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The Effect of High and Low Plane Rearing of Hoggets on Lifetime Productivity

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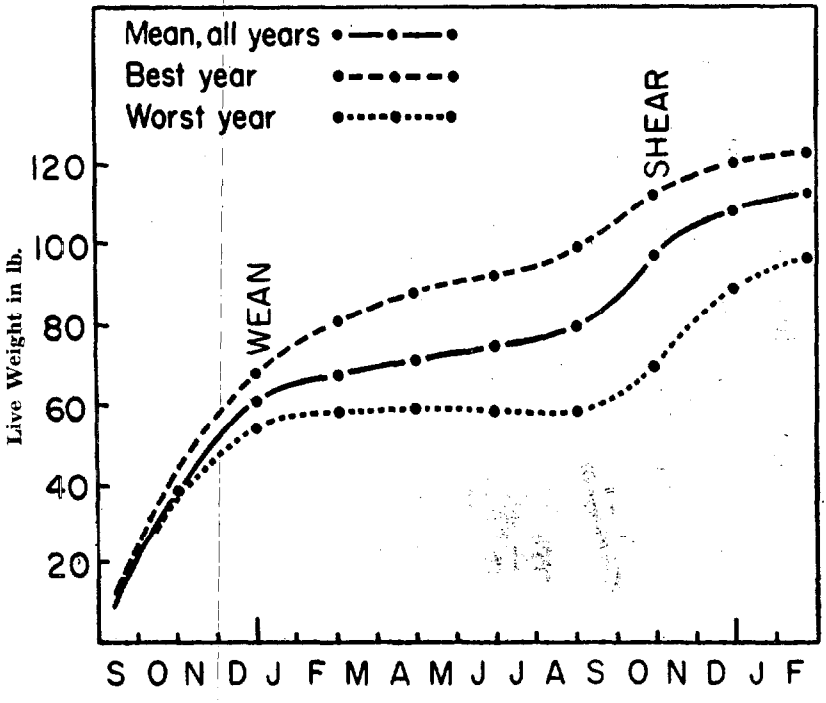
IN this series of papers on hogget rearing it is not necessary for me to emphasise the importance of the problem. We all know it exists and we all await its solution. The particular aspect of the problem to be discussed in this paper is whether the difficulties associated with rearing have any carry over effect on the ultimate productivity of the sheep. Most hoggets are reared on hill country and almost without exception they suffer from a fairly slow growth rate to weaning followed by a period of some 6-8 months of really retarded growth until the spring. I have no figures for hill country hoggets but I do have figures over a ten year period of the growth rates of our own hoggets on the Canterbury Plains, and from observation I consider that hoggets grown on South Island hill country are in the main not as good as our own. Consequently I feel that our observations on the Plains are probably of general application and that the difficulties we have experienced are also being experienced on hill country. We can define this problem best by reference to Fig. I which shows the mean growth curve of our ewe hoggets (200-400 per

Fig. I.

Growth Rates of Corriedale Hoggets over a ten-year period (1946-55) at Kirwee and Ashley Dene.



annum) over a ten year period, together with those in the best and worst years. This figure shows clearly the break in the growth curve at the 4-12 months of age period, or from weaning till the following spring.

Experimental Methods.

In an attempt to answer the question of what effect retarded growth rate might have we started ten years ago and have now completed two series of observations. In the first trial we used two groups of sixty Corriedale ewe lambs born at Kirwee in 1946. These were reared from birth to 12 months of age on artificially produced high and low planes of nutrition. From 12 months onwards the two groups were amalgamated and run as one mob for the remainder of their lives. To maintain a high growth rate after weaning the hoggets were run on the best pasture available in the autumn followed by forage crop and hay during the winter. The low plane hoggets were run on poor pasture, browntop and sweet vernal dominant with only limited supplementary feed during the winter. There were equal proportions of single and twin lambs in the two groups. Liveweight differences of 8lb. were established at weaning and 30lb. at 12 months of age. The growth curves of these sheep are shown in Fig. II. It will be seen from these curves that a substantial difference in bodyweight existed for the next 18 months until the ewes were 4-tooths. In other words the low-plane sheep regained the difference in weight and ultimately were indistinguishable from those reared on the high plane. After four lambings the ewes were culled for age and this trial concluded.

Fig. II.

