

INDUSTRIAL PROTEINS

Versatile raw materials



29/10/2013

Contents

- **Tereos Syral, raw materials and proteins**

- Different raw materials
- Product portfolio
- Protein production and market

- **Industrial proteins: processes**

- Potato
- Corn
- Wheat

- **Wheat proteins: applications**

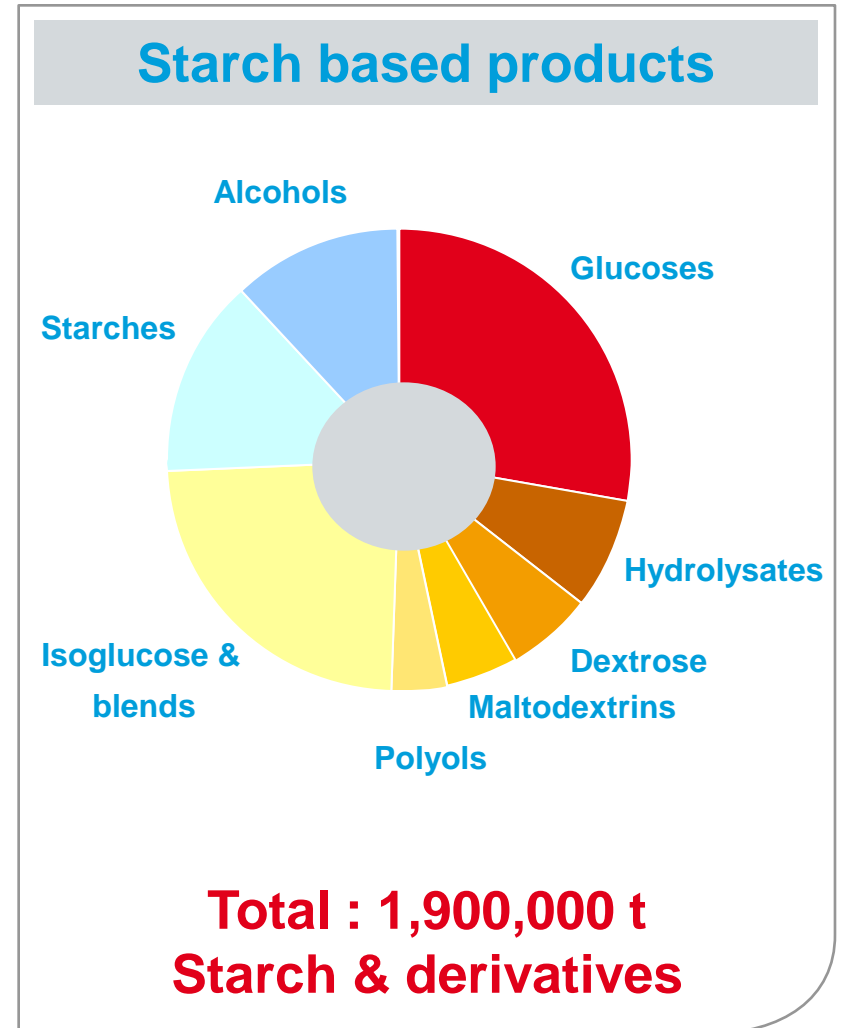
- Food, feed and industrial



Tereos Syral, leader in cereals processing

■ A leading European producer

- #3 globally for starch & derivatives
- #2 for starch-based sweeteners
- #2 for wheat proteins
- #2 for maltodextrins
- #1 for high quality potable grain alcohols



Fiscal year 2010/11

EU Production sites

- Aalst (BE)
- Marckolsheim (FR)
- Nesle (FR)
- Saluzzo (IT)
- Zaragoza (SP)
- Lillebonne - BENP (FR)
- Origny - DVO (FR)
- Selby (GB)
- Haussimont (FR)

Europe



Processed cereals	3 700 000 t
Processed tubers	350 000 t
Starch derivatives	1 900 000 t
Alcohols	500 000 m3
Vegetal proteins	250 000 t
Coproducts	1 300 000 t

Tereos Syral: Protein production in Europe

Europe



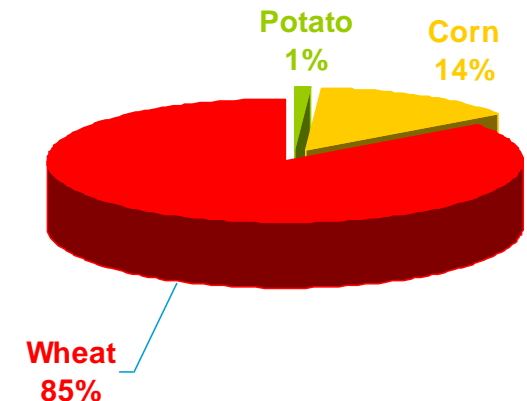
Raw materials :

Wheat

Corn

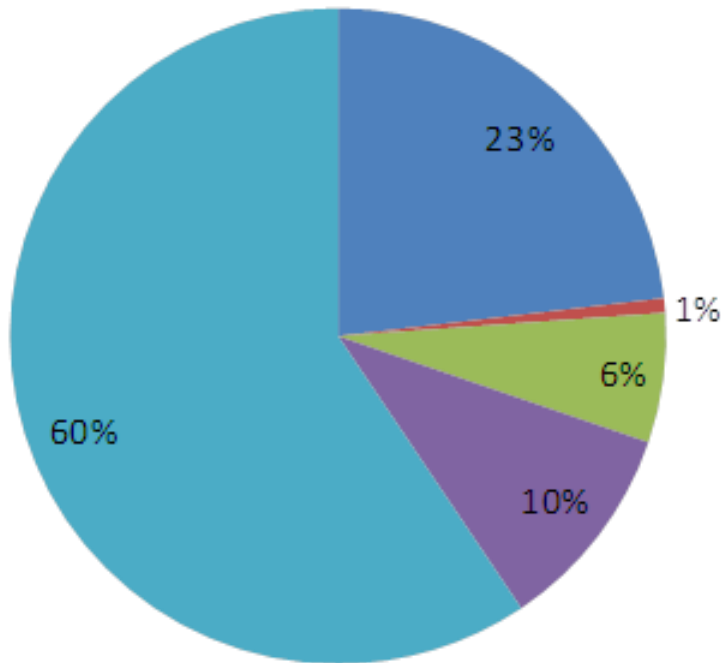
Potato

Repartition of the protein production per raw mat.



