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PHASES IN THE DEVELOPMENT OF THE AUSTRALIAN SHEEP INDUSTRY

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INTRODUCTION

This is an overview of the Australian sheep industry as a whole using some examples from other States but making specific reference to the South Australian sheep industry.

There have been a number of phases in the development of the Australian sheep industry which can be outlined under a series of broad headings:-

I Production Oriented Phase

II Health Oriented Phase - Both Pastures and Animals

III Increased Production Phase

IV Economics and Marketing Phase

I PRODUCTION ORIENTED PHASE

1. The Breeding Phase (1800-1950)

Soon after the introduction of Merinos to Australia it became obvious that they were not suited to the extensive pastoral lands which were the principal areas for the breeding of sheep in the last century. Much of the cereal zone was covered with trees at that time and was only cleared and developed later as the population increased.

The original Saxon Merino was modified by crosses and selection in N.S.W. by the Peppin Bros. and in South Australia by the Hawker family, Murray family and Mr. Fisher. Two distinct strains of Merino were developed. A medium size wool strain in N.S.W. and the large framed, long stapled, strong wool strain in South Australia.

These sheep were bred primarily for the pastoral country of low rainfall (less than 250 mm per year).

Wool production was increased from 2-3 kg/head to 4-5 kg/head by careful selection and breeding and some use of measurement in the early years. The bodyweight, fertility and fecundity of these strains were also increased so that it was possible to have ewes of 40-50 kg and wethers from 45-60 kg in liveweight. There are even records of superfine Saxon wethers cutting 5 kg of wool in Tasmania at that time.

However, flock numbers fluctuated dramatically with seasonal changes which affected both feed and water supply.

The introduction of the wrinkly Vermont Merinos from U.S.A. by Sir Samuel McCaughey in the late 1800's increased greasy fleece weight of rams but not necessarily clean fleece weight. Individual rams cut fleeces of 20-25 kg but the yield of clean wool was as low as 20% in some cases. The problem of wrinkles accentuated the growing sheep blowfly problem which increased to disastrous proportions in the 1930's and 1940's. This crisis led to important research into blowfly control by breeding out the wrinkles from some strains of Merino, notably the South Australian Strongwool strain and later the Fonthill Merino.

2. The Superphosphate Phase (1885-1930)

It was soon discovered that much of southern Australia, particularly South Australia and Western Australia, suffered from acute phosphorus deficiency and the soils and crop yields soon deteriorated on new land. The late Professor Lowrie at Roseworthy College initiated work (which commenced in 1883) on the role of phosphorus in soil, which heralded enormous and miraculous improvement in both crop and pasture production.

A major problem, however, was that the traditional fallow/cereal crop rotation depleted soil fertility and adversely affected soil structure.

By the late 1930's and early 1940's there was severe soil erosion in the form of wind erosion in the lighter soils and water erosion in the red brown earth type soils on slopes in the highlands to the north of Adelaide.

The disastrous depression of the early 1930's forced many people off the land, particularly soldier settlers allocated blocks too small from which to make a living in the lighter soil regions in the Murray Mallee and Upper Eyre Peninsula. (I was reared on a property at Mount Mary, 20 km from Morgan on the River Murray, in a 225 mm rainfall area where we experienced nine droughts in a row and suffered the depression as well.)

3. The Pasture Research Phase (1931-1950)

At its formation CSIRO (or CSIR as it was then) initiated basic research work into pastures and problems of soil fertility, in particular those resulting from trace element deficiencies.

Roseworthy College was the forerunner of the Department of Agriculture in South Australia and the research and administration work was carried out by the South Australian Department from its formation c. 1887. Other research work was carried out by the universities, of which some of the most outstanding was that of Professors Trumble and Prescott at the Waite Institute on rainfall evaporation and drought frequency, and soil and crop studies.

The discovery by Mr. Howard of Mount Barker of subterranean clover in 1930 heralded an era which transformed much of southern Australia in the Mediterranean region. The sowing of Mount Barker sub-clover, as it was called, in a wide range of environments, lifted production of animals and crops enormously. Further work was initiated to select cultivars which were more suited to some of the more extreme environments and soil types in which it could be grown.

Low prices for animal products and cereal grains in this period prevented the development of much of the cereal zone (250-500 mm of rainfall) and certainly the more heavily wooded high rainfall zone (greater than 500 mm of rainfall per year).

