



Soybean meal fermentation: is it worth investigating in Europe? A review

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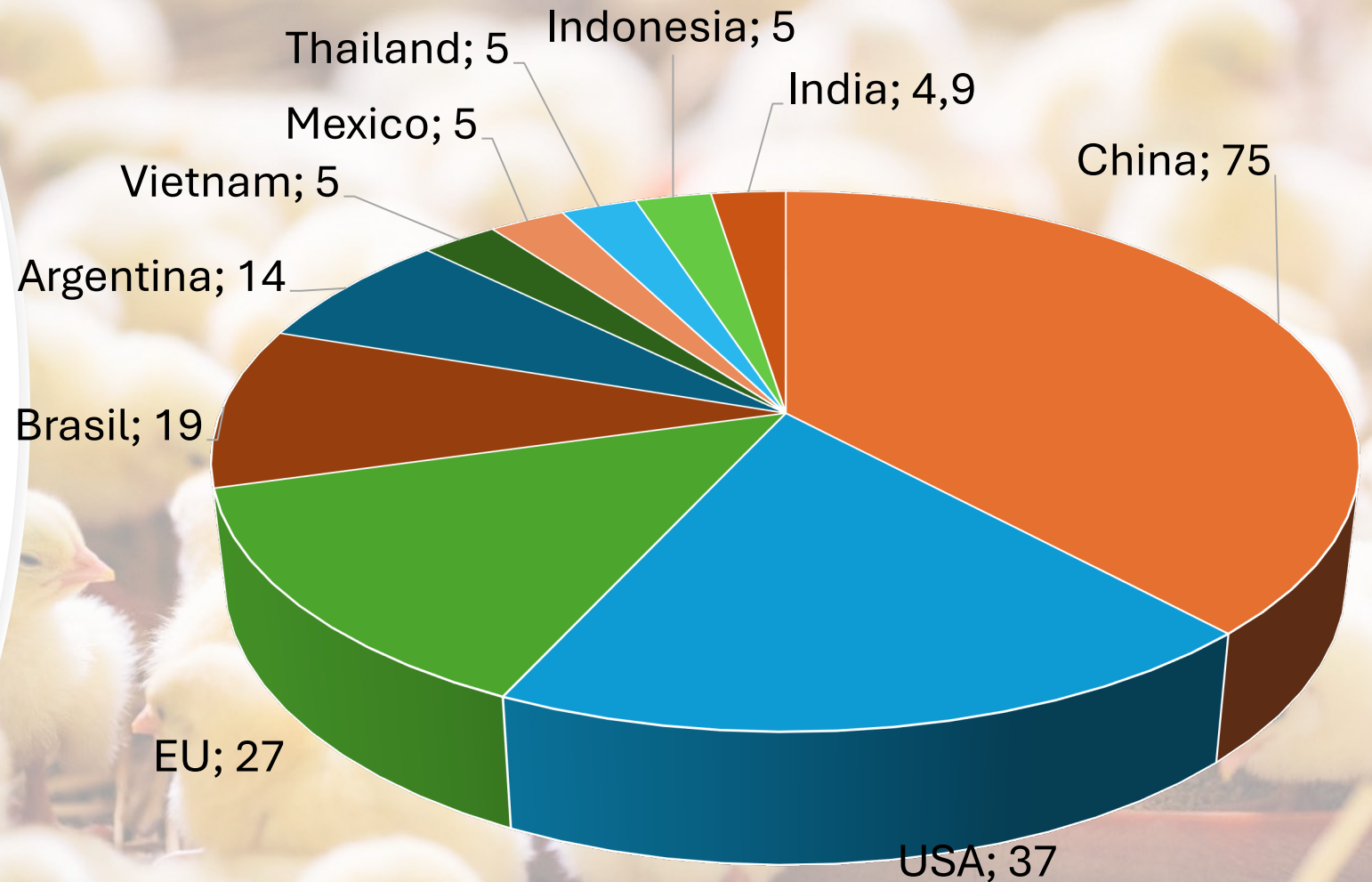
EAAP Annual Meeting 2024, Firenze, 1-5 September



Soybean meal in animal diets : improving quality has big impact

- Systematic review over 2020-2023
- Objective: To assess the impact of Fermented soybean meal (FSBM) on animal feed quality

Soybean meal as feed : 256 million tons in the world

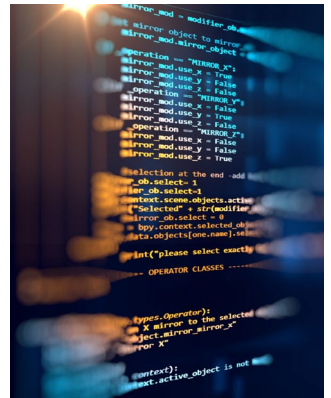


FAOSTAT, 2021

Search methodology



- **Structured query:**
- **TI:** ((soybean meal ferment*) OR (soya bean meal ferment*) OR (soybean cake ferment*) OR (soya bean cake ferment*))
- AND **SU:** ((Pig\$ OR Poultry OR Ruminant\$))
- AND **AB:** (digest* OR nutri* OR perform* OR quality OR methane OR Greenhouse OR environm*)
- AND **YEAR:** (2020 to 2024)
- Short list => **Zotero** => Data Extraction: Key information gathered from each article (matrix : 412 lines x28 columns)

