IMPROVE
Institut Mutualisé pour les PROtéines VEgétales

eip-agri
AGRICULTURE & INNOVATION

Building a market: from farm to end-users
Food Opportunities

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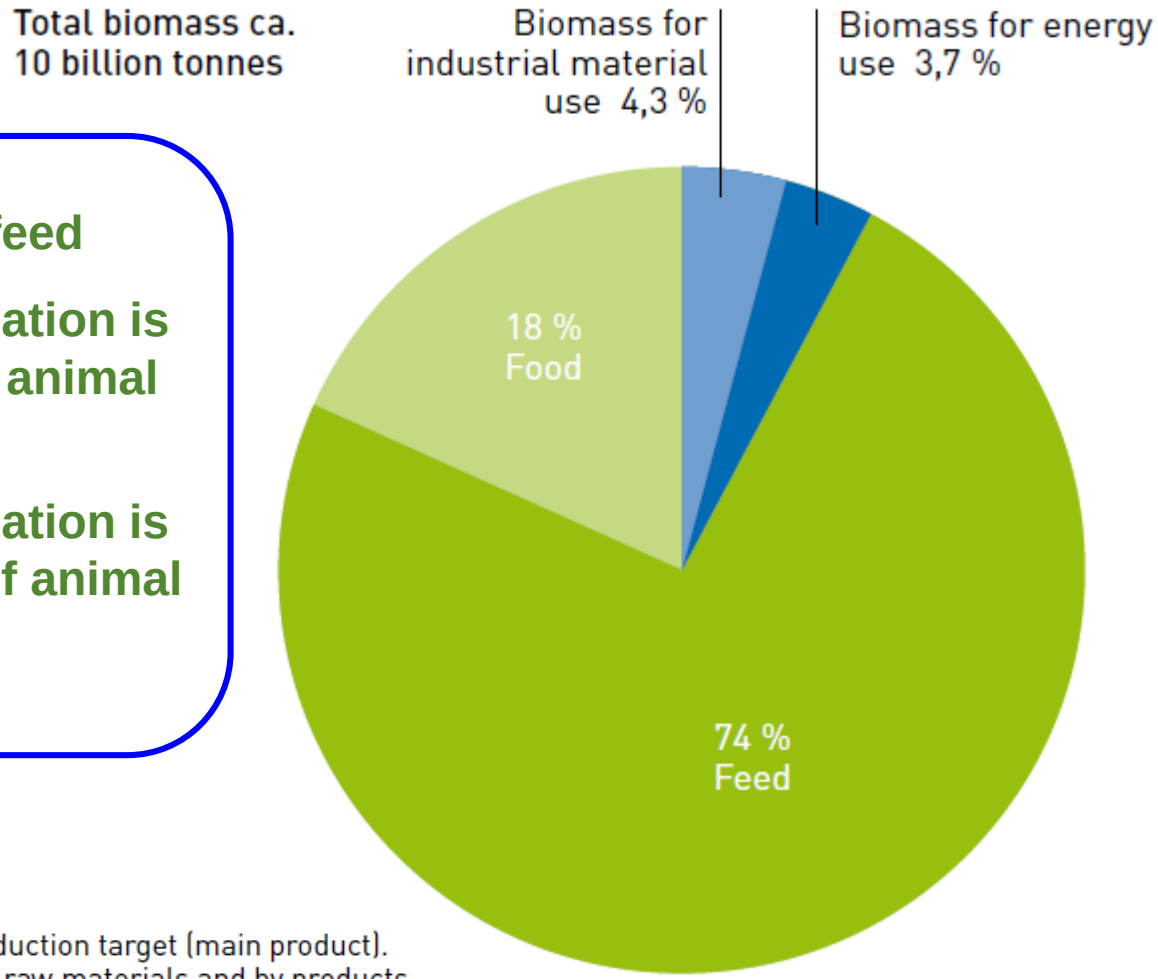
Agricultural ressources usages

Use of harvested agricultural biomass worldwide (2008) (source: nova-Institute)



- **Usages dominated by feed**
- **50% of the world population is using less than 25 g of animal proteins/day**
- **18% of the world population is using more than 60 g of animal proteins per day**

Allocation of biomass to production target (main product). Respective amounts include raw materials and by products, even if their use fall into a different category.

