

Production Systems on Australian Sheep Ranches

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There are few sheep in the north of Australia where monsoons occur with regularity, in the arid interior where rainfall is low (less than 4 inches annually) and pastures consist of unpalatable spinifex (*Triodia* spp.), or along the narrow coastal fringe where conditions are too wet or terrain too rugged for sheep husbandry. In the vast area that is suitable for sheep production, the industry is classified into three broad zones: The Pastoral zone, the Wheat-Sheep zone, and the High Rainfall zone.

In each zone there is considerable variation in the type of product, methods of production, stocking intensities, land ownership, and the combination of sheep production with other forms of agricultural production. It is the object of this article to describe these different sheep production zones of the Australian industry.

The Pastoral Zone

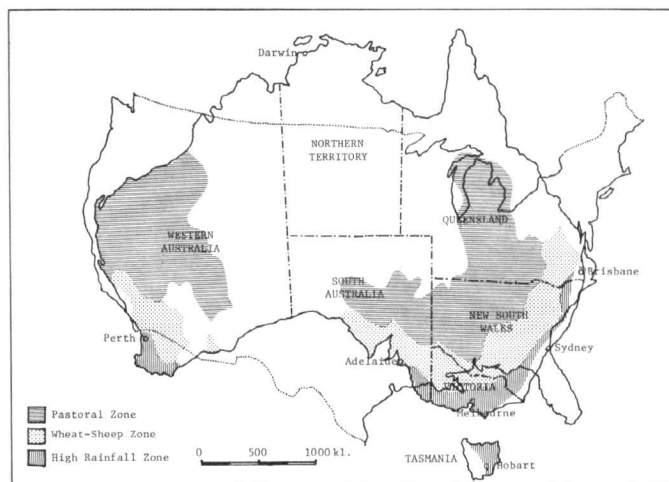
The Pastoral zone is true rangeland, which is characterised by low rainfall (less than 16 inches per year) and open expanses of low carrying capacity grass and shrubland. Although it is the largest of the sheep producing areas, the Pastoral zone carries only 20% (or 45 million) of Australia's sheep. Also, because the pastures are unsuitable for fattening livestock, sheep are raised almost exclusively for wool production, with the Australian Merino the most prominent breed.

Another unique feature of the Pastoral zone is land tenure arrangements. Apart from a very small proportion of freehold (about 1%), land is held under long-term leases (usually 30 to 50 years) by individuals, partnerships, and companies. Property size varies with the type of lease and government policy, although they generally range from 500 square miles in the driest areas of Western Australia to 20,000 acres in the better rangeland areas of western New South Wales.

Compared with America's range sheep industry, Australian government regulations directing the use of pastoral leases are minimal. Stocking intensities are not specified, although broad guide-lines are provided as to the potential productivity at different locations. However, the long-term nature of leases and the legal right to transfer them to beneficiaries evoke a "land ethic" in pastoralists to use the resource conservatively. Although stocking intensity is left to the pastoralists' discretion, laws prohibit the removal of timber and restrict agricultural activities.

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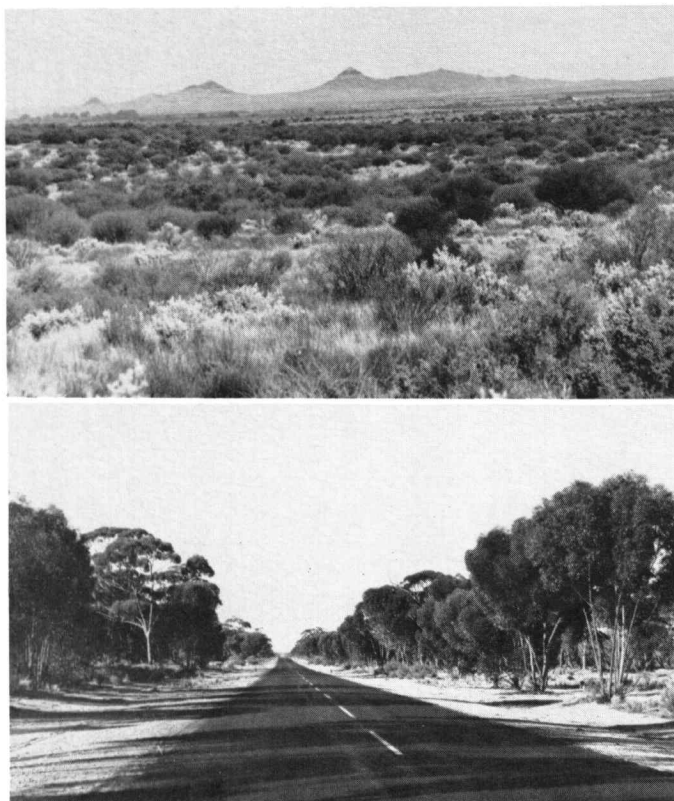


