SHEEP PRODUCTION SYSTEMS

J.M. OBST*

INTRODUCTION

Changes are presently taking place within the sheep industry of Victoria. Will these changes lead to improved productivity and economic viability of the individual sheep farm? In 1980 within the Western District of Victoria the following factors were obvious:

(i) A change to larger sheep Are these larger sheep biologically more efficient and do they produce higher net farm incomes?
(ii) District weaning percentages average 80% Will the use of hormones to stimulate higher ovulation rates improve economic returns?
(iii) Farmers are reluctant to adopt spring lambing Poor weaner growth is used as one reason for this. Will lucerne pastures help to overcome this situation?
(iv) Computers are being used by farmers and consultants Can computers be used to simulate large-scale field experiments and local farming systems?

To study these factors, eight systems of wool production were established at Hamilton (Table 1). The main treatments compared were small traditional Merino vs larger Comeback sheep, autumn vs spring lambing and normal vs increased ovulation rate. In addition weaners only from each of these treatments were compared on perennial ryegrass-sub. clover and lucerne/sub. clover pastures.

In this contract, the environment and experimental details are initially described. Preliminary biological data on wool production from Merino vs Comeback sheep (i.e. ewes, weaners, wethers) are given by Thompson and Wilson. Comparisons of lucerne vs grass-dominant pastures for weaner sheep are then given by Saul. (Some effects of ovulation rate treatments have been discussed by Obst et al. (1984) and are not shown in this contract). Field and computer-simulated pasture and liveweight data for a sample of Merino vs Comeback sheep are presented by White and Bowman. Economic returns from the eight systems are given by Patterson and I will then summarise the preliminary results and compare them with the productivity of local farms and suggest directions for future research.

Environment

The Pastoral Research Institute (PRI), Hamilton in Victoria is at lat. 37° 49' S and long. 142° 04' E, 200 m above sea level. The environment has been fully described in the Victorian Year Book (Anon 1971). Briefly, mean annual rainfall is 700 mm with over 50 mm/month from April to November. Mean maximum temperatures range from 26°C in February to 12°C in July. In most years, pasture growth starts after the opening rains in April and is continuous until December. The daily rate of growth (kg/ha) varies from 20-40 in April/May, 10-30 in June/July, reaching a maximum of 80-150 in October/November. Total pasture production at normal stocking rates exceeds 10,000 kg DM per hectare (Cayley et al. 1980).

The topography is generally undulating and treeless. Soils are clay loam with a fine basalt gravel cover (Martin and Maher 1985). At a depth of 0-10 cm, pH is 5.1-5.6, Olsens phosphorus 8-13 ppm and Skenes potassium 100-200 ppm (Skene 1956).

The ewes and wethers in this experiment grazed areas of improved pasture which had been established for 20 years. These pastures are dominated by perennial ryegrass, phalaris and annual grasses with subterranean clover (cv. Mt. Barker and Bacchus Marsh) constituting from 10 to 20% of the spring pasture. Weaner sheep

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grazed either perennial ryegrass or lucerne pastures which were established in 1981 on soil types appropriate for optimum production of each species (Kenny and Reed 1984).

In 1982, 1983 and 1984 the annual rainfall was 431, 848 and 759 mm respectively. The low rainfall in 1982 severely restricted pasture growth and drought conditions persisted from October 1982 to March 1983. A fire burnt the area in February 1983 necessitating re-establishment of the ryegrass area for the weaners. This area was restocked in August 1983.

The sheep systems

(i) Sheep The eight self-replacing flocks shown in Table 1 were set up in December 1981. The Merino flocks were constituted from two local flocks of Saxon/Peppin strain 20μ wool and mated each year to rams selected from a local Saxon strain stud. Comebacks (Merino×Polwarth) with wool of 23μ were selected from two large local studs; rams from each stud were used in alternate years.

