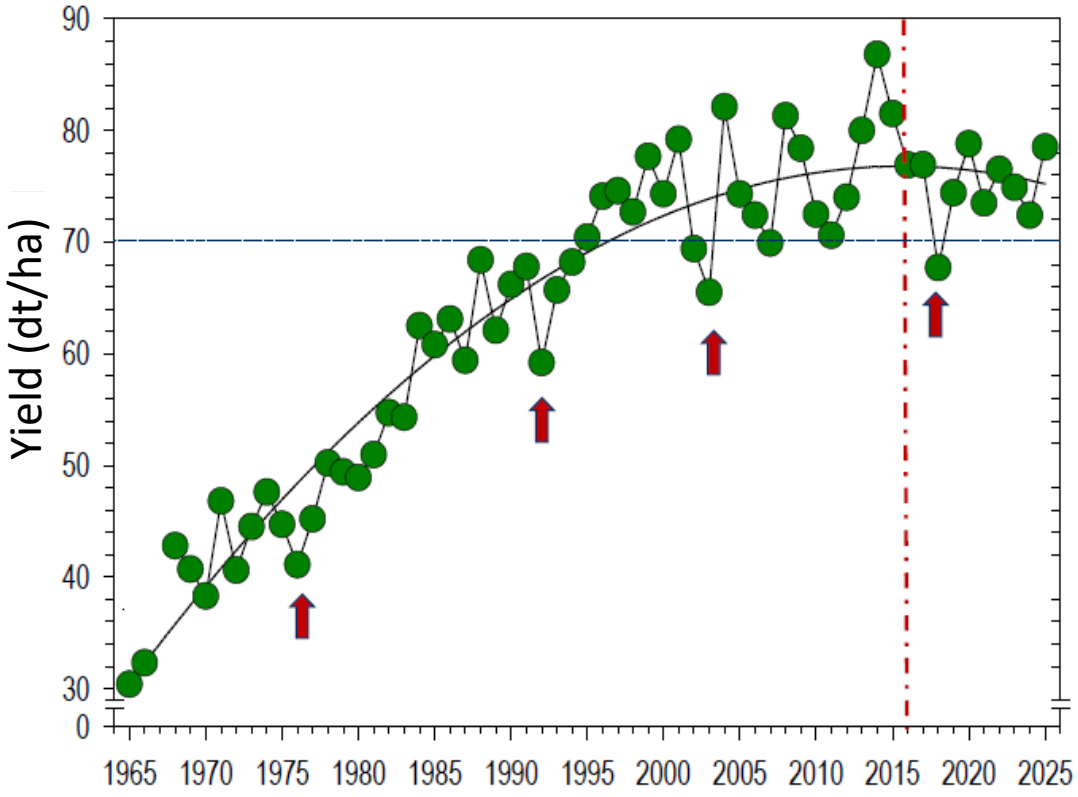
Seed production areas of winter wheat in important European countries

In Estonia

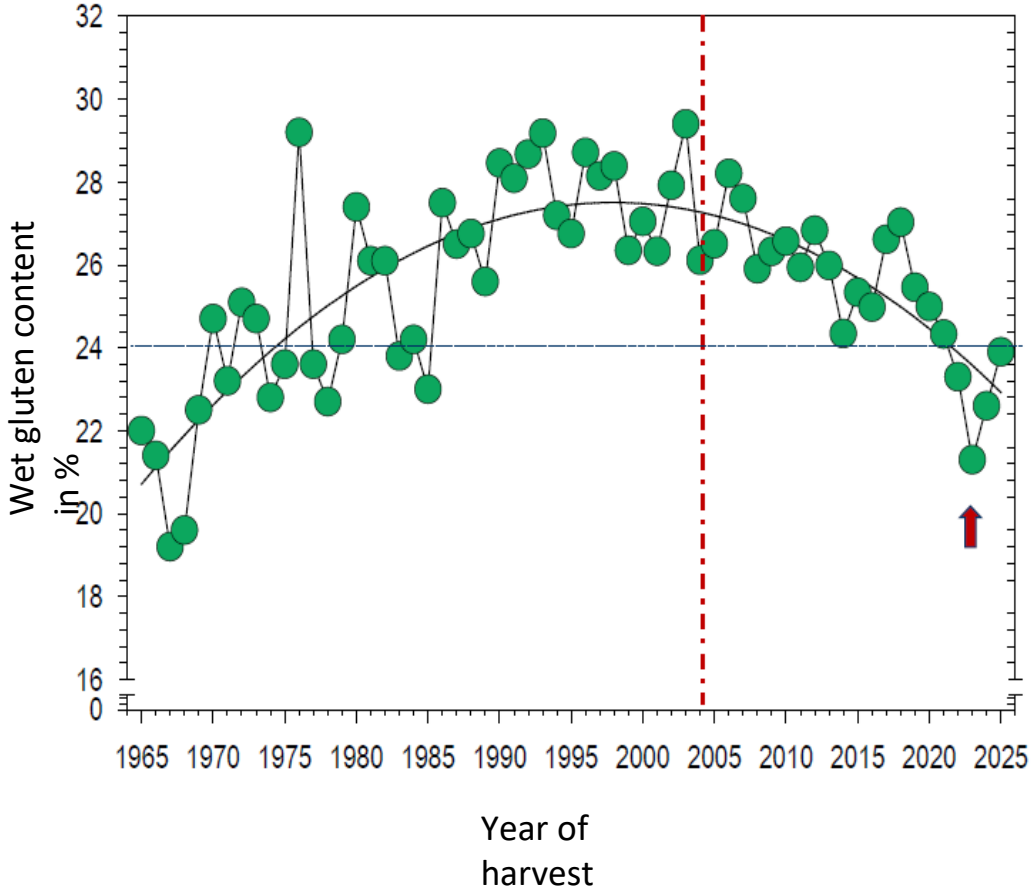


Development of wheat yields and gluten content in Germany over the entire federal territory

