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# BEEF, MUTTON, AND WOOL

A PRACTICAL HANDBOOK ON MEAT  
AND WOOL PRODUCTION FOR THE  
AUSTRALIAN FARMER

BY

W. S. KELLY

PREFACE BY MR. GEORGE JEFFREY

(CHAIRMAN OF THE STATE WOOL COMMITTEE OF SOUTH AUSTRALIA)

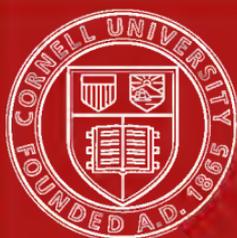


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**BEEF, MUTTON, AND WOOL**







FLOCK SOUTH AUSTRALIAN MERINO WETHERS

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BY  
W. S. KELLY

NEW EDITION, REVISED AND ENLARGED

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## FOREWORD

IN writing a short foreword to my old student and friend, Lieut. Stanley Kelly's excellent work entitled "Beef, Mutton and Wool," I feel sure that I will be voicing the mind of all readers of this little book when I make the only reasonable adverse criticism that can be made, viz.: that the author has not given us enough of that knowledge which he has gained from a lifelong experience on the farm, together with the unique advantages he had while convalescing in the Old Country after being wounded in the great war, to which he had gone as a soldier. This is the more regrettable, because the writer has demonstrated that he not only possesses the requisite knowledge to write a book, but has a ready and easy pen, and is able to put his theories and facts in such a way that "he who runs may read."

The opening chapter on Sheep Breeding is quite unique, in that the principles of breeding are laid so bare and plain, and yet on such sound and scientific lines that the ordinary man will better understand the inner meaning of breeding, and thereby be encouraged in his work and have a fresh interest in that all-important subject.

The writer of this book does not suggest that as a result of reading his work farmers will become experts in the varied branches of Beef, Mutton and Wool production, but rather is his idea to give help along lines which are badly needed; and if, as a result of reading this little work, farmers and those interested receive that stimulus and encouragement which are so necessary to-day when increased production may almost be said to be the salvation of the economic world, then the writer will, I know, be amply repaid.

I can only express the hope that in the near future Australian farmers will have the further pleasure of reading another and larger book, written in the same plain and practical way by Mr. Kelly.

GEORGE JEFFREY.

## PREFATORY NOTE TO FIRST EDITION

THIS little text-book is intended primarily for the use of men in the Australian Imperial Forces who, with or without previous experience, propose to engage in stock-raising and meat-production on their return to Australia. It is compiled for the farmer, and particularly the small farmer, rather than for the pastoralist. It aims at being a guide, and supplement to, and not a substitute for, the practical instruction and training to be given by the expert instructors of the A.I.F. Education Service. At the same time, it is hoped that it may prove of some value to those who, for various reasons, may find themselves unable to attend the A.I.F. classes.

The need for a book of this description arises from the fact that Australian works upon the subject, even if suitable for the present purpose, are not available, and English books, while of value for reference, do not cover Australian conditions.

The writer is indebted to some of the leading English scientists in stock-breeding for the generous and valuable advice and assistance they have given him. The work is essentially of a practical nature, and is largely the outcome of the writer's actual experience as a farmer and stock-raiser in Australia. Many of the matters dealt with have necessarily been treated in a condensed form, but it is believed that sufficient data is given to form the basis of a course of lectures covering all the essential points of Australian meat and wool production on the farm.

The chapters dealing with the Mendelian theory, and the constituents of foods, make no claim to be exhaustive, but have been included for the benefit of those who are unable to obtain the necessary books or to give the time required for a more complete study of these two important subjects. For more adequate treatment, the student is referred to the books of reference indicated at the end of these chapters.

Australia has a unique opportunity to develop her meat and wool industry. The demand exists and high prices are virtually certain. If the Australian farmer adopts the right methods of production, we can double our supply of these commodities. This will mean prosperity to the nation and to the individual.

W. S. K.

CAMBRIDGE, 1918.

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## INTRODUCTORY NOTE

THIS handbook was compiled to meet a peculiar need. A large number of men of the A.I.F. were unable to return to their homes after the Armistice. During the waiting period there arose a great demand for authentic information and a great hunger for instruction. Hence this book. The reception given to this little publication was very gratifying indeed. Since my return I have been asked to reprint these pages. The enquiry has come from breeders of note as well as from young men intending to take up mixed farming. I have revised a few statements and added some valuable data.

I hope this little book will act as an incentive to keener work and greater production.

W. S. KELLY.

Merrindie,  
Giles' Corner,  
South Australia,  
February, 1920.

## NOTES ON BREEDING

A STRANGE confusion exists in the minds of most men as to the general principles that should guide the stock breeder. Should the chief consideration be the individual excellence of the sire or dam or their breeding? When does line-breeding merge into in-breeding? How is it many of the most historic stud animals have been the result of in-breeding. When is it advisable to in-breed? When dangerous?

Again, does pregation from a sire of another breed affect the dam's subsequent progeny? In other words, would a Clydesdale mare be impaired as a Clydesdale breeder through having a foal to a blood stallion?

Some go so far as to be openly sceptical of the value of breeding altogether, and say that exceptions are so common that it is feeding, not breeding, that matters. Yet it must be admitted that we owe an untold debt to the care and persistence of the breeders who evolved our noted strains. Even during the last few years we have seen a remarkable advance in quality and productive power. Moreover, the understanding of essentials costs no money. Nor is the exercise of care in breeding expensive. Millions are lost yearly because of careless indifference on the part of stock breeders. All need not be stud men, but all can, and should, aim at quality in breeding. Few fields show more room for improvement. Without any attempt to be exhaustive, a few fundamental principles and practical suggestions may be laid down.

### "LIKE BEGETS LIKE".

The principle that "like begets like" is the most generally accepted of all theories of breeding. There are many and important exceptions to the rule, some of which will be considered later, but generally speaking it is a sound principle upon which to work. If one consistently culls from his dams inferior animals, and chooses for sires those showing most prominently the characteristics he requires, he must substantially improve his flock or herd.

In choosing a sire it is always wise to buy him as nearly as possible in his natural condition. Many young sires are so artificially forced that their development appears abnormal. Often, however, this development does not continue; the youngster so

full of promise turns out to be a common animal when fully grown. When choosing a bull, therefore, inspect the herd, examining the young bulls together. The animal that stands out prominently under conditions common to all is the one that, generally speaking, will give satisfaction. The mistake is often made of purchasing at shows precocious youngsters whose development is often the result of extreme forcing. If the learner will develop a critical eye for points of frame, constitution, and style of carriage, and will learn to distinguish between fat and flesh, he should soon know how to choose the sire that will improve his herd.

#### CORRECTIVE MATING.

But perfect animals are seldom bred and more seldom bought. Side by side with the principle of breeding only from the best, it is important to practise "corrective mating." Practically all animals have definite and distinct faults. Many have good points equally definite and distinct. The art of the breeder lies largely in judicious mating to correct faults and to perpetuate good points. Only experience and close study will develop the instinct that enables a breeder, by corrective mating, to build up the type he desires.

Supposing a breeder decides that his shorthorns are too bare at the "pins"; the hip bones stand out too prominently and are not covered as they should be with flesh; the breeder will seek a bull strong in this point, one whose pins are almost hidden in flesh. Possibly the bull may slightly incline to be narrow across the hips, but this will be rectified by the tendency of the herd and he should greatly improve the "bare pins". One may easily go too far in mating extremes, but the principle of corrective mating is sound and can be practised in any flock or herd.

#### SELECTION.

Closely allied to the practice of corrective mating is that of selection. The history of breeding is full of illustrations of how men have selected towards a certain standard, until they have evolved an animal altogether superior to that from which they started. This has been well illustrated in the latter day history of the Australian Merino. The middle north Merino flocks of South Australia were noted as big plain-bodied sheep, carrying good fleece of great length, and strength of character. They were lacking, however, in other regards. Often they lacked density, particularly along the back, nor was the quality of the wool all that could be desired. To correct these tendencies the Canowie Pastoral Company and other big sheep breeders imported from New South Wales outstanding sires of Wanganella blood. One of the most famous of these early importations was Donald Dinnie, for

whom £1,200 was paid—a big price for those days. This ram and those purchased by other enterprising breeders have greatly improved the stud sheep of the State. Without losing the features for which South Australian Merinos were previously noted, they added an excellence of quality and an important density of the fleece, greatly increasing its value.

Two considerations are important in the matter of selection. First, selecting characteristics that are not merely the outcome of environment. Much time and patience are wasted in trying to fix the unfixable. Many characteristics are purely the result of circumstance, and cannot be transmitted from one generation to another. Secondly, it is important to concentrate on certain definite characteristics; often on one point alone. Not that other points must be neglected. The faddist who seeks after one point, ignoring all else, is almost certain to fail. But concentration is nevertheless essential. Supposing one decides his herd is faulty in several points, say lacking in depth, "handle" of flesh, and style of head. Naturally he will seek a sire strong in all these points. But such accommodating sires are not easily found. Moreover, it is important that the sire shall not impair other points which he desires to retain in the herd. The wisest plan will therefore be to buy an animal as evenly sound as the pocket will allow, providing that he has the particular point most desired strongly emphasized. Even then it will take years of patient work before the weakness has been made good. If one tackles all the faults at once, one is likely to fail all around.

#### VALUE OF PEDIGREE.

While it is true that, upon the whole, like begets like, yet this is but part of the truth. As a general principle, we must insist that the individual animal be strong in essential points, and that, no matter how an animal be bred, it does not pay to use a mean specimen; yet, we must look keenly into the pedigree. In stock breeding, as in other matters, much of the future can be foretold by a study of the past. Learn to examine a pedigree carefully. See that there are no weak links, particularly in the nearest two generations. Breeders are adepts at laying emphasis upon the points in which the pedigree is strong, but more often than not maintain discreet silence where there is weakness. Always examine, therefore, the record and breeding of the grand dam on the dam's side. This is usually the weak spot. Many writers on questions of breeding complain of the emphasis placed upon the breeding of the dam on the maternal side, as printed in most pedigrees. But it would be an impossible task to print the genealogical tree in full, and usually one can take it for granted that the sire is a specially picked animal in quality and breeding. This is less likely to be so in the case of the dam.

## LENGTH OF PEDIGREE.

While it is important to place due emphasis upon ancestry there can be little doubt but that with some, length of pedigree has become almost a fetish. Many Shorthorn breeders place great stress upon families. A certain beast is in great demand because he or she dates back to some mystical cow of some 15 generations ago. How great a sway have the Duchess and Kirklevington strains held over the imaginations of men!

Galton's law of heredity can only be taken as a guide when applied to a large number of cases—many exceptions will occur in individual cases; nevertheless it is of interest as indicating the average influence of the generations. Galton teaches that the character of the immediate parents have, on the average, as much influence as that of all the other ancestors put together. He describes the effect upon the progeny thus:—

Each parent's influence as  $\frac{1}{4}$ .

Each grand parent's  $\frac{1}{16}$ .

Each great grand parent's  $\frac{1}{64}$ .

Someone interested in mathematics might figure out the influence of one dam in the fifteenth generation! But while the importance of length of pedigree can easily be overestimated, it is vitally important to find out all one can of the parents and grand parents of a sire. Personally inspect the parents wherever possible. If a beast has points common to both his parents, the probabilities are that he will throw true in such points. The extent of prepotency to be expected from a sire can be gauged largely by a look into his ancestry.

## IN-BREEDING.

The question of in-breeding, or breeding between close relations, has always been a fruitful field of controversy. Many urge that there is no surer way to the ruin of a stud. And yet it is an established fact that many of the greatest improvements to stock have been due to in-breeding. The importance of selection and the use to which in-breeding can be put is well illustrated in the well-known story of how Robert Bakewell built up his Leicester sheep and Longhorn cattle studs. Until the middle of the eighteenth century both sheep and cattle in England were of very poor class. They were not raised primarily as meat producers, but the beast was used for the plough and the sheep for its wool. The industrial revolution altered this. Increased population meant increased meat consumption. Bakewell saw a good market ahead. He set himself to evolve fast maturing breeds. He secured large, long-woolled sheep from Yorkshire and Lincolnshire and his cattle from Derby, and set to work upon a process of selection and in-breeding. We do not know just what



"DONALD DINNIE."



MERINO EWE

principles he adopted, but it is established that he used no outside blood for 20 years. He appears to have followed in-breeding rather because he could not buy what he required outside than because he adopted the principle as such. The result was remarkable, particularly in the case of his sheep. He started with a lanky, thin-sided animal, late in maturing power and thin-woolled. He evolved a sheep neat, compact, early-maturing and thick-fleshed. The wool was shorter, but much denser and finer in quality. This sheep has since been used to improve practically all English breeds. He obtained equally successful results in the case of the cattle, and it was not till Colling Brothers some years later evolved the Shorthorn on much the same lines that the breed he established was improved upon.

Bakewell was not the only man who successfully practised in-breeding. Perhaps no breeder has practised it so persistently as Colling Brothers, the originators of the Shorthorn. Their noted bull, Favourite, himself the product of close in-breeding, was put back upon his mother, Phoenix; the daughter, Young Phoenix, was again put to Favourite, and the outcome was Comet, the most noted of all early Shorthorn sires. Watson adopted the same practice with the Aberdeen-Angus stud. Many of the present big studs of Australia have also been built up as the result of a modified form of in-breeding.

An interesting study of relationship is to be found in a perusal of the history of outstanding studs such as the Derrimut Shorthorns of Bolinda Vale, Victoria, the Wanganella Sheep Studs of New South Wales, or the Murray Merinos of South Australia. The latter have been in-bred for 70 years.

What is to be gained by in-breeding? By this means outside factors are excluded and the qualities of the parents are more truly reproduced in the child, or, as James Watson puts it: "In-breeding tends to reduce the amount of variation due to the recombination of characters, and thus to fixity of type." Therefore, if a breeder succeeds in obtaining an animal strong of constitution and possessing most of the good points desired, and showing no serious faults, he will be well advised to mate him to those of his relatives of like good qualities, particularly if strong in the points where the sire inclines to weakness. It is certain that if a breeder definitely refuses to mate close relatives under any circumstances he will sacrifice the opportunity to develop and establish strong points. But whilst in-breeding in the hands of a skilful flockmaster may be used to great effect, it may prove dangerous if used indiscriminately. The danger is that where indulged in to the extreme an ill-effect will be produced upon the vigour and constitution of the progeny. A family of rats, quoted in Prof. Byrnes Jones's "Live Stock on the Farm," were in-bred continuously until the numbers of the litters reduced from 7.5 to

3.2 and the percentage that died during first month increased from 4 to 45, until eventually they died out altogether. Upon the other hand, Dr. King reports in the journal, "Heredity," published in U.S.A., 1917, that another family of rats have been in-bred for 22 generations. The test was accompanied by careful selection. One rat, the result of seven generations of the closest possible in-breeding, weighed 550 grains, while the average rat of the tribe weighed 320 grains.

In this case neither has the average of the family lessened nor has the vigour been impaired.

In-breeding, coupled with careful selection, would appear to be safe, but otherwise to be dangerous. Out-crossing produces vigour and irregularity, in-breeding produces fixity of type, but except with careful selection, inclines to sterility and lack of vitality.

There is another danger in in-breeding when adopted by unskilled hands. Just because in-breeding tends to reproduce the parents, the utmost care is required in the mating. If a ewe and ram are closely related they will tend to have the same fault, and the emphasis on that fault will be most marked if such animals are bred together. Finally, never in-breed except for a definite purpose. If outstanding qualities are found in a sire and in his progeny, in-breeding may be adopted provided serious faults are not also common to both. To fix important features is one of the aims of the breeder, but chiefly he must safeguard constitution, and where any lack of vitality or of strength exists, in-breeding will prove harmful.

Line-breeding is a modified form of in-breeding. The difference lies largely in the degree of relationship. Many competent breeders are loath to use a sire that does not in some way show blood relationship. When a ram representing an entire change of blood is purchased he is often used upon a few selected ewes, and from these a sire selected for more general use. The extent of the variations introduced is thus lessened.

#### TELEGONY.

The theory has been deeply rooted for many years that a dam will be influenced as a breeder of subsequent young by the impregnation from a sire of another breed. The classic illustration of this supposed tendency is that of Lord Morton's quagga. He crossed a quagga stallion on a chestnut mare of  $7/8$  Arab blood. The result was a filly showing marked symptoms of the mixed breeding. Subsequently the Arab mare was sold, and was put to a black Arab stallion. The result was three foals, two of which, according to Lord Morton, bore indisputable evidence of quagga markings. Stripes across the forehead, neck and back were plainly visible. This looks like good evidence. Many will add their

personal experience in support. Instances will be quoted of mares which after having bred from a stallion of another breed proved to be untrustworthy in subsequent breeding. Breeders of dogs are often emphatic believers in telegony. Yet scientific investigation points to the view that there is little more than superstition behind the theory. Sir Everett Millais, after 30 years' experience in the crossing and breeding of dogs, asserts that he has never seen a case of telegony. It certainly is true that many a heavy mare has thrown a light-legged foal to a heavy horse, after having bred a previous foal to a blood; yet this cannot be regarded as weighty evidence, seeing that most of us have seen light-legged progeny as the result of crossing heavy draughts, where there has been no previous crossing with bloods. Many cases ascribed to telegony would be more truly described as reversions to type. In any case, should there be adequate reason for crossing any particular animals one need not be deterred by fear of the influence upon subsequent generations.

## CROSS BREEDING AND MENDEL'S LAW

All who have studied stock breeding must have noticed the fact that, while the first cross of two breeds usually results in a somewhat uniform type, yet, when these are crossed between themselves, or put back to sires of the original breeds, a variety of types is produced. If a Tamworth pig is crossed with a Berkshire, the result is a litter of somewhat evenly-marked pigs of yellow and black; but, if put back to the Berkshire again, instead of obtaining, as one might expect, a litter evenly marked, but showing a preponderance of black, one finds them breaking up into a variety of types and colours, some marked like Berkshires, others like half-breds.

Until quite recently it has been thought that this result was purely a matter of chance, and that the fixing of a type as the result of cross-breeding was therefore an exceedingly lengthy and tedious, if not an impossible, task. This view may now be discarded. These variations and much that has been called "reversion to type" are now found to follow certain laws of breeding and can be anticipated with exactitude. We owe this knowledge to the labours of the Austro-Silesian monk, Mendel, who, in the retired cloisters of Brunn experimented in plant hybridization and reached conclusions of passing importance. The value of his work was not realized in his own day, nor until the beginning of the present century, when scientists re-discovered Mendel's law. Since that time their application has been expanded and their importance more and more admitted. Perhaps the law can best be indicated by examples of breeding with which many will be familiar.

## SHORTHORN COLOURS ILLUSTRATE BLENDING.

It is a well-known fact that if red and white Shorthorns are bred together, roans will be the result. The roan is the intermediate between the red and the white, and this blending is to be expected. But roans cannot be bred from roans with anything like the same certainty. If roans are mated with roans in any considerable numbers, the result will be 50 per cent. roans and 25 per cent. each of reds and whites. Again, if roans are mated with reds, the result will be an equal division of roans and reds, and if with whites, an equal division of roans and whites.

Again the Andalusian fowl, which is a slaty blue, can be bred with great consistency by mating black birds with whites, but Andalusians will not breed true between themselves; in the second generation they will break into 50 per cent. of blue and 25 per cent. of white and black. Mendel did most of his research work upon plant life, and he there discovered certain laws of heredity which have since been applied to all stock. The effect of these discoveries is that we can now set out definitely by means of a formula results which formerly appeared to follow merely by hazard.

## FORMULA SHOWING RESULT OF SHORTHORN CROSSING.

Red crossed Whites ...	Result—All Roans
Roans crossed Roans ...	50% Roans
	25% Reds
	25% Whites
Red crossed Roans ...	50% Reds
	50% Roans
Whites crossed Roans ...	50% Whites
	50% Roans

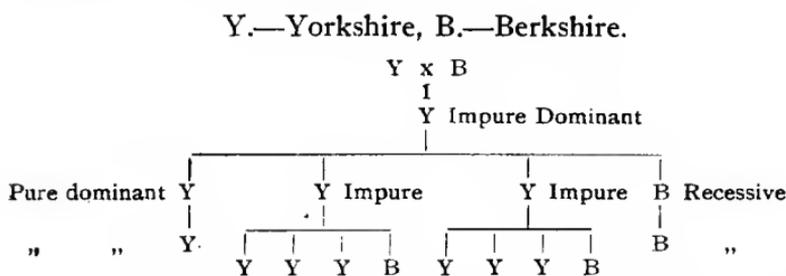
But it will readily occur that cross-breeding does not always result in a merging of the two types, as in the two cases cited. If a Tamworth is crossed with a Berkshire, the result is, as we have seen, a compromise as regards colour. This also is true if the Yorkshire White is crossed with the Large Black pig, although in this case the colours will divide in big blotches rather than in smaller spots as between the Tamworth and the Berkshire. But if either the Large Black or the Yorkshire White is crossed upon the Tamworth or Berkshire the result will be entire litters of white or black pigs according to the breed used. Here we have an example of dominance rather than of blending. The white of the Yorkshire is dominant to the black of the Berk, and if hundreds are bred, the result of the cross will be all whites.

## "DOMINANCE."

The white of the York is called "the dominant" and the black of the Berk "the recessive." But if the white progeny of

this first cross are mated again, we have as a result 75 per cent. white and 25 per cent. black or marked like a Berk. Now, these 25 per cent. recessives, if mated together, or with other pigs derived by the same process, will breed pure and will show no more white in their progeny than if they had not had "white" blood in their ancestors. If the white pigs of the second cross are mated, two out of every three will throw as erratically as the first cross, that is to say, three white and one black or Berkshire marking; but the remaining one-third of the second cross will breed pure white just as if no Berkshire cross had been introduced.

Now, the whites of the second class appear alike, and only experience will prove which will breed pure white and which will break up, as did the first cross. But we do know that the second cross will result in three kinds of progeny: 25 per cent. pure dominant, that is, pigs that will continue to breed white; 50 per cent. impure dominant, which will breed as did the first cross, namely, three to one; 25 per cent. recessive, which will always breed pure. The result may be thus:



All cross-breeding follows either one or other of the two principles mentioned—1, Dominance, as when the Yorkshire is crossed with the Berk, breaking in the second cross into pure, impure, and recessive; or 2, Blending, as in the crossing of Shorthorn colours, namely, a merging into roan in the first cross and breaking into red, roan and white in the second cross.

#### ESSENTIAL DIFFERENCE.

The essential difference between the blending and the non-blending or dominant crosses, is worth grasping. Where either parent is dominant in any particular feature, that feature can readily be fixed; by experimenting to find out which of the second crosses represents the pure dominant, and by breeding to others similarly bred (this, of course, does not necessitate in-breeding), the feature can be fixed. But where characters blend it is entirely different; and it is a waste of time to attempt to fix a blended character. Roan Shorthorns can be mated with roans *ad infinitum*, but they will persist in breaking up into the three colours. This unfortunate result is illustrated in the attempts that have

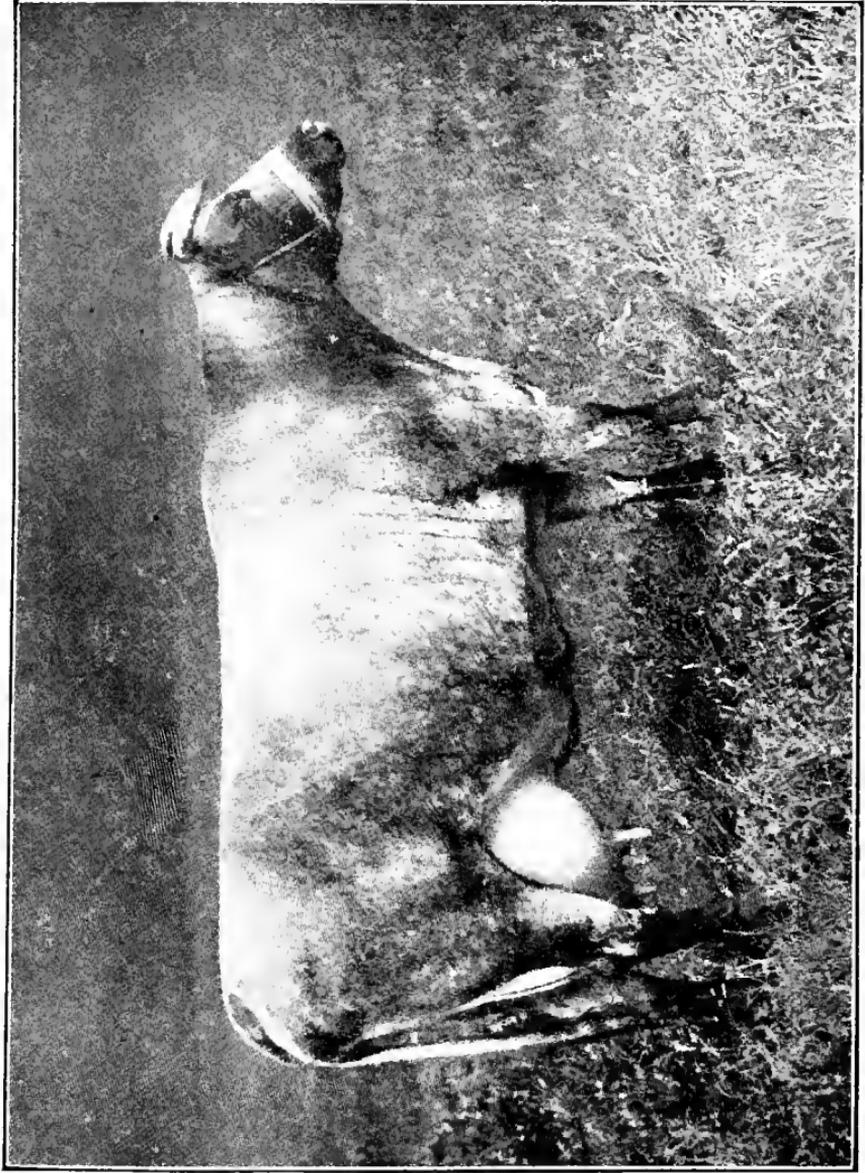
been made to fix a type of sheep between the Merino and the long-woolled Lincoln or Leicester. The half-bred is an excellent sheep with many of the qualities most in demand in the settled districts of Australia. But the crossing of these two extremes in wool results, not in a dominance of fine wool over strong or vice versa, but in a blending, so that 60's quality crossed with 40's, result in 50's. These bred together break up very much as do the roan Shorthorns, and while our able breeders of Corriedales in Australia have produced a strain in many respects excellent, they have not succeeded in overcoming the law that blended crosses cannot be fixed as an even type. Blue Andalusians can be crossed between themselves for any length of time, but blacks and whites will persist. Yet whites and blacks can be mated with the certainty that blues will result.

