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GENOTYPE-ENVIRONMENT INTERACTIONS  
AND GENETIC PARAMETERS IN  
NEW ZEALAND ROMNEY SHEEP

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## ABSTRACT

Performance records of 1,113 New Zealand Romney ewe hoggets from two subflocks maintained on control (CSR) and intensive (HSR) stocking rates were analysed. The data represented the progeny of 34 sires and were collected between 1967 and 1974 inclusive which covered four consecutive two-year sire periods.

The traits investigated were hogget live-weight (HLW), greasy fleece weight (GFW), clean wool weight per unit area (WA), clean scoured yield (Y), staple length (SL), mean fibre diameter (MFD), standard deviation of the fibre diameter (SFD), quality number (QN), crimps per centimeter (CPC), total crimp number (TCN), character (CHG), tippiness (TG), handle (HG), lustre (LG), greasy colour (GCG), scoured colour (SCG), discoloured area (DAG), cotting (CG), cotted area (CAG) and soundness (SG).

Stocking rate had significant effect on all the traits excepting MFD, SFD, TCN and HG. HSR depressed the traits investigated excepting Y, SFD, QN, CPC, HG, GCG, SCG, CG and CAG. Year effects except in DAG were an important source of variation. The influence of birth-rank except on HLW, SFD, CHG and HG was small. Stocking rate x year interactions except in CPC, TCN, CHG, TG, HG, GCG and CAG were important. Sire x stocking rate interactions were significant in HLW, MFD, SFD, TCN and GCG only, whereas sire x year interactions were significant in HLW, GFW, HG and SCG.

Sire x stocking rate and sire x year interactions were included in different ways in some formulae for calculation of heritability estimates. These estimates were calculated from paternal half-sib analyses in CSR,

HSR and combined data. The various estimates for the different traits were in the following ranges:-

HLW 0.21 - 0.72,	GFW 0.38 - 0.61,	WA 0.31 - 0.49,
Y 0.19 - 0.53,	SL 0.54 - 0.63,	MFD 0.34 - 0.87,
SFD 0.35 - 0.66,	QN 0.46 - 0.72,	CPC 0.48 - 0.88,
TCN 0.65 - 1.09,	CHG 0.24 - 0.34,	TG 0.13 - 0.27,
HG 0.23 - 0.66,	LG 0.32 - 0.42,	GCG 0.22 - 0.44,
SCG 0.10 - 0.39,	DAG 0.04 - 0.21,	CG 0.12 - 0.67,
CAG 0.18 - 0.53,	SG 0.00 - 0.22.	

No significant differences between the estimates in the two stocking rates except in CG and SG were observed. The relevance of these comparisons is discussed in terms of sire x stocking rate and sire x year interactions.

Intra-trait genetic correlations between the two stocking rates were close to unity except in HLW ( $P < 0.05$ ); Y, SFD, GCG, SCG ( $0.05 < P < 0.1$ ).

Genetic correlations between traits were calculated by the paternal half-sib method. The correlation coefficients suggest that the HLW selection results in higher fleece weight, longer staples, better fleece character, increased variation in fibre diameter, higher quality number and crimping and more lustre. Selection for fleece weight would result in longer staples, less cotting and less susceptibility to break and increased mean fibre diameter. Correlated responses expected with selection for fineness are reduced staple length, more cotting and less sound wool. Selection for TCN results in favourable changes in HLW, GFW, TG, cotting, colour and soundness. Favourable changes in yield, crimping, discoloured area are expected following selection for whiteness of a midside sample, whereas GFW could decline.

Applications of the results are discussed with particular reference to the role played by sire x stocking rate and sire x year interactions in the genetic improvement of characters of economic importance in New Zealand Romney sheep.

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