



Product quality from a nutritional and sustainability perspective

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feeding the future

Evolution animal product quality: towards a holistic approach

Productivity & efficiency

- Economy

Sustainable development!

Growing importance of societal & consumer concerns



End product quality

- Sensory
- Nutritional
- Safety

Production system



- Social-cultural
- Ecology
- Ethics
- Animal welfare&health
- ...

Animal product quality important for differentiation

Pig production systems identified in EU-23

Production system	Claim	%
40 conventional		
44 (≥ 1 claim for differentiation)	Welfare	68
	Eating quality	70
	Nutritional quality	25
	Environment	41
	Organic	25
	Local	9

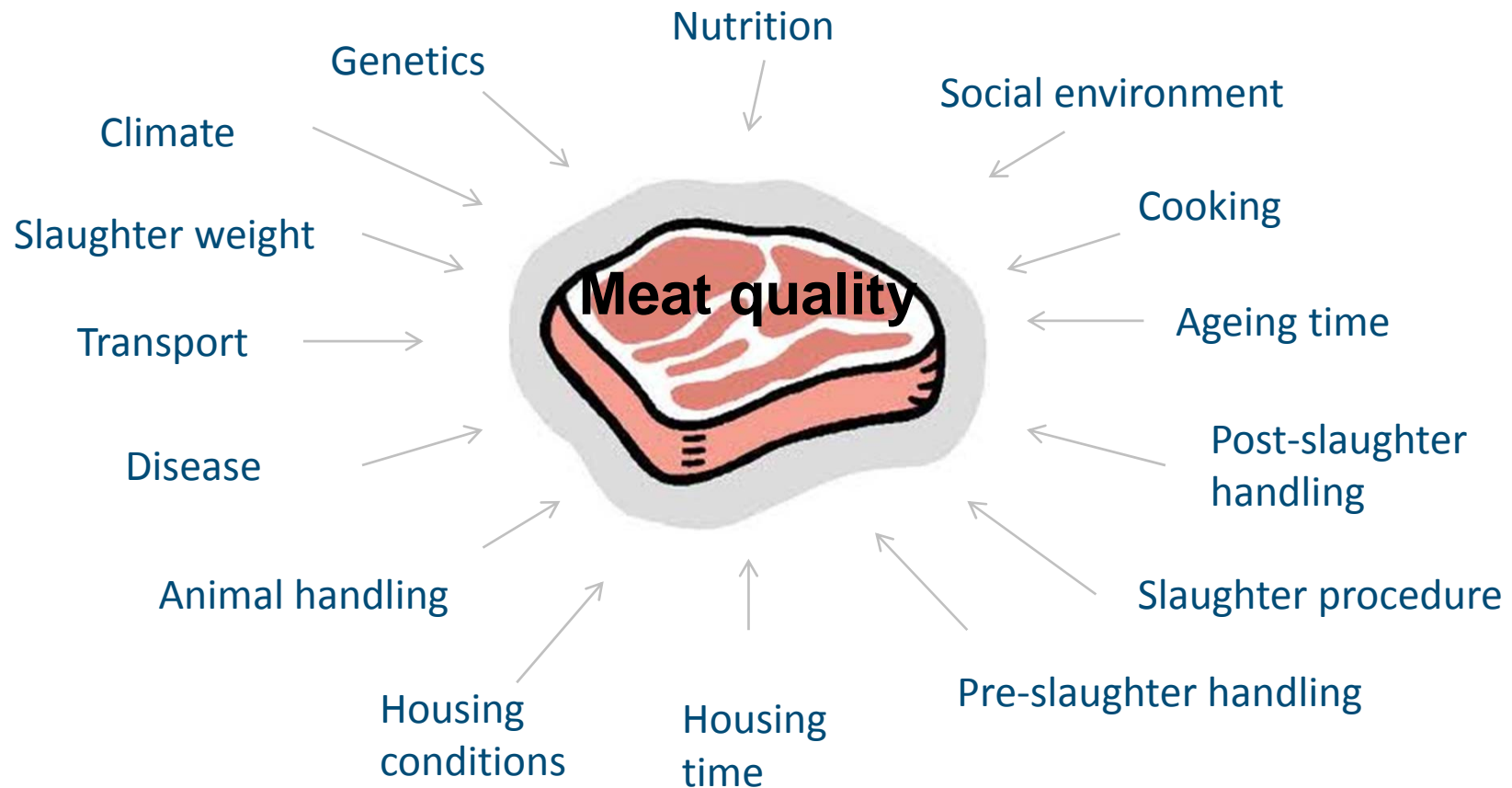
Impact of nutrition on both product & process