It would be futile to attempt to explain in technical terms these laws of breeding. There are many able books by experts upon the subject (see page 18), and all interested are recommended to study some of these works. The man who gains a grip of Mendelism as applied to live stock breeding will be better able to get successful results than the man who is ignorant of these laws. They place breeding on more than an empirical basis. One learns what to expect, is enabled to judge what is and what not possible of attainment. It is largely as a result of the application of these laws that the great improvement shown during the last ten years has been made. Many, no doubt, who are faddists, and lack judgment, will seek to evolve types interesting only as curiosities, but the man who knows what he wants should be able to turn his knowledge into commercial profit.

A few essential points may here be indicated and some practical applications suggested.

#### ESSENTIAL POINTS.

The essence of Mendel's law lies in the fact that each character must be considered separately and not merely as part of an inseparable whole. Each separate character is inherited in accordance with a very definite and simple process. Confusion will arise only if the breeder attempts to deal with all the characters at the one time. No sire will prove dominant in all his points, but certain of them, more or less numerous and important according to the sire's prepotency, will prove dominant, others recessive. By confining attention to one or two important points in which dominance can be obtained, these particular points can be fixed. It is essential to notice just what is and what is not a dominant character. For instance, William Parlour, in Byrnes Jones's "Live Stock on the Farm," gives an example of a series of crosses between the Jersey and the Aberdeen-Angus. The Jersey is fawn in colour, small, thin-fleshed, but rich in quality of milk. The



MILKING SHORTHORN COW



ABERDEEN-ANGUS, "PAN OF THE BURN," TWO-YEAR-OLD STEER  
Champion, all breeds, London Smithfield Show

Aberdeen-Angus is a fine beef breed, black, hornless, but the quality of milk is not high. In this cross, as is usual in such cases, the hornlessness proved dominant, while the black colour, the shape and size of the Aberdeen, also proved dominant over the smallness of the Jersey. On the other hand, the richness of the Jersey milk proved dominant, and the milk was about equal in quality to that of a pure-bred Jersey. Thus was produced a big, black, hornless cow, milking like a Jersey. Naturally these features broke upon the second cross, but here is something to aim at, and no doubt this cross will eventually be firmly established along Mendelian lines.

Crossing, then, does not necessarily imply merging of one quality into another. Its most important function is the transference of one or more features from one animal to another without affecting other features.

If we consider each feature separately we find that hybrids may throw pure-bred species. This sounds strange, but it can easily be demonstrated. Black birds hatched from Andalusian's eggs will breed as true to black as if they had not previously been crossed with white.

#### TEST OF BREEDING.

It has already been emphasised that in selection not only the individual excellence of the animal must be considered but also its ancestors. But we have seen as a result of Mendel's law that an animal may or may not possess the factors which will enable him to transmit certain qualities he himself possesses. He may or may not be a pure dominant, so that the only test upon which reliance can be placed is breeding. Wherever possible, then, the sire must be tested before he is used to any considerable extent. This cannot always be done, but it is the only certain means of obtaining success.

The Mendelian principle need not be confined to cross-breeding. It can be applied in the building up of a stud in points where violent differences do not exist. The flockmaster may desire to appropriate the weight of carcass or quality of fleece of a certain ram, but is anxious not to develop the style of head. He will not use him at large, but will cross him and discover in what feature he is dominant. Possibly the features he desires to appropriate will be dominant and others recessive. In such case his way will be simple and he can be used at large. But even supposing the first cross shows the objectionable head as well as the features desired, the entire strain need not be discarded. Some can be in-bred, when it will be found that 25 per cent. of the second cross are recessive in the matter of head, and that probably one at least will also possess the points desired. This ram can then be used with freedom, for he will breed true in the matter of head, as do all recessives.

The art of the breeder is never an easy one, and always requires patience and care. But the Mendelian laws have given us something definite to work upon. The applications of these laws are still far from fully developed. But during the 15 years since their rediscovery much progress has been made. Great possibilities are suggested. We now know that features can be transmitted independently: one character can be taken and the other left, rather than both merged, as was once thought. The application of this principle will be of great practical importance, and before many years we should see evolved a breed of cattle possessing all the beef qualifications, yet giving a large flow of milk of rich quality and breeding true to type. Already much has been done towards this end.

#### BOOKS RECOMMENDED—

*Mendelism.* Prof. PUNNETT.

*The Principles of Breeding.* Prof. WILSON.

*Mendel's Principles of Heredity.* Prof. BATESON.

*Live Stock on the Farm.* Vol. I. BRYNES JONES.

## THE CONSTITUENTS OF FOODS

All animal foodstuffs contain certain digestible nutrients, each serving a definite purpose. By far the most important of these are albuminoids. Albuminoids are composed of carbon, hydrogen, oxygen, and nitrogen; they closely resemble the albumen, or white of an egg, hence the name. Bone and muscle, as well as milk, consist largely of this substance. If an animal's body is thoroughly dried, albuminoids will constitute about one-third of the weight. Growth, as well as wear and tear, can only be supplied by albuminoids.

The next most important of the constituents are carbohydrates. These consist chiefly of sugar and starch. They contain carbon, hydrogen and oxygen, but not nitrogen. The carbohydrates in the process of digestion are oxydized in the tissues, and heat is given off. Thus they supply energy and maintain bodily heat.

The other constituents are of less importance. Fats are practically interchangeable with carbohydrates, one pound of fats producing two and half times as much heat and energy as sugar or starch. The mineral substances need occupy little attention, as they are usually present in sufficient quantities.

Many careful experiments have been carried out with the object of discovering the exact ratio of albuminoids to carbohydrates and fats that is required by various animals at different ages. It is important that every man who is to have the oversight of stock should be familiar with the standard ration required by various animals. Naturally the young growing beast requires a greater proportion of albuminoids than the aged beast. The youngster is building up muscle and bone, and nitrogenous materials are essential. The calf of six months, therefore, will require a ration with an albuminoid ratio of 1 to 5, whereas a two-year-old beast will do on 1 to 8. A young pig requires a ration rich in albuminoids in the proportion of 1 to 4.

*Pasture.*—A knowledge of the approximate value of the more commonly used fodders is always important. The feeding value of pasture grass varies greatly. Good pasture is an excellently balanced ration, the proportion of albuminoids to carbohydrates being about 1 to 6. While the plant is vigorous and healthy the

ratio is higher. As the year advances, however, the nutriment becomes concentrated in the seed. After the seed falls, the value of the pasture declines rapidly. The nature of grasses of the same species varies greatly in different localities. Stock will fatten in one locality and lose condition in another upon grass apparently about equal. An inexperienced man can best judge the value of a pasture by the condition of the stock. Much can be done by manuring pastures to increase the richness. Except in quite young animals, no concentrated food is required to balance a good pasture ration.

*Straw.*—The feeding value of straw by itself is very slight. This is particularly so in the case of wheat straw. The available albuminoids in wheat straw are as low as .4 per cent., as against 36 per cent. carbohydrates. It is estimated that a horse will consume as much energy in chewing and digesting wheat straw as he will derive from the fodder.

Barley straw is higher with .8 per cent. albuminoids, and oaten straw, as all practical men know, is considerably more nutritious; it contains 1.2 albuminoids as against 38.6 carbohydrates.

*Hay.*—Hay varies in its feeding value perhaps more than any other fodder. Australian hay made from wheat and oat crops is slightly less nutritious than the best meadow hay of England. But the cost of gathering is so much less that it constitutes a wonderfully cheap and valuable fodder. As the crop advances, the albuminoids are concentrated in the seed, and while the proportion may not show a decline, the actual feeding value is lessened by the straw becoming less easily digested as the plant matures. If the crop be harvested before the grain sets, the feeding value will be the better distributed throughout the straw; and though the loss of weight will be slightly greater, the actual feeding value will be higher. The richness of hay varies with its length, the shorter being the richer. Nevertheless, it is doubtful if it is wise to harvest the shorter crop for hay. It will generally be found wiser to cut the higher crop and add slightly more corn. Varieties such as Le Huguenot are of high feeding value. Oaten hay should show 4.5 of albuminoids to 45 of carbohydrates and fats while wheaten hay shows 3.75 to 48, *i.e.*, roughly a ratio for oaten hay of 1 to 10, and for wheaten hay of 1 to 13. Lucerne hay is rich in albuminoids, the analysis showing 12.3 to 40, or almost 1 to 3; silage (oaten) shows 2.2 to 20.

*Roots.*—Root crops contain a very high proportion of water, and the relative proportion of nutritive matter is therefore low in proportion to weight. Turnips contain about 1 of albuminoids to 7 of carbohydrates; swedes are slightly richer. Mangolds are about the same, but improve when stacked. The feeding value of potatoes is about double that of turnips.

*Green Fodder.*—Green fodders contain about 80 per cent. of water. The following are the proportions:

Green barley, 2 albuminoids to 12 per cent. carbohydrates and fats.

Green wheat, 1·75 albuminoids to 12 per cent. carbohydrates and fats.

Rape, 1·5 albuminoids to 10·5 per cent. carbohydrates and fats.

Lucerne, 3·75 albuminoids to 13 per cent. carbohydrates and fats.

Clover, 3 albuminoids to 13 per cent. carbohydrates and fats.

Sorghum is relatively low with '9 to 12.

In cereals, oats make a well-balanced ration, showing 9 albuminoids to 58 carbohydrates and fats.

The other cereals are:

Barley, 5·5 albuminoids to 68 per cent. carbohydrates and fats.

Maize, 7·8 albuminoids to 77 per cent. carbohydrates and fats.

Wheat, 10 albuminoids to 70 per cent. carbohydrates and fats.

Peas, 20 albuminoids to 57 per cent. carbohydrates and fats.

*Concentrated Foods.*—Concentrated foods are for the most part rich in albuminoids.

Decorticated cotton cake (without the husks) contains 34 per cent. digestible albuminoids to 20 per cent. carbohydrates and 8 per cent. fats. We know that fats are practically interchangeable with carbohydrates. So by multiplying the 8 per cent. fats by  $2\frac{1}{2}$  and adding this to the 20 per cent. we have approximately 40 per cent. carbohydrates. The following table shows the relative values:

Decorticated cotton cake, 34 albuminoids to 20 per cent. carbohydrates and 8 fats.

Linseed cake, 26 albuminoids to 30 per cent. carbohydrates and 9·5 fats.

\*Linseed meal contains 35 per cent. of oil or fats, and may easily be used to excess; for ordinary purposes therefore the cake is preferable.

Bran, 11 albuminoids to 42 per cent. carbohydrates and 2·5 fats.

Pollard, 12 albuminoids to 53 per cent. carbohydrates and 3·8 fats.

Milk is high in albuminoids.

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\* Linseed meal as marketed in Australia approximates very nearly to the Linseed Cake of the United Kingdom, and is an excellent fodder.

Cows' milk shows 3·6 albuminoids to 4·9 per cent. carbohydrates and 3·7 fats.

Separator milk, 3 albuminoids to 4 per cent. carbohydrates. and 3 fats.

Having seen the composition of the more common food-stuffs, we can now glance at the building up of a standard ration. The ratio required of albuminoids to carbohydrates and fats will, as has been pointed out, vary with different animals and in different ages. The young beast and the milking cow will require a higher ratio. Generally speaking, however, a ration should contain 1 albuminoid to 5 or 6 carbohydrates.

*Balanced Ration.*—It will be seen, then, that good growing pastures and green fodders are in themselves a balanced ration. Except when a cow is milking very heavily or in the case of a very young animal, if a plentiful supply of good grass or green food is obtainable, nothing more is required. Lucerne is particularly high in albuminoids, and a better value from the food will be obtained if it is mixed with a ration of hay or poorer pasture. Sorghum and maize, on the other hand, are relatively poor in albuminoids, and to obtain the best results a small allowance of concentrated foods should be given.

Seeing that it is almost always the albuminoids in the ration that require building up, it is well to remember that a working horse and a fattening beast of two years each requires about  $2\frac{1}{2}$  lbs. of this constituent per day. A sheep to fatten will require approximately one-third of a lb., a five-months-old pig will require  $\frac{1}{2}$  lb.

Obviously an unbalanced ration means waste. Albuminoids are usually relatively expensive, therefore it is extravagance to supply more than the requirement; on the other hand, if 12 lbs. of carbohydrates are required for a two years beast and 20 are supplied, the beast will gain practically nothing if the albuminoid ratio is deficient.

A cow giving two gallons of milk per day is estimated to require  $2\frac{1}{2}$  lbs. albuminoids and  $12\frac{1}{2}$  lbs. carbohydrates. If the cow has reached her limit, it is useless adding to the ration, but otherwise she should increase or decrease a pint for every one-tenth of a lb. added or deducted. A cow giving four gallons of milk a day will require 3.85 lbs. albuminoids daily. If a beast is being fattened, 20 lbs. of hay chaff mixed with 10 lbs. oaten straw chaff will supply between 12 and 13 lbs. of carbohydrates and slightly less than 1 lb. of albuminoids, but a 1,000-lb. beast requires 14 lbs. of carbohydrates and  $2\frac{1}{2}$  lbs. of albuminoids. The shortage in carbohydrates is so slight that it will easily be made up in the supplying of the albuminoids;  $1\frac{1}{2}$  lbs. of the latter are required. This can be supplied by 5 lbs. of linseed cake and 5 lbs. oats.

Oats, bran and pollard are well-balanced rations, and may be added when both carbohydrates and albuminoids are required.

Barley and maize are strong in carbohydrates and relatively weak in albuminoids. Molasses practically contain no albuminoids, but about 70 per cent. of carbohydrates.

Podding plants are rich in albuminoids; beans carry 25 per cent. and peas 20 per cent.; both lucerne hay and growing lucerne are also rich in this respect. Linseed cake, decorticated cotton cake, and soya beans are the foods strongest in albuminoids, the two latter roughly containing 33 per cent. of this valuable nutrient.

It will readily be seen that if a general shortage has to be made up, it can best be done with oats, pollard and bran. If albuminoids alone are required, it will be cheaper to use those foods particularly rich in this quality, such as peas, linseed cake or lucerne.

Much good foodstuffs have been wasted by mixing badly balanced rations. Sheep fed on cocky chaff, mixed with molasses and crushed barley, and grazing on dry and scanty pasture, would be receiving much more of carbohydrates than was required and far too little albuminoids. This mixture is typical of many badly balanced rations. Crushed peas in place of the barley would help to adjust the balance and add considerably to the value of the food. To give a young bull wheaten hay chaff, mixed with swedes, maize meal and boiled barley, sounds variety enough, yet it would be lacking in the essential constituent, and the bull would not thrive as he should.

It is quite possible also to build up an expensive and unduly rich albuminoids ration. Crushed peas and linseed cake, fed to a beast grazing on lucerne, would be wasteful.

To sum up, the following suggestions should prove of practical value:

- (1) As a general rule maintain the albuminoid ratio about 1 to 5. Increase to 1 for 4 for young animals, and decrease to 1 to 8 for merely maintaining an aged beast.
- (2) When stock are grazing on green grass, but require a little extra food, crushed barley with a little chaff is a good mixture. Barley, maize or oats tend to check scouring in the case of stock which are grazing on grass.
- (3) After the grass has ripened, foods richer in albuminoids are required. Peas are a very useful food for the dry summers and autumns. If barley is used in summer, either cake or peas should be added.
- (4) Use concentrated foods only for the purpose of adjusting the balance; they are most useful for this purpose, but it is easy to handle them extravagantly.

(5) A little calculation is a very profitable thing.

For Tables of Standard Rations and Constituents of Foods, see Appendix III.

BOOKS RECOMMENDED—

*Hints on Feeding.* TODD, H. M.

*Feeds and Feeding.* HENRY.

*Victorian Year Book of Agriculture, 1913.* DR. CHERRY.

# MEAT PRODUCTION ON THE FARM

## THE AUSTRALIAN MEAT INDUSTRY.

### STATISTICS.

Generally speaking, Australia has neglected her meat-raising industry. The following figures show our relative position with other countries, from "Australian Year Book, 1918":

#### CATTLE (in millions).

British India .. .. .	128
United States America .. .. .	63
Russia .. .. .	52
Argentina .. .. .	25
Germany .. .. .	21
Austria-Hungary .. .. .	17
United Kingdom .. .. .	12
Australia .. .. .	11

The position in sheep production is better.

#### SHEEP (in millions).

Australia .. .. .	84
Russian Empire .. .. .	72
United States America .. .. .	48

Australia's live stock figures fluctuate considerably with the seasons, and the 1914 drought caused a particularly serious reduction. But even making all allowances, Australia's position should be greatly improved.

### THE PASTORAL INDUSTRY.

Australia has gained a wide reputation as the home of the large cattle and sheep run. Many of our cattle stations run into hundreds of square miles, and the number of stock upon these great properties is very large. Queensland is the home of the great cattle run, and contains almost half of the cattle in Australia. Our pastoralists are experts in large-scale meat production, and Australia owes much to their pluck and enterprise. Much of our

back country can only be successfully developed if held in large areas. Considerable capital and experience are required to succeed in the drier country.

#### INTENSIVE CULTURE.

But while paying due deference to the landholder in the back country, it is still true to say that we suffer as a community largely because many of our farmers simply copy the squatters' methods. Much country that should be under the plough is still grazed at large by flocks or herds, and even on the smaller farms stock raising follows too closely purely pastoral methods. The meat industry will not develop as it should in Australia until farmers learn to make adequate provision for their live stock upon the farm. Not that meat and wool production must supersede wheat growing. The two naturally go together. Only as we cultivate our land can we maintain adequate numbers of live stock. Meat production should not be a side issue, but an important occupation of the farmer. If we learn to make adequate provision for our live stock, realizing that they will repay expense and labour, we can treble the number of sheep and cattle now to be found in the farming areas. A certain percentage of natural grass is valuable on a farm. But the increase of fodder production as the result of judicious cultivation is remarkable. Mr. Prothero has insisted upon the importance of ploughing up even the rich pastures of England in order that cereal and fodder crops might produce more feeding value. This applies much more strongly to Australia, where many of our paddocks are relatively bare.

#### PRICES.

The neglect of the meat industry in Australia is largely the result of the low level of meat prices which ruled for many years. Prior to the war, however, the demand for beef and mutton was steadily growing. England was yearly requiring more meat, the Continent had begun to purchase chilled and frozen carcasses, and America's demand was fast gaining on the supply.

#### DECREASE OF STOCK.

It is difficult to determine exactly the effect of the war upon the world's flocks and herds. It would appear that America has maintained their numbers at about par, but in Europe this is certainly not the case. Official estimates from Washington place the decrease of the world's stock at 28 million cattle and 54 million sheep. Russia, formerly the premier European stock producer, has lost enormously. The same is true to a lesser extent of France and Italy. The tendency to slaughter stock to supply meat has been strengthened by the great difficulty in obtaining concen-

trated foods for the stock. This has rendered the maintenance of the same numbers impossible in many cases. It seems certain, then, that the supply of the world's stocks will have decreased considerably, and live stock, with the exception of pigs, cannot be increased at all quickly.

#### INCREASED CONSUMPTION.

The factor which may have the greatest permanent effect upon the level of meat prices is that of increased consumption. The army ration has seemed very light in meat to the Australian, but it has represented much more than the average European citizen was able to obtain before the war. A taste for meat has been developed where it was scarcely known formerly.

The higher standard of comfort for the labourer, which is inevitable as one of the results of the war, will enable many to purchase meat as a regular article of food, to whom it was merely a luxury before.

Frozen meat has been introduced into many homes which would originally use nothing but home-grown beef and mutton. In this way a strong prejudice has been weakened and must result in a greater demand.

#### THE FUTURE.

It would appear, then, that we can look forward quite confidently to an assured market for all the meat we can produce. It is difficult to foretell the range of prices, but with a decreased supply and an increased demand, prices must make successful stock raising a thoroughly remunerative business. The present wholesale price for beef is over 1/ per lb., and for mutton and lamb 1/3 per lb. No one expects this level to be maintained, but when it is remembered that lamb was shipped from Australia 10 years ago and sold in England at 3½d. per lb., it is clear that there may be a considerable fall in price, and still leave room for a good profit to the grower. We have every encouragement to push on with the meat-growing industry. Our beef must be grown upon the farm as well as on the station. Our flocks of sheep may well be trebled. We must devote ourselves as directly to growing meat in the future as we have to growing wheat in the past.

### FODDERS

#### SUMMER GROWTHS.

Our chief need in Australia is to make provision for the summer and autumn months. Irrigation will naturally be adopted wherever possible. That question cannot be dealt with here.

**WINDMILL AND PUMP.**

It may be pointed out, however, that if well water can be obtained at a reasonable depth it may pay to erect a windmill and pump to water a small plot of lucerne. This will require very little labour, and will supply valuable fodder during the dry summer months.

**LUCERNE.**

Under favourable circumstances lucerne may be successfully grown without irrigation, particularly when spring water is within 15 feet of the surface. Even if water is considerably deeper, provided there is a rainfall of 16 inches or over, lucerne can often be grown to great advantage.

**GRAZING LUCERNE.**

Lucerne that is grown in larger paddocks without irrigation must be treated quite differently from the irrigated plant. Probably only sufficient growth will be made to allow of one cutting a year. It is well known that grazing affects the crown of the lucerne and gradually thins the plant. But even when grazed the stand will last up to six or seven years, and even longer if water is near the surface.

It is best to cut the crop late in the spring, otherwise the plant becomes stalky and wilted. Lucerne should not be grazed continuously. The plant should be allowed to flower at least once a year. A loamy flat, with good spring water near the surface, will throw a remarkable amount of splendid feed if put down to lucerne and treated as indicated.

**MAIZE.**

Another good summer fodder is maize. This plant, however, requires either irrigation or a considerable summer rainfall. It is seldom a success to attempt to grow maize with less than 25 inches, and a reliable crop cannot be anticipated with less than 10 or 12 inches throughout the five summer months. Wherever these conditions exist maize can be grown with considerable profit.

**SORGHUM, ETC.**

Sorghum and American and Japanese millet will grow upon a rainfall of over 20 inches. These are excellent summer fodders, particularly for cattle. Many fear turning cattle upon a growing sorghum crop for fear of poisoning. The risk is very slight, however, if reasonable care be exercised. The plant is more dangerous when quite young, but as soon as it begins to leave the ground it may safely be fed. Two precautions are necessary. The

beast must not be allowed on for the first time when hungry, and secondly, during the first week the cattle should not remain upon the sorghum for more than an hour or two at a time. After the first week practically all danger is removed. The cattle will derive more value from the fodder if they are daily changed from one class of food to another. This is a general principle that applies to all fodders.

If the plant be strong and labour be available, it will be found better to cut the sorghum and cast it to the cattle.

#### ROTATION AFTER SORGHUM.

Both maize and sorghum can be used in a rotation before a cereal crop. Often the land will take considerable working to prepare another seed-bed, but many successful crops are grown after sorghum on a 20-inch rainfall. Both maize and sorghum are very susceptible to frost, and should not be sown until the frosty season has passed.

#### WINTER FODDERS.

The subject of winter fodders is more familiar to men interested in general farming. Most men can discuss the relative value of the various fodders quite fluently. And yet very few really grow anything like adequate crops of these fodders. Not until we have learned just how we are to make provision for every month of a normal year are we going to make the success we should of stock raising.