Table 1 Design of the sheep production systems

System no.	Breed of sheep	Time of mating	Ovulation induction	No. of sheep† Ewes Pasture	Weaners Ryegrass	Weaners Lucerne	Wethers Pasture	Area of land (ha)
1	Merino	Dec/Jan	No	100	48	48	60	17.6
2	Merino	Dec/Jan	Yes	100	48	48	60	17.6
3	Comeback	Dec/Jan	No	108	52	52	64	22.0
4	Comeback	Dec/Jan	Yes	108	52	52	64	22.0
5	Merino	Mar/Apr	No	100	48	48	60	17.6
6	Merino	Mar/Apr	Yes	100	48	48	60	17.6
7	Comeback	Mar/Apr	No	108	52	52	64	22.0
8	Comeback	Mar/Apr	Yes	108	52	52	64	22.0

† Sheep were grazed as two replicates

Four of the flocks were mated in December/January for May/June lambing and the remaining flocks mated in March/April for August/September lambing. At each mating time, one flock of each breed was treated to increase ovulation rate using pregnant mares serum gonadotrophin in 1981/82 and 1982/83 (Obst et al. 1984) and Fecundin (Glaxo Aust. Pty. Ltd.) in 1983/84 and 1984/85.

May/June lambing systems were shorn post-weaning in September and August/September systems in December post-weaning. After shearing, hogget replacements were selected equally from the lucerne and ryegrass weaner paddocks to maintain the four age (2,3,4,5 years) ewe and two (2,3 years) age wether systems. Selection was based on fleece weight and live weight after culling for visual faults and fleece quality.

Data for 1981/82 have not been included in the analyses because at the first shearing, sheep had not been within the systems for a full year and stocking rate adjustments were made in this period.

(ii) Stocking intensity Sheep numbers (Table 1) were set to maintain a similar metabolic live weight (kg$^{0.75}$/ha) for each breed of sheep. This resulted in stocking rates (sheep/ha) for Merino ewes, weaners and wethers of 12.5, 15 and 18.8, respectively, and for the Comebacks 10.8, 13 and 16, respectively. The success of this approach is seen in Fig. 1 for ewes and lambs and this is supported by the fact that pasture availabilities (t DM/ha) were similar throughout the year for Merinos and Comebacks. In addition amounts of supplementary feed (ME/ha Table 2) given to Merinos and Comebacks were similar.

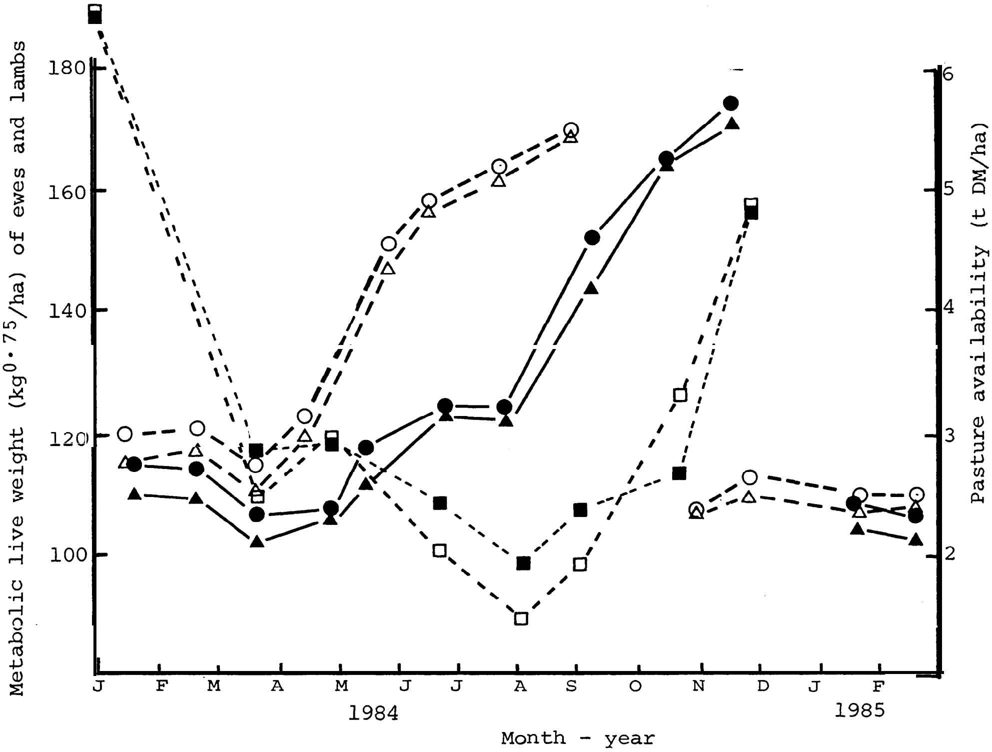

Fig. 1 The total metabolic live weight ($kg^{0.75}$/ha) of ewes and lambs during 1984 for the May/June and Aug/Sept lambing times respectively of Merino (O--O; ●—●) and Comeback (Δ--Δ; ▲—▲) systems and pasture availability (t DM/ha) for the May/June (□--□) and Aug/Sept (■--■) lambing systems.

