Feeding the future sustainably, efficiently and safely

A multi-stakeholder approach can help swine farmers improve efficiencies and support food safety while reducing antibiotic use. Research is shedding light on how mode of action and validation of nutritional solutions in local production conditions can support an integrated approach to swine production with a drastically reduced use of antibiotics.

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Electronic feeding stations allow researchers to evaluate feeding frequency, consumption levels and behaviours. Based on data, nutritional adjustments can be introduced.

How will we feed the future? In the 21st century, one of the most enduring challenges facing humanity persists. By 2050, the world will need to produce enough food to feed 9.8 billion people. Stated another way, the world will need to produce more food in the next three decades than was produced in the last 8,000 years.

Today's challenges and paths of opportunity

Today's food production challenges are evolving from food security toward sustainability, efficiency and safety. How will we meet these challenges?

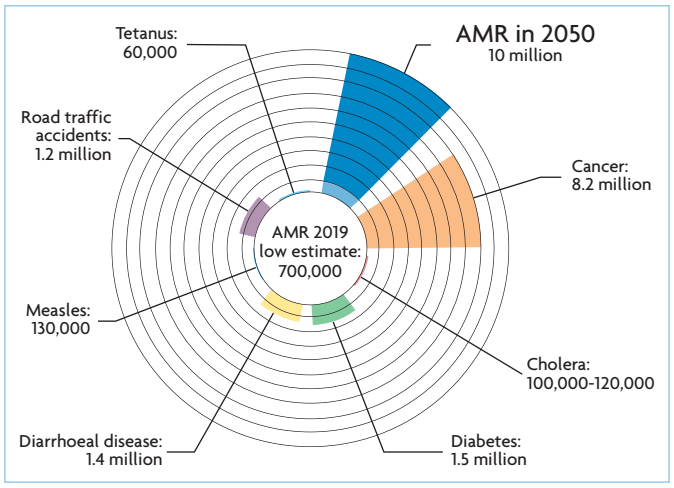
Three areas of focus will help the world meet sustainability, efficiency and safety goals for food production. First, we must consider the resources, energy and results associated with food production. Currently, the planet is consuming resources at a level requiring 1.5 planets – a level that cannot be sustained. A circular approach to agriculture can help support the challenge of feeding the future.

Wageningen University & Research describes the concept as follows: "Circular agriculture is a collective search by researchers, farmers, businesses and governments for the optimum combination of ecological principles (optimisation of use of co-products) with modern technology, new partnerships, new economic models, and credible social services. It not only focuses on good yields and the sparing use of resources and energy, but also stresses the importance of putting as little pressure on the environment, nature and climate as possible."

Circular farming can also help address the yield gap. Worldwide, the productivity of farm animals is 30-40% below their genetic potential due to suboptimal conditions and health status. This performance gap provides a tremendous window of opportunity to boost animals' performance and productivity.

Another path forward requires an integrated, multi-stakeholder model. Trouw Nutrition is focusing extensively on how this integrated model engaging feed-, farm and health management can meet food production goals while addressing key challenges such as antimicrobial resistance and its threat to animal and human health. It has been estimated that if no action is taken, annual deaths attributable to AMR may climb as high as 10 million by 2050, even exceeding cancer as a cause of death (Fig. 1).

Fig. 1. Deaths attributed to antimicrobial resistance were 700,000 in 2014 but could grow to 10 million by 2050 if we do not reduce the use of antibiotcs (Review on Antimicrobial Resistance. Antimicrobial Resistance Tackling a crisis for the health and wealth of nations, 2014).



Amid the diverse challenges facing swine producers and threatening human health, the good news is science has a proven record of helping farmers improve efficiencies, support animal health and produce safe food. During the 20th century, innovative technologies brought a 'Green Revolution' to agriculture and helped resolve the problem of food scarcity in several parts of the world.

As today's focus on food production evolves to food safety encompassing animal health, human health and the environment, a multi-stakeholder approach integrating farm and hygiene management, animal nutrition, genetics and vaccination in robust animals is ultimately required. Swine producers in some parts of the world have demonstrated the benefits of this multi-stakeholder approach.

Encouraging insights from the EU

The Netherlands serves as a good example of a multi-stakeholder model to reduce the use of antibiotics in livestock production without sacrificing animal performance.

In 2006 the European Union banned the use of antimicrobial growth promoters (AMGPs). However, the ban did not result in an immediate drop in antibiotic use on the farm because of the increase by prescription of antibiotics.

Concerned about AMR, the Netherlands government established an aggressive goal of reducing antibiotics in livestock production by 50% between 2009 and 2015.

A multi-stakeholder approach was implemented, combining feed-, farm and health management. The effort resulted in a 63% decline in the sales of antibiotics for livestock production between 2009 and 2017 (Fig. 2). Improvements were also achieved when it came to reversing resistance to various pathogen

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strains such as E. coli. As nations around the globe increasingly ban the use of AMGPs, the Netherlands' multi-stakeholder approach to reducing antibiotics provides encouragement for swine producers transitioning away from antibiotics.

Multi-stakeholder best practices

Successful implementation of the multi-stakeholder model suggests results can be enhanced with the following best practices:

● **Farm and hygiene management:**
Trials have demonstrated that management and hygiene practices can significantly improve performance. For example, 10 trials conducted on 17 different farms with all animals receiving the same feed demonstrated a 10% difference in digestibility, which researchers attributed to improved hygiene and management practices.

