New Perspectives on Range Management & Pastoralism & Their Implications for HKH-Tibetan Plateau Rangelands

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Pastoralism in the Hindu Kush-Himalayan-Tibetan Plateau region is thousands of years old. The fact that numerous unique and, in many cases, prosperous, pastoral groups remain to this day bears witness to the extraordinary diversity and resilience of Hindu Kush-Himalayan-Tibetan Plateau rangelands, as well as to the sustainability of its resources when used wisely. In recent decades, however, many profound changes with implications for the future of rangelands and pastoral production systems have taken place. These changes include the modernisation process itself, which has brought improved access and services to previously remote pastoral areas and also increased demand for livestock products; the expansion of agriculture into rangelands and decrease in the amount of grazing land available; disruption in trans-Himalayan trade networks which were often important parts of pastoral systems; and the expansion of the protected area system with increased regulation on the use of rangelands by livestock.

These changes are transforming traditional pastoral systems and grazing use patterns. Keeping pace with these changes requires that those responsible for managing rangelands remain informed about new management concepts and technologies, incorporating such information into the design of more appropriate strategies for sustainable development of rangeland resources.

This article discusses some of the basic principles behind range management and outlines new perspectives that are emerging for managing rangeland resources. Finally, the implications of these new perceptions for managing Hindu Kush-Himalayan rangelands are discussed.

Range Management Principles — Range Condition and Carrying Capacity

Since vegetation is the foundation for rangeland use, developing range management plans requires information on vegetation ecology and an understanding of rangeland ecosystem processes. Range science, which largely developed in North America, generated principles and methods to describe the state of rangelands upon which management was then based. One of the basic principles is *range condition* class, or interpretations of the 'health' of a particular range site. Determining condition is based on an assessment of vegetation composition both on its own and in relation to what the ideal climax plant community should be like.

The other major range management principle is carrying capacity. The

predominant management concern about rangelands has usually been perceived as the need to control rangeland degradation by regulating livestock numbers. The scientific foundation for this concern is the concept of rangeland carrying capacity; the number of animals that can safely be allowed to graze without degrading the range. Carrying capacity estimates are normally based on assumptions about the impact of livestock on plants and plant succession. Heavy livestock grazing is thought to lead to a decline in range condition; reducing or removing grazing pressure assumed plant successional processes would restore the range to its previous state.

The conventional concept of carrying capacity in rangeland management is based on theories about plant succession, which is explained as the orderly and directional process by which one group or community of plant species replaces another over time. These theories to explain variation in vegetation types were developed in the early 1900s in the USA.

Successional theory assumed that a single, persistent and characteristic rangeland vegetation type, termed the climax, would eventually dominate a particular site. The theory postulated that, even if the climax vegetation was disturbed, by factors such as grazing or fire, it would still return through a successional cycle to the climax. The science of range management adapted these concepts to grazing systems. The responsibility of range managers was to try to balance livestock grazing pressure against the natural regenerative capacity of range plants. By knowing the range condition class, the proper use factor, or the amount of forage necessary to allow plant nutrients to be restored, and taking into account distance to water, slope steepness, and other factors, carrying capacities for a particular range or pasture could be determined. Livestock numbers and/or the time of year animals were allowed to graze were then manipulated to influence rangeland condition. Grazing practices normally tried to maintain or, ideally, improve range condition. This managerial approach is derived from the concepts of plant succession, rangeland condition, and carrying capacity.

New Perspectives

There are increasing questions about the relevance of these range management concepts, largely developed in North America, for planning livestock use on rangelands in pastoral systems in the developing world (Bartels et al. 1991, Ellis et al. 1991, Perrier 1990). The applicability of traditional approaches to range management in arid ecosystems, based largely on the concepts of equilibrium dynamics, plant succession, and carrying capacity, are being challenged and suggest that alternative management practices need to be designed. These concepts developed primarily in what is termed equilibrial ecosystems; areas where climatic variability is not very high and where it was believed livestock grazing was the major factor affecting vegetation.