The English farmer makes systematic provision for every portion of the year. We are now more or less familiar with the system he adopts; turnips and swedes, rape and kale or cabbage, mangols, vetches, winter barley, sanfoin, beans and peas. One constant succession of sowing and feeding off and harvesting. Fortunately we have no call to adopt this system in full. Nor could we if we desired. With us meat production is very much cheaper. Not only is our weather so much milder, but our grass appears to have more feeding value, and our stock thrive with much less attention. But we can learn much by the English farmer's methods.

#### BARLEY AND OATS.

Perhaps no fodders are more profitable than the ordinary oats and barley crops. These cereals are large, germinate easily, and can be sown without a great deal of preparation after the wheat crop has been harvested. They can sometimes with advantage be fed off for three months, and then be allowed to run up and be reaped for corn. If the field is to be fed right through the season,

it is important to keep the crop from becoming too stalky, for barley especially is liable to run out in ear, after which little growth will take place.

#### RAPE.

Rape needs a finer seed-bed, but if the land is of fine texture or sandy in nature, rape will germinate well. This crop is worth the little extra trouble, for its fattening qualities are remarkable. Kale grows less rapidly than rape, but lasts later into the summer. Upon the whole, however, rape throws the most fodder.

#### ROOT CROPS.

Root Crops are not used with us as much as they might be. True, they involve more labour, but they are very valuable, particularly to use through the summer months. Mangols are perhaps the most useful, in that they can be stacked and kept longer than any other root crop. They require a deep, rich soil, however. Our spring is most luxuriant, and during this season animals fatten readily. The aim of the stock man must be to extend this season of plenty as far as possible. Mangols and swedes may help in this direction. They can be stored and fed at the time when the grass is losing its virtue, and provide an off-set to the dry feed. This involves labour, and generally speaking cannot be done upon a large scale. But a good crop of mangols should yield 40 tons per acre, so that a large acreage is not required.

#### PEAS.

Peas form another crop particularly useful for the early summer months. They thrive best upon loamy land, but where wheat growing is a success the crop is a comparatively easy one to grow. Peas may be either fed off by sheep, or raked and stacked and fed out to stock later.

If the crop be threshed and the peas crushed, an excellent food is obtained to mix with fodders of all kinds. Peas have been greatly neglected in Australia; no crop will do more to fatten off a flock of lambs. Vetches make a good fodder, but the cost of seed is very high. Vetches, as well as peas, may be harvested and threshed, thus making the farmer independent of the seedsman.

These leguminous crops will enrich the land, and wheat follows them most successfully.

The fodders indicated by no means exhaust the list of possible crops. There are others, like the white mustard, which, though suitable, has not been used as yet to any considerable extent in Australia. Each man will choose the kind most suited

to his locality, but generally speaking it will be wise to confine oneself to two or three winter fodders and two of summer growth. The chief thing is to do what is done well, and to grow an adequate amount. The fodder crops on many of our farms are absurdly small.

### CONSERVATION OF FODDER.

Green fodders will be of little avail if the season be adverse. Side by side with the growing of these it is essential to adopt an adequate system of conservation of fodder.

#### ENSILAGE.

Foremost of the conserved fodders is ensilage. This is dealt with more fully in the dairying section. By this method of conservation the natural juices of the plant are conserved and digestibility of the fodder increased; this is of great importance in the production of milk and in the maintenance of the health of the animal through the dry summers. By means of the silo also a large amount of growth can be preserved, which would not pay for harvesting under any other method. It is not too much to expect that before many years a farm will be considered ill-equipped that does not possess a well-constructed silo. But ensilage is such a valuable fodder that few will preserve it until the advent of a drought. Generally speaking, the silo is filled and emptied each year. This can scarcely be called conservation of fodder against an adverse season.

#### HAY STACKS.

No means of conserving fodder are cheaper and more effective than the erection of extra hay stacks. It is a good practice for the farmer to erect a small stack of reserve hay each year, as protection against drought. If the hay be cut at the right stage and be well stacked and thatched, it forms an excellent stand-by. If this practice be followed for a few years, sufficient reserve will have been saved to carry through any likely drought. The small farmer should aim at the ultimate conservation of 100 tons of hay over and above what he will require for normal feeding. Apart from the reserve of hay to be held for drought, it is wise always to keep sufficient hay not only to feed working horses, but also to feed the cattle and sheep through some of the autumn months. Too many farmers estimate the carrying capacity of their farms upon the autumn basis. That is, they keep so few stock that in a normal year they will require no feeding; but if this method is persisted in the full earning capacity of the farm cannot be reached. The carrying capacity of the ordinary farm is quite

high during six months of the year, and low during two or three months. We should make provision year by year for cheap but adequate feeding during this short period. By doing so we will be enabled to keep quite double our present numbers of stock and keep them successfully. The erection of good green hay stacks is one of the most practicable methods of meeting this demand.

#### STRAW STACKS.

The erection of straw stacks is also important. The thresher may not be the best machine for harvesting the bulk of the Australian crop, but it may be a good plan to hire a thresher each year to thresh at least sufficient crop to erect one big straw stack. Oat straw, as we know, contains the most nutriment, or if Le Huguenot wheat is grown the straw makes excellent fodder. If these stacks are fenced until they have settled down, the stock may later be given access to them. They will derive considerable feeding value by picking at the straw, especially during the winter months; they will also obtain excellent shelter from the weather. If the stacks are large enough, say 10 yards by 12, the cattle will not cause them to fall; the stacks will remain until an adverse season, when they can be chaffed up with the hay and fed to the stock. After sufficient straw has been preserved for safety, a proportion can be chaffed each year and fed with corn to the animals.

#### OATS STORED.

One other method may be mentioned. An oat bin that will be a protection against mice should, if possible, be erected, and in this sufficient oats kept over in case of an adverse season.

Naturally all these methods of conservation of fodder cannot be practised at once. They all cost money and labour. Moreover, as one form of provision is made the other is less essential; but a farmer is courting trouble who does not make provision in one form or another. The time of drought is a time of profit to a man who has made adequate provision.

#### OVER-STOCKING.

Emphasis has been laid upon the importance of maintaining larger numbers of stock upon the farm. But over-stocking is equally dangerous. Unless adequate provision can be made in both growing and conserving fodder, it is risky to attempt to maintain large numbers of stock. But by adopting a reasonable system of fodder growing more than double the average number of farm stock can be carried.

## BEEF-RAISING ON THE FARM

The farmer can only settle the question whether he will chiefly follow dairying, sheep raising, or beef production after he has considered the local conditions.

Possibly dairying will be the most remunerative if the conditions be favourable. For this industry it is important to notice the number of "green" months, the distance from market, and the supply of labour.

Mutton and wool growing will generally give a quicker and higher return than beef growing, and where the conditions are favourable will therefore be more frequently followed.

Circumstances sometimes exist, however, in which the growing and fattening of beef will be the most remunerative. This is so where the grass is coarse and where there is need to travel a distance for water. But while beef-raising will seldom play the leading part in the live stock industry of the farm, it should form an excellent sideline upon most properties. The American farmer, for instance, augments his income from the dairy by the annual sale of his fat steers and heifers. Often a man can find the labour to cope with a small dairy, but not with a large herd. He can then keep his calves and fatten them off at prices that will greatly assist his income. Nor need there be a clash between sheep and cattle raising. Almost all farmers find, if they make adequate provision for their sheep, that some of the vegetation becomes too rank. In fact, many pastures and fodder crops are greatly improved as sheep feed if young cattle are first allowed to graze the paddock. Moreover, ewes are often difficult to obtain, but the calves from the cows can be retained and automatically return an income.

## BABY BEEF.

It is particularly important in beef-raising that purely pastoral habits should not be followed. Cattle upon the farm will seldom pay if the beasts be kept till four years old, for in four years they will consume a great deal of fodder, and may well have "eaten their heads off" by the time they are sold. It pays the station owner to wait till four or five years of age, but the cost of upkeep is trifling to the pastoralist; his risk is heavy, but his cost is slight. The small farmer, however, cannot turn his beast out and forget he has him. Moreover, it has been firmly established that after a beast is two years old he will show only a relatively small increase of weight in proportion to what he consumes.

## CAMBRIDGE EXPERIMENTS.

An interesting experiment to ascertain the most profitable age to market a beast in England was recently carried out by two

Cambridge men, Messrs. K. J. J. Mackenzie, M.A., and F. H. A. Marshall, Sc.D. The report of the experiment is to be found in the September number of the 1918 "Journal of Board of Agriculture." The following are typical results:\*

Calves that were not forced or finished in the ordinary sense yielded at 12½ months:

673 lbs. live weight.  
376 lbs. meat.

Others were fed heavily during the last six months. These showed at 15 months:

721 lbs. live weight.  
394 lbs. meat.

One youngster, fed heavily from the outset and killed at 10½ months, weighed:

672 lbs. live weight.  
374 lbs. of meat.

This calf showed the following remarkable analysis:

Bone . . . .	15·01
Cartilage . .	1·41
Fat . . . . .	33·01
Lean . . . . .	50·57

so that the lean and fat made up 63·58 per cent. of his total weight.

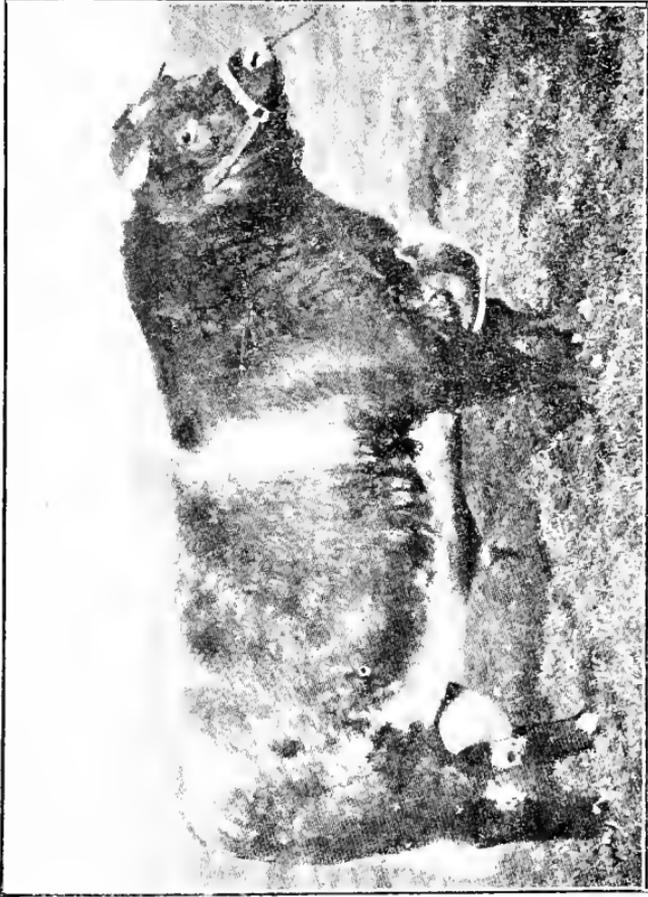
J. D. Gillett, the renowned American beef-raiser of last century, estimated that a well-kept and well-bred beast should scale:

700 lbs. at 1 year.
1600 " " 2 years.
2200 " " 3 years.

The amount of food consumed between the second and third years was so great as to involve a loss for that particular year. Of course, this would not apply where the beast is turned out on big runs, but on the average Australian farm all that a beast consumes is of value. On the other hand, our food being cheaper, it probably will not pay to market calves at 15 months, as it does in England. Still with us it would be wiser to market a fat "beefling" at 15 months than to allow it to lose its flesh and build it up again in 6 or 12 months' time. At the end of two years a beast can be sold that will kill 640 lbs., and this will, generally speaking, prove to be about the most profitable age for the farmer to sell.

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\* These experiments were carried out under war rations, and by no means represent the best weights obtainable.



SHORTHORN BULL, ONE OF THE FAMOUS "COLLYNIE" BLOOD



DEVON COW

## BREEDS FOR CROSSING.

Naturally a great deal depends upon the breed of cattle with which one is dealing. Shorthorn, Hereford or Aberdeen-Angus calves will develop weight quicker than the lighter breeds. But if a farmer is not setting out to grow beef primarily, but is merely fattening his calves from his dairy cattle, he will not have purely beef breeds. Possibly he may decide that it will pay to keep a pure Jersey or Guernsey herd, in which case the income from his calves will be small. But many think it pays to run a dual-purpose dairy herd. The milking Shorthorn pure or grade cow certainly has strong claims. Its progeny responds excellently to the "baby beef" process. If a farmer does not keep his own bull, but has the chance of obtaining the services of bulls in the locality, it will pay him to take sufficient cows to a bull of dairy strain to maintain his herd, and put the other cows to a bull of approved beef strain. One must learn to balance advantages and disadvantages, and the extra value of the progeny from thick-fleshed, early maturing strains is not to be overlooked. A calf from a straight dairy cow crossed with a beef bull will respond well up to the age of 18 months or two years. The influence of the dairy blood does not show itself strongly until later.

## GROWING OF CALVES.

It is important that a beast destined for the market during the second year shall not be allowed to suffer a check. It must be taken in hand at once and kept going. This need be neither difficult nor expensive upon a well-ordered Australian farm. Usually the calf will be taken off the mother and hand-reared. There are circumstances, however, when it pays to let the calf suck the cow. The weight a calf will gain under these conditions is remarkable. If a cow has a good flow of milk she will rear two calves quite well. The wiser way is to keep the calves in a small paddock, with access to a shed, and only to let the cow in to be sucked twice a day. The calves will then be made quiet and docile, and can be given what food is required to keep them going strongly.

## WEANING.

If the calf is to be hand-reared it is usually wise to take it immediately from the mother, but to give it the cow's milk until fit for consumption. The milk from a newly calved cow contains much of a fatty nature, and is highly nutritious. It has a purgative effect, and is almost essential for the calf just born. The newly born calf should receive about one gallon a day distributed over three meals. Change gradually after a few days from new milk to separator milk. But it is wise to keep at least half new

milk for a couple of weeks. As the new milk is lessened food must be added to take its place. No substitute can be used to greater advantage than linseed meal or whole linseed. A  $\frac{1}{2}$  lb. of linseed boiled into gruel will most nearly make up for the lack of the new milk. It is important to warm the milk to an even temperature of about  $98^{\circ}$ .

#### HAND-FEEDING.

As soon as the calf is three or four weeks old it will begin to eat. If green grass is available the calf should be grazed out during the day, provided it has access to a place of shelter. While the calf is feeding on grass, an excellent plan is to give at first  $\frac{1}{2}$  lb., and later 1 or 2 lbs., of crushed oats per day. The oats may be fed dry. If no grass or lucerne is available, it is advisable to give crushed oats and linseed cake in about equal portions. Except where lucerne is available, a calf over six months should have at least 1 lb. of linseed cake per day through the summer. It will be wise to maintain the separator milk for at least four months if possible. The calf will be reared most cheaply if fodder crops are arranged so as to provide good green feed during most of the year. In most districts it is wise to arrange for the calves to drop during June, July, or August. A calf dropped July 1 has five of the best months before him, and will be well grown by summer.

It should be arranged if possible that lucerne be available to assist the growth of the calf through December until the sorghum crop is ready for feeding. It will be wise to continue the 1 lb. of linseed cake while feeding the sorghum, as the latter is deficient in albuminoids.

#### THE AUTUMN.

The months when hand-feeding will most generally have to be resorted to are during April, May, and June. If the sorghum or lucerne has been a failure, feeding will have to be started earlier. If no other picking is available a calf at, say, seven months of age should have about 10 or 12 lbs. of hay chaff, 2 lbs. of linseed cake, and 1 lb. of crushed oats. But feed is seldom lacking altogether. A wonderful effect will be seen by giving a few pounds of chaff with  $\frac{1}{2}$  lb. of oats and 1 lb. of linseed cake daily to a calf running upon only fair feed. It is not very heavy feeding that is required. A small ration will do wonders for the young animal.

Early-sown barley and oat crops will provide good feed by June or July in a normal year. While the feed is soft and growing vigorously a fodder containing a high proportion of carbohydrates is required. This can be best supplied by crushed barley in chaff.

A little of this food will greatly improve a beast feeding upon a young growing fodder crop.

#### FATTENING THE STEER.

If feed be altogether lacking a good mixture is 20 lbs. of chaff, 3 lbs. of linseed cake, and 5 lbs. of crushed oats. As the time approaches when it is decided to sell the steer a food richer in albuminoids is required. A 1,000-lb. steer requires  $2\frac{1}{2}$  lbs. of this valuable nutriment. Remember that 4 lbs. of linseed cake will supply 1 lb. of albuminoid, so that by adding, say, 3 lbs. of linseed cake to the above ration a fattening mixture will be obtained. But it is essential to remember that waste may readily be incurred by too free use of over-rich foods. A beast will seldom add more than 2 lbs. of weight per day, and if 6 lbs. of concentrated food will result in this increase (and little more can be expected) to double the concentrated ration is waste. The heavier a beast becomes the less albuminoid is required relatively, so that no animal requires more than 3 lbs. of albuminoids. Possibly an exception might be made to this rule in fattening a stud bull, which may be justified upon other than the usual commercial basis.

The aim of the farmer should be to grow sufficient fodders that only the minimum of hand-feeding will be required. The chief use of hand-feeding should be to augment the fodder paddocks and to fill the gap when an unfavourable season intervenes.

#### GENERAL DIRECTIONS.

A good guide as to the nature of food required is to be found in the state of the animal's bowels. If there is an inclination to scour, less albuminoids and more carbohydrates will generally be required; if the animal passes hard dry dung, give more albuminoids in the form of linseed cake, crushed peas, bran, or preferably green feed. But cotton cake has a binding effect.

It is important to vary the feed from time to time. Learn to study the coat of an animal as an indication of its health.

#### BUYING STORES.

Some will find that it will pay them better to buy store cattle and fatten them rather than rear "beeflings." This is particularly the case where there is a considerable portion of rougher country that cannot come under the plough. Nevertheless it must be remembered that a  $2\frac{1}{2}$ -year store steer kept for six months and fattened will eat more feed than a calf kept for twelve months, and that the youngster will add more weight.

In buying a line of stores, try to get them in fair store condition. A beast which is very low in condition, and whose coat is

hard and starey, will consume a great deal of good food before he shows much result. It will, of course, pay to buy the right breeds. The importance of the breeding comes out more with age. Look for "bright colours," as the stockmen say. Beware of the Jersey and brindle streaks; these usually go with thin-fleshed and light-weighting animals.

When stores are bought the same principle should apply as to the young calf, namely, that it pays better to feed well for a relatively short time than to keep the beasts on for a long period. Always remember, however, that it is waste to overfeed.

The advantage of store buying is that the animals can be purchased when feed is in sight, and sold when the best part of the season is gone. This is so obvious that everybody usually desires to do the same thing, and this has the consequent drawback that the market fluctuates accordingly.

The sound principle would seem to be to rear calves whenever possible, or if the farmer does not go in for breeding them himself, he can usually buy good calves without much trouble. Then if necessary he can add to the number of cattle on the farm by purchasing stores when surplus food is available.

## BEEF BREEDS

Conditions as to care and feeding of stock differ greatly as between Australia and the United Kingdom. The points of the various breeds of cattle, on the other hand, show but slight differences. For a detailed study of the leading beef strains the reader is referred to the English text-books recommended at the end of the chapter.

### SHORTHORN HISTORY.

The history of the Shorthorn in the United Kingdom centres around the names of a few outstanding breeders. Reference has already been made to the work of Colling Brothers. These breeders paid repeated visits to Robert Bakewell, and watched his great experiments with Leicesters and Longhorns. They applied the same principles to the Shorthorns. Their first noted bull was "Favourite." This bull was the sire of the famous "Durham Ox." his steer was fattened and sent all over England as a demonstration of the meat-producing qualities of the breed. At his death the four quarters of this ox weighed 2,322 lbs.; tallow, 156 lbs.; and hide 142 lbs. By audacious in-breeding Colling Brothers afterwards produced "Comet," who was recognized as the foremost sire of the breed for many years.

### BOOTH OF WARLABY.

The name of Booth has been associated with Shorthorns since 1877. He derived his first blood from Colling through the bull

"Hubback." Booth seems to have gone outside for good cows, ignoring long pedigrees. His chief aim was to develop substance and weight. For many years he dominated the show rings, and obtained high figures for his sires.

#### BATES OF KIRKLEVINGTON.

Thomas Bates had perhaps an even more successful career. From 1800 till 1849 he held a foremost position in the Shorthorn world, and for many years commanded high prices, not only in the British market, but also in foreign countries. His cattle traced back to the best blood, and he placed great stress upon pedigree. His most noted family was that derived from "Duchess" out of a Colling cow by "Favourite." The "Duchess" family maintained its supremacy for many years. The Bates cattle were inclined to be light-fleshed, but were of fine quality, and particularly stylish in appearance and movement. They were also good milkers, and the milking quality still persists in the strain. The chief defect in the Bates blood seems to have been a lack of depth at the girth. Few pure examples of either Bates or Booth cattle exist to-day, but Shorthorn breeders will ever recognize the value of their work.

#### CRUICKSHANK.

Perhaps the man who has done most for the Shorthorn cattle was Amos Cruickshank, of Sittyton, Scotland. A man of great independence of mind, he knew what he wanted and went direct for it. His first famous bull was "Champion of England." This bull he used a great deal. He in-bred him upon his own stock freely. His chief aim was to produce a maximum amount of lean flesh, aiming at thickness of flesh without lumpiness. He put great stress upon hardihood and constitution. The characteristics he developed are now prominent all over the kingdom.

When the Sittyton herd was dispersed in 1876 most of the females were bought by Mr. William Duthie, of Collynie, Aberdeenshire, and Mr. Deane Willis, Bapton Manor, Wiltshire. These two studs still play a leading part in the Shorthorn world. Mr. Duthie's cattle are in great demand, and the prices he obtains from year to year are remarkable.

#### AUSTRALIAN SHORTHORN HISTORY.

The history of the breed in Australia can be but suggested.

The credit for its introduction to any considerable extent, and for the steady improvement of the breed, must be shared between the owners of the Bolinda Vale and the Angaston herds in Victoria and South Australia respectively.

**BOLINDA VALE.**

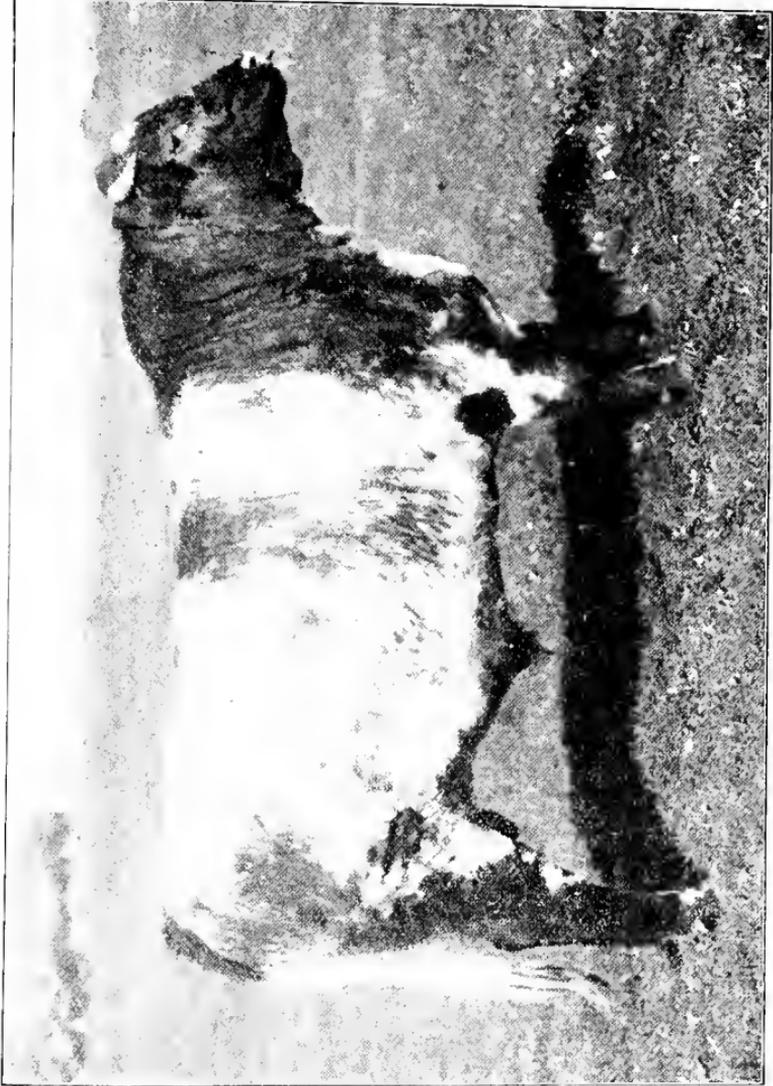
The Bolinda Vale herd was founded by Sir W. J. Clarke, and has been carried on by his son, Sir Rupert Clarke, under the management of Mr. Robert Clarke, who died last year. This able breeder has done a great deal for the Shorthorns in Australia. He was a man possessed of the true instinct of the breeder. Moreover, he possessed sufficient confidence to back his own judgment. The Bolinda Vale herd was founded in 1878 by the purchase of stock from Richard Merton's imported cattle. Sixteen hundred guineas was paid for "Oxford Summerton." This cow, with four more of the Derrimut strain, formed the foundation of this noted stud. All the five cows descended from an imported cow, "Roan Summerton," whose stock are now known as Derrimuts or Summertons, and are to be found in all the show rings of Australia.