A map of Australia showing the three sheep producing zone. The map overlays a map of the United States to give an indication of the relative size of the two countries.

The average flock size of 6,000 is about four times larger than those found in the other sheep production zones, although very large stations (or ranches) may have more than 50,000 sheep. While the average carrying capacity is one sheep to 10 acres, stocking rates range from one sheep to four acres in the climatically favorable parts of the zone to one sheep per 100 acres in areas that border unused deserts.

Grazing management is simple, year-long grazing, since the lack of topographic variation and mild winters precludes the need for seasonal migration. In contrast to the United States, most properties are fenced with sub divisions, a factor which reduces labor inputs since herdsman to shepherd sheep are not required on Australian rangelands. However, in large paddocks (5,000 acres or larger) the strategic placement of water facilities, many of which are artesian in origin, is used to obtain uniform grazing.

Some parts of the Pastoral zone are so arid that sheep fail to reproduce satisfactorily. In these areas, properties graze wethers or dry ewes for wool production with replacements being purchased from better rangeland areas. Where sheep are mated, the reproductive performance is low (about 60%) and post-natal mortality to weaning is high. As in southern United States, paddock lambing is practised, although special lambing paddocks are located close to the homestead to facilitate assistance of difficult births and control predation. Crows and foxes are the most important predators, although more recently feral pigs have wrought havoc amongst flocks, particularly in



The vegetation of the Pastoral zone varies from open salt bush (Atriplex)-grass areas to ranges fairly densely wooded with Eucalypts.

western New South Wales. Traditionally, predators have been controlled by trapping and shooting, but the use of poisons is now a feasible option. With the exception of pigs, losses are low compared with those experienced through coyote predation in the United States.

In addition to losses incurred through predation, kangaroos and rabbits compete with sheep for forage, a problem which intensifies during droughts when the dietary overlap between domestic and endemic animals is greatest. Although emus (ostrich-like birds) are not significant competitors with sheep in most locations, they do cause extensive damage to fences by crashing through them and pushing them to the ground. On a large station with hundreds of miles of fence, this causes problems in maintaining fences in a stock-proof condition.

Blow-fly strike is a perennial problem that can lead to substantial losses because thorough surveillance is not possible in large paddocks and complete mustering of sheep is infrequent. Losses are particularly acute in wet years with flies striking both the breech and moist wool across the sheep's back. Since control methods such as jetting have proven impractical on large properties, most graziers resort to the mulse operation. The operation involves the removal of the wool-producing skin from around and across the top of the tail with a sharp set of shears. The scar tissue that grows back is wool-free, which aids in keeping the breech area clean. While this does not completely eliminate fly-strike, it does significantly reduce mortality under range conditions.

Because wool is the only source of income, shearing is the most important activity on the grazier's calendar, and it also requires the most organization and labor inputs. First the sheep must be mustered from paddocks and herded to shearing facilities. On most stations the shearing shed is located in a central position to minimize the distance that sheep have to be

driven. Mustering in large paddocks usually involves "trapping" sheep as they come to water. In wet seasons, however, it may take several weeks to assemble the flock because sheep water less frequently. Inevitably some sheep are missed and it is common to have sheep in the flock with 24 months' growth of wool.