Ecological research in the last decade in semi-arid rangelands, where climatic variability is high and ecosystem functions very dynamic, suggests that most arid and semi-arid range ecosystems function as non-equilibrial systems (Coughenour 1991, Ellis and Swift 1988). In these areas, plant growth and rangeland productivity were found to be more functions of climate than of livestock stocking rates and the effect of livestock on the range vegetation more sporadic than continuous.

In the semi-arid regions of pastoral areas of East Africa, where much of this seminal work was carried out, it was concluded that rangeland dynamics are largely controlled by frequent drought perturbances and that pastoral systems operate far from equilibrium most of the time (Ellis et al. 1991). Research in arid areas of Australia also determined that the range ecosystem was extremely dynamic and climate driven over time and that the system was better described in terms of its variability than some average value. Researchers here concluded that the concept of carrying capacity was not very useful (Walker 1993). Where ecosystems are highly dynamic, as is often the case in pastoral areas, accurately estimating carrying capacity is proving to be difficult.

Where, then, do non-equilibrial dynamics occur? Some researchers have indicated that, when the coefficient-of-variation of annual rainfall is greater than 30 per cent, the ecosystem will generate such non-equilibrial dynamics (Ellis et al. 1991). It has also been noted that areas that receive less than 300-400 mm of annual rainfall will operate as non-equilibrial systems. These are thought to be relevant estimates for the dry tropics, but it remains to be seen what rainfall levels determine non-equilibrial dynamics in dry temperate areas where diverse patterns of ecosystem behaviour may also occur. It has also been pointed out that, in dry, cold regions, where grazing lands are subject to severe blizzards (such as Tibet) rather than, or in addition to, droughts, non-equilibrial dynamics may occur (Ellis et al. 1991).

Another new perspective is the concept of relatively stable, multiple vegetation states with thresholds or transitions between these vegetation states (Laycock 1991, Westoby et al. 1989). The concept differs markedly from the traditional paradigm of plant succession. In this new view, plant succession does not proceed in an orderly, directional process whereby one group or community of plant species replaces another over time until the climax vegetation is reached. Rather, vegetation changes to a certain state and then stays there instead of moving to another successive stage, even without grazing. Only perturbation, such as fire or severe drought, will allow vegetation to proceed to another stable state. This concept provides a new framework for rangeland monitoring and management and offers promise for improved descriptions and measurements of range condition.

Pastoral development policy throughout the world has largely adopted the 'mainstream view', which maintains that traditional pastoral practices are backward and need to be improved. In recent decades, however, pastoral production systems have been viewed increasingly as highly efficient exploitation strategies to secure a livelihood in a harsh environment where cultivated agriculture is not possible. Many traditional pastoral production systems are being acknowledged as rational responses for using range resources available to herders (Coppock et al. 1986, Coughenour 1991, de Haan 1990, Ellis and Swift 1988).

Over hundreds of years, pastoralists in the Hindu Kush-Himalayan-Tibetan Plateau region acquired intricate ecological knowledge about the pastoral ecosystems in which they live and upon which their livestock production economies depend. Pastoralists' husbandry of land, water, plant, and livestock resources and their strategies are highly skilled, complex, and organized, reflecting generations of acute observation, experimentation, and adaptation to a harsh environment (Brower 1991, Cincotta et al.

1991, Goldstein et al. 1990). Local climatic patterns and key grazing areas were recognised, allowing herders to select favourable winter ranges that provided protection from storms and sufficient forage to bring animals through stressful times. Forage plants were identified that had special nutritive value. Other plant species were known for their medicinal properties or as plants to be avoided since they were poisonous. A wide diversity of livestock and grazing management techniques was employed which enabled herders to maintain the natural balance of the land upon which they were dependent. Complex forms of social organization within nomadic society developed that aided allocation of rangeland resources and, through trade networks with other societies, secured goods not available within pastoral systems.

This expanded appreciation for the complexity and ecological and economic efficacy of traditional pastoral systems is encouraging. It provides hope that the vast indigenous knowledge herders possess will be better understood and used in designing new interventions. Greater awareness of the need to understand existing pastoral systems should also help ensure that the goals and needs of pastoralists are incorporated into new programmes and that local herders become active participants in the development process.

