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A GENETIC IMPROVEMENT PROGRAMME FOR NEW ZEALAND DAIRY GOATS

A thesis presented in partial fulfilment of the requirements for the

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ABSTRACT

The establishment of genetic improvement programmes is an important aspect of any modern animal production industry. The New Zealand dairy goat industry has no national genetic improvement programme aimed at improving performance in economically important traits. A survey of dairy goat farmers was undertaken to collect information about their farming systems. Does were kept under indoor conditions and averaged (and standard deviation) of 2.8±0.2 litres of milk per day. Information on herd structure, reason for culling and death, milk-solids concentration and production, cost of production, revenue and management was collected. Four mathematical models were evaluated using random regression models to estimate lactation yields from test-day records. The Wilmink model (WK) was chosen as the best model based on AIC fit statistic. Does which were 75% Saanen and 25% other breeds or Toggenburg produced the highest milk yield (MY), fat yield (FY) and protein yield (PY), while Toggenburg does produced the lowest yields. Information from the survey was used to develop a deterministic bio-economic model to estimate economic values (EVs) for four payment scenarios. The breeding objective included seven traits: MY, FY, PY, lactose yield (LY), liveweight (LW), longevity (LGTY) and Somatic cell score (SCS). For the Current payment system in New Zealand (payment on milk-solids) the EVs were NZ$11.64, NZ$12.27, NZ$12.39, NZ$-0.10, NZ$-2.15, NZ$0.04 and NZ$-8.22, respectively. Heritabilities and repeatabilities were estimated using uni- and bivariate animal model analyses with two random variables (animal for additive genetic component and doe for animal permanent environmental component). Heritabilities for MY, FY and PY were all 0.21 and 0.22 for SCS with similar standard errors. Repeatabilities ranged from 0.40 for MY, FY and PY to 0.49 for SCS. Genetic and phenotypic correlations between milk traits were positive and high, while between milk traits and SCS were from positive low to low negative. These parameters suggest moderate favourable responses to selection for increased milk solids and reduced SCS. Genetic gain and responses in the traits in the breeding objective were estimated for pedigree and progeny testing selection schemes using a selection index for one (MS) or three traits (MY, FY and PY). Results suggested that higher genetic gain and responses in individual traits occurred using a progeny test scheme. The information generated from this research should be applied to the New Zealand dairy goat industry to improve farm profit per milking doe.

Keywords: Dairy goats, lactation curves, breeding groups, economic values, genetic parameters, selection schemes.

DEDICADA A LAS PERSONAS QUE MÁS AMO

(Dedicated to my most beloved people):

A dios, nuestro señor: Por darnos vida y esperanza (To God for life and hope).

A mi familia (To my family):

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A mi hermano (to my brother) Alberto **y a mi hermana (and to my sister)** Lucía Guadalupe**.**

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(In memory of my grandparents):

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