Conservation, Development, and Use of the World's Rangelands

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Highlight

Some 47% of the world's land area is suitable only for grazing by domestic livestock and game animals—either frequently or occasionally. These rangelands support animals which provide most of the world's meat, milk, hides, wool, and other animal products. They have major values for watershed, wildlife habitat, soil and water conservation, fuel, and important by-products. Large areas are in poor condition, primarily because of overgrazing. The American Society of Range Management has an increasingly important role in focusing attention on the world's rangelands and in stimulating effective programs of research, education, and action.

The American Society of Range Management (1964) defines range as "all land producing native forage for animal consumption, and lands that are revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. Generally considered as land that is not cultivated."

Rangeland includes natural grasslands, savannas, wetlands dominated by grasses and grass-like plants suitable for grazing, and certain shrub and chaparral plant communities. Terms which often are used with similar meaning include steppe, veldt, savanna, and moor. Numerous vernacular terms are used to designate areas of native or natural plant communities used for grazing livestock and big game animals.

Rangeland most often is too dry, steep, rocky, wet, or otherwise limited for more intensive cropping use. In management of rangeland, manipulation of grazing animals in terms of numbers and season of use is the primary measure employed to improve or maintain the desired plant cover. Associated practices may include deferred grazing (resting or spelling land from grazing), rotational deferred-grazing, or other grazing systems.

Improvement in existing range cover may be too slow or even impossible under grazing management alone where deterioration is extreme. When improvement in cover requires considerable change in plant composition, seeding of desired species may be necessary. Control of undesirable plants by chemical, biological, or mechanical means may be needed to accelerate production of desirable cover and forage plants.

[1]The Committee is indebted to Dr. Roald A. Peterson, Pasture and Forage Crops Branch, FAO, Rome, Italy, for reviewing the ms and for granting permission to use previously unpublished material written by Mr. Allred.

Adequate water distributed over the range is essential to meet needs of grazing animals and to encourage dispersal and uniform utilization. Inadequate watering locations on arid grazing lands encourage concentrations around existing waterings. Lack of water and forage in times of drought lead to eventual migration to more favorable areas. In addition to water, fencing, and herding, controlled burns sometimes are employed to influence and control livestock movements and concentrations.

Range forage may be deficient in essential nutrients or minerals during some part of the year. Feeding of supplemental nutrients or minerals can be vital to livestock management and production.

The kinds of grazing animals used to convert range forage to meat, milk, wool, mohair, or hides must be compatible with each environmental situation. Under some conditions, big game animals may be more efficient rangeland users than domestic livestock.

Developing, using, and improving range resources for the benefit of man require an understanding of the physical environment, the plants that can be produced, and the animals that are the most efficient harvesters of the forage. The range resources of the world are begging for such understanding.

Kind and Location of Natural Grazing Lands

Every nation has some natural grazing land but kinds vary greatly by climate. The grasslands cover vast areas of economic importance—large areas of the arable croplands are former grasslands. Grasslands of the more humid zone include the Chernozen belt of Russia, United States prairies from Canada to the Gulf of Mexico, llanos of Venezuela, pampas of Argentina and tallgrass veldt of Africa. Plants include tall and mid-grasses, a few forbs and small shrubs. These are among the most productive rainfed farming lands of the world.

The semi-arid grasslands are composed of short and mid-grasses, forbs and a few small shrubs. Examples are the steppes of Eurasia and Africa, the Great Plains in North America and the plains of Patagonia.

Drier still are the desert and semi-desert grasslands composed of drought resistant grasses, numerous small shrubs and some forbs. Examples are found in the Middle East, much of East Africa and Southwestern United States.

Cold climate grasslands are typical of alpine and subarctic regions and are composed largely of short grasses, forbs, lichens and mosses. None are found in Antarctica.

Savannas represent another large type of grazing land and are of two major kinds.

a. Grasslands intermingled with small or me-

dium-size trees usually in favorable moist areas.

b. Grasslands with intermingled shrub typical of semi-arid to arid climates.

