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## OVERGRAZING IN PASTORAL AREAS

### The Commons Reconsidered\*

by

Jere Lee Gilles & Keith Jamtgaard

The rapid expansion of the great deserts of the world has caused considerable concern among environmentalists and government officials. Presently as much as 19 percent of the world's surface is under the threat of desertification (McGuire, 1978). One of the principal causes of desertification is overgrazing by domesticated animals. While the most dramatic examples of overgrazing may be found in the Middle East and the Sahelian region of Africa, it is also a problem in more industrialized regions of the world. It has been estimated that roughly 75 percent of the publicly held rangeland and 60 percent of the privately held ranges in the United States are in fair to poor condition as a result of overgrazing (Box, 1979; Pendleton, 1978).

Although range conditions are deteriorating throughout the world, the knowledge needed to prevent overgrazing exists. The basic premise of range management is that the number of animals placed on a pasture should never be sufficient to cause the permanent deterioration of plant production or plant quality. Using this principle range scientists have, over the past 60 years, developed a variety of techniques to preserve and improve pasturelands.

The simple, compelling, logic of range management suggests that no livestock producer would consciously overgraze. Yet in spite of this, overgrazing is extremely common throughout the world. The contradiction between the apparent economic interest that herders have in preserving pastures and their tendency to overgraze has long been a subject of concern<sup>1</sup>. The social and institutional constraints to proper range use appear to be greater than the purely technical ones. Among these factors, land tenure arrangements have been singled out as a primary concern. Much of the world's grazing lands is either commonly or publicly owned. Overgrazing on these ranges appears to be more serious than on many privately owned pastures. Public or common pasture ownership has thus been singled out as a threat to proper range management. This paper examines this idea by looking at situations where common ownership of pastures is neither undesirable nor destructive.

#### Land Tenure and Overgrazing

The link between land tenure and overgrazing has been made explicit by Garrett Hardin in his classic article the «Tragedy of the Commons» (1968)<sup>2</sup>. Hardin used the example of a common pasture to demonstrate why many commonly

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held resources - water, air, pastures, fisheries, etc. - have been overused to the point of destruction. Hardin argues that any commonly held resource that is exploited by individuals but is collectively owned will be overused. A common pasture is defined as one that is owned by a collectivity upon which all members may graze animals. Because the pasture belongs to all, it is impossible for one member of a community to exclude another's animals.

Common pastures become overgrazed when they are shared by large numbers of people and when the number of animals placed on a pasture approach its grazing capacity. Once this point has been reached rational pasture management requires that no additional animals be allowed to graze on the commons. Additional animals will lead to the destruction of valuable forage plants and to a decline in the amount of animal products coming from the commons.

While it is against a group's interest to overgraze the commons, overgrazing still occurs. Common ownership of rangeland creates a basic contradiction between group and individual goals. When an individual adds another animal to an overgrazed pasture he or she receives all of the benefits of owning an additional animal but the costs of overgrazing are shared with everyone who used the commons. As a result the benefits of overgrazing will always exceed the costs for an individual. All those who share the commons have an incentive to overgraze. People who do not attempt to increase herd size are, in fact, penalized because the productivity of their herds will be reduced as a result of the overgrazing of their neighbors. As long as individuals cannot prevent others from overstocking, it is also in their best interests to overstock.

Hardin and others have argued that the most effective way to eliminate overgrazing is to eliminate commonly owned pastures replacing them with privately owned ones. Although they recognize that public ownership or regulation of common resources might be an alternative to private ownership, they feel that private ownership of natural resources provides the only stable solution to the problem of resource depletion (Hardin, 1977; Baden & Stroup, 1977).

Although Hardin's arguments are not based upon a scientific study of common pasture systems, many people directly concerned with range management have also argued that the lack of privately owned pastures is a major cause of overgrazing. Whitaker and Wennergren (1978) argue that overgrazing in Bolivia is due to pastures that are used as commons. According to these authors, only the institution and enforcement of property rights can reduce overgrazing. The «tragedy of the commons» has also been used to explain the severe effects of drought in the Sahel (Picardi & Seifert, 1976). However, in most of Africa, conditions preclude the development of individually owned ranches. For these reasons most proposals to reduce overgrazing in African pastoral areas include the introduction of corporate ownership of rangelands in the form of group ranches or grazing cooperatives. In Turkey the government has curtailed range management research and extension programs because it believes that the existence of common pastures makes range improvement impossible.

Although Hardin and others who have dealt with the common resource question would be quick to point out that land tenure is only one of the causes of overgrazing, the lack of privately owned rangelands is seen to be

its principal cause. This line of reasoning tends to ignore both the advantages of common pasture systems and the poor conditions of many privately held rangelands today.