Nutritional transitions

1st nutritional transition

Phase 1 : increase of total proteins demand, based on plant sources complemented with animal sources.

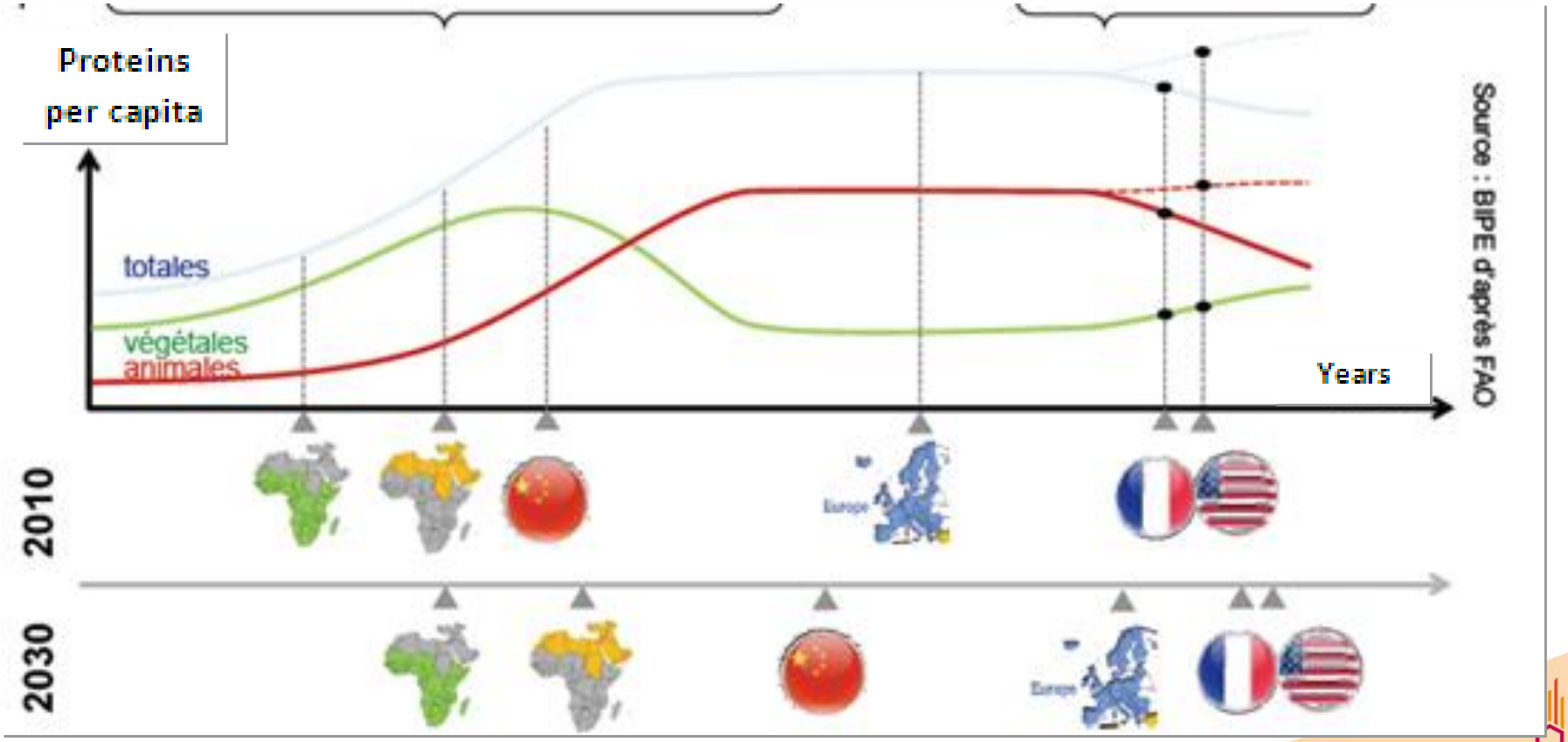
Phase 2: stabilisation of the total demand with a switch from plant to animal proteins