Shearing is contracted to a team consisting of shearers, wool classers, wool pressers, general hands and a cook. In large sheds, 15 or more shearers may be hired so that shearing can be completed quickly. Shearers are true professionals, who can consistently shear 150 to 200 sheep each day, although to watch them they do not appear to rush, but rather look relaxed. The "Tally-Hi" method which maximizes the number of "long body blows" is the generally adopted shearing style, although each shearer has a degree of individuality in performing his craft.

In contrast to America, harvested wool in Australia undergoes most of its preparation for market in the shearing shed. Each fleece (minus the belly wool) is thrown onto a table where it is skirted, a process which removes soiled and short wool from the perimeter of the fleece. The wool-classer grades fleeces into several categories on the basis of fineness, tenderness, color and the amount of foreign material, such as plant seedheads or dust. Fleeces are rolled without the use of twine or paper and packed into "bales" rather than the American-type sack. Usually bales weigh about 350 lb for fleece wool and 450 lb for skirtings, bellies, and pieces, the weight being controlled by union workers at the large stores where wool is stored, sold, repacked and exported.

While returns per unit area are very low, the large size of holdings, the minimal degree of husbandry, the high efficiency per unit of labor (one unit of labor is required for 2,000 sheep) and the low level of capitalization result in high returns to capital. Based on this parameter, the livestock industry of the Pastoral zone ranks amongst the most efficient agricultural activities in the world. However, because of production instability caused through climatic fluctuations, the Pastoral zone has experienced the greatest impact of declining sheep number, as is also the case in the range sheep industry in the United States. Nevertheless, in spite of the arid conditions and economic adversity, the Pastoral zone is the home of many of Australia's best Merino Studs, and the production of stud and flock rams is still a valuable activity for the stud masters.

The Wheat-Sheep Zone

While the Pastoral zone covers the largest area, the Wheat-Sheep zone has traditionally carried the most livestock, although in recent years it has been challenged for the honor by the High Rainfall zone. Today, about 40% of the nation's flock are found in the Wheat-Sheep zone. Like "farm sheep production" in midwest United States, production in the Wheat-Sheep zone is remarkably stable, with the production of wool, first-cross replacement ewes, and lambs for slaughter being conducted concurrently with cereal cropping. However, in contrast to the midwest, where sheep are always a secondary enterprise to farming operations even though income from sheep is both significant and reliable, livestock grazing is often the primary activity in Australia, particularly where rainfall is less than 18 inches per year.

The Wheat-Sheep zone is wedged between the Pastoral zone on the drier boundary and the High Rainfall zone toward the coast. However, while the boundary with the High Rainfall zone is clearly defined by topography and length of growing season, the inland boundary is not static, but is continually

encroaching on the Pastoral zone as the economics of crop production change. Changes in technology, cultivars, costs of production, and the price of wheat, all contribute to the shift in boundary.

More than half of Australia's 76,000 sheep properties are located in the Wheat-Sheep zone. Unlike the Pastoral zone, land is exclusively privately owned, a characteristic which developed from early legislation similar to the Homestead Acts of America. Property size varies from 20,000 acres on the drier margin to 500 acres adjacent to the High Rainfall zone, although the average is about 2,000 acres. Most holdings are still operated on a family basis and few cooperatives operate successfully in this zone, due in part to the independent nature of the Australian farmer. Further, since the price of both wheat and wool are controlled by government policy, competition between farmers at markets is minimized.

