Minimizing environmental impact with proteases

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To face the growing popularity of poultry meat, the broiler industry will need to make some operational changes to ensure increased output is achieved without damaging the environment. Poultry production has always been found to be relatively environmentally friendly, however there are features within poultry production systems that require further attention.

Global Warming Potential (GWP) is a measure of the greenhouse gas emissions to the atmosphere. The main sources of GWP are carbon dioxide (CO2), nitrous oxide (N2O) and methane (CH4). The oxidation/reduction of nitrogen compounds in poultry litter during drying, storage and composting, generates N2O and is proportional to the amount of nitrogen excreted in animal waste.

Eutrophication Potential (EP) is used to assess the results of the over-supply of nutrients that reach water systems. The nutrient enrichment of soils through agriculture can eventually lead to drinking water contamination and soil acidification. The main sources are nitrate (NO3-) and phosphate (PO43-) leaching into water and ammonia (NH3) emissions into air. Both NO3- and NH3 emissions are associated with broiler production.

Acidification Potential (AP) is an indicator of potential reduction of soil pH caused by ammonia emissions and sulphur dioxide (SO2). When released into the atmosphere, SOx and NOx can mix with rainwater forming the acids H2SO4 and HNO3. In poultry production, NH3 is released from poultry house litter as well as when it is spread on fields.

To combat nitrogen emissions, the use of an in-feed mono-component protease such as RONOZYME® ProAct has the ability to improve amino acid digestibility of commonly used feed ingredients reducing the amount of nitrogen excreted without impacting performance.

Lifecycle Assessment (LCA)

LCA is a methodology used to assess the environmental impact of changes in complex livestock systems. It can be used as an effective tool to compare the environmental implications of enzyme-assisted processes. An LCA assessment was undertaken for typical soya-based diets without protease, containing standard protein content (control), and compared with a diet that was supplemented with RONOZYME ProAct.

Results of the analysis of the feed production chain showed that using RONOZYME® ProAct as a supplement led to a reduction of all of the environmental impact categories evaluated. This was particularly significant for GWP, reaching up to 12% in some cases with an average of 5%.

Taking the whole production chain into account, there was a large reduction in both EP and AP. The largest improvement was seen for the AP, with a maximum reduction of 9% and an average of 5%.
Figure 1: Agriculture converts inert nitrogen into a range of reactive compounds that are damaging to the environment.

- **NH₃** can cause acidification, eutrophication, loss of biodiversity and health risk.
- **N₂O** can cause global warming.
- **NOₓ** can cause smog formation.
- **NO₃⁻** can cause nutrient enrichment and loss of biodiversity.