The Future of Animal Feed: Introduction

Background

The future of livestock feed is of major concern to stakeholders of the agri-food industry, including the producers and consumers of livestock products, and regulatory authorities that need to monitor the sustainable development of the sector and ensure food safety [Makkar, 2018; Gurgel, Reilly & Blanc, 2021]. Feed production is the largest contributor to environmental and economic impacts associated with livestock production systems. It is predicted that an increased demand for animal-sourced food will lead to an almost twofold increase in global livestock production by 2050 [FAO, 2019]. The majority of livestock production systems globally rely heavily on unsustainable, plant-based sources to cover the needs for protein in livestock nutrition [FAO, 2018]. Feed production competes directly for resources required to produce human food, particularly due to the changing climate. Soybean, sunflower, and rapeseed meals, the most popular conventional plant-based protein sources in feed formulations, are directly linked to negative impacts including atmospheric pollution and global warming, acidification and eutrophication, deforestation and land degradation impacts [LEAP, 2017; Andretta et al., 2021]. These environmental impacts cause significant negative secondary effects on habitat conservation and flora and fauna biodiversity, and public health [Semper-Pascual et al., 2019; Adam et al., 2021].

Considering the planet's limited biophysical capacity, and instabilities in macroeconomic, geopolitical, and socioeconomic factors, investigating more resilient and sustainable feed ingredients, hence called alternative, is critical to improving the sustainability of the livestock sector and meeting the increasing requirements both for livestock and human nutrition [van Huis & Oonincx , 2017; van Hal et al., 2019; Te Pas et al., 2021]. In doing so, it is important to consider potential impacts associated with such alternatives with regard to the environment, economy, and society, to ensure effectiveness, viability, and sustainability of livestock feed, as well as ensure food safety and prevent threats to human health [Muscat et al., 2020]. Using insect meals as a case in point, Box 1 presents examples of benefits and risks associated with the implementation of this alternative protein source, and highlights the complexity in identifying optimal, sustainable and safe solutions.

Objectives

This Rapid Evidence Assessment (REA) report highlights the opportunities and limitations of existing solutions for sustainable and safe protein in livestock feeds and proposes scenarios and directions for future biotechnological developments for the production of alternative protein sources. By doing so, the REA offers a research and policy roadmap to facilitate Food and Standards Agency (FSA) strategic development towards achieving a more sustainable and safe livestock feed sector, targeting global Sustainable Development Goals (SDGs) and ensuring food safety. The specific objectives of this report are:

1. To identify alternative sources for protein feed ingredients and discuss their potential to substitute conventional protein crops in future livestock feed formulations.
2. To evaluate the specific sustainability and food safety associated opportunities and risks they present, as well as potential trade-offs.
3. To identify key relevant policy recommendations to inform FSA's anticipatory strategic and regulatory policy when considering the incorporation of alternative protein ingredients for sustainable and safe livestock feeds.

Research questions

The report attempts to address the following specific research questions:

1. What are some alternative protein sources that could substitute conventional, unsustainable protein feeds?
2. How environmentally friendly, commercially viable, affordable, and safe are they likely to be?
3. Do they pose any significant risks to feed and food safety and security?
4. How can they contribute towards sustainable development of the livestock sector?