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A STUDY OF LIVEWEIGHT INCREMENTS IN EWES AND OF CARCASS QUALITY AND MATURITY RATES IN LAMBS GROWN ON SOWN PASTURES IN SOUTH-EASTERN QUEENSLAND.

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SUMMARY.

This paper records animal data from an experiment in which lambing ewes were used to measure the quality of feed and the carrying capacity of sown pastures in south-eastern Queensland.

The use of different pastures over two years, with contrasting seasonal conditions, gave varying rates of growth amongst the lambs. The quality of lamb carcasses was assessed by means of a block test to determine the inter-relationship of age at maturity and carcass quality.

The experiment compared four pastures, viz., (1) lucerne (Medicago sativa), **(2) a perennial grass** (Paspalum scrobiculatum), **(3) a mixture of lucerne and** P. scrobiculatum, **and (4) a mixture of** P. scrobiculatum **and the annual legume** Phaseolus lathyroides.

Each of these four pastures was used to carry a separate flock of ewes comprising (a) dry ewes, (b) ewes with one lamb, and (c) ewes with twin lambs, in varying proportions. The data show that in all cases highest weight gains were recorded on lucerne pastures, but the quantity of feed was not sufficient to maintain a standard flock during all months of the year.

On pastures of P. scrobiculatum **and on the mixture** P. scrobiculatum **and** Phaseolus **the quantity of feed was sufficient, but the quality was sub-optimal for lambing ewes in late winter and early spring.**

Mixed pastures of P. scrobiculatum **and lucerne provided adequate feed of near-optimal quality during all months of the year, but this pasture was more difficult to maintain.**

On lucerne pastures, lambs (both singles and twins) were matured in less than 90 days, and they produced first quality carcasses. On P. scrobiculatum**—alone and in combination with** Phaseolus**—the lambs matured more slowly and produced less satisfactory carcasses. The mixture of** P. scrobiculatum **and lucerne was satisfactory for all but twin lambs in 1949.**

Over all treatments there was a close correlation between the quality of lamb carcasses and their age at maturity, with best quality carcasses from lambs matured within 90 days.

I. INTRODUCTION.

In a separate paper one of the authors (Paltridge 1954) has described a number of experiments, each of which is part of a wider study aiming at the development of sown pastures for south-eastern Queensland. This paper records animal data from one of those experiments in which lambing ewes were used to measure the quality of feed and the carrying capacity of selected pastures.

The data were recorded over a period of approximately two years (October 1948—January 1951) with marked differences in the incidence and intensity of rainfall. In 1949 the main growing season was delayed until late February and March, and there was comparatively little growth of summer-growing pasture plants. The winter months were unusually dry with strong drying winds in July and August. In 1950 there was an abundance of feed produced after heavy rains in January and February, the first frosts were delayed until June, and there were unusual flood rains in late June and July (see Table 1).

Table 1.

RAINFALL AT LAWES (IN INCHES) DURING 1949 AND 1950.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
1949 ..	1·29	6·18	5·10	·21	·33	2·07	·96	·82	2·04	6·79	1·46	1·68	28·93
1950 ..	7·83	10·79	2·22	2·60	·43	6·00	5·97	·55	·11	6·08	4·55	1·73	48·86
Mean N=43	4·40	3·36	3·34	1·84	1·54	1·73	1·37	1·06	1·44	1·99	2·89	3·72	28·68

II. DESIGN OF EXPERIMENT.

(*a*) General.

The experiment was designed as a latin square with four blocks and four pastures, viz.,

(1) Lucerne (alone).

(2) *Paspalum scrobiculatum* (alone).

(3) *P. scrobiculatum* + lucerne.

(4) *P. scrobiculatum* + *Phaseolus lathyroides* (annual legume).

In each treatment the pastures were subdivided at random into three subplots planted respectively as a sward and in rows at 42 in. and 63 in. spacing. Individual subplots were separately fenced, and each of the resultant 12 pastures was used to maintain a standard flock of Border Leicester x Merino crossbred ewes.

The sheep were grazed on each block for periods of a fortnight in rotation, and in moving from one block to another individual flocks were maintained exclusively on one type of pasture.

The experiment commenced in October 1948 with a standard flock of nine ewes per treatment (subplot)—equivalent to 3·20 sheep per acre—but by the end of April 1949 it was apparent that some pastures were being overgrazed, and thereafter the numbers were varied to suit seasonal conditions and the quantity of available feed. Excess animals were held in separate paddocks in which those from any one treatment could be maintained on essentially similar pastures.

Individual treatments (subplots) were sampled immediately before each period of grazing, and sub-samples were set aside for subsequent chemical analysis. There were appreciable differences in the yield and vigour of pastures under the three spacing treatments (see Paltridge 1954), but these were not reflected in the animals concerned; therefore in this paper the data from animals on individual subplots have been combined to allow overall comparison of animals on each of the four major pastures.

(*b*) Selection and Allocation of Ewes and Rams.

The choice of Border Leicester x Merino crossbred ewes for this experiment followed preliminary investigation by Briton (1952) in which a number of breed combinations were used to determine the most suitable type of sheep for fat-lamb raising in this environment. In those experiments a number of flocks, comprising (1) Border Leicester x Merino, (2) Romney Marsh x Merino, and (3) Corriedale ewes, were used, each mated with Southdown, Dorset Horn, and Ryland rams. This was primarily a study of genetic values, and in order to provide optimum nutrition all sheep were held, and lambs matured, on irrigated pastures of oats and lucerne. The lambs were slaughtered at a paddock weight of 63 lb.; birth weights and maturity rates were recorded and, as a basis of appraisal, all carcasses were subjected to a modified block test. Under these conditions and using satisfactory breed combinations, high quality carcasses were obtained from lambs matured in approximately 10 weeks (8–11 weeks.)

