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GRAZING IN THE VICTORIAN ENVIRONMENT*

INTRODUCTION

The part played by the animals which accompanied the men who first settled the District of Port Phillip is of critical importance to the theme of Victoria's environment and man. The resource which attracted the early settlers was the thinly wooded land with the rich pastures described by Major Mitchell and Hume and Hovell. The incentive was to graze sheep, as at the time of settlement wool was a highly valued commodity in strong demand in Europe and capable of being shipped economically to overseas markets.

Animals also provided the means by which it was possible to explore, to travel, and to transport men and goods as well as the products for sale. Of all man's activities it was his use of animals that had the greatest effect on the original plant communities, and through these on soils and the native animals which had originally grazed in the primitive environment. The grazing animal was also the prime cause of misunderstanding leading to many clashes between Aboriginals and settlers.

In the longer term the commitment of men to animal husbandry led to the clearing of forests in many areas. However, in others, the treeless plains were planted with shelterbelts and plantations of sugar gums and other eucalypts, pines, and cyprus. Permanent water was provided where previously only isolated waterholes in streams persisted throughout the summer. New pasture species and the use of fertilizer transformed the capacity of pastures to respond to rainfall and sunlight in the life giving process of photosynthesis, the basis of survival and production for both plant and animal communities.

These developments have had a marked effect on the appearance of the landscape, the ecology of plants, and both native and introduced animals which now live in association with man. While some effects can now be deplored, and others applauded, animals comprised an important component of the European agriculture and domestic economy which at the time were undergoing dramatic changes in response to technological advances and in industrial organisation. In the occupation of south-eastern Australia, the emerging European culture replaced the Stone Age culture of the Aboriginals which had had a significant impact on the environment through their use of fire.

ESTABLISHMENT OF THE GRAZING INDUSTRY

Historical background

Although the inventions which initiated the Industrial Revolution date back to the 1770s — spinning and weaving machines for cotton and wool, as well as the steam engine as a source of power — it was not until the early nineteenth century that the application of these concepts began to have wide ranging effects on the population of Britain. The new technology was first applied in the textile industry and made possible the supply of cheap clothing to new mass markets of consumers. However, to survive as a commodity supporting the textile industry, wool had to be modified in fineness and length, and its supply had to be capable of a continuing increase in order to meet expanding demand.

The demand included a wide range of wool types used in woollen manufacture for blankets, worsted for clothing, and carding for short wools of low value used for socks.

*This is the sixth in a series of special articles on Victoria's environment and man. Previous articles have appeared in Chapter 1 of the *Victorian Year Book* since 1976.

The wool produced on British farms included strong long wools and down-type carding wool. There was very little of the fine wool of length suitable for combing. The wool from Saxony, derived by upgrading the original sheep by use of the Spanish Merinos given by the King of Spain to the Elector of Hanover in 1770, was prime quality combing wool. It was better than most other available wool derived from remnants of the flocks of Spain which were dispersed during the Peninsular Wars. Germany had become a large exporter of combing wool and received the highest prices.

The wool production from Australia came to compete with the German trade and, while it lacked the same quality, its production was increasing at a rapid rate. The following table indicates the rate of increase in wool exports:

AUSTRALIA — WOOL EXPORTS, 1821-35
(kilograms)

Year	Wool exports
1821	80,000
1826	530,000
1830	910,000
1835	1,930,000

Source: Roberts, S.H. *Proceedings of Royal Australian Historical Society*, vol. 17 (1931) p. 347.

The sheep which occupied the Port Phillip District came from Van Diemen's Land and the fifteen counties between the Blue Mountains and the sea in New South Wales. These flocks had been built up between 1800 and 1825 to provide meat. The major demand was from the commissariat supplying the Army and the penal settlements and, in course of time, from the free settlers who were increasing as a proportion of total population. The wool was used mainly to provide clothing by hand spinning and weaving.

It was not until 1825 that a significant quantity of Australian wool began to appear each year on the British market but the quality was generally poor. Although some Merino sheep had been introduced from South Africa, the basic flock had been imported from Bengal and produced very little coarse hair and wool.

Captain MacArthur was the first to try to improve the wool. Starting with a small flock of Indian sheep and an Irish ram, he obtained five Merinos that had been imported from South Africa in 1797. In 1804, he obtained eight Merinos from the stud of George III. While grading up from his Indian sheep, he rapidly achieved improved fleeces and he placed great emphasis on fineness and on breeding the pure Merino type. By 1820, the MacArthur flock reached 2,000 sheep but it was not having the impact he expected on the sheep of the Colony. In 1820, he wrote: "At present there are not 10 sheep breeders pursuing any measure for the improvement of wool. I wish to God the Government could be induced to adopt some plan of supplying settlers with Merino rams of undoubted purity of blood at a moderate price".*

Meanwhile the Reverend Samuel Marsden, a rival of MacArthur, had adopted a different approach to breeding. He also obtained some of the Merinos from South Africa in 1797 and crossed them with the Southdown breed with the aim "to unite as much as possible beauty of make, strength of constitution, weight of carcase, and goodness of fleece".

In Tasmania the original sheep came from India and there were some British breeds, but it was not until 1820 that Merinos were introduced. In that year, Governor Sorell arranged with MacArthur to obtain 300 Merino lambs but only 181 survived the voyage to Tasmania. These were distributed to several free settlers who crossed them with Saxon rams. The Van Diemen's Land Company, formed in 1825, imported several hundred Saxon Merinos from Germany and from George III's Spanish flock; up to 1830 it spent $60,000 in buying sheep. Saxon sheep continued to play a significant role in the development of Tasmanian flocks and the midlands of Tasmania developed as a fine wool producing area from the 1830s.

By 1830, most of the land in Tasmania and in the fifteen coastal counties of New South Wales which was suitable for grazing, had been occupied and the available sheep were

* As quoted by Ronald Anderson in *On the Sheep's Back*, Melbourne, Sun Books, 1966, p.12.

grazing it effectively. In the established parts of the Colonies, many young men were looking forward to the time when they could move out to the Australian hinterland, and thus all reports of exploration were studied with interest. Whalers operating in Tasmania were questioned about the land near Portland where whaling had proceeded for many years. The report of Major Mitchell's exploration was awaited with interest and excitement.

Occupation

The Hentys were the first farmers to settle on the north coast of Bass Strait. After abandoning their initial plan to settle on the coastal plain of Western Australia, they had moved with all their livestock and farming tools to Tasmania, but they arrived just after free grants of land ceased in 1831. They petitioned for a special grant in view of the unsuitability of the land they had selected in Western Australia, but their petition was not successful.

Thus they began to investigate the potential of the coast on the other side of Bass Strait, and, after three separate visits, narrowed their choice to Portland Bay. Finally, in November 1834, they landed with their animals and farming equipment and established the first permanent settlement in what was to be Victoria. The settlement, however, was unauthorised.

Major Mitchell's report on his expedition to Portland Bay, was widely publicised and caused great interest in Tasmania. In particular, his reference to the hinterland along the Wannon River attracted a group of settlers to that area. However, most settlers transported their stock to Geelong or Melbourne, as the passage was much quicker and there was a better anchorage for small boats. By 1837, a small fleet of 15 to 20 ships was engaged in conveying stock from Launceston to Geelong. They carried from 300 to 1,000 sheep and operated from January to the middle of May when easterly winds were prevalent in Bass Strait. The passage took 7 or 8 days and sometimes there were heavy losses.

In the early stages the new settlement was heavily dependent on Tasmania. Launceston provided the basic industries of the day — wheelwrights, vehicle makers, and foundries — and in 1840 the value of Tasmanian exports to the Port Phillip District was $1,062,000. Launceston bankers also provided the finance for many settlers until their wool was received.

In May 1836, at the first counting, there were 177 persons in the Port Phillip District, not including Aboriginals. The number of livestock for that year was 41,332 sheep, 155 cattle, and 75 horses. By 1837, 300,000 sheep were grazing in Port Phillip and most of them came from Tasmania. Until 1839, settlers from Tasmania comprised more than 50 per cent of the arrivals. However, subsequently new arrivals direct from Britain reduced the dominance of those from Van Diemen's Land.

The first overlanders from beyond the Murray River were Joseph Hawdon, John Gardiner, and John Hepburn who brought cattle from the Murrumbidgee district to Melbourne in December 1836. The cattle were sold for $20 per head. By June and July 1837, there were numerous overlanders following the same route which became known as Major Mitchell's Line because it followed his wagon tracks. One typical overlanding party comprised 30 men, 5,000 sheep, 600 cattle, 20 horses, and 40 working bullocks. There were four bullock drays and two horse carts. The sheep were watched and folded at night, and the cattle were watched all night by two men. A few of the overlanders followed a trail over the mountains to East Gippsland.

By this time emigration had become an option for many young men in Britain who sought to escape from adverse conditions on farms and in the emerging industrial cities. Most chose the cheaper passages across the Atlantic, but fares for a single man to Australia had then been reduced — from Liverpool a passage cost $100 for a cabin and $40 for steerage. Thus the population of Port Phillip increased from 5,822 in 1839 to 10,291 in 1840. By 1840, most of the Western District had been occupied and by the mid-1840s, when the Port Phillip District had been divided into four regions, there were scattered settlements in each of them. However, there were only 44 runs in Gippsland compared with 282 in the Western District.

Settlement

The newly arrived intending settlers adopted a well recognised procedure in acquiring a run. After presenting whatever introductions they might have brought, they would journey inland to select a site. In general they would have to travel a little further than their predecessors but, in many cases, areas which had been passed over by first settlers made excellent squatting runs for others. The newcomers could expect little help from those already established, and were more likely to receive misleading advice to encourage them to move on.

George Russell, manager for the Clyde Company of Glasgow, travelled on foot with a pack-horse to find his run on the Moorabool and Leigh Rivers. James Ritchie, while employed as an overseer, travelled on foot from Port Fairy to Portland and then inland to the present site of Penshurst where he found his future Blackwood run. While searching he had been told that this area was a dense scrub unfit for anything.

Later comers with capital found no difficulty in purchasing the licence to a run. Many runs changed hands when squatters would find a run further inland which seemed better and thus move on. Niel Black was in this category and was hospitably welcomed at wayside stations. Before he found the site of his future Glenormiston, he had seen much fine land that was useless for want of water. There was much jostling for positions around springs or fresh water lakes or waterholes along streams which survived the summer drought. Having chosen a run and a camp site with permanent water, it was necessary to occupy it to forestall other squatters.

The purchase of stock was the major cash outlay in the venture and was fraught with risks for the inexperienced. There were no regular markets to provide a standard and determine prices, and great distances of difficult travel were involved in inspecting stock on offer. For many this meant returning to Tasmania to buy sheep.

The squatter who had chosen a run and purchased sheep had to seek permission from the Crown Land Commissioner to settle on it and pay $20 for his annual licence. The Commissioner had to be satisfied that the squatter had sufficient stock to hold the land he claimed. It was usual to purchase sufficient stores, tools, and equipment for a year. The provisions would include flour, pork, sugar, tarpaulins, iron pots, pannikins, tin plates, knives and forks, frying pans, tobacco, saddlery, tools, and clothing.

Having purchased his stock, shepherds had to be hired to tend them. The required number of station hands and servants would depend upon the size of the station but three would be a common number. A bullock driver was an important man as he was responsible for the heavy drays and station supplies and for negotiating the difficult tracks. Both 2-wheeled and 4-wheeled vehicles were used — the latter requiring eight bullocks yoked in pairs. The squatter also required a horse and this was an expensive item at $80 to $120. Good quality was important in a horse as it greatly affected the mobility and competence of the owner. There were some horse carts but, in the early stages of settlement, the heavy haulage was done by bullocks.