### The Case for the Commons

Eliminating common ownership of rangeland pastures will not end overgrazing. Overgrazing remains a problem on privately managed rangeland in the United States and Australia. Although overstocking is more serious on publicly owned lands in these nations, land tenure may not totally explain the problem. In both countries public grazing lands are leased to individuals and lessees manage their leaseholds as they would their own property.<sup>3</sup>

There are, in fact, at least two instances where the private ownership of rangeland may facilitate overgrazing. The first has been discussed in detail by Fife (1977). It is the situation in which there are alternative low risk investments that would provide the same rate of return as that of soundly managed livestock unit. Under these conditions entrepreneurs would overstock their pastures when prices permitted high short run rates of return. Extra profits could then be invested in other enterprises and the profits from these investments would, in the long run, exceed those of a properly managed ranch.

The second situation is where the size of holdings is not large enough to provide an adequate standard of living for the families of livestock producers. Experience in Australia and Canada indicated that operators of such small units must take more risks if they are to produce sufficient income to meet needs. One risk that they take is to stock their pastures at higher rates than do their larger more conservative neighbors. A result of this strategy can be overgrazing and environmental degradation (Young, 1979; Bennett, 1969).

In addition to these situations, there are environmental conditions which favor common or public pasture ownership. Many alpine and semi-arid pastures are seasonal and have low levels of production per unit area. In these areas one cannot graze animals continually on the same plot of land and must have access to many different types of pastures through the year. This is best accomplished by having large expanses of unfenced land where animals are free to graze.

Large expanses of open range are particularly needed when the quality of pasture in a given area varies considerably from year to year. This is a common situation in alpine pastures, and in the pastoral areas of Africa and Central Asia. For example, in the tropical and sub-tropical rangelands of the Sahel and East Africa rainfall varies considerably from year to year. But, more importantly, rainfall is unevenly distributed over an area in any given year. Rain is usually produced in this region by individual storms creating narrow rainfall paths with inter-storm areas remaining quite dry. Wallen and Gwynne (1978, p. 27) note that in parts of Kenya these storms rarely exceed five kilometers in width and are normally less than one kilometer wide. As a result of this pattern of rainfall, a traveller on horseback during a single day in the rainy season can easily pass through several spots that are saturated with water and full of grass and others that have not received any rainfall. The proper utilization of such pastures requires that livestock producers have the freedom to move animals over a large area in order

to efficiently use available forage resources. Maasai herders in East Africa must have access to between 120,000 and 200,000 hectares of rangeland to be able to cope with this situation (Institute for Development Anthropology, 1980). Common pastures in Africa and elsewhere are used by large numbers of people with small herds. The conversion of common rangeland into private holdings would only impede the movement of animals and increase the likelihood of overgrazing.

Private ownership of rangeland is often neither practical nor advisable. Where per hectare levels of forage production are low and highly variable only very large units of land can be efficiently used for livestock production. The subdivision of these pastures will lead to overstocking but the only other way to eliminate the commons would be to deprive large numbers of small producers of a source of livelihood. Under these circumstances, common ownership of pastures must be the basis for any ecologically sound but equitable system of range management. More attention must be given to improving the management of common pastures and less effort must be expended on designing schemes to eliminate them. Just as there are many examples of overgrazed private pastures, there are examples of properly managed common pastures. An examination of these should help those concerned with pastoral development understand how the tragedy of the commons can be averted. Three such systems are presented below.

#### The Unabused Commons

Just as there are cases where privately owned pastures are overgrazed, there are several examples where commonly held pastures have not been abused. Three examples will be presented; one from the Peruvian Andes, one from the Swiss Alps, and one from the pastoral Africa. From these examples of traditional systems, general characteristics of properly managed communal grazing systems can be identified.

For as long as 2000 years Peruvian grasslands above 3600 meters in elevation have been used as pastures for domesticated llamas and alpacas (Browman, 1974).<sup>4</sup> While we know little about pre-Columbian land tenure systems, there is considerable evidence that some of these pastures have been held communally since the conquest of the area by the Spanish in the 16th Century. These areas are located at higher elevations where alpaca production is the principal activity. In the Central Andes a long dry season reduces the nutritive value and palatability of range plants. During this season good pastures are scarce and consist mostly of aquatic plants that grow in naturally humid areas called bofedales (Orlove, 1977, 1980). Although the size of these areas may be enlarged through irrigation, the carrying capacity of these springs appears to be less than that of the surrounding rangeland which is used as wet season pasture. While wet season pastures are commonly held, the use of the bofedales are controlled by families or by groups of families (Flores-Ochoa, 1968). Palacios Rios (1977) notes that the wool production of animals pastured on bofedales is closely monitored and stocking rates are adjusted when declines in productivity occur.