General vigour and/or milk production in Border Leicester crossbred ewes were appreciably greater than in other breeds, and ewe numbers were maintained over a period of years, whereas an appreciable number of deaths occurred in both Romney Marsh x Merino crossbreeds and Corriedales.

The percentage of lambs from Dorset Horn and Southdown rams was satisfactory (with matings at times dictated by Queensland conditions), but very few lambs were born of Ryland male parents. Lambs produced by Southdown sires yielded a higher percentage of high-grade carcasses, but those produced by Dorset Horn sires had an advantage in earlier maturity to the extent of one or two weeks. In this experiment, therefore, Southdown and Dorset Horn rams were used in alternate years. All rams were subjected to a preliminary semen test before mating.

At the commencement of each season (i.e., in October 1948 and in December 1949) all ewes were graded according to weight and divided into nine groups, each of 13 animals. One sheep from each weight group was then

included in each of the 12 flocks to be used on individual treatments. The 10 animals in each flock were then re-graded according to conformation, and one (the most atypical) was removed and held as a "reserve" for the particular treatment. The 12 reserve animals were held in separate paddocks, except during mating, when they were added to the main flock for a period of approximately eight weeks.

The ewes were weighed each fortnight (except during lambing, when any unnecessary handling was avoided), and all lambs were weighed at birth and thereafter on the same day of each week.

(*c*) Mating.

During the 1949 season mating commenced on January 25, and Dorset Horn rams were used. At that time it was found that a number of the rams were comparatively infertile; in an attempt to avoid uneven lambing the more fertile animals were allocated at random, and each ram moved from one group of ewes to the next at weekly intervals. In 1950 mating commenced on April 11 and Southdown rams were used. All but two were highly fertile, but the same procedure was followed (i.e., weekly transfer of individual rams from one flock of ewes to the next).

The 1949 mating was comparatively early, and lambs were born in winter when the grass *P. scrobiculatum* was mature and heavily frosted. In 1950 a later mating delayed lambing until September, when this grass was making new growth and the pasture as a whole was richer in protein.

III. RESULTS.

(*a*) Ewe Weights.

(i) *Data for 1949.*—During the first two months of the experiment the mean weight of ewes on all four pastures rose steeply to a common value of approximately 126 lb. Thereafter they remained practically stable until June 14. From that date (i.e., from the commencement of lambing) there were obvious differences in weights recorded for "dry ewes" and for "ewes with lamb", and the 21 animals on each pasture (inclusive of three spacing treatments) were then subdivided as—

(1) Dry ewes.

(2) Ewes with a single lamb.

(3) Ewes with twins*.

Data appropriate to each class were separately recorded.

Ten weeks later (i.e., on August 23, 1949, when the animals were shorn), it was apparent that all ewes had lost weight, but whereas the mean weight for dry ewes had declined by only 3 lb. the corresponding mean weight for ewes with lambs showed a much greater loss (see Fig. 1).

* In the case of triplets (1 in 1949 and 2 in 1950) the third lamb was removed at birth, and the ewe classed as one with twin lambs.

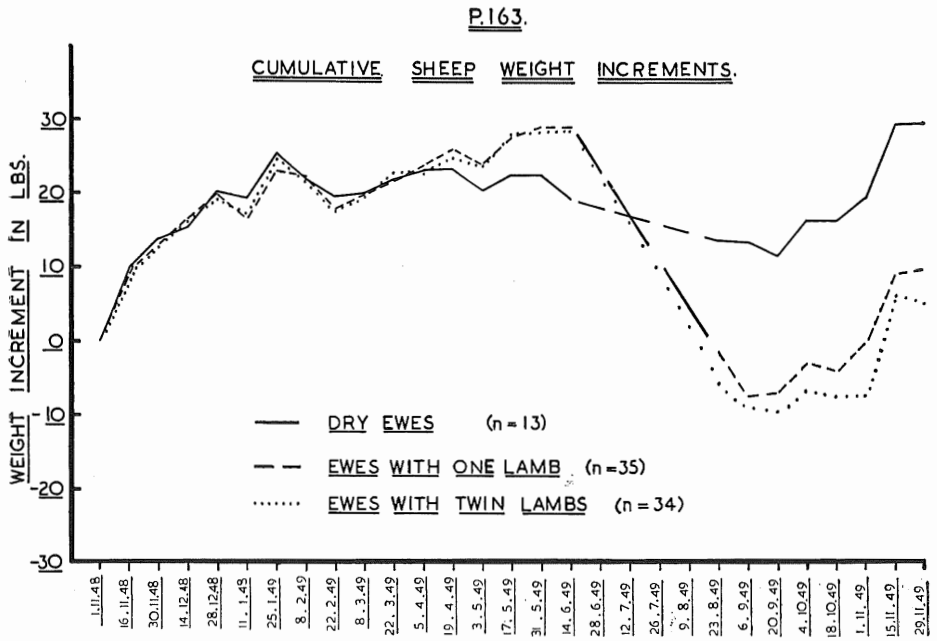

Fig. 1.

Diagram Showing the General Trend of Cumulative Weight Increments (Mean Values for All Pastures) in Dry Ewes, Ewes with One Lamb, and Ewes with Twin Lambs during 1949.

However, within individual flocks (i.e., on each of four pastures) that difference was consistent at a value of approximately 30 lb., and this loss could be attributed to the products of conception, less any subsequent recovery of the ewe (see Table 2).