Source: M. Bonneau, INRA, Q-PorkChains 2011

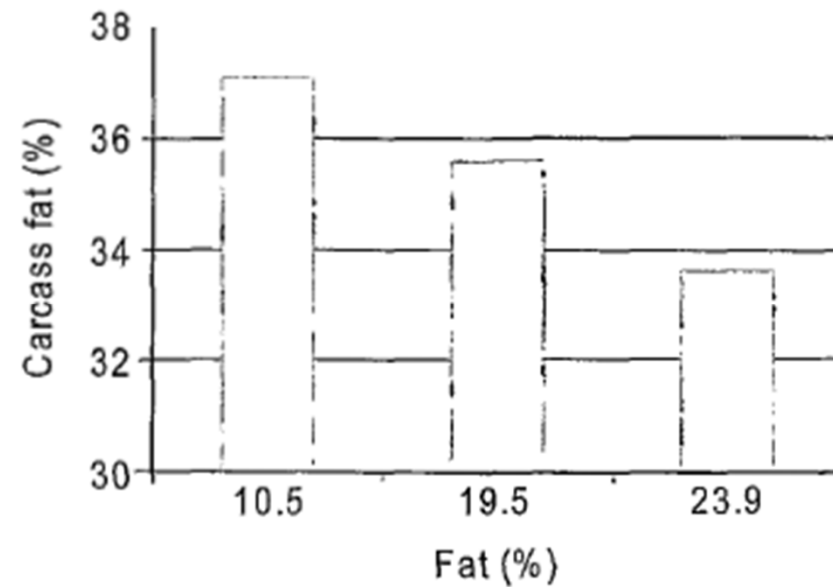
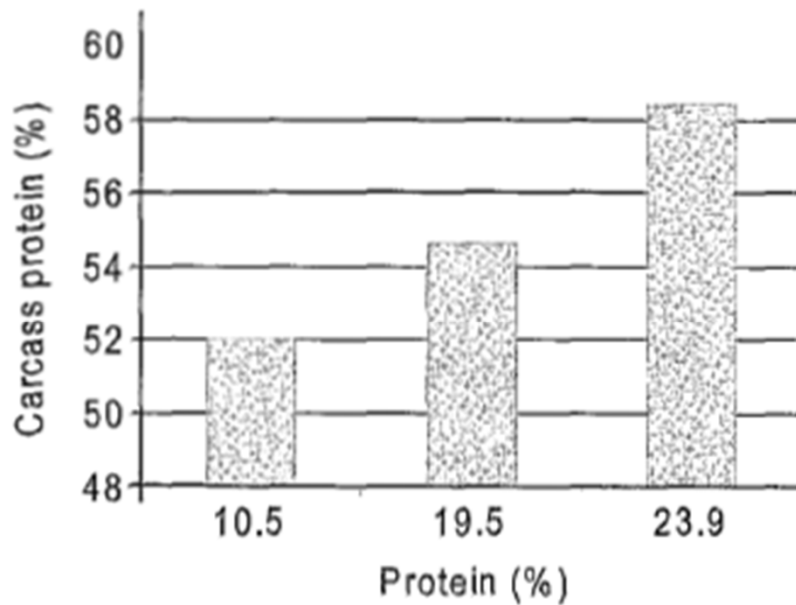
Nutrition only one of the many factors influencing animal product quality (product & process)

Impact on end product quality: factors influencing meat quality



Traditionally, nutrition focus was on improvement of efficiency with interest in side effects on end product quality

Influence of dietary protein levels on broiler carcass protein and fat content (Summers et al, 1992)



In particular the effects of amino acids have been investigated

Influence of lysine on the refrigerated broiler carcass composition
(Moran and Bilgili, 1990)

Lysine (%)	H ₂ O (%)	Protein (%DM)	Fat (%DM)	Ash (%DM)
0.85	66.1	41.3	44.2	6.9
0.95	65.7	45.1	37.2	8.3
1.05	67.2	46.7	34.3	9.4