**THE ANGAS BREED.**

The Angas stud was founded by Mr. G. F. Angas in 1845, and carried on by Mr. J. H. Angas, and later by Mr. Charles Angas. The original importation included a bull by Collings' celebrated "Comet." In 1879 a number of celebrated cows were purchased, including "Rugia Niblett," from whom was bred many of the finest stock Australia has seen. In 1894 Mr. Forbes, the stud manager, purchased from England several noted sires, amongst which was "Viscount Oxford of Ruddington," a very fine bull. Many important purchases have since been made, one of the most successful being "Adbolton Thalia King," from Mr. Hickling's stud. During the last 15 years many other studs have come into prominence, some as the result of purchases from one or other of these two studs, others as the result of later importations.

**POINTS OF THE SHORTHORN.**

The colouring of the Shorthorn may be red, white, or roan. Most people prefer either the red or the roan, but many of the most noted sires have been white. A light washy roan is not in favour. Erratic marking is to be discounted. Red with little white is frequent, but the white should not be too prominent. Dark or brindle streaks are not true to type. The breed is noted for its early maturing qualities, and for its deep flesh of high quality. The prepotency of the Shorthorn is recognized everywhere. A very mixed breed of cows will, when crossed with a Shorthorn bull, throw calves with many of the Shorthorn qualities strongly marked. This power of imparting beef qualities to thin-fleshed cattle has done much to gain so prominent a place for the herd. For the points of flesh and frame see paragraph on "Judging a Bull."



SHORTHORN BULL, "ADROLTON THIALIA KING"



HEREFORD BULL  
Sold for £9,000

But the Shorthorn is not merely a beef animal. The milking Shorthorn strains have been developed to a remarkable extent of late years. Many dairies can be found in the United Kingdom comprised of milking Shorthorns, either pure or crossbreds. These show good meat-carrying qualities as well as giving high milk yields

#### HEREFORD.

This breed originated in the West of England, in the middle of the eighteenth century. They have since won their way all over the world. They are noted for hardihood, early maturing qualities, and great thickness of flesh. Their colour is rich red, with white face and underline and upon the top of the shoulder. The Hereford is excellently represented in Australia. They are particularly well suited for crossing purposes for the big cattle runs.

The Smithfield fattening tests of 1907 show the following result:

Hereford Steer; age, 671 days; live weight, 1,687 lbs.			
Average daily gain	..	2.51	lbs.
Dressed weight	.. ..	1098	lbs.
Hide	.. ..	87	lbs.
Loose fat	.. ..	106	lbs.
Dead to live weight	..	65.08	per cent.

#### ABERDEEN-ANGUS.

The Aberdeen-Angus and the Devon are not so well known as they deserve. The former is a beef breed of very high quality. The Aberdeen-Angus is noted particularly for "dying heavy." At the Smithfield meat show they have secured much the greater number of awards in this connection. This breed holds the record of percentage of dead meat to live weight, and have weighed out at 76 per cent. They are particularly noted for the depth of lean flesh.

The Aberdeen-Shorthorn cross is the favourite one in Scotland. These "Scotch Greys" or "Prime Scots" are blue-grey and hornless, and carry beautiful quality meat, and are much sought after by the butchers. A herd of well-bred Polled Angus cattle is a very fine sight. Pure black and hornless, they are very striking in appearance; scarcely a bone protudes, all hidden in deep, firm flesh. We should see much more of this breed in Australia.

#### THE DEVON.

The Devon is slightly smaller in build than the other beef breeds, but the flesh is of high quality, and the breed is noted for

the weight carried in proportion to the bulk of the animal. Moreover, the Devon is a good dual-purpose animal. The Devon should prove an excellent breed for the inside areas.

The South Devon is a particularly fine dual-purpose animal.

#### IMPORTANCE OF WELL-BRED SIRES.

It is not of great importance whether one or other of these recognized beef breeds are chosen. The important point is that the Australian farmer should determine to breed only from well-bred and well-furnished sires. A man may decide it will not pay him to attempt beef-production. Then he should seek out a bull from the dairy breeds, taking particular care that he derives from cows of high milking standards. But if beef is to be bred, it certainly will pay to study the meat qualities of the animal.

Great loss results year by year as the result of the use of mongrel bulls lacking both in meat and milk qualities.

It has been suggested that the State Governments might do much more in encouraging the maintenance of good stud bulls throughout the farming areas. Remember, the bull is half the herd. Even though one starts with cows of indifferent quality, if good bulls are used a high-class herd can be built up in three generations. Even the progeny of the first cross will compensate the breeder many times over for the expense and trouble incurred.

#### JUDGING A BULL.

The various beef breeds have many more points in common than of difference. In the following paragraphs they have been grouped together in order to indicate what especially requires to be examined in judging a beef animal.

To judge the points of a beef bull, first notice the head. The general appearance should be of strength, without coarseness. The forehead should be broad and slightly concave; the horns short and oval-shaped, creamy white in colour, and curving well out from the head. The eyes should be fairly large, and placid in expression; the hair on the forehead plentiful and curly, but soft to the touch. The legs should be wide set and straight; the chest full and deep.

Standing slightly upon either side, one should notice if the neck tapers gradually from the shoulders. The points of the shoulders should be well covered with flesh. If the "neck vein" is not developed, these points will remain bare. From this angle can be noticed how the beast fills up behind the shoulder.

Next, from the side view, the top and bottom lines should be examined. A deep body, with these lines running parallel, is of great importance. The neck should rise with a graceful sweep from in front of the shoulder, the head being carried slightly

above the line of the back. Notice if the brisket is carried well forward. See that the bull does not "cut up" at the flank, and that it is not deficient at the girth. Wide and deep thighs are of great importance; the shoulders smooth and well covered.

From behind a good view can be obtained of the back, which should be flat and wide. Notice particularly the distance between the hip bones and the tail. The pelvis bones should be thoroughly covered by flesh, forming a broad and level top. The meat must be carried well down the hind legs. The view from the back should suggest a square, the beef should couple across well down and not "split up," as many do. The tail should fall perpendicularly with the back line.

#### HANDLING.

But no man can judge a bull by looks only. It is important to handle the beast thoroughly. Pass the hand over the coat; it should be long and soft. Now grip the skin; it should be mellow and pliable, but fairly thick.

The aim of all beef breeds is to develop a beast that will carry a maximum amount of lean flesh. Therefore it is important to learn to distinguish by touch between fat and flesh. Feel the ribs for thickness of covering; also feel along the back, especially the prominent points. The shoulder points, hooks and rump bones should all be well covered. Lumpiness over the rump is to be avoided. If the beast is fat this may be indicated by the thickness of the flank. A beast that shows a thick flank, but is not well covered on the pins or along the back, is to be avoided. Notice the thickness of the forearm and the depth of meat down the hind legs; this is a good indication of the flesh-carrying powers of the beast, as little fat is carried on these parts. Handle carefully for bare patches, or for soft lumps of fat. The flesh should be soft, but springy. Remember, flesh-carrying properties are inherited and are important. The fat can be added at any time.

#### BOOKS RECOMMENDED—

- Cattle and Cattle Management.* HOUSEMAN.  
*Live Stock on Farm.* Vol II. BRYNES JONES.

# SHEEP ON THE FARM

## THE MERINO

### HISTORY.

Australia owes a great deal to the foresight and enterprise of the men who first imported the Merino.

Captain Waterhouse brought the first draft of 32 sheep from the Cape of Good Hope in 1796. Some of these sheep were bought by McArthur, who soon saw the possibilities of the breed. He visited England in 1804, sold his estates, and invested the money in Merinos. A sale of George III. stud was held at Kew, and McArthur purchased and shipped to Sydney.

### RAMBOUILLETS.

Later the French Merino, the Rambouillets, were imported. These were bigger-framed sheep, possessing high quality wool. The Rambouillet blood is strongly represented in some of the best studs in Australia to-day.

### THE VERMONT.

About 30 years ago the Vermont strain was introduced from America. These sheep are much less attractive in appearance, being small and covered in wrinkles. In some respects they have exerted a harmful influence upon the Australian Merino. In one point, however, the Vermont has greatly improved the breed. This strain is very dense in the fleece, and its introduction has had the effect of adding density to a large proportion of our sheep.

### A DISTINCT TYPE.

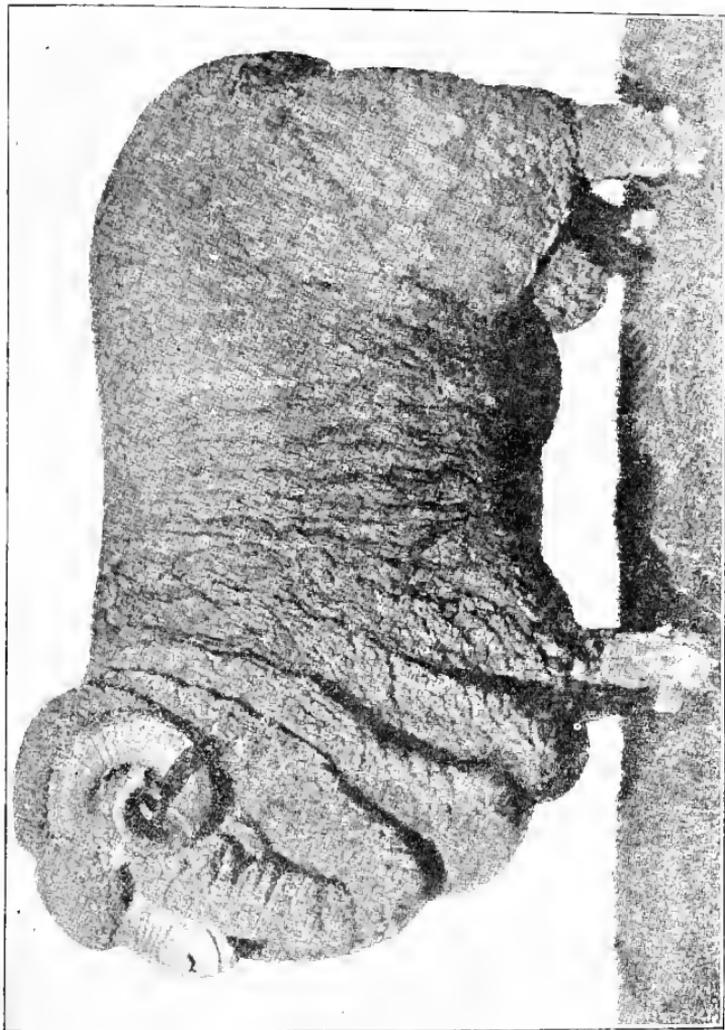
But the Australian is neither Spanish Rambouillet nor American, not merely a combination of these classes; it is a distinct type. In many respects it is a noble animal, and is the finest wool-producer in the world.

### INCREASE IN WOOL PRODUCTION.

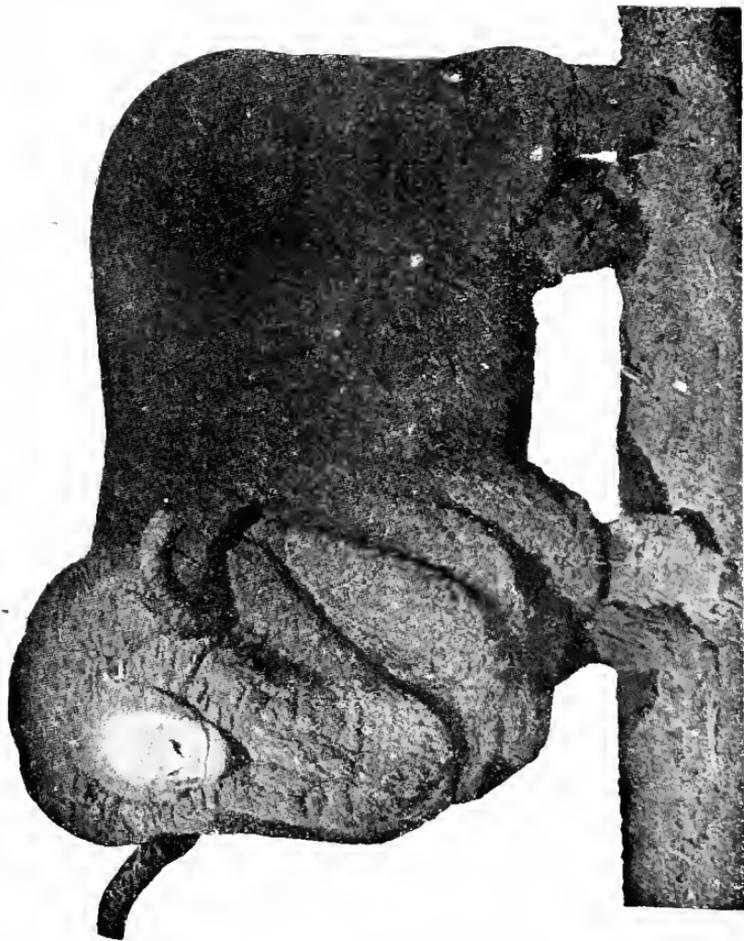
The improvement of the breed may be indicated by the weight of wool that representative sheep have been known to shear at different stages.

In 1801 the highest fleece was  $3\frac{1}{2}$  lbs.

In 1807 this had increased to 5 lbs.



MERINO RAM. "DANDIE DINMONT"  
Sold for 1,550 Guineas



MERINO RAM. "LION II"  
Typical of the plain-bodied Merino

The following figures, taken from Dr. Cherry's book on Australian Agriculture, 1913, show the improvement by selection of the famous Belle Vue stud rams. The weights given represent the best grown in each year:

1868	"Old Sir Thomas"	..	..	12 lbs.
1872	"Sir Thomas II."	..	..	14 "
1878	"Golden Tom"	..	..	18 "
1886	"Golden Tom II."	..	..	26 "
1890	"President"	..	..	23 "
1895	"President II."	..	..	27 "
1900	"Patron"	..	..	30 $\frac{3}{4}$ "
1906	"Patron II."	..	..	31 "

#### "DONALD DINNIE."

This ram was purchased from Deniliquin Park Stud, New South Wales, by the Canowie Pastoral Company in 1906. Since then he has sired over 1,050 lambs, and has averaged 32 lbs. of wool per year for 10 years. In 1915 at 12 years old he cut 31 $\frac{1}{2}$  lbs. of excellent wool.

This record indicates the high degree of excellence which has been attained, not only by one ram, but by many.

#### IMPROVED FRAME.

The frame and construction of the breed has improved equally with the wool-carrying capacity. Australia has a right to be proud of this breed of sheep that has attained an excellence unknown in any other country. The next decade should witness a growing demand for stud sires from other wool-producing countries.

## WOOL QUALITIES.

#### FINENESS.

The distinctive feature of the Merino wool is its "fineness of quality." In technical phrase, the Merino wool is called "sixties" quality, while the wool from the Lincoln is called "thirty-sixes." These "counts" refer to the number of hanks a pound of scoured wool will spin. A pound of Merino wool will spin from 58 to 80, or even to 100 hanks of yarn, while wool from a Lincoln will spin only 36 to 40 hanks, and from a Leicester 40 to 44 hanks. This fineness of quality has caused a great demand for Merino wool. All the finer cloths are woven from this wool. The Merino fleece possesses a softness of touch unknown in any of the other breeds.

#### DENSITY.

Another important character of the Merino fleece is that of density. The fibres are much closer together than is the case with

any other breed. Two important results follow from this density. First, it adds greatly to the weight of wool a sheep will produce. The weight-carrying capacity of the Merino sheep is remarkable. A well-bred Merino ram will cut up to 33 lbs. of good quality wool. Only the density of the fibre makes this weight possible.

Density of wool is also of great importance as a protection against the elements. Wool that is loose and open will be exposed to the heat of the sun, and will carry the dust and sand much more readily than will a dense fleece. Our Merinos now show an excellent covering of wool along the back, and this has been of great value in withstanding the conditions that formerly dried all the yolk and substance out of the top portion of the fleece.

The natural tip to the wool, which most Merino sheep develop, aids greatly in this protection against the weather.

#### CARRIES WOOL WITH AGE.

The Merino fleece is not only heavier and more dense, but it maintains these qualities to a marked degree with age. The English-bred ewe tends to lose in weight of wool after the second lambing; a well-kept Merino ewe, on the other hand, will rear half a dozen lambs and will still cut a profitable fleece.

#### CHARACTER.

The Merino wool is noted for the "character" displayed. The crimps of the fibre are deep and even. This is important, as it gives elasticity to the wool in the manufacturing process.

#### MERINO, THE PASTORALIST'S SHEEP.

The Merino must continue to be much the most important of the breeds of sheep in Australia. In the large pastoral areas, where closer settlement is impracticable and wool-growing is the chief consideration, it will stand alone. The breed is peculiarly adapted for grazing over big areas, and thrives well upon dry vegetation. The Merino is essentially the pastoralist's sheep.

#### THE FARMER'S REQUIREMENTS.

These qualifications do not apply with the same force when choosing the sheep best fitted for the farmer. He must set more importance upon meat-production and less upon the growing of wool. A large flock is required to make any considerable profit out of the wool clip.

#### MATURING POWERS.

One of the most important differences between the Merino and the English-bred sheep is in the matter of early maturity. The

Merino grows and fattens slowly. A Down lamb will develop the same weight in three and a half months as a Merino will in five or six. Early maturity is not of great importance when sheep are grazed at large, as in the pastoral areas. But where the lamb trade is the chief consideration early maturity is of outstanding importance. A three-year-old Merino wether seldom scales more than 70 lbs. deadweight, but well-kept mutton breeds weigh more than this when nine months old. Suffolk lambs, for instance, scale up to 85 lbs. deadweight at this age.

#### IMPORTANCE OF EARLY MATURITY.

The Australian lamb-raiser must always take into consideration the severe summer conditions that prevail throughout most of the mainland. Feed is usually good through the latter part of the winter and through the spring, but early in the summer it dries up very considerably. It is important, therefore, to have obtained sufficient development to enable the lamb to be sold in the pink of condition before the summer approaches. Otherwise the lamb may have to be held until the following season or sold as a store. It is essential, then, that we should adopt a breed that will fatten and weigh at least 40 lbs. dressed weight at five months of age.

#### NERVOUSNESS.

The disposition of the Merino is also a difficulty. It is naturally a nervous animal and will rush into a flock at the slightest disturbance. Bred on broad acres, it is at ease only when left alone in large paddocks. Whereas the mutton breeds will "follow the plough" and will seek feed wherever it is to be found, the Merino is inclined to seek the farthest corner and there remain hungry. They do not respond to intense feeding, and often destroy by trampling more than they eat unless placed upon small rich paddocks of fodder.

#### BREEDS FOR THE FARMER.

It is obvious that the pure Merino is not the best sheep for fat lamb production.

#### PURE-BRED ENGLISH EWE.

Nor would it be advisable to build up pure-bred flocks of English blood for this purpose. An English-bred ewe, with the possible exception of the Dorset Horn, will not take the ram until February, which means that the lambs will not be dropped until July or August. This is too late for most districts, as the summer arrives before the lamb is matured. Moreover, the pure-bred English ewe is distinctly lacking in wool qualities as compared with the Merino.

## CROSS-BREEDING.

The aim then is to cross the Merino with one or other of the English breeds. Which is the best cross obtainable? One or other of two practices may be adopted.

(1) Crossing a short-woolled English ram, such as a Shropshire, Southdown, or Dorset Horn, upon a Merino ewe.

(2) Crossing one of these rams upon a "half-bred" ewe, obtained by crossing a long-woolled breed, such as the Lincolns or Leicesters, on the Merino.

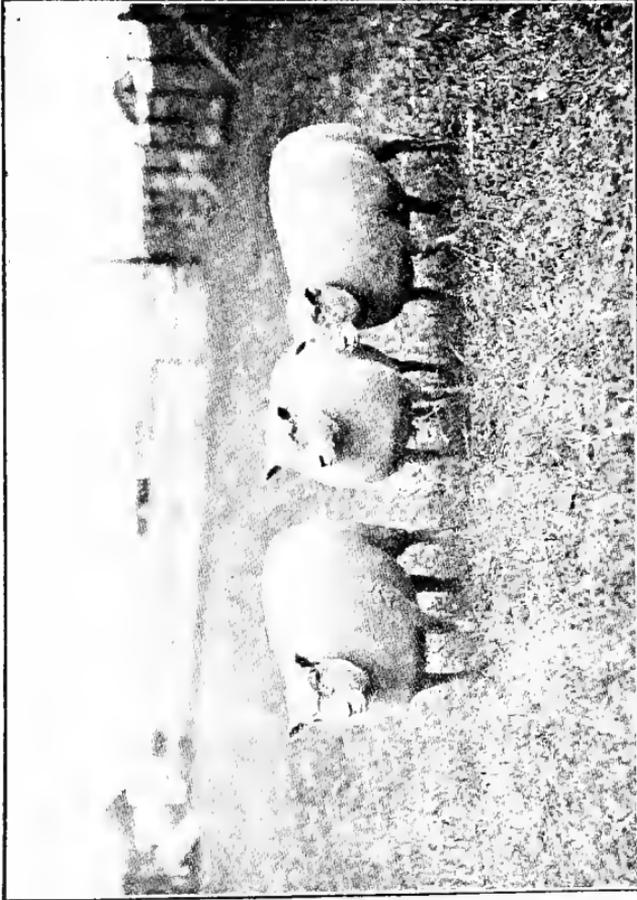
The first practice, that of maintainig the Merino ewe as mother, has certain definite advantages.

## ADVANTAGES—MERINO EWE.

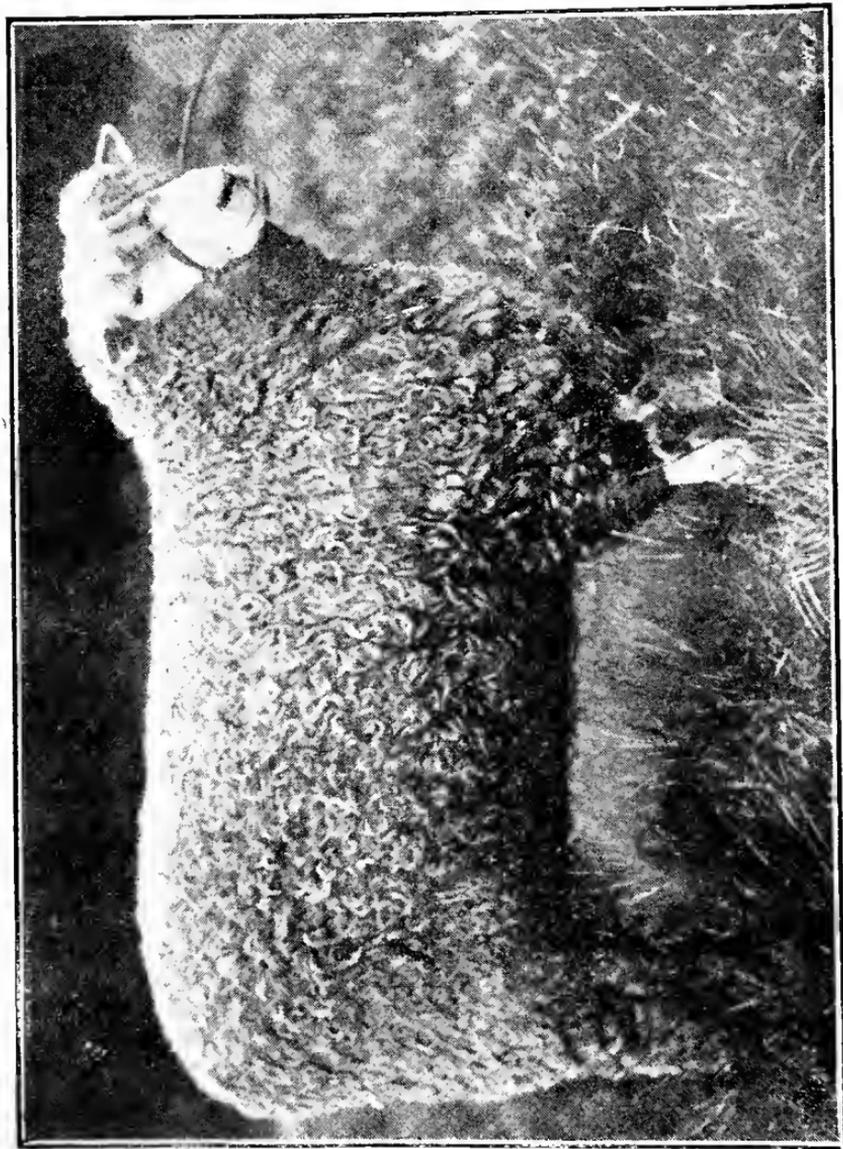
1. The ewe should cut a good fleece.
  2. The lambs can be obtained three or four weeks earlier from a Merino ewe than from a half-bred ewe.
  3. It is usually easier to buy a Merino ewe than a well-woolled half-bred.
  4. The Merino ewe will be less trouble to keep inside fences.
- But there are several weighty facts that favour the second practice, that of using the half-bred ewe for a mother.