Challenges for the Hindu Kush-Himalayan-Tibetan Plateau Region

New perspectives regarding the functioning of rangeland ecosystems raises interesting challenges for research and management in the Hindu Kush-Himalayan-Tibetan Plateau region. Such concepts provide a valuable framework for organizing range research programmes. Are Himalayan and Tibetan Plateau rangelands dynamic ecosystems? Do they function as non-equilibrial systems? In parts of the Himalayas and the eastern part of the Tibetan Plateau, annual rainfall is greater than 400 mm and equilibrial dynamics probably rule the system, but do the periodic snowstorms these areas are subjected to mean that non-equilibrial dynamics assert an influence? What about the drier, colder areas of northwest Tibet where rainfall is less and blizzards frequent? Will conventional methods of range management work there? Large expanses of Balochistan in Pakistan are semi-arid rangelands. Is vegetation here influenced more by variable climatic factors or livestock grazing? Can the carrying capacity concept really be adequately applied in these ecosystems?

In North America, range condition classes and carrying capacity estimates were generally derived from detailed measurements of soil types and range vegetation, combined with information on the proper use factor of key forage plants and livestock use of the range. In the Hindu Kush-Himalayan region, much of this information does not readily exist. Since it is difficult to accurately estimate carrying capacity in the highly dynamic ecosystems in which pastoralism takes place, there are increasing questions about the relevance of the carrying capacity concept for planning livestock stocking rates in such environments. How then should range managers tackle the problem of regulating livestock numbers in pastoral areas in the Himalayan region when such information does not exist?

The difficulty of applying carrying capacity concepts means the notion of 'opportunism' is gaining favour as a management approach for livestock production in pastoral systems (Behnke and Kerven

1994). An opportunistic approach, instead of considering 'average estimated carrying capacity', establishes the annual grazing strategy on that year's forage production. This allows pastoralists to make better adjustments of livestock numbers to the spatial variability of forage, establish a better distribution of livestock to forage availability, and enable increased production. Opportunism in this context requires herders to respond quickly to grazing opportunities and demands high herd mobility and timely destocking or restocking as grazing conditions change. Opportunistic strategies in pastoral systems, therefore, require that pastoralists capitalise on range resources available during good times and exploit outside resources during bad times (Ellis et al. 1991).

Researchers have noted that if non-equilibrium systems do operate in the above-mentioned manner, and if opportunism should be embraced, then the most important development intervention for pastoralists may be that of reducing isolationism and forging better links between the pastoralists and external resources (Ellis et al. 1991). This requires facilitation of the movement of goods and livestock through trade or marketing systems and external economies which can consume and distribute products to and from pastoral areas as they become available.

Opportunistic strategies for managing livestock and range resources are not a new idea to pastoralists. Traditional pastoral management systems in the Tibetan and Himalayan region were designed around mobility and the tracking of favourable forage conditions. Official endorsement of opportunism does not, therefore, require substantive changes in existing livestock production systems, but it does require improvements in marketing channels. By assisting in the movement of livestock and livestock products to markets, herders' incomes and access to goods can increase; their dependence upon the local pastoral environment for subsistence can, likewise, decrease.

A key challenge for researchers working in pastoral ecosystems will be to become more successful in explaining the ecological and social processes at work. Another important challenge will be to determine which aspects of indigenous knowledge systems and traditional pastoral strategies and techniques can be built upon when designing new interventions. Pastoral specialists will also have to try to ensure that research findings are incorporated into new policies and development programmes.

Conclusion

Rangeland ecosystems in the Hindu Kush-Himalayan-Tibetan Plateau region appear to be very dynamic systems. The modernisation process taking place, even in previously remote pastoral areas, is augmenting dynamic processes. Those involved with managing rangelands in the region, and they include herders, researchers, extensionists, and policy-makers, need to make the best use of available information and new ideas emerging about rangeland ecosystems. There is also growing acknowledgment of the need to explore beyond the conventional wisdom of many of the traditional range management concepts to more effectively manage rangeland resources. Some of the fresh perspectives on range ecology outlined above raise a whole new spectrum of enquiries about the functioning of Hindu Kush-Himalayan-Tibetan Plateau rangelands

and traditional pastoral systems. They also suggest new, creative approaches for designing more sustainable pastoral development in the future.

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