Table 2.

MEAN LOSS OF WEIGHT FOR DRY EWES AND FOR EWES WITH LAMB ON EACH OF FOUR PASTURES.

Pasture.	Type of Ewe.	No.	Mean Weight. (lb.).		Weight Increment. (lb.).	Ewes with Lamb, cf. Dry Ewes. (lb.).
			14–6–49.	23–8–49.		
Lucerne ..	Dry ewes	1	130·0	137·0	+7·0	..
	Ewes with 1 lamb ..	9	134·3	117·2	−17·1	−24·1
	Ewes with twins ..	11	141·7	117·8	−23·9	−30·9
Grass	Dry ewes	6	124·4	118·3	−6·1	..
	Ewes with 1 lamb ..	8	119·7	81·4	−38·3	−32·2
	Ewes with twins ..	7	128·0	92·3	−35·7	−29·6
Grass + Lucerne	Dry ewes	3	134·8	135·5	+0·7	..
	Ewes with 1 lamb ..	9	133·3	104·0	−29·3	−30·0
	Ewes with twins ..	8	127·2	95·4	−31·8	−32·5
Grass + Phaseolus	Dry ewes	3	121·7	117·7	−4·0	..
	Ewes with 1 lamb ..	9	134·8	97·8	−37·0	−33·0
	Ewes with twins ..	8	132·1	95·3	−36·8	−32·8
					Mean ..	30·7 ± 1·04

After shearing (i.e., as from September 6, 1949) and with the return to more favourable conditions in spring, all sheep gained weight fairly rapidly until the last week in December. They were then transferred to native pastures until January 18, 1950, when they were re-graded for use in that year.

Over the full period of 370 days there was an overall gain in weight (10·5 lb. per head), but any comparison of treatments is a matter of some difficulty, since the proportion of dry ewes, or of twins, was not the same on all treatments. Mean values for each type of ewe and overall means for each pasture are shown in Table 3.

Table 3.

MEAN LIVEWEIGHT GAINS FOR ALL EWES (EXCLUSIVE OF FLEECE WEIGHTS) IN 1949.

Pasture.	Class of Ewe.	No.	Liveweight Gain per Head. (lb.)	Loaded Mean. (lb.)	Arithmetic Mean (lb.)
Lucerne	Dry ewes	1	35·4	..	..
	Ewes with 1 lamb ..	9	23·5	24·8	27·9
	Ewes with twins ..	11	24·9	..	..
Grass	Dry ewes	6	26·6	..	..
	Ewes with 1 lamb ..	8	—4·9	2·1	3·5
	Ewes with twins ..	7	—11·2	..	..
Grass+Lucerne..	Dry ewes	3	39·4	..	..
	Ewes with 1 lamb ..	9	9·8	9·3	15·8
	Ewes with twins ..	8	—2·3	..	..
Grass+Phaseolus	Dry ewes	3	24·2	..	..
	Ewes with 1 lamb ..	9	6·4	6·1	9·9
	Ewes with twins ..	8	—1·0	..	..

These data show that animals held on pure lucerne pastures gained most weight, whereas those on *P. scrobiculatum* alone gained very little. Those on mixed pastures made intermediate gains, with some advantage in favour of the grass + lucerne mixture. In the case of dry ewes these differences were quite small, and it must be assumed that the quality of feed on all four pastures was adequate for this class of sheep. On the other hand, ewes with lamb, and particularly those with twins, showed appreciable differences indicating a sub-optimal level of nutrition on all but the lucerne pastures (see Fig. 2).

(ii) *Data for 1950.*—In 1950 the sheep were in somewhat better condition when the season commenced (mean weight 121·5 lb.), and there was not the same initial rise in the mean weight for all groups. There were

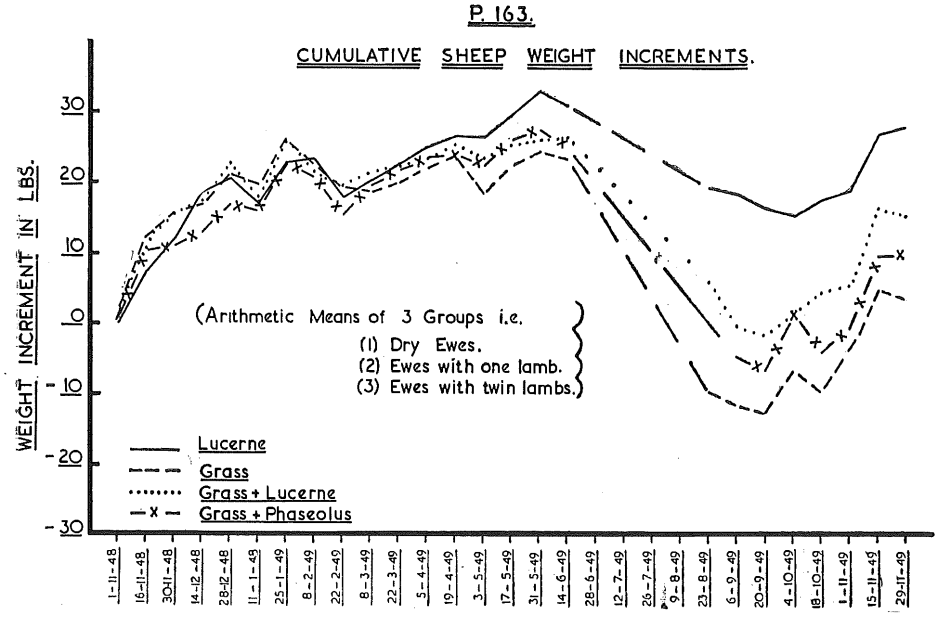

Fig. 2.