(BBE 1965 – 2025)



(BBE 1965 – 2025)



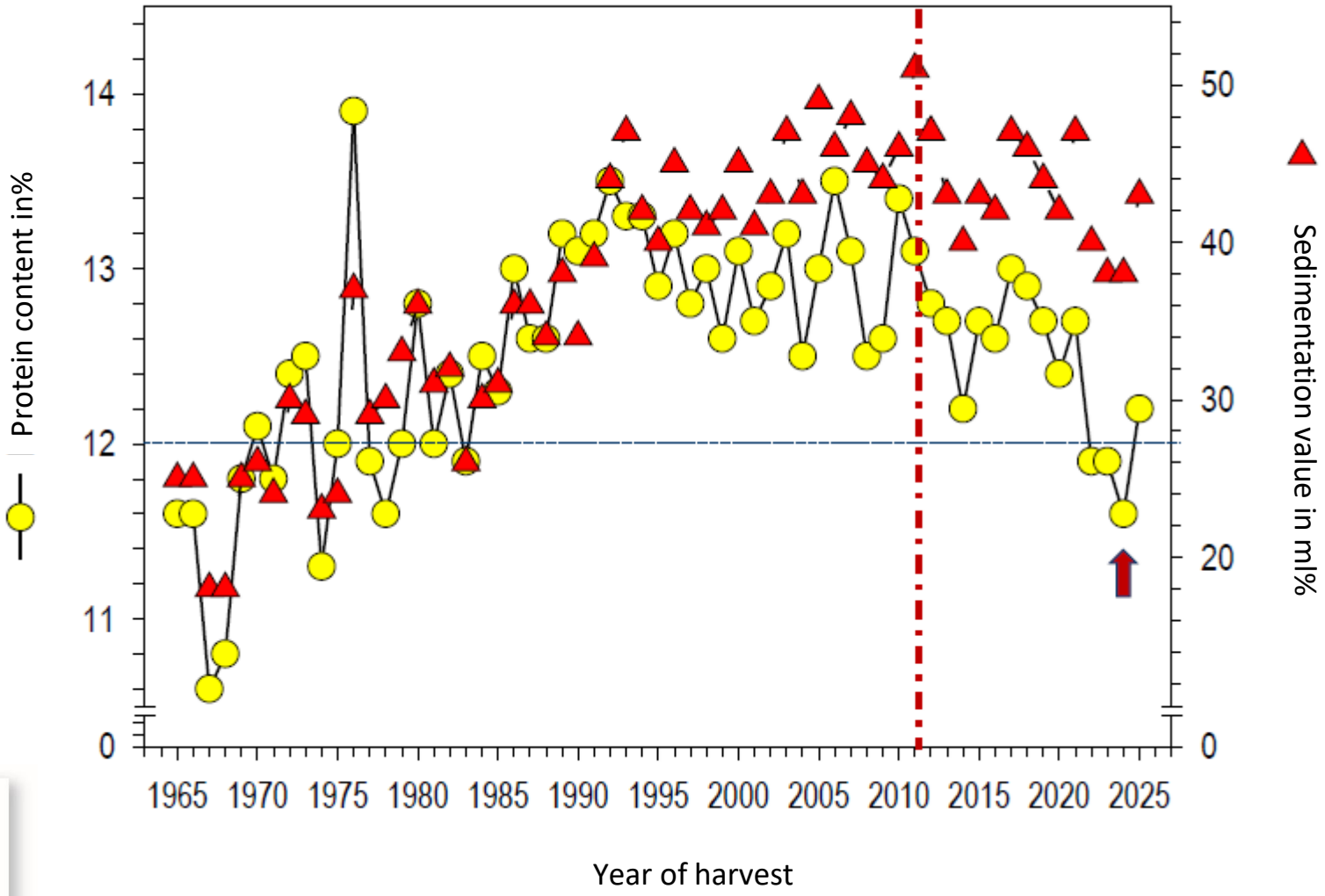
Wheat quality: since 2004, there has been a decline in wet gluten

Source: Hüsken, 2025

Development of protein content and quality in Germany

(BBE 1965 – 2025)

Bread wheat quality requirements: Protein content > 12%; Sedimentation value: > 30 ml



Wheat quality: since 2011, there has been a decline in wheat quality

Source: Hüsken, 2025

Quality parameters in wheat production in Estonia

High quality wheat production

Quality	unit	I KAT	II KAT	III KAT	IV KAT	V KAT	Feed
Moisture	%			11.0 – 14.0			
Specific weight	kg/hl	77	76	75	74	73	72
Falling number	sec	275	250	240	220	190	
Wet Gluten	%	28	26	24	22	22	
Protein	%	14	13	12	11	11	

Influencing factors that	
can be affected	**cannot be affected**
variety – certified seed	Weather
fertilization	
crop rotation	
Site selection	
High input cultivation strategy	

