

Rangeland Management in Australia¹

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Highlight

The term "rangeland" in Australia is used to designate the arid and semi-arid areas unsuitable for crop production. The lands of this pastoral zone cover about 2,200,000 square miles. This vast area accounts for 74% of the continent, yet it is occupied by only 3% of its people. Of the total area, over 99% is unimproved native rangeland, less than one-half of one percent is improved pasture, and less than one-tenth of one percent is cropped. Almost a third of the land is unoccupied. The arid rangelands carry about a third of the country's sheep and beef cattle. These livestock produce about A\$400,000,000 in export income for the country. Ranges are managed on a low capital and labor input system. Many of the larger cattle properties are unfenced; livestock are controlled by water development. Areas around water and smaller properties in the arid zone may be severely deteriorated in range condition. Current research projects are designed to provide information to prevent further decline in productivity, aid development, and to improve management.

The term "rangeland" in Australia is used to designate the arid and semi-arid areas unsuitable for crop production. It encompasses all land in which rainfall on a given area is not adequate for crop production (Perry, 1966, following a definition similar to that of Meigs, 1953). This definition is clear and unequivocal in that land can be classified as arid or non-arid in accordance with a single land use characteristic, that is, whether or not the rain falling on it is adequate for economic crops or sown pasture production. The definition does not make for a static boundary between the arid and non-arid country. The economics of crop production change with changes in technology, development of new crops and varieties and with changes in cost of production or of the value of a product. In response to such changes, the boundary between arid and non-arid land fluctuates but only land marginal to the boundary is affected. Most of the areas remain definitely arid or non-arid.

In Australia, the south and south-east boundary of the arid rangelands is the low rainfall margin for

wheat production which has been determined by long agricultural experience. In the north and north-east, agricultural experience is lacking and the boundary used is a line where the duration of the agricultural growing season, determined from daily rainfall records and a water balance model (Slayter, 1960), is 12 weeks in four out of five years (Perry, 1966).

The Australian definition of rangeland differs markedly from that used by Americans. It separates out the arid and semi-arid regions as rangelands and leaves the unimproved grazing lands of the more humid regions as "native pastures." The accepted American definition, on the other hand, states that any land producing native forage for animal consumption is rangeland. American range managers are currently broadening their definition of rangelands to include recreational lands, watershed, waste disposal areas, etc. that are not traditionally grazing lands for livestock. The Australian definition of rangelands as only arid and semi-arid regions may appear unnecessarily limited in scope to Americans, but it serves a useful purpose in Australia by separating out those lands on which

pastures can be improved by agronomic means from those which must be managed strictly on an ecological basis. Using the American definition of range, the entire Australian continent, with only small portions removed for intensive agriculture and urban development, would be considered rangelands. For the purpose of this paper, we will discuss only the arid and semi-arid rangelands as outlined by Perry (1966), Heathcote (1968), and others.

Australian rangelands thus defined cover about 2,200,000 square miles. They are commonly referred to as the pastoral zone; however, much of the northern undeveloped areas suitable for potential cropping outside the arid zone may be also included in the pastoral zone in some publications.

The boundaries of the arid Australian rangeland are shown in Figure 1. These lands cover about 74% of Australia but are occupied by only about 3% of its people. The area includes a large part of all mainland states except Victoria. The rangeland portion of the various states are as follows: New South Wales 46%, Queensland 63%, South Australia 87%, Western Australia 86%, and the Northern Territory 86% (Perry, 1966).

Agricultural production from arid Australia is presently limited to products from animals grazing native plants. Of the total area, over 99% is unimproved native rangeland, less than one-half of one percent is improved pastures and less than one-tenth of one percent is cropped (Bureau of Agricultural Economics, 1965). About one-third of the land is unoccupied (Heathcote, 1968). Most of the unoccupied land is spinifex (*Triodia* sp.) sand plain or sand dune country which is considered unsuitable for grazing. The harsh, unpalatable spinifex plants will not support stock. When areas of similar country included within established leases are considered, the proportion of unused country in arid Australia is probably nearer one-half than the

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FIG. 1. Rangelands of Australia. The cross hatched area represents those lands defined as rangelands in Australia and covers about 74% of the continent.

one-third quoted by Heathcote (1968).

