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THE INFLUENCE OF THE TYPE OF EWE UPON THE TYPE OF FAT LAMB CARCASS

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IN the production of fat lamb most farmers pay some attention to the carcass conformation of the breeding ewe employed. This is to be seen in the higher price commanded by the short-legged blocky type of ewe compared with the long-legged rangy type when other things are equal. It is to be seen also in the methods employed in home bred flocks where, if possible, the sheepman retains the better carcass types.

This policy is understandable since the breeder expects "like to beget like." Recent studies by the statistical geneticist suggest, however, a very low heritability value for carcass conformation in the sheep; indeed, the heritability ratios reported by workers like McMahon (1) Terrill and Hazel (2) and Rae (3) are so low that it can be well argued that little improvement in carcass conformation can be expected from straight selection of the ewe flock and that the inclusion of this character in ewe selection work reduces the rate of improvement in other more strongly inherited characters for which culling is inevitably restricted. While it is not necessarily true that these low heritability estimates derived from studies within a pure breed apply to the cross-breeding work of fat lamb production, the conclusions reached do suggest interesting and important applications even to this class of breeding.

At Ruakura we are interested in elucidating and evaluating the various factors associated with efficiency of fat lamb production. In such studies we have considered it worthwhile to examine the relationship between the conformation of the fat lamb breeding ewe and the carcass quality of her progeny. The experiment was designed along the following lines: From a group of approximately 1000 ewes from the same origin, the top 10 per cent and the bottom 10 per cent were selected on a basis of carcass type or conformation. The remainder were discarded. The top 10 per cent were short-legged ewes with a blocky, good conformation carcass from a mutton point of view. The bottom 10 per cent were long-legged rangy ewes of poor carcass type. The resulting two groups were then mated to a Southdown ram or group of rams, the ewes running together as one flock from tupping until picking of the lambs. Lambs were picked by a professional fat lamb picker as in normal commercial practice. Every lamb was examined on the hooks, the measurement system of carcass evaluation previously described by the authors being employed. (4)

More specifically the groups were derived in the following way:

(1) 1944 Season. Two groups, each of 100 ewes selected from a line of 600 ewes. These were mated by artificial insemination to a single Southdown ram.

(2) 1945 Season. Two groups, each of 75 selected from a line of 1000 ewes, the two groups being mated to a group of Southdown rams. A small proportion of the ewes in each group was the same as employed in the first season.

(3) 1947 Season. Two groups each of 80 ewes selected from a line of 1400 ewes, a group of Southdown rams being used for mating.

It will be noted that the design of the experiment was such that a very much higher intensity of selection was employed than is ever likely to be met with in practice. Thus in the first year selection in favour of good type ewes involved culling over 80 per cent of the flock and over 90 per cent in the second and third years. For the same reason the poor type ewes represented equally extreme types. It will be obvious that if the carcass type of the ewe exerts any material effect upon the carcass type of her lambs, the lambs from the good type groups should show a marked superiority over the lambs from the poor type groups.

RESULTS:

In respect to width of gigots (G) no difference existed in any year between the two groups of lambs. This measurement alone or in combination with others is highly correlated with the composition of the carcass. Essentially it provides an index of the development of the hind quarters. Wide gigots are desirable from the point of view of conformation so that this measurement has both a qualitative and quantitative significance.

In respect to (T)—the Tibia-Tarsus length—lambs from the good type ewes showed slightly shorter measurements, the differences being insignificant statistically in the first season, but highly significant in the last two years. This measurement is highly correlated with the total bone and muscle of the carcass and in combination with (F)—depth of crutch and (G)—width of gigots—provides an even more efficient index of bone and muscle. A long (T) measurement thus indicates greater muscle development of the carcass. At the same time, however, the most desirable conformation in the fat lamb is associated with a short (T). On this basis therefore, the lambs from the good type ewes tended to have poorer muscle development but slightly better carcass conformation. The differences, however, were small.

The depth of crutch measure (F) again was slightly in favour of the lambs from the better type ewes. This measurement is also one where shortness is desirable. It is important primarily from a qualitative point of view, a short measure indicating a well filled leg with adequate fat cover. A difference of only 2 millimetres existed in the first year, 6 millimetres in the second year and 4 millimetres in the third year, these being significant only in the last two seasons.

The value of the cannon bone weight and length in assessing the total weight of bone in the carcass has been well established. Essentially from a quantitative point of view the heavier the weight of this bone the greater the weight of both bone and muscle in the carcass. Cannon length has mainly a qualitative significance indicating mainly general conformation, a short cannon being associated with a desirable blocky type. Ideally, therefore, the lamb should have relatively heavy cannon weight and short cannon length. On this basis, lambs from the poorer quality ewes showed slightly heavier but longer cannons than lambs from the good type ewes.