Due to the higher feed requirements of grazing ewes during lactation, May/June lambing systems had 20 to 30% less pasture available during the winter months (June to September) than the August/September lambing systems (Fig. 1).

Live weights and condition scores (Jefferies 1961) were recorded regularly. All sheep were drenched for internal parasites with Levamisole; weaners at times determined by the Nemat program (Callinan et al. 1982) and adult sheep according to western Victorian recommendations (Riffkin 1983).

Table 2 Supplementary feed - total ME (MJ/kg DM)

Period of feeding	Nov. 8, 1982 - June 8, 1983		Jan 8 - Aug 31, 1984	
Genotype	Merino	Comeback	Merino	Comeback
ME total	520,600	627,600	115,400	128,000
ME/hectare	14,790	14,260	3,280	2,910
ME/head	1,001	1,048	225	232

Supplementary feeding (Table 2) was started when the body condition score of 30% of any group was less than 2 for ewes or 1.7 for weaners and wethers. Feeding continued until all sheep were above the specified condition score. The total amounts of supplementary feed in the form of either oats, wheat, lucerne or pasture hay fed in 1983 and 1984 have been calculated on an ME basis (Table 2) according to values of the Ministry of Agriculture, Fisheries and Food (1975).

WOOL PRODUCTION IN RELATION TO SHEEP GENOTYPE

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Wool production characteristics of the Merino and Comeback flocks in 1982/83 and 1983/84 were recorded. Production from ewe, wether and weaner flocks grazing ryegrass/subterranean clover based pasture is presented in this paper. The paper by Saul presents the comparison of wool production from weaners grazing lucerne or ryegrass based pastures. Fleeces from the replicates of each treatment were baled together and core tested by the Australian Wool Testing Authority to obtain fibre diameter and yield measurements. In 1983/84 mean staple length, strength and position of break measurements were also determined from bale samples.

Greasy fleece weight per head and per hectare, fibre diameter and yield for ewes, wethers and weaners of each genotype are presented in Table 1. Data from all treatments within each genotype have been combined. The Comeback flock grew more wool per head than the Merinos (P<0.01). The combined ewe, wether and weaner fleece weights averaged for 1982/83 and 1983/84 were 5.2 and 4.0 kg for the Comebacks and Merinos respectively. The average fibre diameter (years combined) for the Comeback ewes, wethers and weaners was 3.0µ greater than the equivalent Merinos. Yield differences between the genotypes were small.

Table 1 Wool production of Merinos and Comebacks in 1982/83 and 1983/84

Stock class	Genotype	Least squares means Greasy fleece weight (kg/sheep)		(kg/ha)		Arithmetic means Fibre diam (µ)		Yield (%)	
		1982/83	1983/84	1982/83	1983/84	1982/83	1983/84	1982/83	1983/84
Ewes:	Merino	4.2b	4.1b	53.2b	51.8b	20.1	20.3	71.9	74.0
	Comeback	5.3a	5.1a	57.2a	54.8a	22.7	23.3	71.5	74.4
Wethers:	Merino	4.3b	4.4b	80.7b	83.0a	19.8	20.1	71.3	72.7
	Comeback	5.8a	5.5a	86.5a	88.3a	22.3	24.0	71.5	73.4
Weaners†:	Merino	3.2b	3.8b	50.1a	56.7a	18.7	19.5	70.1	70.0
	Comeback	4.2a	4.6a	51.9a	59.8a	22.0	22.2	70.2	73.4

Means with different letters within columns and stock class are significantly different (P<0.05)
† Weaners grazing ryegrass-subterranean clover based pasture.