In the case of Switzerland there are records of some communally owned pastures that date from the 13th Century. Alpine pastures and meadows have been held in common in this area for centuries. Privately held pastures exist and common lands are generally limited to seasonal pastures with low and/or variable yields of forage.

0). One of the best descriptions of the management of Alpine pastures is Netting's (1972, 1976) description of the village of Törbel. The management of the commons is facilitated by the fact that a few villagers care for all of the animals which graze on the common alps. Weekly milk and cheese production is closely monitored so that any decline in the quality or quantity of grass can be easily observed. Overgrazing is largely prevented by community regulations that limit the number of animals that can be placed on the commons to those that can be fed through the winter on hay produced in village hay meadows.

a.  
1. There are a number of examples of African pastoral systems where, until recently, common pastures have existed without the occurrence of overgrazing.<sup>5</sup> As mentioned earlier, the patterns of rainfall in the Sahel and parts of East Africa encourage collective control of pastures. In the past epidemics and inter-group conflicts helped to limit herd sizes. In addition the dependence of many pastoralists upon milk and, in some instances, upon blood for most of their food makes them sensitive to daily variations in the quality and quantity of grasses (Dupire, 1962; Horowitz, 1979).

nal For the most part traditional African range management strategies have had two components: one involves mobility and the second involves control over water, or in some cases, dry season pasture. As mentioned earlier rainfall patterns in pastoral Africa are quite unstable. Animals must be moved regularly to provide the best feed for them and to avoid overgrazing. In «normal» conditions annual patterns of animal movement may be quite regular. In periods of extreme drought pastoralists must be able to leave their traditional grazing lands and wander far in search of adequate feed resources. Large expanses of «common» pastures facilitate such movements.

The efficacy of mobility can be demonstrated by two examples, Breman et al. (1978) present evidence that the condition of cattle that make the long 1000 km transhumance to Mauretania from the inland delta of the Niger River is superior to that of the animals that remain year round in this well-watered area. Gallais et al. (1977) have also shown that pastoralists who used the traditional strategy of mobility early in the Sahelian drought of the early 1970's lost few animals and did not contribute greatly to the severe overgrazing problems around boreholes. Herds that were permanently concentrated in one area often were totally destroyed.

y While pastures are typically held in common throughout pastoral Africa, this is not the case for water points. These may be attached to groups of families who have «rights» to their use. By controlling access to certain wells, groups could protect adjacent pastures from overgrazing in periods of low rainfall<sup>6</sup>. Some societies like the Boran of Kenya and Ethiopia may, in fact, use control of access to wells as the basic means of controlling the behavior of group members (Legesse, 1972).

While mobility and control over water sources may have prevented severe overgrazing in traditional pastoral systems, independence and rising sedentary populations have seriously reduced the mobility of nomads. As the agricultural populations of these nations have expanded, farmers have moved into pastoral areas. Although farming in these areas may be a marginal activity, the claims of farmers for land have been honored by most governments

over the objections of pastoralists<sup>7</sup>. As a result, a growing number of animals are confined to ever smaller areas. In addition governments throughout Africa have consciously attempted to settle nomads and to reduce their mobility (Salzman, 1980). Both of these trends have greatly increased the possibility of overgrazing.

Attempts by governments to expand beef production have tended to break down the second traditional means of preserving pastures - the control of wells. In a desire to expand beef production many African governments with the aid of foreign donors launched massive water development programs to expand the amount of pasture land that could be grazed in the dry season. Because new wells were funded publicly and because sedentary populations were more oriented towards beef production than were traditional pastoralists, wells were open to use by all without cost. Water which was formerly available only to members of a single tribe now was available to anyone. In Senegal, Sal (1978) observes that large numbers of sedentary Wolofs invested in livestock and pastured them permanently around new wells. During droughts each well became the center of a denuded desert 10-20 kilometers in width. Considerable numbers of animals were lost simply because the importance of controlling access to water was not recognized by development planners. The tragedy of the Sahelian drought was not one of the commons but was due to the failure of government and donor agencies to appreciate the range management strategies of traditional pastoralists.

#### Managing the Commons

The «Tragedy of the Commons» was not written as a treatise on range management. Hardin used the example of a common pasture to illustrate a theoretical argument about the behavioral foundations of over-population and pollution. In actuality the relationship between overgrazing and land tenure is a very complex one. Common ownership may be the most desirable form of land tenure where large numbers of people use pastures with low variable yields. In these situations people have been able to properly manage common ranges. In Switzerland communities have developed formal written procedures to protect the common Alps. In the African examples cited group decisions concerning the use of wells protect adjacent pasturelands. In the Peruvian example informal small group decisions and fortuitous environmental conditions achieved the same result.

