



Flour Optimization.

**IAOM
Abu Dhabi, U.A.E.**

December 7, 2012

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Agenda.

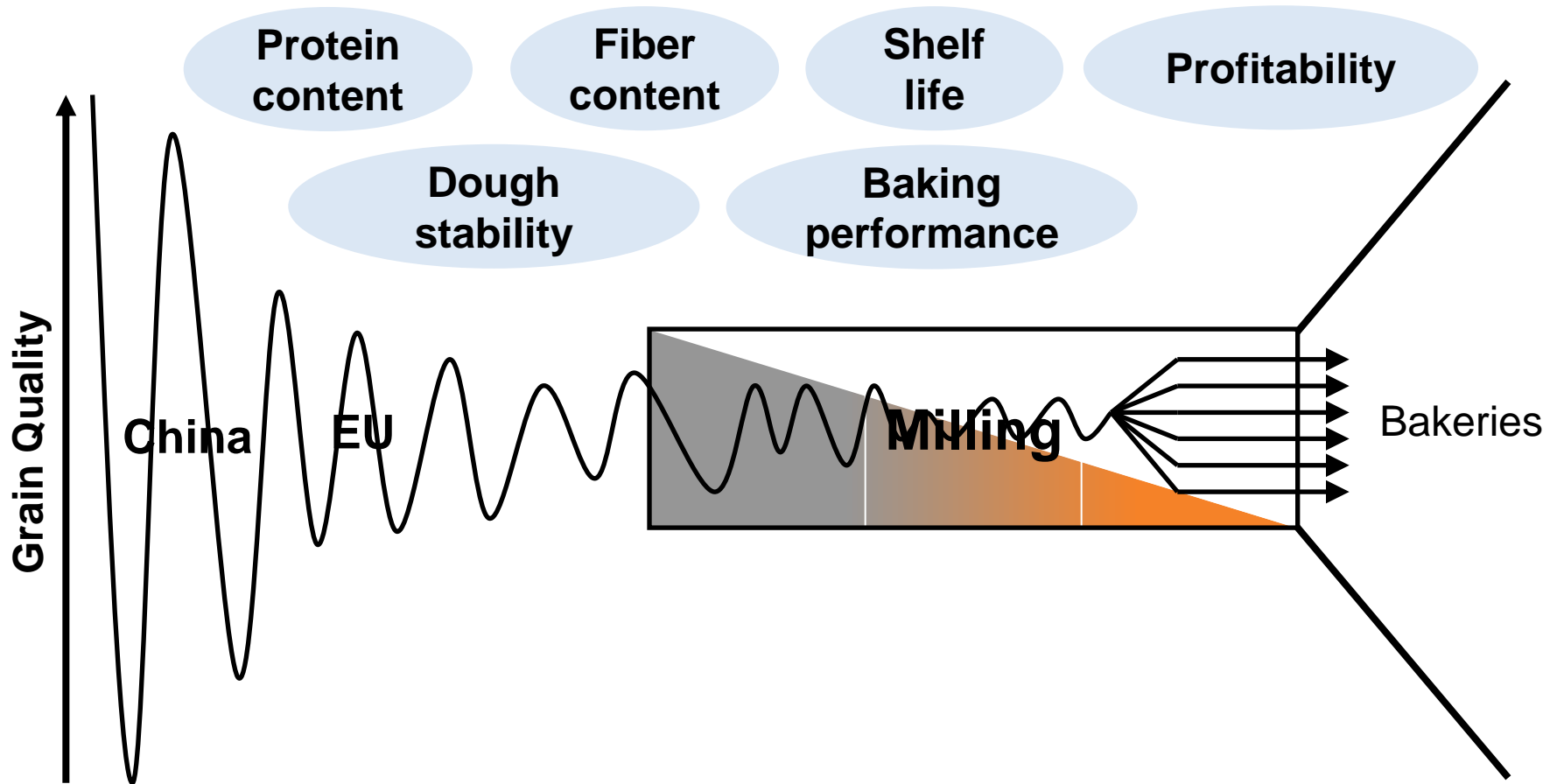
- **Optimal Flour**
- **Market Challenges and Their Drivers**
- **Solutions to Improve Flour Quality**
 - **Technology: Attrition Flour**
 - **Ingredients: Gluten functionality**
- **Food Security - Local Crops (Cassava)**
- **Summary**



The Challenge of the Miller.

Constant Flour Quality

Constant flour quality in respect to what?



Topics in Western Markets.

Consumer's View

- Health (obesity, heart health, blood pressure)
- Convenience
- Clean Label
- Gluten (Celiac Disease)
- Salt Reduction
- Whole grain and Natural Fibers
- Food Safety – Mycotoxins/Contaminants



Topics in Emerging Markets.

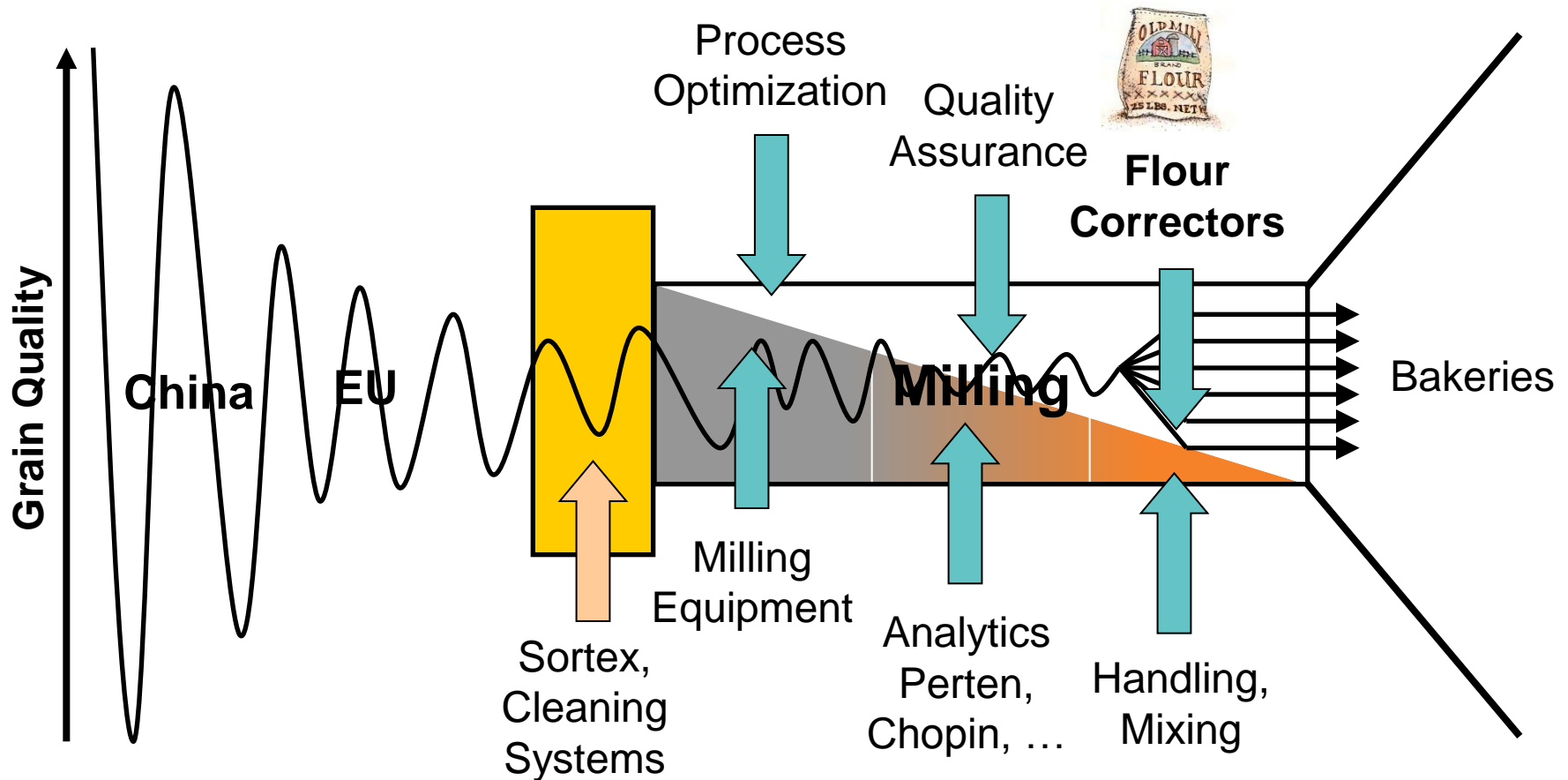
Producer and Consumer Views

- Grain Prices – Availability
- Supply Chain – Logistics (Losses/wastes)
- Quality of Raw Materials
- Import Restrictions - Legislation: Processing of local raw materials (Cassava)
- Malnutrition – Hidden Hunger