2nd nutritional transition

Increase of the plant proteins demand following 2 models

"American" observed in USA, UK, Germany, Finland Sweden

"European" observed in Norway, Denmark, Austria, France



Proteins challenges

conversion ratio of plant proteins into animal proteins						
proteins yield	milk	fish	chiken	porc	beef	sheep
kg per kg	2,3	2,4	2,8	3,3	9,9	9,9

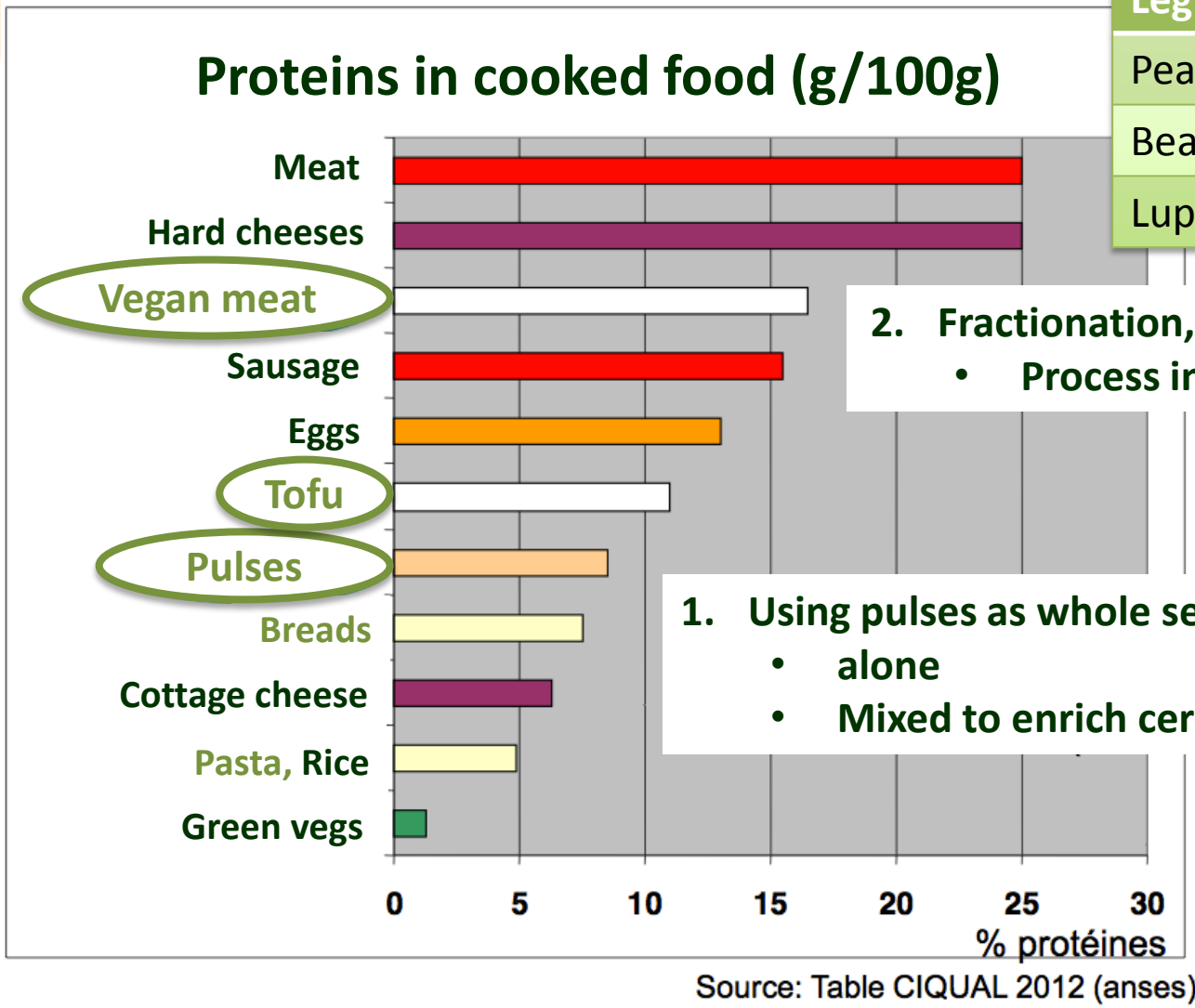
sources CETIOM E Pilorgé 2014

- Weighted world **average is 4,9 kg** of plant proteins necessary to produce 1 kg of animal consumable proteins
- World population will **raise by +24%** in the next 16 years.
- **GDP per capita has a direct impact on diet** → enriching populations can afford to pay for meat
- **High quality proteins** are requested for young animal feeding, pet food and aqua food;

The protein challenge in the nutritionnal transition: a new deal for the legumes?