Comeback ewes and wethers produced more wool per hectare than the Merinos (P<0.05). Genotype did not affect wool production per hectare of the weaners (P>0.05). Measurements taken in 1983/84 indicated that fleeces from Comeback ewes had greater staple length (104.5 mm) and staple strength (39.5 N/Ktex) than Merino ewe fleeces (90.1 mm and 36.3 N/Ktex) (P<0.01).

In a review of the efficiency of conversion of feed to wool, Butler and Maxwell (1984) concluded that genotypes that are larger and have coarser wool, tend to have a greater appetite and be more efficient wool producers. Our trial indicates that if differences in the efficiency of conversion of feed to wool

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exist between the two genotypes these are small when production of each genotype is measured on a per hectare basis.

The importance of the differences in length and strength of the wool will depend on their repeatability between seasons, and the development of price premiums and discounts for wools of different strengths.

The Comeback flock produced 28% more wool per head than the Merino, but the Merino wool was 3.0μ finer, which is similar to industry observations. Differences between similar genotypes were found by Wilson et al. (1986) who reported Comeback wethers (two strains combined) with a mean fibre diameter of 23.2μ producing 9% more wool per head than the average of three fine wool strains with a mean fibre diameter of 19.6μ. When compared with other grazing experiments at Hamilton (Robards 1979), wool production per hectare in our experiment was similar. Large (28%) differences in wool production per head, in favour of the Comebacks, are reduced to small (6%) differences in production per hectare when ewes, wethers and weaners are combined.

WEANER SHEEP PRODUCTION FROM DIFFERENT PASTURE SPECIES

G.R. SAUL*

Many farmers are reluctant to adopt spring lambing, often due to perceived problems of poor weaner sheep growth over the summer. Studies by Kenny and Reed (1984) at Hamilton have shown improved liveweight gains and wool production from weaners grazing a range of legume pastures. However, as their results were obtained from only a limited grazing period over the summer, there is a need to study the year round effect on weaner sheep grazing lucerne compared with ryegrass pastures.

Mixed sex Merino and Comeback weaners born in either May/June or August/September were allocated, following weaning and shearing, to a lucerne (WL 378) sub. clover or a Vic. perennial ryegrass/sub. clover pasture for 12 months to hogget shearing. The subterranean clover consisted of volunteer cultivars Mt. Barker and Bacchus Marsh with introductions of Trikalla, Larisa and Esperance cultivars. Ryegrass pastures were set stocked and in spring topped to a height of 100 mm and the cut material baled and removed. Lucerne pastures were rotationally grazed, 14 days on, 42 days off, and in 1984 and 1985, 25 and 50% respectively of the area was cut and material baled and removed.

Table 1 shows the effect of pasture type and lambing time on the wool production, liveweight gains and supplementary feeding of the weaner sheep, with genotypes combined. (The effect of genotype on weaner wool production is discussed in this contract by Thompson and Wilson). There were no significant interactions between pasture type and time of lambing. Weaners grazing lucerne pastures grew faster in spring, were heavier at shearing and produced more wool than those grazing ryegrass pastures. August-born weaners grew faster over summer and autumn/winter but produced less wool per head than May-born weaners. The live weights of hoggets were similar, prior to shearing at 15 months of age.

It was necessary to feed more grain in 1983/84 to August-born weaners compared to May born weaners (20.7 vs 11.6 kg/hd). Weaners grazing ryegrass pastures were fed more grain than those on the lucerne treatments (19.9 vs 12.4 kg/hd). In 1984/85 little grain was fed to weaners on lucerne with supplementation to weaners on ryegrass remaining at a similar level to 1983/84. This lower level of supplementation to weaners on lucerne was due to improved management of lucerne in the second summer. In late spring 1983/84 lucerne pastures were poorly utilized

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with a strict 14 day rotation as a considerable amount of herbage was trampled and not consumed. During spring 1984-85, the weaners remained in a lucerne paddock for up to 30 d until most of the green feed was consumed. This allowed a more even distribution of lucerne throughout the summer-autumn period.