Diagram Showing Mean Values for Progressive Liveweight Data on Each of Four Pastures. Curves Based on Data for 1949.

relatively few dry ewes; therefore it was not possible to make the same comparisons at lambing. However, the overall loss at lambing (10 weeks) was much less than in 1949, and there was not the same recovery during lactation.

Over the full period of 372 days the mean weight for all animals showed a loss of approximately 1·1 lb. per head, but here again those that were confined to the lucerne pastures gained about 16 lb., while those on grass alone, or grass + *Phaseolus*, lost approximately 10 lb. (see Table 4).

Table 4.

MEAN LIVEWEIGHT GAINS FOR ALL EWES IN 1950.

Pasture.	Class of Ewe.	No.	Liveweight Gain per Head. (lb.)	Loaded Mean. (lb.)	Arithmetic Mean. (lb.)
Lucerne	Ewes with 1 lamb ..	7	22·1	..	..
	Ewes with twins ..	9	12·2	16·5	17·2
Grass	Ewes with 1 lamb ..	9	−7·1	..	..
	Ewes with twins ..	6	−12·7	−9·3	−9·9
Grass + Lucerne ..	Ewes with 1 lamb ..	9	−0·7	..	..
	Ewes with twins ..	6	1·9	0·3	0·6
Grass + Phaseolus	Ewes with 1 lamb ..	11	−9·8	..	..
	Ewes with twins ..	5	−13·9	−11·1	−11·9

The general trend of liveweights in 1950 is shown in Fig. 3.

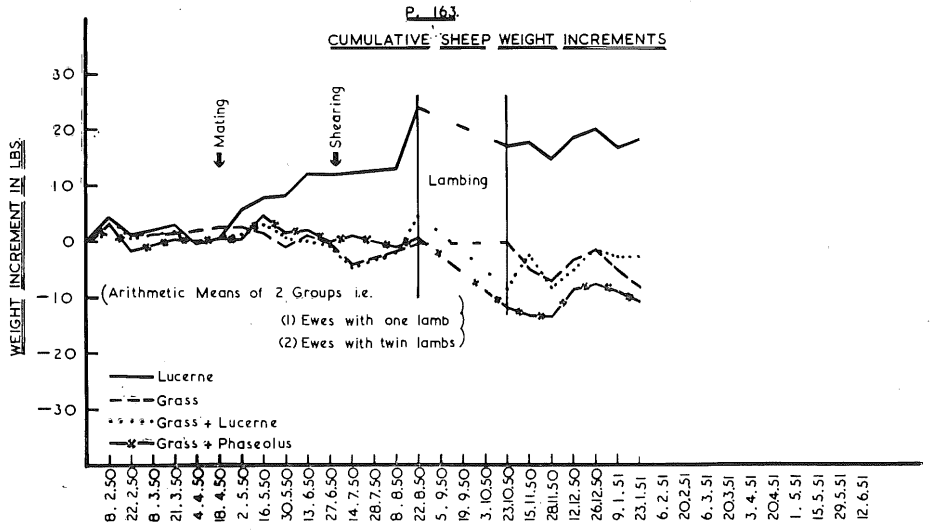

Fig. 3.

Diagram Showing Mean Values for Progressive Liveweight Data in Ewes during 1950.

In both years there was little, if any, growth of the annual legume (*Phaseolus lathyroides*) during lambing and/or lactation, so ewes on this pasture were directly comparable with those on a pure stand of grass.

(*b*) Wool Yields.

The mean yield of wool from ewes on each of these pastures is shown in Table 5. All wools were of a satisfactory type and quality.

Table 5.

MEAN YIELD OF WOOL (LB./HEAD) FROM THREE CLASSES OF EWE ON EACH OF FOUR PASTURES.

Pasture.	Dry Ewes.		Ewes with 1 Lamb.		Ewes with Twin Lambs.		Loaded Mean.		Arithmetic Mean.	
	1949.	1950.	1949.	1950.	1949.	1950.	1949.	1950.	1949.	1950.
Lucerne	9·06	8·85	7·50	7·23	8·44	6·95	8·26	7·10	8·33	7·68
Grass	6·87	5·90	7·13	6·22	7·44	6·55	7·02	6·30	7·15	6·22
Grass+Lucerne ..	7·75	6·30	7·25	6·79	6·81	6·64	7·35	6·68	7·27	6·54
Grass+Phaseolus ..	8·44	6·53	7·56	5·90	7·75	6·18	7·93	6·12	7·92	6·20
Loaded Mean ..	7·81	6·53	7·34	6·46	7·73	6·63	7·63	6·55	..	..
Arithmetic Mean ..	8·03	6·89	7·36	6·53	7·61	6·58	..	..	7·67	6·66

(*Note.*—These sheep were purchased " off shears " in October, 1948, and were shorn, to suit the convenience of the experiment, in August, 1949, and in June, 1950. The above figures for wool yields, for both years, represent 10 months' growth only.)

The data suggest that there was a general tendency towards higher yields from the lucerne pasture and from dry ewes, but there was also a considerable variation in the yields from individual animals within a group, and these differences were not significant.

(*c*) Lamb Data.

