Within reach - UK use of interactive programs

Michael Jones

Marketing IT Manager
ICI PLC Plant Protection Division Fernhurst, Haslemere, Surrey, GU27 3JE, UK

Introduction

UK agriculture and particularly cereal growing has become considerably more complex in the past ten years. Whereas traditionally cereals were a crop where you sowed the seed and shut the gate to open it perhaps only once or twice before harvest, today they demand continuous monitoring so that treatments can be optimized with a view to high yield and profit. Thus greater attention to detail has demanded that many more decisions need to be made and that these decisions be of the highest quality. It is against this background that we have seen the development and use of computers in decision support with farmers.

Aims and Objectives

Although it would be untrue to indicate that all that has happened was part of detailed long term plan, it is true to say that a logical progression has been followed. This progression being in 3 stages, firstly, gather information, secondly use the information to help to educate and understand and thirdly to provide decision support for the person involved in the day-to-day management of the crop.

Nearly all of the systems I will describe in this paper fall into one of these categories.

Gathering Information

The gap between theoretical maximum yield and average yield is often a topic for discussion and debate and it certainly was in 1976 in the UK. The theoretical maximum yield for wheat was put at 12.5 t/ha whereas the average farm yield was well below 5 t/ha. This average, of course, covered a range of extremes but nevertheless the difference between theory and practice were difficult to explain.

At this time an initiative was set up by ICI to try to identify those factors in farm practice which had most influence on yield. This involved the setting up of Ten Tonne Clubs whose major task was to provide the basis for a detailed survey of farm practice in wheat production at field level. The survey involving over 100 questions on each of over a 1000 crops in each of 4 years gave much valuable information when analysed in detail on the mainframe computer.

Educating and Understanding

With the assembly of large amounts of data on farm practice together with the availability of research data an opportunity came for a further step forward. This opportunity was taken up as a fPrm/crop "model" was constructed and used as the basis for a crop management game. The crop management game was initially based on a mainframe computer and became known as Wheatrace. Played by teams of 4 to 5 farmers and advisers they were asked to make all the decision involved in growing some 200 hectares of winter wheat for maximum profitability. The game was played over 3 decision periods, establishment, early spring, and summer, and reports were issued from the computer on the state of the crop after each growth period and at harvest.

At a time when the economic climate under EEC conditions favoured an intensification of cereal growing many farmers enthusiastically took the opportunity to get involved in this crop management game. Growing the "computer crop" gave them the opportunity to try out new techniques and thus gain "experience without risk". Played competitively over 4 years the game attracted up to 800 teams in one season.

Whilst "Wheatrace" was developed for the mainframe computer for use with a large number of teams its potential as a training package for use with small groups was also recognised. It was therefore developed to run on a microcomputer under the name OATS (Online Arable Training System). In this form the game can be set up for a range of scenarios to suit local conditions. Winter Barley and Oilseed Rape have been added to the original Winter Wheat only situation. With annual updates demand for access to the game from farmer groups, distributor reps and colleges still remain strong some 8 years after its original introduction.

Decision Support

It is in the area of Decision Support that most attention is now being focused and where the real potential for interactive programs exist. In the UK two lines of development have emerged, the use of videotex and the use of the stand alone microcomputer. At the same time cereal crops have received most attention with nitrogen rates and timing, and disease control the main topics.

Looking at the micro based programs first, nitrogen advice features strongly. The N-COUNTER program gives help with nitrogen rates and timing based on variety, previous cropping, soi-type, rainfall etc. Basic herbicide, fungicide and plant growth regulator advice is also given. The program was further developed in France under the name OPTI AGRO and extensively used at farmer "clinics" with over 90 micros in use at the peak period of usage in early spring.

The need for more precision in nitrogen timing based on stages of crop development rather than calendar date has led more recently to the development of the N SURE program. Based on ICI sponsored research, which showed clearly that the specific stages of crop development critical to nitrogen timing are not always obvious from external appearance, this program takes into account sowing date, location, temperature, altitude and many other factors. The program forecasts dates when individual crops will reach specific growth stage giving guidance on timing for not only nitrogen but also herbicides, plant growth regulators, fungicides and insecticides.

On the disease control front counsellor has recently been developed for micro use but this will be dealt with in more detail as a videotex application. One must also make mention of the micro version of EPIPRE originally developed in Holland by Dr Zadoks. This program has been of a major significance in disease prediction.

Turning to videotex applications there have been a wide range of applications ranging from simple calculation programs through to Expert Systems. At the time of writing this paper there are two major public videotex systems, Prestel Farmlink from British Telecom and Agvisor from ICI.

Prestel Farmlink carries a number of interactive programs accessible by the farm user but the most significant is the Aphid monitoring and Forecasting system developed at Southampton University. Agvisor also has a range of interactive programs dealing in detail with fertilizer applications for a wide range of crops, disease control, machinery calculations and livestock recording and feed formulation.

Perhaps the most well known videotex application, however, is counsellor an expert system designed to aid in the diagnosis and treatment of diseases in winter wheat. counsellor is only available to registered users on the private videotex system of ICI Plant Protection Division. The unique combination of easy to use videotex, with the two way dialogue and reasoning of expert systems was seen as the ideal bais for a true interactive service for direct farmer use. However, the downturn in British Agriculture has lead to a slowdown in the update of videotex and thus a critical mass of users has not been reached. This had lead to the development of an alternative micro version despite the attendant problems of updating. Nevertheless, the experiment in the use of expert systems has confirmed their potential value for decision support in agriculture because they can simulate across the desk discussions between farmer and adviser answering the important question 'why' to back up diagnosis, prediction and recommendations. Use effectively they have a lot to offer by improving the man/machine interface an important factor if decision support programs are going to gain widespread acceptance in the farming community.

Future Developments

This will be the subject of other papers at this conference but mention should be made of some developments already underway in the UK.

The 'crop model' as the basis for decision support at grower level has already been mentioned but has considerable potential if the man machine interface is properly thought out.

It is often said that "pictures speak louder than words". The potential for mixing pictures with text on screen to aid problem diagnosis and training is vast. Interactive videodisc has already been interfaced to videotex and expert systems in a version of COUNSELLOR and had a very favourable reception from potential users. The use of photovideotex in the samecontext is of considerable interest and technically possible although at high cost currently.

Further developments in natural language processing and voice recognition will further aid the uptake of decision support programmes.

Summary

Computers in agriculture are here to stay. Although they are usually thought of in connection with the farm accounts, livestock or field records their use is already considerably wider than this bearing in mind some of the programs discussed in this paper. With improved communications, easier to run software, cheaper hardware and improvements in the man/machine interface the potential for the wider use of interactive program in agriculture is vast.