Forest areas also are grazed by domestic animals and wildlife. Over half of the area classified as forest is low-producing woodland of value largely for grazing. Forbs, grasses, and low shrubs in forests are grazed by domestic animals but such areas are more widely used by wildlife.

Most deserts provide homes for many meat-producing animals, at least part of the time. Drought-tolerant shrubs, some perennial grasses, and numerous annual plants provide forage at least during years when rainfall is most abundant.

With the exception of polar caps, most of the world's land area is used by domestic and game animals at least some part of the year. About one-third of the sphere is land, or 34 billion acres. Approximately 10% is farmed, 28% is in forest which is grazed by domestic animals and wildlife part of the year; another 15% is covered with icecaps or fresh water, leaving 47% of the global land area too steep, shallow, sandy, arid, wet, cold, or saline for crops and suitable only for grazing by domestic livestock and game animals—frequently or occasionally. They vary from hot humid savannas in Brazil's Matto Grosso to Mongolia's cold arid steppes and differ widely in productivity from Saudi Arabia where 640 acres are required per camel to the Argentine pampa where 2 ha often are enough to support a cow and calf for one year.

Perhaps another 2 or 3% of the virgin land may come into crop production through drainage or irrigation.

Significance to the Human Race

Basic Source of Food and Protein.—Should some cosmic force wipe out the vegetation on the world's natural grazing land, a large percentage of our population would soon starve to death because the croplands are not great enough to feed the numbers of people already short of food. Should such a catastrophe suddenly occur, we would be deprived of most of our meat, milk, hides, wool and animal by-products.

Green plants manufacture their own food which in turn nourishes animals. Ingredients are primarily water, air, and minerals (which animals cannot use for food in their pure state) plus sunshine. In the process of making vegetable matter, plants purify the air for animals by releasing oxygen. In converting vast quantities of raw materials to food on land not suited to cultivation, plants provide much of the food for animals and eventually for man.

Grazing Lands are Watersheds.—Watershed values often are equal to forage-producing values of grazing lands. The vast areas of rangelands serve as watersheds that receive precipitation which eventually drains into rivers and small streams, or sinks into the soil to replenish springs and groundwater reservoirs.

Thrifty vegetation is the key to productive watersheds essential in supplying water for agriculture, cities, and industry. The world is suffering from exploited watersheds menaced by floods and plagued with disappearing water supplies, when need is multiplying yearly. Through cooperation between governments and landowners, many depleted watersheds are being restored to their former state of productivity. One excellent example is on Sandstone Creek, a branch of the Washita River in Oklahoma, USA. Following construction of a few reservoirs, combined with proper grazing of ranges, plus conservation farming of croplands, this wild untamed flood producer, which went dry in the summer, again has a stabilized watershed. Sandstone Creek now produces a steady stream of water all year as it formerly did before the turn of the century. Net farm income has increased.

Habitat for Wildlife and Soil Life.—Most wildlife is found on natural grazing lands and includes big game, small mammals, upland game birds, and predators. Unfortunately, numbers of many game species have been decimated and some have been eliminated because of reckless hunting or loss of habitat due to overgrazing by domestic animals. In many places where increasingly large areas are under conservation management and hunting is controlled, income from game and associated recreation facilities exceeds that from domestic animals.

Soils of well-managed natural grazing land serve as a prime habitat for countless unseen microorganisms such as bacteria, fungi, algae, and protozoa. Also the soil feeds and shelters beneficial insects, earthworms and various burrowing animals. Microscopic life prepares minerals and nitrogen for absorption in a water solution by the roots. Plants could not live if there were no microscopic soil organisms, and these organisms could not live without organic matter originating from dead stems, leaves, and roots of plants. Overgrazing has caused huge decreases in the number of soil organisms essential for full forage yields.

