DEVELOPMENT OF MODELS FOR THE GENETIC IMPROVEMENT OF DAIRY CATTLE UNDER COOPERATIVE DAIRYING CONDITIONS IN BANGLADESH

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This thesis is dedicated to my late parents

ABSTRACT

The aim of this thesis is to enquire into genetic approaches for improving milk yield from dairy cattle in order to overcome the milk shortage in Bangladesh. Survey work on the dairy industry was carried out to reveal its current status. The collected data of different genotypes (Pabna cattle, Australian-Friesian-Sahiwal × Pabna, Holstein × Pabna, Jersey × Pabna, and Sahiwal × Pabna) from 1999 to 2001, and in two seasons, were used to predict model parameters, fit-statistics and total lactation yields, by fitting ten lactation curve models. Best fitting model(s) were chosen on the basis of fit-statistics. The input parameters from best fiting model(s) were used for: developing a deterministic model; estimating the profitability of individual cows; estimating whole farm profitability; and for developing a profit function to estimate the economic values of traits in breeding objectives. The individual cow performances for different traits were stochastically simulated in respect of additive genetic, permanent and temporary error, herd and age effects, and mendelian sampling under progeny and parent-average testing breeding schemes based on three selection objectives applied over on 20 year period. Genetic gains in different traits were calculated from the regression of trait values on the selection index.

The estimated lactation curves model parameters, and predicted lactation milk yield were significantly different between breeds, years and seasons. From four fit-statistics values, the CCC value was considered superior, and this value indicated that the Nelder model best represented the test day records. The net annual income for Holstein × Pabna cattle was the highest (US$229) and was lowest (US$115) for Pabna cattle, while all other genotypes were intermediate. The economic values (EVs) of milk yield for all genotypes were similar (US$0.32), and due to payment for milk volume only, the EVs of fat and protein were negative. EVs of liveweight, calving intervals and calving rate were negative, but survivability was positive in all genotypes. The parent-average testing selection scheme showed higher genetic gains than progeny testing. The highest (US$15.80) genetic gain was obtained for milk yield when selection was for milk merit only.

The study will assist in undertaking a genetic improvement programme for the increase of milk production in Bangladesh and thereby enhance food security.

(**Key words**: Dairy cattle, genetic improvements, models, stochastic).

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