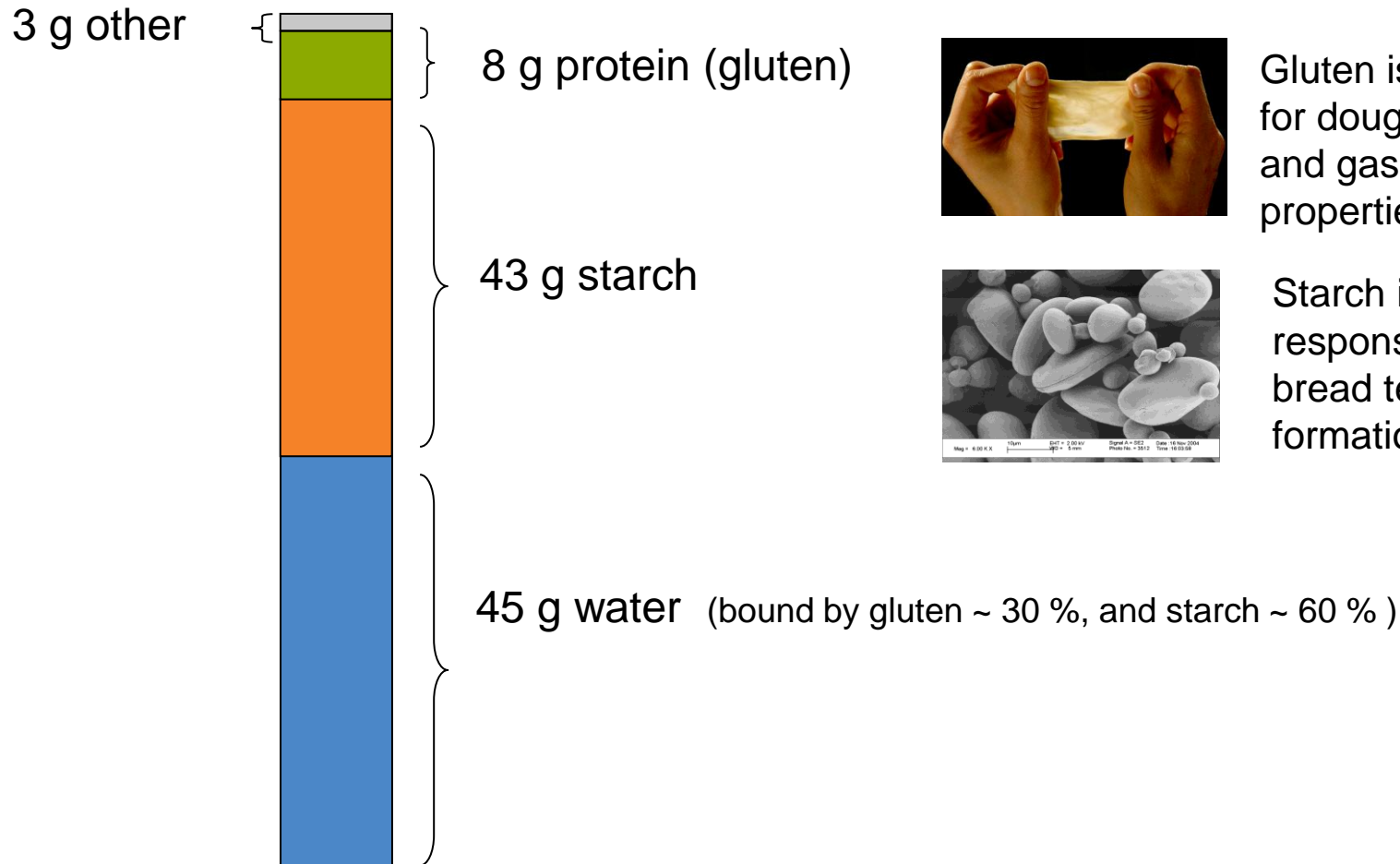
Constant Flour Quality to Meet Customer Specifications.

Different Approaches – From Technology to Ingredients



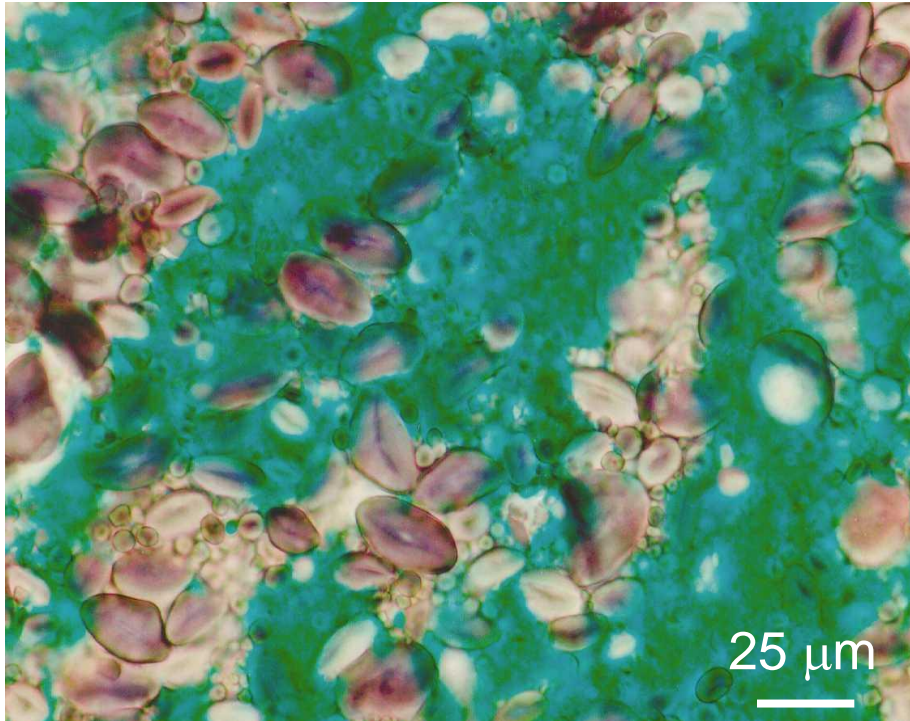
Bread dough is a water swollen system based on gluten and starch.