Value for Conservation.—A healthy cover of natural vegetation provides an effective and economic cover for soil and water conservation. As a reward for conservation management, native plants maintain a self-mulching process at little cost with generous returns. Watershed stabilization on areas of natural vegetation is accomplished largely through conservation grazing of forage plants and prudent harvesting of timber. Leftover

protective plant cover, or litter, maintains the soil in a productive condition; water cannot get into most soils effectively without this filter of unused plant parts to let it in. On properly managed ranges and forest areas, raindrops dash harmlessly into a spongy or soft mass of litter and stubble, where water penetrates deeply into the soil and is stored safe from evaporation but available for deep-rooted plants needing it for growth.

Naturally landscaped, grassed, or wooded lands are of major interest to an increasing number of nature lovers seeking outdoor recreation and pleasant scenery provided in variety all through the growing and dormant seasons.

Fuel and Timber.—Woodlands are grazing lands. Often savannas and groves of low-value commercial timber are dependable sources of fuel and building materials for small construction. In developed countries, fuel wood has a declining use because of substitutes. However, in developing countries destruction of dwarf woodlands and browse plants continues at an alarming rate. This is doubly vexing because usually these plants are valuable for both grazing and fuel, and conservation measures are needed. Intermingled with grazing lands often are found commercial forest sites on mountains, favored exposures, or along river flood plains. A grazing program for such sites must be planned to further tree growth without damaging the timber resources. Moderate grazing often helps to control weed species and reduce the fire hazard. Animal dung is a vital by-product of grazing lands and is the prime source of fuel in some areas.

Medicines and Industrial Compounds.—Many primitive foods, medicines, and useful compounds originate from natural vegetation including sugar, nuts, seeds, turpentine, rubber, quinine, digitalis, gums, and poisons for control of insects and parasites.

Minerals and Construction Materials.—In addition to vegetation values, native grazing lands yield some of the world's great supplies of minerals and construction materials and fertilizers such as: coal, oil, precious minerals, tin, magnesium, uranium, limestone, granite, and phosphorus. Once these resources are exhausted, their raw excavation scars and heaps must again be covered with vegetation. In time nature heals them with grasses, herbs, trees, and shrubs but the process can be hurried through reclamation of destroyed surfaces by planting trees and grass for forage production or for recreation.

Dependence of World Livestock Industry On Natural Grazing Lands

We have already recognized that presently domestic animals obtain about 75% of their forage needs from natural grazing lands, while wildlife obtain most of their needs from this source. One of the great needs, howver, is to orient future animal feeding programs to provide for an increased amount of farm-grown supplements as well as more of the basic livestock ration. This is now fairly well integrated in developed nations but accomplishing it in developing countries is difficult because farming and livestock raising are generally independent operations carried out by non-related interests. Also, the traditionally small farmer has neither the size of operation nor the financing essential for successful livestock raising.

The world animal population has a colossal appetite that needs to be satisfied with nutritious forage every day but the supplies and quality are far below need. The estimated numbers of domestic animals in the world for 1963–64 are as follows:

Kind	*Number* (millions)
Horses	62.8
Mules	15.5
Asses	41.7
Cattle	992.3
Pigs	534.1
Sheep	1,008.5
Goats	356.2
Buffalo	106.0
Camels	11.6

Value of meat products alone amounts to approximately 40 billion dollars annually, second in worth only to cereals and rice. However, livestock eat one-third of all cereals produced. Over 7% of meat production goes into international trade, including live animals, carcasses, and prepared and canned meat worth around 3 billion dollars per year. In 1959–61, this trade amounted to 13% of world exports of all food and beverage sales, compared with 21% for cereals and rice, 16.5% for coffee, cocoa, and tea, and 5.5% for dairy products.

Who Owns World Grazing Lands

Probably 75% of the grazing lands are publicly owned, the amount varying widely among nations. For example, about 25% of the United States' grazing lands are owned by the public; nearly all the Arabian Peninsula is public land. The remainder is under some type of private ownership including individuals, grazing associations, cooperatives, estates, and corporations.

Outside of the United States and Canada, few nations have set up public land managing organizations for the conservation of publicly owned grazing lands. Legislation similar to that in the United States and Canada needs to be adopted and management executed in all countries.