Factor
Variety

The variability of yield and baking quality of wheat tested at six sites from 2011 to 2014 in Estonia

spring wheat

Parameter	Manu	Mooni	Quarna	Specific	Uffo
yield	4.7	5.2	5.1	5.3	6.1
Protein content	14.4	13.5	14.8	13.3	11.8
Gluten Content	32.5	29.2	32.5	28.8	22.7
Alveograph	216	132	409	269	

winter wheat

Parameter	Ada	Fredis	Ramiro	Skagen	Kallas
Yield	6.6	6.5	5.9	7.5	7.2
Protein content	13.6	14.2	13.6	13.0	12.7
Gluten Content	29.7	32.9	30.6	28.2	27.6
Alveograph	226	190	214	208	221

Source: Koppel et al., 2020, The variability of yield and baking quality of wheat and suitability for export from Nordic–Baltic conditions

How to choose a variety vs how breeding works

the goal is high quality combined with high yield

A farmer looks for a variety that

crucial	has high quality attributes as well as high and stable yield
preferable	is winter-hardy healthy stable resilient early

How to choose a variety vs how breeding works

the goal is high quality combined with high yield

year	NB of varieties	Number of plots	Selection criteria
1	30.000	1	1 x Observation
2	15.000	1	1 x Observation
3	3.000	1	1 x Observation; 1 x yield
4	300	5	4 x Observation; 5 x yield; 2 x Grain quality
5	60	12	4 x Observation; 12 x yield; 2 x Grain quality; 2 x Baking quality

Selection for yield starts when we have already got rid of 90% of our varieties!!!

Selection for quality starts when we have already got rid of 99% of our varieties!!!

Official testing at Bundessortenamt

year	NB of varieties	Number of plots	Selection criteria
1	110	56 (14 x 4)	28 x observation; 56 x yield; 8 x grain quality; 8 x baking quality
2	50	56 (14 x 4)	28 x observation; 56 x yield; 8 x grain quality; 8 x baking quality
3	25	84 (21 x 4)	42 x observation; 84 x yield; 8 x grain quality; 8 x baking quality

All data make up the basis for the **descriptive variety list**, which serves as a source of information for plant growers, advisors, the food industry and consumers.

Factor
Variety

determination of the quality of wheat varieties is difficult

Private examination
1 year; 2 samples

Submission of the variety to the NL trials with a proposal for E, A, B or C

official examination
3 years; 24 samples

determination
as E, A, B or C

at application	after 1th year
A	E
A	A
A	A
A	A
A	A
A	A
A	A
A	A
A	A
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	B
A	C
A	C
A	C
A	C
A	C
A	C
A	C

at application	after 1th year
B	A
B	A
B	A
B	B
B	B
B	B
B	B
B	C
B	C
B	C

at application	after 1th year
E	E
E	A
E	A
E	A
E	B
E	B
E	B

at application	after 1th year
C	C
C	C

Varieties are submitted to official testing with a quality class based on a test with two samples – many of them don‘t reach this class in official testing with 8 samples after the first year:

27 A: 1 E, 8 A, 11 B and 7 C
10 B: 3 A, 4 B and 3 C
7 E: 1 E, 3 A and e B
2 C: 2 C

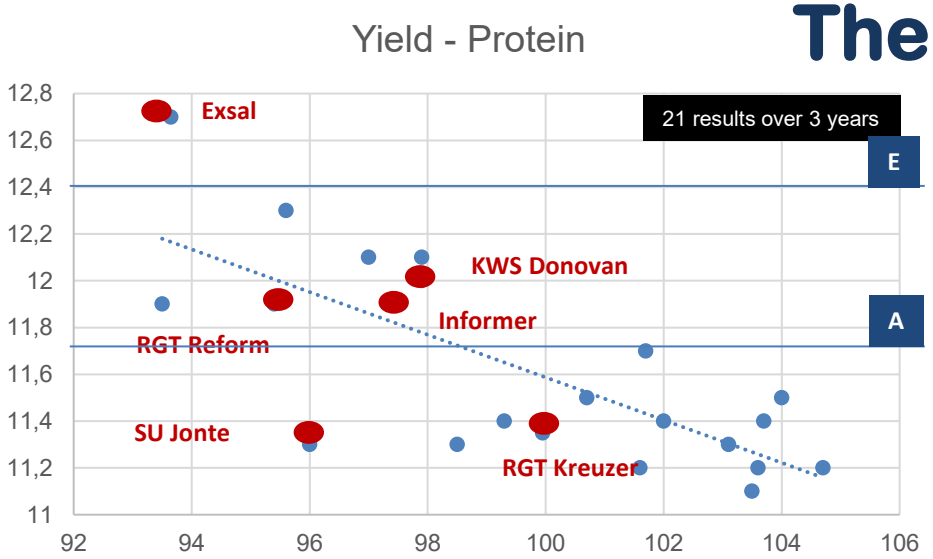
WvB

rapool
Der Raps

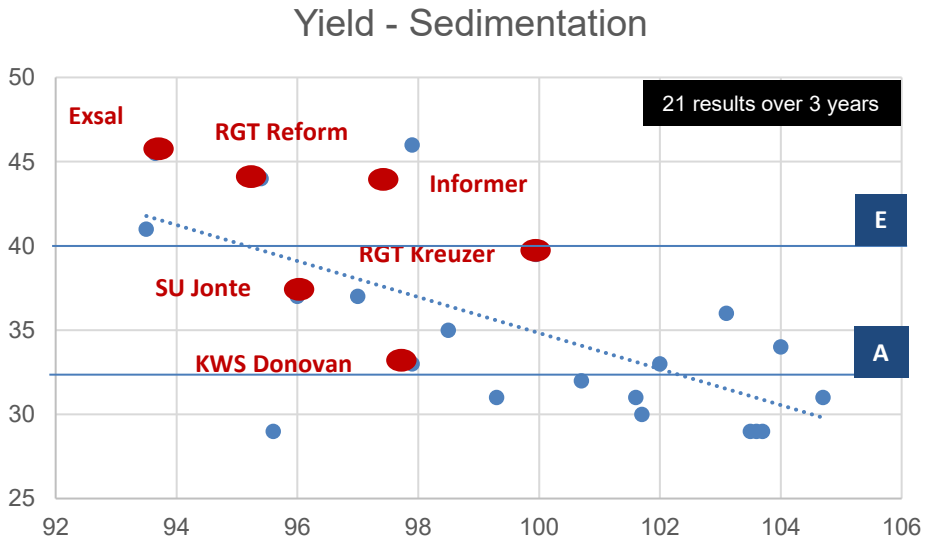
Factor
Variety

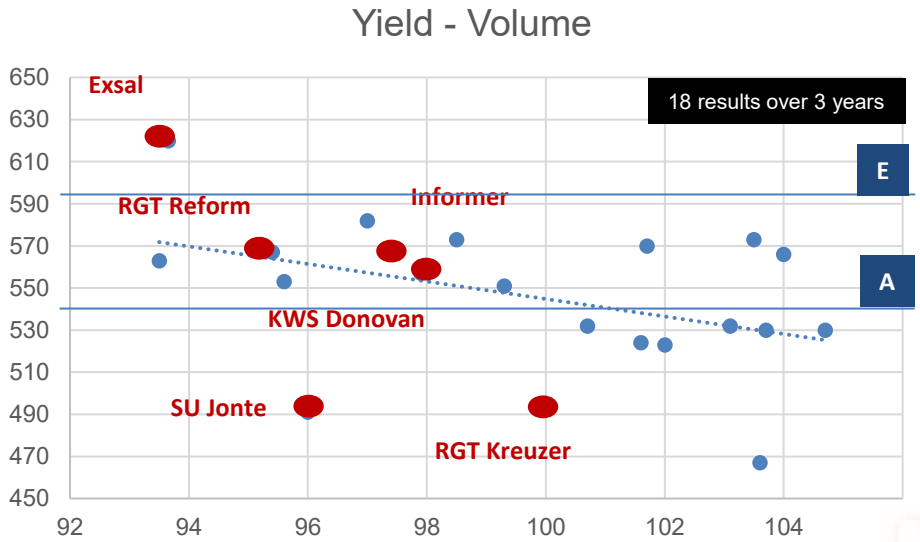
The Variety

There is a strong negative correlation between yield and quality parameters