The organisation and conduct of the move to the run involving sheep, cattle, and wagons with station hands and stores for a year was a critical test for the prospective squatter. The venture involved a major capital investment and risks were high. In most cases several weeks would be spent on the track and if much rain fell this could be extended to months.

Arriving at the run, a camp would be established which would gradually be improved into a more permanent establishment. However, as land tenure was not secure, and there were often possibilities of moving on to a better site or a new run, most squatters settled for huts that could be built quickly with materials at hand. Bark huts were used if suitable trees were handy. Other alternatives included wattle and daub and thatched roofs using long grass. Where heavy clay soils could be found, sod huts were used for buildings and sod fences for sheep yards. More permanent houses were made after a time, often several years, and timber slabs, stones and *pisé* were included in materials chosen. As well as the station homestead, other huts would be required for a kitchen, store, men's huts, and yards for sheep and cattle. In time, stables, the blacksmith's shop, shearing shed, barn, and dairy might be added.

Early pastoral management

Shepherding

Shepherding was the accepted method of sheep husbandry. The shepherd was responsible for taking the sheep to suitable grazing and allowing them time and space to graze until their appetites were satisfied, while keeping them under control and protecting them from dawn to dusk against dingoes, Aboriginals, or unscrupulous Europeans. They would be taken to water at least once a day, and at night were yarded in a small enclosure made of brush or rough hurdles. A shepherd would be responsible for 500 to 1,000 sheep and was assisted by a hut keeper who prepared meals during the day and slept in a watch box near the sheep yard at night, with a dog nearby to give the alarm in case of trouble. The shepherd would receive about $60 per annum and the hut keeper a little less. The hut keeper was responsible for preparing the fold, and when it became fouled, he would move the hurdles on to a clean area. The watch box was equipped with handles so that it could be moved with the fold.

There were many accounts of attacks on flocks by Aboriginals, both by night and day. Hut keepers were given a carbine to protect themselves and the sheep, but they were at risk in a concerted attack. However, the Aboriginals often stole a few sheep by stealth without disturbing the dogs and watchman. While they took sheep because they were hungry, they did not confine themselves to their immediate needs. They would often take large numbers and keep them for future use by breaking their legs. Such acts infuriated the squatters as the flocks represented their fortunes and hopes for the future.

Attacks by dingoes in packs were a more common disaster, particularly in the early years of settlement. The sheep would rush in panic and bleat while the dogs barked furiously. George Russell's diary records a ewe taken from a flock at midday, another killed at night, four others killed at night, sixteen killed when dogs got into the yard, and six missing, believed driven away, at night. Dingo hunts using dogs were organised and meat baited with arsenic was hung from trees. The first general meeting of the settlers of Port Phillip agreed to give a bounty of 50 cents a head for every dingo killed. These efforts had their effect and gradually their numbers decreased. Some reports suggest that distemper of domestic dogs spread among the dingo population and helped to exterminate them.

Lambing

In the early years of squatting in the Port Phillip District it was not possible to separate ewes and rams and all grazed in one flock. Under these conditions lambing tended to concentrate in autumn and spring. Most ewes would lamb only once in a year but some would produce three lambs in two years, particularly on the better pastures and when seasonal conditions were good. The rate of increase in flock numbers in the whole district suggests more frequent lambing or more multiple births than the rates which subsequently became the norm. After a few years, conditions permitted some management of the breeding flocks and some squatters tried to have three lambings in two years. However, the effects of climate on pasture growth meant that annual lambing was more successful. In 1841, George Russell expected a lambing percentage of 87 from his older ewes and by January of the following year, surviving lambs represented 74 per cent of all ewes mated. One ram was considered sufficient for about 70 ewes.

Washing and shearing

Shearing continued from October to about mid-February. Lamb shearing was often held over until February or March. In response to requests from London firms, it was the practice at the time to wash the wool on the animal's back before it was shorn. Many Western District squatters attempted to do this by driving sheep through running water. Effective treatment required a period of wetting and there were many variations in the procedures. Pens were made in the water and sheep were dropped in from a jetty. They were kept swimming in this soaking pen for some time and then passed to a pen where five or six shearers would rub off the dirt with flat sticks. When clean they swam through a long race to a landing where they could scramble out dripping and exhausted.

Miss Ann Drysdale of Boronggoop, near Geelong, describes shearing at this time. The sheep were shorn with hand shears in the open or in a rough log shed. The station hands were put on to piece-work and extra men were employed. Shearers earned $2 per 100 sheep and a tally of 70 was average for an experienced man. An adult sheep would cut about 1 to 2 kilograms of washed wool depending on the breed. A Saxon Merino cut about 1 kilogram, while a large framed Leicester would double that weight. Miss Drysdale commented on the absence of sheep blowfly at that time. She claimed that it was not necessary to put tar on cuts because, although there were plenty of flies, they never got blown. It is now known that the sheep blowfly did not arrive in Australia until about 1883.

It was recognised that cold water washing was not an efficient method of removing dust and dirt and in 1842 the Learmonth brothers experimented with warm water and soap. However, this was not widely adopted at that time because the advantages were considered not to compensate for the expense. In the 1840s, a new system of spout washing became widely adopted. John Cotton, a settler on the Goulburn River, was one of the first to use the method and he gave the following account in a letter to his brother in 1845: "Having previously been soaked for 20 minutes or half an hour, each sheep is held under a spout of water for 10 minutes. We had fortunately the means of erecting a spout at the cost of a few shillings. The spout requires only 2 men to stand in the water whereas on the old plan, 6 or 8 men were standing in the water a whole day".*

Cotton claimed that the price of wool washed by the spout was advanced by 4 cents per kilogram. Not all settlers were able to erect a spout at such a low cost. George Russell expected to pay $500 for the erection of a place for spout washing. Differences of opinion regarding the advantages of different systems of washing wool or of selling it in the grease continued for about 50 years. The washed sheep could not be shorn for several days, as it was necessary to wait until the wool was again greasy with some yolk.

Marketing

The wool was usually sorted into at least two classes but, under rough conditions, it would all go as one line. Wool was tramped into bales or in some cases pressed with a rough lever press. By the mid-1840s, screw presses were widely used and as well as being much more efficient, screw pressed bales were charged lower freight.

The wool was carted by bullock dray to Portland, Geelong, or Melbourne and the bullock driver was responsible for delivering it. The drays arrived in late summer and converged on the towns where they were received with great acclamation. Colonial agents in Geelong and Melbourne would receive the wool, press it with screw presses to reduce the size, and ship it for sale at the London auctions. Squatters had the choice of selling to the local agents or receiving an advance and selling in London.

The question of whether to wash or sell wool in the grease had implications for marketing. It was more difficult to estimate the yield and quality of washed wool, and in rubbing off the dirt, the quantity of noils was increased.

Diseases

A major problem for the emerging wool industry concerned the diseases prevalent in sheep. The worst of these was scab — a parasitic disease caused by the mite *Psoroptes communis* which caused the sheep to rub. Scabs form over the injured areas and the fleece becomes matted, broken, and is finally shed. Scab was introduced from Tasmania and it appears to have spread during shipment across Bass Strait. It spread to Victoria and almost every flock was scabbed at one time in the 1840s. Various cures were tried including tobacco, arsenic, and corrosive sublimate — the latter two being worse than the disease. It became a general practice to dress sheep after shearing with an infusion of tobacco, possibly with salt or soap added. Eventually tobacco with equal quantities of sulphur prepared in hot water and applied warm three times at fortnightly intervals became the accepted treatment.

Catarrh was prevalent in sheep from Sydney, and in the flocks overlanding along the Mitchell Line, thousands died. It was not unusual to find 500 dead sheep in the yards

* Peel, L.J. in *Rural Industry in the Port Phillip Region*, Melbourne, Melbourne University Press, 1974, p. 34.

holding the flock overnight. The risks of catarrh were considered greater than that of scab and Tasmanian sheep were preferred on this account. Catarrh was a respiratory complaint which spread rapidly; there was no known cure, but after 1863 it disappeared entirely from Victorian flocks. There is no clear understanding of what factors caused it to disappear.

Cattle husbandry

From the beginning cattle accompanied sheep in the occupation of the grazing land. In the Western District, as well as in East Gippsland, it was recognised that parts of the country were so unsuitable for sheep that they became cattle raising districts. However, even in the best sheep country, cattle were run and fattened for the colonial meat market. The Learmonth brothers had a herd of 1,300 and on the Clyde Company's run, George Russell grazed 10,000 sheep, 300 cattle, and 16 horses.

Niel Black recognised that Glenormiston was better suited to cattle than sheep but he persevered with sheep because wool had a world market and its price was more attractive than that for fat cattle, which was always uncertain. However, from the beginning he kept good quality Shorthorns and imported several Durham bulls at considerable expense. In the wet country around Port Fairy and Warrnambool, cattle were favoured and bullocks could be sent to the Adelaide market.

In 1840, Port Phillip stock numbers showed 782,283 sheep and 50,837 cattle — a ratio of 15:1. By 1846, shepherds and hut keepers were given as 15,000 and stockmen as 6,000. Stockmen had a much higher status than shepherds; the fact that they were mounted tended to enhance their standing. There was rivalry between the two occupations and that of stockman was certainly less monotonous. When cattle were accustomed to their runs they gave little trouble. They did not need to be guarded at night as they were not troubled by dingoes, but they required regular inspection to ensure that they did not stray.

First depression, 1841–1843

A major challenge to the new settlement came in the form of a general economic depression during the years 1841–1843. In March 1841, Niel Black was shocked by the distress in money matters in both Melbourne and Sydney. Several failures had taken place and more were expected. This was the first check to the optimism of the late 1830s when credit was readily available and young men with a little capital could borrow a large amount to invest in sheep. The immediate gains were in sheep numbers which, on paper, showed great profits. However, sheep prices depended on demand for sheep and this depended on the availability of additional land. Once the desired stocking on the criteria of the day was achieved, the demand for sheep declined and prices collapsed. With many more flocks the supply of fat sheep also exceeded demand and fat sheep likewise became very cheap.

George Russell had started with 3,000 sheep at a landed cost of $3.50 each, and by the end of 1841 he had 15,000 but the price had declined so much that the cash value of his flock had not increased. Wool receipts just covered costs so that after five or six years there was no cash profit, although the station had been established.

Another feature of the depression was a consequence of earlier land speculation. Until the end of 1840 large amounts of money were spent in buying Crown land in subdivisions near Melbourne and other towns. This land changed hands frequently at ever increasing prices but most of it remained unproductive. Merchants were also over-optimistic in purchasing consumer goods from Britain. When prices began to fall confidence gave way to doubts and business activity declined.

The fall in the price of sheep continued and there was uncertainty about how far it would go. The situation improved when it was shown that sheep could be boiled down for their tallow. Widely publicised trials showed that a good fat sheep could yield 50 cents to 80 cents for the skin, legs of mutton, and the tallow. As the tallow could be exported, it provided a base value for sheep.