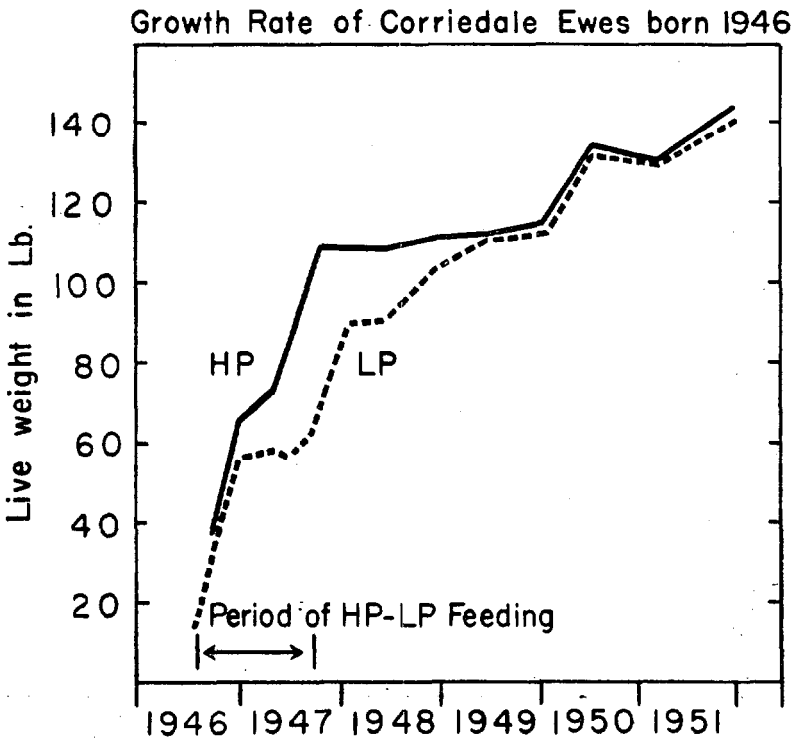
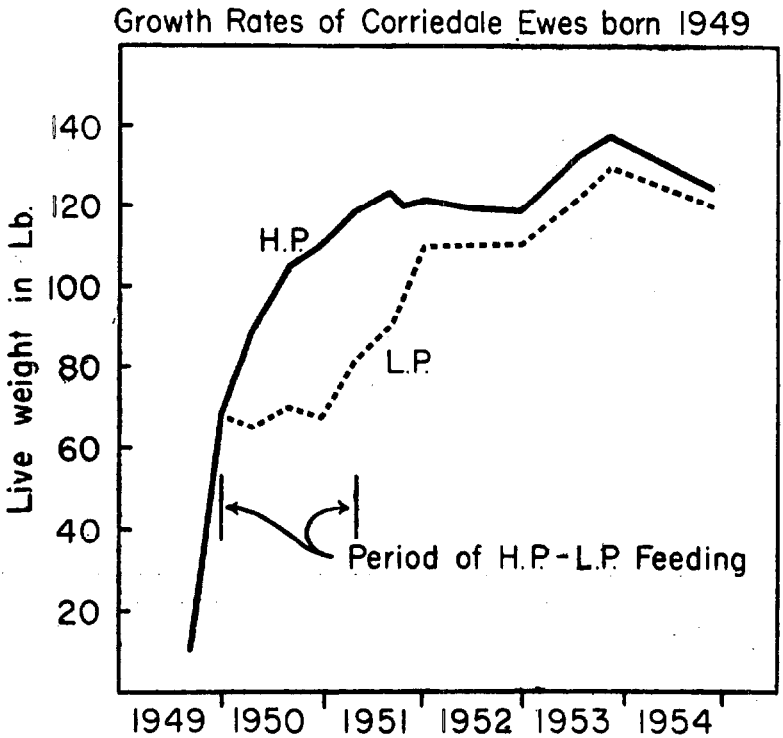


Fig. III.



The second trial employed groups of sixty Corriedale ewe lambs born at Ashley Dene, in 1949, Fig. III. In this case the differential planes of nutrition were applied after weaning and until the first mating, that is from 4-18 months of age. The high plane group were fed at all times on the best pasture available in the best hogget rearing year we have ever experienced, and they made consistent gains throughout. The low plane group was maintained on poor pastures, with occasional spells on turnips during the winter. This group made no weight gains from 4-16 months of age but recovered somewhat just before mating. The two groups were amalgamated for mating and run as one mob from then onwards . The differential treatment between these two groups was greater than in the 1946 trial, for not only did it last over a longer period but a 35-40lb. difference in bodyweight was established at the end of the treatments. It is considered that the treatments were more extreme than occurs in farming practice for the high plane two-tooths were a really top line and the low plane ones were very poor and comparable only with high country two-tooths. This trial continued for four lambings.