... as well as effects of fats from raw materials on fatty acid profile

Effect of fish meal feeding to cattle on longissimus dorsi fatty acids
(Mandell *et al*, 1997)

Parameter	Fatty acids (%)		
mg /100 g fresh weight	0.0	5.0	10
n-3 FA	37	63	77
EPA 20:5	5.2	19.1	29.8
DHA C22:6	1.8	9.7	10.9
EPA and DHA	7.0	28.8	40.7

Balance in nutrition is important for optimizing end product quality

Fat level in carcass

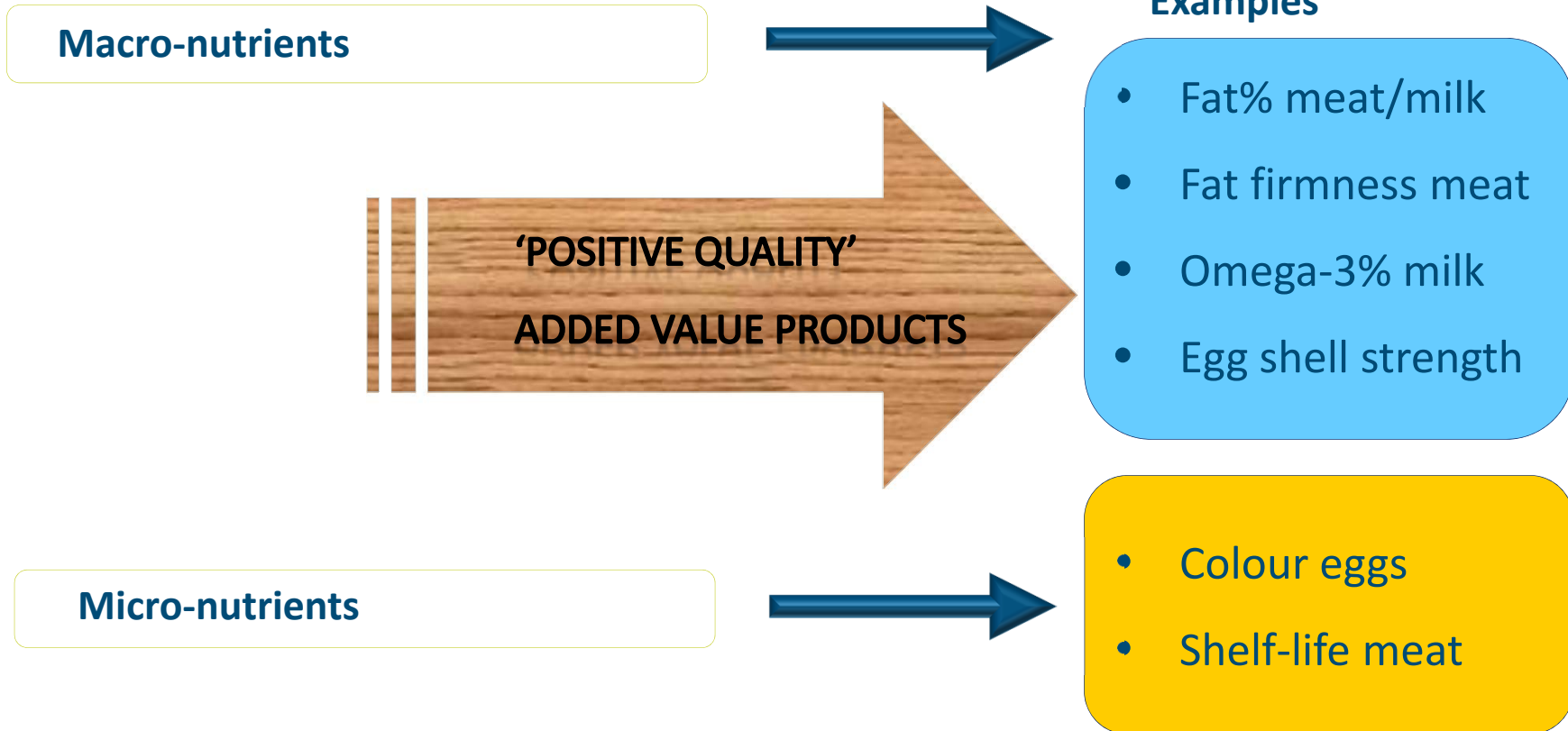
Minimum level

- Guarantee good flavour and texture
- Avoid excessive drying out when being cooked

