

BOOK REVIEW

Range ecology at disequilibrium: New models of natural variability and pastoral adaptation in african savannas.

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The theme of this book is the implications of new ecological theory and associated models of forage production and soil erosion, for the assessment of correct stocking rates on communal grazing lands. The case studies and examples are mostly from the communal grazing lands of Africa, but the conclusions are relevant to all rangelands with a low and variable rainfall (e.g. <400 mm, CV >30%).

The title suggests an academic treatise on ecology, but the main theme running through this book is the scientific assessment of stocking rates for sustainable production. The problem is exemplified in Zimbabwe's communal areas, where stocking rates have been much higher than the supposed ecological carrying capacity for some time. Although numbers have fluctuated in relation to rainfall, the forecast crash in land condition has not occurred. The general conclusion is that past assessments may be seriously flawed. Several authors outline the practical difficulty of assessing carrying capacity when production varies widely from year to year according to rainfall and where stock migration is common. Furthermore the recommended proper use factors remain vague, with a range of from 35-50%. The authors point out that the stocking rate for the upper level in this accepted range of proper use is 50% higher than the lower level, which shows the difficulty of determining stocking rates mathematically. The book also points out that the correct carrying capacity is greatly influenced by the type of production system. Optimum stocking rate is both an ecological and an economic concept, so that the correct stocking rate for a cattle breeding enterprise within a market economy is quite different to that of a subsistence system involving milk and bridewealth.

The book consists of twelve chapters, prepared by some 21 authors, that cover a variety of case studies and modelling exercises on the rangelands of African countries from Botswana to Ethiopia. They cover such topics as climatic variability, biological stability, the concept of carrying capacity, analyses of feed demand and forage supply, estimating soil erosion and the value of reducing stock numbers. The book arises from a meeting held in Woburn England in 1990 that was called to examine the scope of Commonwealth action on soil erosion, desertification and related drought problems in Africa. There was consensus at that meeting of the need for a thorough review of range management theory and practice.

The book argues that disequilibrium ecology applies in low rainfall environments, with an increasing difficulty for the application of the traditional view of a direct relationship between stocking rates and range degradation when annual rainfall is below 400 mm. Case studies of lands that are theoretically overgrazed show that they remain highly resilient, although botanical composition may be changed. They also produce more food and have a higher gross margin than they would at the recommended rate. Soil erosion is higher, but the soil is still calculated to last 400 years. The authors argue that this is sustainable in the eyes of the current people, although I doubt if this would be regarded as sustainable in Australia or USA. They suggest that an adaptive approach to setting stock numbers is required, which is based on rainfall event management. However, little indication is given as to how this approach may operate.

The book criticises the conventional wisdom of a smooth relationship between livestock numbers and plant succession, and accepts the sudden, unpredictable and perhaps irreversible

change that is frequently seen when drought and livestock interact to bring pressure on the land. Several chapters present outlines of detailed models that may be used to estimate carrying capacity and argue for their utility in planning. However, it seemed that these estimates are subject to the same shortcomings noted earlier, so I doubt whether we are yet able to set stocking rates on an objective basis.

The final chapter is a description of current views on landscape ecology in central Australia and is of a more theoretical nature. It covers current views on climatic variability and spatial differences in production potential arising from the redistribution of water and nutrients in arid landscapes. The authors outline these processes, together with the pattern of soil movement and animal distribution, and how they can be tracked by satellite imagery. This represents an elegant description of landscape processes and the impact of livestock on the land, but the subject matter does not integrate well with the earlier chapters.

The content of the book is challenging on a number of issues. Are carrying capacity assessments really worthwhile? Are our rangelands as degraded as we have been led to believe? (It may depend on our definition of degradation. This book assumes from the start that degradation is measured solely as a decline in economic good). How can mathematical models of carrying capacity be made useful when it is difficult to forecast the rainfall and assess such factors as proper use and wildlife use? What is the place of complex spatial models that use Landsat imagery to estimate the pattern of cover and soil movement? The book does not have all the answers, but it is an important reference for anyone engaged in research or decision making in this area.

The African context presents no barrier to its relevance for other low rainfall rangelands around the world. I recommend that it be read widely.

A.D. Wilson