Approx. composition of 100 g dough

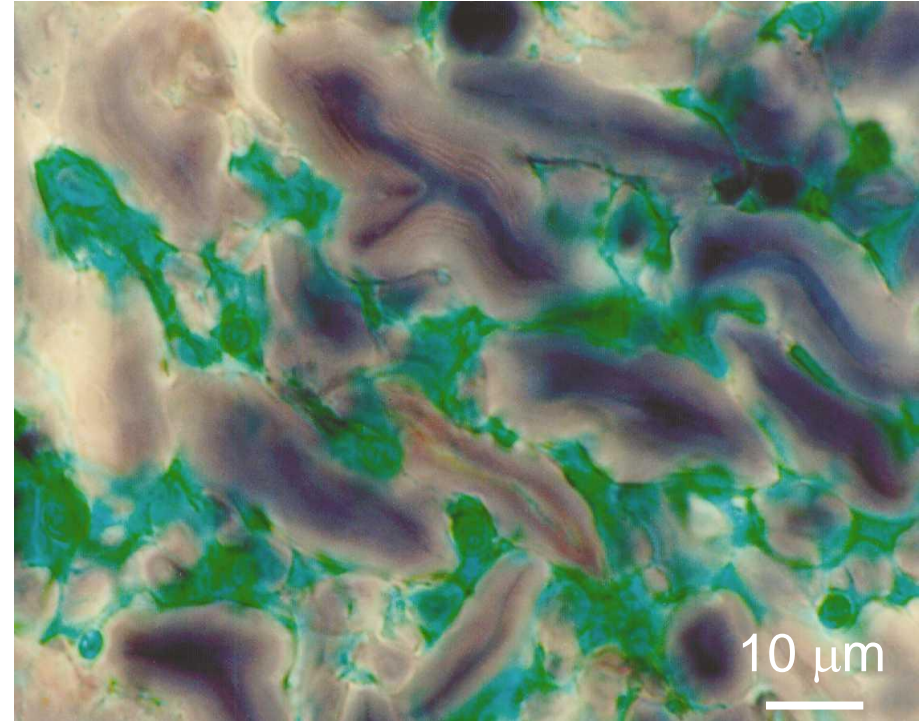


Starch plays a key role in bread as texturing agent

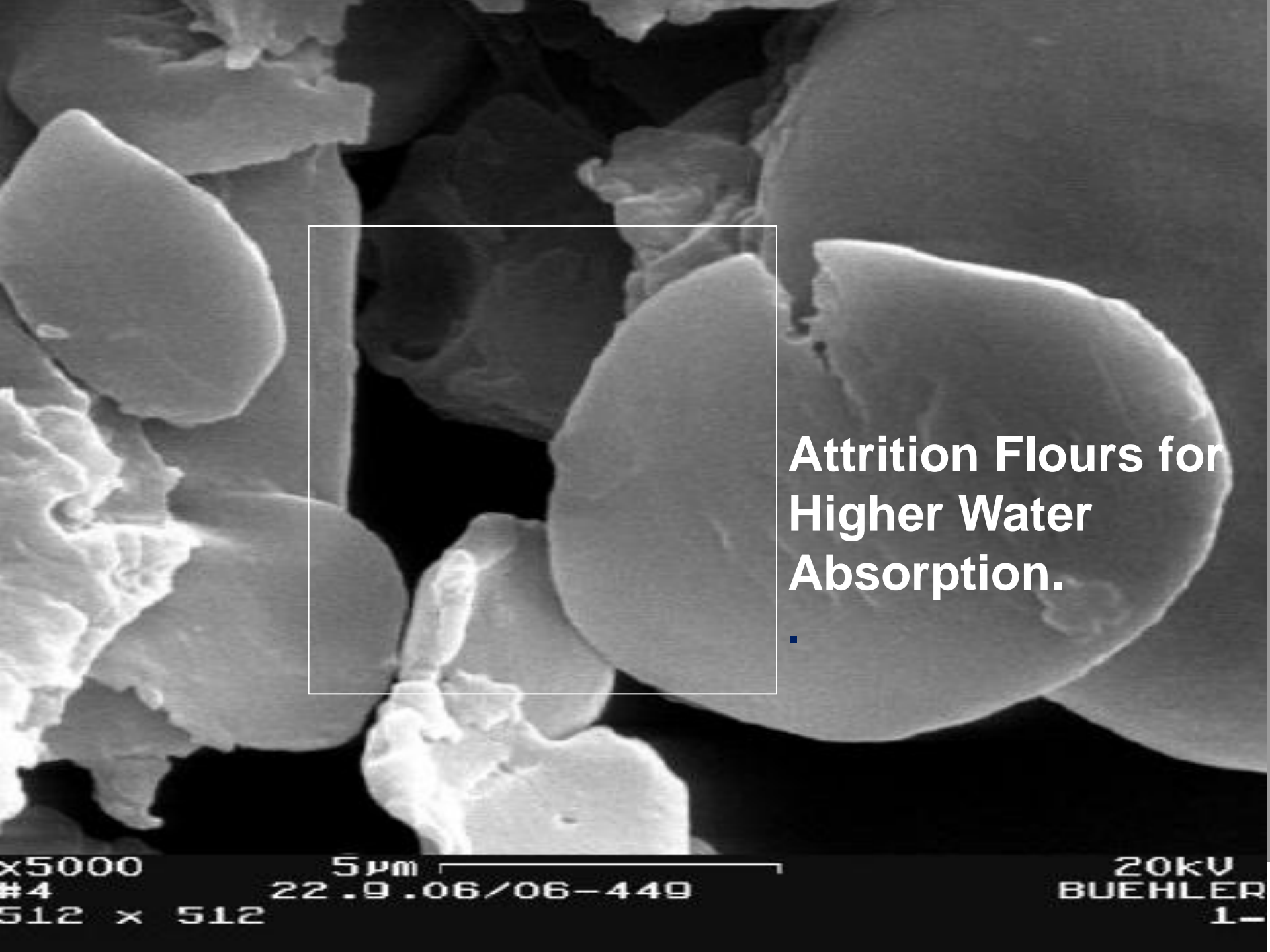
Images ETH Zürich (Hug-Iten, 2000)



Dough: limited swelling capacity
of native starch granules



Bread: extensive swelling of starch
granules leads to setting
of bread texture



**Attrition Flours for
Higher Water
Absorption.**

x5000

#4

512 x 512

5µm

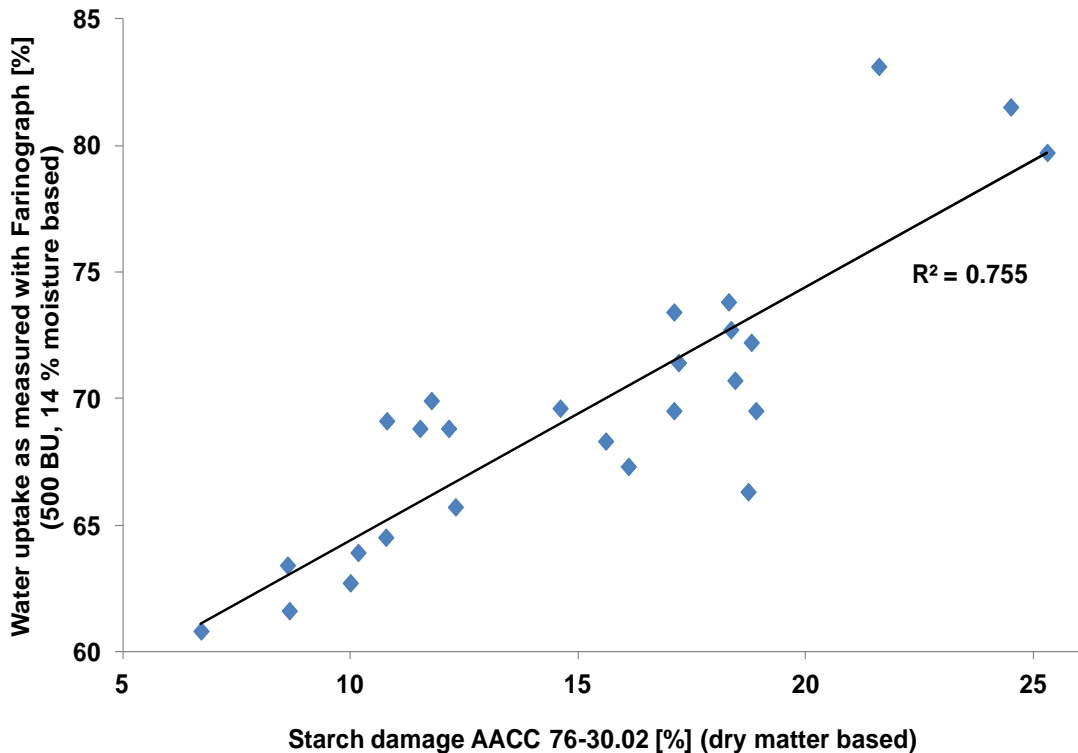
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20kV
BUEHLER
1-

Attrition Flours.