## ADVANTAGES—HALF-BRED EWE.

1. The half-bred ewe is decidedly more prolific, there being many more twin lambs. Fully 15 per cent. more lambs should be obtained from a half-bred than from a pure Merino flock.
2. The half-bred makes a better mother, milks much better, and cares for its lamb more jealously.
3. The half-bred ewe follows largely the disposition of the pure English-bred sheep rather than the Merino. This implies a tendency to crawl through fences, but this can be overcome by erecting a good six-wire fence and keeping it strained. This habit of hunting for fodder is most useful in other respects. They will become much quieter and will respond better to heavy feeding.
4. While the half-bred ewe will lamb later than the pure Merino the progeny from the second cross, which we can call the "cross-bred," as distinct from the "half-bred," will mature much quicker, and usually will more than overtake the half-bred, even if lambled a month later.
5. The cross-bred lamb "dies" much better than the half-bred. The flesh is thicker and of much better colour. The appearance of the carcass is much more attractive.
6. If the half-bred ewe is bred on the right lines the value of the fleece will be very little less than that of the Merino.



A GROUP OF SOUTHDOWNS



LINCOLN RAM. CHAMPION ROYAL SHOW, GREAT BRITAIN  
H. Dudding

## CONSIDERATION OF LOCAL CONDITIONS.

In judging whether to adopt the Merino or the half-bred as the ewe flock, the quality of the country and the climate must be taken into consideration. If the paddocks are rough and cannot be cultivated, the Merino may be more suitable. Or if the season is usually a very early one, and it is necessary to lamb in April and sell in August or early in September, the Merino may be the better choice. But early lambing is dangerous in many districts when the early autumn is a very precarious season. Generally speaking, it is wiser to lamb a little later, when the feed is more likely to be good. And by using the half-bred ewe a lamb can be obtained that will come away from the jump, and go off plump and heavy at four and half months. When it is intended to cultivate for sheep fodder and the lamb industry is to be made important, the half-bred ewe will be found the most satisfactory.

## THE ENGLISH BREEDS OF SHEEP

The English breeds divide into two main groups:

These vary in many ways from the heavy-woolled Lincoln to the lighter-woolled but hardier Cheviot.

## 1.—THE LONG-WOOLLED BREEDS.

From this group will come the sire to use when the aim is to breed the half-bred ewe. They vary in their wool-carrying and early-maturing qualities. They will be studied in relation to their suitability for crossing with Merinos.

## 2.—THE SHORT-WOOLLED BREEDS.

These vary from the neat and compact Southdown to the fast-growing but somewhat lanky Dorset Horn. The quality of mutton is generally high amongst this group. This class will supply the ram to use on half-bred ewes. But it is a mistake to keep the ewe progeny of rams from this group, as they all lack wool-carrying capacity.

## THE LONG-WOOLLED SHEEP.

## 1.—LINCOLN.

The Lincoln is the heaviest wool cutter of all the English breeds. Rams average about 15 lbs., and occasionally cut up to twice this weight. The Lincoln will carry its fleece with years better than other English breeds. The wool is very strong or coarse in spinning quality, varying from 36 to 40 counts per pound. The character of the wool is high, the waves or crimps

being plainly marked. The wool shows a fine lustre when opened.

The Lincoln is also the biggest of all English sheep. Great weights are attained by the fully developed Lincoln wether. Two year-old wethers scale up to 370 lbs. each. A fat Lincoln ewe scales as high as 360 lbs., and rams considerably higher. The flesh is relatively good, although none of the long-woolled groups are as high in quality as the best of the down breeds.

The Lincoln is a magnificent sheep when fully developed, but is inclined to show somewhat loosely knit and slab-sided when young.

The lamb is inclined to be delicate at birth.

This breed is excellently suited to cross upon the Merino ewe to produce half-bred ewes or wethers. The wool blends well with the Merino, producing 46's to 50's quality. The strongly marked character of Lincoln wool helps to maintain this important feature in the half-bred. The Lincoln is particularly suitable for the breeder upon a large property, who aims at supplying half-bred ewes for the market and who keeps his wethers until they develop. The wether makes a fine sheep as a 4-tooth, and will cut heavy fleeces in the meantime. The large head of the Lincoln is a difficulty in crossing upon small framed Merino ewes, and often causes trouble in the lambing.

Half-bred Lincoln lambs lack in early maturing qualities, tending to grow rather than fatten. The breed is essentially fitted for production of half-bred ewes and wethers, rather than for the typical frozen lamb. No better mother for lamb breeding can be obtained than the half-bred Lincoln Merino. She will cut a fleece of 10 lbs. of good wool, and if put to a Down ram will rear a first-class freezing lamb.

#### THE LEICESTER.

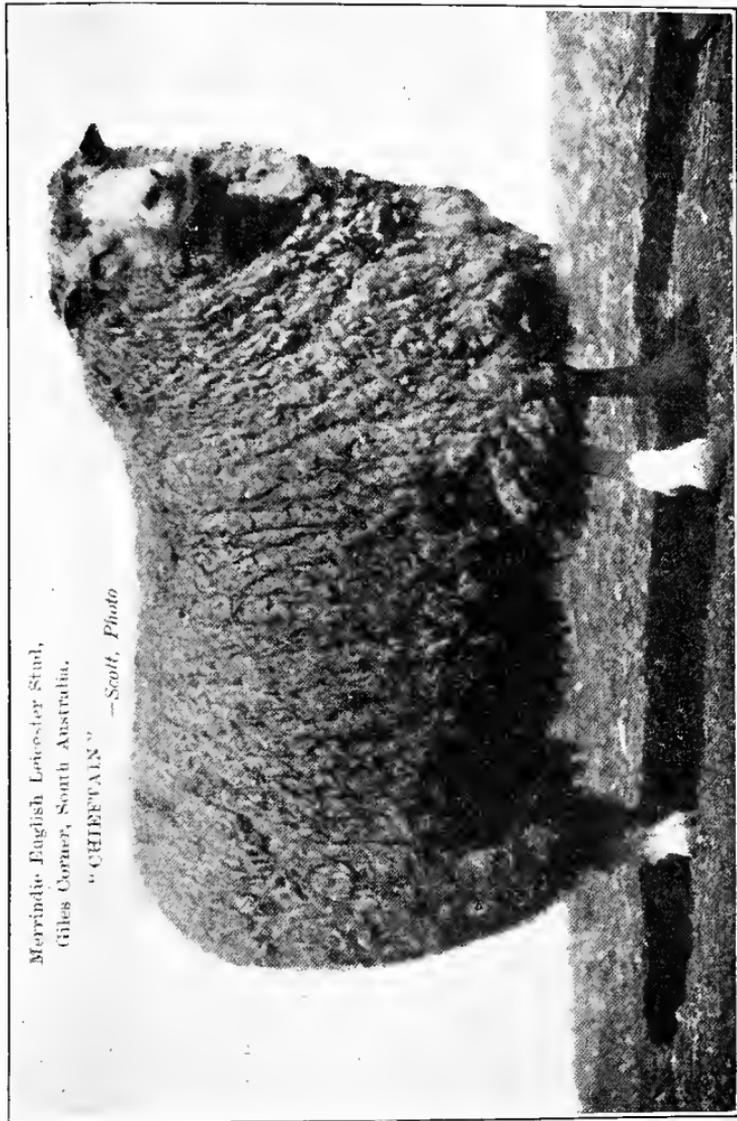
The Leicester is second only to the Lincoln in weight of fleece.

The quality of the wool is finer and spins from 40's to 44's. This is an important consideration for crossing with the Merino; the half-bred Leicester-Merino wool will spin 50's and over, and this extra fineness as against the half-bred Lincoln often results in considerably keener competition and higher prices. The character and lustre of the Leicester wool are excellent.

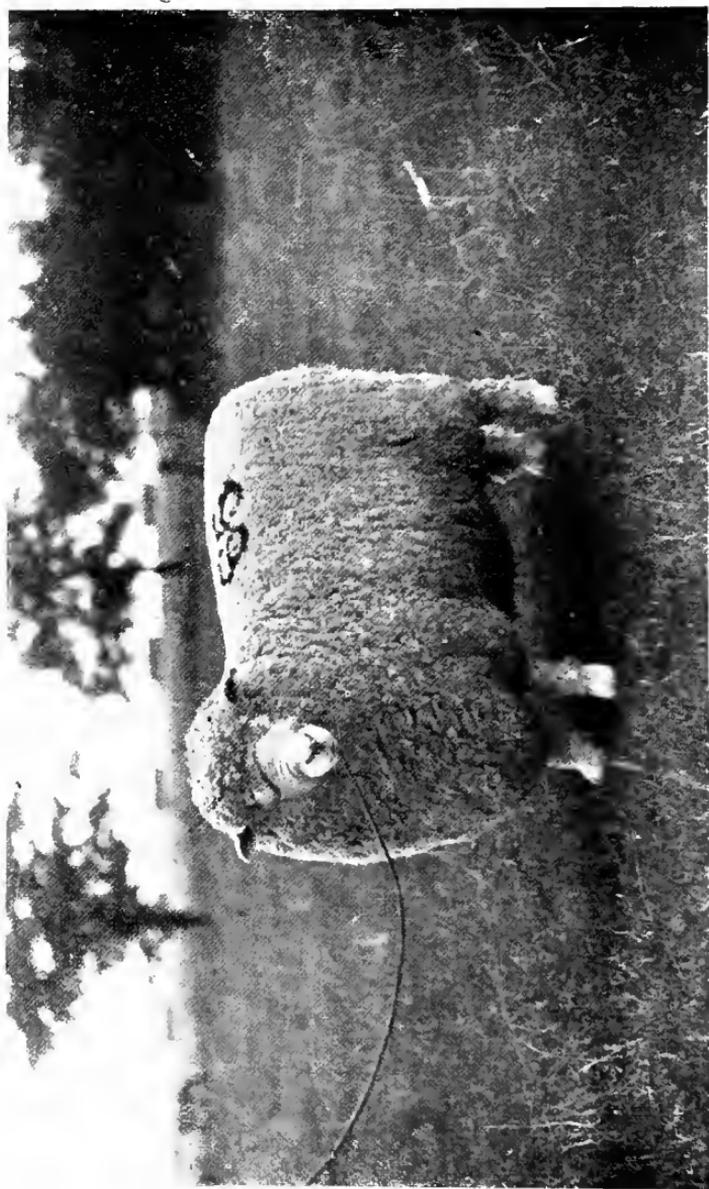
The Leicester does not, however, maintain its weight of fleece with age as well as does the Lincoln. It is not as big as the Lincoln, but is neater and more compact. The head is finer, and gives less trouble in lambing. The Leicester is exceedingly strong through the heart, along the back, and across the loins; the hind-quarters are not so well developed as are the Down breeds. The breed is particularly valuable to cross with Merino ewes. The half-bred lamb will develop and fatten readily, and at the same

Merrindie English Leicester Stud,  
Giles Corner, South Australia.

"CHIEFTAIN" — *Scott, Photo*



LEICESTER RAM



ROMNEY MARSH RAM  
Sold Argentine buyer 1918 for £1,000

time if a percentage of the ewe lambs are kept for breeding an excellently built and woolled ewe flock is obtained. It is essentially a dual-purpose sheep. The pure bred is inclined to become over-fat, but this tendency is rectified by crossing with the Merino. The half-bred Leicester ewe cuts less wool than the half-bred Lincoln, but the quality and character of the fleece are extremely good.

If the feed is very rich the Leicester Merino ewe will incline to become over-fat and fail to breed.

The celebrated Canterbury lamb of New Zealand is largely obtained by crossing short-woolled rams with the half-bred Leicester ewe.

THE BORDER LEICESTER carries a lighter and finer fleece than the Leicester. The locks are not so broad, and the wool does not stand with age as will either of the two foregoing breeds. Neither is the character, nor the lustre, quite so well defined. In point of view of early maturity it stands higher than either the Lincoln or the Leicester. The flesh is of good quality, and it is not inclined to carry superfluous fat, as are the other two breeds. The Border is a very active, smart sheep, and is a good hardy doer. The legs and the neck are somewhat long. When hung up, the hind-quarters incline to show rather too much bone.

The breed is an exceedingly useful one for crossing. Being lighter in the wool, it is less valuable to breed half-bred mothers, but as a fast maturer it is excellent. The Border is a very useful ram to work upon either of the heavier long-wooled half-bred ewes.

THE ROMNEY MARSH carries a very dense fleece. The weight of fleece is slightly less than the Leicester. The spinning quality of the wool is about equal to the Border. The wool tends to be somewhat harsh, and lacking also in character. The wool is shorter than the Lincoln or Leicester.

The Romney is a very weighty sheep, and runs the Lincoln very close in this respect. He is more compact and thicker than the Lincoln, and shows a better hind-quarter than the Leicester. He is deficient in meat covering along the back, and the ribs do not spring as well as the Leicester. Bred for many years upon the marshes of Kent, he is exceedingly hardy. He has been bred to withstand footrot, and of all the breeds is the most immune from this trouble. The Romney makes an excellent cross with the Merino. The wool qualities of the half-bred Romney Merino are somewhat lacking. The fleece shows a splendid density, but the fibre is shorter and the character is somewhat plain. The half-bred lambs thrive splendidly, and are excellently suited to withstand a cold, severe climate. The Romney shares with the Cheviot the honour of being the hardiest of all the long-wooled breeds.

THE COTSWOLD is little known in Australia. The fleece is not unlike the Leicester, but comes straighter off the skin and is more fluffy. The breed matures well and weighs heavily. The Cotswold develops a great amount of superfluous fat. The breed is a very hardy one.

THE CHEVIOT is closely related to the Border Leicester. The wool is shorter, however, and possesses less character. It presents a smart, attractive appearance, but inclines to become too fine in the neck. It thrives well under severe conditions, and is particularly proof against cold.

### THE SHORT-WOOLLED SHEEP.

The breeds of sheep falling under this class are useful for an entirely different purpose from the long-woolled group. Chief amongst these short-woolled varieties are the "Down sheep" or the black-nosed sheep. The quality of meat of these breeds is very high. They are noted, too, for early maturing qualities. Their use is obviously for the second cross from the half-bred ewe. They are deficient in fleece and are therefore not suitable to breed a half-bred mother; but they possess the necessary mutton qualities which fit them for the cross on the long-woolled half-bred.

#### THE SOUTHDOWN.

This breed, which rivals the Leicester for purity of blood and length of history, is recognized as possessing meat qualities second to none. The quality of the mutton is excellent, being very firm and tasty. The sheep is as nearly perfect in frame as it would be possible to imagine. The brisket, the heart measurement, ribs, loins, and hind-quarters are all excellent. The Southdown is one of the smallest of the British breeds, and the lamb does not gain weight so quickly as some other breeds. There is an inclination to lay on fat too freely if the feed is rich. The wool is very light, and lacks character, and the fleece from a Southdown Merino ewe is not at all profitable. But the breed is excellent to cross upon either a Merino or a half-bred ewe if all the progeny are to be sold for the lamb market.

#### THE SHROPSHIRE.

This breed is not unlike the Southdown. The marking is darker at the points. The Shropshire is a larger sheep, and the lamb will gain weight more quickly. The Shropshire is well built, and in this respect resembles the Southdown very closely. The head is stronger and clothed in wool. In this respect it is unique. The amount of wool carried over the head is unfortunate in that

the Shropshire Merino lambs tend to become blind as the result of the wool growth over the eyes. The quality of the Shropshire meat is good; the proportion of lean flesh is high.

Dark spots are liable to develop in the skin, and must be guarded against. The wool is poor, though somewhat heavier than the Southdown. The Shropshire is an excellent sire to use if the lambs are to be marketed; but the half-bred Shropshire ewe is relatively unprofitable.

#### THE HAMPSHIRE.

This breed is somewhat larger than the Shropshire. If well fed, the Hampshire is particularly fast-maturing. These sheep for the most part have been bred to build up weight quickly, and under the intense feeding they receive in Wilts and Hants they will develop the remarkable weight of 144 lbs. in six and a half months. Sixty pounds deadweight at six months of age is quite ordinary. The mutton is of high quality. The head of the Hampshire is inclined to be coarse and large. The points are black, and the ears are long and droop somewhat. They are little known in Australia, but should cross exceptionally well on half-bred long wools, and where the feeding is good they should give excellent results.

The wool of the Hampshire is poor.

#### THE SUFFOLK.

This breed, while dark in the points, follows the Border somewhat in shape. The head is quite devoid of wool. The Suffolk is long in build and is an exceptionally early maturer. It shares many qualities with the Hampshire, but is more prolific and harder. The head is easier for the ewe in lambing.

This sheep is somewhat light at the brisket and hind quarters.

The quality of the meat is very high, the proportion of lean to fat in a well-grown lamb being perhaps higher than any other breed. The Suffolk has secured a large proportion of the prizes awarded at the Smithfield competitions for best carcasses. A nine-months-old lamb will scale up to 85 lbs. dressed. This breed is very deficient in wool.

If our lamb trade develops as it should, the Suffolk must come into prominence in Australia.

#### THE OXFORD.

The Oxford breed is the result of a cross between the Hampshire and the Cotswold or the Leicester. It possesses qualities to be found in each of these breeds. It is not so fast-maturing as the Hampshire, but is more neatly built. The points are brown.

rather than black. Its ears are more erect, and it carries an attractive topknot, without inclining to become muffled over the eyes. The sheep is a good thriver, and the quality of the mutton is high. Naturally, the wool is better than the other black-nosed breeds. The fibre shows considerable character and is not so harsh as most of the Down breeds. Nevertheless, it would be unwise to use the Oxford to breed half-bred ewes.

#### THE DORSET HORN.

This breed rivals the Suffolk and the Hampshire for early maturity. Some remarkable weights have been obtained from ten-month-old lambs. The Dorset is the only English-bred sheep that will take the ram at practically any time. In this sense it is like the Merino, which it resembles also in that the ram grows long, curly horns.

The shape of the Dorset is not so pleasing as most of the short-woolled breeds. His head is big and his body long and set upon long legs. The bone is very strong, and the carcass inclined to be bare of meat down the hind-quarters. The Dorset is not good in the heart measurement. The breed is noted for the number of twins in a lambing. It is amongst the most prolific of the breeds; this, coupled with the quick growth of the lamb, makes the breed popular.

The wool of the Dorset is light and poor, and it is not suitable for breeding half-bred ewes.

#### OTHER BRITISH BREEDS.

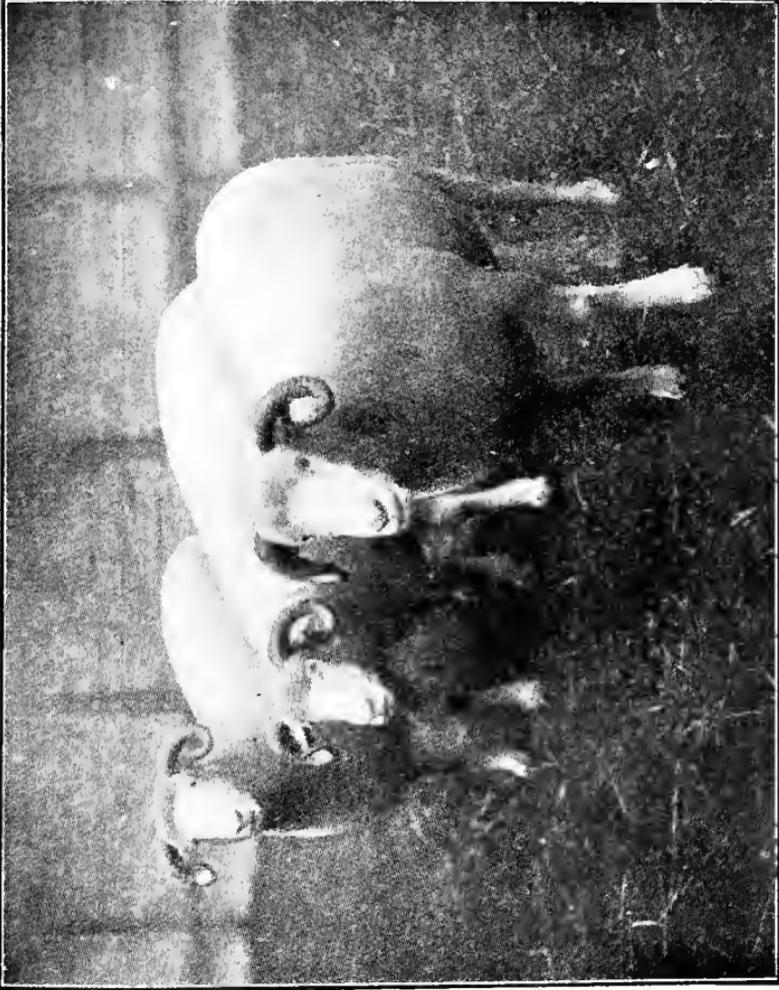
Many other breeds of sheep exist in England, most of which are of less importance as not being likely to be introduced in any quantities. Two of the "Mountain Breeds" however deserve mention.

#### THE EXMOOR.

The Exmoor is a relatively small sheep, but very thick through the heart and well rounded in all its turns. The Exmoor is a very hardy sheep, and the mutton is of high quality. The breed will come into greater prominence. The wool is dense, but somewhat short, the fleece being midway between that of the long and the short-woolled breeds. The Exmoor grows a small horn and is white-faced.

#### THE KERRY HILL.

The Kerry Hill is a Welsh sheep. The type does not appear to be quite settled, but the breed is a very hardy one, and fattens readily on ordinary grazing. The wool is fairly good. The Kerry Hill is mottled-faced.



DORSET HORN EWES



SHROPSHIRE RAM

### THE CORRIEDALE.

This Australian breed has come into a position of importance during the last few years. The Corriedale is the result of crossing the Lincoln-Merino, and it is claimed that a type has been fixed possessing all the good qualities of the half-bred long-woolled sheep. Difficulty, however, has been found in maintaining evenness in the spinning quality of the wool.

This sheep cuts a good profitable fleece, and is well fleshed. The Corriedale sire may be conveniently used where a half-bred ewe flock is already in existence. Naturally, however the progeny does not possess the early-maturing qualities in the same degree as is the case with the pure English sire.

## CARE OF THE FLOCK

We can best deal with each section of this important topic by taking the months of the year chronologically. Shearing is generally accepted as the end of one year and the beginning of the next. We will assume that the shearing has taken place during October, and will proceed to treat the questions of husbandry in the sequence they will normally occur.

### DIPPING--IMPORTANCE.

The importance of dipping can scarcely be over-estimated. Many of the drier districts of the back country are not troubled with either lice or tick, but in most of the localities where the lamb trade will be practised these pests will be found. In all such districts sheep-dipping should be enforced. The loss that is yearly occasioned as the result of the neglect of dipping is very serious. Tick are more obvious, and therefore, perhaps, less dangerous. But lice may exist and not be seen. This insect is very small, no larger than a flea and light flesh coloured. Moreover, they lie right on the skin, and are very difficult to discern. But it is not necessary to see lice to know of their existence. The lousy sheep will be continually rubbing itself. Where a flock of sheep show wool along the sides uneven and straggled in appearance, or when all the protruding posts or rocks show signs of sheep having rubbed around them, one can be sure that lice or tick exist. Lice are particularly partial to English-bred sheep. The skin of these sheep is softer and the flesh more tasty. A long-woolled half-bred sheep will lose several pounds of wool actually rubbed off. The sides and the shoulder, where the very best wool should grow, will often show less wool than the back, merely because it has been rubbed off, the side being most easily rubbed. But the amount actually lost in this way represents only

part of the whole loss. The remainder of the fleece is injured and is not nearly so attractive or valuable, and the sheep itself is very seriously retarded in its fattening by the constant irritation. Dipping costs very little. In many respects it improves the quality and quantity of the fleece. The lack of dipping often halves the income from the wool of half-bred ewes and seriously affects the lambs' fattening qualities.

#### THE PROCESS.

Dipping should take place after sufficient wool has grown to retain a proportion of the solution and before the wool becomes too long, when waste would ensue. Merino sheep should have almost one month's growth of wool. English-bred and half-bred sheep about six week's growth. The plan of dip should follow one or two designs.

1. A dip of sufficient length for the sheep to take approximately one minute to swim. This has the advantage of pace. If the yards are well laid out, the sheep should pass through this class of dip as one continuous stream.

2. A smaller circular dip into which the sheep are placed. In a dip five or six feet in diameter, five sheep can be put in at once and kept in for one minute.

The smaller dip is naturally slower and requires more labour than the long dip, but it has considerable advantages for the owner of smaller flocks. It will require much less material to fill it. A considerable waste takes place in the bigger dip if only required for small flocks. If the catching pen is conveniently small and built with a slight slope down to the tip, and a flag stone with a sharp gradient placed at the edge of the dip, it will be found that sheep may be put in tail first without much effort or splash. Two men can conveniently put through 1,000 sheep in one day.

It is essential to use a recognized preparation of arsenical dip. The carbolic dips are useful for improving the wool clip, but not nearly so effective for destroying vermin.

It is important not to dip in the midst of excessive heat or cold. Sheep should be rested before dipping begins. Before erecting a dip the farmer should carefully study other tried dips, and, if possible, assist in the process of putting a flock through another dip. He will then learn many points that appear of small importance, but really play a great part in the efficiency and ease of the operation.