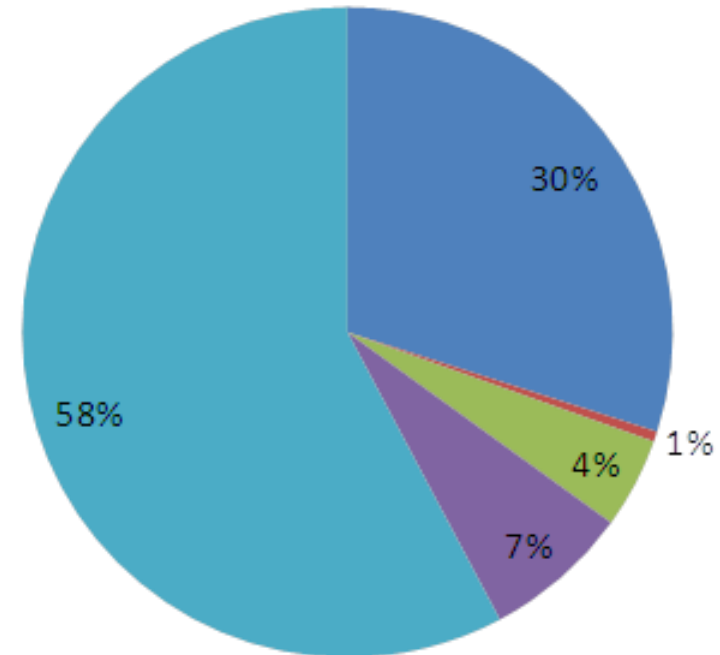
GLOBAL PRODUCTION WHEAT GLUTEN: 2012 – 2018 - BY GEOGRAPHY

1.1 mio tonnes
(2012)

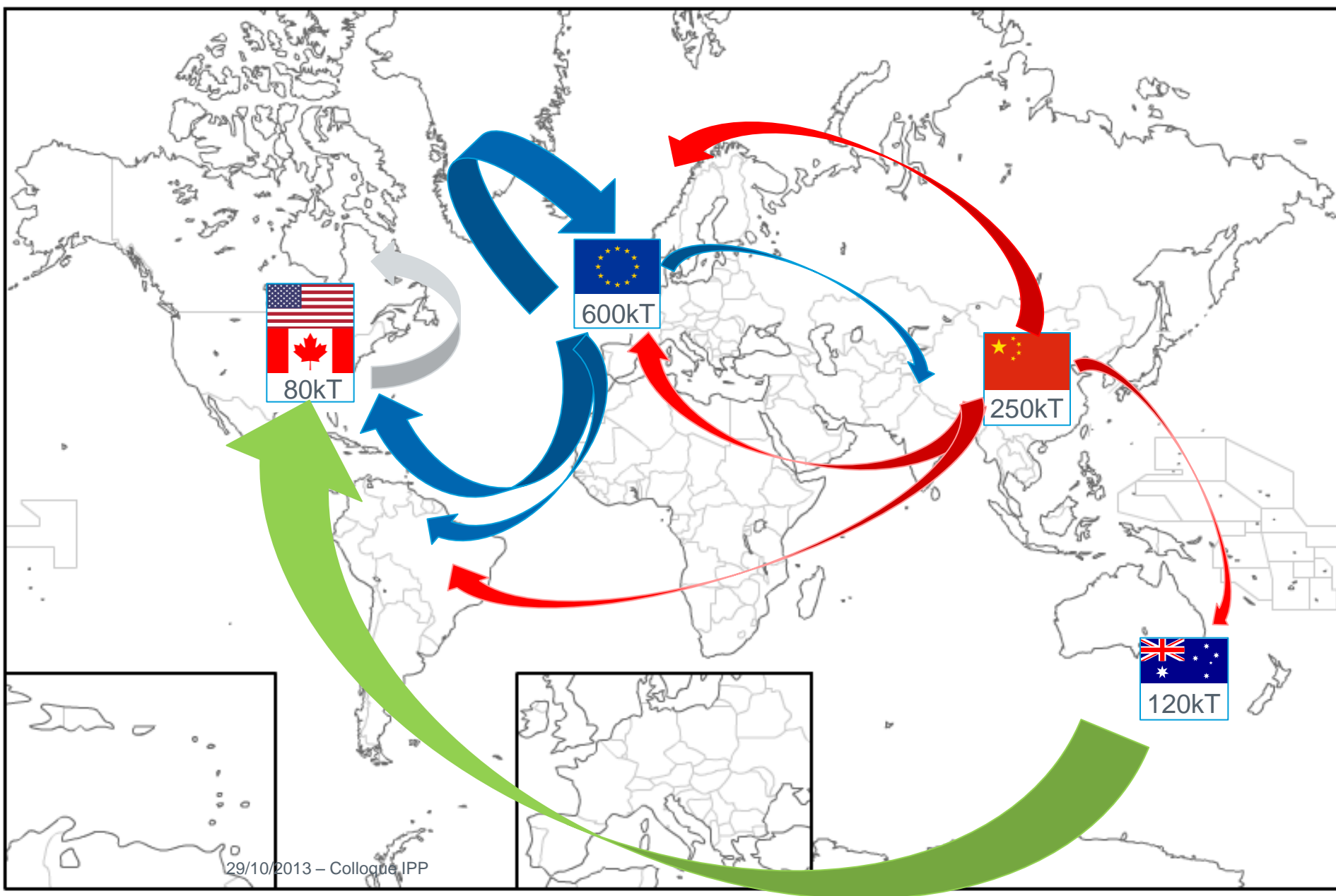


1.5 mio tonnes
(Proj. 2018)