The spreading plague of rabbits in the 1940's further limited pasture establishment and utilisation of pasture by domestic animals.

II HEALTH ORIENTED PHASE - Pastures and Animals

4. Trace Elements (1940-1970)

Certain soil types became problem areas in which improved pastures could not be grown satisfactorily and/or animals wasted away and died; particularly in the calcareous sand dune areas of the then 90-mile desert (Coonalpyn to Keith) and calcareous limestone areas along the coast of South Australia, in particular the Murray Mallee and Yorke and Eyre Peninsulas.

(1) Copper Deficiency

Sheep with black wool developed white cr grey bands across the staple. Sheep with well-crimped wool developed a secondary wave over the normal crimp, which finally straightened out and was lost to give a shiny steely appearance (hence the name "steely" wool). Fortunately, Merino wool is a sensitive indicator of copper deficiency.

More severe deficiency affected pasture and crop growth. It also affected the health of animals so that blood and liver reserves were extremely low and the breeding performance of ewes was affected. Lambs developed "sway back" or ataxia due to inco-ordination of the hindquarters as copper deficiency affects the central nervous system.

Work done at the CSIRO Division of Nutrition in Adelaide, followed by further research by officers of the Department of Agriculture, discovered that in areas of low carrying capacity (less than 2 sheep per ha) copper supplements could be supplied:-

- in a mineral lick (commercially available);
- or as minerals dissolved in non-metal drinking troughs (because copper reacts with metal);
- or as sub-cutaneous copper glycinate injections.

In areas with over about 400 mm of rainfall suitable for sowing of crops and/or improved pastures, copper supplements can be applied with fertilizer applications. Copper is supplied by the fertilizer companies mixed with superphosphate as 1.25, 5 or 10 kg of elemented copper per tonne. As the cost of mixing is one of the major costs, we recommend using the 10 kg/tonne, which is equivalent to 40 kg of copper sulphate (blue stone) per tonne of fertilizer.

Recent work by Messrs. Reuter and Hannam has shown that, once there has been 2-4 kg of elemental copper applied per ha, this is sufficient to last at least 20 years and will correct the deficiency of copper in crops, pastures and animals. The use of black sheep as indicators of copper deficiency is a useful aid.

<u>Warning</u>: There is a warning that livestock should not be put onto copper top-dressed pastures until there has been at least 8-10 mm of rain to wash the copper off the plant leaves or stock may be poisoned.

(2) Cobalt

Cobalt is necessary in the rumen of ruminant animals to enable the bacteria to manufacture Vitamin B12, which is essential in the formation of red blood corpuscles.

Animals deficient in cobalt became anaemic with pale, tender skins and young sheep wasted away and exhibited watery or rheumy eyes as an indication of the deficiency.

When cobalt and copper deficiency occurred together the disease was called "coast disease" because it was so common near the coastline of South Australia. Unfortunately cobalt could not be stored in the liver and weekly drenches of cobalt sulphate were necessary but these were too costly and alternative methods of administration were sought. Top-dressing of pastures with cobalt was not practicable so a "bullet" of cobalt oxide was administered and which slowly releases cobalt to the animal. The addition of a grub screw of similar size (1 cm by 1 cm in diameter) provided friction to keep the surface clear of precipitants and aided in the release of cobalt to the animal.

The use of Phalaris as a grass in south-eastern pastures increased pasture production enormously as the plant grows profusely. However, when almost pure stands of Phalaris were grazed while it was young and growing vigorously, sheep developed staggers known as "Phalaris staggers" in which their heads started to nod and when they tried to run they crashed forward onto their jaws. The application of cobalt bullets into the reticulum corrected this problem.

(3) Zinc

Certain sub-clover based pastures in the South East of South Australia did not grow until traces of zinc sulphate were added to the fertilizer. The use of these three trace elements (Cu, Co and Zn) and plentiful applications of superphosphate up to an aggregate of 2 tonnes per ha, transformed the 90-mile desert and caused it to be renamed the Coonalpyn Downs. Stocking rates increased from 1 sheep to 5-10/ha up to 5-10 sheep/ha as sub-clover based pastures were grown in the winter and lucerne pastures were grown in the summer (until recently when the aphids have almost destroyed it).