On sheep stations the greatest cost was the labour for shepherding. When the land was settled, the common flock size was about 800 sheep, but under the stress of the

depression, flock sizes increased to nearer 1,500 to 2,000, thus reducing the number of shepherds. The control of scab and progress in controlling the dingo played a part in this reduction in numbers of station hands. By the end of 1844, there were clear signs of recovery when the demand for labour revived. In September 1845, a sheep station on the Loddon River was sold for $6,000, the sheep averaging $1.30 per head. Eighteen months earlier the station had been bought for $2,400. In Britain, trade had revived and capital began to flow again.

By March 1852, there were 6,589,923 sheep and 390,923 cattle in the Port Phillip District and wool exported amounted to approximately 1.1 kilogram per sheep. The grazing industry had been established and by this time was the sole economic basis for the viability of the settlement.

Development in the 1850s

In February 1851, Hargraves discovered gold near Bathurst in New South Wales. The news was reported in the *Geelong Advertiser* in May and created great excitement and some foreboding among the squatters. In June, gold was discovered at Clunes and near Warrandyte, and in August there was a more spectacular find at Buninyong. Two days after the latter finding, one-tenth of the population of Geelong were reported to be going mad to get off to the diggings. The Ballarat field had been discovered and Geelong was the supply base for it.

A census taken just before the gold discoveries in March 1851 showed that Victoria had a population of 77,345 excluding Aboriginals. At the succeeding census of April 1854, the population, Aboriginals excluded, had increased to 236,798 persons of which 155,887 were males.

The effects on the grazing industry were dramatic. Within months shearing rates increased by 50 per cent and bullock drivers demanded three times the rate for carting wool. However, after trying the diggings, many farm workers returned to the farms at higher wages.

After the first inconvenience, squatters began to benefit from the gold diggings. Cattlemen like the Manifolds who were running 8,000 to 10,000 head on Purrumbete found their fortunes were made overnight. However, distance from the diggings decided which areas benefited from the demand for meat. By 1853 wage rates had steadied and married couples could be hired for $120 to $140 per year and single men for $80 to $120 compared with respective rates in 1851 of $60 to $80 and about $52.

Fencing

The old system of shepherding was re-appraised. With the removal of the dingo and the increasing size of the flocks, hurdles were discarded and flocks were quietly camped down at dusk near the shepherd's hut. Some tried using a small, brush fenced paddock to hold sheep at night at each outstation. Soon others were bringing the shepherds in from the outstations and giving them horses so that they could ride out each day to tend their flocks, but leave them out at night.

Opinions were sharply divided on the question of fencing but more and more fences were built. The first were simply trees felled but moved into a line with the branches thrown on top. More permanent chock and log fences often followed the brush. In closely settled areas some hedgerows of gorse, hawthorn, or boxthorn were planted. In stony areas on the basalt plains, stone fences were widely used and where good timber was available, split posts were morticed to take two or three rails about 3 metres long.

In the early 1850s the Hentys were erecting wire fences on their run at Merino. In the long-term wire became supreme as a means of fencing. Wrought iron, ungalvanised wire about 6 mm diameter was pulled through holes bored in posts spaced at about 3 metre intervals. Others using wire fences in the early 1850s included Terrinallum, John Robertson at Wando Vale, the Learmonths, and Niel Black at Glenormiston. Fencing proved to be a solution of the shepherding problem and squatters found that the sheep did much better when left alone. By 1860, fencing had been widely adopted. Leased land was not often fenced but by then the purchase of runs was proceeding steadily.

ADAPTATION OF ANIMALS TO THE ENVIRONMENT

Sheep breeding

From 1850 to 1875

The sheep grazed in the Port Phillip region during the 1840s were of very mixed breed. They had more of the Merino type than any other but in response to the demand for mutton, there was a strong infusion of Leicester blood. The variations in breed type strongly influenced weight and quality of the wool and the weight of the carcase.

Under the conditions prevailing during the establishment period, the squatters were fully occupied in maintaining their flocks intact and with their own economic survival. There was little that could be done to improve the flock by selective mating. Under the shepherding system it was not possible to select an elite flock of ewes which could be mated and lamb separately so that superior ram lambs could be bred. It was difficult even to control the lambing season. Under these conditions the breed type would tend to become a more uniform mix of the original component breed types.

The wool trade was aware of the generally poor quality of Australian wool. One of the London brokers — J.T. Sims — was requested by Campbells of Campbell's Wharf, their agent in Sydney, to send a competent person as buyer, sorter, and instructor of sorters. In 1844, the firm sent Thomas Shaw, a Yorkshireman, who had spent 20 years working for some of the first dealers and manufacturers of foreign and Australian wools. Thomas Shaw convinced Campbells that he should gain first hand knowledge of the grazing industry and the types of sheep and husbandry methods related to wool quality with a view to discovering why Australian wools were deteriorating. He spent four years travelling throughout wool growing areas in Australia and New Zealand. He then published a treatise *On the Australian Merino* which was widely read and became the focus of much argument in the newspapers of the day.

Shaw boldly told the Australian sheep breeders that they knew nothing at all about wool. " . . . They bred a mongrel breed in which may be found every shade between the real Australian Merino and dried up Leicesters mixed with myriads not fit to class as respectable goats. Every ewe is bred that is not black, rams are raised like cabbages by the thousand and bought without a shadow of discrimination. With the exception of a very few flocks that have been kept pure, this is the character of all the sheep in the Colony."*

He conceded that Victoria could produce wool finer than the Spaniards or Germans, but this fine wool did not have enough substance. He said that Australia had yet to breed its own type of sheep which could adapt itself in wool and carcase to the climate and the soil. He presented this as a challenge to which every stock-owner could contribute.

Outraged sheepmen wrote letters to Melbourne newspapers refuting the claims or making excuses of lack of labour or money. The *Portland Guardian* which had previously criticised wool quality was full of praise for Shaw's treatise. To hammer home the point they printed long extracts from the book. Shaw proceeded to answer the correspondence with zest and at great length.

Shaw's association with the Learmonth brothers was productive and successful and benefited both parties. He helped them class their flock to achieve an elite ram breeding group of ewes and he was entrusted with the task of travelling to Tasmania to select Saxon rams from W. Kermonde of Mona Vale. Under Shaw's direction, the Learmonths' flock was culled regularly each year and he was able to see the desired type of sheep emerge. He found the fleece free, bright, and closely set on, the yolk sparkling like diamonds with a fine frame, square, deep, and compact. This experience became the basis of his advice to many sheep breeders he was to visit in the ensuing years. Shaw's aim was the adaptation of sheep both in wool and in carcase to soil and climate. His method was to pass each sheep in the flock through his hands and examine it point by point, classing it to first, second, or third class.

To the first class he put the best rams that could be obtained and from them he bred rams for the flock. When the flock attained perfection, he considered it was exactly suited to its location. He warned against bringing blood from a different soil and climate. He advocated weighing fleeces as an aid to this selection, and many sheep breeders followed

* Thomas Shaw in *On the Australian Merino*, Melbourne, Gideon E. Lang, 1849, page 12.

this advice. They also freely acknowledged Shaw's contribution. The Learmonth brothers agreed that he taught them all they knew and J.L. Currie attributed to Shaw the formation of the Australian Merino.

The first sheep show at Skipton was held in 1859 and Shaw's son, Thomas Shaw, junior, was credited with suggesting the formation of the Western District Pastoral and Agricultural Society which conducted the show. The show was an outstanding success and was supported by the leading squatters in the region including Francis Ormond, Alexander Anderson, J.S. Ware, the Learmonths, and J.L. Currie. The show was followed by a ram sale and during the ensuing fourteen years, the ram fair at Skipton was the outstanding source of quality rams in Australia. By 1869 the best rams were selling for $746. J. L. Currie averaged $195 for his rams in 1870.

The period when Skipton was famous for its ram fair ended in 1873 when the location was changed to Ballarat. Soon after, other major shows started at Melbourne and Geelong and throughout the pastoral areas, and many agricultural societies were formed to run shows. The 1860s were a period in which the principles set out by Shaw in his treatise were widely applied by a significant proportion of sheep breeders.

The intensity of community interest in sheep breeding was reflected in the writings of G.A. Brown who was a journalist working for the *Australasian,* a national weekly journal. Under the *nom de plume* of Bruni, he wrote a weekly column on sheep breeding and visited at shearing the major flocks in Victoria, New South Wales, and South Australia. In addition to describing the origin and breeding policy of each station, he reported on the quality of the wool and the average fleece weight of the ewe flocks. This information was much more reliable than the oft quoted fleece weights of the top cutting rams.

Bruni's reports on Victorian properties during the 1870s showed that for eight properties including Ercildoune, Wooriwyrite, Skene, Mt Fyans, Carngham, Borriyallock, Langi Kal Kal, and Mt Hesse, the flock average was 1.4 to 1.6 kilograms of hot water or spout washed wool. On the estimates used at that time this would be equivalent to 2.2 to 2.5 kilograms greasy wool. The statistics of wool exported and used in the Colony demonstrate that a dramatic increase in average production per sheep had been achieved. In the period 1845 to 1850, wool exports from Victoria divided by sheep numbers equalled 1.1 kilograms which is equivalent to 1.5 kilograms greasy wool. For the period 1875 to 1885, wool exported plus that used for local manufacture divided by sheep numbers averaged 3.6 kilograms. The proportion of wool being washed declined between 1850 and 1875 as more growers abandoned washing, and greasy fleece equivalent would have been 2.5 to 2.7 kilograms.

The figures suggest that the leading flocks visited by Bruni were not producing more than the average but they were growing fine Merino wool, whereas crossbred and mutton producing sheep included in the mean would cut heavier fleeces. Nevertheless overall wool production per sheep had increased by 80 per cent during a 30 year period from 1850. Such an increase could only be achieved if Shaw's message had been heeded by most sheep breeders in the Colony. The development of many agricultural societies in the period suggests a broad based support in the rural community for animal breeding. The increase of 80 per cent in 30 years can usefully be compared with the subsequent performance of Victorian sheep. Between 1880 and 1910, there was no clear evidence of any increase from Victorian statistics on wool exported per sheep grazed. In 1910, Commonwealth rural statistics showed that wool shorn per adult sheep based on farmers returns exceeded 3.0 kilograms. Between 1910 and 1940, this mean increased by 22 per cent and between 1940 and 1970 by 28 per cent.

Shaw's methods were applied elsewhere in Australia. In the Riverina the development of the Peppin strain was followed by the rise to prominence of the Jerilderie Sheep Show and the Peppin Merino became the accepted type of sheep for breeders in the Riverina.

Eventually the dominant sheep shows migrated to the capital cities and State-wide associations of breeders became custodians of Merino breeding in each State. However, the various strains within the Merino breed retained regional characteristics which depended upon local circumstances applying when they were formed. It can be claimed that the Australian Merino was created during the 1860s and 1870s; however, it was not a single breed type but a group of strains which by then had emerged.

Bruni also reported on the annual fleece competitions which had become a feature of the sheep breeding scene in the 1870s. There were Colonial and national competitions and in 1878 Richard Goldsbrough's Great Wool Exhibition for which prizes were calculated on the value of the fleece. Many breeders sent fleeces to an international exhibition in Paris.

One consequence of this development was that flocks from regions in which the vegetation and climate favoured wool growth throughout the year would tend to win events and thus stud breeding became associated with these favourable areas. In this situation Victorian breeders were at a disadvantage relative to those in natural wool growing country in South Australia, the Riverina, and the northern slopes of New South Wales. This is further illustrated in Bruni's reports during the 1870s. Several flocks in South Australia including Mt Crawford, Mt Remarkable, and Conowie and Hill River cut 3.9 to 4.1 kilograms of greasy wool from the ewe flocks. The Peppin Sheep at Wanganella cut 3.5 kilograms in the grease from 11,000 ewes of the station flock in 1879.