Lamb weight data have been derived from weekly records of the weight of animals which were born at different times and matured on feed of changing quality (i.e., at different stages of growth) under varying seasonal conditions. In 1949, for example, lambs born during the second week of June were matured on feed grown during the previous season; those born during the third week of August were partly matured on more succulent new season's growth. This variation, however, was common to all treatments, and mean values for each pasture were calculated by taking the date of birth as zero time, and thereafter average values for the weight of lambs at the age of 1, 2, 3, 4 weeks and so on. Because each lamb was slaughtered at a paddock weight of 63 lb., mean values for any one pasture were not computed after slaughtering was begun.

(i) *Birth weights and percentage lambing.*—Mean birth weights and the percentage of lambs (at marking) are shown in Table 6.

Table 6.

PERCENTAGE LAMBING AND MEAN BIRTH WEIGHT FOR ALL LAMBS BORN IN 1949 AND 1950.

Pasture.	Year.	Lambs at Marking. (%)	Mean Birth Weight.	
			Singles. (lb.)	Twins. (lb.)
Lucerne	1949	147	11·5	9·2
	1950	148	9·9	9·6
Grass	1949	91	9·5	6·5
	1950	134	10·6	8·1
Grass+Lucerne ..	1949	109	10·4	6·9
	1950	119	10·1	9·6
Grass+Phaseolus ..	1949	105	9·3	6·6
	1950	119	9·9	8·5
Mean		121	10·1	8·1

In both years the number of lambs born on lucerne pastures exceeded that for either of the three grass pastures—mean values of 147·5 (from lucerne) and 113 (mean for all grass pastures)—but the difference was not significant. Also the birthweight of twins was consistently less than that of singles, but there were no significant differences between treatments.

(ii) *Growth rates.*—The growth rate of lambs on each of these four pastures was a matter of obvious importance, and in order to make appropriate comparisons the mean weight for all single lambs and for twins was separately plotted against time (i.e., age, in weeks, after birth). In every case the resultant curve was practically a straight line, indicating a close correlation between age and weight (see Fig. 4). Such a remarkable regularity of growth was not anticipated, and no completely satisfactory explanation is available. However, it is reasonable to assume that these lines would lie along a tangent at the point of inflexion in normal sigmoid growth curves, and that differential growth-rates in lambs born at different times would mask any minor inflexions.

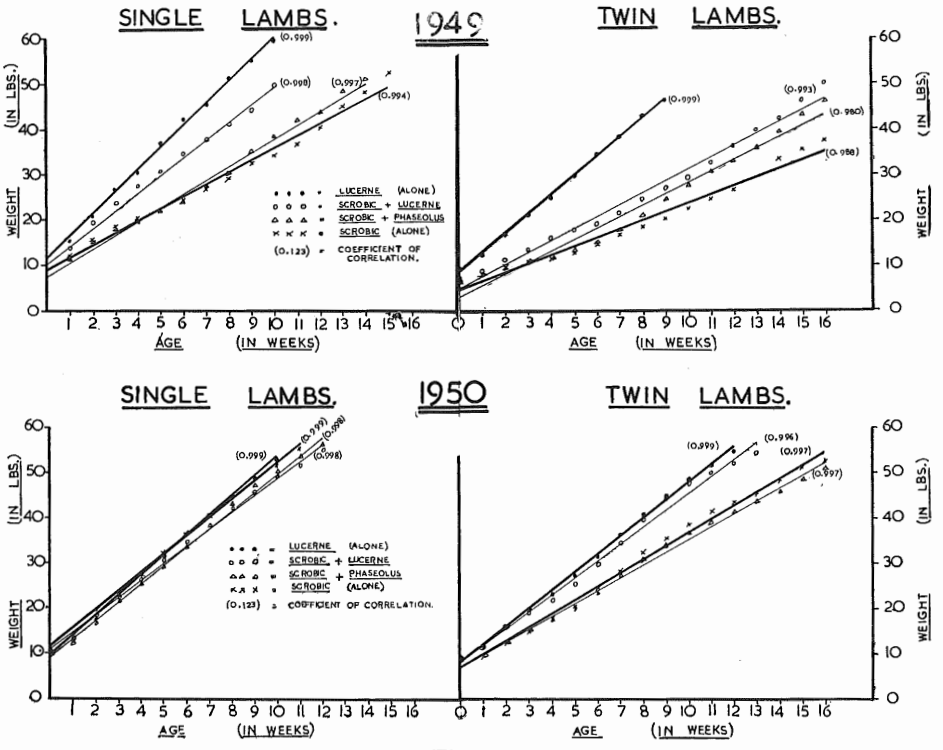

Fig. 4.

Diagram Showing Mean Weight of All Lambs, on Each of Four Pastures, at Weekly Intervals as from the Date of Birth.

The data show that in 1949 (the more rigorous season) there were appreciable differences in the growth rate of lambs matured on different pastures. On the lucerne treatments all lambs, both singles and twins, gained rapidly (up to 5 lb. per week), and they were matured in 10–12 weeks. On "grass alone" and "grass + *Phaseolus*", single lambs took 14 weeks to mature, and the growth rate of twins was still further depressed.

In 1950 the growth rate of single lambs was much the same on all four pastures, and only twin lambs on the "grass alone" and "grass + *Phaseolus*" pastures matured more slowly.

(iii) *Carcass appraisal.*—As these lambs matured (i.e., attained a paddock weight of 63 lb.) they were crated for 12 hours (overnight) to simulate conditions of normal transport to an abattoir, and then slaughtered. The carcasses were then held in cold storage for a further 24 hours, when they were appraised on the basis of a modified block test. Mean paddock weights, liveweight shrinkage (in crates), dressing percentages and carcass shrinkage (in cold store) are shown in Table 7.

Table 7.