■ Asia
■ Latin America
■ North America
■ Oceania
■ EU

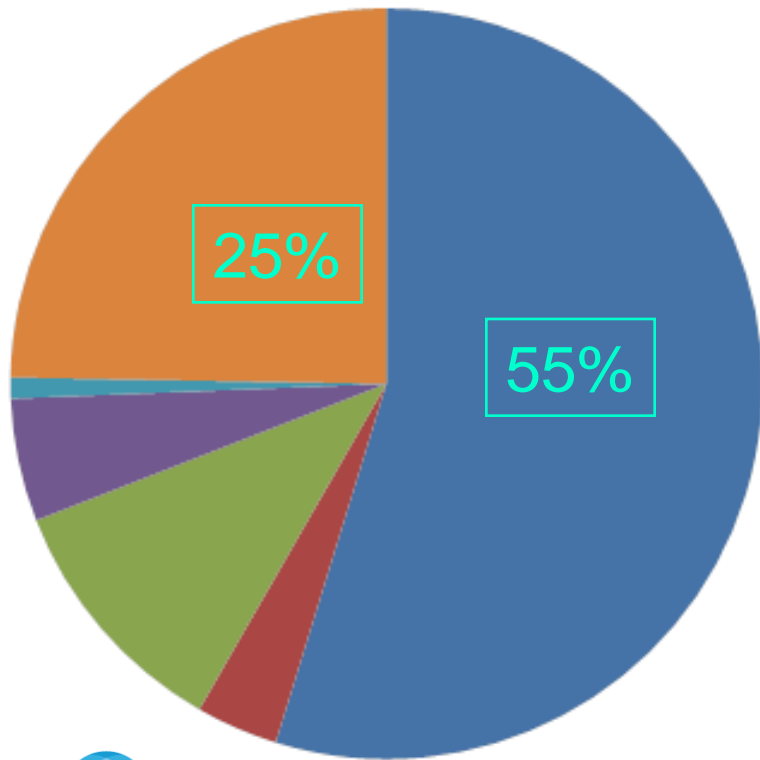


GLUTEN TRADE FLOWS - 2012



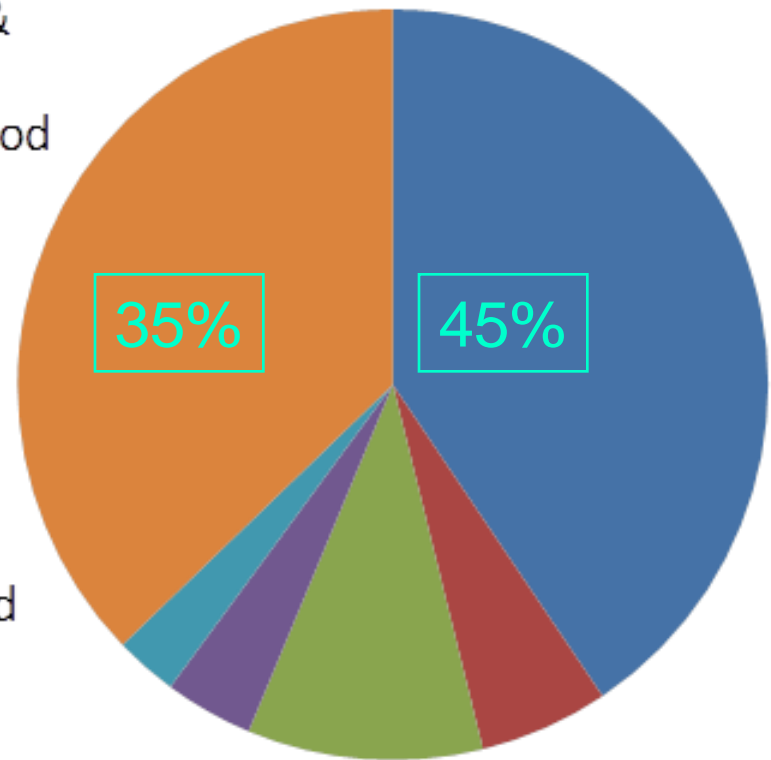
WORLD CONSUMPTION WHEAT PROTEINS BY APPLICATION

1.1 mio tonnes
(2012)



1.3 - 1.5 mio tonnes
(Proj. 2018)

- Milling & Baking
- Other food
- pet food
- veal
- starters
- aquafeed



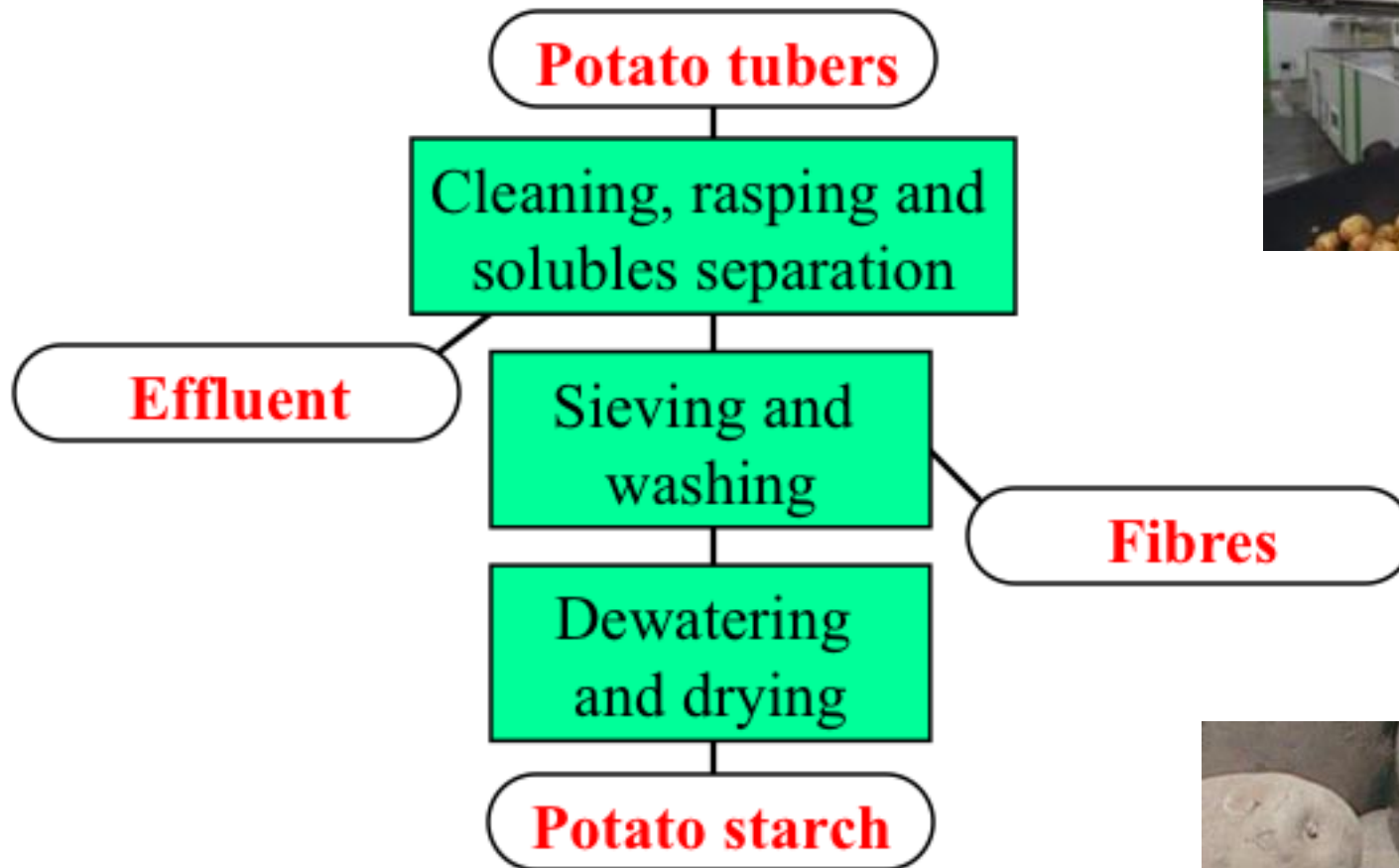
Wheat Proteins value potential

- **Wheat contains abt. 11% Proteins**
- **Protein value from Starch milling :**
 - 60% recovered as Vital Wheat Gluten
 - Value protein > 1,5 €/kg pure protein
 - 40% remains in lower value co-products
 - Value protein < 0,5 €/kg pure protein
- **Protein modification :**
 - Enzymatic hydrolysis : value gain : 20 % to 100%
 - Other modifications : value gain : 50 % to 400%