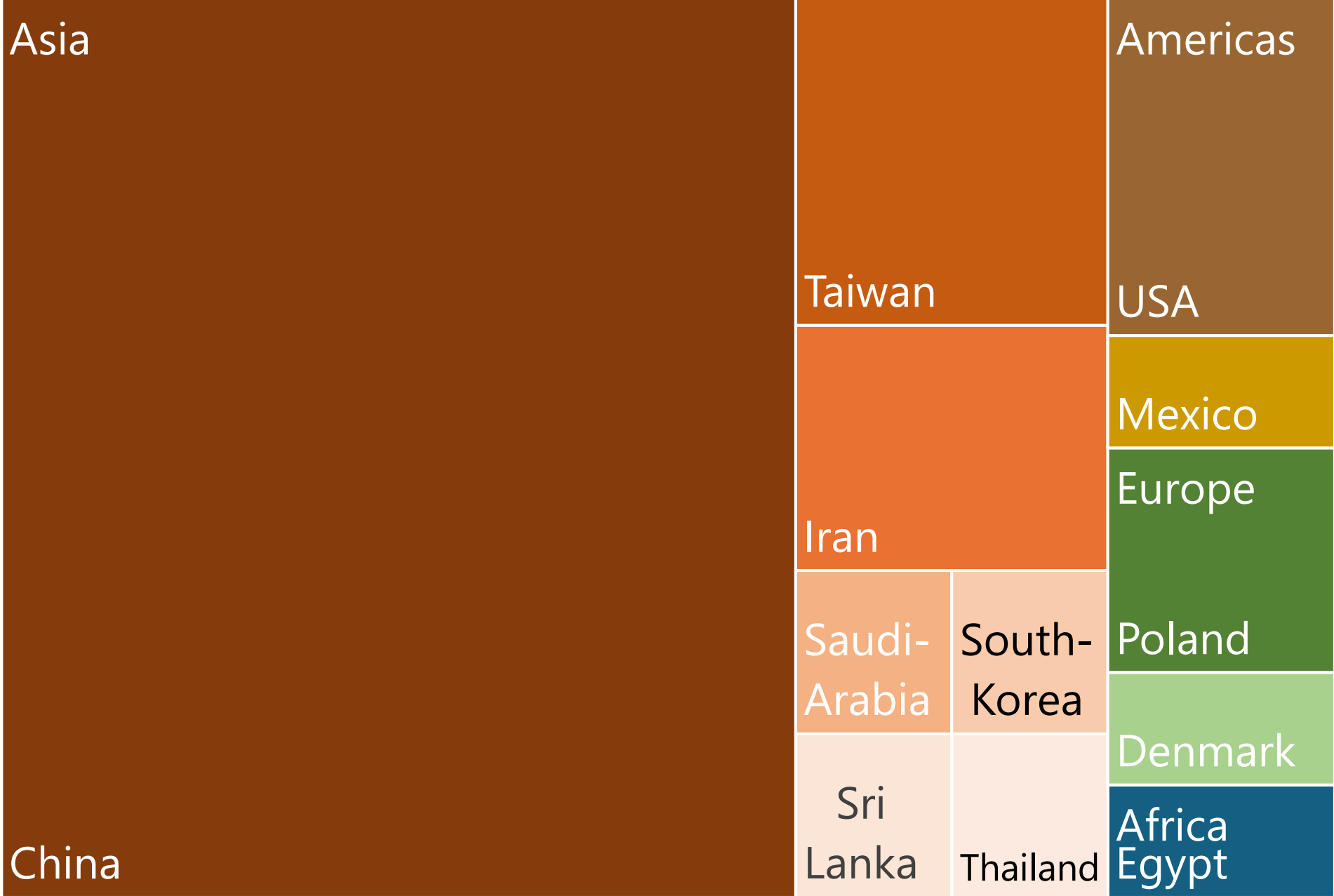




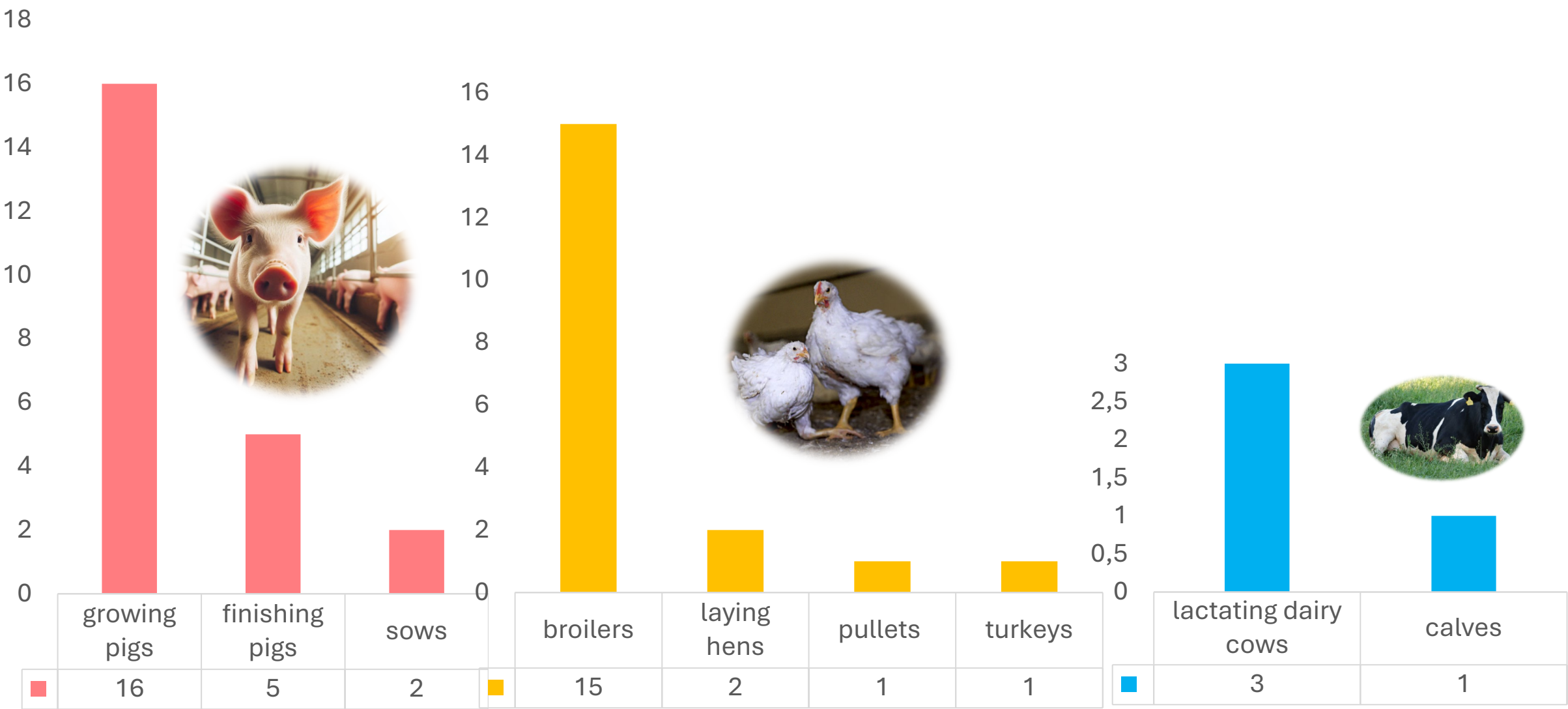
Results

Origin of experiments, animals, process and Effects of FSBM on Composition, antinutritional factors, nutritive value, animal health and performance, quality of animal products, economy, and environment

Geographic distribution of studies



FSBM research: for which animals?