(4) Molybdenum

Quite large areas of laterite soil in Victoria did not produce very good pastures, except where tree stumps were burnt. Finally, molybdenum was isolated and very small quantities of about 50 g/ha were mixed with the superphosphate. This transformed pasture production in those areas.

However, there are peat soils in some areas, notably at Eight Mile Creek, south of Mount Gambier, which had an excess of molybdenum which tended to render copper unavailable to the animal. Consequently, the delicate balance between the two elements had to be studied carefully. Often copper had to be applied at the same time as molybdenum.

(5) Selenium

In certain areas of the high rainfall zone animals develop white streaks in the muscles of their hearts and other parts of their bodies and wasted away and died (hence the name white muscle disease). It was found that selenium, also administered as a bullet into the reticulum, could correct this deficiency and so stimulate growth rate, wool production and meat production of sheep grazing in these Se deficient areas.

Summary

It will be noted that all of these trace elements will not produce much pasture growth or animal response by themselves but are dependent upon correcting the much more severe phosphorus deficiency of most of southern Australian Mediterranean soils. There are a few soil types in Australia in Western New South Wales and southern Queensland that do not need superphosphate.

The CSIRO at "Chiswick", Armidale, commenced work in 1947, spanning these two phases mentioned above, and helped understand much of the complex pasture/animal relationships. The CSIRO at Dickson first, and later at Ginnindera near Canberra, augmented this work, together with the Universities and Departments of Agriculture around Australia.

The potential for expansion of pasture and livestock production in southern Australia was severely limited by the large rabbit population and the relatively low prices for agricultural products. There were only limited funds available for development, which included clearing of scrub, sub-division, watering and sowing down of pastures. Expansion was further halted by the very severe three year drought of 1944-46 when the South Australian sheep population fell from 10 to 6 million. In the same period the Australian sheep population fell from 123 to 96 million and did not recover to pre-drought levels until 1953.

III INCREASED PRODUCTION PHASE

5. Post-War Boom - Developmental Phase (1950-70)

After the Second World War ended in 1946 there developed an enormous demand for wool and other agricultural products. From 1950-56 there was an exceptional run of above-average seasons and an unprecedented rise in prices for wool in particular and for most agricultural products.

(1) Pasture Improvement

The dramatic rise in incomes to farmers enabled them to re-invest a considerable portion in expansion and development. This period saw the rapid development of large areas in the cereal zone and, particularly in the high rainfall zone with the clearing of scrub and forest, correction of macro (phosphorus, potassium and nitrogen) and minor (copper, zinc, molybdenum, selenium and cobalt) element deficiencies.

Development costs could be used as a taxation deduction which provided a strong incentive for developing new land and expanding production.

In this period South Australian sheep numbers increased from 10 to 19 million by 1969 and the Australian sheep population increased to 181 million in the same period. Probably the most dramatic increases occurred in Western Australia where there were huge areas cleared and sown to pasture (often at the rate of ½-1 million hectares per year being sown to pasture). The State population in W.A. increased from 10 to 35 million in this period.

A halt to the expansion occurred with the serious 1967 drought. It was severe in its intensity but was not as prolonged as the 1944-46 or the 1975-78 droughts.

However, because of the destruction of the rabbit population and the greater stability resulting from the pasture improvement and the development of the South Australian Ley Farming System in the cereal zone, there was only a drop of 1 million in the sheep population and no decline in the cattle population and recovery was quite rapid.

(2) <u>Sheep Selection and Breeding Research</u>

During this period an attempt was made to separate the effects of improved pastures and use of fertiliser on pastures from the effects of selection and breeding on increasing wool production particularly in the Australian Merino which comprises 75% of the Australian sheep population. It was discovered that most of the increase in wool production per head in Australian commercial wool flocks could be attributed to the use of fertiliser and improved pastures rather than as a result of selection and breeding. Indeed it was calculated that the increase in average wool production from genetic means over the previous 30 years was as low as 0.03 per cent per year. Experiments were started in the CSIRO by Dr. Helen Newton-Turner and at Trangie by Dr. F.H.W. Morley and later Dr. R.B. Dun based on selection for and against single characters. It was clearly demonstrated that the average gain from visual selection alone as practised by many stud breeders could only produce gains of up to one per cent per year in increased wool production compared with up to three per cent if measurement of clean fleece weight alone were used.