→ **Where the legume proteins can be found?**

Legumes	Proteins
Pea, lentil	20 – 25%
Beans	30 – 35%
Lupin, soja	40 – 45%



Source: Table CIQUAL 2012 (anses)

2. **Fractionation, development of new products**
   - **Process innovation, formulating**

1. **Using pulses as whole seed:**
   - **alone**
   - **Mixed to enrich cereals-products highly consumed**

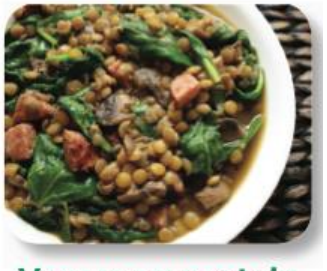
+ other nutritional advantages: fibers…

From INRA, G. Duc & M.-B. Magrini - https://colloque6.inra.fr/legumineuses_alim_humaine/Actes2

Which innovation to boost pulses usage as whole seeds?

- ✓ **Process innovation:**
  - Reduce coocking time
  - Combine pulses with cereals in end products
  - Ready to eat: recent innovation…

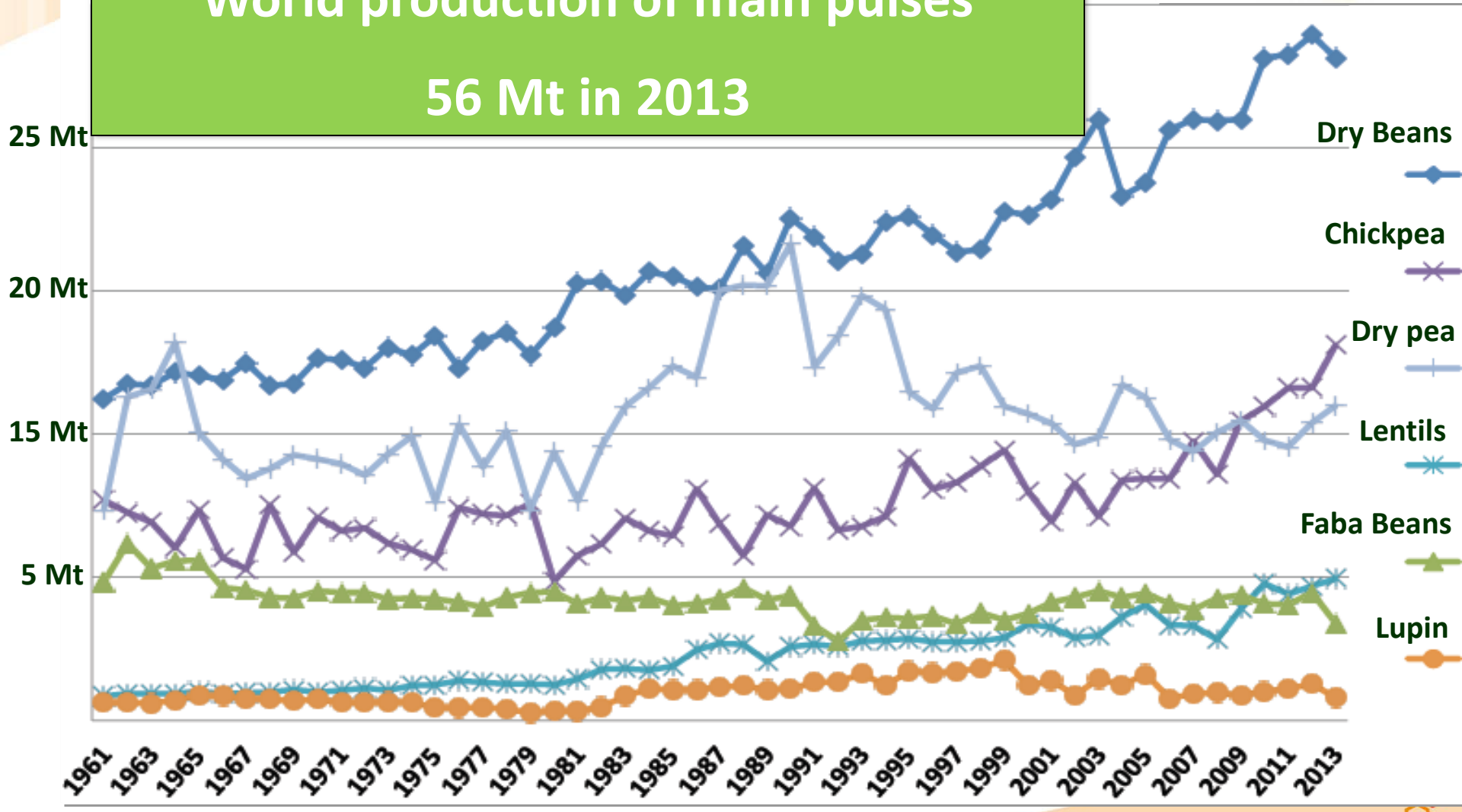
- ✓ **Communication :**
  - Nutritional classification to be revised?
  - Which nutritional value to promote 1st?
  - Green-label ?
  - role of prescribers
  - Collective brands?
  - …