high yield cannot be combined with high quality

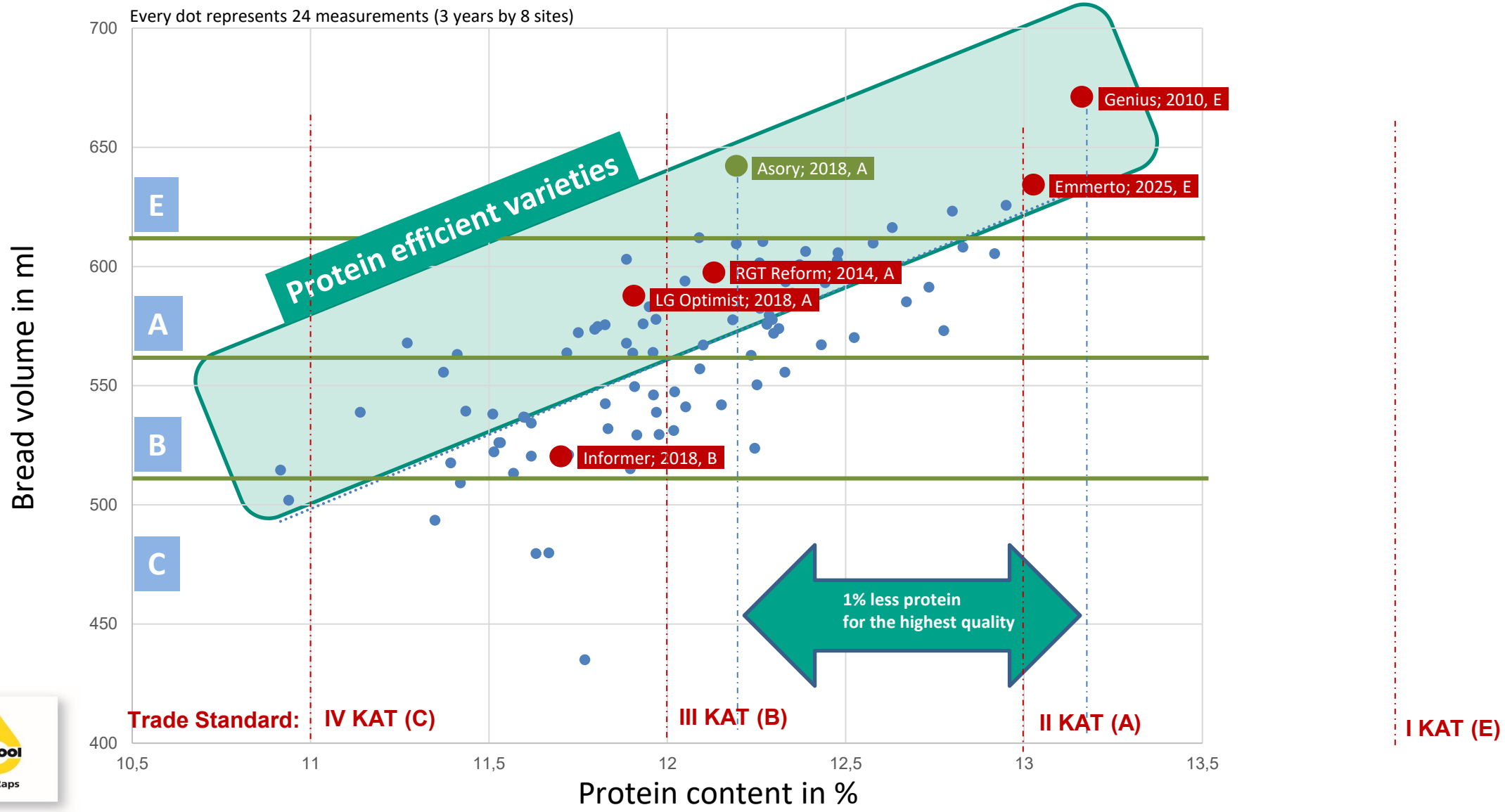




Factor
Variety

Relationship between bread volume and protein content

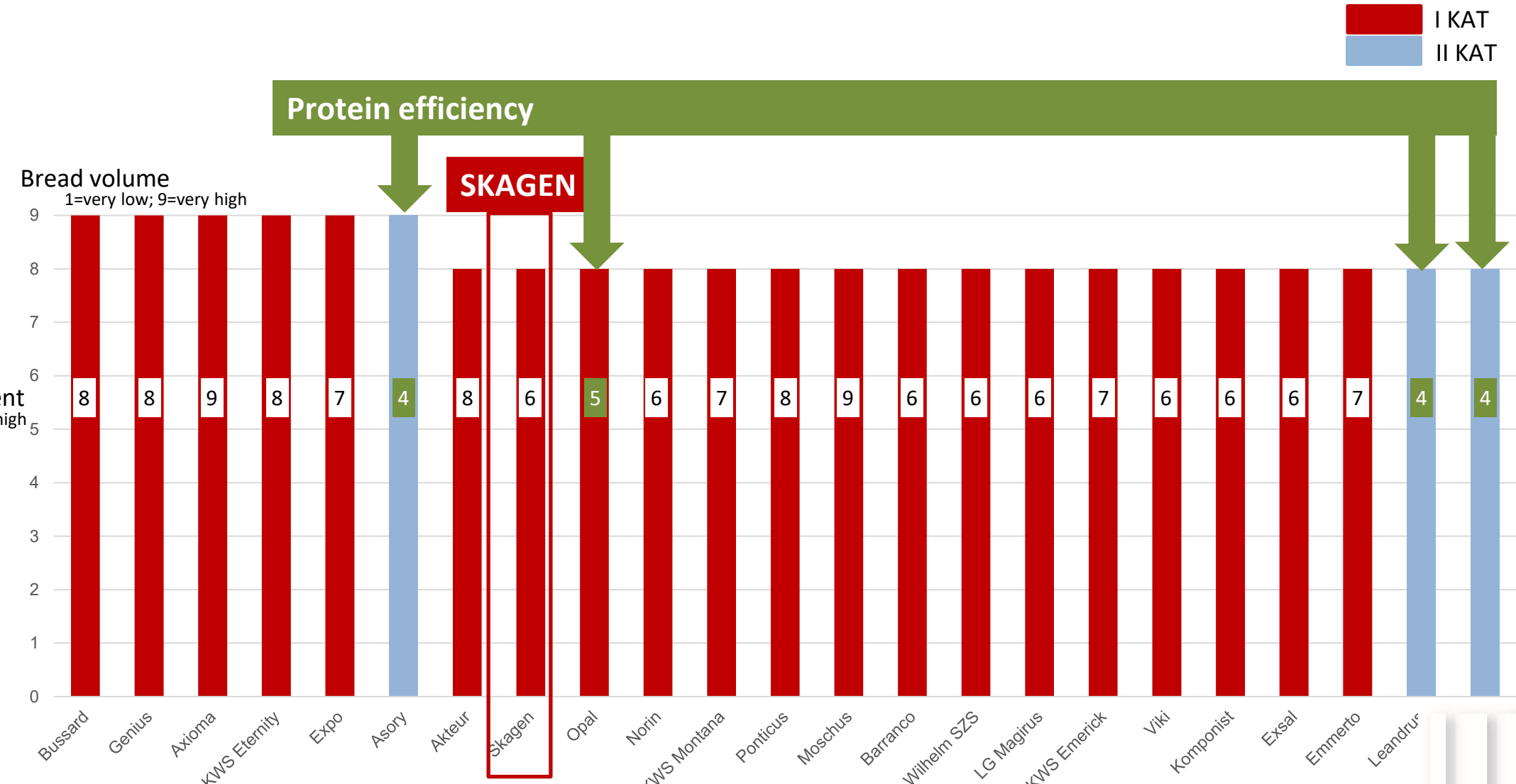
LS-Means of all varieties got listed from 2018 to 2026