Table 1 Liveweight gain, wool production and supplementary feeding to weaner sheep grazing either lucerne or grass pastures

Measurement	May/June born weaners (weaned Sept)		Aug/Sept born weaners (weaned Dec)		F test	
1983/84	Lucerne/ sub.clover	Ryegrass sub.clover	Lucerne/ Sub.clover	Ryegrass/ sub.clover	Pasture type	Time of lambing
Wt. gain (g/d)						
31 Oct-20 Dec 1983	129	95			*	
20 Dec-9 Apr 1984	12	6	40	44	NS	**
9 Apr-5 Sept 1984	61	56	81	70	NS	**
5 Sept-27 Nov 1984			113	79	NS	
Oat grain (kg/hd)	10.3	12.9	14.5	26.8		
Wool data	(Shorn Sept 1984)		(Shorn Dec 1984)			
Greasy fl. (kg)	4.8	4.3	4.4	4.1	*	*
Fibre diam (μ)	21.2	21.1				
Yield (%)	71.5	71.7	§	§		
Pre-shear. wt. (kg)	46.2	42.9	46.9	43.5	**	NS
1984/85						
Wt. gain (g/d)						
4 Oct-18 Dec 1984	150	108			**	
18 Dec-24 Apr 1985	3	16	57	55	NS	**
Oat grain (kg/hd)	2.6	20.8	2.6	28.0		

* P<0.05; ** P<0.01; NS P>0.05; § Data unavailable

The pasture on offer to the weaner sheep in different seasons (Table 2) was estimated using a falling plate meter similar to that described by Bransby et al. (1977) and samples of herbage were sorted to determine green and legume components. While there were few differences between the pastures due to lambing time, the lucerne and ryegrass pastures were markedly different. Lucerne pastures contained less dead material and had a higher green legume content (35 vs 7%), up to half of which was subterranean clover. Differences between the composition of the pastures were larger in spring and summer.

Table 2 Pasture on offer (kg DM/ha) to the weaner sheep

Date and parameter	May/June born weaners		Aug/Sept born weaners	
	Lucerne/sub. clover†	Ryegrass/ sub. clover	Lucerne/sub. clover	Ryegrass/ sub. clover
February 1984				
Total available	1540 - 1050	2980	1340 - 1100	3290
Green	650 - 80	90	670 - 180	100
Green legume	620 - 80	0	600 - 180	0
May 1984				
Total available	1810 - 1020	2580	1470 - 1020	2740
Green	1250 - 290	1190	1090 - 390	1120
Green legume	1030 - 110	50	970 - 150	110
August 1984				
Total available	1930 - 1390	1870	1890 - 1350	1960
Green	1740 - 1210	1230	1700 - 1170	1200
Green legume	870 - 390	170	850 - 340	160
November 1984				
Total available	5940 - 3370	4600	4980 - 3190	3250
Green	5700 - 2260	4230	4780 - 2110	2990
Green legume	2320 - 540	740	2690 - 1020	460
February 1985				
Total available	3760 - 2240	2680	2530 - 1960	2640
Green	960 - 110	80	1110 - 230	80
Green legume	860 - 110	0	980 - 230	0

† Mean values before and after grazing

Studies will continue to obtain information on the long-term production from lucerne/sub. clover pastures, and the efficiency of wool production from these pastures and of Merino compared with Comeback sheep.

A COMPARISON OF OBSERVED AND SIMULATED RESULTS

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Simulation models are an effective means of extrapolating the results of a field experiment to other locations, seasons and production systems. They enable the biological and economic consequences of adopting particular management treatments or genotypes to be assessed. Though theoretically appealing, such an approach is valid only if it can be convincingly demonstrated that a particular model adequately mimics reality.

The detailed observations on pastures, ewes and lambs in the PRI systems experiment provided an excellent opportunity to further test the flock model of White et al. (1983), adapted for the perennial pastures and small-framed Merinos of western Victoria (White et al. 1982). The model had already been validated in part of the Hamilton environment against pasture and liveweight data for weaned lambs (Callinan et al. 1982; A.P.L. Callinan, unpublished data) and wethers exposed to different management treatments (White and Bowman 1984; P.J. Bowman and J.W.D. Cayley, unpublished data).

