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UTILISATION OF NEW ZEALAND WOOLS

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Very little information is available to wool producers about the use normally made of their clips. What fabrics are woven from the £16,000,000 worth of wool produced in this country each year? In actual fact, it is not easy to answer this question precisely because many lines of wool are suitable for several alternative uses. It is not possible to follow special lots of wool through sorting, blending with wool from different sources, and through many different factories or processes to the finished fabric. The exact destination of any particular clip, or part of a clip, depends upon market conditions, supplies of labour and machinery, and the abnormal demands or lack of demands for certain types of cloth brought about by wars, booms and depressions. Wool consumption, however, tends to fall into certain broad trends of uses; short fibres can never be used in place of very long fibres; coarse fabrics are fundamentally different from fine wool fabrics, while wools with serious defect can seldom be substituted for high grade raw material. The purpose of this bulletin is to indicate the general direction of these trends and their bearing on farming practice.

Many changes must be wrought upon the fleece to convert it from a loose collection of fibres standing side by side, to an end to end arrangement in strong threads suitable for weaving or knitting. As pointed out in Agricultural Bulletin No. 167—"Wool, Its Use in Manufacture"—two different methods of effecting this conversion are available to the wool manufacturer. These produce yarns, and hence fabrics, of fundamentally different structure. In the first system—the woollen system—long fibres form the centre or core of the yarn, and the shorter fibres point in all directions. This gives a soft, fuzzy thread without great strength, suitable for blankets, rugs, tweeds and flannels. In the second system—the worsted system—short fibres are first removed and the longer fibres are laid parallel and twisted. This gives a firm, smooth yarn of great strength suitable for hard wearing serges, and fine fabrics for suits and costumes. Speaking very broadly, the woollen system of yarn production is designed to make best use of cheap, short fibred wools, while the worsted system uses the longer and more valuable, raw material.

Although fibre length plays an important part in deciding the methods employed in wool manufacture, fibre fineness largely determines the softness, or handle and many other valuable properties of the final fabric. So important is the average fibre fineness of a wool sample that the term "quality" is often applied solely to this one feature of the material. Fine wools are said to be of high quality. For many purposes this use of the word is apt to be misleading because garments made from fine wool, while soft and warm, do not withstand hard wear and tend to shrink rapidly on washing, unless the wool has been specially treated.

Merino Wools

Merino sheep, which grow the finest and most valuable of the true wools, produce only approximately two per cent of the Dominion's clip. The best merino wools come from Australia, where, in general, conditions are ideal for growing sound, long stapled, regularly crimped, snow white fleeces, free from serious dust and dirt contamination. Merino wool goes to make the finest and softest of all wearing apparel. When processed on the **worsted system** it gives us luxury

underclothing, fine coatings and the greater part of cloths used for men's suitings, as well as the better quality knitting wools and fine hosiery. **Woollen spun** merino yarns give us cashmeres, delaines, fine flannels, billiard cloths and fine dress and coating materials.

Corriedale and Halfbred Wools

Much more important than Merino wools in New Zealand are those grown on the Corriedale and Halfbred sheep of the South Island. Very often these go into fabrics which set out to imitate, at a cheaper price, cloths made from finer wools. Such fabrics can usually be recognised by their harder handle and more lustrous appearance. Typical Corriedale and Halfbred wool fibres are half as coarse again as those found on the Merino, and this difference is responsible for the harder handle, because the coarse fibres do not bend so easily. In this case soft handle, although a good indication of power to retain warmth, would be a false guide to ability to withstand hard wear.

Romney Wool

In general, coarse fibre wools go to make strong fabrics of great wearing ability, to be used where appearance is a secondary consideration. This applies particularly to the bulk of New Zealand's wool clip, which is derived from sheep of predominantly Romney blood. Romney wools are about twice as coarse as the finer lines of Merino, and nothing can be done to change the characteristic handle of fabrics made from them. Even the best and most beautifully grown wool of this class still possesses a relatively coarse fibre, which sets a limit to the sort of fabric which can be manufactured. There is a saying about a silk purse and a sow's ear which applies very aptly to the utilisation of the stronger grades of wool. At the same time many types of cloth can be made successfully only from strong wools. Such fabrics as saddle tweeds and battledress, though lacking in softness and perhaps in appearance, have great strength and wearing power. In addition, of course, they have the advantages common to all wool goods — of warmth, ability to give out heat when wetted, great capacity to absorb moisture, elasticity, and resistance to burning. Among specific materials made from strong crossbred wools on the **worsted system** might be mentioned uniform cloths of all descriptions, warm working clothes, cheap hard wearing serges for school children's clothing, cheap knitted goods and heavy working socks, and certain types of linings. From the shorter fibred material, manufactured on the **woollen principle,** we get sports tweeds, blankets and rugs as well as cloth for overcoats and army greatcoats.