It is important to follow closely the directions as to mixing, etc., supplied by the dip manufacturers.

#### MATING RAMS AND EWES.

This is an exceedingly important operation, and time should be allowed to attend to all details. The question of the best time

of the year must be decided according to the district. Approximately five months intervene between time of pregnation and the birth of the lamb. The farmer should aim at getting his lambs before the cold of the winter, yet not so early that he will run the risk of having his ewes lambing while the feed is still dry and sparse. If the middle of May be decided upon, he will mate the flock about the 15th December. If both the ewes and the rams are of one class little drafting will be required. In this case the process will be a simple one.

#### THE RAMS.

Five rams should be used to every 200 ewes. In a flock of 200 or over, it is wise not to put all the rams in at once. They are liable to fight and also to wear themselves down and become stale. The English farmer is continually changing his rams, putting them in and taking them out for quite short periods.

Rams should not be too fat when put to the ewes. It is important that they should be active and sound on their feet. On the other hand, it is a mistake to starve a ram before putting him with the ewes. His vitality is reduced more than his weight by this process. The proper way is to keep the ram from becoming excessively fat, especially after shearing. Keep him upon short hard feed through the spring, and give a little oats before mating. When the rams are working they require either good picking or a little extra hand-feeding. If the practice is adopted of keeping only half the rams with the ewes, and the remainder shut away, when they can be rested and fed according to their requirements, it will be found that the ewes will be served more regularly and the rams will maintain fair condition.

The ewes and rams should be yarded together overnight until there is evidence that the rams are serving freely.

If English-bred rams are used it is important that they should not be kept until too old. These breeds are liable to become unduly heavy and lazy. Australian farmers attempt to use most English-bred rams too long. Often the percentage is affected and the lambing is not punctual. The aim should be to have some young active rams at least every second year. If rams are sold after four years service, a reasonable price can be obtained from the butcher, and the loss on the transaction will be much more than made good by using active, vigorous sires.

#### THE EWES.

The ewes should be in good order at mating time, but it is important that they should not be too fat. As soon as the lambs have been either sold or weaned, the ewes should be kept upon short hard feed.

### "FLUSHING" THE EWES.

When the ewes are placed with the rams they should be placed upon good, rich feed. If possible feed should be supplied that is rich in albuminoids. Ewes fed upon good food will take the ram more readily and are much more likely to breed twins. Green feed is often difficult to obtain during the summer, but this should be arranged if possible. Failing lucerne or rape, the flock might be turned upon a newly-reaped oat stubble or some feed where there is rich picking. Where pastures are bare a little hand-feeding should be adopted. If unthreshed pea straw can be carted out to the flock, this will do admirably. This forcing of the ewe need not be practised for more than about two or three weeks. If the ewes are half-breeds it is important not to start the flushing before the ewes are likely to take the ram, otherwise much good food may be wasted. If flushing is practised just as a fair number are beginning to take the ram, a high percentage and an even drop should be secured. Ewes suckling lambs will not take the ram at all evenly, therefore any late lambs should be weaned before mating season, otherwise the next drop will be uneven.

### CLASSING THE EWES.

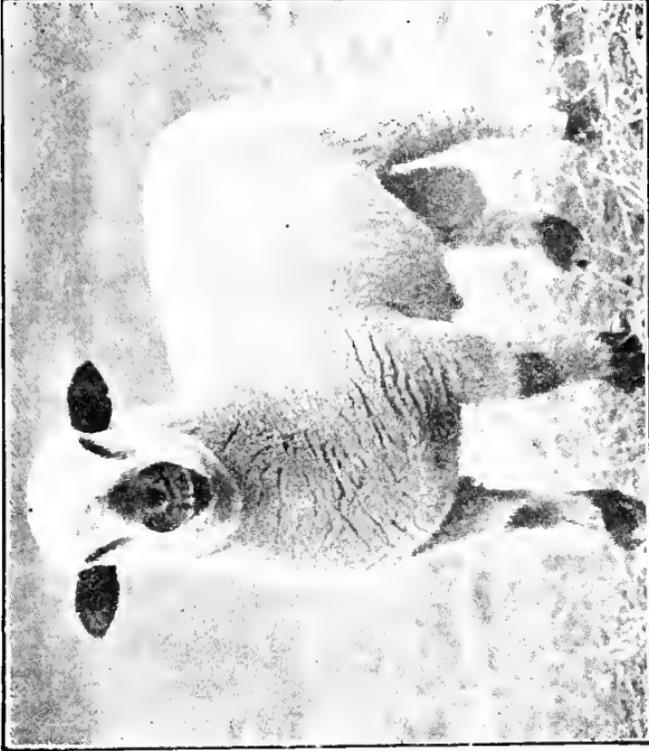
If the flock be a large one, or if different breeds be kept, the mating season is of great importance, for it is then that the important classing takes place. If the ewe flock contains Merino and half-bred ewes and the rams represent both long and short-woolled rams, the ewes will require to be drafted. The Merino ewes will be placed with the long-woolled rams, such as Lincolns or Leicesters, and from these ewes lambs could be kept; the half-bred ewes placed to the Down rams and their progeny sold.

Even if they are all of the same breed it is important to class both the ewes and rams and mate them so as to correct faults. This is the all-important task of the stud breeder.

The writer maintains a relatively even flock of half-bred Leicester-Merino ewes by putting the strong-woolled ewes to Merino rams and the finer-woolled to Leicester rams.

When flocks are divided according to quality for mating purposes the lots should be branded with distinctive figures, otherwise if they once become mixed the work has to be done all over again. If branded differently they can be drafted out with but slight loss of time.

While care should be taken to get the main drop of lambs within a fortnight if possible, it is always wise to leave the rams in for a longer period, as usually a later lamb is better than none.



HAMPSHIRE RAM LAMB



SUFFOLK RAM

Usually some rams will be left in six weeks or two months. Do not, however, leave a young ram, that is working heavily, too long with the ewes.

### THE AUTUMN AND FEEDING.

This season of the year is in many districts the test of husbandry. Usually the dry grass, the fallen seed, and the stubbles, will keep the sheep in good condition through the summer. But, unless the rains come very early, feed becomes very scarce during March and April. Many farmers make the big mistake of allowing their ewes to lose condition during these months, with the result that, by the time the lambing season approaches, the ewe is weak and poor. This is bad policy from every point of view: the wool gets a serious check which affects the weight at shearing time, and the ewe has not the reserve strength she requires to rear her lambs satisfactorily.

#### HAND-FEEDING.

As soon as the sheep are beginning to show hunger, troughs should be placed out in the fields and feeding begun. It is remarkable how little food will be required to keep sheep in fair heart if the pasture is not entirely bare. It is important to start the feeding while the sheep are still strong. Even a pound of green hay chaff per day will greatly assist ewes to maintain their strength. When oats are cheap, this is an excellent fodder. A  $\frac{1}{2}$  lb. of oats will assist sheep greatly, and even if the pasture is very bare 1 lb. of oats will keep ewes in good condition. If peas are available they make the best fodder under these dry conditions, as they are rich in albuminoids. The expense of maintaining ewes in strong condition for a month or six weeks through the autumn is comparatively light, and it is exceedingly bad policy to neglect this matter.

Should the lambs drop before the green feed is sufficiently advanced, the feeding needs to be upon a higher scale. In fact, the lambing season is a very difficult one if the feed is very short. For this reason it is wise not to lamb too early, as there is usually some good picking by the latter end of May.

Lambing ewes on bare pasture should obtain either some silo, peas, or linseed cake. If peas or silo are not available, a good common mixture is 2 lbs. of green hay chaff and 1 lb. crushed oats per ewe and lamb. Oats per pound cost a little less than twice that of chaffed hay, but are more than twice as valuable as fodder. If chaffed straw is fed,  $\frac{1}{2}$  lb. of oats and  $\frac{1}{2}$  lb. of linseed cake should be added.

But it is to be hoped that the farmer will not often be called upon to feed a lambing flock without assistance from the pastures.

Probably by the time the lambs are dropping a fairly good picking will be found. Under these circumstances much less food is required, but it is a big mistake to discontinue the hand-feeding until plenty of pasture exists. When the green feed becomes available less albuminoids are required, and  $\frac{1}{2}$  lb. of crushed barley or oats added to 1 lb. of chaff, per sheep, will assist them greatly.

## THE LAMBING SEASON.

### PERCENTAGES.

Australian lambing figures compare unfavourably with those of Great Britain. In England the farmer expects fully 100 per cent. of lambs; often 150 per cent. are tailed; many of the flocks average 120 per cent. year after year. In Australia 85 per cent. is considered a good average, and the percentage is as often as low as 70 per cent.; only occasionally is 100 per cent. exceeded.

These figures are the more striking when the weather conditions are taken into consideration. With us, lambing usually takes place during mild and warm weather; in England the temperature is often below freezing point, and in most years there are considerable falls of snow.

### ENGLISH METHODS.

How is it that the English farmer is able to beat us so badly in the matter of percentage in spite of the adverse weather conditions?

(1) The English-bred ewe is more prolific and a better mother; we must be prepared to use the half-bred ewe if we are to get the best results.

(2) He is more particular to use sufficient rams and more readily rejects old and stale rams.

(3) He arranges shelter for the lambing ewes, and the shepherd is in constant attendance.

Much of the labour spent upon a lambing flock in England is unnecessary with us. But certain attention and care are always required, and the neglect of this is the cause of a great deal of needless loss.

### CARE OF THE EWES.

As the lambing season approaches, the ewes require to be handled with great care. Much harm is continually being done by allowing badly bred or badly trained dogs to rush the sheep about. A well-trained dog, that will work quietly and keep well out, will help to tame sheep, but a rough animal should be destroyed.

## THE LAMBING PADDOCK.

Care should be taken to reserve fodder upon one paddock near the homestead, where the flock can be brought for lambing. In many localities a piece of unploughed native grass is the best obtainable. The paddock should be well-drained and clean under-foot.

The lambing paddock should be as protected from the prevailing winds as possible. The planting of timber-breaks upon the weather sides of our stock paddocks would do a great deal for the success of lambing and the comfort of the stock generally.

Usually it will be advisable to divide the flock before lambing, picking the ewes that are likely to lamb early so that the flock may not be too large. This picking of ewes heavy in lambs can be done best by feeling the udders of the ewes. Every care must be exercised not to roughly handle the ewes.

## THE SHEPHERD WORK.

Few farms in Australia have a man specially set apart to care for the flock alone. Nor is this usually required under our local conditions. If the paddock be handy to the house and the flock does not exceed 500 ewes, one man, using the inevitable farm hack, should be able to do all that is required, in three hours a day, while the weather is mild. He will visit the flock at least twice a day, moving quietly through the flock, noticing every sheep. He will keep a sharp look-out for ewes in the labours of lambing. It is unwise to interfere too early, for often nature will right itself and damage is often caused by interfering. It is often wise to pass a ewe quietly and to return after an hour or so.

## ASSISTING THE EWE.

If assistance is required it should be given with all care and gentleness. Should the presentation be the normal one of fore feet followed immediately by the nose, little difficulty should be encountered. Care should be taken to assist the ewe as she strains, pulling gently outwards and downwards. Often, however, the presentation is at fault. Then difficulty will be encountered. Perhaps the most common fault is for the head to show without the feet. In this case the legs are back rather than forward. Sometimes the feet show, but the head is doubled back. Another trouble is when the lamb comes tail first, and the hind legs are doubled back. (If the hind legs protrude, as is often the case with one of twin lambs, little difficulty will be encountered.) When any of the foregoing difficulties occur the practice to adopt, is to gently push the lamb back into the womb, turn the lamb, and reach for the head or feet, as the case may be, and thus correct the position before attempting to draw the lamb.

This is often a difficult task, and only experience will teach a man thoroughly, but remember that it is cruel, and often fatal, to attempt to drag the wrongly presented lamb away by main force. There is sufficient room in the womb to turn the lamb, and then little difficulty will be encountered. Cleanliness must be carefully observed, and if the case is a difficult one the ewe should be anointed with carbolic oil.

If a ewe will not take to her lamb she should be enclosed in a small yard with the lamb, and, if necessary, tied up. For the first few days she will need to be held while the lamb obtains a drink. Usually the ewe will take the lamb in this way. A motherless lamb can usually be placed upon a ewe that has lost her lamb in the same way.

As the lambs become stronger they, with their mothers, should be shifted into richer foddors.

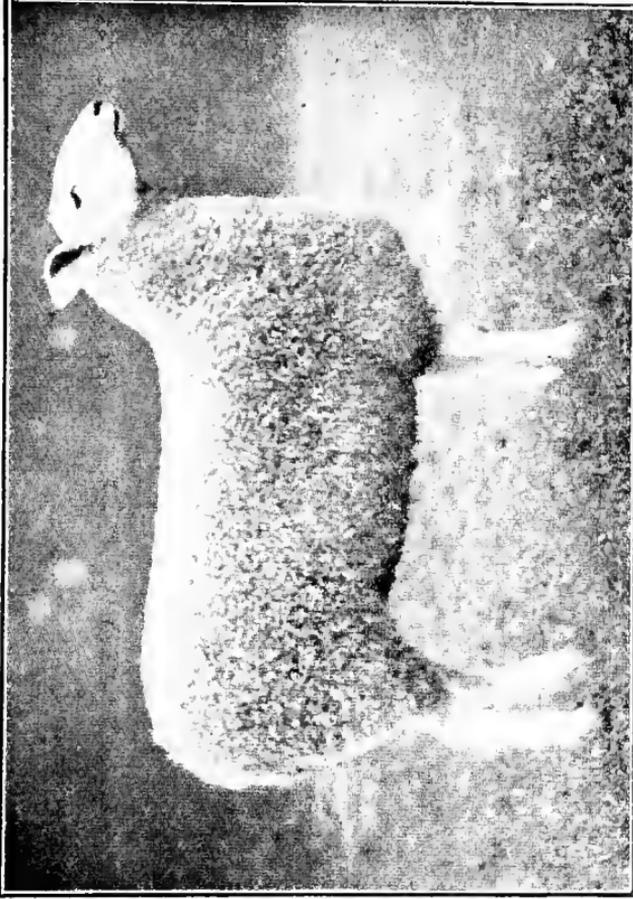
#### DURING ROUGH WEATHER.

Little difficulty will usually be experienced with a lambing flock during mild weather. It is when the weather is rough and stormy that the lamb casualties occur. During a wet, cold spell the sheep need constant attention. In the early morning after a rough night newly-born lambs are often found almost dead with cold. If instant attention is not given heavy losses will be suffered. During such mornings an olive-oil bottle should be carried full of warm milk. A drink from this will often revive a lamb that would otherwise die. The milk should be kept warm by carrying it wrapped in wool and in the pocket. Often the lamb's life can be saved by bringing it into a warmed room. If the lamb is exhausted, a little diluted brandy should be given.

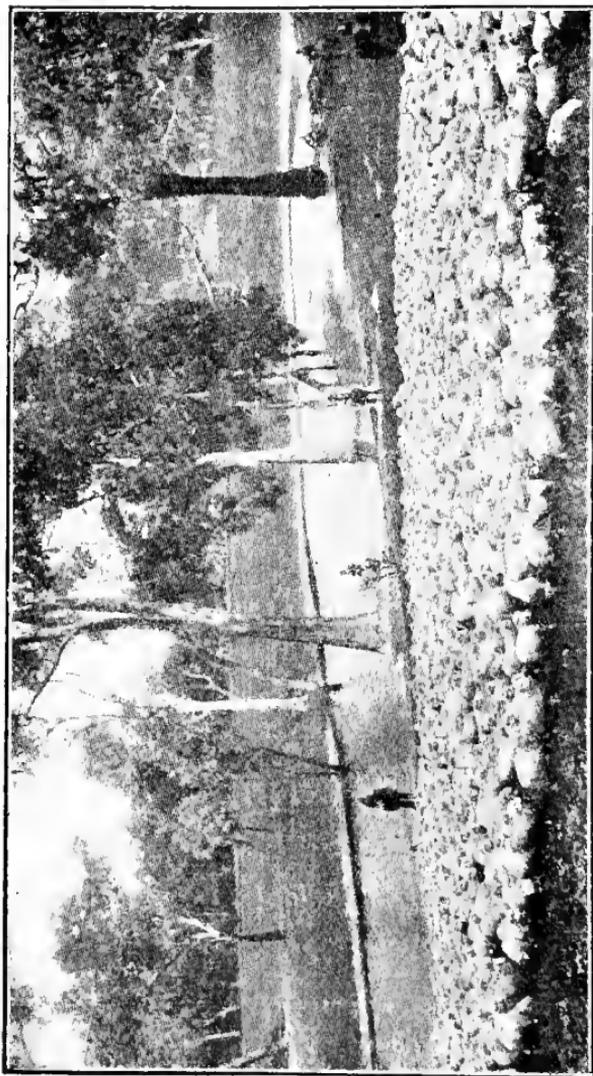
#### THE LAMBING PEN.

Where the flock is relatively small and the paddocks are not well sheltered, the lambing pen should be used. While not adopting the practice of penning sheep for almost the whole of the season, as is done in many counties in England, we might, in many cases, with great profit, use the lambing pen in a modified form. A pen can be erected with very little expense as a permanent improvement to the farm. When not used for sheep it will be useful for other stock. It should be constructed upon good firm soil in a well-sheltered position and within easy distance of the house.

It may be convenient to build the pen in the lee of a shed, or, failing this, straw can be packed between two fences five feet apart and carried up to about eight feet. This makes a good wind-break for the side from which the roughest weather comes. Along the other side a lower fence that will break the wind can be erected. The yard need not be very large. In fact, provided



BOKDER LEICESTER KAM



UNDER THE GUMS

the sheep are comfortable, the smaller yard is warmer. A yard one chain square will be sufficient for 300 ewes. A small straw stack should be built, either at the side or in the centre of the yard, and this can be used freely for littering the pen and keeping the sheep comfortable underfoot. In one corner small pens should be fenced off with hurdles, and protected with some covering. Here ewes with weak lambs can be enclosed and fed.

The lambing pen need only be used during rough weather, but it will greatly assist in obtaining a good percentage, especially in the wetter and colder districts.

The pen will serve to introduce the shy flock to trough feeding, and will be very useful for shelter for other stock, during the seasons when it is not required by the lambing flock.

#### TAILING LAMBS.

This operation should be conducted while the lambs are relatively young. If the lambing is at all protracted it is a mistake to wait until all the lambs have dropped.

The best age is about two weeks.

Two processes for tailing are adopted.

(1) *The Knife*.—This is quick and easy to perform, and the stump heals more quickly after the knife than after the searing iron. There is some risk, however, of the lamb bleeding to death. English-bred lambs being more vigorous, will bleed more freely. Even if the lambs do not bleed to death it is reasonable to believe that many will be weakened. Much bleeding can be saved if the tailing be done during cool weather. The flock should be rested before and after tailing.

(2) *The Searing Iron* stops the bleeding almost entirely. It is, however, inclined to cause a scab, and the tail does not heal as quickly as it does after the knife. Care should be taken to keep the iron at an even heat. If white hot it will injure the bone, and if too cold causes unnecessary pain and will not check the bleeding properly.

The searing iron is to be preferred if the lambs are of three-quarters English breeding, especially when they are thriving well. A poorly fed lamb does not bleed so freely. Searing is much more satisfactory if done when the lambs are quite young; if left till the lambs are over a month old it is not satisfactory. A still better method is to cut off the tail with a knife and sear the main artery with a heated iron. This stops the bleeding without causing a scab.

#### EAR-MARKING.

This should be done at the same time as the tailing. Each farm should have its distinctive ear-mark, which should not change.

When the ewe lambs are kept for breeding, an age-mark should be used. If the mark is placed in a different position for each year, say up to five years, it will greatly facilitate the drafting of the wether from the ewe lambs, and will also enable the farmer to pick out without trouble the ewes of certain ages. Supposing a notch at the end of the off ear is the identification mark for the farm. The wether lambs will have this only. The ewe lambs can then have an additional earmark.

1918—One notch in front of off ear.

1919—One notch at back of off ear.

1920—One notch in front of near ear.

1921—One notch at end of near ear.

1922—One notch at back of near ear.

If a draft of ewes of a particular age be wanted, they can then be drafted out without handling. This rotation can be repeated after five years as sheep can easily be distinguished when five years separate them. This system of ear-marking is simple and quick and only necessitates two notches upon the ears of any one sheep.

### FATTENING THE LAMB.

After the lambs are dropped, the farmer's next task will be to keep the flock in good heart and the lambs going well until the time arrives for marketing.

### THE FREEZING LAMB.

In the past the weight of the ideal freezing lamb has been between 35 lbs. and 40 lbs. With the greater demand for meat, however, this weight may well be increased. If we can put good prime six-months-old lambs on the market weighing 50 lbs. and over, they will be bought up readily. The export lamb trade would be greatly assisted by a careful classification by the Government departments of the carcasses, so that sheep of two years old and over shall not be sold as "lamb". The weight of the typical English lamb is about 60 lb. dressed, and the public are accustomed to joints from such carcasses.

It is essential to study local conditions and to arrange the lambing so that its life will include the best five or six months of the year. It is likewise a mistake to keep the lamb after the good feed has gone, or to sell him while the best months still remain. It will pay us to study the fluctuations of the market less and the maturity of the lamb more. Particularly is this so when we are working upon an export basis.

### FODDER CROPS.

Probably the first ewe and lamb feed will be an early sown crop of barley, later an oat crop, and then a rape field. In feeding

all these paddocks, it is essential to realize the importance of change of food. The change should not be obtained by shifting the sheep each week or so; this often does more harm than good, especially in regard to a rape crop. The changing should, if possible, be done daily. If some pasture land is available and the sheep are allowed to feed there through the night and morning, and are then placed upon the rape during the afternoon, much more feeding value will be obtained from the crop and the sheep will be much less liable to suffer from bloat or from scouring. If the paddocks are laid out systematically, this daily moving of the flock, while upon rich fodder, may be carried out with little loss of time.

Every care should be taken to check the lambs from scouring. Often it will pay to give half a pound of crushed barley or oats per head to the lambs, if there is an inclination to scour. The lambs may be given access to the troughs through narrow spaces between hurdles, through which only the little fellows can pass. The amount of corn suggested is sufficient to check the scour, and to make bloat much less likely, and it will do a great deal towards adding flesh to the lamb. Half a pound of barley a day per head for 300 lambs would represent one bag of barley per day, and would cost approximately £15 for the month. Feeding such as this should not be required as the season advances, and, in fact, will often not be required at all. But the feeding of a slight corn ration is certainly justified to correct scouring.

#### WEANING.

The question of weaning ewes and lambs is a topic for much discussion. Many assert that a weaned lamb will never make the same quality of meat, and that it will be badly checked in the process. This, however, is not borne out by experience.

If the lamb is to be sold as a four and a half months' youngster it is certainly better to sell it direct from the mother. But if the object be to sell a 50 to 60 lb. lamb, which means holding it for six months or over, weaning will be the better method. To grow lambs to these heavy weights the feed must be thoroughly good, and if the ewe is kept on this good feed all the while, not only will much valuable fodder be consumed, but the ewe will become too fat. By weaning the lambs at four months only half the numbers will require to be highly fed. The ewes can be placed upon short feed, and the lambs given the first pick of all the best fodder.

If the feed is good the lambs will receive scarcely any check as the result of weaning. This slight check will be much more than compensated for by the extra amount of high quality food available.

If the fodder crops are heavy, particularly with rape, kale or lucerne, it is wise to "bait out" with hurdles or netting portions of food sufficient for each day. This saves the great waste that would be caused by the sheep trampling over the fields, and will result in each portion being cleaned up in turn. The erection of the feeding pen is only a short task and is well repaid, provided that the fodder is sufficiently luxurious.

#### THE EARLY SUMMER.

During the best months of spring the lamb will thrive with but little care. As the summer advances, however, he must be sold, or, if retained, care must be taken lest the lamb lose its bloom. Swedes are often of great use at this period. But the best foods are lucerne and peas. The lucerne may be grazed, as has been already described. Portion of the pea crop will probably be raked and stacked for future use, but the lambs may be turned into the remainder, for peas are a splendid food to top off the lamb flock. This fodder has been neglected in Australia, but is certain to come into greater prominence during the next few years.

#### PROFIT IN LAMBS.

Much of the Australian farming country is eminently fitted for fat lamb production. The summer is severe, but the lamb should be sold before the extreme heat dries up the feed. A well-bred lamb, such as one by a Down ram out of a long-woolled half-bred ewe, if kept growing well, say from the 1st of June until the end of November, should dress from 50 to 60 lbs. weight. This will require management, but can be done. Hampshire lambs under special feeding weigh as high as 80 lbs. dressed weight in six and a half months, and the same can be done with other breeds, such as the Suffolk or the Dorset Horn.\* While this great weight is the result of a degree forced feeding, that will not pay generally under Australian conditions, there is little doubt but that a six-months' lamb can be made up 50 or 60 lbs. without undue expense.