However, fleece value was also important and the Victorian wool at that time was worth 40 per cent more because it was finer and more of it was still being washed. The relative quantities of wool exported, sheep numbers, and mean fleece value are set out below for the Australian Colonies in 1878:

AUSTRALIA — EXPORTS OF WOOL FROM THE AUSTRALIAN COLONIES, 1878

Colony	Sheep	Wool exported	Price/kilogram	Average per sheep	
				Weight	Value
	('000)	('000 kilograms)	(cents)	(kilograms)	(cents)
New South Wales	29,967	56,000	27.7	1.9	52
Victoria	**9,379**	**33,563**	**29.3**	**3.6**	**68**
South Australia	6,377	22,400	21.1	3.5	74
Queensland	5,564	10,200	28.8	1.8	54
Tasmania	1,838	3,350	29.0	1.8	53

After 1875, Victorian flocks ceased to influence sheep in other Colonies; South Australia became the parent stud for Western Australia and New South Wales was influential in Queensland. Nevertheless, Victoria had set an example of establishing breeding aims on a regional basis and achieving widespread support within the community. By 1875, the centre of gravity of sheep breeding in Australia had moved to the north.

Appraisal of early breeding

Shaw's statement of aims and of philosophy owes much to the principles established in the eighteenth century in Britain during the period when Robert Bakewell (1725–1795) founded systematic animal breeding and developed the Leicester sheep and improved the Longhorn cattle. The principles applied in this system used the genetic potential of the animals available by the fusion of different breeds and types, mating selected animals showing the desired visible characteristics, rigid culling, and better feeding aided by improved pastures.

Shaw used the first three of these principles and he put a strong emphasis on breeding to suit the soil and the environment. Although he was not specific about using different breeds and types in most of the flocks in which he was influential, he advised the use of rams of both Saxon and Camden origins and he accepted the ewes available for the foundation females. Shaw appreciated contribution of the Saxon breeders who had improved upon Spanish wools producing superior fineness and softness combined with sufficient soundness and freeness to stand the operation of combing, whereas he considered that descendants of the Spanish sheep in Australia "lacked substance".

His emphasis on suiting the breed to soil and climate was probably less relevant. In practice Shaw was selecting for an economic climate in which the price of wool, the weight of fleece, and meat value of the sheep were the critical factors. He was precise and accurate in selecting for wool value. The high rate of improvement in fleece quality and weight in the period 1850 to 1875 can be attributed to the application of these principles and to the high proportion of the total flocks which were considered in selecting the parents of the next generation of sires. This would occur if a high proportion of sheep

breeders accepted Shaw's advice. The success of the Skipton Show in a period when the difficulties of travel would limit the radius from which sheep could be entered, strongly suggested broad support among sheep breeders.

From 1875 to the First World War

The decade of the 1870s was a watershed for sheep breeding in Australia. Changes in the environment and various social and economic conditions ensured this.

The stock carried on grazing land which had been readily available in Victoria were confronted with the threat of starvation when periodic droughts limited pasture growth. Stocking rates had caught up with the limit of survival under the conditions then prevailing. For the next 50 years stock numbers would build up for periods of five to ten years, only to slide back when drought recurred. By 1925, sheep numbers were only a little higher than in 1875. This is illustrated in Figure 1 below.

The recurrent periods of hard grazing had its effect on native pastures and species such as Kangaroo grass *(Themeda australis)* disappeared on much of the area.

There was also a change in the attitude to sheep breeding. The wide publicity given to the weight and value of prize winning fleeces and the impressive presence of champion rams which by then were being hand fed, produced an inferiority complex in many sheep breeders who were breeding rams for their own use. Would they not do better in buying all their rams from a breeder of prize winning rams and fleeces? Thus, buying stud rams took the place of breeding rams in selected flocks on stations that had heeded Shaw's advice. In 1875, the Australian Merino Breeders Association was established and a stud book was opened. In general, Victorian stud breeders remained aloof from this association, but buying stud rams became the accepted management strategy.

The capricious fashions which can affect stud breeding were apparent in the importation of the wrinkled Vermont sheep from America. In the early 1880s, leading breeders in New South Wales joined the craze for wrinkles which were intended to grow more wool by

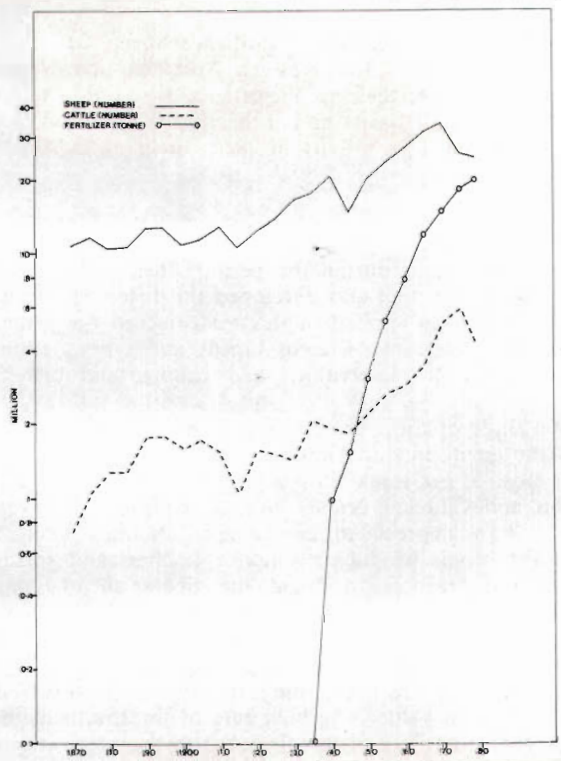


Figure 1. Victoria — Number of sheep and cattle since 1870 and quantity of fertiliser used since 1935.

increasing skin area. The fashion took 30 years to run its course and great damage was done to many of the plain bodied productive flocks which Bruni had described.

In 1900, a letter from J.L. Currie's son to Thomas Shaw, junior, commented: "You are right about fashions changing in sheep. The flocks of Skipton days are I think as good now as then but find no favour. If a Skipton grand champion was exhibited in Melbourne nowadays it is quite likely that the judges would condemn him untried for want of 'weight', i.e., hair grease and wrinkle, for without them he is worthless so say the wise judges".*

Nevertheless some ignored the Vermont fashion and after it had passed they emerged as undisputed leaders. These studs included Chatsworth House and Nareeb.

The practices of pampering show sheep by artificial feeding and shedding were criticised by the older generation, and there was also a suggestion of dishonest shearing to include more than one year's wool in an exhibition fleece or show animal. J.L. Currie voiced this criticism in stating that the practices had brought Victorian sheep into disrepute and would hold them there so long as the one is practised and the other suspected.

By the 1880s, railways were being extended from Melbourne, roads were much better, and coach services were established. It was now possible to conduct a sheep show in Melbourne with a Colony-wide competition. However, costs involved meant that only the large stud breeder could afford to exhibit. Local agricultural shows persisted, but the limelight was on the major event.

Trends in the twentieth century

For the first half of the twentieth century sheep breeding continued to be dominated by stud breeding but was less susceptible to change in response to fashion and longer-term breeding aims were followed.

After the Second World War the modern science of genetics was applied to sheep and demonstrated the form of inheritance of traits including fleece weight, density, and fibre characteristics which contribute to productivity. The important work was conducted by the New South Wales Department of Agriculture and by the Commonwealth Scientific and Industrial Research Organization. The potential gains from selection for such productive traits have yet to be realised in the industry.

From the beginning of the 1970s a new consideration in breeding aims has arisen in the increase in price of sheep meats relative to wool. This is primarily related to the demand from the Middle East countries and also Japan and South East Asia. The Middle East demand is for leaner lamb and young mutton and for mature wethers shipped live to Arabian Gulf ports. This development puts emphasis on fertility, growth potential, and mature size, but the new markets are not concerned with conformation and fatness demanded in the traditional fat lamb export trade to Britain.

The challenge for the future is to combine in the one breed type productive traits for efficient sheep meat production with those for good quality apparel wool.

Refrigerated exports

With the progress in the industrial revolution in Britain major changes were taking place in shipping. Steam engines replaced sail, iron ships replaced timber, and by the 1880s the lighter steel ship was developed and the tramp steamer began to service not only the British Empire but a major proportion of world trade.

By 1880, the refrigerated ship had arrived and filled a need not only for Australia but for Britain which was seeking food for its expanding population in the new industrial cities. The first refrigerated ship *Strathleven* arrived in London in February 1880 with a cargo of 41 tonnes of beef and mutton in excellent condition. The meat had cost 6 to 8 cents a kilogram in Australia and it sold for 18 to 24 cents a kilogram at Smithfield market. The voyage was followed by the formation in Melbourne of the Australian Frozen Meat Export Company. The effect of refrigerated shipping was to open up a new market for the grazing industry so that meat contributed a higher proportion of the total returns from sheep. It was soon apparent that the higher rainfall country could best supply this demand and that it would pay to use specialised sheep for lamb and mutton production.

* Kiddle, M. *Men of Yesterday: a social history of the Western District of Victoria 1834-1890.* Melbourne, Melbourne University Press, 1961, p. 379.

In the favourable districts, Lincolns and Leicesters had long been used for supplying fat sheep for the Melbourne market. In some cases Shropshire, Southdown, and Romney Marsh were used as sires to breed fat lambs by crossbreeding. Under the influence of the new demand, breeding of fat lambs and heavy wethers became important enterprises in favourable districts. However, New Zealand was a strong competitor and supplied half the British market.

In addition to these specialised crossbreeding systems, it was realised that there was scope to breed a dual purpose sheep which would have a heavy fleece of quality wool and also produce lambs and fat wethers. For this purpose the Lincoln was used and it was found that crosses with Merino bearing ½ to ⅞ Merino blood would give dual purpose production. Crosses bred back to Merino were called Comebacks. Richard and Alexander Dennis set out to breed a fixed type of Comeback. They succeeded and in due course breeders of the "Dennis" Comeback joined with other Comeback breeders to establish the Polwarth breed.

Lincoln and Merino crosses were also used as the basis of the Corriedale breed. This was originally developed in New Zealand and similar matings were made by Henry Corbett in Victoria commencing in 1882. The name Corriedale came to be used in both countries for what was a stabilised half-breed. In course of time the breeding of Polwarth and Corriedale sheep and the breeding of Comeback sheep by systematic crossing of Lincoln and Merino accounted for a substantial proportion of Victorian wool production. This was essentially dual purpose wool and meat production and the specialised crossing systems for fat lambs also contributed to the total wool produced.

Cattle breeding

Early role of cattle

It is no coincidence that in 1840 in the Port Phillip District there was one head of oxen to 15 sheep and, at counts in the late 1840s, proportions better than two-thirds of this still prevailed. Cattle were of vital importance to the new settlement in the transport of goods and for meat and dairy products. These came from the one generalised type of animal.

For the transportation of goods at that time cattle were more important than horses, and were given priority in the critical limitation of space on ships. The relative scarcity of horses was reflected in the price being four to six times that of an ox. Horses were reserved for riding and for personal conveyance in the towns. Early drawings of Melbourne and Geelong show the dominance of the ox drays. Oxen continued to be used for inland transportation to the end of the century but with the development of railways and better roads, the journeys were shortened and horses played a more important role. By the 1870s and 1880s, horse drawn wagons were carting wool from stations to the nearest railway or port.