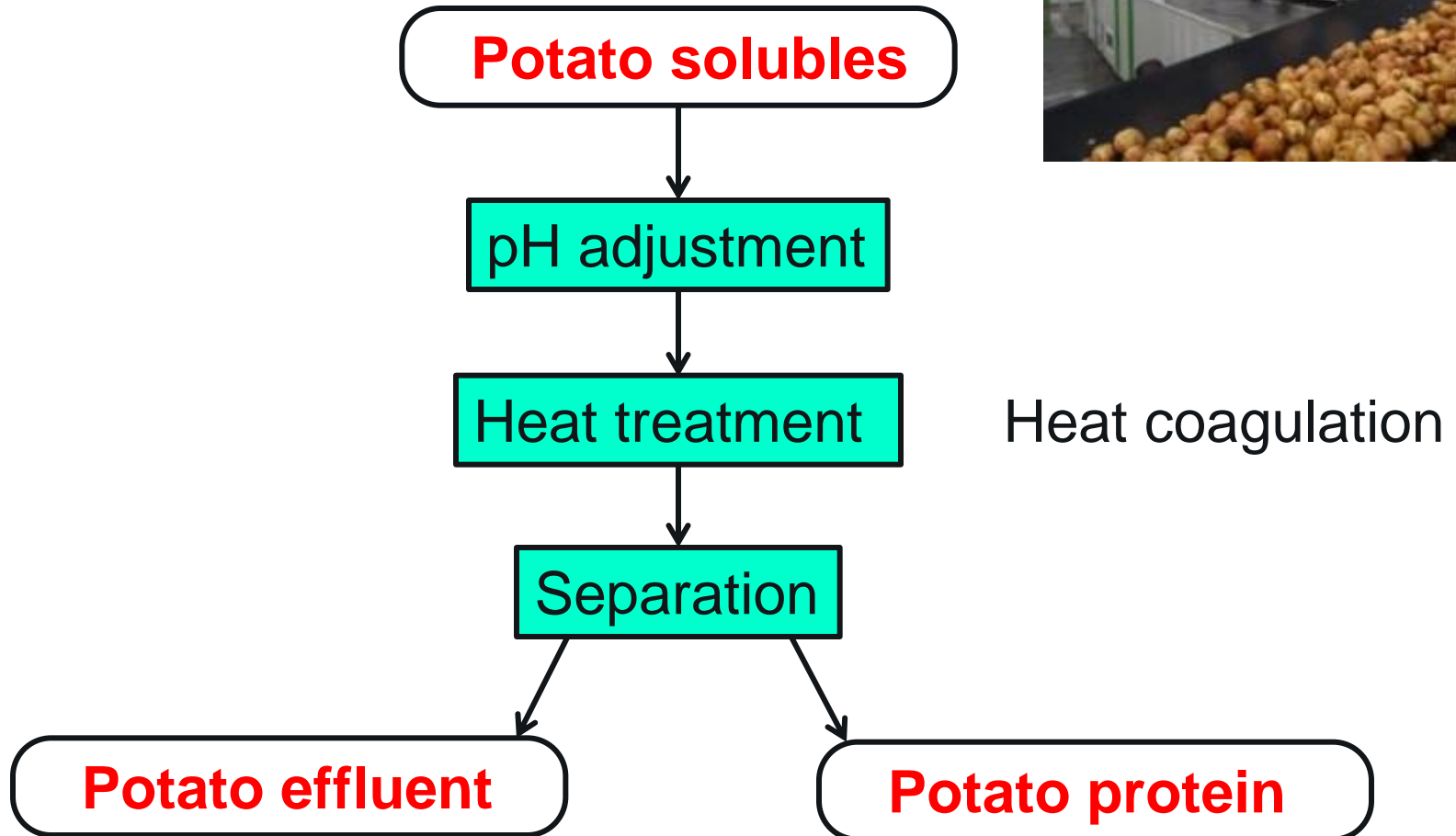
INDUSTRIAL PROTEINS PRODUCTION PROCESSES