Despite the variety of situations where common pastures can be found, they all share some similar features. It is these features that should be incorporated in any attempt to common pastures. These are: 1) the existence of an information system that permits people to evaluate short-term changes in forage quality and animal production; 2) the existence of collective regulations or rules that control access to resources critical to the production of livestock.

In each of the examples herders were cognizant of changes resulting from relatively short term changes in the quality and quantity of forages. In the Swiss and African cases daily or weekly milk yields provided a good indication of forage quality. In the Andean case, Aymara herders monitored wool clips closely. It is important to note that all of the groups discussed have traditionally depended upon their animals for most of their subsistence

needs. These groups have thus acquired an acute sensitivity to relatively small changes in the condition of their animals. One cannot assume, however, that sedentary people who have traditionally depended upon agriculture would be able to evaluate minor changes in the forage situation. Agricultural people may need to be taught how to evaluate changes in the health of ranges. Likewise, traditional pastoralists may have to be re-educated if development results in the replacement of dairy production by beef production. It is much more difficult to monitor the effects of changing range conditions on meat production.

More important than a means of monitoring range conditions is a system of controlling access to pastures that are in danger of being overgrazed. Although in each of the examples, free access to pastureland was given to anyone belonging to a community or group, there were other factors that limited the number of animals placed on common pastures. The access to some critical resource - dry season pasture, water points, or winter feed - was controlled by extended families or by a group of people. In some cases individual decisions concerning the use of these resources automatically protected the common pastures. More commonly, in the case of Törbel, a community had to develop explicit rules linking the management of critical resources to the use of common pastures.

While adequate pasture monitoring systems may not exist everywhere, in most areas some resource outside of the common pastures is usually in short supply. Group efforts to regulate animal numbers should concentrate on these resources, as they are easier to monitor than are vast rangelands. In many arid and semi-arid regions water may be the critical resource. In others, access to dry season pastures is critical. In temperate areas the availability of winter feed may limit herd sizes. The regulation of these resources rather than the management of common pasture itself is the key to the improvement of pastures in these areas<sup>8</sup>.

As an abstract model of human behavior, the tragedy of the commons idea is useful. As an analysis of common pastures systems, it has serious deficiencies. The analysis is based upon two questionable assumptions. The first is that the benefits derived from converting common range into private pastures will exceed the costs. The second is that persons whose survival depends upon the maintenance of common pastures are incapable of acting collectively to protect these resources. An examination of existing common systems reveals that under many circumstances the elimination of common pastures is neither feasible nor desirable. In addition, it is clear many pastoralists have developed ways to protect and effectively utilize common pastures, just as agriculturalists have learned to manage collectively owned irrigation systems.

It is unfortunate that Garrett Hardin used a pasture to illustrate the problems of managing collective resources. His abstract construct of a common pasture scarcely resembles most existent common pasture systems. His analysis, however, has been accepted unthinkingly by many of those charged with livestock sector development. It is ironic that a literal acceptance of Hardin's ideas may have delayed a solution to the overstocking problem in areas where common pastures are prevalent. In these areas collective strategies adapted from traditional management systems promise to regulate livestock numbers while preserving the advantages of common pastures.



### Notes

1. See Ian Livingston (1977) for a review of social, cultural and demographic causes of overgrazing.
2. Hardin did not originate this idea but he did popularize the concept. He was not interested in range management but borrowed the example from William Forster Lloyd's lectures on population.
3. In the U.S. leases have been so secure that ranchers treat them as private property. The value of leases is incorporated in the sale price of a ranch and can be used as part of the collateral for loans (Baden & Stroup, 1977).
4. The alpaca is native to the Andes and is well adapted to local forages. In areas of Peru where sheep production and/or crop production are important, overgrazing is quite common.
5. This argument only relates to pastoral people like the Fulani, Tuareg, Gorane, Boran and Maasai who depend primarily on livestock production to meet their subsistence needs.
6. See Bernus (1974) for a similar discussion of waterpoint development in Niger.
7. It is interesting to note that the decline of the English commons may have resulted from the exclusion of animals from agricultural lands. In the English open field system animals grazed on the commons during the summer months and fed on stubble and hay during the rest of the year. As fields became privately owned, animals had to spend longer periods on the commons. The result was overgrazing.
8. Critical resources are often controlled by an individual or a group of families. In some cases, decisions concerning the optimal use of these resources may prevent overgrazing. Usually, some type of community regulation of these resources is needed to prevent persons from eliminating the bottlenecks created by the lack of these resources. For example, without regulation wealthy individuals might be able to dig their own wells or purchase feed. Both steps could lead to overgrazing.

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