The first cattle brought to Australia were from India and Zebu types predominated in the early days at Port Jackson. However, British cattle were imported at a later date and, among these, the Shorthorn breed predominated, but Ayrshire was also common and there were a few Hereford and Devon. By the time of the settlement of Victoria, the Zebu characteristics had gone and the cattle were, in general, typical of the above breeds and their crosses.

The cattle population of the early Colony included working oxen, house cows, and small herds used for milking in and around the towns and on small farms and breeding herds out on the squatters' runs. The breeding herds produced fat bullocks for the town markets, stores for use as working oxen, and surplus cows and heifers. A major problem with beef cattle was the limited market and its recurrent periods of oversupply which generally made cattle breeding less profitable and less reliable than wool production. Those who persisted with beef cattle were those in rough and forest areas less suitable for sheep and wetter areas where pastures would fatten stock more readily.

In the south-west, cattle were used and bullocks were driven to the Adelaide markets from the Warrnambool and Portland district. East Gippsland with its isolation, forests, and high rainfall, was also more suited to cattle than to sheep. In forest country the main task was to keep track of the cattle by tailing them and to burn sections of the forest as the regrowth would attract the cattle. The herds were mustered annually for marking and branding and any surplus drafted out for sale.

The establishment of a port at Port Albert opened up the prospect of shipping steers to other markets and in 1842, the first ship to leave the port took 50 bullocks to New Zealand. Subsequently Captain L. Macalister established a regular consignment of cattle and sheep to Hobart where he could compete favourably against the local producers. Angus McMillan took to Hobart a pair of bullocks as a sample of 500 more ready for shipping. In the next 12 months, McMillan shipped 900 head.

Between 1860 and 1890, the largest and most regular mobs of fat cattle to supply Newmarket came from the central district of Gippsland between Morwell and the Avon River. Regular mobs made up of bullocks from 10 to 20 different owners would be driven through a track cleared in the bush from Warragul to Dandenong.

Beef cattle breeders

From the beginning the leading squatters were concerned about the quality of their animals and they went to great trouble to acquire well bred bulls. At the end of the 1840s, Niel Black of Glenormiston could boast that his cattle were not surpassed in quality or condition by any in New South Wales. Among the early settlers were the Bolden brothers from a well known family of Shorthorn breeders in the north country of England. They brought with them the best cattle they could get including three bulls and two cows of top quality, one of which was the bull Mussulman costing $840. The herd went to the Grassmere run near the site of Warrnambool and, despite the risks from dingoes and Aboriginals, they multiplied. Unfortunately the two brothers died within three months and the herd was dispersed. Among the purchasers of the registered animals were the Manifold brothers who purchased the Grassmere run, Niel Black, Joseph Ware, the Learmonth brothers, and Charles Hamilton MacKnight.

Meanwhile, Niel Black had shipped out four bulls of first rate quality at a total cost of $796. Black was meticulous in culling his herd and keeping detailed pedigree records. He soon had one of the premier stud herds in the Colony. Another notable breeder was William Robertson who had a run called The Hill which became a leading Shorthorn stud. Joseph Ware of Minjah was also a prominent breeder and in 1856 he imported the bull Master Butterfly, the unbeaten champion of England. Ware paid $2,520 for him. The Morton brothers, also from a Shorthorn breeding family in England, established a stud at Mt Derrimut in 1850 and gradually built up a magnificent herd.

During the 1870s, there was a boom in cattle breeding and in stud bulls and high prices were paid. By 1880, the boom came to an end as the breeders had over-reached themselves and were supplying too many bulls. Also in New South Wales and Queensland, the demand for bulls declined as more profitable sheep of the Peppin type began to occupy the northern plains.

The collapse of prices for Shorthorn stud cattle may have discredited the breed and in the rivalry between disappointed breeders it was claimed that some of the studs were becoming too closely inbred. This situation paved the way for the Hereford breed to rise to prominence. As a similar trend was apparent in the United States, the change was doubtless associated with the changing fashions in the international market for stud cattle which Britain was supplying. When Herefords began to dominate in terms of prices paid at stud sales, they were able to expand at the expense of the Shorthorn breed. This situation of leading breeds was repeated at a later stage by the Angus breed, again on a world scale, but the extent to which one breed replaced another differed in different countries. Angus was a much more successful competitor for Hereford in New Zealand than in Australia.

Trends in the twentieth century

In cattle breeding the trend in the first half of this century was to develop a range of highly specialised breeds for both beef and dairy production.

In beef cattle breeding imported cattle continued to be seen as superior to locally bred animals and stud breeding became more closely integrated with that in Britain.

The trend is illustrated in the Hereford breed. The growth of stud breeding is shown by the number of registered animals. After the formation of the breed society in 1880, it required 50 years for the total female registrations to reach 500 but thereafter the cumulative total doubled every 10 to 15 years. Since 1930, over 95 per cent of the genetic

make-up of stud Hereford cattle has been attributable to stock imported from Britain. Any specific adaptation to the Victorian environment which might have been achieved by the early breeders has, of course, been lost, but climatic differences from Britain are not serious.

Since the Second World War, the development of new markets for beef has increased the competition between enterprises capable of utilising pasture. In particular the United States market for manufacturing meat has resulted in a long-term increase in beef prices. When wool prices were depressed in the early 1970s, there was a major swing from wool growing to beef production. While carcase quality is still important on the domestic market, the general level of beef prices depends on the demand for manufacturing meat. In these circumstances it is the total productivity from the breeding herd which determines enterprise returns and this has been shown to be much more strongly influenced by characteristics expressed only in cows, than by conformation and breed type which receive the most attention in conventional breeding. These characteristics include milk production, early puberty, and regular trouble free calving. Some of these appear to have been neglected in the conventional British breeds.

During the 1960s, the development of methods of storing bull semen at low temperatures enabled semen of exotic breeds of cattle to be imported and distributed in Australia for breeding purposes. This meant that new breeds previously unavailable for quarantine reasons could be imported. As a consequence several European breeds characterised by large mature size and high growth rates were established in Victoria.

There is some doubt of the extent to which size *per se* can improve the efficiency of production in a breeding herd, and it does tend to be associated with more calving difficulty. The use of artificial breeding, and the advent of new breeds kindled some interest in cross-breeding which is a means of combining productive traits of different breeds and has been shown to be efficient for animals used for meat production.

The variety of highly specialised modern breeds is in contrast to the generalised multi-purpose types originally imported to Victoria, but the latter may well have had more productive breeding cows.

Dairying

Dairy products were an important part of the diet of the early settlers as they had been in Britain. From the first days of the settlement, cows were milked and butter and cheese were made. Much of this was supplied by house cows even in the towns, but around the towns there were many small dairy herds which provided milk for townspeople. As the settlement progressed, butter making was developed in many areas where seasonal conditions provided good grazing for most of the year. Niel Black at Glenormiston had some of his Shorthorn cattle milked in a small dairy as early as 1842. In the early days in Gippsland, butter was carried by packhorse on rough tracks and roads.

However, it was not until refrigerated shipping became a practical reality after 1880 that the dairy industry had the prospect of developing export trade. The first shipment of refrigerated butter in 1883 realised 29 cents per kilogram which can be compared with 2 cents per kilogram previously obtained by Gippsland farmers. The economic depression of the 1890s stimulated a swing to dairy production. It was one industry that promised a return when beef, mutton, and wool prices were depressed.

In many herds kept mainly for beef, cows were brought into rough dairies and milked. This expansion of dairying was associated with a new approach to the handling of the product. The centrifugal separator was introduced in 1888 and before long creameries were established where milk could be separated and the cream alone sent to the butter factory. The next stage was for dairy farms to have their own separators and deliver cream at regular intervals ranging from daily to once a week.

In 1888, the Victorian Government allocated the sum of $466,000 to provide bonuses for the establishment of butter factories, creameries, and cheese factories. The bonus was regulated according to the quantity of butter exported and the price obtained on the export market. The factory-made butter was of much better quality than farm-made butter and in five years the value of exported butter increased from $108,738 to $1,146,214. Cheesemaking also developed as a commercial enterprise, especially in the Western District. Experts with knowledge of Canadian methods were obtained. By 1900, there were

399 creameries and 212 butter and cheese factories in Victoria. The co-operative movement has always been strong in the dairy industry and through it farmers controlled the marketing and export of their products.

Dairy cattle breeding

As dairying expanded and the handling of the product improved, more specialised breeds of dairy cattle were used. The Shorthorn breed was used for both beef and dairy production, but finally in 1921 dairy Shorthorn breeders formed their own breed society. The first dairy breed society was the Ayrshire formed in 1892 and this was followed by the Jersey in 1907, the Friesian in 1914, and the Red Poll in 1918. The Australian Illawarra Shorthorn was developed as a distinct Australian breed, mainly in New South Wales, and was formally established in Victoria from 1919.

During the 1920s, herd testing was widely adopted in the dairy industry and was applied to both commercial herds and to stud herds. The results of herd tests were applied to bulls by means of the average production of the daughters and those most successful were sought after and their prices were correspondingly higher. In due course the successful studs, in terms of herd testing, were those that prospered.

This linking of production testing with stud breeding was advanced a stage further after the Second World War when artificial insemination enabled the resources of the leading bulls to be widely used. The whole system of testing, selection, and very wide usage of artificial insemination was effective in improving the production of the commercial dairy cattle. The genetic gain was based on very wide and active support by the whole industry and community and involved co-operative investment and professional assistance by geneticists from the Department of Agriculture.

In recent decades the Friesian breed has expanded at the expense of other breeds and has developed into an important branch of the world population of Friesian cattle. Victoria has contributed significantly to export demand for breeding stock in developing countries.

MODIFICATION OF ENVIRONMENT FOR ANIMALS

Clearing forest to provide pastures

The initial occupation of the grazing lands in Victoria had not involved the systematic destruction of forests or trees in the open savannah grasslands. There was simply not enough labour to clear forests except near towns, and grazing was confined to open country with or without a thin covering of trees.

After the gold fever subsided and the more accessible gold was exhausted, gold mining settled down to become an industry conducted by mining companies which worked the basic reefs containing gold and deep alluvial gold. The great increase in population associated with alluvial gold mining was eventually absorbed into the more industrialised society but unemployment was a problem in the late 1850s. Inevitably many of the newcomers challenged the squatters in the possession of the land. This challenge became a political issue as the movement to unlock the land found expression and leadership from competent politicians and strong support from the Melbourne *Argus*. The early legislation to achieve the objective was less than effective and a prolonged political battle ensued before acceptable and effective legislation was enacted. In the end the squatters were able to purchase a substantial proportion of the land held under lease, but many new farms were nevertheless established.

After 1870, pastoral leases ceased to be issued and land for settlement could be purchased from the State. Under the Land Act of 1869, a selector could take up to 149 hectares for $32 in the first year. The land cost $2 per 0.4 hectare but payments were spread over 20 years. The Selection Acts and their application are described in the *Victorian Year Book* 1973, pages 96–103. The new legislation was the means of opening up areas of land including forest which had not attracted squatters. Between 1860 and 1880, the area of land under cultivation in Victoria increased from 175,000 hectares to 702,000 hectares. This was largely in response to the demand for wheat and much of this land was north from Bendigo to Echuca which from 1864 was served by a railway.