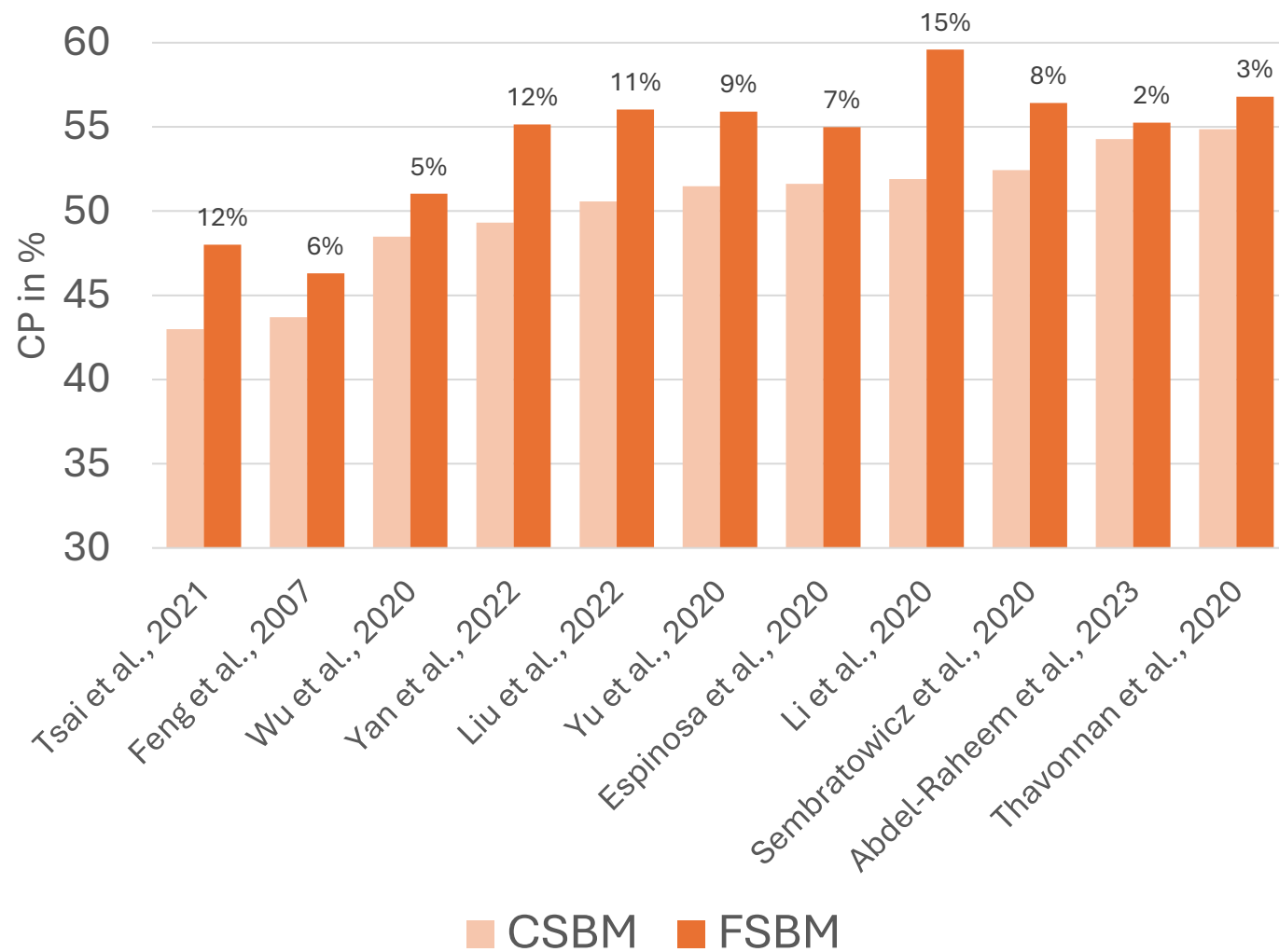
Fermenting soybean meal

- Solid-state fermentation
- 2-stage (aerobic/anaerobic) fermentation
- Ferments:
 1. *Bacillus subtilis* alone or in mixture with *Lactobacillus* spp or *casei* or *acidophilus* + *Saccharomyces cerevisiae* (12 exp.)
 2. *Lactobacillus* spp. alone or in mixture with *B. subtilis*, *Aspergillus oryzae*, *Enterococcus faecalis*, *Saccharomyces cerevisiae*... (9 exp.)
 3. Other *Bacillus* spp. in mixture (8 exp.)
 4. Other combinations