The product of (T) x (G) provides one of the most satisfactory indices of total bone and muscle in the carcass and a very small difference existed between the two groups, lambs from the poor ewes showing slightly higher figures.

The all over picture presented by these results is one indicating a slight superiority in favour of lambs from the good type ewes which were of slightly better conformation but with less bone and muscle though more fat than lambs from the poor type ewes.

That these differences were reflected to some small degree in grading is indicated in the following summary which sets out the number of Prime Down Cross, Prime Crossbred and Second Grade lambs from each group.

Effect of Type of Ewe on Grading of Lambs.

	Down Cross		Prime		Second	
	Poor	Good	Poor	Good	Poor	Good
Total number	131	139	71	67	24	8
Average per cent	58%	66%	31%	31%	11%	3%

It will be noted that lambs from the good type ewe yielded 8% more Down Cross bred grade, the same percentage of Prime Grade and 8% less Second Grade lambs than lambs from the poorer class ewe. These differences are not statistically significant. This trend was more or less similar in each season although the small numbers involved are inadequate to measure the statistical significance of 'within season' differences. In the third year where measurement differences were significant and numbers fairly large, the grading difference that existed was in favour of lambs from the poorer type ewes these grading 77% of Down Grade and 22% of Prime against 75% of Down and 25% of Prime.

DISCUSSION.

It is clear from three successive season's results over a total population of approximately 3,000 ewes, a very intensive selection potential of approximately 90% for conformation, resulted in only a very small difference between progeny groups. This situation might be interpreted as indicating the marked dominance effects of the Southdown breed when mated to a long-wool breed in the production of meat animals, or, alternatively, since the Southdown has been used on both groups, it could also be argued that the results substantiate the low heritability estimates previously mentioned for carcass conformation in the Romney breed. The differences between progeny groups are quite in keeping with McMahon's heritability co-efficient for Romneys of 13%.

From a commercial point of view, the grading results indicate very little difference between the two groups over the three years. Indeed, in view of the price differential of approximately 5s per head normally existing between ewes of the two types, employed, the 8% fewer Down Grade and more Second Grade lambs amongst the progeny of the poorer type ewes is not nearly large enough to compensate for the higher ewe cost. The average difference between Down Grade and Second Grade lambs is approximately 1d lb. or 3/- per lamb on lambs of the weight involved in this experiment. The increased return of 3/- per lamb over only 8% of the flock does not nearly meet the extra cost of 5/- per ewe over the whole flock.

At least it can be said that in the commercial production of fat lambs there is no material advantage in selecting ewes for carcass conformation to the degree normally applicable in practice, or, alternatively, where ewes are purchased for fat lamb production it is unlikely that a higher price paid for better conformation sheep will result in greater net returns.

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Discussion on Miss Walker's and Dr. McMeekan's Paper

Mr. ROWLANDS: I thought it interesting that the loss in the cannon bone weight appeared to carry through to the final weight of the animal and the good carcass showed a loss of a pound weight which is approximately 9d per pound on a carcass and a farthing per pound in the increased price overall to offset that loss of weight. Looking at your graph you will see that the progeny from the good ewes weighed a pound less than the progeny from the poor ewes.

Dr. McMEEKAN: I forgot to mention the weight side. I don't think those differences are significant on the numbers involved.

Mr. ROWLANDS: It looked to me as though the cannon bone loss had just been carried right through.

Dr. McMEEKAN: Yes, there may be a relationship there but the differences in weight are not great. In the first year they were identical in the two groups; in the second year they were 37 and 36 lbs. Statistically the difference in weight between the two groups is not significant in any one year or over the three years. In other words, I do not think that the lambs from the good type ewes weigh less than the lambs from the poor type ewes. It is just that it worked out that way in averages. The numbers are so few that I do not think we can rely on that figure.

Mr. HOW: Was the weight of those lambs taken on the hooks?

Dr. McMEEKAN: Yes.

Mr. HOW: The cannon bones would not come into it.

Dr. McMEEKAN: No. There is, however, a relationship between them.

Dr. DRY: What are the non-genetic factors determining carcass characterisation? Do they operate before the lamb is born or at some later stage?

Dr. McMEEKAN: I think Dr. Dry has said what I have been trying to say—that the heritability factor of the variance in respect to carcass is low. Obviously a conclusion like this one, if true, should make one think about selection methods and also about studies of other factors which probably affect the situation a bit. It is rather significant, however, that all the sheep work that has been reported at this conference so far over the past years has all been of a negative type. This paper is no exception. In other words, we do not seem to be able to demonstrate any strongly inherited situation in respect to sheep insofar as economically important characters are concerned. In a way I regard this particular job as an attempt to test out experimentally the theory of the statistical geneticist who has reported just the same thing, but in terms of correlation coefficients which I myself find difficulty in understanding.