Maximum level

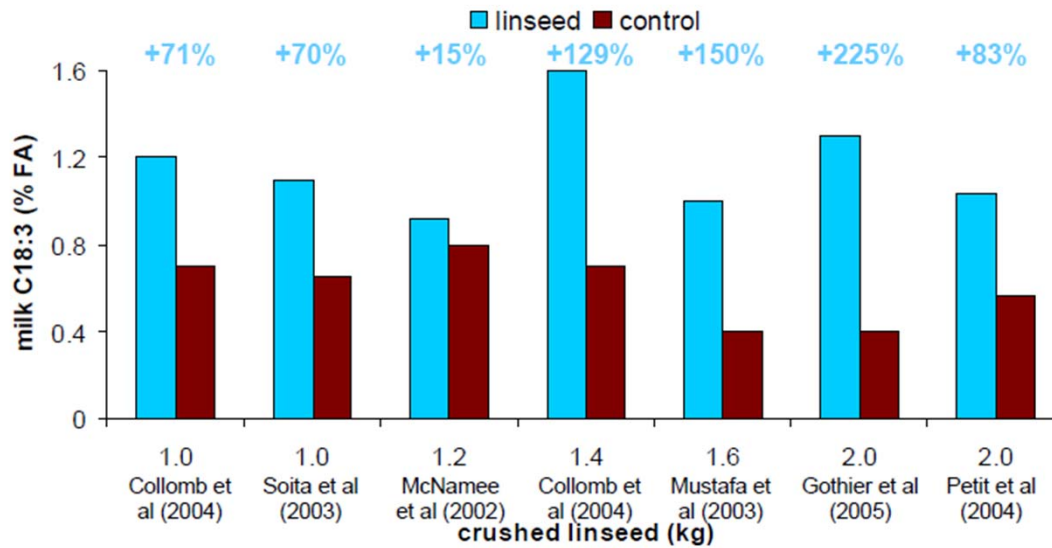
- Customer acceptability
- Health implications

Today many effects of nutrition on end product quality are known



Commercialisation sometimes difficult...

Omega-3 milk from dairy cows fed on omega-3 rich raw materials



Fortification of end product sometimes more simple...



Nutrition not only influences “positive quality” but also “negative quality”

Macro-nutrients



Examples

- Fat% meat/milk
- Fat firmness meat
- Omega-3% milk
- Egg shell strength



Micro-nutrients



- Colour eggs
- Shelf-life meat

'Undesirables'



- Contaminants
- Residues
- Microbes
- Prions



Nutrace® - Quality feeds value

Nutrace® is Nutreco's company-wide proactive programme to assure feed-to-food quality and safety. Nutrace® safeguards the quality of Nutreco products and services. The programme, complying with legislation and customer demands, is structured in five standards:


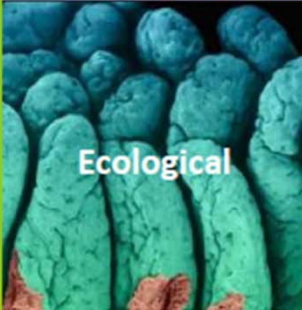
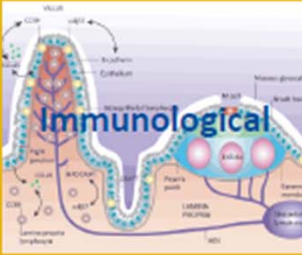
1. Certified Quality & Food Safety
2. Ingredient & Supplier Assessment and Management
3. Monitoring & Control
4. Risk Management
5. Tracking & Tracing



Nutrition is also related to the production system

Role of nutrition in reducing antibiotic use

Nutritional strategies for optimizing gut health

Mode of action	Functional ingredients
 <p>Bactericidal</p>	<p>Zn / Cu, Organic acids, MCFA, Bacteriocins, Bacteriophages, Etheric oils,...</p>
 <p>Ecological</p>	<p>Gut flora modulators Gut integrity & morphology enhancers</p> <p>Probiotics, Prebiotics, Enzymes, ... Glutamine, Xylanases, Butyrate, ...</p>
 <p>Immunological</p>	<p>'Stimulating' 'Inhibiting'</p> <p>Beta-glucans, Vitamin E, ... Omega-3 fatty acids, Mannanases, ...</p>