During the next few years these lambs should be worth from 25s. to 35s. per head upon an export basis. If the ewe is bred on the right lines she should cut a fleece worth 12s. per head, so that, given a good percentage, a ewe should earn, if well kept, £2 per head. A 300 ewe flock, on this basis, should bring in £600. Possibly the prices will fall to a certain extent, but a well-fattened

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\* A Hampshire ram lamb not more than four months of age was slaughtered in Salisbury a few years since, and dressed 81 lbs. This extraordinary weight is vouched for.

50 lbs. lamb will undoubtedly make good money during the next 10 years. (NOTE.—These prices are to be taken only as an indication of what can be done if the flock is well bred and handled and not as the average earnings.)

Before profits can be calculated the depreciation of the ewe flock has to be considered. A half-bred ewe will rear five or six lambs well. She will then have to be fattened off and sold, and a younger ewe bought. This will generally involve a certain amount of loss. But even if the loss amounts to £1 per head in the turnover, this does not represent a great amount per year spread over five or six years.

An alternative plan is to retain a proportion of the ewe lambs. These will not require heavy feeding. If this second plan be adopted the ewe lambs to be retained should be from rams of the long-woolled class. This is the better way in a larger property, but the smaller farmer may find it more profitable to sell his stock of lambs and buy more ewes when his are aged. Often, however, it is difficult to obtain the right class of ewe, and, where possible, about one-third of the ewe lambs should be held each year.

A 400-acre farm of good quality in a 20-inch. rainfall, if managed as indicated, should carry 300 breeding ewes and rear their lambs well, and at the same time produce 100 acres of corn for sale and run a few dairy cows. This cannot be done on the merely grazing principle, but will require cultivation for fodder with conservation of hay or a silo for the autumn.

#### KEEPING WETHERS.

An alternative plan is to keep a line of wethers. This is more simple, but is, on the average, less remunerative. Dealing is unwise for any except the widely experienced. Usually the auctioneer makes more profit than the farmer if stock are turned over at short intervals. Upon the average the farmer will get paid in proportion to what he produces, and the sheep that is being continually bought and sold does not have the opportunity to develop much value.

Many excellent stories are told by farmers who deal continuously in sheep. Wonderful profits they sometimes make; but it is a strange thing that most persistent dealers die poor!

It is, of course, a wise policy to purchase lines of wethers to make use of surplus feed, but the ewe, if well cared for, will give not only the greater pleasure, but also the greater profit.

#### CULLING.

A few days before shearing, the sheep should be carefully culled. The yearling ewes, or ewe hoggets, which have been kept over from the previous lambing, must be examined carefully. It

is a mistake to use a poor quality ewe for two or three years, and then sell her. The percentage from two-tooth ewes is always lower than from older ewes, so that if a ewe is to be sold it is better to sell her as a hogget before she goes to the ram.

Examine for carcase, constitution, and wool qualities. It is poor policy to breed from narrow, ill-thriving ewes; ewes of this shape will merely produce culls. Examine the wool carefully. Length, density and character are the three essential points. Wool that will "grip" well, or will "fill the hand" is what is wanted. Naturally one cannot be too particular, but after 10 per cent. of the poorest hoggets are taken out, the flock will be greatly improved. Watch particularly for coarse breech wool, thin fleeces of plain wool, or short, harsh stuff. Make a point of culling all poor sheep out of hoggets at once. If this be done the sheep need not be culled for quality in subsequent years; only an odd sheep will need to be taken out that has gone obviously wrong. Culling as hoggets can be done much more satisfactorily, as it is a difficult job to cull ewes that are rearing lambs. At this stage the mother of twins or the ewe giving the most milk will usually be culled by the novice.

The necessity for this first culling applies equally to a newly purchased flock. Many men feel they must keep the whole of a bought flock when they would cull 10 per cent. if they bred them.

The axiom is: "Cull well for quality once, and they need only be culled for age afterwards."

#### ODD FAULTS.

Breeding ewes require to be culled for defects other than those of quality.

It is important not to keep ewes with faulty udders. They cause much trouble, and often lose their lambs.

Barren ewes should be sold. Probably they have become too fat. If they are of extra quality they may repay the trouble involved in reducing their condition; but experience proves that if a ewe misses two seasons her proper destination is the butcher.

#### AGE.

If the ewes have been ear-marked according to the year of their birth, culling for age will be very simple. Otherwise, their teeth will have to be examined. It is usually poor policy to keep a ewe after her teeth are broken.

#### PESTS.

##### THE MAGGOT FLY.

This pest presents one of the most difficult problems of the sheep-owner in Australia. In some districts the actual loss of

sheep is very serious. In 1914 the Upper Hunter district in New South Wales lost 48,000 sheep out of 601,000 sheep, or about 8 per cent. of the total. Bombala district lost 14,500 out of 411,000. These figures do not indicate anything like the total loss. Where such a high death rate occurs there must be a great many sheep affected and cured. These will have lost considerably both in flesh and wool.

The fly strikes more frequently in warm, damp climates, particularly in heavily wooded country. Little trouble is encountered out in the drier areas.

#### PREVENTIVE MEASURES.

Nothing has yet been discovered that will rid the sheep-owner of this scourge. Much, however, may be done to minimize the evil.

(1) *Dipping*.—This will greatly assist in protecting against the fly. Experiments conducted on behalf of the Queensland Government in 1914 showed that of the sheep examined 53 per cent. of those not dipped were struck, while only 18 per cent. of dipped sheep suffered. It is, of course, essential to use a powder dip for this purpose.

(2) *Crutching*.—Where the fly is bad the ewes should be crutched a month before lambing. This can be done with little cost on a small property. Take the wool off as neatly as possible around the crutch, and off the lower portion of the tail. The ewe then keeps cleaner, and is much less likely to be struck. Crutching greatly lessens the amount of dirty wool at shearing time.

(3) *Spraying*.—This can be done with or without crutching. Mix a powder dip into a strong solution, and, with an ordinary spray pump spray the solution well into the skin around the tail.

(4) Dead carcasses should be destroyed. This helps to check the spread of the fly.

(5) *Cross-breeding*.—Usually if the above precautions are adopted the fly will do little damage. In some districts, however, great loss ensues in spite of all that is done. This is because in certain damp, warm districts the fly will strike the closely woolled Merino upon any part of the body. In districts such as these the farmer can greatly overcome the pest by raising crossbred sheep. The wool of the half-Lincoln or half-Leicester is not so dense as the pure Merino, and is much less likely to be affected.

#### FOXES.

Foxes do a considerable amount of damage amongst the young lambs in Australia. In many flocks 10 per cent. of the

lambs are killed by this imported pest. Unless farmers unite to make it impossible for the fox to spread, the trouble will increase. Some maintain that the fox kills the rabbit, and therefore should be allowed to live. While this may be plausible from the dairyman's point of view, the lamb raiser certainly cannot afford to let the fox multiply.

#### MEASURES.

By far the best method of killing the fox is by the use of strychnine. The fox has a reputation for cunning, but in reality he is very easily poisoned. Perhaps the best bait obtainable is small birds. He has a particular liking for parrots. Insert the knife into either breast, and drop in as much strychnine as will cover a threepenny piece. This can be done best when the bird is warm. The bird will be seen more readily if hung on a dry bush or on a wire fence, and it is a good idea to scatter a few bird feathers around to attract attention.

Where birds cannot be readily shot, pieces of liver, or any similar meat, will serve the purpose. Cut the meat into small inch cubes; it is wise to fry these in fat so as to make them more savoury. Then drag the paunch of a sheep (one a few days old for preference), and bury along the trail and just below the surface the fried liver into which the poison has been inserted.

There is less need to bury the birds, though to half bury them is quite a good plan. But it is essential to bury the pieces of meat or fat, otherwise crows or magpies will probably carry them off.

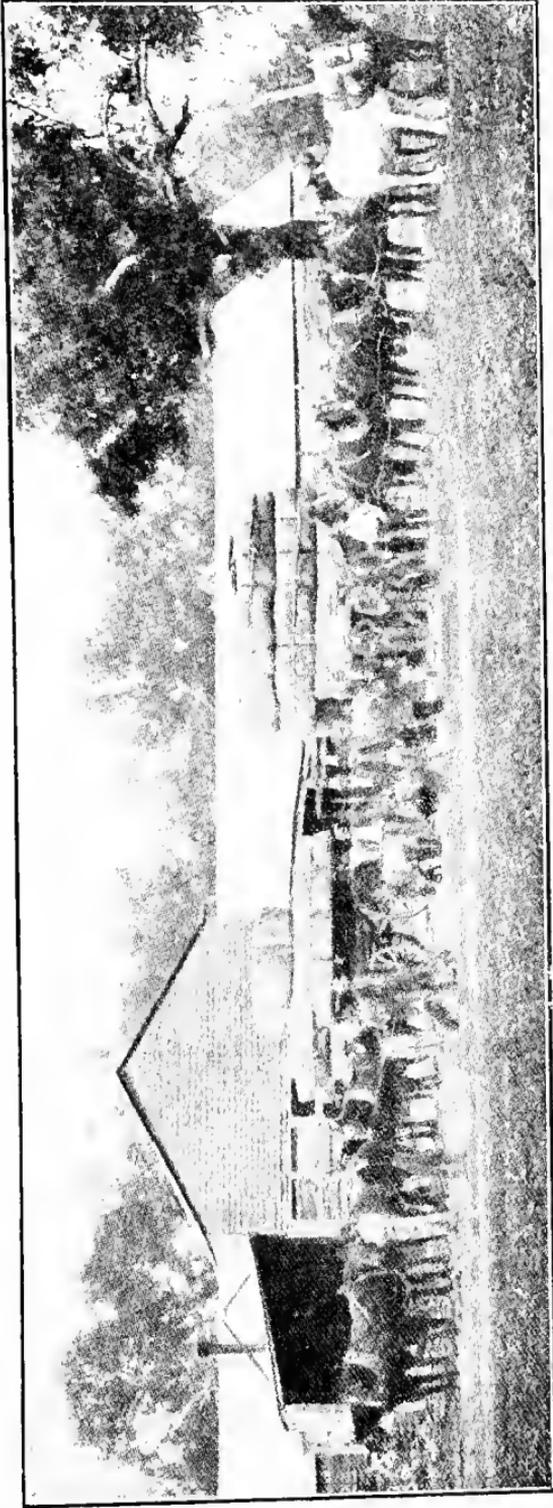
It is seldom any use to poison a dead lamb, other than one that has already been partially eaten. If a campaign of poisoning can be instituted just as the lambing begins, the foxes will be greatly reduced. Incidentally, when fox poisoning is regularly followed, many dangerous dogs are disposed of.

#### BOOKS RECOMMENDED—

*Sheep and Sheep Management.* WRIGHTSON.

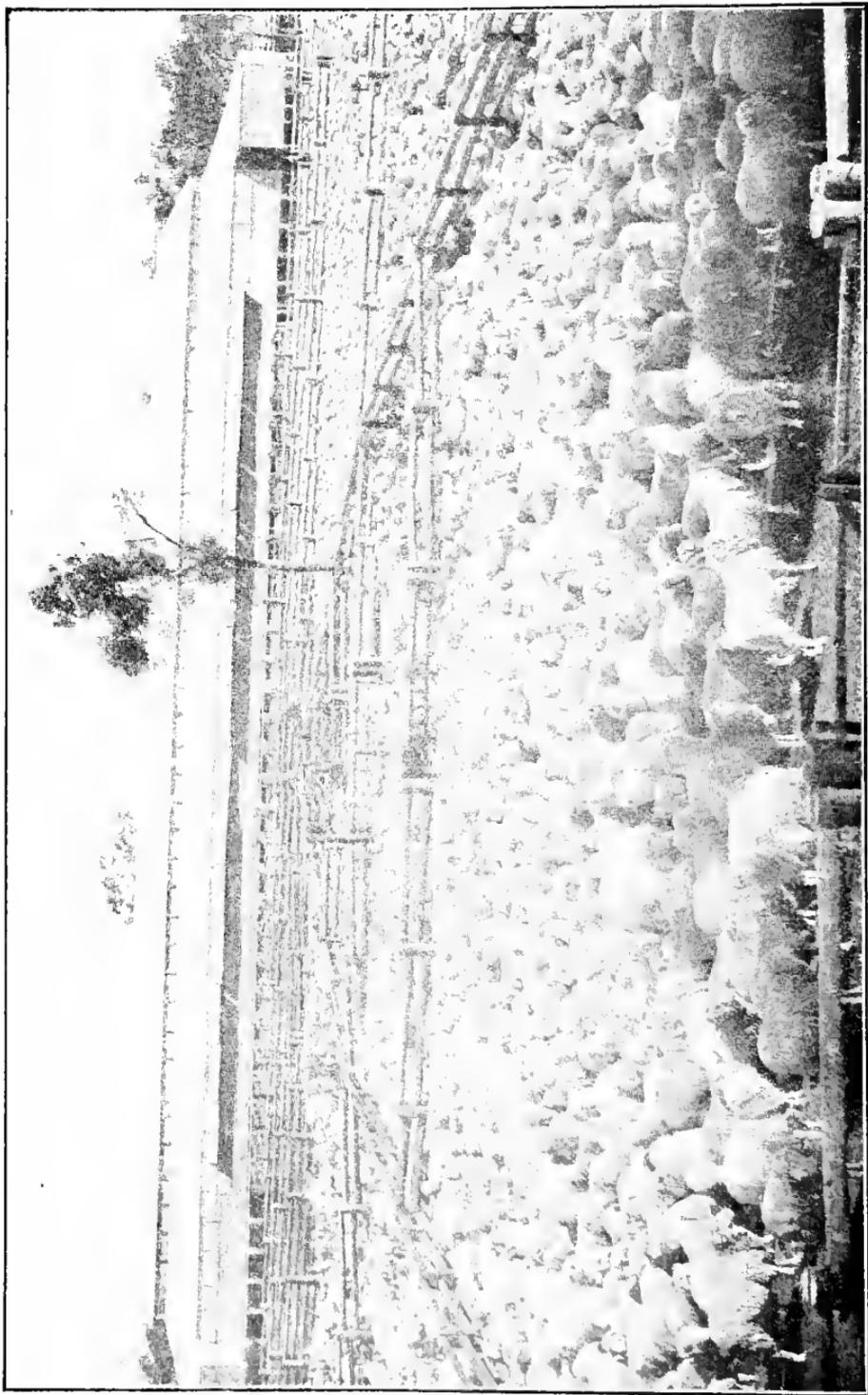
*Sheep: Cross-breeding.* W. MATHEWS.

*Live Stock on Farm.* Vol. III. BRYNES JONES.



WOOL TEAMS. TYPICAL AUSTRALIAN SHEEP SCENE

*Ex. face p. 64*



SHEEP YARDS AND WOOL SHED

# SHEARING TIME

## PREPARATION.

There will be little justification for erecting a wool shed upon many small farms. If the barn is wisely planned it can readily be fitted up for shearing. It will pay the farmer to purchase the adjustable fittings required for this purpose. A couple of dozen light sheep hurdles will be found of great use for the improvised shed and yard. In fact, a number of spare sheep hurdles are always useful about a farm.

Prior to shearing, the flocks should be divided into their respective classes—hoggets, ewes and lambs, wethers, etc. This will greatly facilitate the handling of the wool.

## HANDLING THE WOOL.

The subject of wool classing can only be properly dealt with by expert instructors at equipped wool rooms. The following notes are included for the purpose of assisting those who are unable to attend such classes.

The general principles will be briefly indicated, and a few practical suggestions made as to the handling of a clip from a small farmer's flock.

## TERMS.

Three terms are important:

(1) *Spinning Quality*.—This refers to the fineness of the fibres; the "counts" are high or low in proportion to the number of hanks of yarn a pound of scoured top will spin. Thus 56's quality wool will spin 56 per pound. A hank contains 560 yards of spun wool or yarn.

(2) *Condition*.—Wool varies greatly in the amount of foreign matter it contains. Some wools are heavy in yolk, and this, combined with foreign matter such as earth, seeds, etc., may cause the wool when scoured to weigh only 30 per cent. of the original weight; others will "scour" up to three times this percentage. The wool heavy in yolk or grease is said to be heavy in "condition." A light "conditioned" fleece will scour a high percentage of pure wool.

(3) *Character*.—The crimp of the wool fibre should be clearly marked and even. Such wool shows good "character." Wools lacking in character are called "plain" wools.

## PRINCIPLES OF CLASSING.

The aim of wool classing is so to divide the wool as to enable the buyer to purchase what he requires without having to take a great deal of wool that will be of little use to him. A manufacturer may require wool up to a certain "count." Naturally he will be prepared to pay more for that wool, if he can buy it unmixed with wool of other qualities which he does not require. If, for instance, he is wanting wool of 56's quality, but cannot obtain it unmixed with fleeces of 44's to 46's quality, he will only purchase at a discount.

It obviously pays to "match" wool, *i.e.*, to put like with like. This gives confidence and results in higher values. The extent to which this classing may be carried is governed largely by the size of the clip. Clearly the distinctions can be made much finer if the clip be large. It is a mistake to overclass a small clip, but even in this case the general principle still holds that as far as possible the wool shall be "matched."

Wool is classed in accordance with :

1st. The spinning quality, *i.e.*, the fineness of the fibre.

2nd. The yields, *i.e.*, the proportion of wool that will be left after scouring. This will be affected by several considerations, but chiefly by the "condition" of the wool.

The broader the wool the greater the importance to be placed upon quality, while in classing finer wool, condition will be of the greater importance.

## CROSSBRED WOOLS.

Spinning quality is here the important point. The wool from sheep of English breeds is much broader than from the Merino. A coarse Lincoln fleece will spin as low as 32 counts. The finer half-bred wools will spin as high as 58. But all these wools vary much more in quality than does the Merino wool. Generally speaking, the length varies with the breadth of the fibre; the lower the count the longer the wool. Because of the variation in diameter of fibre, the chief task of the wool classer of English or half-bred wools is to match the qualities as nearly as possible. In a relatively small crossbred clip this can usually best be done by having two main classes, at the same time taking a few very strong fleeces out and selling them separately.

Do not start classing the fleeces until a fair number of sheep have been shorn. The standard can then be set which it is essential to maintain right through. The eye and the hand should be trained to pick out the different "counts" in a moment. Failing a good instructor, the learner should obtain a few samples of wool of standard counts and keep them for reference. Fifties will often form a convenient dividing line in crossbred wools. The number

of the crimps varies largely in proportion to the thickness of the fibre. Thus the crimps of Lincoln wool are few, while the crimps of fine Merino wool are much more numerous. This can only be taken as a general indication of the breadth of the fibre, because a purely bred wool that lacks in character will naturally show a longer crimp and thus suggest a lower count, while it may be of relatively fine quality.

The "yields" of crossbred wool are usually high, and the variation is not very great. Naturally, however, some fleeces will be found heavy in grease or foreign matter, and should be classed separately.

### MERINO WOOL.

Merino wool varies from 58 counts up to 80 or 100 counts. The variation of quality is not of so great importance in this case. Wool over 64's can be classed as fine, and it matters little from the small woolgrower's point of view whether it spins 70 or over.

### YIELDS.

The chief task of the classer will be to divide the wool according to the "yields," *i.e.*, the weight of scoured wool one pound of wool will produce. The wool buyer has to be particularly careful to estimate as nearly as possible the percentage of "clean scoured" any line of wool will yield. The importance of correct estimates of yield will be seen when one realizes that, at the present high prices, an error of one per cent. in the estimations of yields will result in wrongly valuing the clip by almost  $\frac{1}{2}$ d. a pound. Even at normal prices every 1 per cent. variation in yield will affect the price to be paid from one-eighth to one-quarter of a penny per pound. It is therefore of the utmost importance to the buyer that the clip should be fairly and evenly classed, otherwise the difficulty of a correct estimate is greatly increased. When wool varying greatly in condition is offered, the buyer simply safeguards himself by writing the price down to a safe level. A few fleeces heavy in grease will greatly affect the value of a nice line of light wool.

### ESTIMATING YIELDS.

Expertness in estimating yields is only attained after much practice. An instructor can teach by actual example what cannot satisfactorily be explained upon paper.

#### *Important Considerations:*

(1) The amount of grease. This is the most important consideration in estimating yields. Feel the wool for clamminess. The high-yielding wools feel warm to the touch, while the low-yielding wools are cold and clammy.

(2) Amount of foreign matter. In the dry parts of Australia the backs are full of dust, and this must be allowed for. On the other hand, dusty wool is often dry wool, and therefore will yield a higher percentage than a novice might expect.

(3) Length of staple and the class of tip. The shorter the staple and the heavier the tip, the lower will be the yield.

(4) "Filling the hand" wool should "grip" well. Wasty wool that squeezes to a small compass when pressed will not scour heavily. The motto is: "The wool that fills the hands fills the bale."

In a small clip the classes should not be too numerous, otherwise the lots will be too small. If the fleeces are consistently divided into two classes, with a few fleeces very heavy in the grease taken out and sold separately, all requirements should be met.

The spinning quality of Merino wool is of less importance in a farmer's clip. It is only necessary to take out a few very strong fleeces, which can then be sold separately.

A knowledge of wool which is to be gained under a competent instructor will be found of greatest assistance in the woolshed, the show ring, and the sale yard.

#### PRACTICAL SUGGESTIONS.

No attempt can here be made to follow the wool through the various processes of skirting, piece picking, classing, etc. All men intending to handle wool should seek practical instruction before attempting to deal with even a small clip. Knowledge on this point can be obtained relatively quickly.

The following considerations should be borne in mind:

(1) The skirting aims at removing all the stained wool and the heavy low-yielding edges from the fleece. It should be performed as lightly as is consistent with the end in view.

(2) If the fleeces contain burr, judgment must be used; either practically all the burr must be taken off, or if this cannot be done, it is better to ignore them altogether. Nothing is gained by taking half the burr into the pieces and leaving the remainder in the fleece.

(3) Only occasionally will it pay the farmer to take out the backs.

(4) Roll the fleece neatly but not too tightly. The shoulder wool should show upon the outside.

(5) Nothing better repays classing than lambs' wool. A few handfulls from off the belly and points of the older lambs should be taken out and put in with the shorter wool from the young lambs. This will leave a top line of light bright wool.

Length and freedom from burr is of particular importance in the case of lambs' wool.

(6) Classing of pieces, beyond carefully removing "stained ends," will seldom pay the farmer. He should, of course, be most careful not to mix the Merino and cross-bred pieces.

(7) "Honesty is the best policy" is a motto that should be hung up in every woolshed.

#### BOOKS RECOMMENDED—

*Wool-classing.* (Not procurable in England.) G. JEFFERY.

*Sheep and Wool Industry in Australia.* SMITH.

*Wool.* F. OMEROD.

*Wool Carding and Combing.* BARKER and PRIESTLEY.

## APPENDIX I.

## HINTS ON JUDGING SHEEP

## THE MERINO RAM.

1. Observe the general build and appearance.  
 Head should be masculine and strong. Horns should curve gracefully and out from the head. The general appearance should be of strength. Depth of girth and breast measurement are particularly important.  
 Folds of skin at the neck are an advantage, but the body should be almost free of wrinkles.
2. Examine the wool closely for:
  - (A) Length of staple. Notice how the wool carries down to the points, and to the turn of the belly.
  - (B) Density, particularly along the back. This can be gauged by noting the amount of skin that shows as the fleece is opened. It is important here also to grip the wool, noticing how it fills the hand. Density has more effect upon weight carried than has length of staple.
  - (C) The character should be well defined and even, the crimp evenly showing from the skin to the tip of the fibre. This is relatively easy to obtain in fine wool, but is very difficult to obtain in stronger fleeces.
  - (D) The spinning quality should be even. Examine the fleece carefully; the breech wool should show as nearly as possible the same count as the neck and shoulder. This is difficult to attain, but heavy, coarse breech wool is to be avoided. Opinions vary as to the correct strength of the lambs' wool, but it is important that the sire's fleece should not be too fine.
  - (E) The quality\* of the wool should be high, soft to the touch, showing life and health. The due appreciation of these more subtle points will only come with experience.