In 1962, the arid lands carried about one-third of the country's sheep and beef cattle. Since then the proportion has declined partly because of droughts and partly because of the demand for animals to stock the rapidly developing improved pastures of non-arid Australia. Annual export income from the livestock industries of the arid area exceeds \$400,000,000, Australian currency.

Sheep and cattle are not evenly distributed. Seven-eighths of the sheep are concentrated in the two eastern states of Queensland and New South Wales. The rangelands of these two states account for slightly over one quarter of the Australian sheep population. By contrast, rangelands in South Australia and Western Australia combined support less than 4% of Australia's sheep. Of the 47,700,000 sheep in arid Australia in 1962, 22,200,000 were in Queensland, 19,349,000 in New South Wales, 3,965,000 in Western Australia, 2,200,000 in South Australia, and only 9,000 in the Northern Territory.

The distribution of beef cattle is somewhat different. Over half of

the beef cattle in the rangelands occur in Queensland and one-fifth in the Northern Territory. The arid areas of these two states together support one-quarter of Australia's beef cattle population (Perry, 1966). Of the 4,491,000 cattle, 2,240,000 are in Queensland, 904,000 are in the Northern Territory, 601,000 in Western Australia, 466,000 in New South Wales, and only 100,000 in South Australia.

The Vegetation of Australian Rangelands

The vegetation of Australian rangelands has been described in various ways. Williams (1955) and Cochrane (1967) listed 17 structural sub-formations. Leigh and Noble (1969) and Moore and Perry (1970) have recognized 10 major sub-formations. Of these 10 sub-formations, 5 are woodlands mostly characterized by eucalypts occupying 16.9% of the total Australian arid land area. They are variable in form, ranging from midheight to low trees and dense to very open stands.

Shrublands occupy 43.8% of the Australian arid land area. Of these *Acacia* shrublands, characterized by

tall shrubs or low trees, are the most widespread and occupy 32.8% of the arid land. Shrub steppes dominated by low chenopodiaceous shrubs (mainly *Atriplex* and *Kochia*) account for most of the remainder of the shrubland area and are widespread, mainly south of the Tropic of Capricorn.

Grasslands occupy 39.3% of the arid rangelands. Of these, the arid hummock grasslands dominated by spinifex (*Triodia* and *Plectrachne*) account for 30.5% and are the second most widespread sub-formation in the arid areas. Although important from the viewpoint of area they are not used extensively and are mostly vacant land. Arid tussock grasslands characterized by Mitchell grass (*Astrebla* spp.) occupy 8.8% of the arid lands. They are extensive on cracking clay soils in the northern half of the zone and because of their high stock carrying capacity are very important to the grazing industries.

Status of Australian Rangelands

Extensive botanical changes have occurred on most of the rangelands following grazing and indiscriminate lopping for drought feed. These changes have resulted in the disappearance of some palatable shrub species and a marked increase in some of the less palatable or increaser species. In Australia some of the shrublands, such as the saltbush ranges in the winter-rainfall areas, degrade into grasslands with overgrazing. In most cases, American experience has been the other way around.

Although they are sparsely populated, it is apparent that the arid lands are far from in virgin condition. In just a little over a century much of Australia's interior has changed from the world's largest land mass untouched by the hand of modern man to the degraded pastureland of modern day graziers.

The original plant communities were unique, reflecting many thousands of years of evolution on an isolated, exposed land mass. The

endemic warm blooded animals were likewise unique, consisting mainly of marsupials and birds that had evolved in the absence of native predators. The coming of the aborigine, and apparently the dingo with him, represented the first alien influence to this isolated continent, and their introduction is recent in geologic time.