SLAUGHTERING DATA FOR 1949 AND 1950.

Pasture.	Year.	Mean Paddock Weight. (lb.)	Mean Pre-Slaughter Weight. (lb.)	Liveweight Shrinkage.		Dressing. (%)	Carcass Shrinkage.	
				(lb.)	(%)		(lb.)	(%)
Lucerne	1949	65·5	61·4	4·1	6·2	55·9	0·8	2·3
	1950	64·2	60·3	3·9	6·1	55·0	0·8	2·4
Grass	1949	61·5	56·9	4·6	7·5	49·7	1·0	3·5
	1950	63·3	58·5	4·8	7·6	50·2	0·9	3·1
Grass + Lucerne ..	1949	62·9	58·4	4·5	7·2	52·9	1·0	3·2
	1950	64·1	58·8	5·3	8·3	53·5	1·0	3·2
Grass + Phaseolus	1949	61·9	57·3	4·6	7·4	50·8	0·8	2·7
	1950	63·4	58·4	5·0	7·9	51·9	1·0	3·4
Mean	1949	63·3	58·8	4·5	7·1	52·9	0·9	2·9
	1950	63·8	59·1	4·7	7·4	52·7	0·9	2·9

These data show that there was a remarkable overall similarity in the slaughter data for lambs in 1949 and 1950. There was also a trend towards better quality from the lucerne pastures (i.e., in terms of dressing percentage, liveweight shrinkage, and carcass shrinkage), but these differences were not significant.

The carcasses were appraised on the basis of seven criteria, as follows:—

Feature.	Score.
(By inspection)	
1. Balance of conformation .. .. .. (fullness of quarters) (flatness of withers) (parallel sides)	0–10
2. Fat cover .. .. (colour 5, distribution 5)	0–10
3. Legs .. .. (well filled and fine boned)	0–10
4. Ribs .. .. (light and well sprung)	0–10

(By measurement)	
5. Leg length (short)	0–10
6. Eye muscles—	
(*a*) Size (large)	0–15
(*b*) Shape (index)	0–15
7. Backfat thickness (correct proportions)	0–20
Total	100

The score assigned to each feature was based on a series of observations recorded for several hundred lamb carcasses in earlier experiments (Briton 1952), and an overall or "total score" was recorded for each carcass.

In each of these seven features a definite relationship was observed between the score awarded and the age of the animal at slaughtering. Lambs which had matured more rapidly gave better quality carcasses.

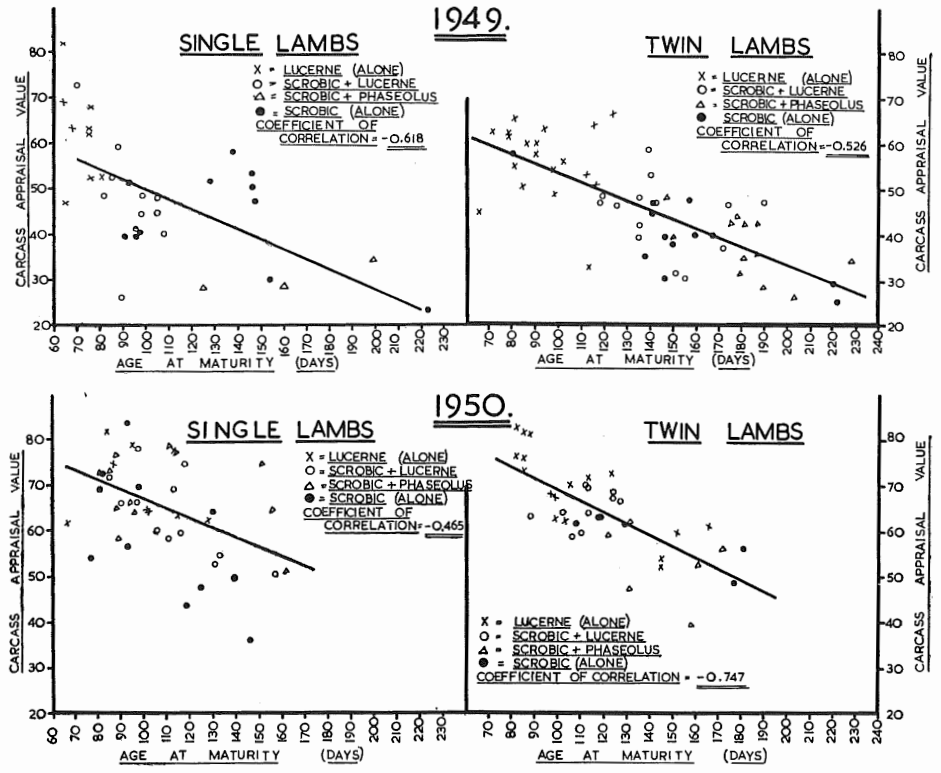

Fig. 5.

Separate Diagrams Showing the Relationship Between Age at Maturity and Appraisal Values for Twin Lambs and for Single Lambs in 1949 and 1950.

Features 1, 3, 4, and 5 would be affected more by genetic differences than by the quality of feed; the others would be more directly related to differences in feed quality. However, earlier work (Briton 1952) had indicated a general relationship between desirable conformation and rate of maturity in lambs of nine different breed combinations, all maintained throughout at an optimum level of nutrition. It would appear, therefore, that within any one breed combination each feature relating to carcass quality follows the same trend in relation to maturity rate, irrespective of whether it is basically a function of breed or not.