Complete records of production and mortality were kept during the growth and lifetime of all sheep. All the ewes were individually identified and lambs were tagged at birth. It was recognised at the outset that the numbers of sheep involved were adequate in regard to wool production and lamb growth rate, but inadequate for determination of treatment effects on lambing percentage and mortality unless these effects happened to be large.

Results.

The following results are expressed in terms of lifetime production, that is over the four lambings:

Ewe Mortality. In the 1946 trial there was a higher mean annual death rate in the low plane ewes, 6.5 per cent compared with 3.5 per cent in the high plane group. In the 1949 ewes the rate was the same in both groups—namely 3 per cent.

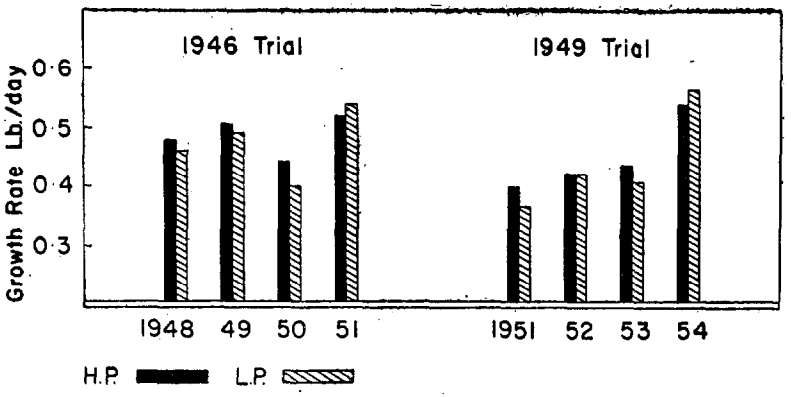
Lamb Mortality was consistently higher in the low plane groups. In the 1946 ewes 16 per cent compared with 11 per cent, in the 1949 ewes 16 per cent compared with 14 per cent.

Barrenness was also consistently greater in the low plane groups. In the 1946 ewes 8 per cent compared with 3 per cent, in the 1949 ewes 13 per cent compared with 7 per cent, although in this latter case all of the difference occurred at the two-tooth stage.

Prolificacy was unaffected by treatment in the 1946 ewes but there was a statistically significant difference of 12 per cent fewer twin bearing ewes in the low plane ewes of the 1949 series.

Longevity. The low plane rearing consistently caused a reduction in the useful life of the ewes. At 5½ years of age in the 1946 trial 60 per cent of the low plane ewes were culled for teeth compared with 45 per cent, while in the 1949 series the corresponding figures were 50 per cent in the low plane and 20 per cent in the high plane.

Fig. IV.



Lamb Growth Rate. The ewes were mated to either Corriedale or Southdown rams according to circumstances on the farm at the time. The mean growth of single lambs are shown for each year in histogram form in Fig. IV. These growth rates are calculated from the weaning weights and age at weaning. The mean of the four years in the 1946 series for single and twin lambs was 0.48 and 0.42 in the high plane, and 0.47 and 0.43 in the low plane respectively. The corresponding figures in the 1949 series were 0.44 and 0.35 for high plane singles and twins, and 0.43 and 0.36 in the low plane. In other words the growth rates to weaning are to all intents and purposes identical.

Wool. The mean fleece weights are shown in histogram form for each year in Fig. V. It will be seen that there was a 2½-3lb. difference in fleece weight at the hogget shearing in both trials definitely attributable to the treatments during the hogget stage. In the 1949 trial where the treatments continued over into the two-tooth year (1951) there was a difference of 1.2lb. But once the treatments were over there was no further influence on fleece weight.

In the 1946 series the mean of the four years ewe shearing corrected for dry/single/twin bearing ewes was high plane 9.84lb., low plane 9.76lb. In the three comparable years of the 1949 series the corresponding figures were 8.37lb. and 8.32lb. These differences are very small and not significant.