Until 1870, the settlers had left untouched the main forest areas of Gippsland but from 1875 onwards the land was rushed. At that time there was no export trade in dairy products and dairying as a main enterprise did not offer a means of livelihood for such a

large area. The objective of these settlers appears to have been to establish pastures for beef and mutton production with dairying as a sideline. The virgin forest was dense and the trees were huge and the axe was the only means of clearing. Selections of 149 hectares often took up to twelve years to clear and involved the destruction of immense quantities of timber. By the time the farms were established, dairy production was expanding and prices were attractive.

Clearing of forest proceeded in many parts of the State, including substantial areas for cropping in the Wimmera, North Central, and the Mallee. Much of this country was cleared by ring-barking the larger trees, and, as dead timber fell, it was placed around stumps and burnt.

The specific effects of settlement on landscapes, plant communities, and vertebrate fauna were described in some detail in the *Victorian Year Book* 1976, pages 1–43, which is the first article in this series. In particular, it refers to the loss of grey box and sheoak in the Wimmera, the clearing of most of the forest in south Gippsland, the ring-barking of red gums in central Gippsland, and clearing of country that was too steep or infertile in central Victoria and the Otway Ranges.

Shelter belts and plantations on treeless plains

Much of the Western District was grassland carrying an association of casuarina, banksia, and acacias, and devoid of eucalypts. The open country on the Wannon, described by Mitchell, was grasslands associated with red gums *(E. camaldulensis)*. Red gum country did not extend east of the Hopkins River or south of a general line through Hamilton and Casterton. The southern part was occupied by grasslands with swamp gums *(E. ovata)* and this merged with dense forests south of Terang and Colac and around Warrnambool. In the centre of the Western District was a virtually treeless plain from Cressy to Darlington and this was passed over by the early squatters. Subsequently it proved to be excellent country for sheep. Berrybank Station in the middle of this plain is described as having only four trees on the whole station when it was occupied by Joseph Gardner Mack and his family.

In the 1870s, the Lismore Plain was the cradle of experiments which in course of time transformed the appearance of grazing country. The experiments involved planting eucalypts in fenced plantations to provide shelter for stock against the bleak conditions prevailing in winter. They were initiated by Alexander Buchanan and continued by L. J. Currie at Titanga. The method involved shallow ploughing followed by one or two strokes of the harrow, before sowing by hand with seed mixed with ashes. Sufficient seed would fall below the turned sod to establish the trees. The method was applied with sugar gums *(E. cladocalyx)*, the Tasmanian blue gums *(E. globulus)*, and numerous other species of eucalypts. Alexander Buchanan planted 55 hectares between 1873 and 1882. Between 1887 and 1889, 230 hectares were planted by Currie in long shelterbelts extending across the plain. This technique was adopted very widely and plantations of sugar gums, together with pines and cyprus, have changed the appearance of the grazing country and greatly improved it as an environment for sheep and cattle. This development, together with provision of stock water by means of a dam or windmill and trough for every paddock, has provided new habitats for birds and the populations of some native species have greatly increased.

Stock water supplies and irrigation

Good permanent water was a prerequisite for establishing a grazing run, and from the earliest days of settlement great effort went into improving existing or developing new water sources. Wells were dug, small dams were made in suitable catchments, and water holes were developed in intermittent streams. Initially the work was done with hand tools.

During the period when alluvial gold was sought, major works were undertaken to provide water for domestic use in the gold mining towns and for supplies for washing the dirt containing gold. The Chinese community among the gold seekers were especially skilled in dam and channel building, and in moving about the country would often contract to build dams on farm properties as a means of paying expenses.

Oxen, and later horses, were used with ploughs and scoops to undertake more ambitious earth-works. Engineers and contractors developed techniques which in due course became the means of building large dams and the channel systems.

The earliest official ground water investigation was conducted by A. Selwyn in the 1850s. He examined the potential use of artesian wells, and in so doing recognised all the existing sedimentary basins except the Otway basin. By the late 1880s, auger, diamond churn, and Canadian pole drills were all being used in the Mallee and Wimmera in search of the Murray artesian basin. These new techniques for drilling were also used by private contractors in finding suitable stockwater in sands and gravels along streams and in the cracks in the basalt underlying the plains of the Western District.

To make use of such water, windmills were developed to suit local conditions. From this start, the typical Australian windmill was developed as a mass produced product. From the 1890s, drilling rigs and the mass produced, efficient windmills provided new sources of water to establish permanent water supplies. When combined with the use of wire and dropper fencing, the basis for more efficient use of land by stock was established.

By the Irrigation Act of 1886, the year of a severe drought, the Victorian Government took the first step in controlling and developing water resources for irrigation. A number of headworks were constructed and a start was made in establishing irrigation settlements. The early history and subsequent development of irrigation in the State is reviewed in the *Victorian Year Book* 1973, pages 116–19.

The next chapter in this series of special articles in the *Victorian Year Book* will examine the effects of irrigation and drainage systems on the Victorian environment.

Introduced birds and mammals

Another effect of animals on the environment was associated with the deliberate introduction of many species of birds and mammals of the European countryside. However, some introductions competed to an unexpected degree with domestic animals. The successful introduction of the skylark in 1853 caused widespread comments of surprise and delight and may have prompted further importations.

The Acclimatisation Society was formed in 1861 and among its most enthusiastic supporters were Frederick (later Sir Frederick) McCoy, Professor of Natural History at the University of Melbourne, Ferdinand von Mueller, Director of the Botanic Gardens, Edward Wilson of the *Argus*, Charles Hamilton MacKnight, Samuel Wilson, James and Thomas Austin, and the Chirnside family. At the end of their first year of activities, the Society claimed that the thrush, skylark, blackbird, and probably the starling, could be considered as permanently established.

The Austins at Barwon Park attempted to acclimatise pheasants and partridge and also imported six red deer and later the rabbit and hare. The earlier importations of domesticated rabbits did not succeed and subsequently they imported the wild grey English rabbit. By the end of 1870, attempts to control or eradicate the rabbit were costing vast amounts of money for both the squatters and the shires. In farming areas great damage was done to struggling selectors who had fewer financial resources. Control methods included trapping and poisoning with carbon bisulphide and phosphorus. Hunting with dogs was also effective and rabbit packs and the poison cart became common on sheep stations. The problem continued until the mid-twentieth century when myxomatosis and the poison 1080 provided a basis for an effective control programme co-ordinated by the Lands Department.

Improvement of pastures

During the period of the late 1850s and 1860s, the squatting runs were consolidated into sheep stations and as well as the many improvements effected in fencing, sheep and cattle yards, and woolsheds, some attempts were made to improve pastures. This followed the English experience in the early nineteenth century when the use of ryegrass with white clover, red clover, and trefoils had been widely adopted as a means of improving the productivity of pastures.

Perennial ryegrass, cocksfoot, timothy, Yorkshire fog grass, white clover, and red clover became established from an early date in the more fertile soils and better rainfall areas including Glenormiston, Colac, Clunes, and areas used for milk supply to Melbourne in western Gippsland. However, these areas remained very limited and the productivity does not seem to have been greatly increased. In general the Western District was reckoned to carry about one sheep per 0.4 hectare.

It was not until after the First World War that steps were taken which led to widespread improvement of pastures in Victoria. Success depended upon identifying a legume species which could thrive in the environment and correcting the serious deficiency in phosphorus content which is typical of Australian soils.

Among the many European plants accidentally introduced at the time of settlement (in the form of seed) in fodder for stock or in the wool of sheep, was an annual legume, subterranean clover. Although it persisted in many locations, it failed to spread and made only a small contribution to pasture production. The credit for recognising this clover as a pasture plant capable of improving pasture production belongs to A. W. Howard of Mount Barker in the Adelaide hills. In addition to farming he grew crops for seed and traded in seed. In 1906 he wrote: "In the Mt Barker district we have a weed which I believe will go far to solving the problem of introducing nitrogen into the soils. It first made its appearance 12 years ago in a paddock at Blackiston and now may be seen in most grazing paddocks in the district. When growing amongst grass, a large quantity can be harvested as may be seen in the grass stacks in the district".*

Howard's experience on his farm related to a paddock which had been cropped for oats and fertilised with a phosphate fertiliser.

After the First World War the establishment of a local fertiliser industry greatly reduced the price of superphosphate and direct top dressing of pastures was tried in the Narracoorte district of South Australia. This made a dramatic difference to subterranean clover which became a prolific and vigorous plant capable of setting a large quantity of seed and regenerating each autumn. The development of the superphosphate spinner which when attached to a truck could broadcast fertiliser rapidly, and of a sheepskin roller which could pick up the clover burr and harvest seed much more quickly, can also be attributed to the Narracoorte district. Victorian farmers were quick to adopt these techniques and from the mid-1920s pasture improvements based on subterranean clover and superphosphate extended rapidly.

The early commercial seed of subterranean clover was very variable in terms of the characteristics of the plant produced. This observation was made by J. E. Harrison of the Victorian Department of Agriculture. He obtained seed from many locations, and planted rows of individual plants in which growth habit and flowering data could be observed. He demonstrated that many strains existed and that pure strains such as Bacchus Marsh and Tallarook could be produced. The work led to the first system of pasture seed certification in Australia.

In 1932, the Victorian Pasture Improvement League was formed as a co-operative group involving farmers and the Department of Agriculture. The League established demonstration plots throughout the grazing country in Gippsland and the Western District and these became the site of many local field days on pasture species and the fertiliser needs of pastures.

Meanwhile the depression of the 1930s was having a drastic effect on farm incomes and there was very little money for investing in pasture improvement. Nevertheless the use of fertilisers on pastures continued and stock numbers built up to record levels. The stage was set for a revolution in pasture production, but fulfilment of the potential was further delayed by the Second World War and the severe droughts and rabbit plagues which were concurrent with it. From the end of the Second World War, pasture improvement proceeded apace and the only limitation was the rate at which flocks could increase.

For the next 20 years sheep numbers increased at a mean rate of 4 to 5 per cent per year. This response may be attributed to the higher nutritive value of improved pastures.

The quantity of beef produced rose with increasing herd numbers and carcase weight grew despite a decline in the mean age of slaughter which in turn would increase the turn-off rate from beef herds. Likewise the mean carcase weight of slaughtered sheep increased by 19 per cent, and fat lamb production was greatly expanded.

The effect of pasture improvement went beyond pastures and animal production. It involved the whole ecology of the region and the addition of phosphorus in the soil was adding a catalyst to the biological process of photosynthesis. Net primary production of plant tissue was increased four to eightfold and this supported more animals, insects and

* Quoted by J. E. Harrison in a letter to *Stock and Land* 30 October 1963.

GRAZING IN THE VICTORIAN ENVIRONMENT

The settlement of the grazing lands which Major Mitchell had termed "Australia Felix" was for the prime purpose of grazing sheep and cattle. Animals also provided the means for travelling and transporting essential goods for occupying the land and for conveying products for sale to coastal harbours. Of all man's activities, the grazing of animals had the greatest effect on the original plant communities, soils, and wildlife. Thus, as well as providing a sound basis for the economic development of Victoria, the grazing industry has had a definitive effect on the appearance of the countryside.

Tom Roberts, (b. England 1856 arr. Australia 1869 d. 1931.)
Shearing the Rams, 1890 oil on canvas on board 121.9 x 182.6 cm. Felton Bequest 1932.

Tom Roberts' painting epitomises the squatting age. The shearing shed is Australian in concept, materials, and design, but the focus is on the men.