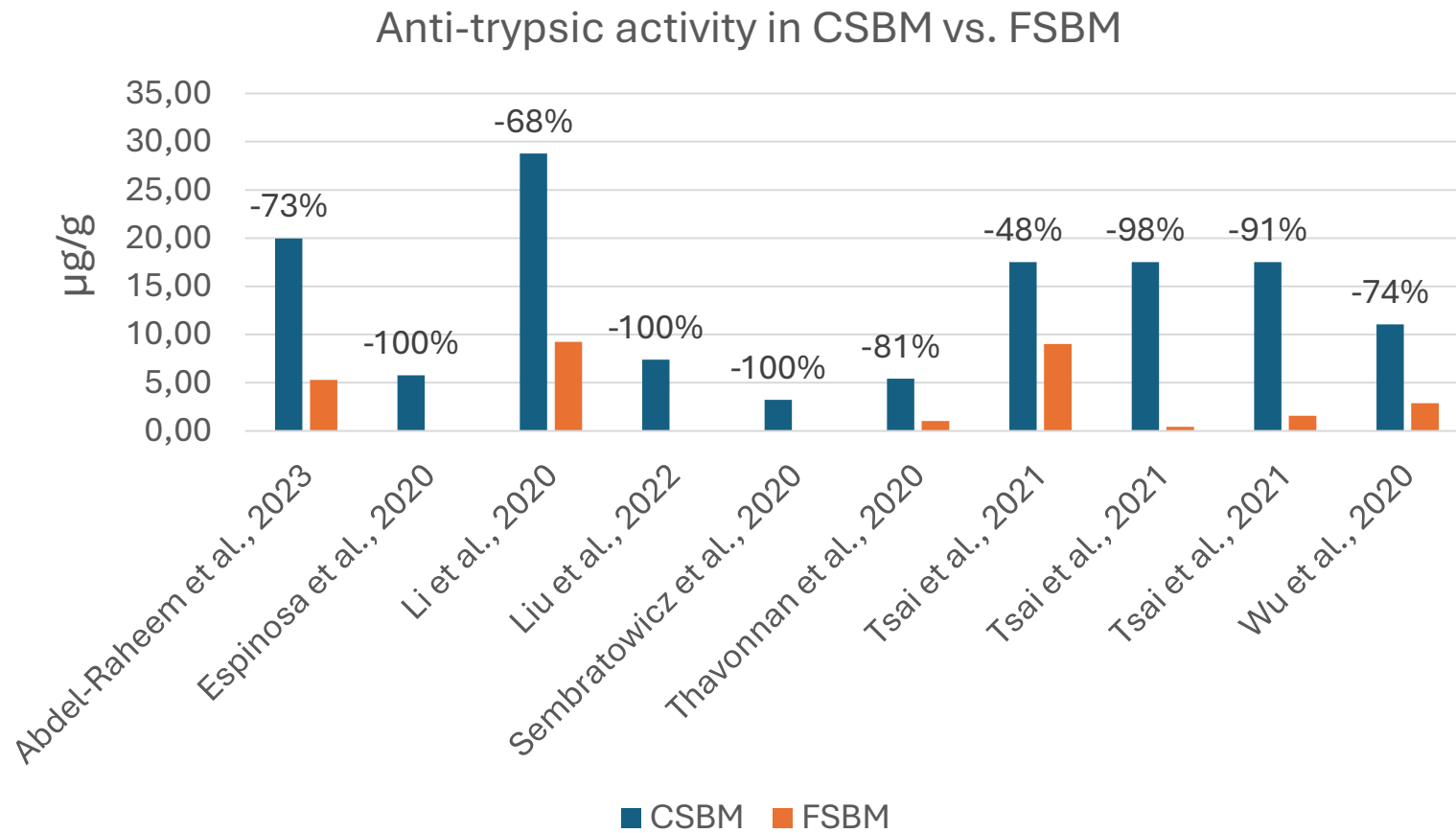


FSBM main characteristics

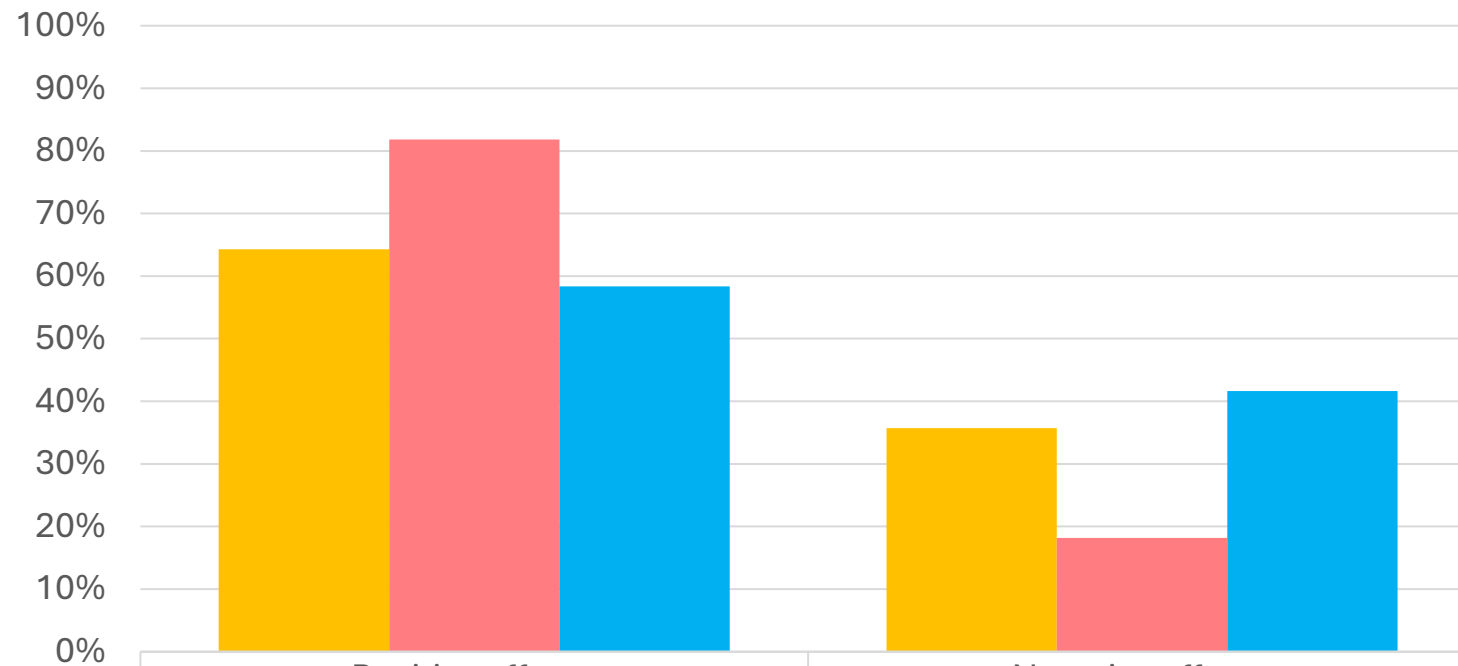
Crude protein content CSBM vs.FSBM



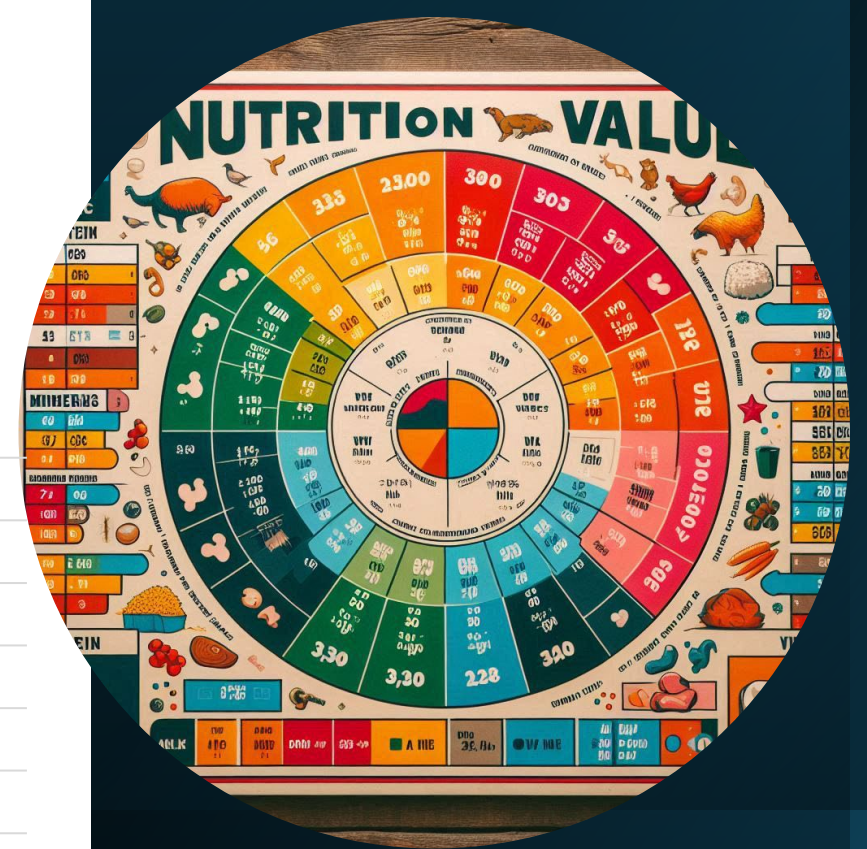