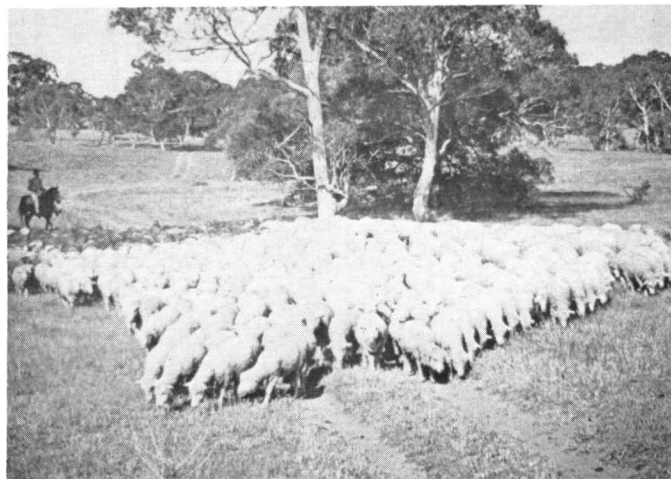
Where meat production is the main objective of the livestock enterprise, lambs may be produced from a wide variety of breed combinations. The most popular combination is Merino ewes joined to either Border Leicester or Dorest Horn rams to produce first-cross lambs. The wether portion is sold as prime lamb, while ewe lambs are often purchased by producers for second-cross lamb production in the High Rainfall zone or irrigation areas. Although some dual-purpose breeds (Corriedale and Polwarth) are grazed in the Wheat-Sheep zone, the Merino combination is favored because of the price advantage gained with the higher wool quality of the breeding ewe flock.

Most lambs go straight to slaughter after being pasture fattened. In contrast to the American situation where farm produced grain is used to fatten animals in feedlots, Australian lamb is almost universally finished on legume-based pastures. These pastures not only provide high quality forage, but they significantly increase the status of the nitrogen deficient Australian soils. Supplementary feeding is only implemented on an "opportunistic" basis during periods of drought.

On sown pastures in the Wheat-Sheep zone, stocking rates of 4 sheep per acre are common, particularly on alfalfa pastures, but volunteer pastures can only sustain levels of 1 to 2 sheep per acre. However, while grazing management similar to that used in the Pastoral zone is adequate for volunteer pastures, the longevity and productivity of alfalfa and subterranean clover pastures are increased by implementing intensive management procedures such as rotational grazing. In addition to improved animal nutrition, the regular movement of livestock minimizes the impacts of endoparasites and enables adequate surveillance to be made for blow-fly strike.

The percentage yield of lamb is critical to the success of lamb production operations. While the lamb crop may vary with the skill of the manager, over 100+% is desired. This percentage, however, is much lower than the 150+% reported for the midwest sheep farms, although the larger size of the Australian flocks possibly accounts for the difference. In both countries high lambing percentages can only be obtained by purchasing good sires with known performance. Another factor that may explain the difference in lambing percentage is that Australian graziers do not keep strict records on reproductive performance as is the case with their counterparts in the midwest.

In contrast to sheep ranches in the Pastoral zone, Wheat-Sheep holdings have a large capital investment in land and machinery which results in a poor return to capital in economic analyses. However, this is compensated for by the versatility in output which increases adaptability to market conditions and enables more economical use of labor and machinery. Furthermore, the rotation of crops with pasture improves soil



The Wheat-Sheep zone in its pristine condition before the Eucalypts are removed to facilitate cropping.

fertility, a factor which ensures a productive future for this zone.

The High Rainfall Zone

The High Rainfall zone encompasses a narrow semicircle of the southern part of the continent between the 25 and 35 inch isohyet. Since the terrain and length of growing season preclude most cereal cropping, the High Rainfall zone, like the Pastoral zone, has traditionally raised sheep for wool. However, in contrast to the other two zones, there has been a significant growth in the number of non-Merino sheep for wool production and lamb enterprises using first-cross ewes and various Down-type rams in the High Rainfall zone. These activities are now as important as Merino woolgrowing.

In the pristine state, the sclerophyll forests and woodlands contain a high proportion of palatable perennial grasses (*Poa*



The High Rainfall zone is characterised by topography that is unsuited to large scale cropping.

spp. and *Danthonia* spp.) in the understory. While much of the vegetation could be classified as rangeland, the successfulness of pasture improvement programs means that pastures are managed on an agronomic, rather than an ecological basis. Although highly productive in the climax state (2 sheep per acre), the sowing of perennial ryegrass, cocksfoot and white clover coupled with phosphatic fertilization has doubled the potential carrying capacity.