The Spurwing Plover (now called the Masked Lapwing) lives and nests on open pastures. It has adapted to improved pastures and has benefited from the presence of farm dams.

Australian Bureau of Statistics

The widespread use of farm dams for stock water has provided suitable habitats for ducks, but this may have been partly offset by the drainage of swamps.

Department of Fisheries and Wildlife

The hare is one introduction from Europe for which the Austins of Barwon Park need have no regrets. It has adapted to the Victorian environment.

Department of Fisheries and Wildlife

The Wedge Tail Eagle is a carrion eating raptore. It has been regarded as a predator of lambs by some pastoralists and has declined in numbers because of control measures.

F. P. Stephens

The Magpie has increased greatly, as more insects have become associated with improved pastures, and as nesting sites have increased in farm plantations.

F. P. Stephens

The creation of large areas of open grasslands with improved pastures has suited the Stubble Quail. It nests in long grass in the spring.

J. R. McCann

The Hentys' homestead was built on the shores of Portland Bay, the sawn timber shingles and bricks having been brought on the "Thistle" in 1834. Major Mitchell visited the Hentys in 1839 and watched a whale chase in the bay from the verandah.

"New Idea"

(Above) The "Titanga" homestead was built by Alexander Buchanan in 1872. It is a comfortable family house with a wide verandah supported by iron columns and is typical of the period.

Henrietta Lang

The "Hermitage" homestead on Mt Hermit which was built in 1850 by David Reid, the husband of Hamilton Hume's niece. Situated near Barnawartha in north eastern Victoria, it has been in the Whitehead family since 1857, and carries a National Trust B classification.

F. D. Ackroyd

(Above) This early photograph shows a homestead site emerging from forest. For the settler it involved total commitment to many years of exhausting work.

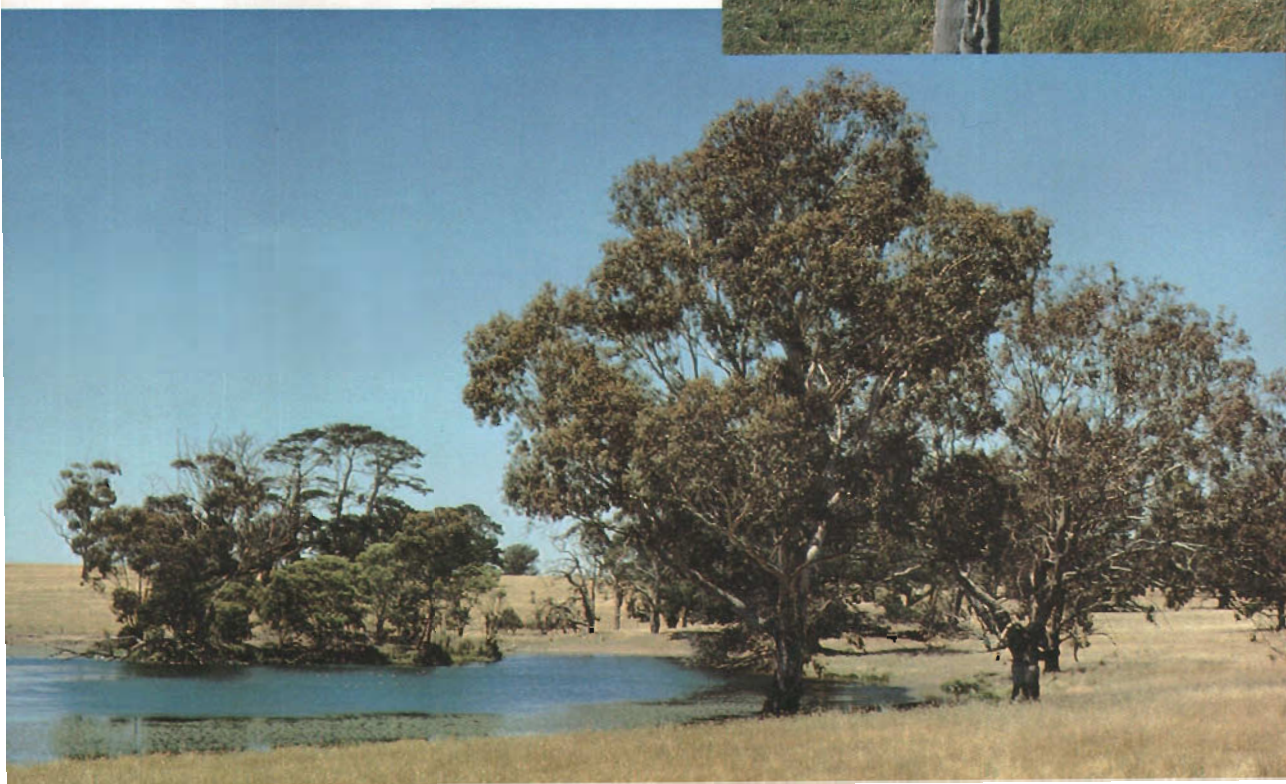
La Trobe Library

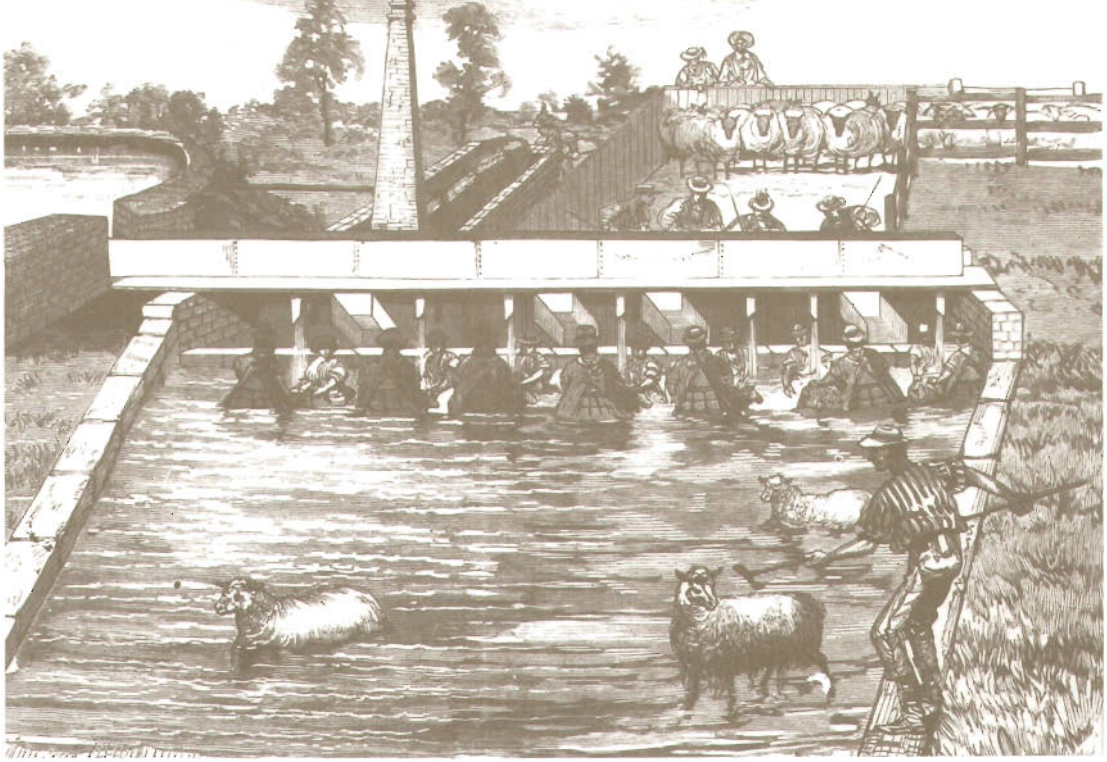
(Below) The landscape of "Titanga", Lismore, has been radically changed since the 1870s by the planting of 200 varieties of eucalypts and other natives and exotics. This has provided more adequate shelter and beautification of the landscape.

Henrietta Lang

(Right) A demonstration of the pasture treatments comparing superphosphate and manure on pasture containing subterranean clover.

J. E. Hosking





The sheep wash was a major capital investment on early sheep stations, and the washing process an exhausting task for the station hands and shearing team. Only a product of high value could have borne the costs of this procedure.

"Australian Sketcher" La Trobe Library

S. T. Gill's contemporary drawing of a shepherd and flock expresses the loneliness of the early sheep stations. The flock moves towards the primitive homestead for folding at night. The small fenced enclosure is for growing cereals.

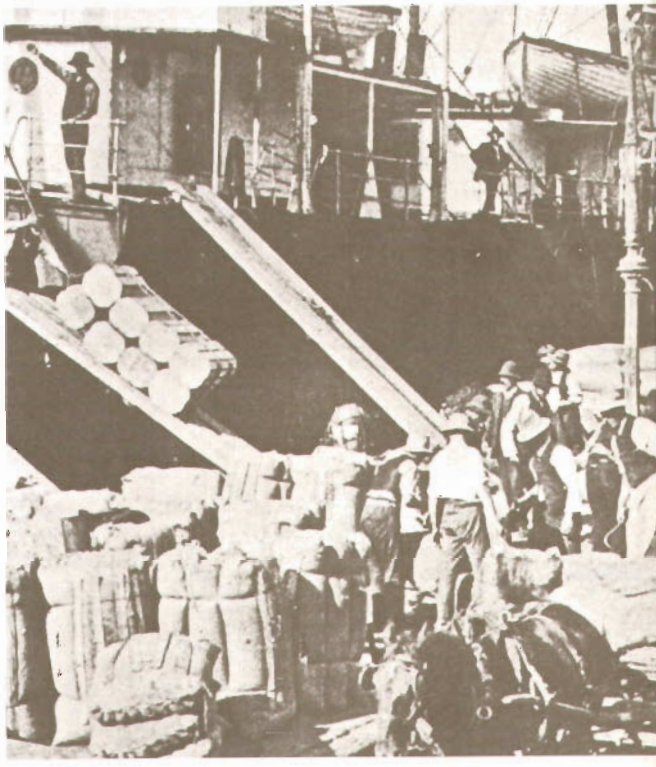
La Trobe Library

The bullock wagon bore the brunt of heavy transport in the early Colony. Bullocks were slow but they could manage bad roads and live off the land. After 1870 with better roads and some railways, horses replaced bullocks.

Department of Administrative Services

(Right) Millions of bales of wool left Australia by the process illustrated. The bales were processed by hydraulic presses to reduce bulk. The procedure is now being replaced by the use of high density bales packed in containers.

Geelong Advertiser



(Below left) Skirting fleeces and rolling them before pressing was an early development in the preparation of wool for sale. Skirting removes stained or sweaty wool and clumps of burr or seed where these are problems.

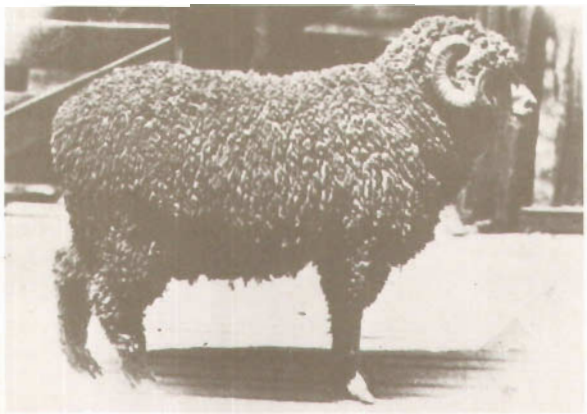
Australian Wool Corporation

(Below right) The sample staples of Merino fleece wool indicates fineness, crimp frequency, and yolk all of which are important to wool marketing and sheep breeding.