Strong Wool Breeds

Small, but appreciable quantities of very coarse wools are grown in this country by Lincolns, Leicesters, and strong wool Romneys. Where the fibres are long these wools go into speciality fabrics such as bunting and filter press cloths, as well as into furnishing materials, cheap socks and other working clothing. Short fibred wool of this type goes to make carpets, coarse tweeds and blankets, horse covers, and certain types of felt.

Skin Wools

Freezing works contribute a relatively large quantity of wool to the New Zealand clip. Skin wools, or slipes as they are called usually have less than 12 months' growth and the short staple makes special machinery necessary for processing. Slipe wools often have a proportion of Southdown blood, which makes them of special value to the knitwear trade. One reason for this is that Down-type wools are more springy and give a soft, spongy type of yarn. Another reason is that Down-type wools are considered to be less subject to shrinkage on washing.

Tendency to shrink is another characteristic of wool goods which is related to fineness. Fine fibres stretch and contract with relative ease, especially when wet. When the fibres move, their surface structure comes into play, and they wander, in much the same way as a worm crawls, from one thread of yarn to another. This causes entanglement and results, ultimately, in the felted structure which is characteristic of badly washed wool goods. Blankets made from fine wools are an expensive luxury because they shrink so much when washed. The relatively coarse fibres found in crossbred wools, by contrast, are not so easily deformed when wet. Though lacking in softness, blankets, working socks and heavy duty knitwear

made from stronger wools have a longer useful life. This still applies when the comparison is made with goods containing finer wools subjected to some, at least, of the anti-shrink treatments. Of course, the tickle, which is disliked by people with sensitive skins, is more pronounced when the raw material contains coarse fibres. Even the tickle, however is claimed by some authorities to be advantageous, because it stimulates the skin and promotes circulation.

It is clearly not possible in a bulletin of this length to touch more than the high spots of such a wide subject as the present one. One general principle, however, does emerge. It is that the major portion of our clip is used in fabrics where durability and service are the main requirements. This conclusion must be considered in planning our sheep breeding and farm management programme because it establishes the factors which make for excellence in crossbred wools. It seems obvious that soundness, or freedom from breaks and tenderness, must be given attention before worrying over a little harshness, or a small amount of hairy fibre. A further point is of interest here. All but the very shortest fibred strong crossbreds are still long enough for combing if market conditions demand it. At the same time, wool that is bad for one purpose is first class for another. This combination of facts, coupled with the use of crossbreds in relatively rough cloth, results in only a small premium being paid for quality in the broad sense of the term, i.e., within fineness grades. The sheepman growing strong crossbred wools can safely work on the principle that the most profitable wool for him to grow is the one which gives him the highest weight of clean, scoured wool per sheep, and per acre of country in use. There is, however, a qualification to this. Under harder environmental conditions, which are more suited to the production of finer wools, the principle can only be applied within count or fineness grades. Although at the present time the premium paid for fineness is not great, it is sufficient to compensate for loss of weight in finer fleeces but within any given fineness grade, the advice is particularly sound, because research has shown that the heaviest fleeces tend to be the most desirable from a buyer's point of view. For example 10 pound fleeces of 46s quality are, on the average, worth more **per pound** on a clean basis than 7 pound fleeces of similar count, and the grower gains both ways. Similarly among halfbreds of say 56s count, 8 pound fleeces are more valuable per pound, than 6 pound fleeces.

Artificial Fibres and Future Prospects

The uses of New Zealand wools, too, have an important bearing on the artificial fibre problem. Although in the future there is little doubt that man-made fibres with all the valuable properties of wool will be produced, at the present time most "ersatz" materials are lacking in durability. They cannot, therefore, compete directly with the major portion of our clip. It is possible, also, that the handle and appearance of fabrics made from crossbred wools will be improved by the admixture of a finer staple-fibre. This will increase the range of materials in which our product can find an outlet. It must be remembered, however, that some crossbred wools are used because they are cheaper than Merino wools. If the price of fine wools is kept low by competing materials, the demand for crossbreds must suffer in sympathy. It seems likely, too, that the availability of large quantities of cheap substitutes may reduce the possibilities of wool prices soaring to phenomenal heights, as they did after the last war.

