Book Reviews

Goat Nutrition. Edited by P. Morand-Fehr, with 41 text contributors. 1991. Centre for Agricultural Publishing and Documentation, (Pudoc), Wageningen, Netherlands. Distributed in U.S. by UNIPUB, Lanham, Maryland. 308 p. US$83.00 cloth. ISBN 90-220-1009-0.

This book summarizes presentations at seminars held at Reading, U.K. in 1982, Grangeneuve, Switzerland in 1984, Nancy, France in 1986, and Potenza, Italy in 1988 by scientists under the Programme of the FAO Cooperative Research Sub-Network on Goat Production. Twenty-four major chapters plus an introduction cover both basic research findings and practical applications related to the nutrition, physiology and management of goats. The editor's hope was that the book would be useful to scientists, teachers and students of animal husbandry, and to experts in agricultural development, livestock production, and goat breeding and management. Geographically, the volume focuses on Europe, and to a lesser extent the Middle East and other goat producing regions in content and in literature cited. Several of the chapters cite considerable North American research.

The volume is divided into 4 parts entitled General Goat Nutrition, Evaluation and Utilization of Feeds, Feeding of Adult Goats, and Feeding of Young Goats. Discussions of production systems relevant to the technical research presented are found in many of the chapters. Compared with much research on sheep and cattle, the goat management practices and production systems presented are less intensive, and their descriptions are more readable. Several chapters specifically concern goat management on rangelands or extensively managed pastures. Chapter 14 by M. Meuret *et al.* examines the value and use of rangeland forages by goats. Discussions of goat management practices relevant to production systems involving rangeland are dispersed throughout the book.

All chapters are written in English with abstracts in English and French. In some chapters an English language assistant editor might have smoothed the syntax, which is unrefined in places. Still the messages get through, mostly without pretentious prose or perplexing paradigms to sedate the reader. Some of the chapters do contain considerable technical, nutritional jargon. *Goat Nutrition* does not have unifying introductions to its 4 sections; in content and message some of the individual chapters are better balanced than the book as a whole. The book has no general index.

Goats are major products in some countries. Where they are not, researchers and producers of them seem comfortable as niche players in ranching industries. In the United States and in other developed countries, goats seem to have a secure future as components of sustainable, extensive production systems. The chapters in *Goat Nutrition* are readable syntheses of basic research and applied practices that readers will find relevant to a wide variety of production systems involving goats.—*David L. Scarnecchia,* Washington State University, Pullman, Washington.

The Landscapes of Craters of the Moon National Monument. By R. Gerald Wright and Stephen C. Bunting. 1994. University of Idaho Press, Moscow, Idaho. 103 p. US$24.95 paper. ISBN 0-89301-168-1.

This short book evaluates the vegetational changes in Craters of the Moon National Monument by comparing 34 pairs of contemporary and historic photographs. The monument, located at the northern edge of the Snake River Plain in central Idaho, is a stark landscape of geologically recent basalt flows and cinder cones in a cold desert environment. Because of its harshness, the area saw little documented exploration until the early 1900's. Earliest photographs used in the vegetation comparisons date to the 1920's.

The book begins with some background on the project which produced it, followed by brief descriptions of the history, geology, environment, vegetation, and visitor use of the area. Brief sections discuss the concept of environmental change, the photographic method of evaluation of long-term environmental change, and trends in vegetational change on the Snake River Plain. The black and white photographs come next, followed by a discussion of what the photo comparisons reveal. An appendix of the common and scientific names of relevant plants, a list of literature cited, and a general index complete the book. The book contains five one-page maps including four showing photo locations.

The semi-technical discussions are in a relaxed style that makes the book satisfying reading. That the authors enjoyed working on this project shows in the tone of the book. The black and white photography, necessary in the case of the older photos, seems especially appropriate in this land of gray and black. The unusual landscape makes the observed vegetational changes partly a curiosity, but they still have some relevance to the larger Snake River Plain and bordering foothills. The book's coverage of the history, geology and ecology of Craters of the Moon, combined with its past and recent photographs should answer most of the questions a curious visitor would have about this offbeat area. —*David L. Scarnecchia,* Washington State University, Pullman, Washington.