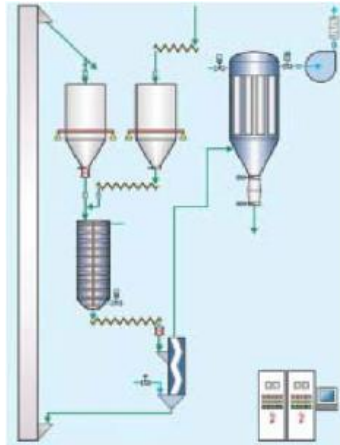
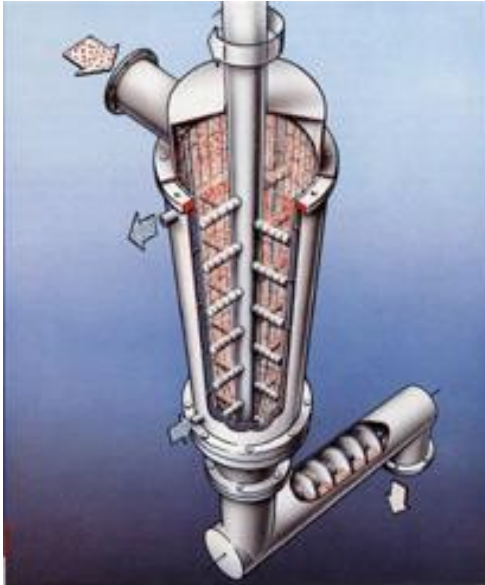
Higher water absorption through mechanically damaged starch.

- Damaged starch through roller mills.
- Grinding pressure deforms the starch granule and partly destroys the crystalline structure.
- Damaged starch granules possess a higher water retention capacity



Attrition Flours.

System comparison of ball mill system versus roller mill.



Ball mill system



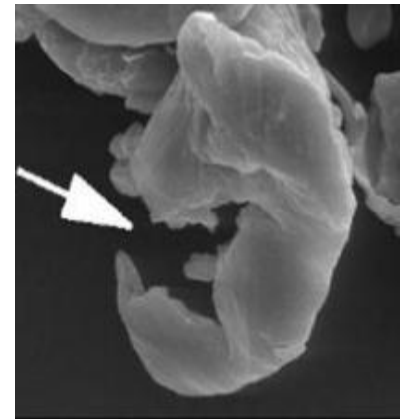
Fine Grinding
Impact Mill
MJPB



Attrition Flours.

Attrition flour from coarse semolina.

- Semolina reduction with high grinding pressure.
- Fine Impact Mill MJPB for detaching flakes.
- Mechanically damaged starch absorbs five times more water than intact starch!



Attrition Flours.

Increase of water absorption by addition of attrition flour.

Product	Water absorption [14% Basis]	Starch damage [%]
Standard flour type 550	62.6	9.9
Attrition flour processed with roller mill and Fine Grinding Impact Mill Type MJPB	87.8	25.5
Blend of 92% standard flour 550 and 8% attrition flour	65.1	11.0

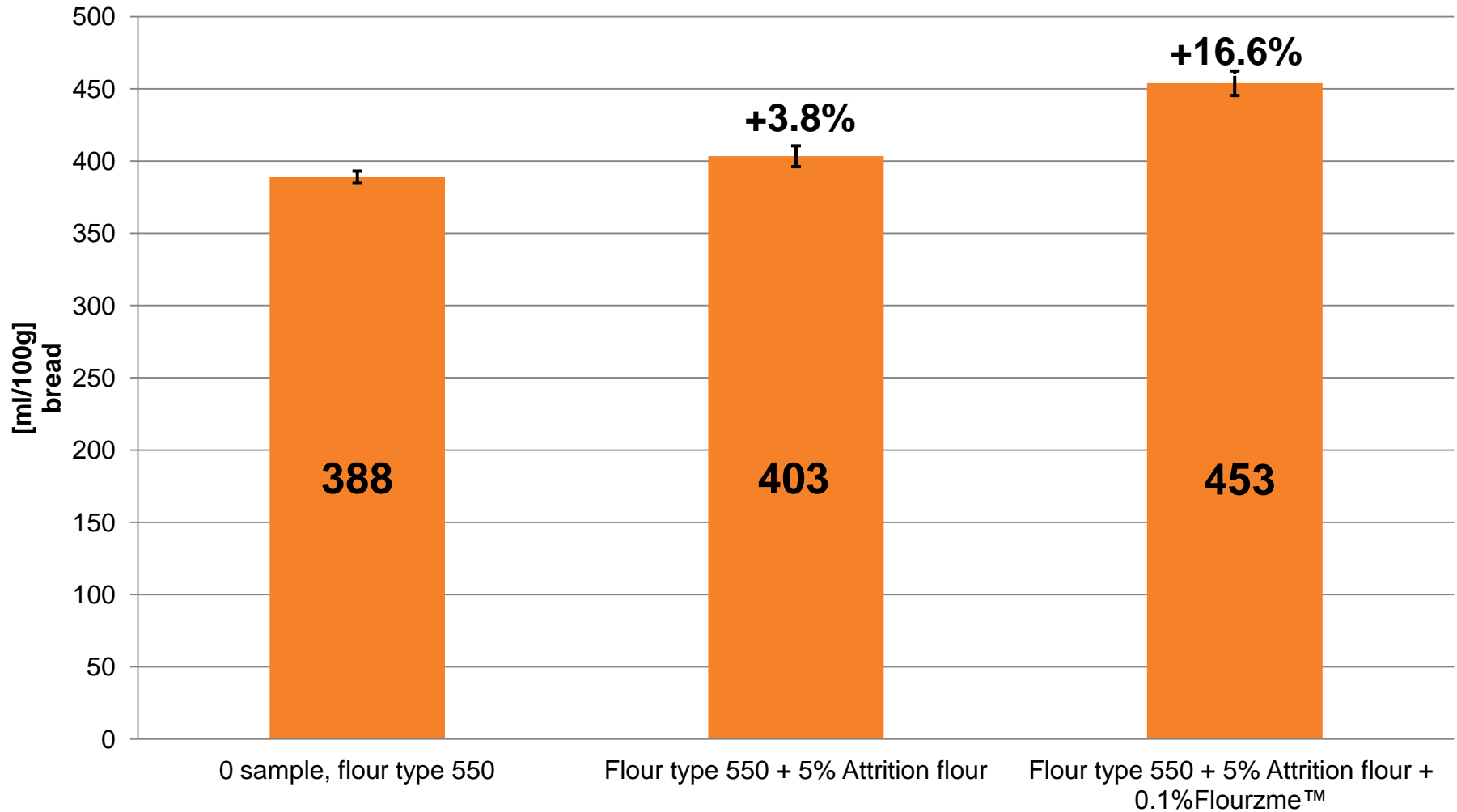
Formulations – Attrition Flour

Positive Effects on Bread Production

Ingredients	Trial 1 [g]	Trial 2 [g]	Δ [%]	Trial 3 [g]
Flour type 550	1000	950		950
Attrition flour	-	50	5	50
Water	650	660	1.5	660
Salt	20	20		20
Yeast	30	30		30
Flourzyme™	-	-		1.00
Total	1700	1710	0.6	1711

Specific Volume

Attrition Flour

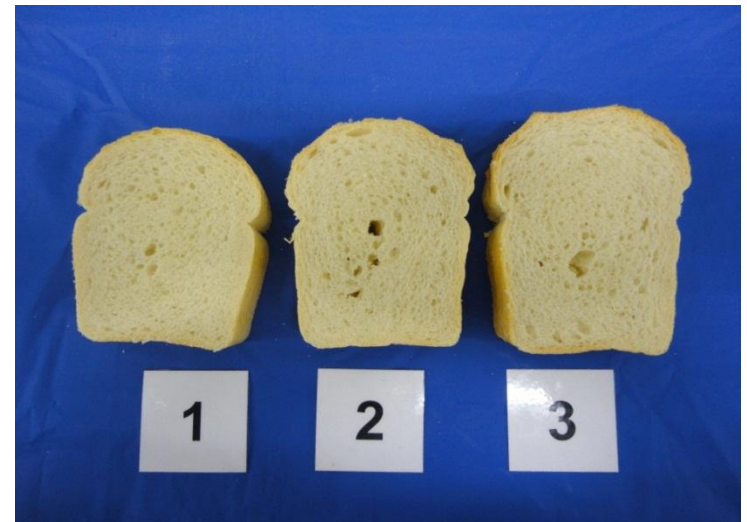


Specific Volume – Texture

Breads with 5% Attrition Flour



- 1: Flour Type 550**
- 2: Flour Type 550 + 5% attrition flour**
- 3: Flour Type 550 + 5% attrition flour
+ 0.1% Flourzyme™**



Attrition Flours for Higher Water Absorption.

