MODELLING MILK PRODUCTION

P.L. SEWELL*, WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE OFFICERS and D. BENNETT*

To meet his daily milk production target, in terms of both quality and quantity, the dairy farm manager has to employ the operational techniques of forage cropping, pasture deferment, fodder conservation, feed purchasing, timing of calving and age at replacement. In this situation traditional "whole farm" experimentation becomes almost impossible since there is little likelihood that interactions will be small.

Changes in dairy farm management and grazing techniques are usually hard to implement, because the farmer is loathe to depart from an established technique which has kept his family alive in the past. Unfortunately, these old practices usually are self-perpetuating because they leave little time for on-the-farm experimentation. How can research and extension crawl out of this apparent impasse? The methods we are attempting to innovate are threefold: mathematically modelling the production system; exploring the output to both test the validity of the model and the management options available; and using linear programming to determine an optimum.

Our first attempt at dairy farm modelling has involved the programming of information drawn from Rickards and Passmore (1971), set up as an interactive computer game. From a set of monthly pasture growths, the model produces figures representing milk production and liveweight change subject to the management options exercised (stocking rate, time of calving, fodder conservation and return, and supplementary feeding). Several areas of weakness are apparent to us at this stage. Briefly, these are:-

(1) The partitioning of energy between liveweight change, maintenance and milk production for which the only data we have seen are those of Flatt et al. (1969). The undefinable areas in the partitioning are for bodyweight change and milk yield energies. Owing to the relatively predictable pattern of bodyweight change this has been used as the determinable component to allow prediction of milk energy. We do not have the necessary experimental facilities to obtain more data locally.

(2) Prediction of intake from feed availability, especially when concentrates and hay are being offered. We have assumed that the feed with the highest digestibility is preferentially consumed. We hope to validate that assumption in the future.

The objectives of this joint research programme are threefold:-

(1) To improve dairy herd management strategies.
(2) To test the usefulness of modelling, simulation computer games, and optimization techniques in improving dairy herd management strategies.
(3) To see whether a systems approach incorporating the components listed above will help improve dairy herd management strategies.

No proof will be possible since success and failure will be dependent on our own strengths and failings. But we feel that slow but significant progress is being made.

REFERENCES


* CSIRO Division of Land Resources Management, Private Bag, Wembley, W.A. 6014.