Rangeland Health: New Methods To Classify, Inventory, And Monitor Rangelands. By National Research Council. 1994. National Academy Press, Washington, D.C. 180 p. US$26.00 paper. ISBN 0-309-04879-6.

Rangeland Health is an important book for those concerned with managing U.S. rangelands because it provides the U.S. Congress and concerned federal land management agencies with guidelines on the direction that federal policy regarding national-level range condition and trend assessments should take. The intended audienced includes the public, special interest groups, and policy makers in the federal land management agencies.

Rangeland Health includes an executive summary, five chapters, an appendix, resumes for each of the 14 panel members, and an index. Chapter 1 provides a definition of rangelands, explains why they are a relevant issue to the public, and introduces the need for a national assessment of rangeland condition and trend. Chapter 2 introduces a new term: *rangeland health,* and a conceptual model of land degradation herein called the health threshold model (HT, Figure 1, p. 38). Chapter 2 also contains illustrative case studies of three different rangeland ecosystems examined in terms of newly introduced ecological concepts. The book lacks a glossary, which should have been added because of the many ecological terms used. Chapters 3 provides a history of data collection methodologies and their ecological bases. Chapter 4 explains the ecological indicators used in range assessments and provides an excellent discussion on the distinction between an ecological assessment and interpretations based on management values and decisions. Although it omits a discussion of Native-American rangelands under the federal jurisdiction of the Bureau of Indian Affairs, chapter 5 provides an excellent historical review of legislative policies, ecological methodologies, and past federal surveys that are the basis for the conduct of national level assessments. The book emphasizes the change in the ecological theory upon which range degradation assessments are based. It also points out that a lack of standard methods and data collection systems among federal agencies has hindered the national-level determination of the ecological condition of the U.S. rangelands. The book recommends that federal agencies cooperate by using a similar sampling framework such as that proposed by the Environmental

Protection Agency's Environmental Monitoring and Assessment Program (EMAP) to determine national-level resource degradation. The recommendation for interagency cooperation has been acted on most recently at a "Rangelands Health Assessment Workshop" in Ogden, Utah.

From the perspective of ecological risk assessment (Suter, 1993. *Ecological Risk Assessment.* Lewis Publishers, Boca Raton), ambiguities are present in chapters 2 to 4. The HT model is presented too early in the text. It would have been better to introduce the model after chapters 3 and 4, where the model's theoretical and practical bases are introduced. The terms *rangeland health* and its derivatives (e.g., unhealthy, Figure 1: x-axis) are problematic because they are ambiguous. Rangeland health is an attempt at specifying an assessment endpoint: a formal expression of the actual environmental value that is to be protected. An assessment endpoint has the following characteristics: social relevance, biological relevance, an unambiguous operational definition, accessibility to prediction and measurement, and susceptibility to a hazard (Suter 1993). The term *rangeland health* does not fit these requirements. In order for rangeland health to be socially relevant or to satisfy values, a linkage would have to be made between ecological and either economic aspects of rangelands and/or human health. The development of the site conservation threshold model (SCT) by the Society for Range Management (Task Group for Unity in Concepts and Terminology. 1991. *New directions in range condition assessment.* Report to the Board of Directors. Denver: Society for Range Management; Figure 1, p. 16), a precursor of the HT model, is consistent with ecological risk-assessment protocols.

The SCT and HT are both presented as 2-dimensional graphs; however, both axes of the HT are ambiguous (i.e., y = capacity to produce commodities and satisfy values and x = a range of healthy range conditions; Figure 1, p. 38). Suter (1993) observed that such terms "are not suitable subjects for assessment because they cannot be measured or modeled from any measurement." The quantification of rangeland commodities (y-axis) is an area of ongoing economic research. The quantification of satisfaction of societal values and their relationship to ecological principles is a new area of fertile and necessary research which is found primarily in the social and political sciences. The quantification of the axes of the SCT model has been carried out by physical scientists. The SCT model's axes are measurement endpoints of range degradation [i.e., soil erosion (y-axis) and vegetation cover (x-axis); Figure 1, p. 16]. A measurement endpoint is a standardized ecological indicator (e.g., percent loss in vegetation cover) that comes from an existing data series, it is correspondent or predictive of an assessment endpoint, is easily measured, is appropriate to the scale of the disturbance, and it possesses particular temporal dynamics and routes of exposure. A measurement endpoint also should have low natural variability, be diagnostic of a disturbance, and be broadly applicable (Suter 1993).

