IMPLEMENTATION OF A FERTILIZER DECISION MODEL IN FARM ADVISORY SERVICES

P. SEWELL*, D. BENNETT* and J.W. BOWDEN+

Summary

Over the last three years a model has been developed to estimate phosphate fertilizer requirements. The model is now being used by farmers and farm advisers in Western Australia. This paper discusses the problems encountered in getting the model accepted by the user.

We think the model has been accepted whenothers have not because of: the availability of a large pool of research data from which the model could be developed; a clearly stated objective; the use of a simple model, and the involvement of the eventual user in developing the model.

I. INTRODUCTION

Models have not been widely accepted in farm management advisory work. Dent (1975) states: "Systems concepts and simulation models have had very little impact on the farming industry. This failure may be related to a number of factors:-

(a) a lack of appreciation of the structure and function of the various biological sub-systems within the farm and enterprise model.

(b) the lack of 1iaison between systems researchers and decision makers.

(c) the preoccupation of systems researchers with the model building phase of their work without concommitant attention to validation and application.

(d) the genuine uncertainty about how systems theory might find application in practical agriculture".

One of the main problems with agricultural decision models is a lack of appreciation of the farmer's role as a decision maker. Model developers endeavour to provide either an unexplained recommendation to the farmer or a simulation model in which the optimum is obscure.

In this paper we outline some of the problems faced, and experience gained when a deliberately simple model for making fertilizer decisions was presented to agricultural advisers and to farmers in Western Australia.

The model, "Decide" is adequately described by Bowden and Bennett (1975).

II. IMPLEMENTATION - RESEARCH WORKERSWITH FARMERS

The initial stimulus in the development of the model resulted from an exercise to see how research information could be used to provide one particular farmer with advice on optimal rates of superphosphate. This led to a computer programme which was used to provide that farmer and one or two others with advice on superphosphate rates. No attempt

* CSIRO, Division of Land Resources Management, Wembley, W.A.
+ Department of Agriculture, South Perth, W.A.

was made to explain the model in detail, though some explanation arose during conversations.

In March 1974 a research programme to investigate the problems that might arise from the wider use of this model in extension was commenced. Three workshops were held with different groups of farmers, each lasting three hours. All farmers in all groups could be considered as early adopters of new technology in that they voluntarily attended the meetings. The farmer participants were asked to complete a questionaire. The first objective of the questionnaire was to gauge the ways farmers think about deciding on a fertilizer rate. The model appeared to account for most of the factors the farmers considered important when making their decisions. Previous superphosphate history was the most important determinant of phosphate rate, followed by the crop to be grown. Other questions were concerned with alternative ways of influencing decisions, through field trials, soil tests or advisory service.

Generally it was concluded that farmers increase superphosphate rates if they see a response in a field trial, but they do not decrease the rate if they see no response.

III. IMPLEMENTATION - RESEARCH WORKERS TO ADVISERS

In August 1974, as a consequence of the announced rises in superphosphate prices (from $14 to $56/tonne) the Western Australian Department of Agriculture decided that adviser training in the use of "Decide" be commenced to enable advisers to estimate new rates to recommendin the changed economic conditions. Advisers were then to evaluate the use of the model within their district for its ability to cope with, among other things, these price changes. Two workshops were held, each of three days duration, for separate groups of advisers. Three days allowed time for a thorough explanation of the model and numerous hand calculations of model components. Full model documentation was provided in the form of drafts of a series of "Technotes".

IV. IMPLEMENTATION - ADVISERS TO FARMERS

One or two advisers armed with their three days of training attempted to teach the process of calculation used in "Decide". They had limited success for several reasons:

There was a marked variation in the educational level of the farmers involved. Most farmers were not educationally equipped to follow the use of natural logarithms or understand the calculation and the advisers were not at that time sufficiently prepared to handle searching questions put by farmers on practical points.

The advisers had (justifiably) insufficient faith in the validity of the model calculations to support the predictions when these were different from the normally accepted rates.