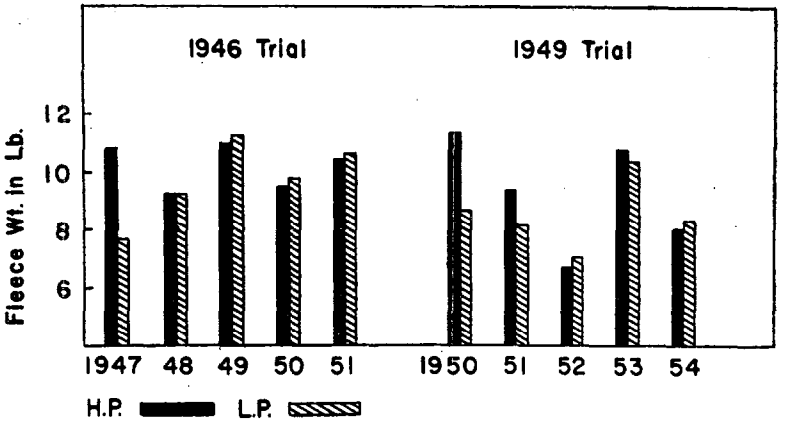


Fig. V.

Discussion

Ewe and lamb mortality, barrenness, prolificacy and longevity can all be considered as contributing to reproductive rate. It must be remembered that the numbers of sheep involved were relatively small, hence a considerable degree of caution is necessary. Although there have been differences in some particular aspects between the 1946 and the 1949 trials in the five aspects of reproduction as listed above, the low plane has either been the same as or worse than the high plane. Yet I feel confident of only two real effects. The first concerns barrenness. Where the low plane rearing was extended to 18 months of age as it was in the 1949 trial and the ewes at mating were only 80-85lb. in bodyweight the onset of oestrus was delayed and a very high (38 per cent) incidence of barrenness followed. In other words if the retardation of growth is sufficiently severe the two-tooths are just not big enough to be mated very successfully, and of course high country farmers have known this for a long time. But it does point to the fact that in two-tooths normally put to the ram there is often a proportion which on account of small size must be expected to give a high percentage of barrenness. The second point I feel fairly sure of is that the low plane rearing causes a shortening of useful life mainly through a higher degree of dental attrition. Taking all the figures as they stand, in both the 1946 and 1949 series the sum total of effects is such that the low plane ewes wean 18 per cent fewer lambs per annum and 25 per cent fewer lambs per lifetime than the high plane ewes. These effects are considerable even bearing in mind that in one of the trials (1949) the treatments were rather extreme. One cannot claim that they are sufficient or even that they are of the correct magnitude, but I think they do suggest that an effect exists and that large scale trials to measure it would be profitable.

On the other hand our experiments have shown that the low plane rearing has had no effect on the wool producing and milk producing potentialities of the ewe, measuring the latter in terms of lamb growth rate. It seems to have no effect even in the early years when there is a significant difference in body size between the high and low plane ewes. Although the treatments have produced

large differences in fleece weight at the hogget stage presumably the number and function of the wool follicles has not been impaired in any way.

The advantages of maintaining a steady growth rate during the hogget period in comparison with the normal very low growth rate may thus be summarised as lower hogget mortality, 2-3lb. more wool as hoggets, and a higher reproductive rate of unknown though possibly large magnitude. The only disadvantage is the higher cost of rearing in terms of provision of feed or reduced ewe carrying capacity. One must conclude however that on balance the high plane is much to be preferred, if only it can be attained.

I would conclude this paper with a few observations on hogget rearing in our Canterbury Plains environment. They are summarised in Fig. I giving the results over a period of ten years. The best year 1950 was one in which the farm was understocked and autumn pasture growth was ideal, while in the worst 1952 there was no autumn growth at all and as a consequence the farm was overstocked. These two extremes correspond very closely to the artificially produced high and low planes of nutrition.

With regard to growth rate the following generalisations may be made:

(i) In autumn growth rates of 2-3lb./week can be obtained on forage crops. On permanent pasture under ideal conditions the most that can be obtained is 1½lb./week and on average it is well under 1lb./week. This is in spite of the fact that the autumn pasture on chemical analysis is not inferior to forage crops and is definitely superior to November-December pasture on which 15-month-old hoggets will grow well.

(ii) In winter growth rates of 1-2lb./week can be obtained on green-feed and good forage crops, whereas with autumn saved pasture plus hay mean growth rates are under 1lb./week.

(iii) In the spring and early summer all hoggets have a burst of renewed growth at about 2lb./week and the poorest hoggets grow fastest.