... but choices are difficult

Soy debate

Environmental impacts of locally cultivated or imported feed materials

	Soybean meal South-America	Lupines NL	Peas NL	Rapeseed meal NL
Land occupation (m ² /g)	9,43	34,15	14,39	7,56
Energy use (MJ/ton)	11,32	26,06	15,11	22,68
GHG (kg CO ₂ -eq/ton)	4,28	12,17	6,24	4,80
Acidification (kg SO ₂ -eq/ton)	0,01	0,04	0,02	0,05
Eutrophication (kg NO ₃ -eq/ton)	0,37	0,44	1,45	0,64

Milieueffecten van diervoeders, WUR 2009

Animal production chains committed to solutions

Aim: set up multi-stakeholder participatory process that promotes economically viable, socially equitable and environmentally sustainable production, processing and trading of soy

Status:

- 28 criteria and 98 of auditable indicators
- RTRS certified: 1 mio ton in 2012; 3-5 mio ton in 2013



The '5 Principles':

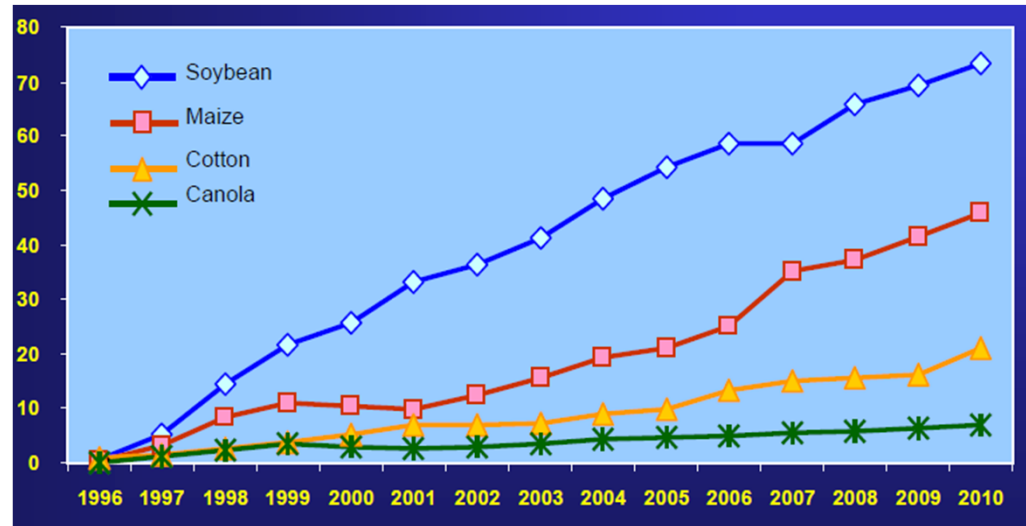
- **Legal compliance & good business practice**
- **Responsible labour conditions**
- **Responsible community relations**
- **Environmental responsibility**
- **Good agriculture practices**