Summary.

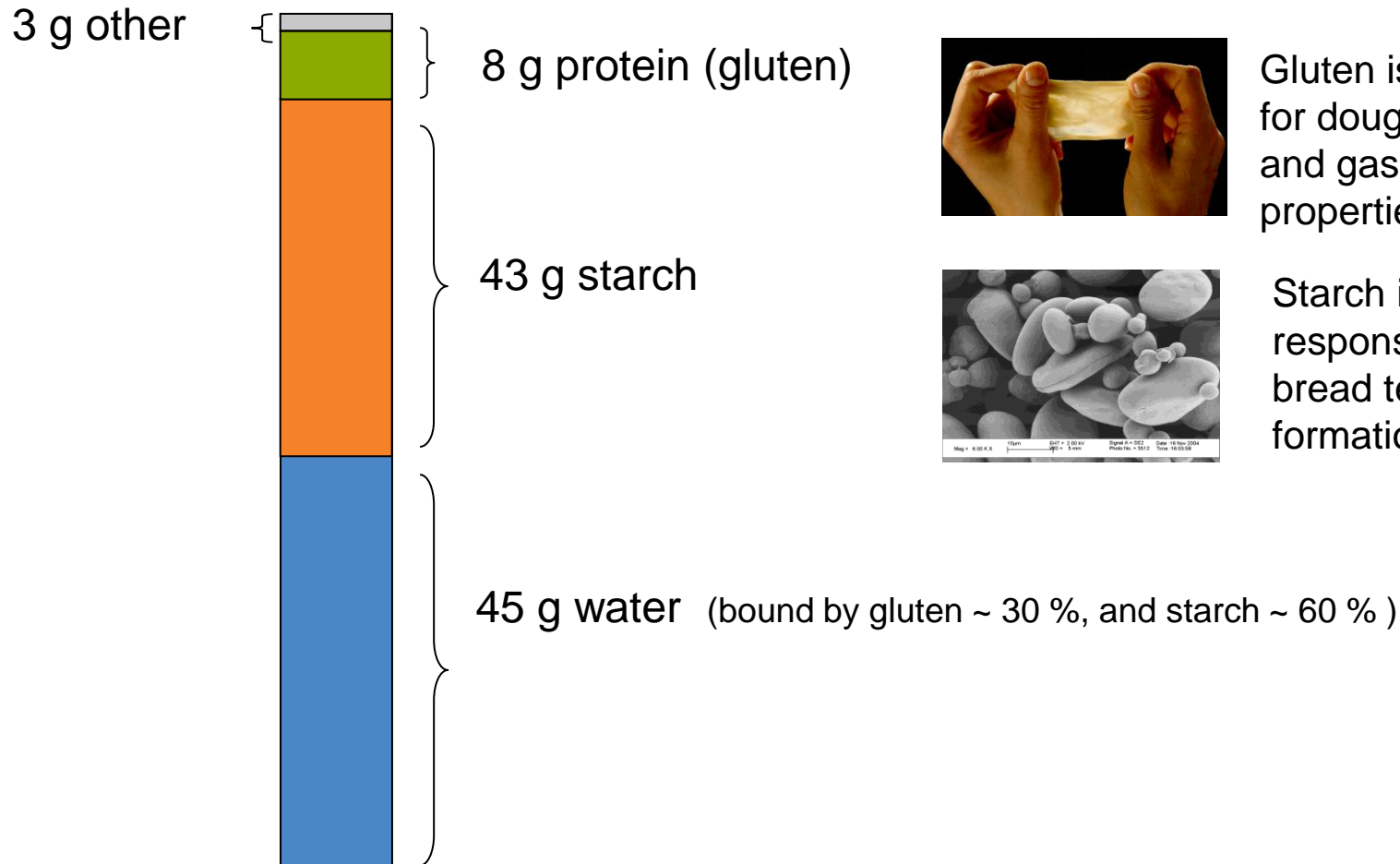
- Attrition passages increase flexibility and can add value to your flour by
 - Increased water absorption
 - Higher dough yield
 - Improved bread volume
 - Extended shelf life
- Attrition process via roller mill is an economical solution. It is user-friendly and requires little maintenance.



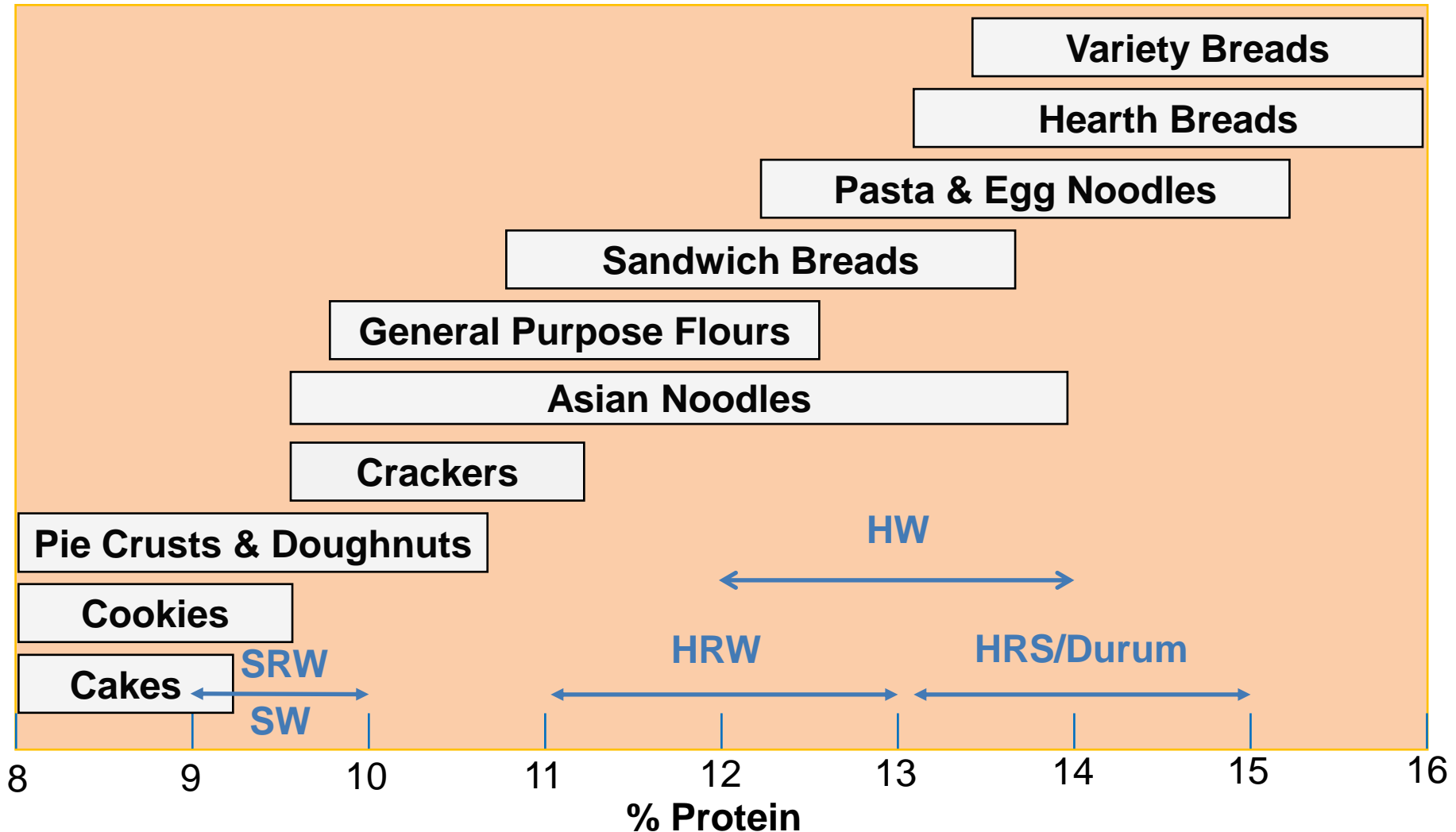
→ The simple value-added process for a flexible milling operation

Bread dough is a water swollen system based on gluten and starch.