The mortality from weaning to October shearing has varied from 1 per cent to 14 per cent with a mean of 6 per cent. The mortality picture has been complicated by some severe losses mainly in the autumn in good years due to sudden deaths following changes of feed. As far as ill-thrift is concerned there seems to be a steady wastage right through from weaning until the spring, which is quite small in good seasons and severe in poor ones. In recent years as our experience has increased losses from ill-thrift have been less than 2-3 per cent in spite of very small weight gains in poor seasons. We have been able to rear our hoggets on permanent pastures which are often far from good, with weight gains of less than ½lb./week from weaning to spring and with these light losses by the following methods.—Using the best permanent pasture available from weaning until a month before lambing of the ewes starts, setstocking and avoiding changes of feed, commencing hay or silage feeding early and feeding these ad lib through the winter. Drenching is not part of the programme although we have on occasions drenched when the faecal egg count has indicated its advisability. While we may have had some little success in getting our hoggets through the autumn and winter without undue loss we are still unable to achieve the high rate of gain on permanent pasture which our high and low plane experiments would lead us to believe is so desirable.

Discussion

Mr. SINCLAIR: Could Professor Coop tell me whether this ill-thrift occurred in the midst of the autumn pasture growth? From my experience in Canterbury, I believe it is more the effect of malnutrition than ill-thrift.

Professor COOP: We do not get the severe ill-thrift in the autumn in which hoggets suddenly lose condition but rather a slow wastage and often associated with lack of suitable feed due to very dry conditions. In other words, the condition is not quite the same as in the North Island.

Dr. WALLACE: The growth curves show that the ill-reared and well-reared hoggets approach each other in bodyweight as they reach maturity. I should like to know what the difference was in lambing percentage at this stage after the weight difference had been eliminated.

Professor COOP: Generally speaking, the difference in barrenness and twinning continued in the three and four-year ewes after the liveweight differences had been eliminated or greatly reduced. The only exception to this was the difference in barrenness in the 1949 trial in which all the differences occurred at the two-tooth stage.

Mr. JEBSON: I would like to ask whether these lambs had been weighed at any stage before weaning. In my district, lambs frequently appear to stop growing in December before weaning.

Professor COOP: That is quite correct. In our experience the rate of growth of lambs falls off noticeably from about the end of November onwards. This is one reason why we are now drafting and weaning earlier than in the past. I feel that this is associated with deterioration of pasture quality rather than ill-thrift.

Mr. McFARLANE: I have been trying to collect some of the vital statistics of flock performance in the Gisborne district and it seems to me that differences between flocks are mainly determined by the performance of two-tooth and four-tooth ewes. To what extent do you think your management is emphasizing the inherent characteristics of the sheep?

Professor COOP: Barrenness at the two-tooth stage is emphasized by the nutritional treatments but there is still a carryover effect in both barrenness and twinning in later years.

Dr. RAESIDE: How long were rams left with the ewes?

Professor COOP: Usually about 7 to 8 weeks. All the ewes would have ovulated during this time.

Dr. McMEEKAN: I have been a student of growth for most of my working life. I would like to point out that the permanency of nutritional effects is dependent upon two things: The age at which under-nutrition starts, and the length of time over which it extends. At Ruakura, as I think you know, we have been studying the effect of under-nutrition upon dairy cattle and in this experiment we have started the under-nutrition virtually at birth and it is continued over the first two years of life. Under those conditions, there is a permanent effect upon body weight in the majority of animals but in terms of performance there is no difference in production from the third calving onwards, in line with Professor Coop's observations on sheep. It is obvious that a great deal of work has to be done before the precise effect of nutrition on growth and subsequent performance is known.

With reference to teeth, Professor Coop suggested that the teeth of his underfed sheep have been invariably poorer and as a consequence the sheep have a shorter working life. Massey has reported that, in contrast sheep on a higher plane of nutrition in this part of the world have teeth that are poorer and last a shorter time. Has he any suggestions to make on the apparent anomaly?

Professor COOP: The two situations are not comparable. In the Massey work, the ewes were on the good or poor country all the time time and the shorter life on the good country could be due to more fed eaten, different type of feed, differences in abrasive power of the feed and so on. After all, Merino sheep in the high country have very little to eat and yet have excellent teeth. My sheep, on the other hand, were on good and poor feed for only a few months during the hogget stage after which the feeding was the same .Nutrition at this hogget stage seems to have affected the subsequent useful life of the permanent incisor teeth.