However, it was never recommended that measurement should be used by itself but only as an aid to selection among sheep already selected visually and approved as acceptable by the stud breeder. Depending upon the emphasis given by the stud breeder to show characteristics, and characteristics not of economic importance in commercial flocks (even if they did help to sell rams), gains in wool production of up to two per cent per head per year were possible.

The stud and commercial Merino sheep industries were developed during the previous century into a hierarchy of large parent or closed studs at the top of the pyramid to the daughter or general studs at the second tier and commercial flocks at the third tier. The large social pressures based on (a) genetic influence (b) social influence and (c) commercial or vested interest influence kept stud breeders within the limits defined by their peers with a few notable exceptions. Dissatisfaction with this system and the fact that a number of breeders felt they were not able to purchase rams of the type which they desired at a price which they could afford to pay led to them looking for alternate means of breeding or obtaining rams. Many of them became stud breeders in their own right and they then had to abide by the rules of their breed association. Others were stimulated by the growth of group breeding schemes in New Zealand.

Mr. Jim Shepherd in Western Australia, himself a stud breeder with over 4 000 stud Merino ewes, caught a vision of what could be accomplished by the use of scientific principles of genetics in breeding. He formed the Australian Merino Society (A.M.S.) which has now been developed into a pyramid or hierarchy similar to the stud Merino industry illustrating that either have the potential for passing on genetic gains at the top of the pyramid down to commercial flocks at the bottom.

This group breeding scheme has a central nucleus flock of about 5 000 ewes at the top of the pyramid, a number of ram multiplying flocks at the second tier and some 600 commercial breeders at the base corporately owning

1.5 million ewes. The major difference between this scheme and the stud industry is that measured high producing acceptable ewe hoggets ($1-1\frac{1}{2}$ years of age) can move upwards to the central nucleus and top rams move down, either via the ram multiplying flocks, directly to commercial flocks or via the use of artificial insemination. Some 100 000 ewes in the second and third tiers have been inseminated by the top central nucleus rams each year in recent years.

Some 1-2% of the top ewe hoggets from commercial flocks move up to the ram multiplying flocks and the top half per cent of ewe hoggets born in these second tier flocks move up the central nucleus: Thus drawing on the genetic potential of this huge flock of sheep.

IV ECONOMICS AND MARKETING PHASE

Both Australian and South Australian livestock sheep numbers reached an all time record in 1969. It could be regarded as a culmination of the developmental phases mentioned above.

Subsequent events caused producers, extension and research workers, economists and administrators (both Governmental and political) to reconsider the goals of the sheep industry. It became clear that insufficient emphasis had been given to the marketing of the products of the sheep and other industries. An example of this is the way in which the wool industry developed. Generally it grew as a fragmented series of operations, not always related directly with one another. Even wool processing machinery was only developed to handle the wool that was available rather than attempting to modify the wool clip so that machines might operate more efficiently.

The rapid expansion of the textile industry to cope with burgeoning populations in most of the consuming countries led to the dramatic rise of the synthetic or man-made fibre industry. The proportion of the total textile fibre requirements filled by wool continued to decline. Even if all wool is sold each year the wool industry could not provide sufficient fibre to satisfy the needs of the textile industry. It then became a competitor and the stimulus from the synthetic fibre industry motivated considerable research into wool as a fibre and its promotion to consumers.

A further development in the Australian wool industry has been the growth of the Australian Merino Society Group Breeding Scheme. As mentioned above, this scheme now incorporates over 600 producers. In addition to being a parallel method for breeding sheep with the aid of scientific principles and for distributing rams to producers at reasonable prices the A.M.S. has become a marketing system for wool.

The innovator and promoter of this scheme, Mr. Jim Shepherd of Kwolyin, W.A., has visited wool processing mills in the major consuming countries in an attempt to define what they require in an effort to increase the efficiency of wool processing compared with that of synthetic fibres. He discovered that in many cases wool yarn has to be spun at slower speeds than synthetic yarn because of limitations of the raw wool product due to environmental or genetic influences.

However, the very best wool fabric from a top tailor in London exhibited amazing characteristics not seen in other fabrics. On analysis it was observed that the fibres in the yarn were more uniform than the average in fibre diameter without coarse fibres greater than 30 microns.