USDA

World production of main pulses

56 Mt in 2013



World plant proteins production

- World usage for high vegetal proteins ingredients was **1,7 millions ton** in 2012
- This is **a fast growing market**.
  - Forecast for 2012 – 2018 is +5 %/year (Forst & Sullivan 2013)
- Main sources of high vegetal proteins ingredients available are:
  - **soy proteins → 56 %** of the market
    - Soy proteins isolate (15 % of the market)
    - Soy protein concentrate (27 % of the market)
    - Soy texturized proteins (14 % of the market)
  - **Wheat vital gluten → 43 %** of the market
  - **Pea proteins → less than 1 %** of the market
  - **Others → ~1 %** of the market: Rice - Potato – Rape seed – Lupin – Sun flower – Algae's – Microorganisms – Fungi.

World pulses ingredients production

Production de pois secs

• *En 1 000 tonnes, principaux pays producteurs*

	01/02	10/11	11/12	12/13	13/14
Chine	1 120	911	1 190	1 114	-
Inde	700	675	593	625	-
Pakistan	61	54	57	55	54
Canada	2 023	3 018	2 502	3 341	3 849
Australie	416	395	342	320	363
Etats-Unis	172	645	255	493	708
Russie	1 272	1 188	2 021	1 660	1 973
Ukraine	603	452	364	443	494
Rép. Tchèque	93	48	52	31	33
Hongrie	64	37	43	43	40
France	1 720	1 108	676	589	533
Royaume-Uni	361	147	123	63	114
Allemagne	560	172	155	139	128
Danemark	113	28	20	18	15
Espagne	49	238	253	137	177
MONDE	**10 531**	**10 439**	**10 050**	**10 438**	-

Sources : UNIP avec FAO, STAT Publishing, ABARE, sources professionnelles européennes et Eurostat (provisoire pour 2012/13 et 2013/14)

Production de fèves et féveroles

• *En 1 000 tonnes, principaux pays producteurs*

	01/02	10/11	11/12	12/13	13/14
Chine	1 950	1 400	1 550	1 400	-
Ethiopie	454	611	698	715	-
Royaume-Uni	606	580	419	400	450
Maroc	82	149	171	148	-
Egypte	439	234	175	185	-
Italie	84	104	82	96	48
Tunisie	19	48	73	72	-
Allemagne	81	50	61	61	57
Espagne	15	36	43	24	28
France	167	521	336	306	265
Australie	350	324	268	377	365
MONDE	**4 701**	**4 705**	**4 559**	**4 522**	-

Sources : UNIP avec FAO, ABARE, sources professionnelles européennes et Eurostat (provisoire pour 2012/13 et 2013/14)