The uses of crossbred wools have a further important bearing on possible future market trends. In wartime, growers of coarse crossbred wools tend to receive a premium above the peace time value of their product, because strong wools are in demand for uniforms, warm, hard wearing underwear, army blankets and great coats and even for certain munitions. Fine wools, on the other hand, tend to suffer because of reduced civilian demand for the less utilitarian fabrics. At the present time (March, 1944) there are indications that war demands are falling back to a maintenance level and it is likely that stocks of coarse wool will commence to accumulate. Under post war conditions such stocks may not be as easy to sell as the stocks of fine wools which have been built up during the war to meet rehabilitation needs. Even in 1942, South American crossbred wools of super style 40/44s quality fleece were selling for as little as

9¼d. on an uncontrolled market. Shipping clearly plays a part here, but the disparity with controlled prices in Empire countries gives cause for serious thought. It seems likely that the world price of strong wools may fall considerably, and breeders might well consider now, the possibility of utilising a finer wool ram on their flocks in the near future.

This advice is given with very considerable reserve, for forecasts of trends in wool prices are notoriously unreliable. The effect which a wool-starved Europe will have on prices is not easily predicted and in the long run there is the probability of increased wool consumption in backward countries to be considered. Just what part economic controls will play has not yet been made known, but it seems certain that both war-ravaged Europe, and the newly developed markets will demand a cheap product. This might absorb a surplus of crossbreds, but it might also be met by increased production of synthetic materials. In either case, the indication is still towards a lower price for the stronger grades of crossbred wool.

Unfortunately, it is impossible to get reliable information about wool stocks, while vague newspaper statements give no indication about the composition of "strategic stockpiles" in terms of different wool types. Decisions about the ultimate post war disposal of such stocks must be taken now if plans are to be laid so that the programme can develop without delay. Adequate publicity for these decisions would enable wool producers, in turn, to plan their breeding and management policies to best advantage and with the minimum disruption of the national economy.

Conclusions

(1) Fine wools are utilised for high priced luxury cloth while strong wools of the sort mainly grown in New Zealand go into fabrics required for durability and hard wear.

(2) Because of the coarseness of the fibres, even the most beautiful strong wools, from a breeder's point of view, cannot in general be used to make high quality cloth.

(3) Fleece features affecting cheapness of production and fibre durability are more important, in most New Zealand wools, than features affecting harshness of handle or finer points of quality in the broad sense of the term. This makes fleece weight of prime importance in breeding.

(4) Research has recently shown that on very much of our sheep farming country, fleece weight must be considered in relation to fineness grade. Even under present market conditions the premium paid for finer wools compensates for appreciably lower fleece weight.

(5) Artificial fibres are not likely to compete directly with New Zealand wools in the near future, but the New Zealand grower will be indirectly affected if a reduced price is paid for finer wools.

(6) Strong crossbred wools may be difficult to sell soon after the end of the war, suggesting that now might be the time to consider using finest wool rams consistent with efficient meat production.

(7) New Zealand wool growers should take steps to discover, as accurately as possible, the amount and composition of existing raw wool stocks, and the extent of control which is planned for the Post-War wool industry, so that management and breeding programmes can be rationally planned.

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supplying those nutrients needed in greater abundance. Though grain and mash are usually fed in equal amounts, one at morning and the other at night, it matters little which is fed first, and no harm will follow a change in their proportion (made gradually) should one or the other be difficult to procure.

Opinions differ as to the respective merits of "wet" and "dry" mash feeding. In dry mash feeding the mixture is available to the birds all the time, dry, in specially designed hoppers, to eat as and when they wish; the plane of nutrition being controlled by making the mixture more or less bulky. Provided the mash is palatable (in the sense defined above) this method has proved quite successful in many large commercial units. Its advantages are—a great saving of labour, the birds never have to wait for their breakfast, and can feed ad-lib without waste, while the shy birds do not get crowded out. This method, or perhaps a combination of it with mash and grain feeding, is well worth considering by those who do not find it possible to be punctual as regards feeding times. Maximum consumption and production cannot be achieved if the birds are sometimes kept waiting and hungry. In either system the last feed at night should be grain or wet mash which can be quickly eaten, so ensuring that the birds go to roost with a full crop. Laying hens should always be given some kind of food during the middle of the day. It is sometimes difficult in the short daylight hours of winter to induce laying birds to eat all they need for maximum production. In fact it is for this reason that the electric lighting of some large commercial units has resulted in appreciably increased consumption of food and production of eggs during winter months.