Despite the observational data to support the SCT, neither the SCT nor the HT have been empirically tested as appropriate models of rangeland degradation, whereas Dysterhuis' model (1949. "Condition and management of range land based on quantitative ecology." *J. Range Manage.* 2:104-15) has seen international application. Further, both models lack an explanatory theory as to why the observed changes in plant species' response to environment occurs (e.g., Roberts D. 1986. "A dynamical systems perspective on vegetation theory." Vegetatio 69:27-33; Lockwood, J.A. and D.R. Lockwood. 1993. "Catastrophe theory: a unified paradigm for rangeland ecosystem dynamics." *J. Range Manage.* 46:282-88). It would be better and more interesting to test the validity of the patterns in nature suggested by each model before they are applied. Once this is accomplished, integration of the SCT into the HT model would be appropriate.

Although space and time scales are recognized as legitimate concerns, no serious attempt is made to incorporate them into the discussions in Chapters 2-4. A watershed-bounded ecosystem perspective is suggested as the level of observation to determine rangeland degradation. The recommended measurement endpoints of ecosystem function are point-based or spatially aggregated soil and vegetation-based indices (Table 4.8, p. 130-31). The problems with a watershed view are that it has insufficient resolution to detect changes in phenomena that act at larger and smaller spatio-temporal scales and that the requisite measurement endpoints do not account for location (i.e., they are not spatially explicit). Because observational perspectives are scale-independent, arbitrary boundaries are necessary to detect change at different spatio-temporal scales. This suggests that the appropriate observational perspective for a national-level assessment is the landscape where measurement endpoints such as shape complexity (fractal dimension) have been effective in detecting anthropogenic disturbance (e.g., Krummel et al. 1987. "Landscape patterns in a disturbed environment." Oikos 48:321-24.

Additionally, the SCT axes can be viewed as multi-dimensional, thus measurement endpoints specific to different observational perspectives and spatio-temporal scales can be specified. As suggested in the book, the obvious tool for data collection at large geographic scales is remote sensing. A proactive response at the national level requires that measurement endpoints be incorporated in spatially explicit models. These measurement endpoints are likely to be proxies or surrogates of point-based indices of vegetation and soil degradation that are incorporated within a hierachial Geographic Information System (GIS). This style of data analysis will allow predictive capabilities. National-level assessments that utilize remote sensing and GIS are currently being conducted by the National Biological Survey and FMAP using landscape, ecoregion, and biome points of view. The measurement endpoints used for the landscape perspective (e.g., landscape diversity and fractal dimension; see Turner and Gardner 1991. *Quantitative methods in landscape ecology: the analysis and interpretation of landscape heterogeneity.* Ecological Studies Vol. 82, Springer-Verlag, New York) need to be related to range degradation.

Rangeland Health provides an admirable synopsis of the problems of ecological monitoring of U.S. rangelands. The recommendations made are aimed at decision makers but provide little guidance for theoretical and applied ecologists. The conceptual model presented is ambiguous and not amenable to theoretical specification and, therefore, measurement. Consequently, generalities but no specific guidelines are given to field managers and scientists who are responsible for acting on these recommendations. Therefore, for technical guidance, I would recommend Archer and Smeins (1991. *Ecosystem-level Processes.* pp. 109-139. in R.K. Heitschmidt and J. Stuth (Eds.). 1991. *Grazing Management: An Ecological Perspective.* Timber Press, Inc., Portland, Oregon). For a review of successes and failures of old methods and a discussion of new concepts and methods: West et al. (1994. *Monitoring and Interpreting Ecological Integrity on Arid and Semi-Arid Lands of the Western United States.* New Mexico Range Improvement Task Force, Las Cruces, New Mexico). For a heuristic study, I highly recommend Behnke et al. (1993. *Range Ecology at Disequilibrium: New Models of Natural Variability and Pastoral Adaptation in African Savannas.* Overseas Development Institute for Environment and Development, and Commonwealth Secretariat).–*Robert A. Washington-Allen*, Research Associate, Utah State University, Logan, Utah 84322-5230 and Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.