... many challenges to solve

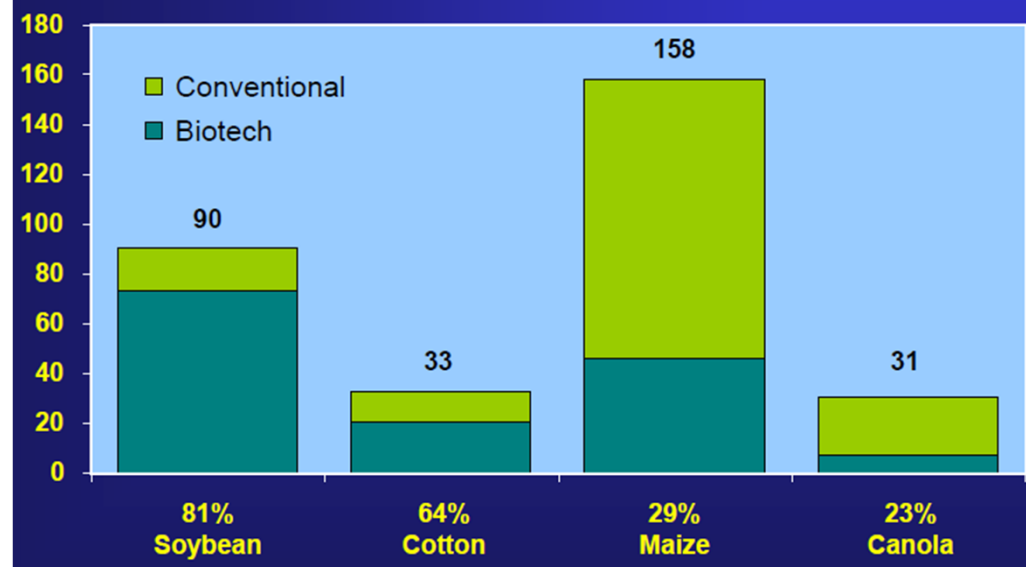
Steady increase cultivation biotech crops vs consumer concerns

Biotech crops:

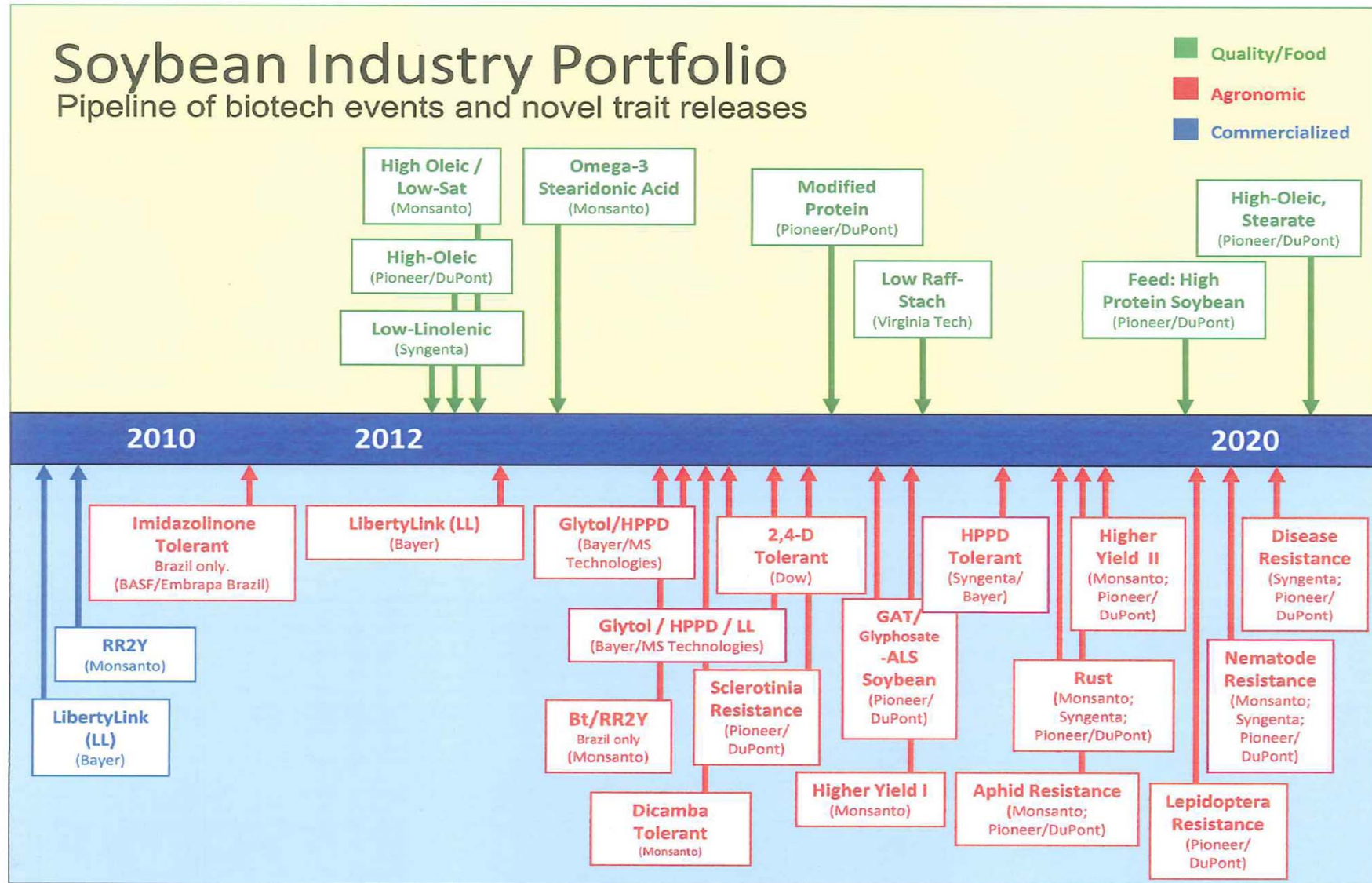
- Global adoption rates (%)