Approx. composition of 100 g dough

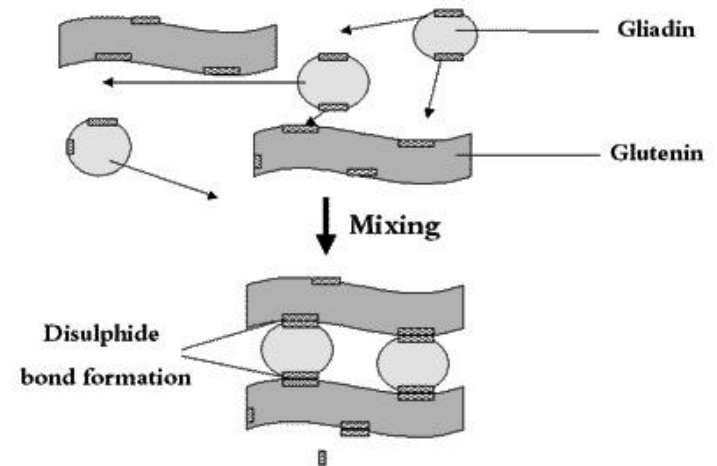


Wheat Protein Content for Different Applications



Improvement of Gluten Quality and Performance

- Wheat of a good gluten quality resulting in an optimal baking performance is expensive.
 - The addition of vital wheat gluten can deliver a better baking performance, but can be costly
-
- ✓ Flourzyme™ – improves the baking performance of low-protein flours and
 - ✓ Flourzyme™ – Omits the use of vital wheat gluten



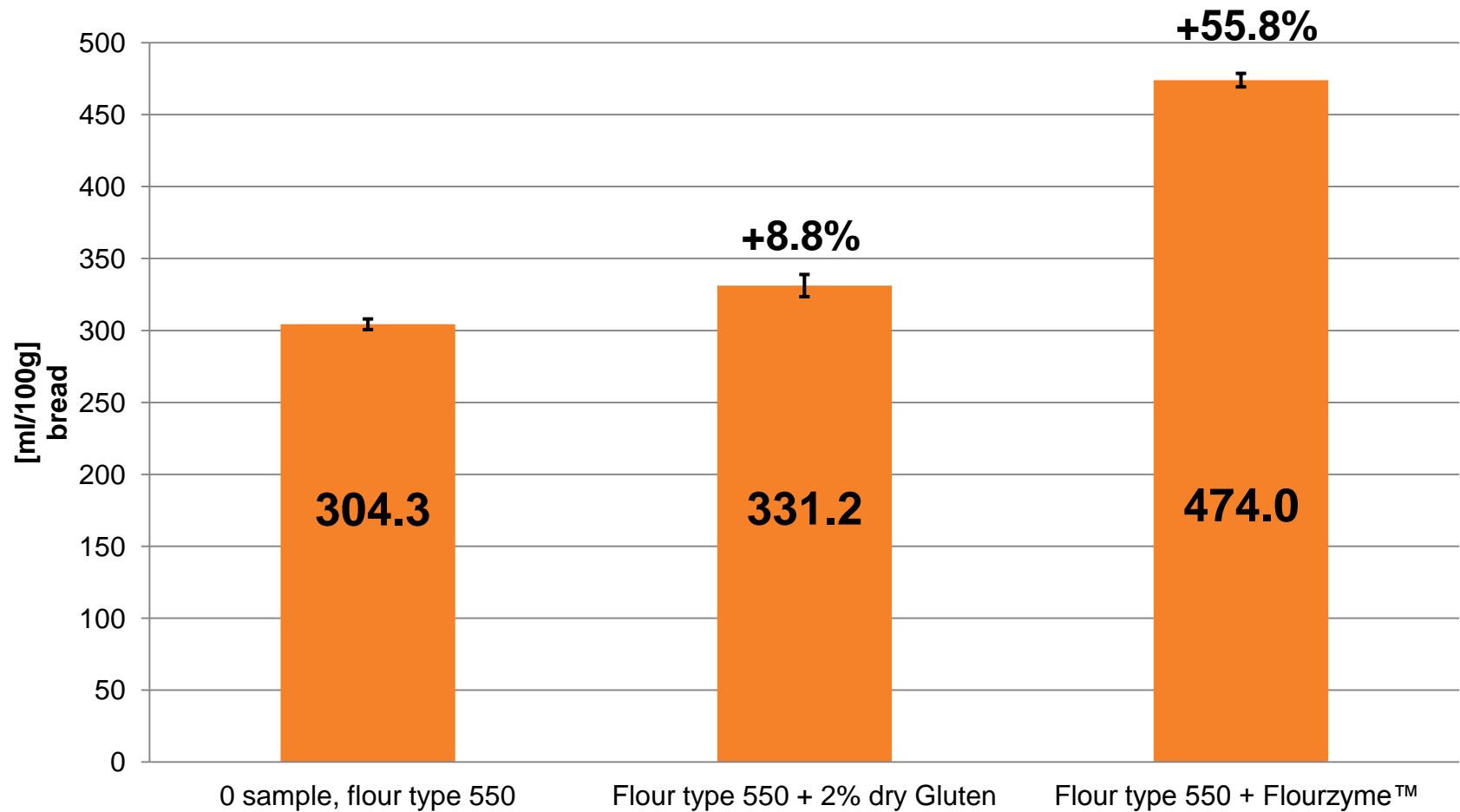
Formulations

Gluten Replacement

Ingredients	Trial 1 [g]	Trial 2 [g]	Trial 3 [g]
Flour type 550	2000	1960	2000
Water	1250	1250	1250
Yeast	60	60	60
Salt	40	40	40
Dry Gluten	-	40	-
Flourzyme™	-	-	2
Total	3350.00	3350.00	3352.00