Australian Wool Corporation

(Opposite page) The demand for sheep meat in the Middle East is a new factor in Australia's export trade, and is changing economic priorities in management. The export of live sheep is a recent aspect of this change.

G. Baker

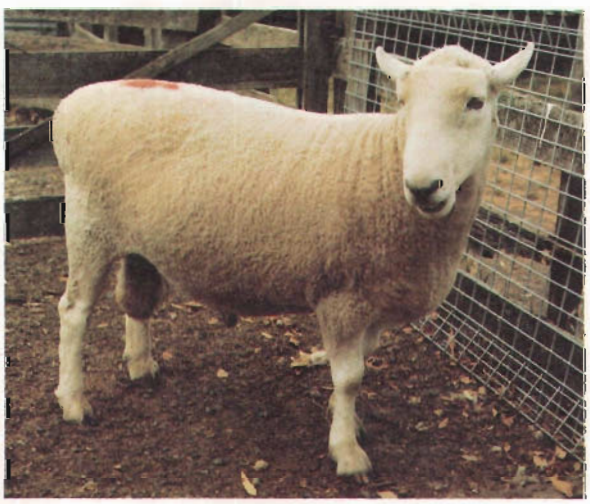


An Ercildoune ram from a sale catalogue of 1884. This was typical of the sheep of the Skipton show era, and represented Thomas Shaw's vision for the Australian Merino.

Robert Ingpen

The Vermont type of sheep which dominated stud breeding between 1880 and 1914. Having done great damage to Australia's commercial flocks, they were finally abandoned.

Department of Agriculture



The Border Leicester is one of the British longwools, and is used to produce Crossbred ewes for fat lamb production.

Kennedy Burnside

The Lincoln with its long coarse wool made a significant contribution to Australian sheep breeding in the formation of the Corriedale, Polwarth, and Comeback. It survives in very small numbers.

Kennedy Burnside

The Merino is still the dominant breed in Australia. There is increasing interest in crossing the various strains to achieve larger and more productive sheep.

Australian Wool Corporation

When the export trade in frozen meat commenced, the Corriedale was developed as a dual purpose breed. It is more often a wool and mutton breed than fat lamb producer.

Kennedy Burnside

Sheep grazing is a competitive economic enterprise in all but the most favourable natural conditions.

F. D. Ackroyd

(Below left) Shearing is the annual harvest of wool for the owner. Research has so far failed to replace the long established technique.

Nigel Smith

(Below right) Corriedale lambs 6 months of age waiting to be shorn. Wool value and their suitability for live exports are important factors in running these sheep.

F. D. Ackroyd

The Simmental is a new breed in Victoria, being derived from semen imports in the past decade. In Europe it is a dairy and beef animal of large body size. It has potential as a crossing breed for beef production.

Victoria Ferguson Livestock Publicity

The Murray Grey breed developed in Victoria mainly since the Second World War. The grey cattle first appeared on upper Murray properties. It is now a firmly established breed which does well in carcase competitions.

Murray Grey Beef Cattle Society

(Above) The Polled Hereford is a fairly recent genetic modification of the Hereford. Together the Herefords comprise the major breed in Victoria and the red and white cattle with their white faces are features of the countryside.

Australian Bureau of Statistics

(Below) The black polled Angus is the second most popular breed of cattle, being used in about half as many herds as the Hereford. It is low and compact and early maturing. In crossbreeding the colour and polledness tend to be dominant.

Angus Society of Australia

(Above) In recent decades the Friesian has been crossed with other breeds to become the dominant dairy breed. Steers of Friesian breeding perform well for beef production. Victoria exports significant numbers of breeding stock to developing countries.

Friesian Society of Australia

(Below) The Angus Hereford cross produced uniform progeny which are black and polled with a white face. In crossbreeding the main advantage comes from the use of crossbred dams which have better fertility and wean heavier calves than the parent breeds.

Australian Bureau of Statistics

(Left) The Shorthorn was the first British breed to become dominant in Victoria. It still has devoted stud breeders and a loyal but small commercial following. It has achieved a high degree of uniformity of appearance.

Australian Bureau of Statistics

S. T. Gill's drawing "On the Barwon" depicts the type of cattle first imported. They were large general purpose animals providing beef, work oxen, and dairy products, and were quite variable in appearance.

La Trobe Library

other organisms decomposing unused residues of plants and animals, and more vigorous flora and fauna in dams, streams, and lakes.

EFFECTS OF PASTORAL INDUSTRY ON WILDLIFE

The development of the pastoral industry in Victoria had a major effect on wildlife species: in some cases it led to their near extinction and in others it helped them to multiply. Both effects were caused mainly by the alteration of habitat in the clearing of trees, with its consequent variation of the flora and insect life on which the food chains of the various species depended.

The dingo was exterminated over most of the pastoral land in the early years because of the damage it caused to sheep flocks. It still persists over the mountainous parts of eastern Victoria where it has crossed with domestic dogs; the progeny have become greater destroyers of sheep than the original pure dingo.

Kangaroos were killed by the early settlers for meat and dog food, and because they ate pastures. However, they managed to survive in small pockets, and are now plentiful in such areas as the Grampians, the Macedon Ranges, and many national parks, and most country east of the Hume Highway. Generally they are on the increase. Much the same could be said of the emu, although its numbers are generally fewer.

The clearing or part clearing of the timber created large areas of open or semi-open grassland which suited the magpie and grass frequenting species such as the Stubble Quail and larks.

The creation of many farm dams was a benefit to the Spurwing Plover (now called the Masked Lapwing) and to some ducks, although the benefit to ducks may have been partly offset by the draining of swamps and the reduction in numbers of tree hollows for nesting.

The increase in the amount of carrion from dead farm animals and later from rabbits must have been of great benefit to crows and ravens and carrion eating raptores such as the Whistling Kite and Wedge-tailed Eagle. However, the eagle has declined in numbers because it has been regarded by some pastoralists as a predator of lambs and sheep.

The two white cockatoos, the Sulphur Crested and Long Billed Corella, have a greatly increased food supply from grain crops and have prospered; the spread of onion grass in western Victoria has been of benefit to the corella which digs up the bulbs. The notable spread southward of the inland galah during the past 30 years or so is almost certainly due to the increase in seed available to it.

The creation of more open grassland in earlier years caused the Plains Wanderer to increase, but the more recent practice of changing native grasses to more productive clovers and rye grass has probably been the cause of it becoming an extremely rare bird in Victoria.

The increase in grassland in earlier years must have helped the bustard; however, because it can easily be shot and has very desirable flesh, it has become a very rare bird. For the same reasons, the magpie goose has become almost extinct in Victoria. Both these birds are being bred at Serendip by the Fisheries and Wildlife Department for possible release in the wild.

However, the clearing of trees decreased the flowers available to the many nectar eating birds which abounded in Victoria such as the four brush tongued lorikeets and the many species of honey-eaters with their specially adapted tongues for extracting pollen. They all still exist, but in reduced numbers, and only in areas which retain the original vegetation. These are mainly in national or other parks, in mountainous country too steep to clear, in unfertile land not worth clearing, and in many instances, in home gardens.

The stone plover (now called by the official name of Bush Thicknee) has almost disappeared as a result of the clearing of timber and predation of foxes and feral cats. It was once very common and widespread.

Many species of birds and mammals of the denser shrublands exist in the remaining pockets of their original habitat only, and the clearing and draining of heathlands have caused some heathland species of both birds and mammals to become restricted in range.

The population explosion in the last century of the rabbit caused many pastoralists to keep large packs of dogs to help in their destruction, but the dogs also killed the Spotted

Native Cat and the Barred Bandicoot. The latter was extremely common on the grassy plains of western Victoria but became almost extinct in the 1920s. It is being bred at Serendip for possible release in the future; with the use of myxomatosis and 1080 poison to control the rabbit population it may increase in the wild. As well as being killed by dogs, the Spotted Native Cat declined for unknown reasons, possibly because of some introduced disease; it is now considered virtually extinct.

The greatest effect on wildlife has taken place in western and central Victoria where most of the land is fertile and not mountainous, and where the clearing of timber has been worthwhile for the grazing of cattle and sheep. Although many species have been wiped out in areas of the Wimmera and Mallee where the land has been cleared for cereal growing, there are still large areas reserved in national or other parks which harbour all the species which once existed. Barring disastrous and widespread fires they can be considered to be safe for posterity.

A very large proportion of the land east of the Hume Highway has never been and will never be cleared of timber; all the species that once lived there still do so, even if in restricted areas.

The present significant increase of national and other parks in Victoria will probably ensure that there is sufficient habitat for all the original species of wildlife to survive, except the Spotted Native Cat which may be extinct here but is still plentiful in Tasmania.

CONCLUSION

The use of domestic animals, particularly grazing sheep and cattle, was central to the purpose and process of settlement and to the economic success of the venture.

In due course the developed resource of the grazing lands and the populations of sheep and cattle became the major component of the economy of Victoria, except for the period when gold was dominant. This prime position in the economy was subsequently threatened by manufacturing, mining, and energy industries, but the threefold increase in productivity in the past 50 years has enabled it to continue as a most significant contributor to the prosperity of the State.

The development of the grazing industry was influenced by the cultural and agricultural background of the settlers who were required to adopt the British tradition to a much drier climate, much less fertile soils, and a much more extensive economy. Where the British tradition worked it was adopted; where it did not, great ingenuity was shown in providing a solution as in the cases of washing sheep, controlling scab, fencing, homestead buildings, and mechanised shearing.

These two aspects of the adaptation of traditional methods to a new environment are illustrated in animal breeding. The breeds of cattle available from Britain at the time were well adapted to the multi-purpose use involving breeding work oxen, fat bullocks, and cows capable of being used for dairying. The British tradition of stud breeding was adopted and Victorian breeders have in general continued to operate as an extension of the British cattle breeding. As a consequence there has been little adaptation of cattle to the Victorian environment.

With respect to sheep, the initial approach was different. There was no British breed of sheep which produced the high quality wool required by the British wool industry. The Australian Merino was developed as a group of strains each originating in a different region and the Victorian contribution to this was the development of this process involving definition of aims, arousing widespread interest, and providing a basis for community participation in the project. Although frequently described as selecting to suit a particular environment, economic aspects including wool value and fleece weight were the priority selection criteria. The formation of the Australian Merino during the period 1850 to 1880, which was accompanied by an increase of the order of 80 per cent in clean fleece weight, must be regarded as one of the great achievements in the history of animal breeding.

The adaptation of the environment to the animal requirements in the form of pasture improvement was the most significant development. A permanent change has been made to the fertility of Victorian soils and to the plant communities which constitute the pastures. The result has been the evolution of a new ecology in which domestic animals and wildlife, both native and introduced, share a plant community composed of native and introduced species.

The original squatters and their successors are often criticised for negative attitudes towards the environment and wildlife. While there is some justification for this, lack of knowledge at the time must be recognised and the mistakes of the squatters in the introduction of species which became vermin and noxious weeds were actively supported by the leading scientists and academics of the time. While too much forest was cleared in many areas, there are credits in other parts including the widespread planting of shelterbelts and the preservation of a high proportion of the red gum forests of western Victoria.

Of the squatters who came to make their fortunes and return to England to retire, most stayed to die in the land they had so tenaciously adopted.

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