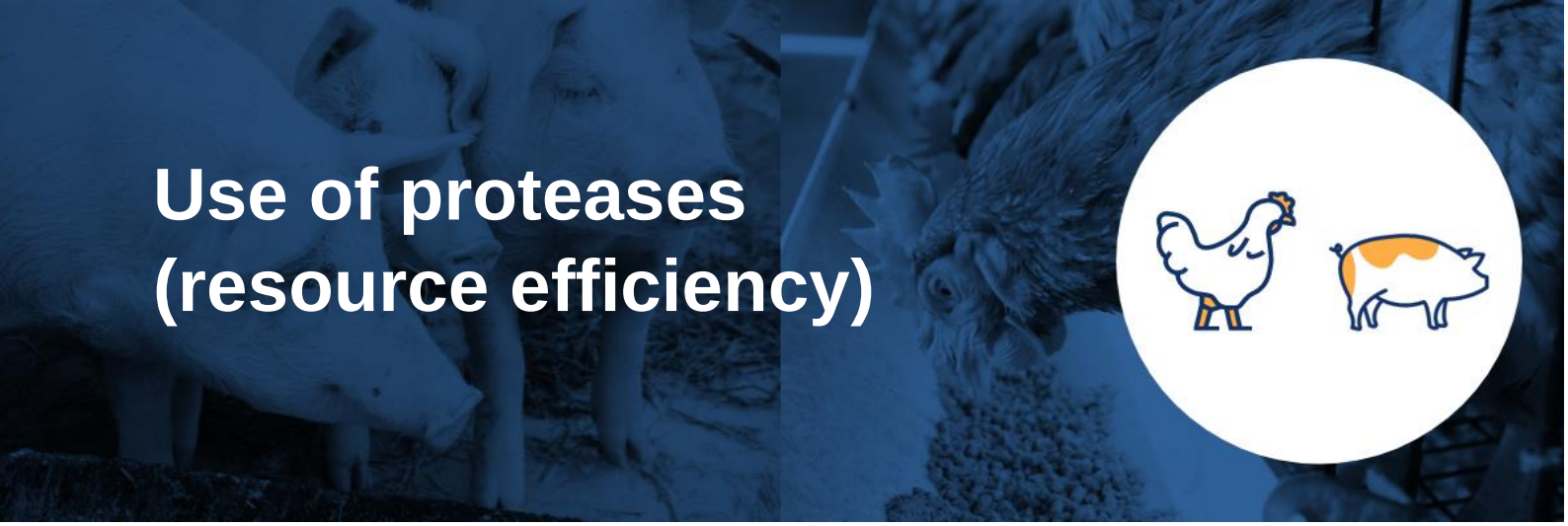

Use of proteases (resource efficiency)

Last update: 2 June 2023

- **Type of challenge:** Environment.
- **Challenge**: Resource management (Food-feed competition, resource efficiency, nutrient losses).
- **Action:** Enhancing digestion of dietary vegetable proteins.
- **Animal category**: Pig and poultry.
- **Technique**: Adding authorized proteases to feed, facilitating the substitution of highly digestible protein sources (soybean meal) with less digestible co-products (e.g. rapeseed meal) without increasing the total dietary protein level.
- **Mode of action**: Proteases increase the digestibility of amino acids.
- **Potential efficacy:** Increased apparent ileal amino acid digestibility in poultry (AIAAD) by 4 % on average.
- **Nature of evidence of efficacy**: Peer-reviewed scientific publications (meta-analysis); EFSA assessment.
- **Factors impacting on efficacy**: Nutrient profiles of feed ingredients (different amino acid composition and molecular weight); total protein level in the feed; the type of protease; age of the animal; presence of other enzymes (phytases, NSPases).
- **Mode of use:** Pre-treatment of the protein source (eg. soybean meal incubation with the protease product under optimal pH and temperature conditions) or adding the enzyme to the feed.
- **Requirements/limitations**: Must be added in a mixture by a registered feed business operator applying HACCP (Regulation (EC) No 183/2005); only proteases produced from non-GM microorganisms may be used in organic farming.
- **Economic consequences**: Increase in body weight (1.38%) and reduction in feed conversion ratio (–0.92%) observed for poultry; the use of lower digestibility protein sources reduces feed costs.
- **Other considerations**: Supplementing protease into diets already containing other enzymes (eg phytase) gives no improvement in AIAAD.
- **References**:

  - Lee *et al*. (2018). *Meta-analysis: Explicit Value of Mono-component Proteases in Monogastric Diets.* Poultry Science - Volume 97, Issue 6, 1 June 2018, Pages 2078-2085. https://doi.org/10.3382/ps/pey042
  - Bertechini *et al*. (2020). *Amino acid digestibility coefficient values of animal protein meals with dietary protease for broiler chickens.* PubMed Central (PMC). https://doi.org/10.1093/tas/txaa187
  - Leinonen *et al.* (2015) *Effects of dietary protease on nitrogen emissions from broiler production: a holistic comparison using Life Cycle Assessment*. Journal of the Science of

Food and Agriculture – Volume 95, Issue 15, December 2015, Pages 3041-3046. https://doi.org/10.1002/jsfa.7202

- EFSA opinions on safety and efficacy of proteases (various opinions)

- **Other techniques:** Use of highly digestible protein sources; use of phytase (release of N blocked by phytic phosphorous).

Charter Ambition: 4