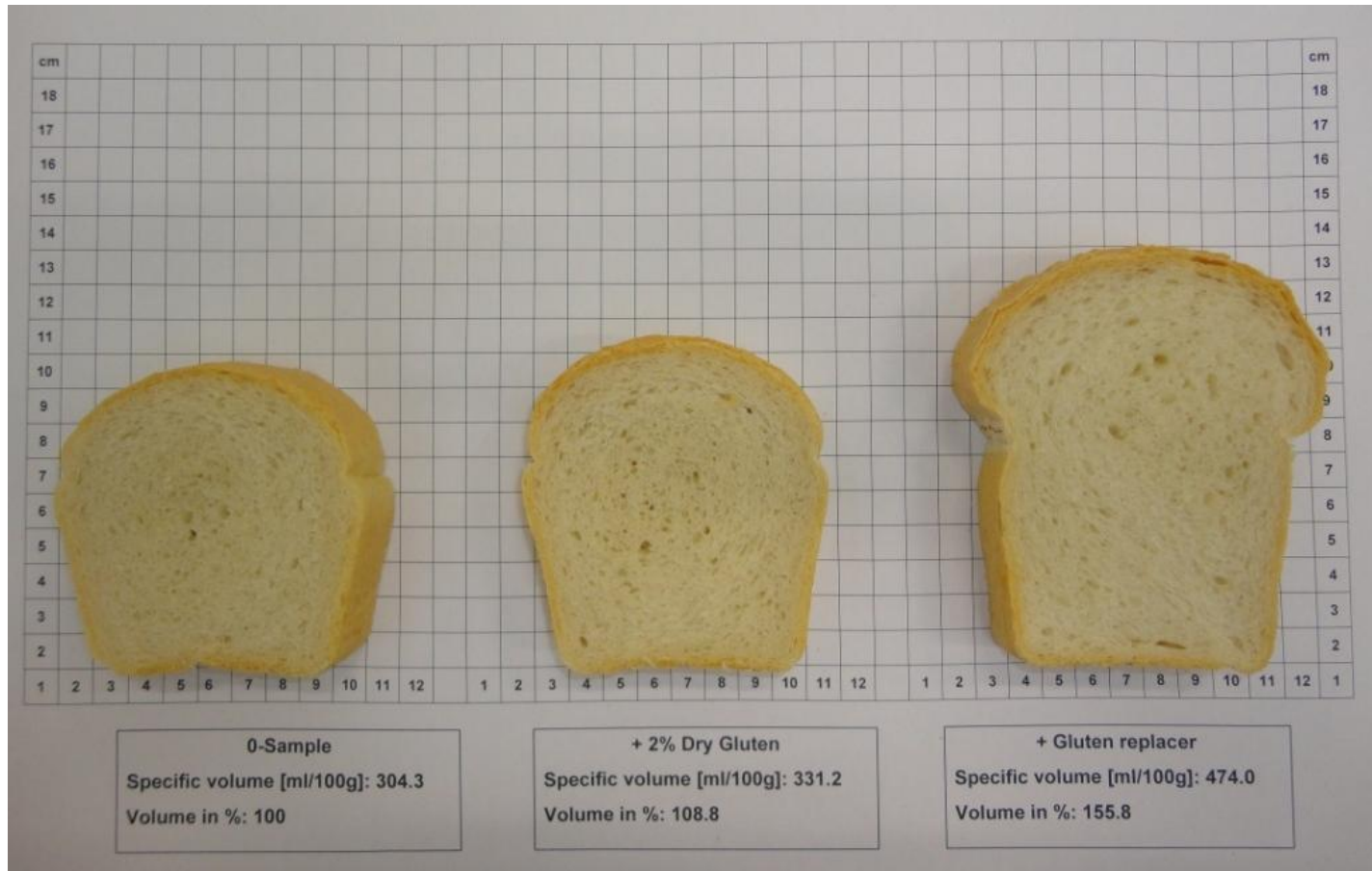
Specific Volume

Gluten Replacement



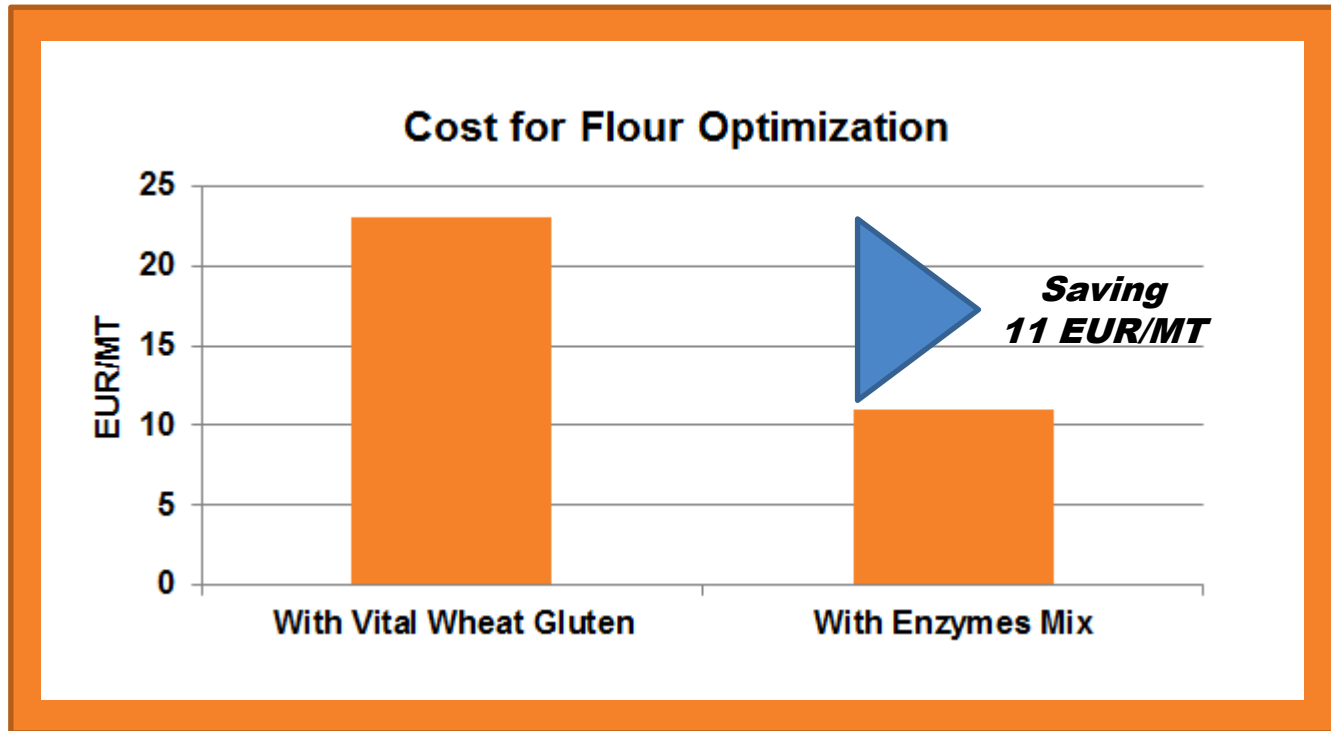
Specific Volume - Texture

Gluten Replacement



Cost Benefit

Gluten Replacement



Food Security

Policies to substitute Cassava Flour for Wheat Flour in Nigeria

- The Government of Nigeria plans to cut wheat imports by introducing a new policy **compelling cassava flour inclusion in wheat flour**.
- Their plan is to impose a levy of 15% on wheat imports, **increasing the duty from 5% to 20%**.
- A **fiscal incentive** is introduced to stimulate domestic production and processing of cassava.
- Implementation has started in March 2012 with **10% cassava** flour inclusion in wheat flour.
- The inclusion rate is expected to increase steadily to **40% cassava** by 2015.