Production de lupins

• *En 1 000 tonnes, principaux pays producteurs*

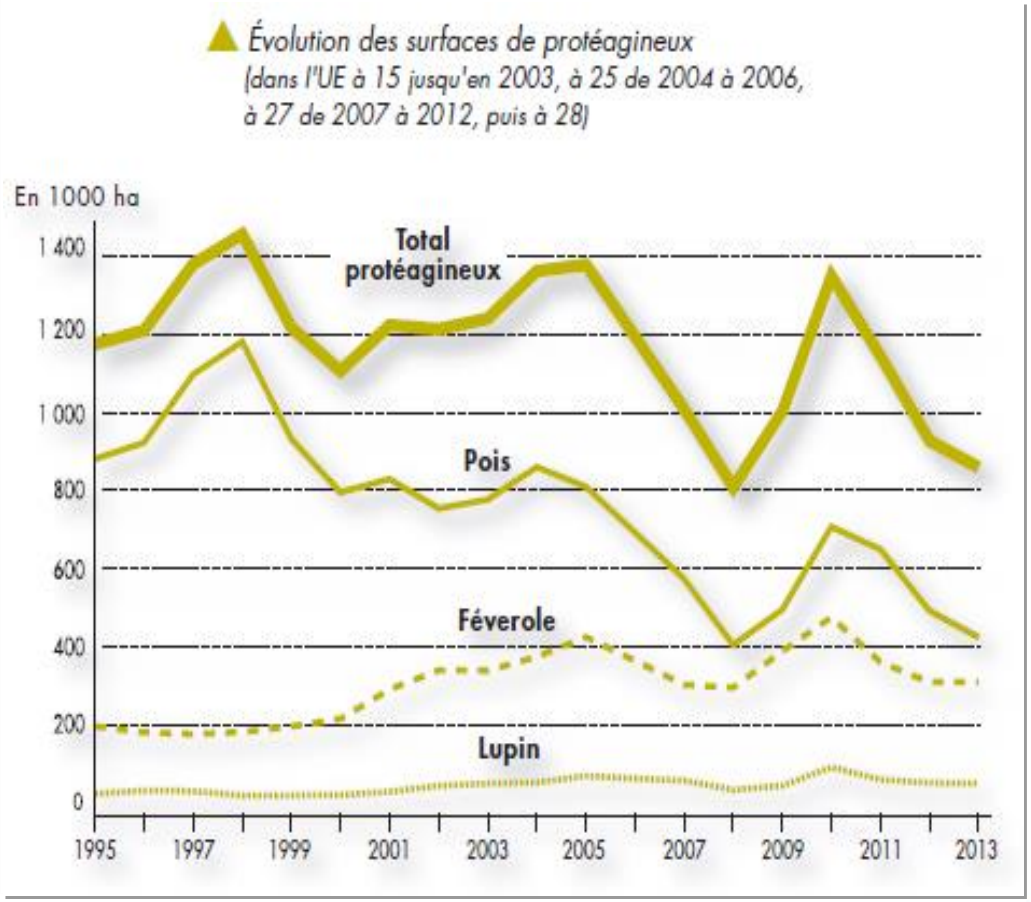
	01/02	10/11	11/12	12/13	13/14
Australie	1 220	808	982	459	581
Pologne	18,7	126,2	78,6	77,8	75,0
Chili	37,0	73,3	44,2	38,9	-
Allemagne	92,0	30,6	27,6	31,5	30,0
France	27,0	14,4	6,9	5,5	7,0
Russie	23,7	9,7	21,1	26,4	19,0
Afrique du Sud	16,3	16,1	16,0	18,0	-
Pérou	9,9	10,5	11,3	11,7	-
Ukraine	-	60,4	38,9	37,5	-
MONDE	**1 482**	**1 210**	**1 280**	**768**	-

Sources : UNIP d'après FAO, ABARE, sources professionnelles européennes et Eurostat (provisoire pour 2012/13 et 2013/14)

- Steady production world wide
- **15,7 Mt in 2013** (2/3 from pea)
- Main producers are:
  - **Canada**, China and Russia for **peas**
  - **China**, Ethiopia and UK for **Faba beans**
  - **Australia**, Poland and Chile for **lupin**