Resulting from these investigations one of the aims in the breeding program for this group breeding scheme is to produce wool of a definite type (without coarse fibre) in sufficient quantities to supply a complete mill, i.e. quantities in the order of 1 000 bales of wool per week.

This is only one example of the need for studying market requirements and directing production to meet those requirements. A similar situation has developed in the meat industry, cereal grains and now alternative crops.

If a satisfactory market can be identified and conditions are suitable for producing such an item, then research and extension are directed along these lines.

Because of the small population in Australia relative to the major consuming countries a very large proportion of many Australian agricultural products are marketed overseas rather than locally. Consequently the prices determined on those overseas markets, over which we have little control in this country, tend to influence strongly the price on the local market as well.

Efforts are being made to attempt to even out the violent fluctuations in both production and marketing of Australian agricultural products. The present beef and wool booms would tend to indicate that these efforts need to be revised.

6. The Collapse of Wool Prices (1970-71)

Many producers were caught towards the end of the expansion phase because they were unable to service their debts incurred in developing large areas of land. The collapse of wool prices brought with it a drop in prices for meat; Wheat quotas prevented expansion to alternate enterprises.

Many sheep farmers panicked and changed over the cattle in what turned out to be, in many cases, an unwise decision. The efficient sheep farmers continued to make a profit out of sheep. Those who changed to beef cattle often had little knowledge or experience in their management. Large costs were incurred in upgrading fencing, watering and yard facilities to handle cattle and the boom in beef prices was short-lived.

7. The Collapse of Beef Prices

Farmers began to realise that the sheep was an extremely versatile animal with a number of market outlets, viz: wool, mutton, lamb and the developing live sheep trade to the Middle East. Producers were caught in an unprofitable position after having bought breeding cattle at exorbitant prices of over $200 per head and discovered that the market fell to $50 or less. It became unprofitable to market even fat cattle.

Fortunately, there were two outstanding seasons in 1973 and 1974 when the pastoral zone had exceptionally high rainfall of from 400 - 1 000 mm per year. The cereal zone also had outstanding seasons. Therefore it was possible to retain the surplus cattle without undue inconvenience. The beef prices began to rise again before the onset of the severe 1975-78 drought and it was possible to unload some of the surplus fat cattle.

8. The Effect of Severe Drought (1975-78)

As a result of this production-oriented developmental phase, livestock production reached very high levels with some 37 million dry sheep equivalents in South Australia in 1974 (17.6 million sheep and 1.7 million beef cattle and 200 000 dairy cattle). These numbers were greatly whittled down by sales at unprofitable prices in many cases. In the severe years of 1976 and 1977 and early 1978, some cattle were killed, burned and buried and the "Potter" Scheme to dispose of unsaleable shorn sheep for 40¢ a head as meat meal was introduced. A Compensation Scheme was introduced to pay $10 a head compensation for cattle slaughtered as unsaleable.

This severe drought tested the South Australian Ley Farming System to the limit and emphasised the need for conservative stocking in the lighter soil areas of Upper Eyre Peninsula, North of Yorke Peninsula, the Murray Plains and the Murray Mallee. Farmers in these areas must retain stock in reasonable condition so that they have flexibility to dispose of them quickly at satisfactory prices before drought conditions become too severe. It is important to retain a cover of pasture or pasture residues on light sandy soils to avoid wind erosion which devastated large areas during the drought. This raises the question whether some of these light sandy areas with low and erratic rainfall should be allowed to return to a pastoral, grazing-only situation rather than trying to continue cereal growing with attendant risks of soil erosion. Some farms around Cowell on Eastern Eyre Peninsula have been allowed to return to saltbush, some trees and herbs and grasses which are grazed at low stocking rates designed to maintain stock in strong condition and a satisfactory soil cover.

9. The Present Position (1978-1979)

Livestock numbers have begun to recover after the drought with the advent of a good season. The sheep population at March 31st, 1978, fell to 14.1 million and probably was down to 13.5 million before the drought broke on 1st June, 1978. Cattle numbers fell to 1.25 million of which 1.1 million were beef cattle.

Recent dramatic rises in the price of wool, mutton, lamb and beef have encouraged producers to build up numbers again. There has been considerable resistance to rebuilding cattle numbers in the cereal zone because of the drought experiences and the aphid attacks on lucerne areas, particularly in the Upper S.E.