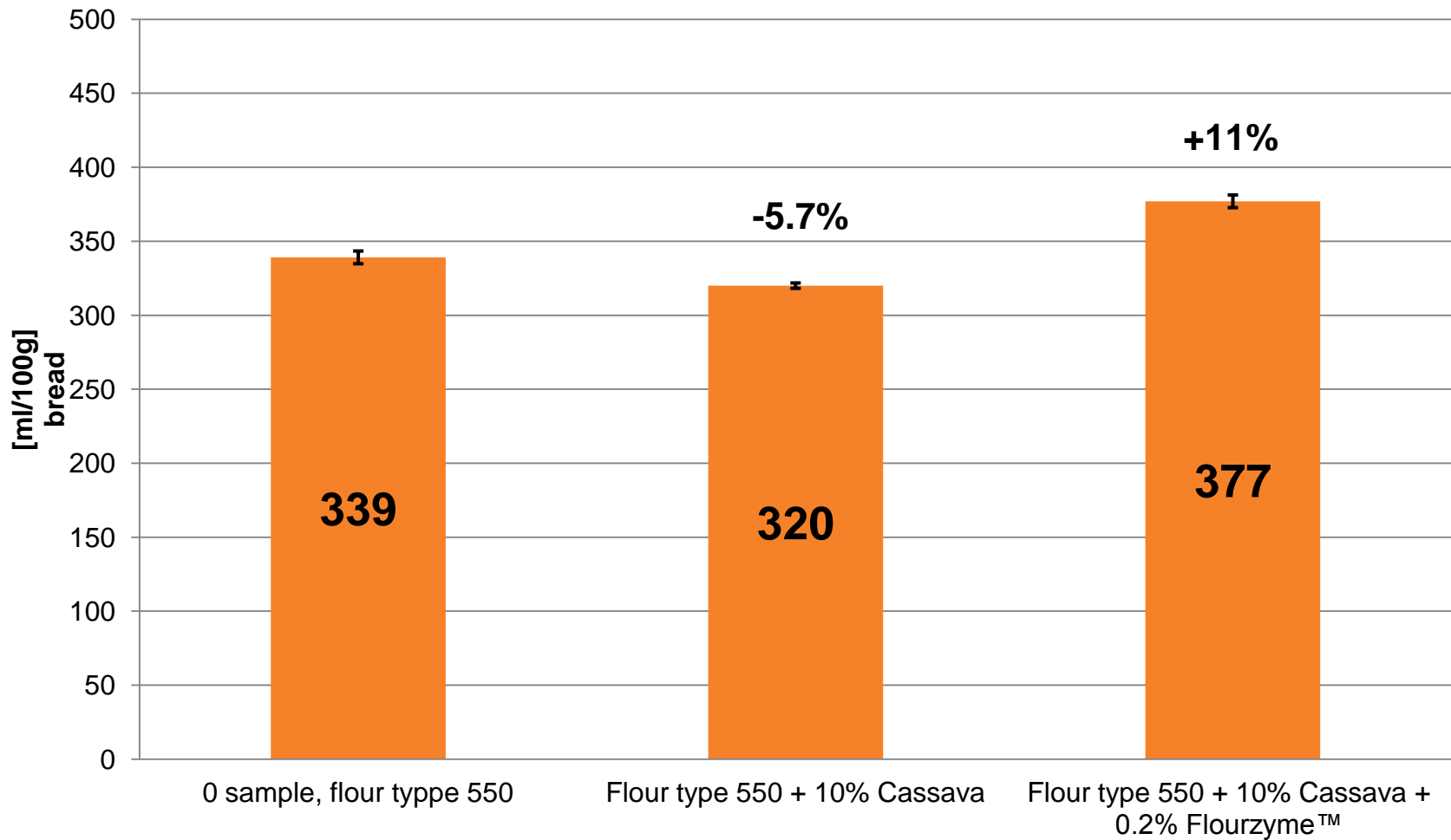
Formulation

Bread without and with 10% Cassava Flour

Ingredients	Trial 1 [g]	Trial 2 [g]	Trial 3 [g]
Flour type 550	1000	900	900
Cassava flour	-	100	100
Water	640	640	640
Yeast	30	30	30
Salt	20	20	20
Sugar	100	100	100
Vegetable Fat	10	10	10
Flourzyme™	-	-	2
Total	1800	1800	1802

Specific Volume

Volume development without and with 10% Cassava Flour

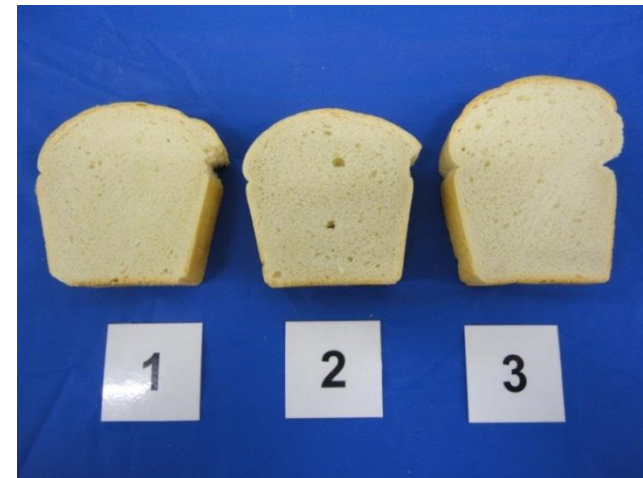


Product Applications

Bread with 10% Cassava Flour



- 1: Flour Type 550**
- 2: Flour Type 550 + 10% cassava**
- 3: Flour Type 550 + 10% cassava
+ 0.2% Flourzyme™**



Product Applications

Bread with Cassava

- Inclusion of cassava flour into wheat flour up to about 20% could still give an acceptable fresh loaf depending on the source of wheat flour.



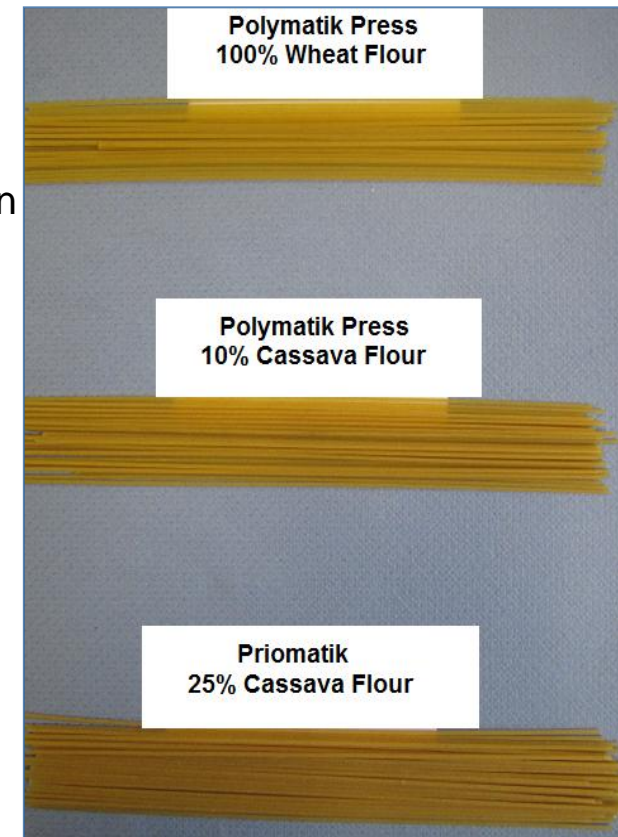
Bread on display for sale in Nigeria

Product Applications

Pasta with Cassava

- Wheat flour blended with 10% native cassava flour had **no negative effect** on cooking properties or texture firmness
- The sample with 10% cassava had a **less sticky surface** when compared with 100% wheat flour
- **Cooking loss** as well as **firmness of the texture** were significantly influenced by addition of 25 or 40% cassava flour.

Trials		Cooking loss	Texture analysis
Technology - Sample		Starch release [%]	E-value [mJ]
Polymatik - 0% Cassava		4.7	0.7380
Polymatik - 10% Cassava		4.6	0.7380
Priomatik - 25% treated Cassava		5.6	0.5350



Summary

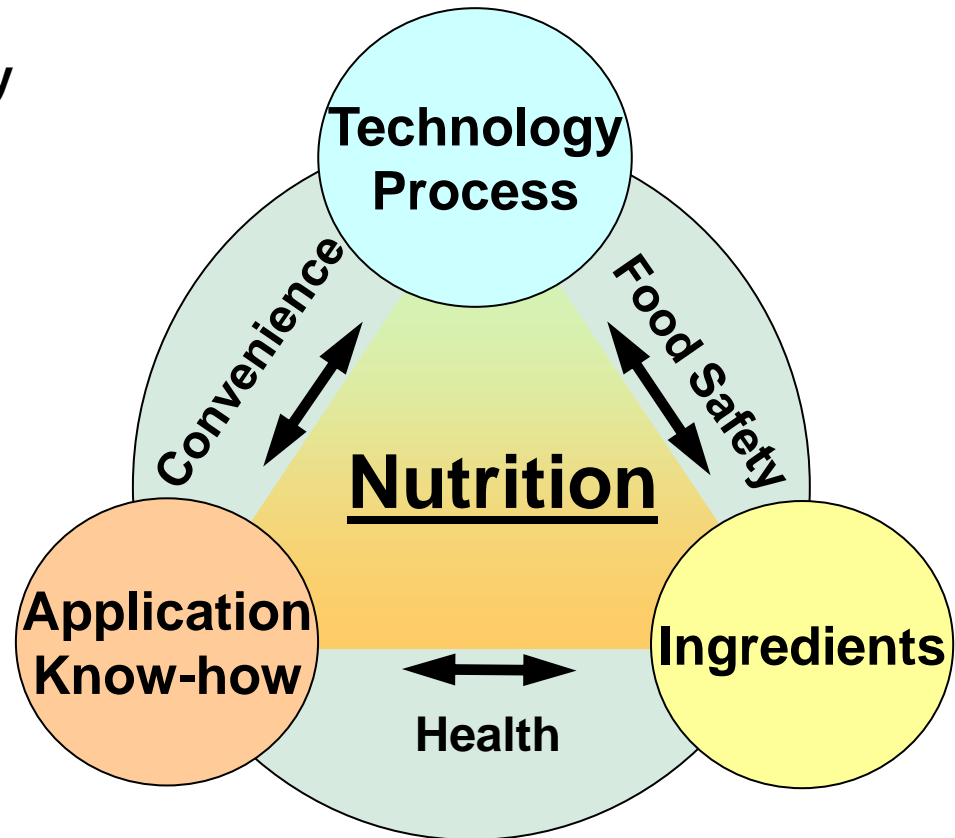
Optimization of Flour Quality

■ Optimal and constant flour quality requires know-how in:

- Technology
- Processes
- Biochemistry and
- Applications

■ Customer Value

- Innovations for the marketplace.
- Higher-value products through new processes or ingredients.
- Upgrading of by-products.
- Development of new market segments.





Thank you!

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