WvB

Factor
Variety

Wheat varieties that have a I KAT (E) bread volume level



WvB

rapool
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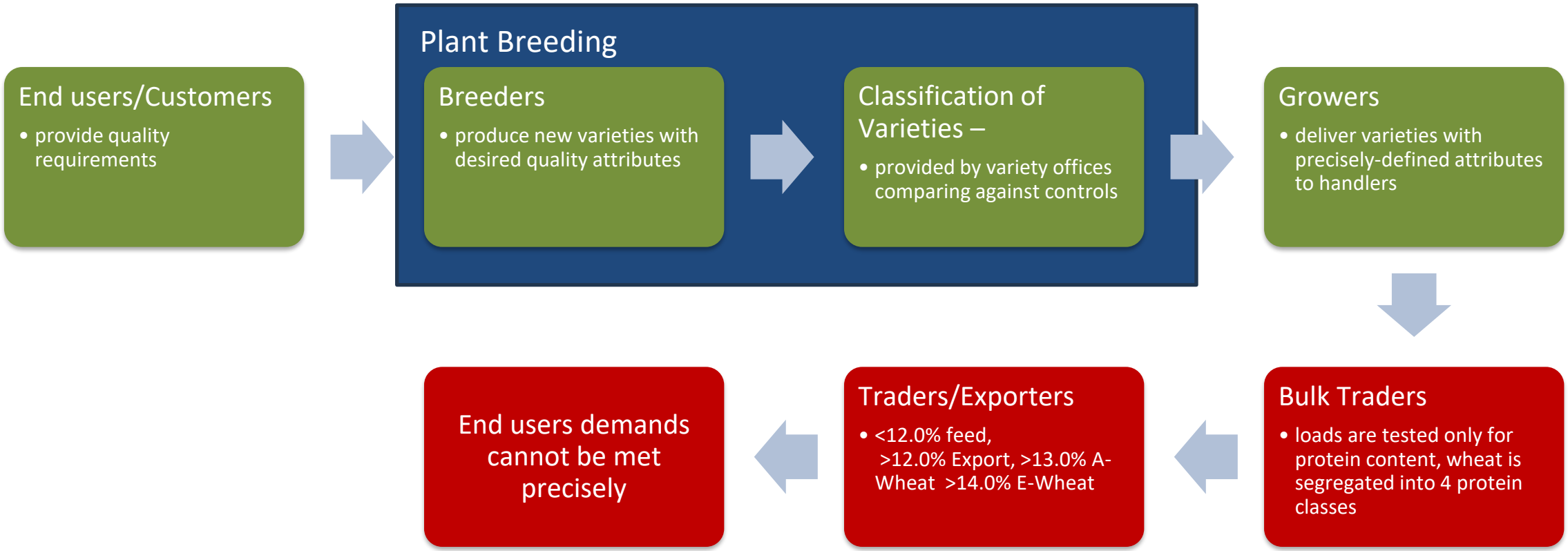
Wheat quality across the supply chain



- Varieties don‘t reach end users. Flour and dough are mixtures of several varieties on the same protein level
- Varieties have to be declared and stored separately as a ‘VARIETY’

The safest source for a variety: certified seed

- **Price components of certified seed**

1000 kg big bag: 800€*

Standard crop price

This part doesn‘t go to Breeders: 650€*

Packaging, transport, storage

Overheads

Seed treatment

Certification fee

Producer‘s fee, Profit margin

Royalties for breeding costs, research and development

Royalty: 150€*

Financing the breeding through

* Average wheat-prices at Saaten-Union in Germany in 2025

The benefits of certified seed

High Genetic Purity – Certified seeds are produced from approved parent plants, ensuring the variety is true-to-type and consistent.
Better Germination Rates – They are tested for viability, so more seeds sprout successfully.
Uniform seed size and accurate TGW, allowing precise sowing and better crop establishment.
Disease and Pest Control – Certified seeds are inspected and treated to reduce the risk of seed-borne diseases and pests.
Higher Yields – Because of better genetics and quality control, crops grown from certified seeds typically produce more.
Improved Crop Quality – The resulting produce tends to be more uniform in size, color, and maturity.
Traceability and Assurance – Certification systems guarantee that seeds meet official standards for quality and performance.
Better Adaptation – Certified varieties are often selected for good performance in specific climates and soil conditions.

Factor
Fertilization

Not using fertilization and reducing the use of fertilizers are not viable solutions

