A KNOWLEDGE BASED DECISION SUPPORT SYSTEM FOR QUEENSLAND DAIRY FARMERS

D.V. KERR[A], R.T. COWAN[A], J. CHASELING[B] and F. SURAWEERA[B]

[A] Australian Tropical Dairy Institute, Dept of Primary Industries, Mutdapilly Research Station, MS 825 Peak Crossing, Qld 4306
[B] Griffith University, Kessels Road, Nathan, QLD 4111

A knowledge based decision support system called *DAIRYPRO*, was developed to help dairy farmers identify deficiencies in their management, and to allow them to estimate the profit or loss they may incur by changing the level or mix of physical inputs.

Survey data of dairy farms (Kerr and Chaseling 1992, Kerr *et al.* 1995), results from research (Lake 1994), and the knowledge of experts in dairy farming systems in Queensland were incorporated into *DAIRYPRO*. It is a combination decision support and expert system, designed to be used by extension officers or consultants to help dairy farmers make strategic decisions relevant to the productivity of their farms. The combination of statistical models and heuristic human process models based on 'rules of thumb' means the decision making process in *DAIRYPRO* incorporates regional circumstances and farmer goals. It is designed to be used on a notebook computer during farm consultations.

The first module *(FARMPROD)* gathers the data to run the predictive models and rules. This enables the program to make estimates of average regional production (using predictive statistical models) and achievable target production of an individual farm (using rules). Both predicted average regional production and estimated achievable production for the farm are compared with the farmer's actual production. The module enables farmers to make hypothetical changes to the inputs on their farm, and examine the expected increase or decrease in milk production resulting from each change. The profit (or loss) associated with these changes is also displayed. Profit (or loss) is determined from an expert's calculations of the average cost of production for each component of the farming system, together with actual milk price. Farmers may use their own estimates of cost and milk price if desired.

The second module *(FARMDIAG)* uses the expert's rules to determine if one or more of the four components of the dairy farm is performing below optimum. These four components have been defined as (i) winter feeding, (ii) summer feeding, (iii) concentrate feeding and (iv) capital and labour. *FARMDIAG* provides an assessment of how far above or below achievable production each of these components is performing, thus indicating the component(s) which requires further investigation.

DAIRYPRO was developed using evolutionary prototyping methods (Berry 1994) with nine farmers and three dairy extension officers providing end-user comments during development. Evaluation of *DAIRYPRO* involved assessment of program utility, a peer review of the rules used and comments about its value from farmers not involved with the development process. The rule review process involved dairy extension experts from each of four dairy farming regions in Queensland. Farmer responses to the system varied from wanting to purchase *DAIRYPRO* immediately to feeling that it had not correctly identified problems on their farm. Twenty-five out of 26 farmers shown *DAIRYPRO* thought it was useful on their farm.

DAIRYPRO is iterative, with new data able to be used to update the statistical models, and continual expert evaluation of recent farming practices being used to update the rules. *DAIRYPRO* can assist extension professionals by offering technical assistance, thus enabling them to concentrate on their role of facilitating change. This assistance should mean that extension officers can concentrate less on acquiring the latest technical information and more on the process of information dissemination.

BERRY, D.C. (1994). *Expert Systems* **11**, 3-28.
KERR, D.V and CHASELING, J. (1992). A study of the level and efficiency of production in relation to inputs for dairy farms in Queensland, (Dairy Research and Development Corporation: Melbourne).
KERR, D.V., DAVISON, T.M., COWAN, R.T. and CHASELING, J. (1995). *Asian Australas. J. Anim. Sci.* **8**, 505-513.
LAKE, M. (1994). 'Dairy Management Handbook'. (Queensland Department of Primary Industries: Brisbane).