Antinutritional factors



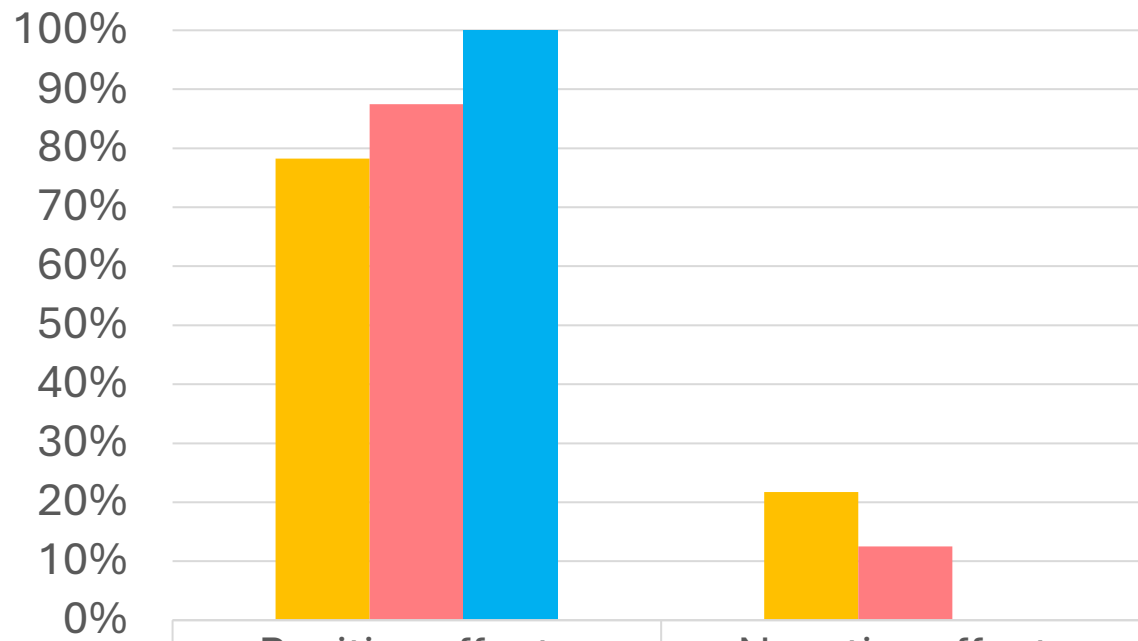
Nutritive value



■ Poultry	64%	36%
■ Pigs	82%	18%
■ Ruminants	58%	42%