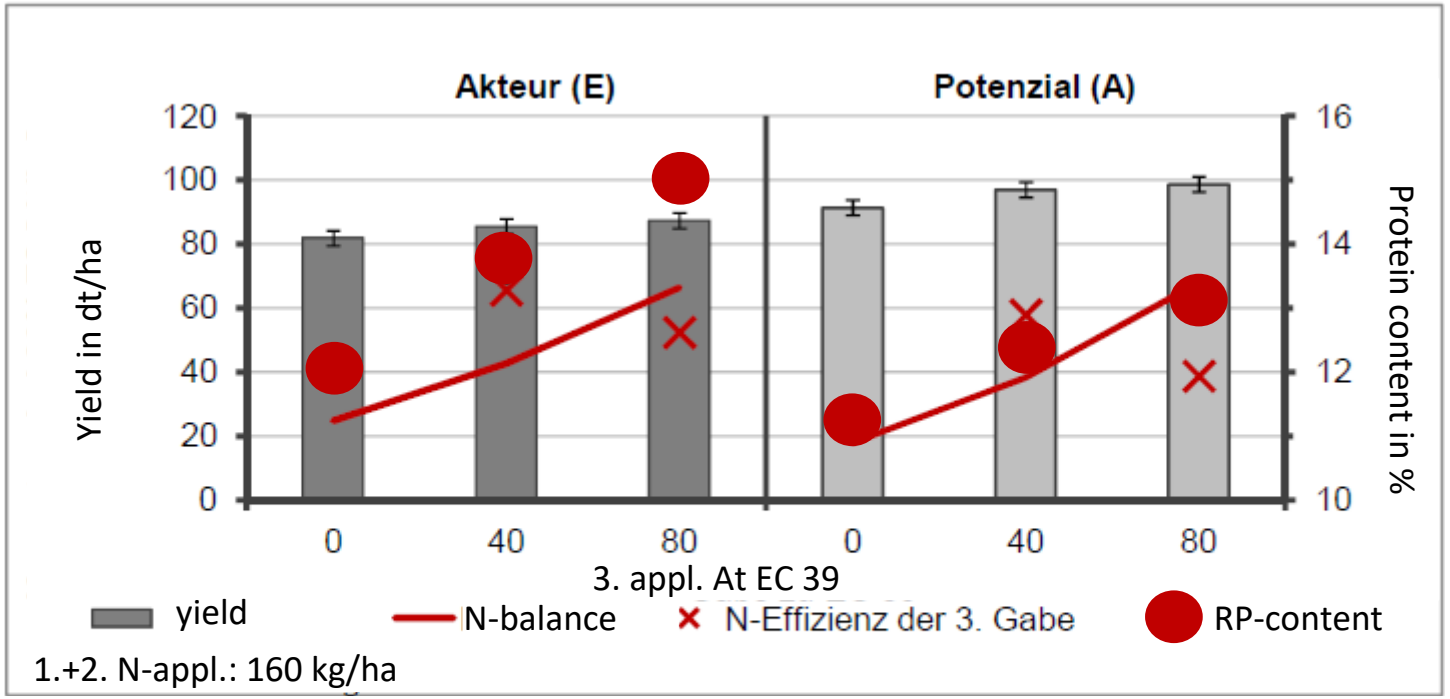
Quality	Variety	Conventional farming		Organic farming	
		Yield (dt/ha)	Protein (%)	Yield (dt/ha)	Protein (%)
C (IV KAT)	KWS Keitum	100	12.0	65	9.5
A (II KAT)	Asory	94	13.0	60	10.4
E (I KAT)	Moschus	86	14.4	55	11.9

Conventional farming: yield oriented, utilizing full treatment with fertilizers and pesticides to maximize production
Organic farming: without synthetic fertilizers and pesticides, adhering to the standards set by organic farming regulations

Source: Longin (Postregistration trial results Baden-Württenberg 2021 and 2022)

Factor
Fertilization

The impact of late nitrogen application (0, 40, and 80 kg/ha) on the protein content and yield of both E- (Akteur) and A-Varieties (Potenzial)



Source: Landesamt für Umwelt, Naturschutz und Geologie (LUNG)
Landesforschungsanstalt für Landwirtschaft und Fischerei (LFA)
LMS Agrarberatung - Zuständige Stelle für landwirtschaftliches Fachrecht und Beratung (LFB)

Factor
Fertilization

Fertilization strategy for quality wheat production

Soil Testing
Conduct a soil analysis at the beginning of the growing season to assess nutrient availability.
Test for:

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- pH level
- Organic matter
- Micronutrients

Proper sulfur supply leads to
Higher **grain protein quality**
Stronger **gluten**
Better **baking quality**
Improved **nitrogen efficiency**
Increased **yield stability**

Nitrogen (N)
Total: 140–220kg N per hectare (depending on yield target).
Apply in split doses:

- Early spring (tillering stage)
- Stem elongation
- Booting stage (**crucial** for protein improvement)

Phosphorus (P) and Potassium (K)
Apply according to soil test results.
Typically applied before sowing or during seedbed preparation.

Micronutrients influence several **quality parameters**:

Quality trait	Micronutrient influence
Grain protein	Zinc, N interaction
Grain filling	Manganese, Zinc
Enzyme activity	Zinc, Copper
Photosynthesis	iron, Manganese
Baking quality	Zinc, Copper

Why is crop rotation important?

Pest and Disease Management

Changing crops disrupts the life cycles of soil-borne pests and pathogens, preventing them from establishing

Improved soil health and fertility:

Alternating crops prevents nutrient depletion and enhances organic matter

Weed control:

Different planting times, growth habits, and cultivation practices hinder the buildup of weed species