Since aerial sowing on lands too steep to cultivate has proven as successful as conventional methods, the High Rainfall zone has increased in importance as a sheep-producing zone. While wool production has remained relatively constant, the increase

from 49 million sheep in 1959 to over 65 million in 1970 (40% of Australia's flock) reflects the increase in lamb production, particularly in New South Wales and Victoria.

As in the Wheat-Sheep, land ownership is mainly private although property size is smaller than the cropping areas, averaging about 1,500 acres. However, with pasture improvement and sophisticated management, reproductive performance liveweight gains and wool growth exceed those of the Wheat-Sheep zone. In addition, since sheep production generates the entire ranch income, the average flock size of 2,000 ewes is greater than that of the Wheat-Sheep zone with their dual income. ●

From Sagebrush to Alfalfa

Gene Handl and Dave Heilig

Two tough winters in a row proved the soundness of the decision by Freddie Berzel to convert sagebrush flats to productive alfalfa hayland. "The last couple of winters a person just about had to have his own hay," said Berzel, who ranches ten miles south of Ismay in Fallon County in southeastern Montana. "If I hadn't had the new hay meadows, I would have had to reduce my herd."

The story begins back in 1967 when Freddie and wife, Dixie, purchased a 12,000-acre ranch on O'Fallon Creek. "We had two major problems", Berzel said. "We lacked a hay base and cross fences." Previously, the ranch had been used as a range sheep operation. "We saw the need to control our grazing because cattle naturally like to hang along the creek. The bottoms were badly abused and the outlying areas unused."

Because they were starting from scratch, Freddie and Dixie sought assistance to improve their operation. They joined the Little Beaver Conservation District and applied for technical and financial assistance. The Soil Conservation Service furnished technical help while financial assistance came from the Great Plains Conservation Program and the Agricultural Conservation Program.

First, the Berzels built 8 miles of cross-fence and five artesian wells; then, they started planning for more hay production. A 1973 ranch resources inventory showed 60 acres of hayland producing less than 2 tons per acre. The straw from 400 acres of cropland was used to supplement this meager hay supply.

It was decided that 150 acres of sagebrush flats along O'Fallon Creek could be developed for hay using a modified water-spreading irrigation system. The system, developed in 1974, is made up of a series of 2- to 3-foot dikes placed on contour with weir boxes for water control.

To continue with the project Berzel worked out an agreement with his neighbor to build a control structure on an existing dam on Spring Creek to divert excess spring run-off into his dike system. This resulted in the development of 125 acres of water-spreading, which included two elevated ditches, a pump site in O'Fallon Creek, and a control structure on the diversion dam.

This is a unique system in that it offers two options for flooding most of the fields. The first option is to flood the whole system by diverting the water from Spring Creek into a level elevated ditch and a normal grade canal in combination.

The other option is to reverse the flow by pumping from O'Fallon Creek into the level ditch. This option floods the lower fields in the system. The system works automatically by allowing water to flow from one dike to another as each fills to the level of the weir boxes. The major share of the water flows through the weir boxes.

The flooded area behind each dike is designed to have an average water depth of 1 foot. At times of peak flow, emergency spillways at the end of each dike handle the excess water. These spillways provide protection to the system from excessively large amounts of water.

The diked area was seeded to a mixture of 5 pounds per acre Vernal alfalfa and 2 pounds per acre pubescent wheatgrass. "Production was over 3 tons hay per acre in one cutting last year", Berzel said. He had planned to get two cuttings, but the latter part of the season was dry so he decided to try for a seed crop instead. The result was about 60 pounds bulk alfalfa seed per acre. "Something I hadn't planned on," he said. "Nice to get an added check in the fall." Normally he takes two cuttings of hay.

"The water-spreading system played a critical role in the development of this unit," said Berzel. "It decreased my

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