In this study we tested the model against pasture and liveweight data from one replicate of the spring lambing, normal ovulation rate for Merino and for

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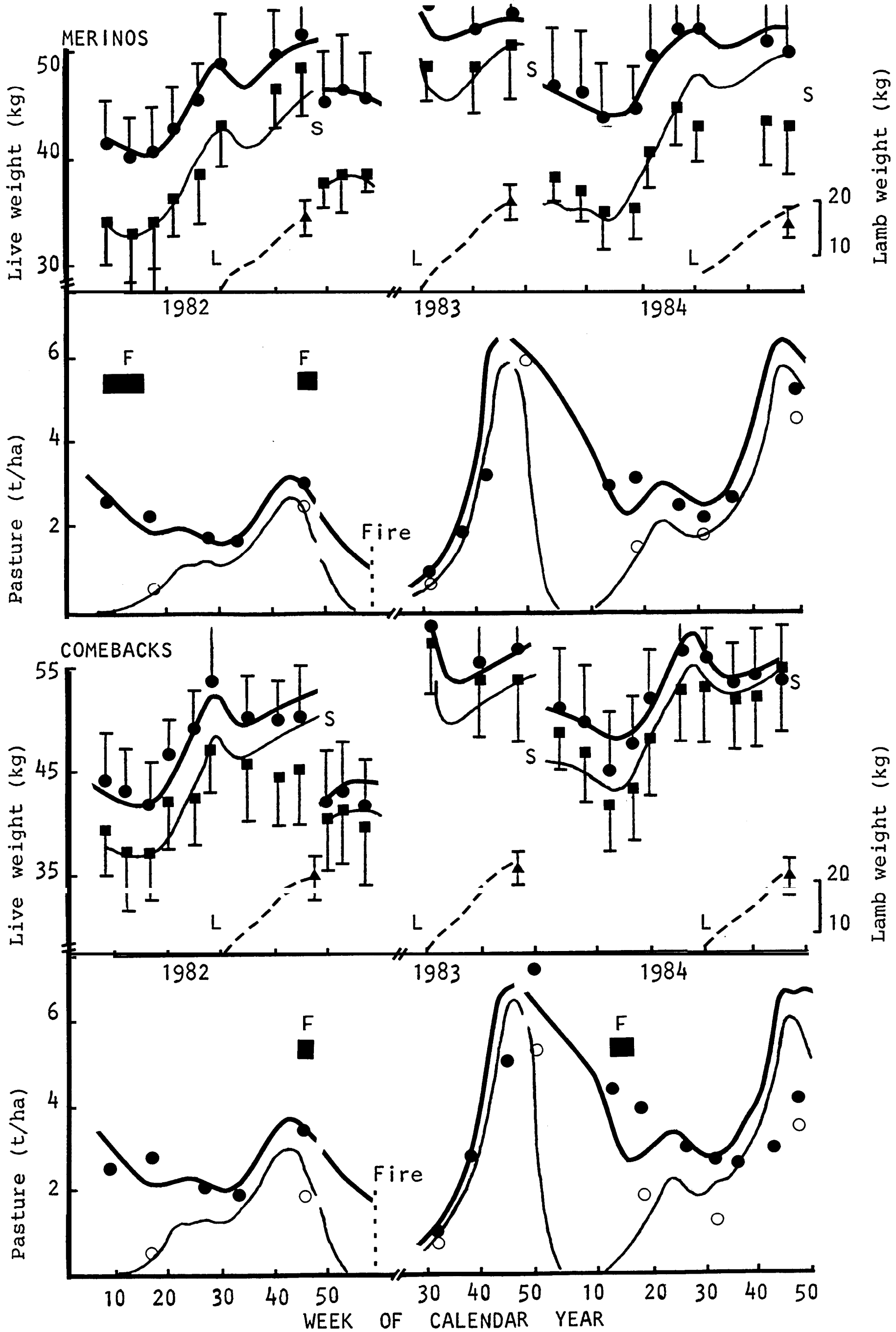

Fig.1 Predictions (—,▬) and field observations (○,●) of green and total herbage availabilities, respectively, and the liveweight of Merino and Comeback lambs (--,▲), young (—,■) and mature single-rearing ewes (▬,●). S= weaning and shearing, L= lambing, F= feeding supplements, T⊥= standard deviations about each mean.

