SYSTEMS MODELLING IN ANIMAL PRODUCTION RESEARCH:

AN INTERACTIVE CASE STUDY

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ABSTRACT

Synthesis of improved systems of year round dairy herd feeding requires whole systems to be assembled and evaluated. In the field, only a limited number of possibilities can be examined and it is likely that there will be interaction between systems and the unique environments in which they are necessarily set. Modelling was undertaken to enlarge the possible number of syntheses and to provide a constant environment in which they could be compared.

A number of forage sources and a variety of milk production patterns were combined in a linear programming model which maximized economic or physical returns from combinations of forage supply and demand, within constraints of pasture and crop management, cow intake and forage quality.

The linear programming model was validated, firstly by exposing details of structure and output to an expert panel and secondly, by comparing model structure and output with those of several real farms.

Experiments were carried out in which cropping level, stocking rate, conservation level, cow production level and forage yield and quality were varied. Selected systems were subjected to simulated climatic variability and milkfat price variability to test the stability of preliminary conclusions.

It was shown clearly that the main thrust of the field research, feeding for higher production per cow, was likely to be both feasible and highly profitable. Most of the potential means for facilitating this were shown also to be feasible and economic, though there were limitations which had not previously been obvious.

Nitrogen fertilizer on pasture was shown to be potentially very valuable. Schedules for nitrogen use in practice would require much better definition of response patterns and the modelling lent weight to decisions regarding research in this area.

High quality, wilted, pasture silage was shown to be an essential component of systems without maize silage where high production (160 kg milkfat per year) per cow is required.

Preliminary evaluation of a summer-growing grass showed large potential benefits and supported an increase in the effort to develop such a grass for commercial use.

Several other forage crops were shown to have value. Somewhat surprising was the finding that grazing these crops was often a more profitable and productive means of utilization than conservation, despite inferior efficiencies in dry matter utilization. This was due to the higher cost of conservation allied with lower quality.

Maize silage was a particularly valuable forage source and it was shown how efforts to increase its yield or energy density, but not its protein content, would be rewarding.

It was concluded that the interaction of modelling and field research had been valuable in both development and testing of hypotheses. Suggestions are made for more formality in validation, for greater continuity in parallel modelling and for more generality in field data collection.

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