- Global area (mio hectares)



New opportunities



Source: Pipeline from Industry Sources; prepared by ASA, USSEC, USB. Updated May, 2011

RVSD Biotech Pipeline 050311 V10

Need for quantitative, predictive models



Productivity & Efficiency

Optimising ration composition

End product quality

Optimising milk production and composition

Production system

Minimising environmental footprint

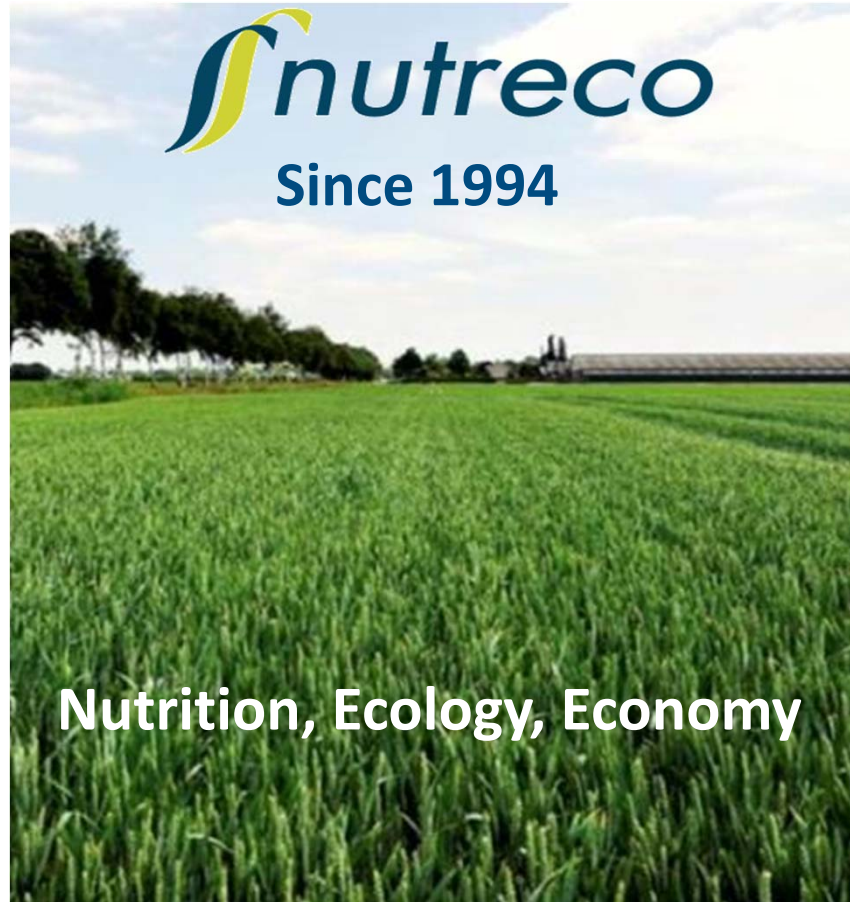
- N, P
- GHG



Concluding remarks

- *Sustainable development requires a holistic approach for animal product quality*
- *Nutrition is of crucial importance for steering the animal product quality*
 - Effects on end product and production system
 - Both 'positive' and 'negative' quality (i.e. added value products and food safety, resp.)
- *Importance is growing because of*
 - increasing awareness of role nutrition in sustainable / social responsible production of animal products
 - Need for product differentiation

Thank you



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