As might be expected, farmer response varied in several different ways, depending largely on personality, but also on how the information was presented and most importantly, on how the predictions matched up with experience. Some could not conceive that previously successful rates based on different inputs (especially fertilizer price) were no longer a relevant guide.

When "Decide" was taught at an individual level, there was far better acceptance of the theory being presented. Most advisers reported a general appreciation of what "Decide" was trying to do when it was presented to individuals. However these farmers had misgivings similar to those of the advisers when it came to the question of accepting or

rejecting "Decide" recommendations for the situation.

The most valuable aspect of these tutor-student approaches has been the feed back and unearthing of inherent problems and inconsistencies within the model. Feed-back has caused several modifications in the model which is now generally accepted in Western Australia, and is used not only as a predictor but as a teaching aid for students, farmers and . bank managers.

V. EXTENSION AIDS

A guiding principle in the development of "Decide" has been that the users should make decisions rather than be faced with recommendations. Emphasis has been placed on developing extension aids which will help the farmers understand the process. A ready reckoner which uses semilogarithmic graph paper to present the response curves has found a lot of support. Several advisers have reported that they have little trouble in teaching farmers to use it. One of the most widely distributed aids was a self learning text, the first draft of which was produced by the Farm Management Foundation. 6000 copies of a subsequent version (developed by Clint Lester of the Narrogin Office of the Department of Agriculture) have already been distributed. (There are only 16000 farmers in Western Australia).

A computer service is available and has been extensively used, especially when interactive consoles were placed at the Perth Royal Show and at country field days.

VI. CONCLUSIONS

For the purposes of this project we defined "success" as being the acceptance and use of the model by the Department of Agriculture and more than 100 farmers. By this criterion the project has been highly successful. In looking at the reasons for the success of this project as compared with the failure of most others, we would like to repeat and re-emphasise some of the points that have been made by Dent (1975), Mar (1974) and Biswas (1975).

(a) Research background and field trials

The formulation and development of this model depended on the existence of a research background on which it could be based. In addition the availability of field trials against which the model could be checked were extremely helpful.

(b) A clear objective

From June 1971 the objective has been quite clear: to produce a methodology to assist farmers in making decisions about phosphate fertilizer rates. The methodology should preferably be dependent on the records that farmers can easily muster rather than the need for more complicated inputs like soil tests.

(c) Model simplicity,

Recent trends in agricultural simulation models have been aimed at integrating research findings to represent in fine detail the total process as known to science, usually validated against data at one location. We have found little inspiration for extension models from these efforts. Extension models will have to remain simple to enable explanation and to ensure that a check of the model by hand calculation is possible. But the model must be sensitive to the variations which the decision-makers and their advisers recognise as important. Thus the

acceptance of this model is attributable, at least in part, to the model's sensitivity to the variables recognised by both advisers and farmers as being important to this decision.

(d) User involvement

The need for the model was established with farmers and advisers. The model was developed with a small group of farmers and close collaboration between Department of Agriculture and CSIRO personnel has been maintained at all times.

It is obvious that the agricultural adviser, whether private or employed by the government, will have a very critical role to play in the introduction of models for modern agricultural management. While the standard of education, though not the intelligence, of Australian farmers remains relatively low, they appear to require an understanding of the concepts contained within models, even when they cannot appreciate the mathematical procedures. Advisers need to bridge the education gap for the farmer, and to explain how the system works in the farmers language. By doing this, the advisers are able to feed back those parts of the real system which the scientist has failed to represent in the model.

(e) Opportunity

There is no doubt that the need to adjust fertilizer rates as a consequence of the recent changes in the price of superphosphate and a number of agricultural products made the use of the model imperative. However the need for the model was forseen before the 1974 price changes (Bennett and Ozanne 1972). We feel that these price changes have probably caused the model's adoption to be advanced by about one year. That year could have been productively used to resolve a number of the teething problems encountered during the last six months of 1974.

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