Potato starch production

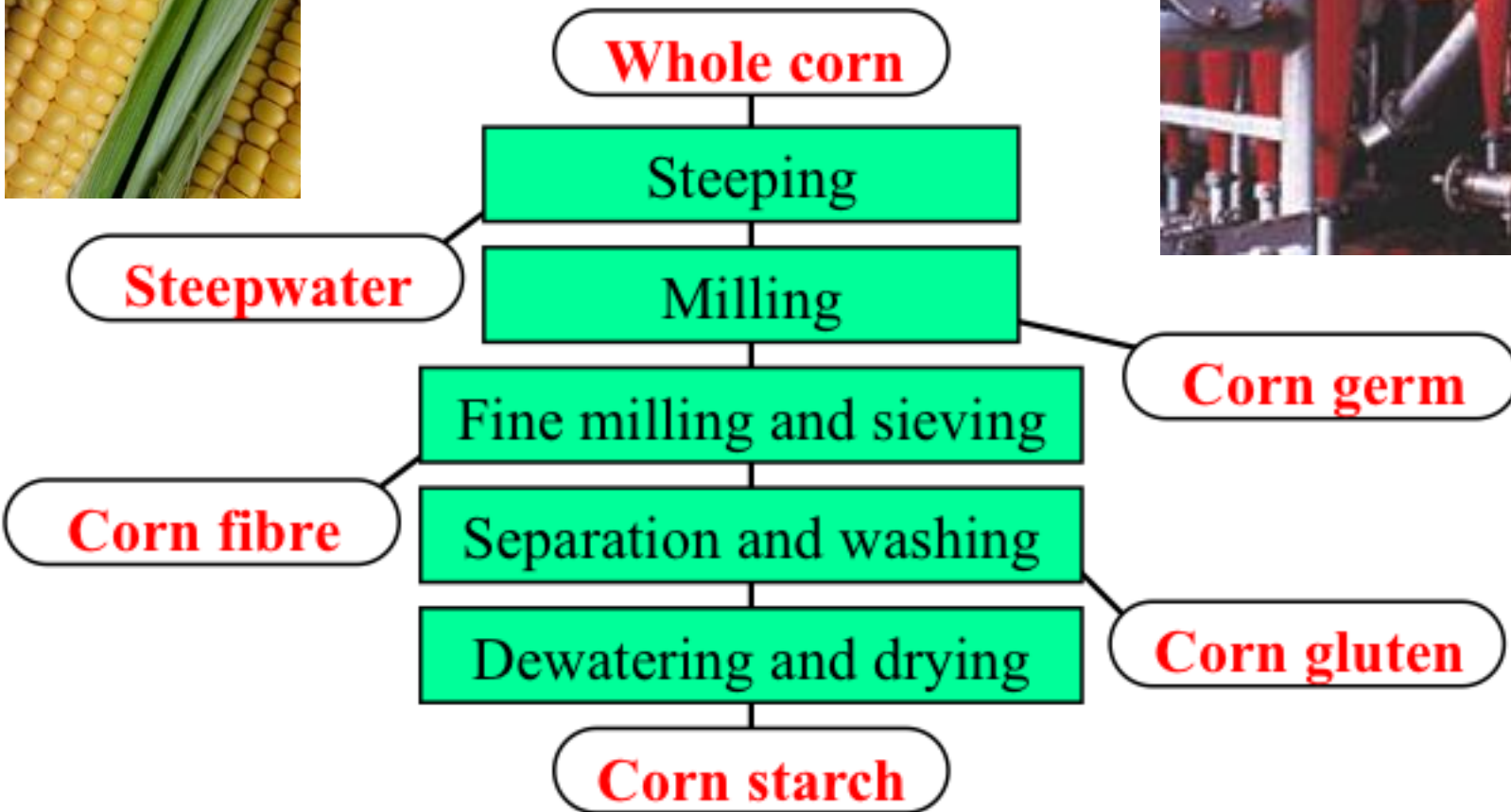


Potato protein production

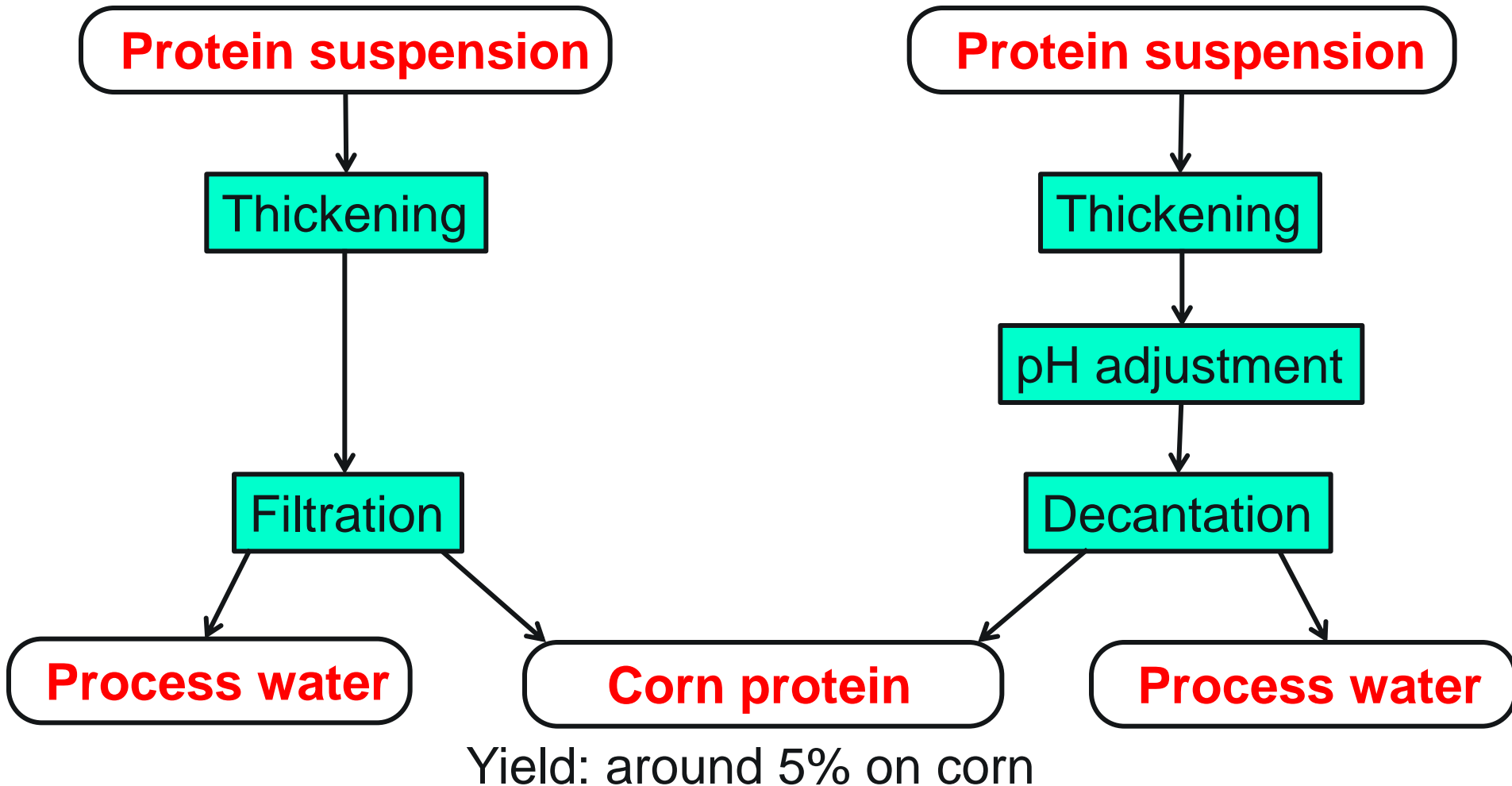


Yield: around 1% on potato
= 4% on dry substance

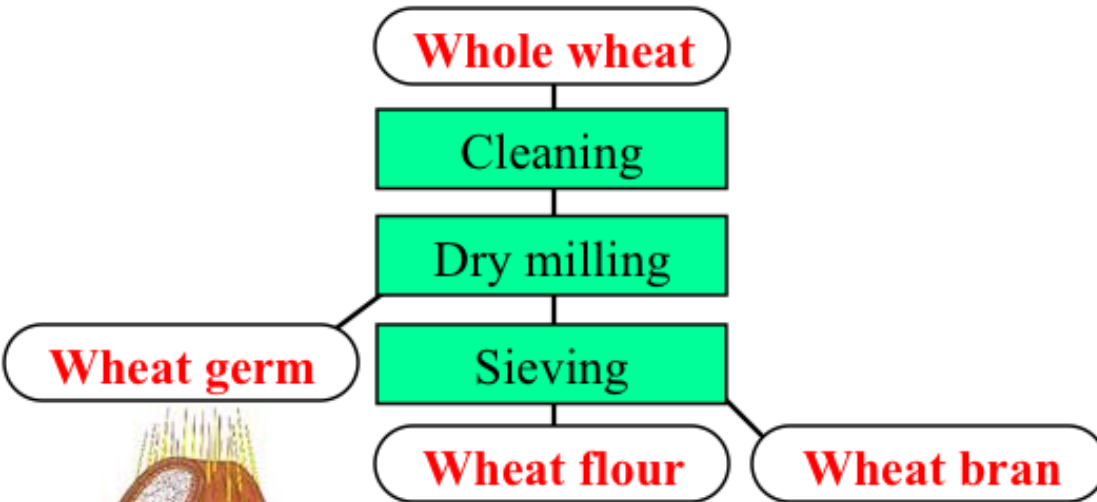
Corn starch production



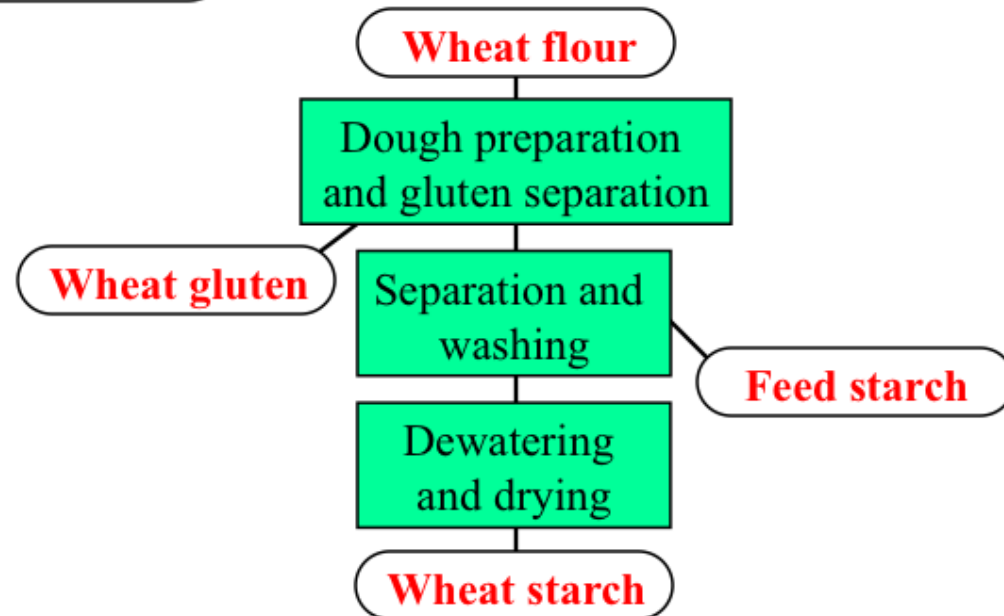
Corn protein production: 2 processes



Wheat starch production



Moisture	12 %
Starch	62 %
Protein	11 %
Fibers	9 %
Sugars	3 %
Fat	2 %
Ash	1 %

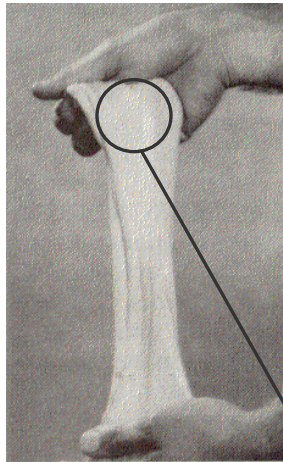


Wheat proteins: Gluten structure and functionality

Gluten in bread dough

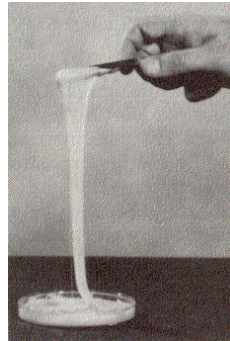


Hydrated wheat gluten

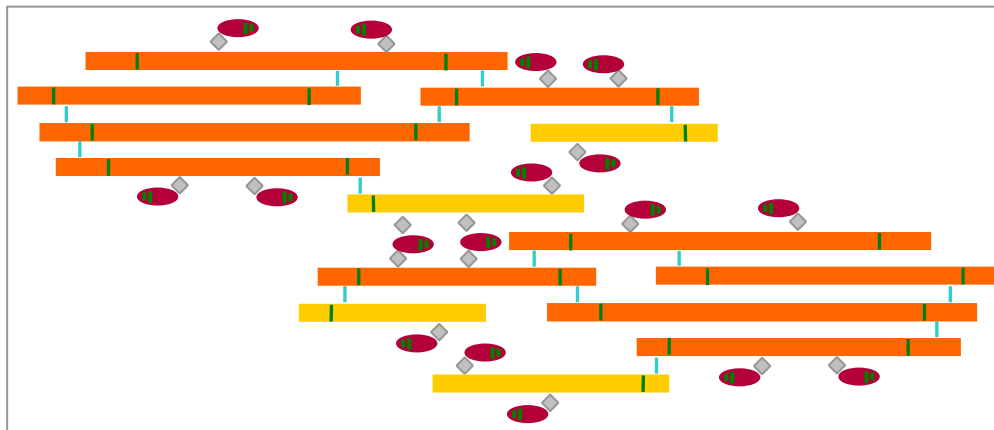


Gliadins: 'viscous' part

Glutenins 'elastic' part



Visco-elastic network



Gliadins

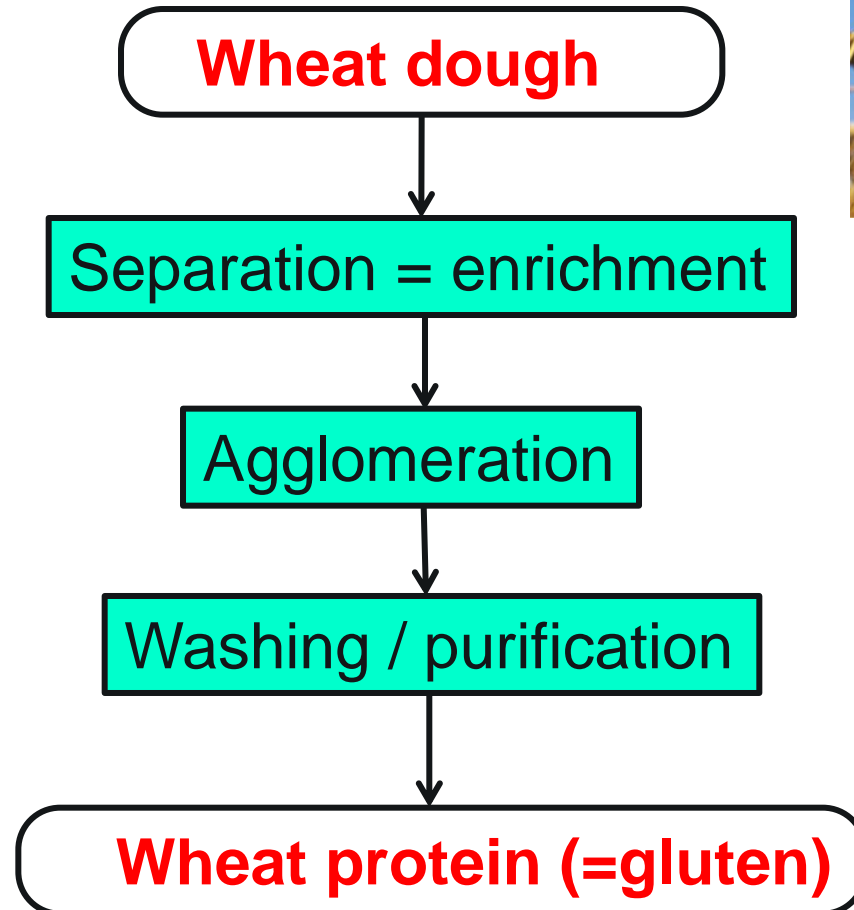
**LMW-
Glutenin**

**HMW-
Glutenin**