● **Nutrition:**
Life-start sets the stage for life performance. The first six weeks in a piglet's life is an especially critical phase. Trouw Nutrition researchers use feeding and water stations equipped with monitoring systems to track, evaluate and manage piglets' individual intakes. By viewing animals' feeding frequency, consumption levels and behaviours, nutritional adjustments can be introduced. Research trials show that optimal nutrition during the critical life-start phase can steer development across an animal's lifetime. In addition, functional additives for gut health, trace mineral sources and optimising quality control of raw materials can help farmers improve animal performance and get a higher return on their feed investment.

● **Genetics:**
As animals are not achieving their genetic potential, opportunity exists to develop more robust animals positively supporting health and performance.

● **Vaccination:**
Effective vaccines can support a strong immune system to help protect against disease.

Effective innovations and rapid analysis

Effective innovations to support livestock health and production goals are driven by an understanding of the mode of action. Trouw Nutrition conducts more than 70 global R&D studies annually at its in-house research facilities to develop nutritional products, models and services and also to explore the mode of action of the products. In addition to exploring how ingredients function in animals, multiple studies focus on the ingredients in feed. Rapid, on-site analysis helps verify the nutritional value of raw materials and screen for harmful components in feed.

Trouw Nutrition developed technology using on site rapid analyses, to analyse raw feed in real-time, compare analyses to ingredients in a global database and make adjustments to meet quality and nutrient standards. The rapid analysis tools and technologies also detect mycotoxins present at customer locations.

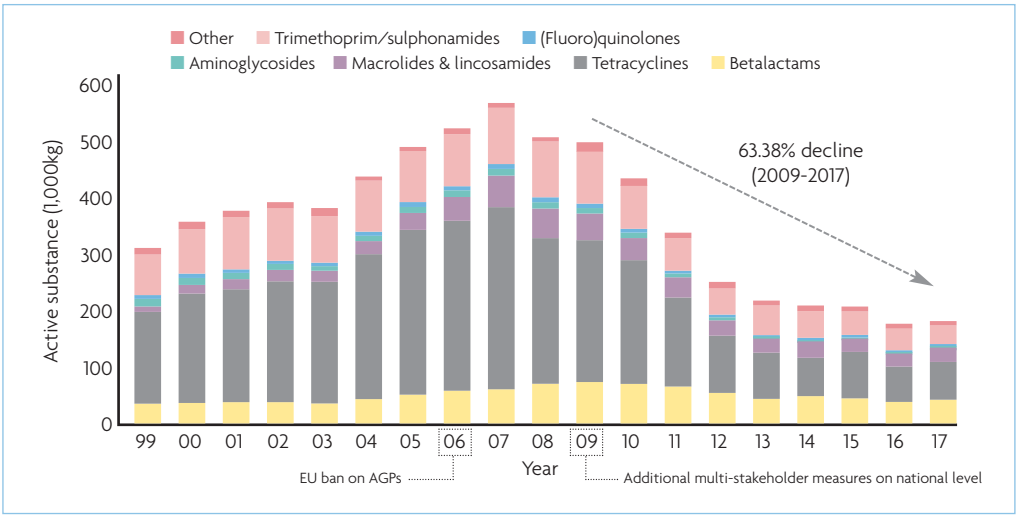

Fig. 2. A decline of 63.38% in antibiotic sales in the Netherlands (2009-2017). A ban on antimicrobial growth promoters (AGPs) does not automatically reduce antibiotic use; ambitious targets in combination with multi-stakeholder commitment is pivotal (MARAN, 2018).

Understand the modes of action to steer intestinal health

As intestinal integrity contributes to animal health and performance, understanding the composition of the microbiome can help support porcine health and performance. Intestinal health can be positively influenced by several best practices, including:

● **Preventing pathogen intake:**
Water and feed provide opportunities for Gram-negative bacteria such as E. coli and salmonella as well as Gram-positive bacteria to proliferate. Trials show functional ingredients can combat these pathogens.

● **Microbiota management:**
Trouw Nutrition partners with universities to advance understanding of relationships occurring in the microbiome. DNA isolation, pyrosequencing and microflora profiling conducted at in-house laboratories allow researchers to map the presence and diversity of microbial communities and inform functional ingredient tools to restore diversity within the gut.

● **Improving gut integrity:**
In-vivo and in-vitro methods evaluate the efficacy of feed ingredients on the mucosal barrier and inform a toolkit of feed additives such as organic acids, medium-chain fatty acids, butyrate and phenolic compounds to achieve desired effects.

● **Immunomodulation:**
Researchers are studying how combinations of functional feed and drinking water additives can support the animal's immune response, allowing more energy to be used for digestion.

As animals in challenged situations often have different amino acids and nutrient requirements, a one-size-fits-all approach is inadequate. Therefore, precision nutrition interventions are required to target specific challenges.

Validating globally and locally to test efficacy of nutritional solutions

Beyond Trouw Nutrition's in-house research centres, more than 80 studies are conducted annually with universities and research institutes around the globe to test the efficacy of nutritional solutions in local conditions. These findings are also conducted on commercial farms employing local diets and production practices.

Across these varied environments, encouraging progress is being achieved. Producers are realising the same technical results in diets with functional feed additives as in diets with AMGP's. The Green Revolution of the 20th century is being replaced by a new type of revolution driven by a focus on sustainability, efficiency and food safety. ■

References are available on request from the author

During the 11th European Symposium of Porcine Health Management (ESPHM) 22-24th May, Trouw Nutrition will present research findings supporting an integrated, multi-stakeholder approach to swine production that can ultimately feed the future

Understand the modes of action to steer intestinal health.