Destruction of Grazing Lands

The bulk of world grazing lands are in poor condition and are producing less than half their potential animal products. Unfortunately, deterioration is continuing at an alarming rate, especially in arid and semi-arid regions. In such areas, restoration is extremely slow, especially where the good perennials have been killed and only annuals and unwanted perennials are present. Many of the remaining plants are low in palatability, some like loco, *Rhayzia stricta,* and milkweed are poisonous. Many overgrazed ranges have been invaded by low-quality, but high water-using shrubs, which are plaguing an increasingly vast acreage. Replacing them is costly and generally unsuccessful because in spite of the hundreds of millions of dollars spent in brush control, the invasion is increasing faster than it is being controlled.

The shocking fact is that badly needed animal production from natural grazing lands has been cut in half as a penalty charge against mismanagement while destruction continues. A hungering world gets hungrier while a valuable natural resource erodes away for lack of rational programs and proper management. Our comfort and health are threatened for lack of foresight and use of remedial measures that will halt destruction and create new sources of protein and meat.

Half of a full animal ration goes for body maintenance. Because a vast proportion of our domestic animals are fed only a maintenance ration, they are essentially wasting forage because they are not getting enough for economic production.

If all animals were on a full diet there would be far fewer of them but animal production would be greatly raised. This point can be illustrated by an experience from one of the ancient bemas where tribal managers in Saudi Arabia had made conservation use of one range area for decades. Lamb production from this properly grazed range was about 85% and lambs weighed 65 lb at 5 to 6 months of age. On the adjoining overgrazed range, lamb crops averaged only 35% and lambs at 5 to 6 months of age weighed 30 to 35 lb.

Individual sheep production was about 60% higher on the properly grazed bema, death losses were much less and meat quality was superior.

Reasons for Grazing Land Deterioration.—Overgrazing is the single greatest cause of range degeneration according to reports of 20 FAO pasture and fodder experts made to the Pasture and Fodder Crops Branch in Rome. Two or more of the statements came from each continent and all said that staffing, budgets, economic evaluations, research, and training were far short of need in developing countries. In some areas, indiscriminate burning is a contributing factor to range deterioration.

Within the developed countries are numerous technicians with the skills required to bring immediate improvements in grazing land use. To do this, these experts would need facilities, staff, budget, legislation, and administrative support. The biggest deterrent to technical advancement of conservation use of grazing land is public inertia due to apathy and a misunderstanding of biologic laws for plant perpetuation. The specialist has not been able to inspire the public with the genius of his economics and technology. There needs to be a matching up of technologists with policy makers, financiers, planners, and legislators with the powers for mass education and motivation. The key men, the policy makers, do not know that such a serious problem exists and are not aware that they should take on the responsibility and provide the way for solving it. There is no satisfactory method for free communication between policy makers and technicians. College leaders, agency heads, and other prestige leaders need to inspire policy makers to action.

What Can Be Done to Shift from Destruction to Improvement

Properly distributed and implemented, there is a large foundation of skilled specialists in developed countries capable of heading up a rational program of world grazing land conservation. Additional budgets are needed to hire and train a supplemental staff. Also practical institutional and legislative requirements are known and could be adapted to local conditions wherever needed. Fortunately, immediate good can be achieved without great cost because much grazing land improvement comes from natural healing through correct use and management. Governments own most of these lands and their legislative bodies have the power to get action quickly by providing proper legislation and regulations, budgets, and staff.

How to Cultivate Interest and Action Among Researchers, Policy Makers, Programmers, and Budget Designers

1. Sponsor international range research through the International Biological Program.
2. Set up World Grazing Year (similar to Geophysical Year).
3. Put in motion a modern appealing educational and training program at all levels.
4. Make it a major plank in the Freedom from Hunger Campaign.
5. Set up an international grazing land improvement committee under FAO chairmanship.
6. Enlist interest and aid of both scientific and world betterment groups.
7. Develop targets and guides for action.