The general trend of this relationship between maturity rate and carcass quality is shown in Figs. 5 and 6. The correlations are of a relatively low order (0·465 to 0·747), but this is to be expected when two factors (genetics and nutrition) are both exerting their influence on carcass quality, with varying emphasis on individual features.

The observed relationship between carcass quality and maturity rate appears to hold good irrespective of the type of pasture, and since the scores for individual features all showed the same trend, overall appraisal values (total scores) were plotted against the age at maturity of both single and twin lambs (see Fig. 5).

A similar diagram based on the data for all lambs born on the experiment is shown in Fig. 6.

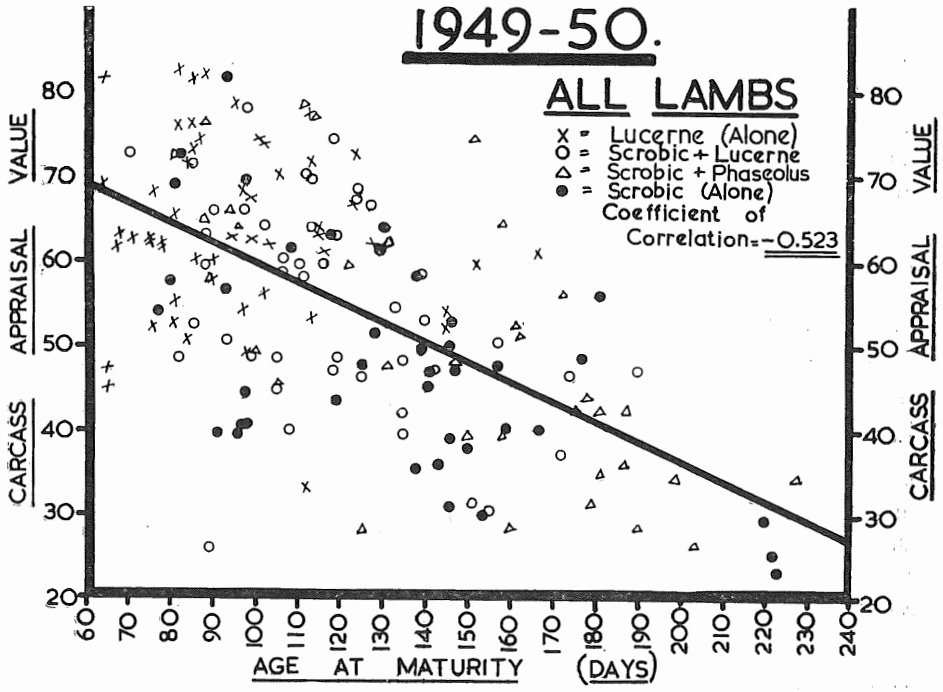

Fig. 6.

Diagram Showing the Relationship Between Age at Maturity and Carcass Appraisal Values for All Lambs Produced in 1949 and 1950.

(*d*) Sheep Numbers and the Intensity of Grazing.

Up to this point all the evidence from this experiment has favoured lucerne pastures as being most suitable for raising fat lambs in south-eastern Queensland. Few significant differences had been recorded, but there has been a general trend in favour of lucerne which was consistent, and which could be summarized as follows:—

(1) Highest weight-gains in ewes were recorded on lucerne pastures.

(2) These sheep gave the highest yields of wool.

(3) There was some increase in the percentage of lambs at marking.

(4) Differences in the growth rate of lambs—when apparent—were all in favour of lucerne pastures.

(5) There was some improvement in the dressed weight (%) with a smaller loss from carcass shrinkage, etc.

(6) There was a higher proportion of first quality carcasses.

In all cases these differences were most pronounced in twin lambs or in the mothers of twins (i.e., under the greatest demand for high level nutrition).

On the other hand, there were also appreciable differences in the carrying capacity of these four pastures, and in this respect the lucerne treatments were at some disadvantage. The experiment was designed deliberately to measure qualitative features of the pastures, and to this end the numbers of sheep were reduced initially to 3·2 ewes per acre and subsequently to as few as 2·2 ewes per acre. Other experiments, both preceding and subsequent to this trial, but using the same plants in various combination, have carried 4·0 dry sheep and/or 3·0 lambing ewes in very good condition, and in some cases under very adverse conditions.

At this intensity of grazing there was at all times an abundance of feed on each of the three grass pastures (grass alone, grass + lucerne, and grass + *Phaseolus*), but the lucerne pastures proved inadequate, particularly in 1949, when additional areas were required to maintain a continuous supply of feed. During that period (i.e., June 15, 1949 to September 20, 1949) the number of sheep/days grazing on all pastures were as shown in Table 8.

In effect these data are not entirely representative, since animals transferred to other paddocks would have an abundance of feed, probably more than sufficient to counteract the effects of any previous shortage when they were held on the experiment. It is also of interest that in this case (i.e., where quantitative factors were involved) there was some definite advantage in favour of the row-cultivated plots.

In 1949 the three grass pastures, comprising a total area of 26·6 acres, carried 81 ewes from November 7, 1948, until lambing (June 14, 1949), and 63 ewes from then until November 29. In addition, one ram and one reserve ewe were added to each subplot during the mating season (i.e., a total of 99 adult sheep for a period of eight weeks commencing January 25, 1949).

Table 8.

GRAZING DATA FOR THE CRITICAL MONTHS IN 1949.

