

Role of Animal Nutrition in Boosting Livestock Productivity and Public Health

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Description

Animal nutrition is a fundamental aspect of both agriculture and scientific research, having extreme implications for livestock productivity, ecosystem sustainability, human food security and even public health. Given its multi-disciplinary nature, animal nutrition surround everything from biology and chemistry to economics and environmental science. With the global population rising and dietary demands shifting, especially towards more protein-rich foods, understanding and improving animal nutrition has never been more critical. This article analyses key dimensions of animal nutrition, including its importance for livestock health and production, the challenges of feed formulation and sustainability, as well as the evolving trends that might shape the future of the field.

Animal nutrition

At its core, animal nutrition involves the study of nutrients and how they are metabolized by animals. These nutrients are primarily classified into six categories: Carbohydrates, proteins, fats, vitamins, minerals and water. Each plays a unique role in an animal's overall health, growth and reproductive success. Carbohydrates and fats are primarily sources of energy, while proteins are critical for tissue growth and repair. Vitamins and minerals are required in smaller quantities but are nonetheless need for metabolic functions, enzyme activity and immune responses. Water, often overlooked, is important for hydration, digestion and temperature regulation. One of the challenges in animal nutrition is determining the optimal balance of these nutrients based on species, age, production stage and physiological condition. For instance, the nutritional requirements of a dairy cow will differ significantly from that of a broiler chicken. Furthermore, growing animals have different requirements compared to mature animals and the nutritional needs of animals in lactation differ from those in maintenance stages.

Proper nutrition is the foundation for improving livestock productivity. Inadequate or imbalanced diets can lead to a range of issues, including poor growth, reproductive failures, susceptibility

to diseases and in extreme cases, death. On the other hand, a well-balanced diet ensures that animals reach their genetic potential for growth, milk production, egg-laying or other functions. For example, dairy cows with optimized nutrition produce more milk with better fat and protein content, while poultry fed the correct blend of nutrients grow faster and lay more eggs. In beef cattle, efficient feed conversion the ability to turn feed into body mass is critical for achieving desirable meat yield. However, feed formulation is often complex, especially when balancing nutrient intake against cost. Feed constitutes the highest operating cost in animal production systems, often accounting for 60%-70% of the total expenses. Therefore, creating cost-effective and nutritionally optimal feed blends requires a deep understanding of animal physiology and nutrition, as well as economic principles.

Sustainability in animal nutrition

A growing concern in animal nutrition is the sustainability of feed resources. Traditional feed sources such as grains, soy and fishmeal are often in competition with human food resources. As the demand for meat and dairy products increases globally, especially in developing countries, the pressure on feed resources intensifies. This has led to the analysing of alternative and more sustainable feed ingredients, such as insects, algae, food waste and agricultural by-products. Insects, for instance, are highly efficient at converting waste products into protein and their production has a smaller ecological footprint compared to conventional livestock. Similarly, algae are being described as a source of protein and omega-3 fatty acids, which are often sourced from over-exploited fish stocks.

Another aspect of sustainability in animal nutrition is reducing the environmental impact of livestock farming, particularly regarding greenhouse gas emissions, water use and land degradation. Ruminant animals, such as cattle, sheep and goats, are significant producers of methane, a potent greenhouse gas, during digestion. Research is ongoing to develop feed additives that can reduce methane emissions, such as dietary supplements like seaweed or specialized probiotics that alter rumen fermentation processes.