Dr. HAMILTON: Were any other data collected outside carcass quality? For example, were data on fleece weight collected?

Dr. McMEEKAN: We have incomplete data on the fleece side. This is one of the jobs that was carried out at Ruakura when staff was few in number and so handled in a way that the staff could cope with it. It is a field experiment that did not need a great deal of looking after and the measurement of results did not involve a great deal of time. However the wool data that we have based on some 70 pairs

of ewes scattered over the three seasons shows that the poorer ewes on an average clipped $\frac{1}{2}$ lb. more than the good ewes. We were unable to investigate the milking qualities of the ewes for the same reason.

It has been suggested that the poorer carcass type ewe might yield a lamb as good as did a better carcass type since the former might be a better milker.

Mr. LAWRY: I would like to ask Dr. McMeekan whether the twinning rates in these two groups of ewes were similar. Obviously if one group of ewes had a higher twinning rate than the other the growth in carcass formation of the progeny should be affected.

Dr. McMEEKAN: There was no difference in the twinning rate, remembering that the number of ewes in any one season was very small. There would be a difference of one or two sets of twins but no great difference in the percentage of twins.

Mr. BULL: When these ewes were culled at the works would there be a difference in weight in favour of either type?

Dr. McMEEKAN: The poor carcass type would be heavier than the good carcass type by about 7 or 8 lbs.

PROFESSOR CAMPBELL: I think the farmers' main reaction to this story would be to pick on one point Dr. McMeekan mentioned. That is that these ewes were all of the same origin. I take it from Dr. McMeekan's story that he would expect the result to be identical or practically the same if the different types of ewes had been chosen from totally different origins or flocks.

Dr. McMEEKAN: I apparently did not make that point clear but my reason for describing the precise design of the experiment in each year was to emphasise that point. Actually the ewes were derived from different origins in each year except for a small group of the same ewes that were put into the second year experiment. The 600 ewes in the first year were ewes that were mainly of Gisborne origin purchased as ordinary fat-lamb ewes in the yards in that area. Actually I bought a line of 600 ewes from the Morrinsville sale yards as would a farmer in the Waikato. In the second year a few of the same individual ewes being followed through for two years were used, but the balance was selected from 1000 ewes in the Manawatu. In the third year the ewes were selected from a line of 1400 that were from two different origins, one Gisborne and the other King Country. In other words, the answer I would give to your question is that since the experiment was designed in that way I would not expect any material difference if we worked on a selection basis within any of the main supply sources of ewes.

Mr. ROWLANDS: There is one factor that ought to be considered. Were these ewes from the Gisborne area brought up by boat? It is a very heavy journey for ewes to make and good results could not be expected in the first year.

Dr. McMEEKAN: That is possible, but of course both groups did the journey. We took the ten best ewes and the ten worst ewes from a line of approximately 1000 ewes. Both lots made the same journey but whether that journey had any effect on progeny I do not know.

Mr. WOODYEAR-SMITH: Would Dr. McMeekan be able to give an opinion about this? A Mr. Jones has had a remarkably constant success in his fat-lamb production in the Smithfield competitions. Those people have bred their own sheep for very many years. Two years ago they were runners-up in the North Island championship, last year they won it and this year they were in the team going home for the competition.

Dr. McMEEKAN: That brings in, of course, a completely different angle. My opinion would be: I think Miss Walker could have picked out of the lambs from either group, lambs that would not have disgraced themselves in a Meat Board competition. Remember, any competition is done in that way—a man picks his best lambs and puts them in. The second point is this: Selecting lambs for a Meat Board competition is a highly skilled performance on the part of the farmer. Individual men have ability to judge or prejudge what a lamb is going to be like on the hooks. A man going into Meat Board competition work for the first time is usually well out in his judgment, but he will improve with practice. It is a question of skill and judgment on the part of the breeder concerned.

Mr. SIMPSON: I would like to ask if any record was kept of the difference in difficulty at lambing time and also of the weights of the lambs at birth.

Miss WALKER: We did not keep any records.

Mr. MAYHEAD: I should like to ask if there was any difference between the two groups in the time taken from birth to sale weight.

Dr. McMEEKAN: No. About the same percentage of each group went off about the same time. They were born about the same time each year. We can detect no real difference between the performances of those two groups of ewes except the differences I have noted. Those differences I believe are quite in keeping with the heritability estimates that have been recorded by people approaching the subject in a different way.