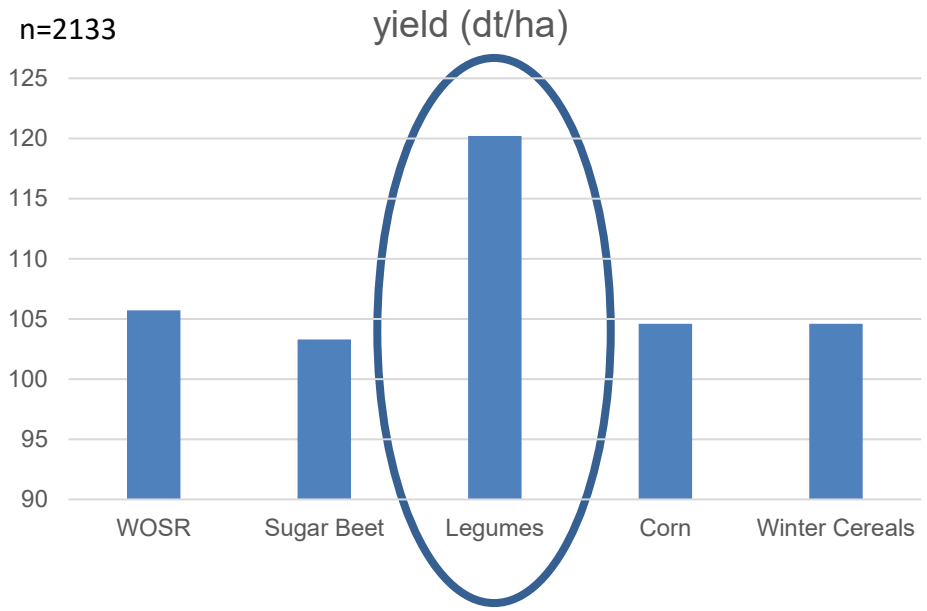
Increased yields and sustainability:

This practice maximizes resource use, reduces chemical input costs, and increases overall productivity

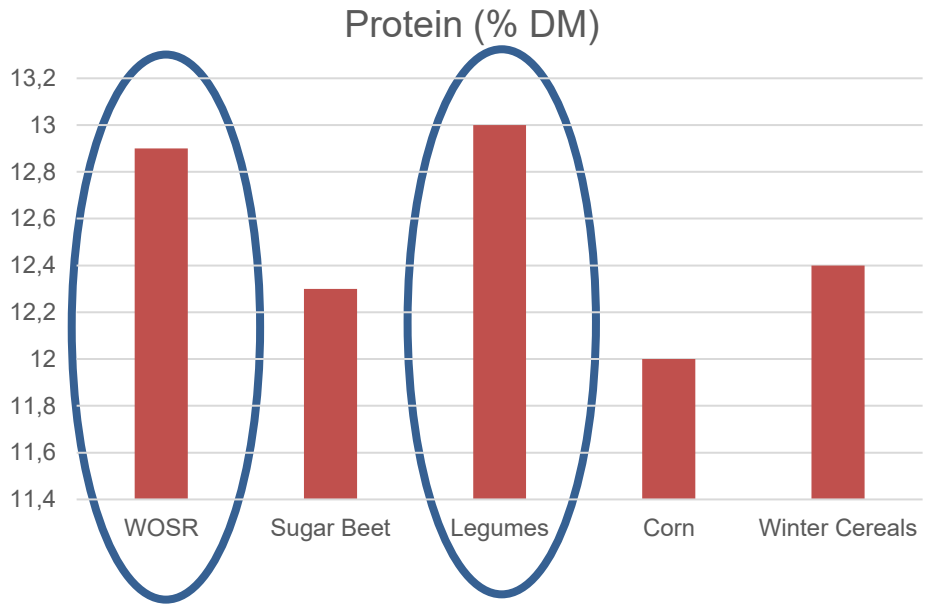
Factor
Crop rotation

Yield and Protein content of Wheat depend on the previous crop

17 dt/ha more Wheat after Legumes than after Sugar Beet



0,9% more Protein after WOSR and 1% more protein after Legumes than after Corn



- **Winter wheat National List Trial (BSA 2015-2017)**

Factor
Site selection

Requirements for a site to grow high-quality wheat

Climate Requirements

Moderate temperature: Wheat grows best between **15–25 °C** during the growing period.
Cool conditions during grain filling: This helps produce **better grain quality and protein content**.
Adequate rainfall: About **450–650mm per year** is ideal. Too much rain during ripening can reduce grain quality.
Plenty of sunlight: Good solar radiation improves **photosynthesis and grain formation**.

Soil Requirements

Fertile soils: Soils should contain sufficient nutrients for healthy plant growth.
Good soil structure: Loamy soils are best because they allow good root development.
Well-drained soil: Waterlogging can damage roots and reduce yield.
Soil pH: The ideal pH is **6.0–7.5**. Slightly neutral soils help nutrient availability.

To sum up: Quality wheat production…

…is a high input quality management approach, as it often requires significant investments in:

- Certified seed of at least two different varieties (one I KAT and one II KAT)
- Soil health
- Fertilization
- Pest control

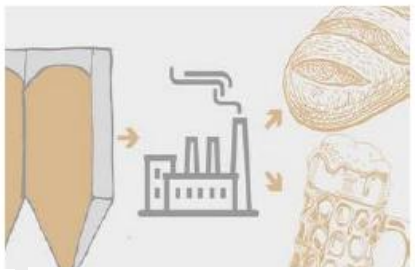
to achieve high yield combined with high protein content and quality

Dealing with raw material flows

Varieties

Recording

Flour assignment



Application

Apexus
Asory
Bright
Etana
KWS Universum
LG Optimist
Pallas
Pontiform
Skagen
SU Banatus
SU Henner
SU Pulsion

I KAT Variety
II KAT Variety
III KAT Variety
IV KAT Variety

Assignment	Gluten content	Intended use
strong	>28%	Bagels, pretzels, pasta
normal	>26.5%	Bread, rolls
weak	22-26%	cookies
Very weak	<22%	Extrusion, etc.

The bottom line is:
what do I want to use my flour for?

Baking row comparison – low-gluten flour with different additives

Thank you!

Aitäh!

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