Wet mash should be only dampened into a moist, crumbly condition, and if skim milk (or whey) is available it may with advantage be used for this purpose. It is preferable not to feed the mash on very hard surfaces, such as concrete or metal, since the birds dislike the jar this gives to their beaks, and no such factor which is likely to discourage the birds from their maximum consumption of food should be overlooked. For the same reason the wooden feeding boards or troughs should not be left sour with fermenting "left-overs, and should provide plenty of room for all the birds (6in. per bird) when feeding. No more should be given in one feed than the birds will clean up in 20-30 minutes.

Green Feed

Fresh green feed supplies iron and lime and most of the essential vitamins, provides the yellow pigment needed for a rich yolk colour and favourably influences the hatchability of eggs. A daily supply is therefore essential; but a fouled grass run plus a few old cabbage stalks must not be regarded as a supply of green feed. Fresh lawn clippings, lucerne, clover, watercress, silver beet, chou moellier or any other of the cabbage family are all excellent. Green feed can be placed in a wire netting rack, but probably more will be eaten and less wasted if it can be chopped or chaffed and placed in troughs. A small amount may be mixed in the mash, although, as already explained, this can easily make the mash too bulky.

Lucerne is the most valuable of all green feeds for poultry, being well supplied in all the minerals they most need. For winter feeding, if fresh green feed is not available, lucerne leaf meal is an excellent substitute. Failing this, first quality green lucerne hay, cut in the young pre-flowering stage, with well preserved leaf, may be used. It can either be ground into a meal or chopped. Poultry cannot digest fibrous material, too much of which only takes up space that digestible food could occupy; hence such fibrous feeds should be used with discretion only if fresh green feed is not available.

Grit and Water

Experiments have shown that birds can be reared successfully without any grit to assist the grinding work of their gizzards; but the same experiments proved that when grit is supplied the birds use up less energy in the process and so make more efficient use of their food. Grit should be supplied in a form such as screened finely crushed "metal." This is not a substitute for shell or limestone grit, which must also be supplied for the different purpose of keeping up the suply of lime for the formation of egg shells. It requires one ounce of shell grit or limestone to supply the lime for 4 egg shells. A mixture of both kinds of grit (gravel and shell) should be constantly before the

birds. Needless to say there should also be an ever-present supply of clean fresh water. Dark combs often indicate a lack of water. If skim milk is provided for the birds to drink (an excellent plan) this should be in addition to fresh water, as the birds should not be compelled to drink milk which they may not want in order to quench their thirst. Digestive troubles may follow if this mistake is made.

Moulting

Feathers, unlike wool and hair, cease growth when fully formed and can only be renewed by moulting the old feathers and growing a new crop, a process which normally occurs once each year in the mature bird. Feathers are composed almost entirely of protein, and make up 25 per cent of the bird's total store of protein. Hence the demand for protein for new feather growth during the moult is unusually heavy, and if this extra protein is not supplied, the birds will lose condition and the moult will be unnecessarily prolonged. Moreover, moulting always puts the birds off the lay for a while since the limited supply of protein cannot be turned into both eggs and feathers. The object then should be to get the birds through this moult and back to laying as quickly as possible by increasing the proportion of the protein concentrates in the ration.

Conclusion

Sound feeding is only one of the lines in the chain of success, and much good and costly feed can be wasted if equal attention is not paid to such matters as draughty and damp houses, insufficient protection from cold wet winds, insect infestation, or undue disturbance, as from nearby dogs or traffic. The laying hen is very sensitive and is quickly put off the lay by faults in feeding and management. Regularity of feeding is of the greatest importance, while sudden changes in the diet have often put birds off the lay or even induced a premature moult. Whether it be on the commercial scale or simply as a means of providing the household with this valuable item in its diet, it is those extra eggs that can be obtained by thoughtful and understanding attention to the needs and habits of the birds that make the keeping of utility poultry a satisfactory and profitable enterprise.

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