Book review

Forage evaluation in ruminant nutrition

The world’s forages make a significant contribution to the overall nutritional economy of meat-, wool- and milk-producing ruminants. They provide over 90% of the feed energy consumed by cattle, buffalo, sheep, goats and camels. Depending on forage species, climate, degree of maturity, etc., forages are inherently variable in nutritive value. Also the kind of treatment (chopping, conservation, etc.) can fundamentally change the nutritional characteristics of the original forage. The importance and variability of forages as well as pressures to maximise the use of forages in ruminant diets emphasize the need for fast and inexpensive methods for the estimation of their nutritional value. In this book the current status of research in this area is reviewed and discussed. It covers all forages eaten by ruminant animals. The book contains a total of six sections with a total of 21 chapters contributed by scientists from Australia, Denmark, Ethiopia, France, Honduras, the Netherlands, Spain, UK and USA.

Section 1 (The importance of forage evaluation for humans and animals) considers the definition of forage, their characteristics and contribution to animal production in Chapter 1. In Chapter 2, an initial review of the processes of nutrient digestion and utilization in ruminants is presented. Subsequently a review of how forage nutritive value is currently assessed and how it should develop is given. Chapter 3 starts by considering the main principles of intake control and forage factors that determine intake. This is followed by sections on effects of interaction with animal and dietary components and on prediction and manipulation of intake.

Section 2 (Estimating the energy value of forages) comprises seven chapters which focus on developments in energy evaluation of feeds, particularly forages. They deal with the use of energy-balance measurements, in vivo digestibility trials, in vitro techniques using faeces, enzymes and measurements of gas-production and the in sacco method in combination with mechanistic mathematical modelling in predicting energy supply to the animal, as well as the limitations and merits of the approaches.

In the first chapter of Section 3 (Estimating the protein value of forages) the authors give a critical review of various in vivo techniques for the estimation of protein value. In the second and third chapters of this section the advantages and disadvantages of in situ methods and enzymatic and microbial-cell preparation techniques for predicting rumen degradation and postruminal availability of protein are discussed.

Section 4 (Physicochemical approaches) deals with chemical characterization methods as well as principles and practice of NIR spectroscopy, nuclear magnetic resonance (NMR) and other new physicochemical techniques for the estimation of forage quality.
and voluntary intake. They cannot give a direct estimate of nutritive value, but rather rely on statistical association to measure digestibility, intake and performance.

The first three chapters of Section 5 (Minerals, vitamins, antinutritive and other factors) focus on the factors affecting the trace-mineral, major-mineral and vitamin status of different forages, their interactions and their importance for animal health and performance. The section ends with a discussion of results from research on *Sesbania seban* and *Trifolium pratense* (red clover), as a way of illustrating the effects of secondary plant compounds on forage evaluation.

Current procedures, future requirements and the need for standardization are summarized and discussed in Section 6 (General discussion and conclusion).

The book contains an index which helps quick reference. The reviews of the processes of nutrient digestion and utilization in ruminants, of techniques for the estimation of feeding value and of principles of intake control are of general interest not only in connection with forage but also with concentrates. The book can be very useful for researchers, students, teachers, feed analysts and advisors.

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