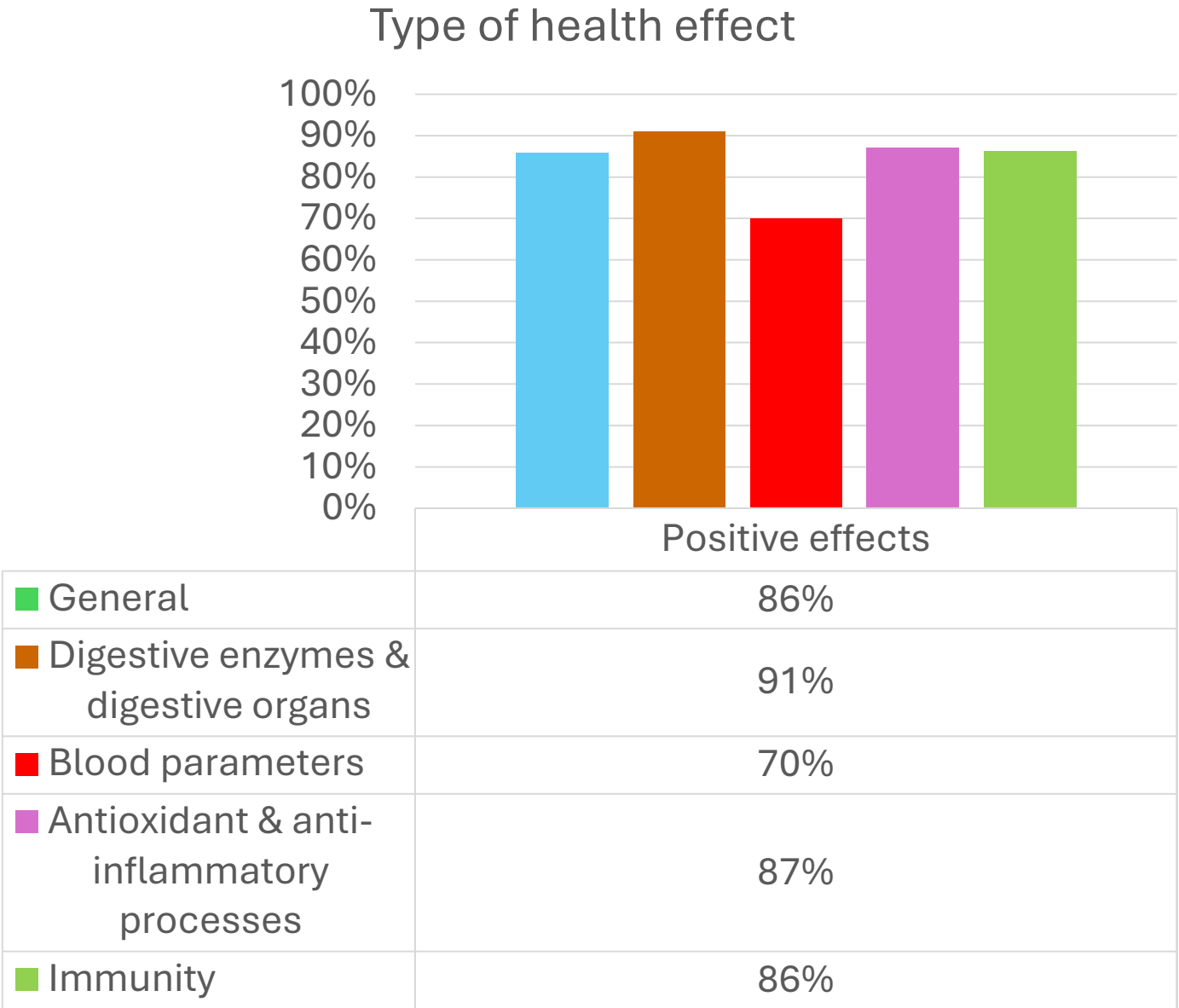
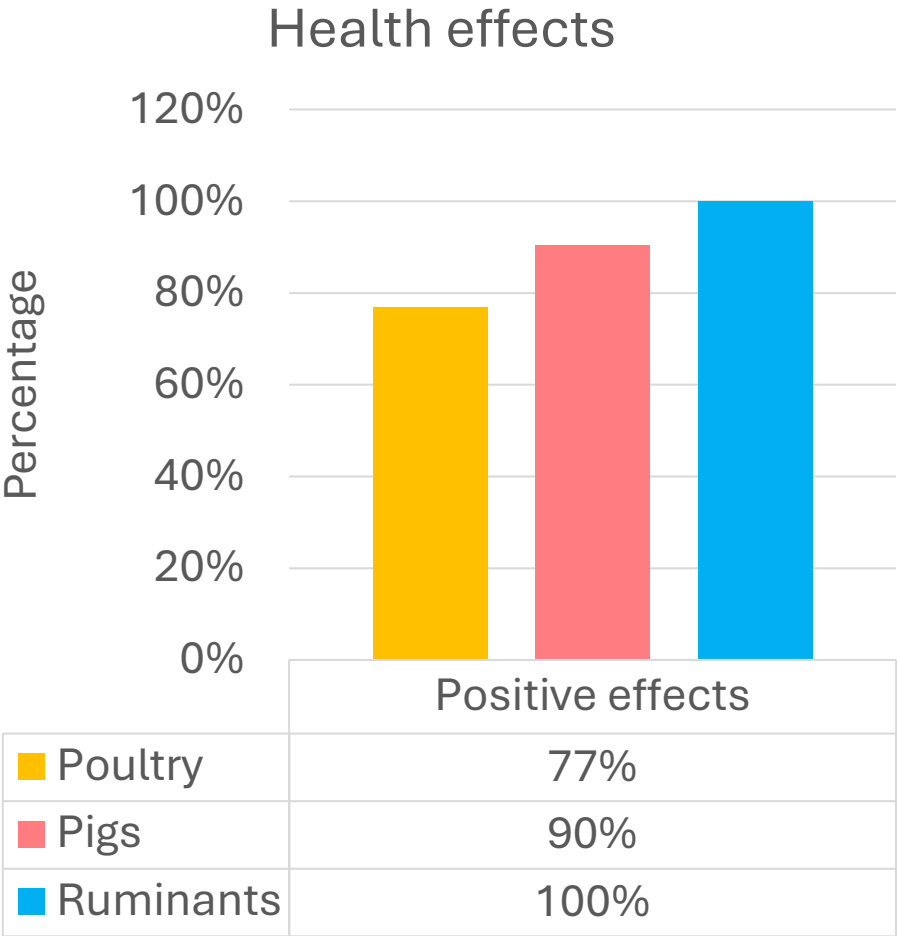
Animal performance



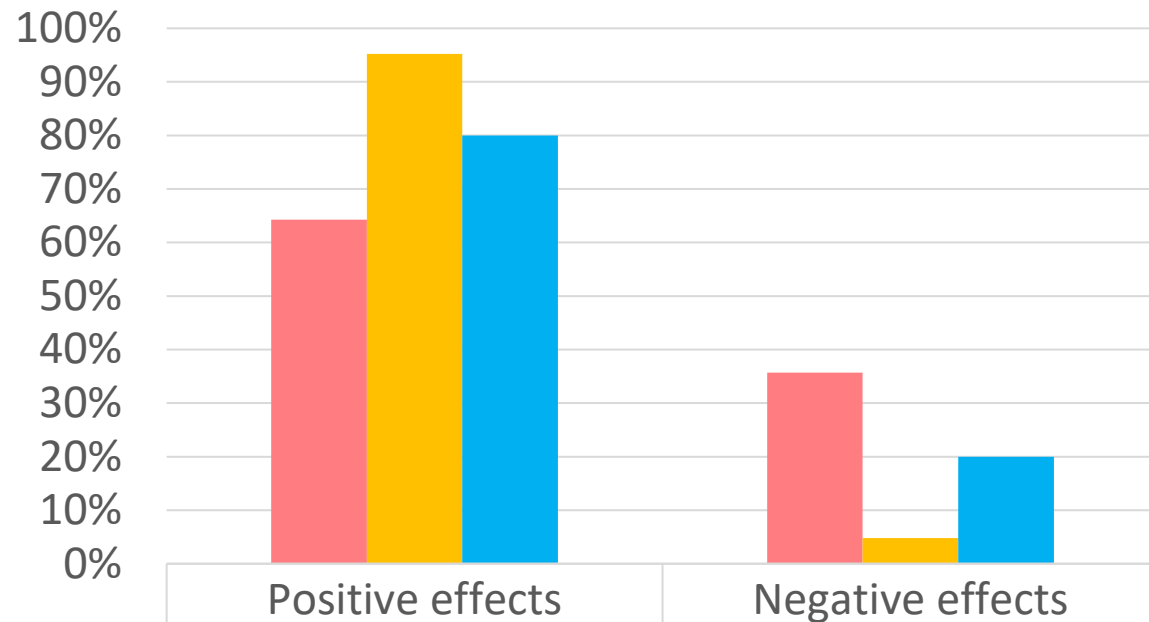
Poultry	78%	22%
Pigs	88%	13%
Ruminants	100%	0%