Comeback breeds. The predicted upper limits to the voluntary intakes of each class of sheep (U, kg organic matter/day) were varied according to their fleece-free, conceptus-free live weight (W, kg), age and physiological state, predictions of actual intake took into account the availability and digestibility of green and dead herbage, and supplement if offered (White et al. 1983-j. In non-lactating sheep, U was determined relative to their normal live weight (BN, kg), where BN at any time is the minimum of (i) the highest weight attained so far by the sheep in that class and (ii) the weight (WA, kg) of a well-grown sheep of the same age (AGED, days) (Christian et al. 1978). The functions used were WA = 45-40.exp (-.0045 AGED) and WA = 50-45.exp(-.005 AGED) for Merino and Comeback sheep, respectively.

Instead of the original curvilinear function relating U to BN (equation 17, White et al. 1983) a sequence of linear functions was introduced. These functions distinguished between mature ewes and all other classes, namely lambs, hoggets and young ewes (<3 years). After fine-tuning the model, the following-functions were used to predict U.

Merinos: If BN<40, U = 0.50 + 0.0150 * BN; U<1.10
If BN<25, U = 0.25 + 0.025 * BN; If W>45, U = 2.6 - 0.0333 * W

Comebacks: If BN<43, U = 0.54 + 0.0154 * BN; U<1.15
If BN<30, U = 0.25 + 0.025 * BN; If W>48, U = 2.9 - 0.0354 * W

The maximum availabilities in spring were approximately 3, 6 and 5 tonne DM per hectare for 1982, 1983 and 1984 respectively (Fig. 1). There was substantial agreement between the simulated and observed results.

In general, the predicted live weights of the mature ewes closely followed changes observed in the field. The most notable departure from the field data were for young Comeback ewes in 1982 and young Merino ewes in the spring of 1984. Despite the apparently adequate availability and digestibility of the green pasture, the field data for the lactating ewes rearing their first lambs showed they did not regain weight. Similarly, young ewes that failed to conceive (not shown) gained only about 5 kg during this period. This again was about half of that predicted.

Since critical information is lacking on intake and energy partitioning in young ewes, particularly when these are rearing their first lamb, these processes may not have been adequately modelled.

Overall, the ability of the simulation model to mimic, within seasons, changes in both pasture parameters and live weight gives us further encouragement to continue with model development and improvement. Certain areas need more research, particularly the intake of young ewes. Simulation can provide us with a valuable aid for assessing the productivity and profitability of different genotypes and sheep production systems in western Victoria.

SHEEP PRODUCTION SYSTEMS - AN ECONOMIC COMPARISON

A.J. PATTERSON*

The economic performance of the Merino and Comeback-sheep systems has been analysed for the 1983/84 and 1984/85 financial years using a method similar to that for the Hamilton District Monitor Farm Project (HDMFP) (Patterson 1985) which uses the computer services of the Agricultural Business Research Institute at Armidale, N.S.W.

For both genotypes, the physical inputs and outputs were recorded and used to calculate costs and returns, Wool prices were based on annual Australian average prices for wool of the relevant micron category (Australian Wool Corporation 1975 to 1985). Livestock prices were calculated per sheep for those suitable for the live sheep export trade, those unsuitable for this trade were assessed on a dressed weight basis using average Hamilton saleyard prices (Department of Agriculture, Victoria 1982 to 1985).

Enterprise costs were based on actual animal husbandry practices including animal health, shearing, crutching and mulesing, supplementary feed, casual labour, freight, wool packs and fertilizer (Victorian Young Farmers 1983 to 1985). Overhead costs were derived from the per hectare averages recorded from the HDMFP.

The two components of gross income, wool income and livestock returns are shown in Table 1. Overhead costs were constant for each genotype within each year, but increased from $43 per hectare in 1983/84 to $48 per hectare in 1984/85. Enterprise and overhead costs were deducted from gross income to provide net income values for the two genotypes in each of the two financial years. In addition the 1984/85 results were adjusted by substituting the 1984/85 average price for 20 and 23µ wool with a new set of prices calculated from the average 10 year price difference between the two micron categories. The net incomes for the two genotypes are also shown in Table 1.

Table 1 Genotype income per hectare ($)

Income			1983/84	1984/85
Wool income	-	Merino	224	293
	-	Comeback	214	233
Livestock returns	-	Merino	59 (63)	44 (25)
	-	Comeback	62 (100)	51 (75)
Gross income	-	Merino	283	336
	-	Comeback	276	283
Net income	-	Merino	146	203
	-	Comeback	149	156

Figures in parentheses are the number of wethers exported as a percentage of total wethers sold.