Range Research Needs of an International Nature

Several areas in the International Biological Program are closely relevant to the agricultural disciplines. As succinctly stated by Byerly (1967): "Inherent in IBP is the necessity for imaginative research designed to maintain a self-sustaining chain of food production. . . . An accurate count of animal and plant species and their distribution, an examination of the interaction of communities upon each other, what sustains them and whether they have protective or adaptation mechanisms—all these and more are relevant to the agricultural disciplines. The problems are global. It is therefore axiomatic to tackle them internationally." Byerly (1968) described the four sectional committees of IBP of particular interest to rangemen in the May issue of the Journal of Range Management.

The American Society of Range Management, in fostering advancement in the science and art of grazing land management, has encountered a need for expanded research knowledge to bring all North American grazing lands under proper management. Moreover, since its organization there has been increasing appreciation and involvement by the Society with foreign grazing lands having similar and perhaps even more pressing needs for concerted effort in range management research. There has developed a general awareness of major gaps and deficiencies in the scientific and technological foundations needed for maximum production of the range ecosystem. Recognition, encouragement, and support of research on the vast complex of the world's grazing resource are sought in the following areas:

1. Range plants including forage species, weeds, and poisonous plants—life history, habits, requirements, values, genetics, and ecology.
2. Range insects, diseases, rodents, game, and other animals—life history, habits, appraisal of values, or damage.
3. Habits, requirements, and nutrition of range livestock—grazing habits, forage preferences, rations for maintenance and weight gain on different types of range, effect of range fertilization.
4. Nature of the range communities and ecosystems—composition and characteristics in relation to grazing usage and forage values, including successional and regulatory processes, community interrelations, and population fluctuations.
5. Physical environment relations of range—topographic, soil, altitudinal, and climatic conditions.
6. Range management—inventory and classification of vegetation types; determination of grazing capacity, system of grazing, timing and rate of forage use; kind, class and breed of livestock to graze; interrelations of grazing, forest production, water supplies, wildlife and recreation.
7. Range improvement—evaluation of range condition and measurement of trend in vegetation and soil stability; control of runoff and erosion; conservation of water by spreading, contour furrows, loss reduction from transpiration and evaporation; control of undesirable plants, diseases, insects and rodent pests; role of prescribed burning; planting methodology and species selection.

In view of the world's expanding population and the probable increased demands for meat and animal fiber, expansion of present range and related research is urgent. Although rangelands are often characterized by low per-acre value which precludes use of many practices of established value on arable land, their aggregate contribution is significant from the standpoint of domestic livestock and related values associated with increasingly intensified use.

Considerable effort has been made to obtain recognition of world rangelands by the Pasture and Fodder Crops Branch of the Food and Agricultural Organization of the United Nations. Several effective rangeland programs have been initiated towards improvement of rangelands to better serve the people. These programs of FAO include range-trained people.

The United States Agency for International Development (AID) has made some progress in assisting in development and improvement of the world rangelands, but the total effort in this area is far below needs. Rangemen are included in assistance teams and missions far too seldom in relation to the scope of rangelands and the opportunities for making them more useful to man.

The International Grassland Congresses include rangeland or natural pastures in their programs only after determined and persistent efforts on the part of the American Society of Range Management, individual rangemen, and some agencies. Hopefully, groups concerned with organizing future Congresses will give more attention to rangelands.

Finally, the American Society of Range Management has an increasing and continuing role in focusing attention on the world's rangelands and in stimulating effective research, education, and action programs. Symposia such as that at the 19th ASRM Annual Meeting in New Orleans in 1966, "RANGE MANAGEMENT WORLDWIDE" (Chapline et al., 1966) should be included in every annual meeting. More range scientists from foreign countries need to be encouraged to write about

their rangelands and range work for the Journal of Range Management. The Society should also work more directly with universities and agencies to emphasize the importance of rangelands and to get more range-trained men in contract teams and missions.

Above all, positive, enthusiastic, and persistent effort is needed. The International Relations Committee of the American Society of Range Management can be the generating core within the Society to help it meet its responsibilities in relation to rangelands worldwide.

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