Animal health



Microbiota

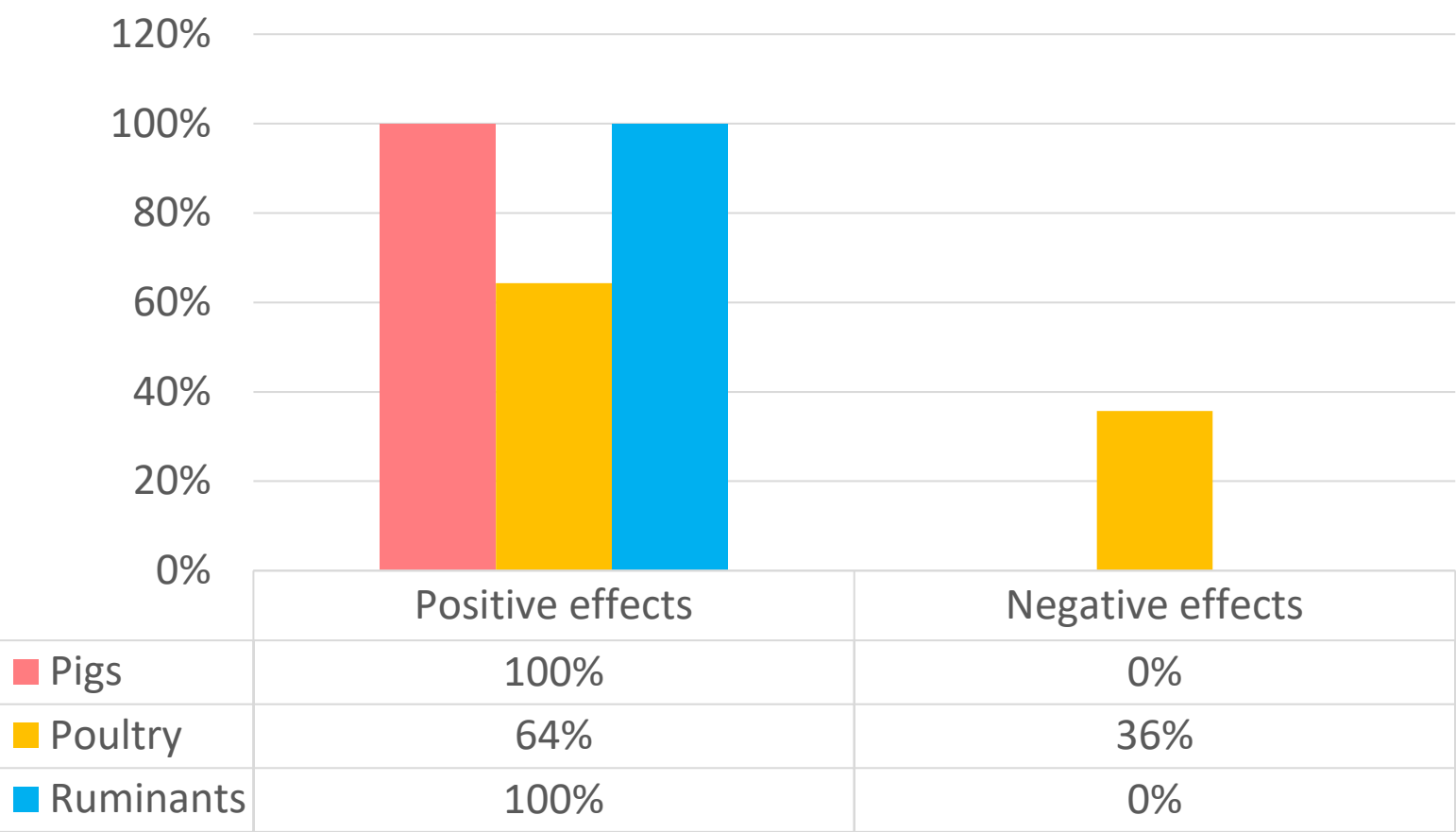


■ Pigs
■ Poultry
■ Ruminants

■ Pigs ■ Poultry ■ Ruminants

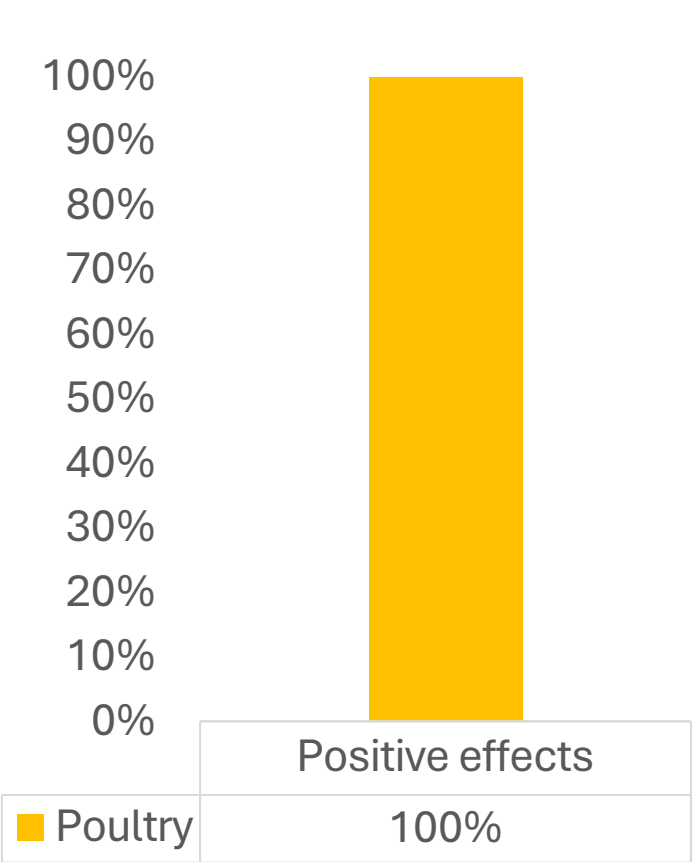


Quality of products

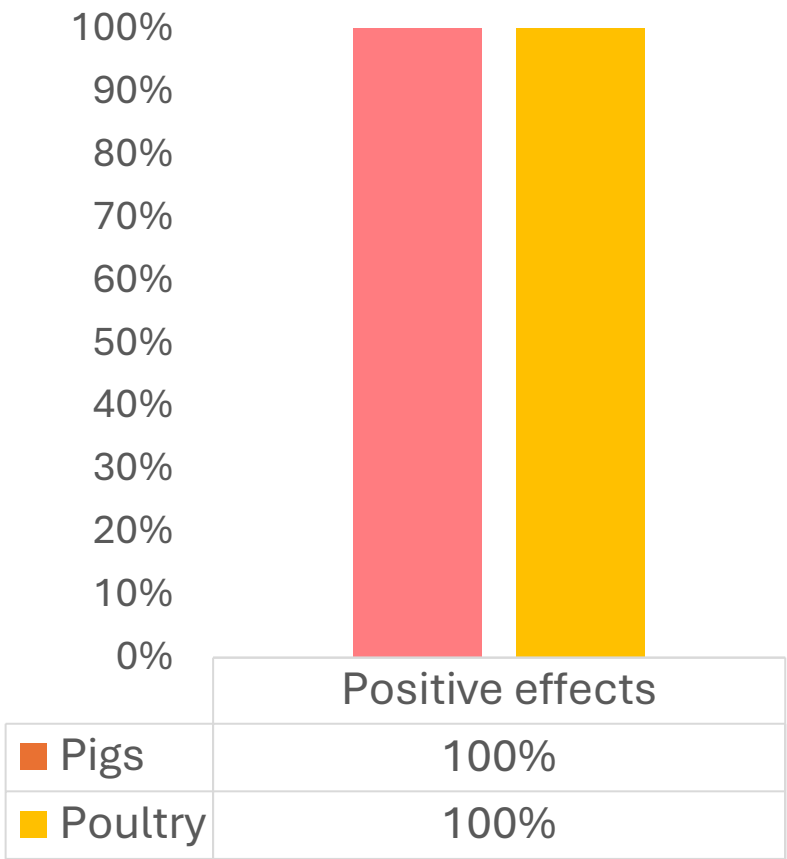


Economy & environment

Economy



Environment



Key findings for FSBM in pig and poultry

- **Growth performance:** Improved WG and FCRs.
- **Intestinal morphology:** Positive changes such as increased villus height and crypt depth, stronger intestinal barrier.
- **Microbial diversity:** Increased diversity of gut microbiota and Promotion of beneficial bacteria like *Lactobacillus* and *Bifidobacterium*.
- **Pathogens:** Reduced effects of detrimental bacteria such as *E. coli* and *C. perfringens*.
- **Immune modulation:** Enhanced immune response with increased anti-inflammatory cytokines.



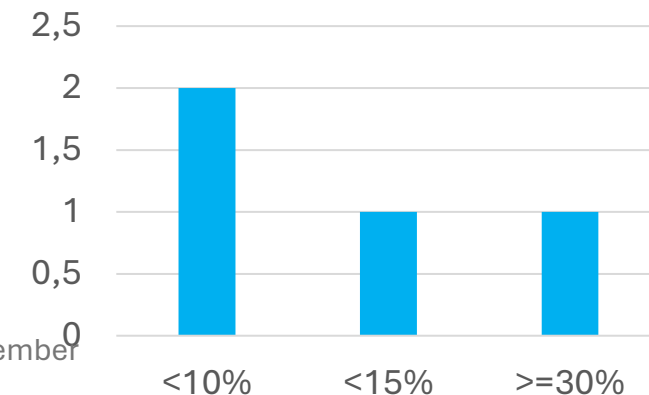
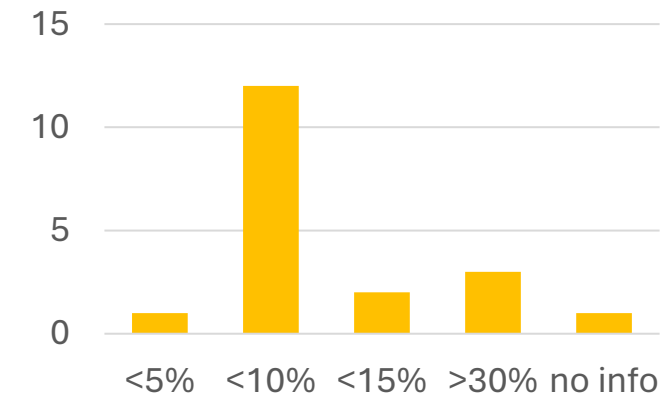
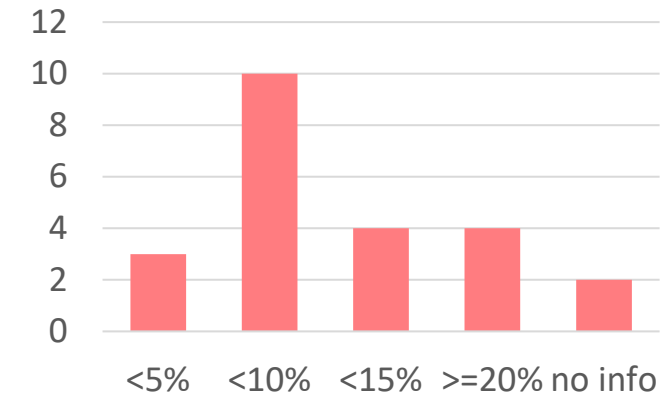


Discussion of results

Is Fermented soybean meal worth investigating in Europe?

Experimental Protocols

- **Variability:**
 - In protocols:
 - 48 articles; 14 without described protocol or under patent
 - the others are different from each other
 - In inclusion rates



Gaps of knowledge

FSBM in ruminants

Microbial Strains : cellulolytic strains for fermentation?

Economy and environment

Research in Europe (suitability of FSBM in European livestock systems)

Recommendations

- Check protocols and effects of FSBM in pigs and poultry in European context: consider feeding habits, European microbial strains, costs of processing, animal genetics, etc.)
- Investigate suitable inclusion levels
- Deepen microbiota analysis: expert
- Research in ruminants ?



Acknowledgments

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- **Corresponding author:**
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- **Thank you for your attention !**



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