When the average 10 year price difference between the two micron categories was substituted, net income from Merino sheep became $160 per hectare and from Comeback sheep $153 per hectare.

The net incomes from Merino and Comeback sheep were similar in 1983/84 with the net income from Merinos being 30% higher in 1984/85. Net incomes were marginally in favour of the Merino sheep using the 10 year average wool price differential between the 20 and 23µ wool types.

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During 1983/84, the year following the drought, a combination of a 10% price discount and 11% higher wool production from Comebacks resulted in the wool income for Merinos being 5% higher. After allowing for higher livestock returns, gross income from Comebacks and Merinos was similar. In 1984/85, the price differential between 20 and 23μ wool doubled, however the Comebacks had a higher wool cut per hectare, an 11% higher weaning percentage and a 16% higher income from livestock sales. The overall effect was a 19% higher gross income for the Merinos. Over the 2 years, the enterprise costs per hectare for the Comebacks were from 7 to 10% lower than for the Merinos due to lower numbers per hectare. Substracting these and the constant overhead costs from gross income led to the net incomes in Table 1.

Care must be exercised when examining the yearly results as they are heavily influenced by the very good seasonal conditions in 1983/84 which resulted in above average productivity. Also the price difference between 20 and 23μ types in 1984/85 was much higher than the 10-year average.

The average 10 year (1975-76 to 1984-85) price differential between 20 and 23μ wool was only 14% compared with 30% for 1984/85. Applying this differential to the 1984/85 data results in net income per hectare varying by only 4% between the two genotypes.

CONCLUSIONS

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A comparison of self-replacing wool flocks has suggested that when Merinos of 20μ wool are stocked at a similar metabolic live weight to 23μ Comeback sheep the following occurred:

(i) Comeback sheep produced 28% more wool per head but only 6% more wool per hectare than the Merinos. Wool per hectare averaged 61.7 and 58.2 kg for Comebacks and Merinos respectively.

(ii) Weaners grazing lucerne based pasture received less supplement, grew more than 35% faster in spring, were 8% heavier at shearing and produced about 10% more wool than those grazing perennial ryegrass based pasture.

(iii) Accurate computer simulation of pasture growth and live weights of mature reproducing ewes has been achieved. Further research is needed on young/pregnant lactating ewes.

(iv) Net incomes ($/ha), based on the 10 year average wool prices for 20 and 23μ wool resulted in similar values (160 vs 153) for the Merino and Comeback systems, respectively.

Over 60 kg wool per hectare was produced in the systems which is equivalent to the highest value of the 30 farms in the HDMFP for 1983/84; the average of these farms was 42 kg per hectare (A. Patterson pers. comm.). As wool production per hectare is positively associated with economic return ($/ha) within the HDMFP, there is opportunity to increase wool production and hence profitability on many district farms. This view is confirmed when it is realised that the stocking rates of the systems sheep are in the medium range when compared with data from stocking rate trials in many areas of southern Australia (Obst 1985). Simulation analyses of White et al. (1982) suggest that the stocking intensity of this sheep production systems project was optimum for highest mean net farm income.

Increasing mean wool production of self-replacing flocks beyond 60 kg per hectare is the real challenge. It would appear that changes to flock structure (Wilson et al. 1986) and increasing weaning percentage (Obst et al. 1984, Wilson et al. 1986) will not markedly increase economic returns. Differences in the efficiency of wool growth between genotypes and between sheep of the same genotype offer a large potential increase in production (Wilson et al. 1986) provided these superior sheep can be identified.

Changes to the types of pasture grazed by sheep may-also increase productivity per hectare. At Hamilton, sheep grazing lucerne pastures have produced more wool per hectare and have needed lower levels of supplementation. At Kybybolite (A. Craig, pers. comm.), ewes and lambs on Trikkala pastures produced up to 10 and 20% higher wool cuts per head, respectively, than the sheep on Mt. Barker pastures. Fig. 1 highlights the need to further develop pasture and management systems to allow feed requirements to fit more closely the seasonal pattern of pasture production.

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