It is doubtful that either the dingo or man did much to alter plant evolutionary patterns in their brief residence of 30-40 thousand years. Populations of both men and dogs have always been low in Australia. The men were largely nomadic and possessed no grazing animals. They did not till the land or destroy the natural vegetation. With the exception of burning, they lacked tools necessary for major landscape modification; therefore, neither the plants or the animals evolved the protective features necessary to survive under the impact of European man's land use.

The desert shrubs of Australia do not have the protective spines that grow in the deserts of other continents and were soon grazed beyond their capacity to endure. Many native marsupials were defenseless against the onslaught of the fox, the feral cat, the domestic dog, and other predators that were introduced into the environment. The result is that in the last hundred years, many Australian rangelands have developed into vast degraded arid ecosystems. Some plant and animal species have been lost forever, others have been reduced to low populations and the environment altered to such a point that they may never be able to survive. Still others, although weakened, can be brought back with proper management. Some animals (e.g. kangaroos) increased with the development of stock watering points. The European rabbit which spread into the rangelands between 1880 and 1900 effectively occupied the ecological niches of many of the small to medium sized native herbivores.

The Australian environment today is not what it was a hundred years ago and the so-called natural balance can never be reclaimed.

Not all of Australia's rangelands are degraded. In general, those areas that have been settled the longest or the areas with smaller properties are the most heavily grazed. In addition, areas near water development on larger properties may be severely flogged. The conditions of Australia's arid rangelands are better than many arid regions of the world, such as the Middle East and North Africa. The major difference is that the Australian rangeland has been settled for a very short period of time and the human population pressures have not been great. In addition, many of the perennial plants of the arid regions are relatively unpalatable and water developments are still relatively sparsely distributed. For these reasons, Australia is fortunate in that many of its rangelands are still in relatively good condition; however, most of the ranges in the occupied area of Australia have shown a continuous downward trend since they were settled.

The rapidity with which Australian environment changed with European settlement has been well documented. Most of the area was not settled until the 1880's. Within a few years of settlement of each area, articles began to appear in the popular press taking note of the change due to overgrazing. By the 1890's, papers were being read in the Royal Societies on the effects of grazing intensity. Since that time, papers have appeared periodically describing disastrous effects of grazing on various local areas in Australia. More recently, the effects of grazing on vegetation throughout Australia has been summarized by Moore (1962), Perry (1966, 1969), and Heathcote (1968). In 1969 Perry wrote:

The rangeland pastoral industries are valuable but because of lack of knowledge, they are exploitative, i.e.; they are mining the land resources on which

they depend. Most rangelands show some deterioration, already some have deteriorated badly. Continued and accelerating deterioration can be expected unless scientifically based management practices designed to preserve the rangeland resources are adopted.

Management of Range Lands

Part of the problem of rangeland deterioration in Australia is associated with the type of management in the arid areas. Here livestock operations have developed on an extensive, low input structure. Large properties are operated with low labor forces and with a minimum amount of physical structures involving capital input. The extensive nature of these operations may vary from rather low input operations to stations where cattle and sheep are raised almost as feral animals and mustered once or twice a year for branding and shipping. Although this type of operation may seem wasteful to many range managers, the return to investment is usually good. In 1968 Heathcote wrote:

Relative to the other primary producing areas, the pastoral land use seems to provide a greater return on capital, if at the expense of extensive rather than intensive settlement, despite extremely low yields per acre. Efficiency of use has been achieved by minimizing the labor involved and the investment in improvements (often limited to fences for greater control of the use of the forage and water facilities to supply the scarcest commodity) and making sole use of the native self-regenerating forage.

As might be expected, the turn-off rates for such operations are extremely varied. For instance, throughout most of the arid zone the sheep operations produce no fat lambs. The increase from the greater portion of the flock normally goes into maintaining the breeding ewes and wether portions of the flock. Any take-off from these operations generally consists of aged wethers and ewes and breeders that have been culled for one reason or another.

Cattle production in most of the arid zone is likewise low when measured in turnoff rates. Figures of 13% to 19% annual turnoff from the herds of western Queensland, Northern Territory, and northern western Australia are common. In some cases as much as 60% of female stock produced on stations is needed for herd maintenance alone. Under those conditions any appreciable sale of female stock tends to lower the livestock turned off from a given station.