| Intramolecular SS bonds | Intermolecular SS bonds

◊ Hydrophobic interactions

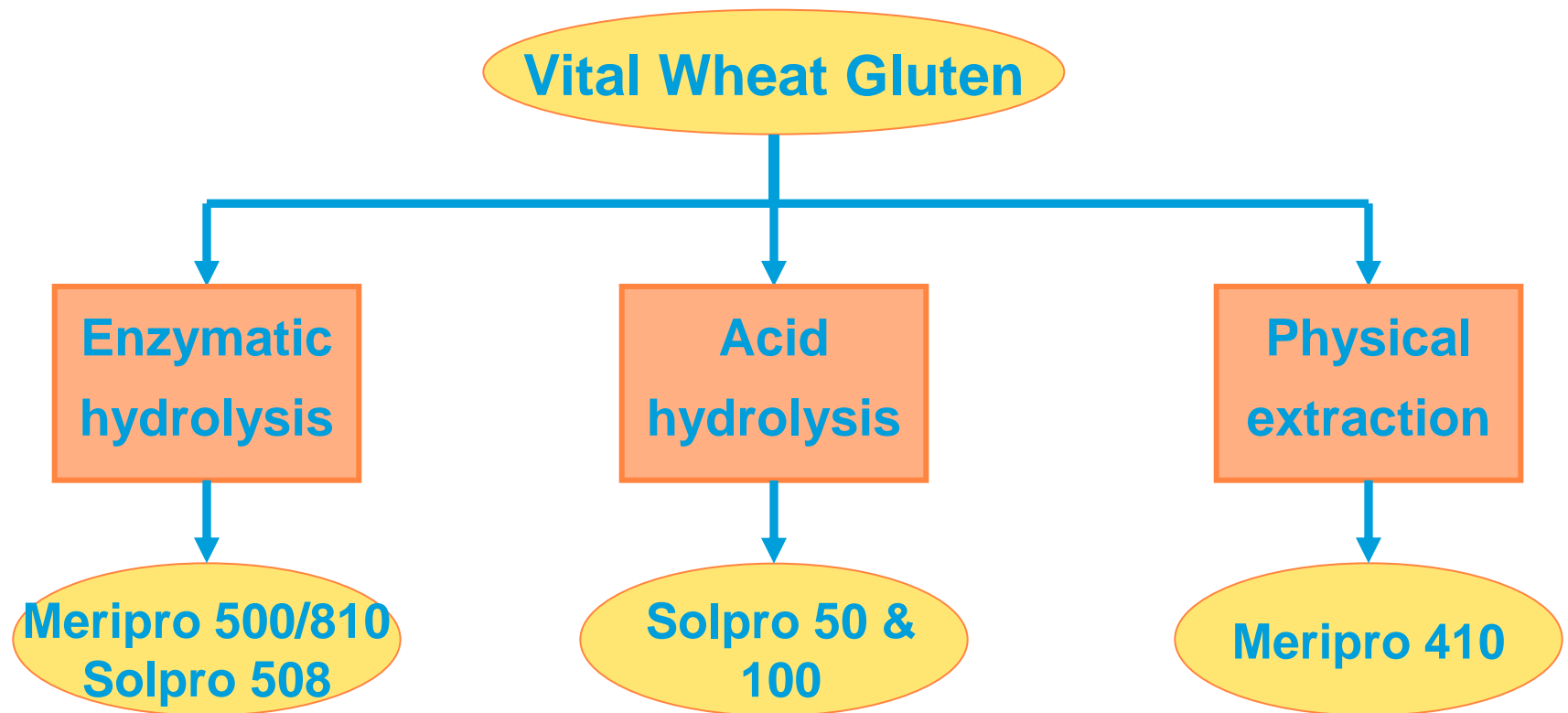
Wheat protein production



Yield: around 8% on wheat

Modified wheat proteins

Production process

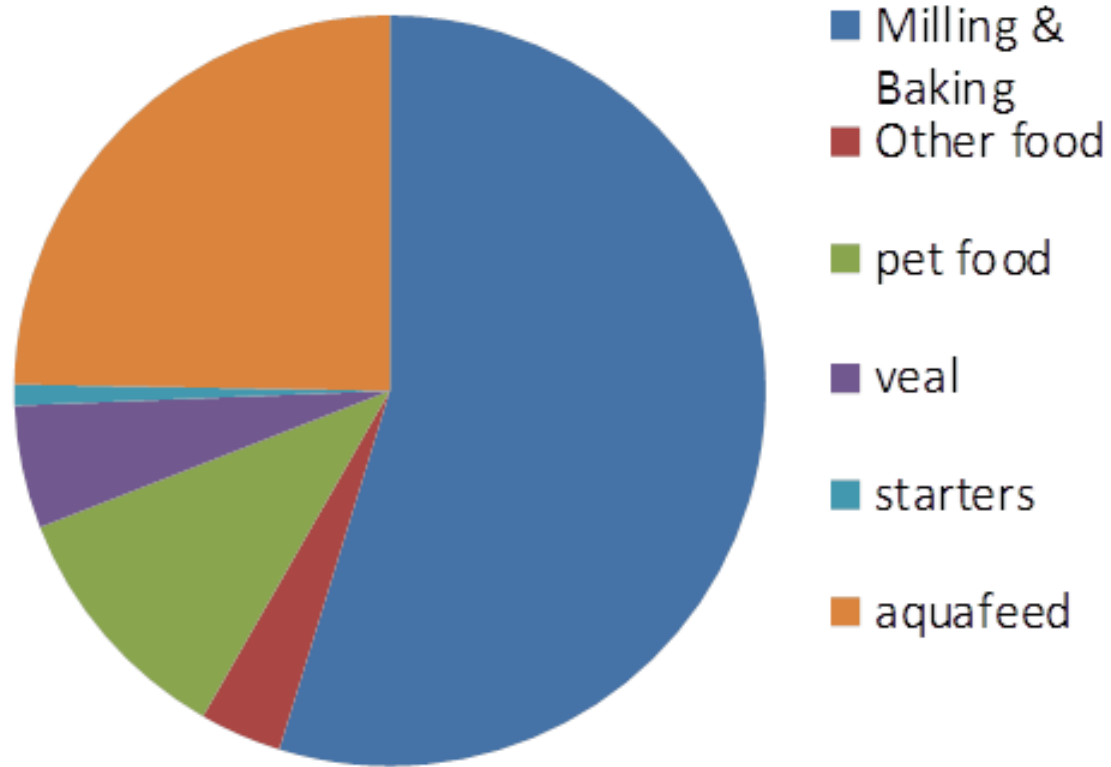


APPLICATIONS of WHEAT PROTEINS



Applications wheat proteins

A 1100 kT market
in 2012



Food applications

Gluten in breadmaking

- **Mixing**



- **Proofing**



- **Baking**

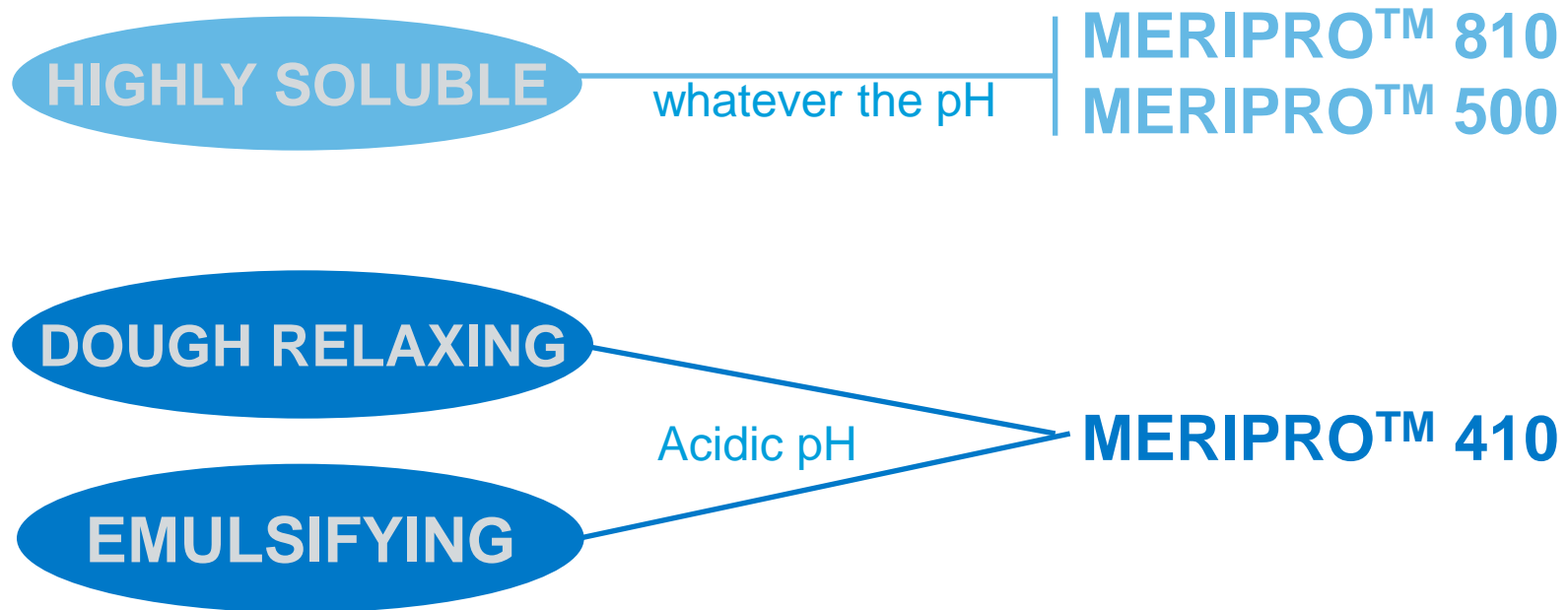


Functionalities gluten:

- Texturising, binding
- Dough rheology/strength
- Baking consistency
- Shelflife
- Freeze thaw stability
- Proofing tolerance

Food applications

Modified wheat protein range



Food applications a highly soluble protein

Application	Replacement of	Advantages	Functionalities	Recommendation