Pulses ingredients production in Europe

- Decreasing volumes produced →
  -30% in 18 years
- Global European production:
  2,46 Mt in 2013.
- Yields reduction
- **France** is by far the **1er European producer** with 33% of tonnages and with production rate per hectare **50% above European average**.
- **Fluctuating yield** (4,2 t/ha +/- 10% on peas).
- **Market price linked to wheat price** with 50 €/t premium for pea and 100 €/t for faba bean**.**
- **Strong competition on export** markets (quality, supply chain)



Mains industrial pulses ingredients producers

Industrial producers of pea ingredients

- **Axiom Foods** and **Nordic Food Partners** US company producing different vegetal extracts including pea
- **Burcon NutraScience Corporation** Canadian company producing pea and canola proteins.
- **Cosucra**, Belgian company producing a range of pea proteins.
- **Fenchem**, Chinese company active in food, feed, cosmetic
- **Kerry Ingredients & Flavours** Irish group, very dynamic in the food sector.
- **Nutri-Pea** Canadian producer
- **Prinova** US company, proposing blends of vitamins, hydro-colloids and plant proteins.
- **Roquette** French starch producer
- **Sotexpro** French company producing fractionated and texturized pea proteins.
- **Yantai** Chinese company proposing a portfolio of pea fractions.

Mains industrial ingredients producers

Industrial producers of faba beans ingredients

- **Sotexpro** French company producing fractionated and texturized faba bean proteins
- **AIT;** AXIANE MEUNERIE; EUROGERM S.A. ; GEMEF INDUSTRIES; GRANDS MOULINS DE PARIS - NUTRIXO ; LIMAGRAIN CEREALES INGREDIENTS ; LOUIS FRANCOIS **:** French companies producing faba beans flour for the bread making industry (lipoxygenase activity)

Industrial producers of Lupin ingredients

- **Lup'ingredients** French company subsidiary of TERRENA group.
- **Prolupin** German company proposing a portfolio of products extracted from lupine
- **Twello** subsidiary of Barentz group in Nederland

Expectations from industrials

- **Valorise the different fraction of the kernel**
  - To be profitable it is key to valorise the 3 main grain's fractions (proteins, starch and fibres).
- **Develop new R&D initiatives on grains quality improvement**
  - Reduce fat content (oxidation, taste & flavour, technological hurdle on air classifying and emulsion)
  - Improve capabilities for the dehulling, the milling, the air classification
  - Improve organoleptic properties
  - Increase proteins content
  - Reduce agronomical yields fluctuations
- **Develop new varieties**
  - In Canada new varieties are introduced in the market every years.
  - Most of varieties used in Western Europe are more than 10 years old.
  - It is common practice for European farmers to produce its own seeds (50%).

Prospects for pulses crops

Promising future

- Major **durable proteins** sources (> 1 t de proteins / ha; low chemical usage; diversification of crop rotation…).
- **OGM free** world wide (important for European customers).
- Produced and consumed **all around the world** → no cultural limitations.
- New technologies will support **quality improvements**.
- **Competitive** proteins prices
- Texturized proteins from pea, soy and wheat are **without equivalent** in animal proteins.
- Consumers are demanding more and more plant proteins, pulses have a **key role to play**.

Recover sufficient production volumes

- Sufficient productions for feed and food can allow to **make trade-offs** on different quality requirements

IMPROVE SAS: 1st R&D centre on plant proteins

IMPROVE's technological road map

1- Native Protein extraction: Properties assessment

2- Protein interaction: Aggregation, Crosslinking, Interaction with other proteins or polysaccharides

3- Enzymatic Hydrolysis and fractionation for functional, nutritional and biological properties

4- Biological properties: Mechanism of interaction with Human and animal metabolism: Bioactive peptides, allergenicity and digestibility

5- Proteins modifications

- Chemicals: Sustainable chemistry
- Enzymatic
- Thermochemical

6- Market, societal & Economical Studies

- To identify and anticipate hurdles to increase plant based proteins in food
- To make proposals to address those hurdles

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Thanks

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