In the Kimberley's of Western Australia it is generally accepted that herds suffer a normal death loss of about 11%. Calving percentages and branding percentages are low. Under such conditions, a little over a fourth of the herd or about 28% are breeders. The rest are either replacement animals or bullocks to be held to an advanced age for sale.

Such low turnoff rates indicate that there is a great opportunity for increasing output from the livestock producing areas of arid Australia. Unfortunately, little information is available from the field. In fact, many figures quoted are broad estimates because most of the stations never have a complete muster of the cattle and do not know how many of the livestock are actually available for producing purposes. In most cases, the only measure of production is the number of animals sold when mustering takes place.

Most of the large cattle properties are unfenced. There is little opportunity to practice scientific range management. One of the most pressing needs for increasing livestock production in arid Australia is to bring the livestock under control. The principles of animal husbandry and range management cannot be applied to animals which are essentially in a feral condition. Such simple and proven management practices as controlled breeding programs, supplemental feeding, improved grazing systems, and safe stocking rates can do much to

improve the productivity of Australian rangelands and improve the condition of the vegetation on which the animals graze.

Australians are just now beginning to realize the value of their vast arid interior. Most of the human population is concentrated in the humid fringe around the outside of the continent. The entire political and economic structure of the country has revolved around the outer fringe. The recent drought and the activity of Australian professional biologists concerned about the arid interior have resulted in the establishment of a rangelands research unit in the Commonwealth Scientific and Industrial Research Organization (CSIRO) to study the maintenance and use of the rangelands resources. The leader of this unit, Ray Perry, has said:

Because of our short history of settlement, Australia is still in the fortunate position of having large areas of rangeland in relatively good condition. The alternatives are clear: that we either learn to maintain its condition or watch it deteriorate to unproductive wasteland from which it cannot be restored (Perry, 1969).

Traditionally, Australian rangelands have been used primarily for livestock production. Little attention has been given to the multiple use management of rangelands as we know them in America. The timber resources of the arid interior are not great. Most of the watersheds drain internally and do not contribute to the water supply of large metropolitan or agricultural areas. Therefore, little emphasis has been given to forestry or watershed management.

The present value of arid rangelands for recreational purposes is far overshadowed by its potential. Australians, for the most part, look to the sea and the beach for outdoor recreation. Foreign tourism has largely been attracted to the population centers, the beaches, and other coastal areas. As the human population grows and

beaches become more crowded, the need for solitude and wide open spaces will cause more people to turn to the arid zone for recreation. The wide open spaces of the outback will be at a premium.

In fact, the increase in tourist visits to the center of Australia has already begun. In 1967, 40,000 tourists visited the Northern Territory. Almost 20,000 found their way in 1968 to Ayers Rock, an isolated monolith 350 miles from the nearest town in the center of a hostile desert. Alice Springs has already established itself as a major attraction for world travelers. The natural beauty of arid landscapes is beginning to attract visitors from near and far. Lower transcontinental air fares are predicted with the coming of jumbo jets and supersonic aircraft. Domestic travel facilities are constantly improving. Arid Australia can look forward to an ever increasing tourist industry.

Australia quite logically has concentrated most of her research efforts and her development dollars in the humid zone where most of the people live and where political pressures are greatest. Like most countries, she has put first emphasis on the immediate and most urgent needs of the majority of her people; however, the potential of Australia's arid lands far outweighs actual contribution to the present day economy. In the future, it is likely to remain largely pastoral, but its contributions in minerals, irrigated agriculture, and outdoor recreation are bound to increase.

Australia is in a fortunate position of being able to profit by the mistakes made in other countries. It is an advanced country with scientific and technical expertise on a par with any country in the world. There is no reason why the Australian rangelands cannot be maintained in their present rate of production—and perhaps increase in productivity—if the Australians themselves decide that their rangelands are important.

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