Date.	No. of Ewes.	No. of Days on Experiment.			
		Lucerne.			Common Value for All Grass Pastures (Sub-plot.)
		Sward.	42" Rows.	63" Rows.	
15/6—25/6	9	14	10	7	14
26/6—12/7	9	14	14	13	14
13/7—26/7	7	10	14	15	14
27/7— 9/8	7	Nil	Nil	Nil	14
10/8—23/8	7	10	10	10	14
24/8— 6/9	7	7	10	14	14
7/9—20/9	7	7	10	14	14
Total Sheep Days		483	524	551	742
Relative Grazing Intensity		65	71	74	100
			Mean 70		

From June 14, 1949, the number of lambs rose steadily to a total of 64, of which the majority were maintained on these three pastures from August 21, 1949, to November 29, 1949. Assuming a lamb to be the equivalent of one extra sheep for half its life, it has been estimated that the three grass pastures provided 32,986 sheep/days grazing (i.e., an equivalent of 3·2 sheep per acre). On the same basis the lucerne pastures carried approximately 2·9 sheep per acre.

In 1950 conditions were more favourable and good feed was available in greater quantity. However, in view of the number of multiple lambings (twins and triplets) that occurred in 1949, it was decided to reduce the intensity of grazing to 2·6 ewes per acre until the last week in August (lambing) and thereafter to 2·2 ewes per acre.

The three grass pastures therefore carried a total of 63 ewes until the last week in August, and thereafter 54 ewes until June 1951. As before, during the mating season (i.e., eight weeks commencing April 11, 1950), one ram and one reserve ewe were added to each subplot, and during the period August 31, 1950, to January 24, 1951, the number of lambs rose steadily to a total of 72. It has been estimated that over a period of 12 months these three pastures provided 26,060 sheep/days grazing (i.e., the equivalent of 2·7 sheep per acre). The lucerne pastures carried approximately 2·4 sheep per acre.

Over the full 2-year period, each of the three grass pastures carried 2·6 lambing ewes per acre, and the lucerne pastures carried 2·0 lambing ewes per acre. Under these conditions the lucerne pastures were grazed to capacity, but on all grass pastures the supply of available feed was at all times in excess of the demand.

IV. DISCUSSION.

In Queensland the fat lamb industry is at present of relatively minor importance, and lamb meat constitutes only 1% of meat passing through the Brisbane Abattoir. Current statistics for Brisbane and for the whole of New South Wales are shown in Table 9. The numbers of sheep in Queensland

Table 9.

ANNUAL CONSUMPTION OF MEAT (IN LB.) PER HEAD OF POPULATION.

—	Beef.	Veal.	Mutton.	Lamb.	Total.
Brisbane..	165	190	21	4	380
New South Wales ..	124	1	35	28	188

suited to fat-lamb production are so small that they have evidently been considered not worth recording in the statistical data for the State (see Table 10). At the present time nearly all locally produced fat lambs are

Table 10.

STATISTICAL TABLE OF INTENDED MATINGS FOR 1951 (1,000,000 EWES).

Breed.	N.S.W.	Vic.	S.A.	W.A.	Tas.	Qld.
Merinos, Corriedales, and Polworths (mainly wool-growing sheep) ..	16·0	4·2	3·5	4·2	0·5	7·3
Others (including fat lamb sheep) ..	4·6	4·4	1·0	0·6	0·6	..

reared on the Darling Downs, where cereal crops (wheat and oats) are used for winter feed. In that district there are approximately 2·7 million sheep.

The main factors limiting the production of fat lambs in Queensland are (1) the uncertainty of subtropical rainfall and the poor quality of native pastures in winter and spring, and (2) the normal breeding season of British breed ewes, which necessitates mating in late summer or autumn, with the result that lambing occurs when native pastures are of very low feed value.

This experiment is one of a series which show clearly that, given satisfactory sown pastures, there is no fundamental reason why fat lambs should not make an important contribution to food production in Queensland, and thereby to Australian food production. If the production of lamb meat is to increase in Queensland, it is highly desirable that top quality "sucker" lamb carcasses should be the objective. High quality lamb meat can be expected to find ready acceptance both for local consumption and for export. Lesser quality carcasses and "carry-over" lambs should be avoided. The close correlation obtained between the age of the lambs at slaughter and carcass quality demonstrates the importance of rapidly maturing the lamb crop.

The grass *Paspalum scrobiculatum,* when utilized in association with lucerne grown under row cultivation, can provide satisfactory pasturage in south-eastern Queensland for quality lamb production. The important characteristics of these pastures are:—

(1) The grass *Paspalum scrobiculatum* provides a bulk supply of winter feed for the dry ewe flock in the form of standing foggage. This is both palatable and readily digestible, and it is, of itself, almost sufficient to maintain dry ewes in good condition.

(2) Under row cultivation the lucerne pastures will provide virtually a continuous supply of protein and of green feed, at least sufficient to ensure maximum consumption of the bulk of grass.

Under normal seasonal conditions a late mating (March-April) is desirable. Mating at this period is conducive to high lambing percentages, whilst the grass (*P. scrobiculatum*) will invariably make new growth in spring when mean temperatures rise above a threshold value (Paltridge 1954). High quality feed is thus available when it is most needed for the lambing and lactating ewes. Lambing in spring will allow also for maturity of the lamb crop in late December or January. After disposal of the lambs for slaughter the ewes can be removed to allow full growth and production of a large bulk of feed in readiness for the ensuing winter.

At that time (late summer) the incidence of effective summer rains will normally provide an abundance of feed of reasonably good quality on native pasture and/or on cultivated land; and, in any case, if the ewes were to lose weight during this period, the disadvantage would be more apparent than real, since they would be returned to the sown pastures almost two weeks before mating, when a rising level of nutrition would favour a high rate of conception.

This type of management would therefore approach ideal conditions, both for the animals and for the sown pastures.

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