



Can We Balance Profit, Production and Pollution when Feeding Livestock?

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Editorial

Livestock systems are typically managed to provide a least-cost ration balancing energy, protein, minerals, and vitamins in the diet according to the estimated requirements of the average animal. Optimizing the utilization of available food and its quality is important to the profitability of any production system, as well as helping to minimize the proportion of nutrients consumed by the animal that are lost to the environment. For a dairy cow, 35% of energy consumed in the diet can be lost in the form of enteric methane, faeces or urine and 77% of nitrogen consumed can be excreted in faeces or urine. Furthermore, poor quality food can impair the production and wellbeing of the animal which leads to an inability to achieve desired intakes of food, therefore resulting in increased land required and reduced nutrient efficiency.

While large areas of grassland worldwide offer an affordable and appropriate food source for ruminant livestock, pasture-based livestock systems are more vulnerable to variable forage quality due to changes in biotic and abiotic factors than those using blended concentrate feed, or even conserved forages such as grass silage. High input livestock systems have increasingly become reliant on high energy dense diets that include concentrates to allow high genetic merit animals to reach their production potential. Concentrate feeds typically have a more reliable content than forage, but are more costly and vulnerable to changes in market price (depending on ingredients used such as wheat, soya and barley). Also, bought-in concentrate feed has a higher carbon footprint than home-grown forage, which can also be said for commodities such as purchased synthetic fertilizer and

dietary additives. Given that feed costs associated with a production system can be as much as 70% of variable costs, particularly if reliant on high inputs of concentrates, matching the amount and quality of home-grown feeds and bought-in feeds with an animal's production requirements is important to the viability of the farm business. Market forces influence the characterization of livestock systems and feed use, which impact on land use requirements for animal food. Changes in the market also contribute to a conflict between humans and animals for cereal products, which with an ever-increasing global demand for both human edible cereal products and animal feed the allocation of resources becomes more paramount. It makes sense that it is more efficient to utilize crops that are suitable for human consumption directly rather than as a livestock product. Gill et al. found that high inputs of cereals in US monogastric and dairy systems had brought high and efficient production, but these systems were not net contributors of food for human consumption. In the case of sheep and cattle fed predominantly forage or by-products, these systems can be more, or as efficient, as monogastric systems in terms of converting non-human-edible food into products, particularly when comparing systems on energy and protein utilization.

Therefore, the challenge to society, scientists and farmers is to improve efficiency of plant and animal production by better matching available and appropriate resources to requirements, to optimize profit, production and minimize pollution (from waste) and reliance on human-edible foods in livestock diets.

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