Soups, cereal bars, sports drinks	Vegetable and animal proteins	Vegetable Cost Taste Nutritional	Solubility, neutral taste	MERIPRO™ 810, MERIPRO™ 500
Wheat milk analogue, dessert creams, ice creams	Dairy and vegetable proteins	Vegan suitable Non-dairy protein source Cost	Partial or total dairy proteins replacement Solubility Low viscosity Neutral taste and colour	MERIPRO™ 810, MERIPRO™ 500



Food applications

a vegetable texturiser and emulsifier

Application	Remplacement of	Advantages	Functionalities	Recommendation
Laminated dough Pizza dough Frozen dough	L-cysteine Inactivated yeast Protease	No E number Volume Better freeze-thaw stability	Dough relaxation Good extensibility Freeze-thaw stability	MERIPRO™ 410 MERIPRO™ 410 MERIPRO™ 410
Sauces	Egg yolk	Vegetable Cost Cholesterol-free	Emulsifying Acidic stability Thermal stability	MERIPRO™ 410



Feed applications

Functionality Wheat Proteins

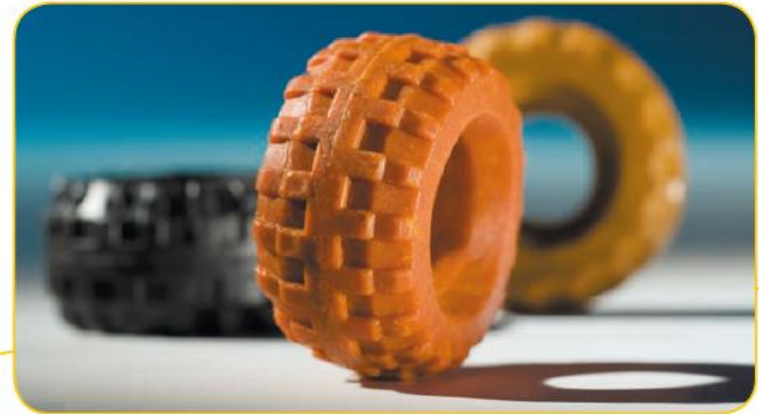
PRODUCT	FUNCTIONAL PROPERTIES	FEED FUNCTIONAL AND NUTRITIONAL INTEREST
AMYTEX 100 & 106	Binding / structural properties Viscoelastic Thermosetting High water binder	Extruded aqua feed Extruded dry pet food Moist pet food Pelletized feed (piglets, broilers)
SOLPRO 508	Solubility Dispersible	Calf milk replacers
SOLPRO 050	Emulsifying properties + gelling at high temp. Soluble Foaming / Texturizing	Moist pet food
SOLPRO 100	Strong emulsifying properties Soluble Foaming / Texturising	Spraying of fat concentrates



MERIPLAST®

A novel protein-based bioplastic

- **Flexible and elastic**
- **Thermo-curing**
- **Water adsorbing**
- **100% Renewable & Biodegradable**
- **Applications**
 - 3D objects for interior use (eg toys)
 - 2D objects (eg leather imitation)





www.tereos-syral.com