## THE LONG-WOOLLED RAM.

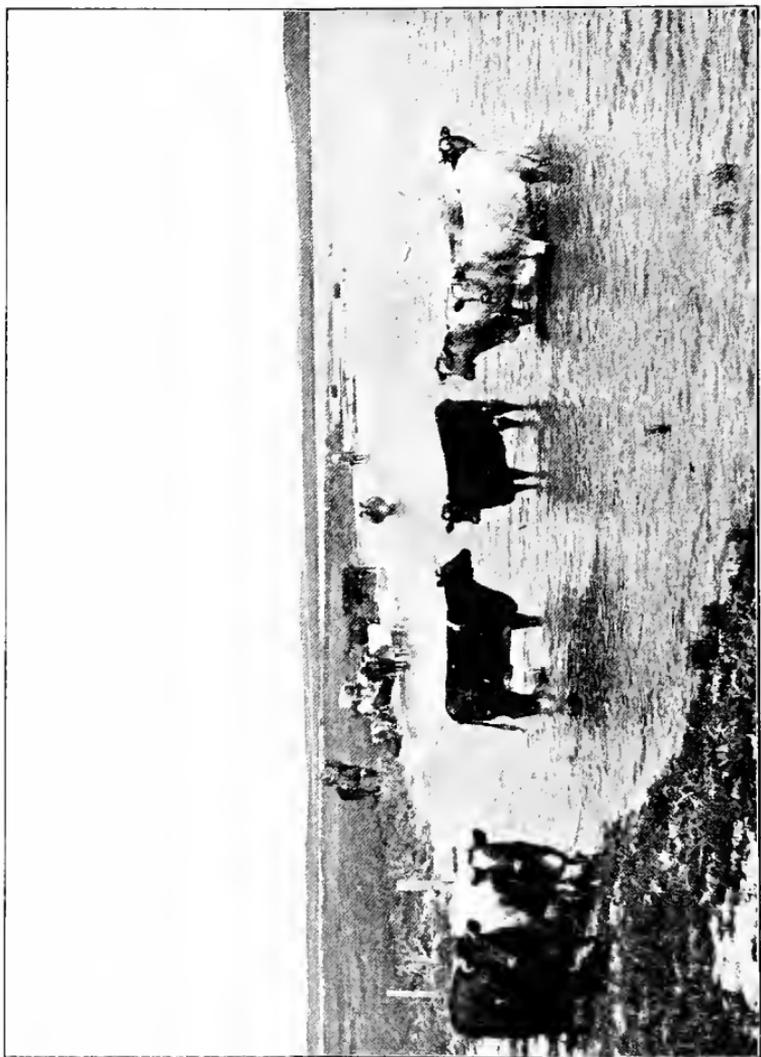
Points of frame, constitution, etc., are more important in the judging of the long-woolled ram than in the case of the Merino. The Merino is essentially a wool grower; the Down is essentially a mutton producer; the Long-woolled ram comes mid-

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\* The term "quality" is used in a dual sense as applied to wool. In the shearing shed it usually has a technical meaning, and refers to "spinning quality;" in judging a sheep it is often used non-technically, and refers to those excellencies difficult to describe by any other word, and therefore called "quality."



MERINO "HERCULES"  
Sold for 1,700 Guineas



GROUP SHORTHORNS, POINT STURT

way between the two; equal consideration has to be given to mutton and wool qualities.

1. Notice general appearance and bearing. The sheep should stand up squarely and hold himself well.

2. Examine for mutton qualities carefully:

(A) Feel along the back. The backbone should be well covered. The top should be broad and level, the flesh springy and not too soft. Feel the scrag, which should be thick; the withers should be well covered. Stretch the hand across the loins, noticing the width across and the thickness of the flesh. The tail should not droop.

(B) Feel the ribs for covering, and ascertain the width by placing one hand on either side of the sheep. Do not trust the eye. The heart measurement is particularly important.

(C) Stand back and notice the depth and the top and bottom lines. Notice, too, how the brisket carries out.

(D) Stand behind and notice the coupling of the hindquarters. The mutton should be carried well down.

(E) Make the ram walk; he should move freely and gracefully; his legs should be squarely set.

3. The wool qualities should be examined as indicated for the Merino. It is especially important that the wool should have lustre and be free from harshness.

### THE SHORT-WOOLLED RAM.

The Short-woolled ram should be examined for the same points of frame and constitution as the Long-woolled ram. In this case fully 75 per cent. of importance should be given to considerations of frame and type of head. (The type of head cannot be dealt with specifically here, each individual breed having its own distinctive features.)

In examining the Short-woolled ram one must depend very largely upon the touch, as the Down wool, not having a natural curl at the tip, naturally lends itself to barbering.

1. Examine carefully the points of frame and mutton qualities, as indicated in the case of the Long-woolled ram.

2. Less importance is to be placed upon the wool; the various breeds differ considerably in the qualities required. All breeds should possess a compact, dense fleece. Examine the wool carefully for grey or black fibres; these are very likely to spread over the head, in some cases down the front of the neck, in others up the hindquarters.

3. Examine the skin carefully, which in every case should be a light pink. The Down breeds tend to develop dark patches, which, if neglected, will spread quickly. The colour and quality of the flesh are closely related to the colour of the skin.

## BEEF, MUTTON, AND WOOL

APPENDIX II.  
BREEDERS' TABLE.

TIME OF SERVICE.	MARES: 340 Days.	COWS: 283 Days.	EWES: 150 Days.	SOWS: 112 Days.	BITCHES: 63 Days.
January 1	December 6	October 10	May 30	April 22	March 4
" 8	" 13	" 17	June 6	" 29	" 11
" 15	" 20	" 24	" 13	May 6	" 18
" 22	" 27	" 31	" 20	" 13	" 25
" 29	January 3	November 7	" 27	" 20	April 1
February 5	" 10	" 14	July 4	" 27	" 8
" 12	" 17	" 21	" 11	June 3	" 15
" 19	" 24	" 28	" 18	" 10	" 22
" 26	" 31	December 5	" 25	" 17	" 29
March 5	February 7	" 12	August 1	" 24	May 6
" 12	" 14	" 19	" 8	July 1	" 13
" 19	" 21	" 26	" 15	" 8	" 20
" 26	" 28	January 2	" 22	" 15	" 27
April 2	March 7	" 9	" 29	" 22	June 3
" 9	" 14	" 16	September 5	" 29	" 10
" 16	" 21	" 23	" 12	August 5	" 17
" 23	" 28	" 30	" 19	" 12	" 24
" 30	April 4	February 6	" 26	" 19	July 1
May 7	" 11	" 13	October 3	" 26	" 8
" 14	" 18	" 20	" 10	September 2	" 15
" 21	" 25	" 27	" 17	" 9	" 22
" 28	May 2	March 6	" 24	" 16	" 29
June 4	" 9	" 13	" 31	" 23	August 5
" 11	" 16	" 20	November 7	" 30	" 12
" 18	" 23	" 27	" 14	October 7	" 19
" 25	" 30	April 3	" 21	" 14	" 26
July 2	June 6	" 10	" 28	" 21	September 2
" 9	" 13	" 17	December 5	" 28	" 9
" 16	" 20	" 24	" 12	November 4	" 16
" 23	" 27	May 1	" 19	" 11	" 23
" 30	July 4	" 8	" 26	" 18	" 30
August 6	" 11	" 15	January 2	" 25	October 7
" 13	" 18	" 22	" 9	December 2	" 14
" 20	" 25	" 29	" 16	" 9	" 21
" 27	August 1	June 5	" 23	" 16	" 28
September 3	" 8	" 12	" 30	" 23	November 4
" 10	" 15	" 19	February 6	" 30	" 11
" 17	" 22	" 26	" 13	January 6	" 18
" 24	" 29	July 3	" 20	" 13	" 25
October 1	September 5	" 10	" 27	" 20	December 2
" 8	" 12	" 17	March 6	" 27	" 9
" 15	" 19	" 24	" 13	February 3	" 16
" 22	" 26	" 31	" 20	" 10	" 23
" 29	October 3	August 7	" 27	" 17	" 30
November 5	" 10	" 14	April 3	" 24	January 6
" 12	" 17	" 21	" 10	March 3	" 13
" 19	" 24	" 28	" 17	" 10	" 20
" 26	" 31	September 4	" 24	" 17	" 27
December 3	November 7	" 11	May 1	" 24	February 3
" 10	" 14	" 18	" 8	" 31	" 10
" 17	" 21	" 25	" 15	April 7	" 17
" 24	" 28	October 2	" 22	" 14	" 24
" 31	December 5	" 9	" 29	" 21	March 3

## APPENDIX III.

## TABLE OF STANDARD RATIONS.

The following Tables of Standard Rations and Compositions of Foods are taken from Mr. H. M. Todd's book on Feeds and Feeding. This book is of great value and is printed by Vinton & Co., and sold for about 3/6.

The figures deal with English products, but except in the case of their more nutritious hay, the figures will be applicable in Australia.

In the composition of Foods it is important to notice the difference between the Total Analysis and the Digestible Constituents. The latter is much the more valuable set of figures.

	Per day per 1000 lb. live weight.				
	Dry Matter.	Digestible Constituents.			
		Albu- minoids.	Carbo- hydrates.	Fats.	Albu- minoid Ratio.
	lb.	lb.	lb.	lb.	
<b>CATTLE—</b>					
Maintenance Ration.					
Full-grown Ox at rest ...	19	0.7	8.0	0.15	1 12
Growing Cattle.					
To maintain thriving condi- tion for Dairy Purposes:					
Age. Av. live wt.					
2—3 months 150 lb. ...	23	4.0	13.0	2.0	1 4.5
3—6 " 300 lb. ...	24	3.0	12.8	1.0	1 5.1
6—12 " 500 lb. ...	27	2.0	12.5	0.5	1 6.8
12—18 " 700 lb. ...	26	1.8	12.5	0.4	1 7.5
18—24 " 900 lb. ...	26	1.5	12.0	0.3	1 8.5
Growing Cattle.					
To maintain good condition for beef purposes:					
Age. Av. live wt.					
2—3 months 160 lb. ...	23	4.2	13.0	2.0	1 4.2
3—6 " 330 lb. ...	24	3.5	12.8	1.5	1 4.7
6—12 " 550 lb. ...	25	2.5	13.2	0.7	1 6.0
12—18 " 750 lb. ...	24	2.0	12.5	0.5	1 6.8
18—24 " 950 lb. ...	24	1.8	12.0	0.4	1 7.2
Fattening Cattle.					
To maintain an average in- crease of about 2 lb. per day for 100 to 120 days:					
First period ...	27	2.5	15.5	0.5	1 6.7
Second period ...	26	3.0	15.0	0.6	1 5.5
Third period ...	24	2.8	15.5	0.7	1 6.1



AVERAGE COMPOSITION OF FOODS AND  
AVERAGE PERCENTAGE OF DIGESTIBLE  
CONSTITUENTS.

	TOTAL ANALYSIS.						DIGESTIBLE.		
	Water.	Ash.	Albu- minoids.	Crude fibre.	Carbo- hydrates.	Fats.	Albu- minoids.	Carbohd. and fibre.	Fats.
HAY.									
Meadow Hay, poor ... ..	14.3	5.0	7.5	33.5	38.2	1.5	3.4	35.0	0.5
"  "  average ... ..	14.3	6.2	9.7	26.3	41.4	2.5	5.5	41.0	1.0
"  "  very good ... ..	15.0	7.0	11.7	21.9	41.6	2.8	7.4	41.7	1.3
Red Clover, poor ... ..	15.0	5.1	11.1	28.9	37.7	2.1	5.7	36.2	1.0
"  "  average ... ..	16.0	5.3	12.3	26.0	38.2	2.2	7.0	37.0	1.2
"  "  very good ... ..	16.5	6.0	13.5	24.0	37.1	2.9	8.5	37.3	1.7
Rye Grass ... ..	14.3	6.5	10.2	30.2	36.1	2.7	5.1	35.3	0.8
Sainfoin ... ..	16.7	6.2	13.3	27.1	34.2	2.5	9.3	35.1	1.6
Trefoil ... ..	16.7	6.0	14.6	26.2	33.2	3.3	9.2	36.3	2.0
Crimson Clover ( <i>T. incarnatum</i> ) ... ..	16.7	5.1	12.2	30.4	32.6	3.0	6.2	34.9	1.4
Lucerne ... ..	16.0	6.2	14.4	33.0	27.9	2.5	10.1	34.4	1.0
White Clover ... ..	16.5	6.0	15.5	25.6	33.9	3.5	8.1	35.9	2.0
Kidney Vetch ... ..	16.0	5.6	9.4	30.8	35.9	2.3	5.2	36.7	1.2
Vetch ... ..	16.7	8.3	14.2	25.5	32.8	2.5	9.4	32.5	1.5
Oats, in ear ... ..	11.5	6.1	7.5	30.1	42.4	2.4	3.8	38.9	0.9
Peas, in bloom ... ..	16.7	7.0	14.3	25.2	34.2	2.6	9.4	33.1	1.6
GREEN GRASSES AND CLOVERS.									
Pasture grass, average ... ..	80.0	2.0	3.5	4.0	9.5	0.8	2.0	10.0	0.4
"  "  rich meadow ... ..	78.2	2.2	4.5	4.0	10.1	1.0	3.4	10.9	0.6
Oats ... ..	81.0	1.4	2.3	6.5	8.3	0.5	1.3	8.9	0.2
Rye ... ..	76.0	1.4	2.9	6.5	12.4	0.8	1.8	12.4	0.4
Maize ... ..	80.6	1.2	1.7	5.6	10.4	0.5	1.0	9.8	0.3
Rye Grass ... ..	70.0	2.0	3.6	10.6	12.8	1.0	1.8	12.2	0.4
Sainfoin ... ..	81.4	1.2	4.2	5.2	7.3	0.7	3.0	7.9	0.5
Trefoil ... ..	80.0	1.5	3.5	6.0	8.2	0.8	2.2	8.7	0.5
Crimson Clover ... ..	81.5	1.6	2.7	6.2	7.3	0.7	1.5	7.5	0.3
Red Clover ... ..	80.4	1.3	3.0	5.8	8.9	0.6	1.7	8.7	0.4
Lucerne, just in bloom ... ..	74.0	2.0	4.5	9.5	9.2	0.8	3.2	9.1	0.3
White Clover ... ..	80.5	2.0	3.5	6.0	7.2	0.8	2.2	7.9	0.5
Kidney Vetch ... ..	83.0	1.3	2.8	5.3	5.2	0.4	1.6	7.4	0.2
Vetches ... ..	82.0	1.8	3.5	5.5	6.6	0.6	2.5	6.7	0.3

## THE COMPOSITION OF FOODS (continued).

	TOTAL ANALYSIS.						DIGESTIBLE.		
	Water.	Ash.	Albu- minoids.	Crude Fibre.	Carbo- hydrates.	Fats.	Albu- minoids.	Carbohd. and Fibre.	Fats.
<b>GREEN CROPS.</b>									
Cabbage ... ..	89.0	1.2	1.5	2.0	6.0	0.3	1.2	8.0	0.1
Rape ... ..	84.5	2.0	2.3	2.6	8.4	0.5	2.0	8.0	0.3
Mustard ... ..	82.7	1.4	2.1	5.8	7.5	0.5	1.4	7.9	0.3
Swede leaves ... ..	88.4	2.3	2.1	1.6	5.2	0.5	1.5	5.1	0.3
Mangel leaves ... ..	90.5	1.8	1.9	1.3	4.0	0.5	1.2	4.0	0.2
<b>ROOTS AND TUBERS.</b>									
Turnips, white fleshed ... ..	91.0	0.7	1.1	0.8	6.3	0.1	0.7	7.0	0.1
Swedes ... ..	87.0	1.0	1.3	1.1	9.5	0.1	1.0	10.0	0.1
Mangels ... ..	88.0	0.8	1.1	0.9	9.1	0.1	1.0	10.0	0.1
Sugar Beet ... ..	81.5	0.7	1.0	1.3	15.4	0.1	1.0	16.7	0.1
Carrots ... ..	85.0	0.9	1.4	1.7	10.8	0.2	1.1	11.0	0.1
Parsnips ... ..	88.3	0.7	1.6	1.0	10.2	0.2	1.1	12.0	0.1
Potatoes ... ..	75.0	0.9	2.1	1.1	20.7	0.2	2.0	20.0	0.1
Kohl Rabi ... ..	88.2	1.0	2.3	1.5	6.9	0.1	1.2	8.0	0.1
<b>STRAW.</b>									
Oat ... ..	14.3	4.0	4.0	39.4	36.3	2.0	1.0	40.0	0.7
Barley ... ..	14.3	4.1	3.5	40.0	36.7	1.4	1.0	40.0	0.5
Wheat ... ..	14.3	4.8	3.0	42.0	34.9	1.3	0.5	33.0	0.4
Rye ... ..	14.3	4.1	3.0	44.0	33.3	1.3	0.7	33.0	0.4
Beans ... ..	16.0	4.6	10.2	34.0	34.2	1.0	3.0	35.0	0.5
Peas ... ..	16.0	4.5	6.5	38.0	34.0	1.0	3.5	37.0	0.5
Clover, thrashed ... ..	16.0	5.6	9.4	42.0	25.0	2.0	3.0	30.0	0.1
<b>CHAFF.</b>									
Oat ... ..	14.3	10.0	4.0	34.0	36.2	1.5	1.3	36.6	0.6
Barley ... ..	14.3	13.0	3.0	30.0	38.2	1.5	1.2	35.0	0.6
Wheat ... ..	14.3	9.2	4.5	36.0	34.6	1.4	1.0	33.0	0.4
Beans ... ..	15.0	5.5	10.5	33.0	34.0	2.0	4.0	35.0	1.0
Peas ... ..	15.0	6.0	8.1	32.0	36.9	2.0	4.5	35.0	1.0
<b>SILAGE.</b>									
Maize ... ..	79.1	1.4	1.7	6.0	11.0	0.8	1.1	11.0	0.6
Red Clover ... ..	79.2	2.1	4.2	5.9	6.4	2.2	2.8	7.2	1.5
Oats and Vetches ... ..	81.3	2.4	3.4	5.5	6.6	0.8	2.0	7.0	0.5
Grass ... ..	86.0	2.0	2.0	6.5	8.1	0.8	1.4	8.5	0.5

## THE COMPOSITION OF FOODS (continued).

	TOTAL ANALYSIS.						DIGESTIBLE.			
	Water.	Ash.	Albu- minoids.	Crude Fibre.	Carbo- hydrates.	Fats.	Albu- minoids.	Carbohd. and fibre.	Fats.	
<b>CEREALS.</b>										
Oats	12.1	3.3	10.7	10.6	58.3	5.0	9.0	48.0	4.3	
Barley	14.0	2.7	10.0	4.9	66.1	2.3	8.0	60.0	1.5	
Wheat	14.0	1.7	12.0	3.0	67.3	2.0	10.5	65.0	1.2	
Rye	14.0	1.8	11.0	3.5	67.4	2.0	10.0	65.0	1.1	
Maize	12.7	1.6	10.1	2.3	68.6	4.7	7.0	66.0	4.0	
Dari	11.1	2.6	10.2	1.7	71.3	3.1	8.2	67.0	2.5	
<b>CEREAL BY-PRODUCTS.</b>										
Wheat Bran	13.0	5.6	13.6	8.9	54.9	3.4	10.5	50.0	2.5	
Pollards (fine bran)	12.1	4.1	14.1	7.3	58.2	4.2	11.0	50.0	2.5	
Sharps (white meal)	12.0	2.5	15.0	5.0	62.0	3.5	12.0	56.0	3.0	
Oat Hulls	9.4	6.5	2.7	27.9	52.2	1.3	1.3	40.1	0.6	
Rice Meal	10.5	9.9	12.0	10.0	45.6	12.0	7.5	47.0	10.0	
Rice Husks	9.5	12.0	6.0	25.1	44.1	3.3	4.2	38.0	2.3	
Maize Bran	11.8	3.4	10.2	9.0	61.8	3.8	7.5	56.0	3.0	
"  Germ	8.1	1.3	11.1	9.9	62.5	7.1	9.0	55.0	6.2	
"  Gluten	10.0	1.0	38.0	2.0	15.0	4.0	32.0	42.0	3.5	
"  "  Feed	10.0	2.0	26.0	6.0	53.0	3.0	21.0	52.0	2.5	
Barley Malt	7.5	2.3	9.4	8.7	69.8	2.3	7.5	67.0	1.8	
Brewer's grains, wet	76.1	1.1	5.3	3.9	12.9	1.5	3.5	10.0	1.3	
"  "  dried	9.3	4.2	20.2	15.0	43.6	7.7	15.0	34.0	6.0	
Malt Sprouts (Culms)	11.8	7.6	23.3	12.4	42.8	2.1	12.0	40.0	1.0	
<b>LEGUMINOUS SEEDS.</b>										
Beans	14.4	3.2	25.0	6.9	48.9	1.6	21.0	48.0	1.4	
Peas	14.4	2.7	22.6	5.4	53.0	1.9	18.0	53.0	1.4	
Vetches	13.4	3.2	26.4	6.6	48.6	1.8	23.0	50.0	1.6	
Lentils	14.5	3.0	23.8	6.9	49.2	2.6	21.0	51.0	2.2	
Lupins, blue	14.0	2.9	29.5	11.2	36.2	6.2	26.0	41.0	5.2	
Indian Gram	9.8	2.8	20.6	10.0	52.2	4.6	17.0	53.0	3.5	
<b>OIL SEEDS AND CAKES.</b>										
Cotton Seeds	11.4	4.3	19.9	18.8	20.2	25.3	14.5	13.7	22.8	
Decorticated Cotton Cake	8.7	7.1	39.1	7.2	28.0	9.9	33.0	20.0	8.0	
"  "  Meal extracted	9.0	7.5	43.0	8.5	31.0	1.0	32.0	25.0	0.8	
Egyptian Cotton Cake	12.3	5.3	23.6	20.8	33.7	5.1	18.0	20.0	4.5	
Bombay " "	11.6	6.3	19.4	20.1	38.0	4.6	15.5	21.0	4.0	

## THE COMPOSITION OF FOODS (continued).

	TOTAL ANALYSIS.						DIGESTIBLE.			
	Water.	Ash.	Albu- minoides.	Crude Fibre.	Carbo- hydrates.	Fats.	Albu- minoides.	Carbohd. and fibre.	Fats.	
OIL SEEDS & CAKES (continued).										
Soya Beans ... ..	10.0	5.0	33.4	4.8	29.2	17.6	30.0	25.0	15.8	
Soya Bean Cake ... ..	11.4	5.6	42.7	5.7	28.5	6.1	33.0	28.0	5.0	
"  "  Meal, extracted ... ..	9.0	5.7	44.0	6.0	34.3	1.0	32.0	20.0	0.8	
Earth-nuts ... ..	6.3	3.2	28.2	13.9	7.2	41.2	23.7	12.0	39.0	
"  "  Cake (decorticated) ... ..	10.7	4.9	47.6	5.1	23.7	8.0	40.0	25.0	7.0	
"  "  "  (with shells) ... ..	9.8	6.5	31.0	22.7	20.7	8.9	25.0	19.0	7.2	
Linseed ... ..	12.3	3.4	20.5	7.2	19.6	37.0	20.0	19.0	35.0	
"  "  Cake ... ..	11.8	7.3	28.7	9.4	32.1	10.7	25.0	30.0	9.5	
"  "  Meal, extracted ... ..	9.7	7.5	33.2	8.8	38.7	2.3	27.0	35.0	2.1	
Coconut Cake ... ..	10.3	5.9	19.7	14.4	40.7	9.0	17.0	40.0	8.0	
Palm-nut Cake ... ..	12.0	3.7	19.0	10.0	48.3	7.0	15.0	40.0	6.0	
Hempseed Cake ... ..	11.9	7.8	29.8	24.7	17.3	8.5	20.9	16.5	7.2	
Sunflower Cake ... ..	10.8	6.7	32.8	13.5	27.1	9.1	28.0	25.0	8.0	
Sesame Cake ... ..	11.1	10.9	37.2	7.5	25.5	7.8	33.0	15.5	6.5	
Compound Cakes, poor ... ..	12.0	6.0	12.0	14.0	50.0	6.0	10.0	50.0	5.0	
"  "  "  good ... ..	11.0	6.0	24.0	11.0	40.0	8.0	20.0	40.0	7.0	
MISCELLANEOUS.										
Flesh or Meat Meal ... ..	10.8	4.6	71.0	...	0.5	13.1	67.0	0.5	12.8	
Fish Meal ... ..	15.0	24.0	57.0	0.3	0.2	3.5	51.0	0.2	3.0	
Hens' Eggs ... ..	73.7	1.1	12.6	...	0.6	12.1	12.6	0.6	12.1	
Milk, cows' ... ..	87.5	0.7	3.2	...	5.0	3.6	3.2	5.0	3.6	
"  "  separated ... ..	90.5	0.7	3.9	...	4.5	0.4	3.9	4.5	0.4	
"  "  whey ... ..	93.8	0.4	0.6	...	5.1	0.1	0.6	5.1	0.1	
"  "  goats' ... ..	86.9	0.9	3.7	...	4.4	4.1	3.7	4.4	4.1	
"  "  mares' ... ..	91.0	0.4	2.1	...	5.3	1.2	2.1	5.3	1.2	
"  "  ewes' ... ..	81.3	0.8	6.3	...	4.7	6.8	6.3	4.7	6.8	
"  "  sows' ... ..	84.0	1.1	7.2	...	3.1	4.6	7.2	3.1	4.6	
Treacle (beet molasses) ... ..	20.8	10.6	9.1	...	59.5	...	(?)	55.0	...	
Apples ... ..	84.8	0.5	0.4	1.5	12.5	0.3	0.3	11.2	0.2	
Acorns, fresh ... ..	55.3	1.0	2.5	4.4	34.8	1.9	2.0	34.0	1.5	
Sugar Beet Pulp, dried ... ..	11.6	7.1	6.6	19.3	54.8	0.6	4.1	65.0	0.6	
Buckwheat ... ..	13.2	1.8	10.1	15.0	58.4	1.5	0.5	51.8	1.1	
Locust or Carob Beans ... ..	13.0	1.8	6.0	5.9	71.3	2.0	4.0	65.0	1.1	

NOTE.—It must be distinctly borne in mind that the figures in this, or any other similar table, are only averages and must not be taken as giving the exact composition of any particular sample.

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