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## AVOMAN: A FARM MANAGEMENT DECISION SUPPORT SYSTEM FOR AVOCADO

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### Abstract

Poor uptake of available research information by a large proportion of the Australian avocado industry has indicated a need for alternative methodologies for the transfer of technology. Specifically, low orchard productivity and poor fruit quality have been identified as priority areas for research and development by the Australian avocado industry. AVOMAN is a computer program designed to aid avocado growers with the management of fruit production and quality.

The AVOMAN program comprises two software modules. A relational database management system (RDBMS) forms the basis of a farm diary style application in which farm descriptions and management information can be recorded. The RDBMS is also selectively exploited by a decision aid module which produces farm specific phenology based management recommendations. A multi-disciplinary project team construct decision frameworks for each recommendation. Refinement of the decision framework and wide scale evaluation of prototypes complete the development cycle. Details of the management system and its development are discussed.

Additional index words: database, decision aid, phenology, software

### 1. Introduction

The AVOMAN project is a national initiative designed to improve the management of avocado productivity and quality in the Australian avocado industry. Horticultural research scientists, extension officers, agribusiness professionals and commercial avocado producers are all contributing to the project which is funded for two 3 year terms, the first of which is now complete.

#### 1.1. Purpose of the project

In 1992, the Australian avocado industry listed problems of low orchard production and irregular fruit quality among its research and development priorities. Despite the fact that the Australian avocado industry has been well serviced by research programmes, poor uptake of subsequent technology by a large proportion of the industry has been observed in recent years. The AVOMAN project was created to provide a framework with which to standardise and package existing and future production technology as well as providing a vehicle for transferring these to the Australian avocado industry.

## 1.2. Program Structure and Function

The most significant product to emerge from the AVOMAN project is a suite of computer software programs which can be broadly categorised as either information or instruction oriented. The information oriented software suite, called AVOINFO, comprises an avocado reference database and a diagnostic system for identifying various pests and disorders. The instruction oriented suite, broadly referred to as the AVOMAN software, comprises a farm-diary style relational database (AVOREC) in which descriptive and quantitative farm data can be recorded, and a decision support module (AVOGRO) which uses information from the AVOREC module to provide timely, phenology-based farm management recommendations. The range of software products being produced as part of the AVOMAN project is illustrated in figure 1.

The AVOMAN software is designed primarily to be used on farm by commercial avocado producers. The purpose of the software is twofold:

1. To simplify and standardise the regular acquisition and storage of descriptive and quantitative information relating to the management of avocado farms; and
2. To utilise this information in accordance with predefined decision frameworks to make better decisions relating to crop production.

## 2. Collaborators

The AVOMAN project team comprises a multi-disciplinary group of professionals from around Australia, including researchers, extension officers, computer programmers and horticultural consultants. The majority of team members are extension officers whose role is to ensure that the AVOMAN products accommodate the wide range of growing conditions in Australia. Researchers have the responsibility of providing and checking the accuracy of information to be built into the software as well as assisting with the development of decision frameworks. Software technology is advancing at a rapid pace and the computer programmers not only have to write the software but also ensure that developed products meet current industry standards. Agribusiness professionals and members of the avocado industry also play an important role in the AVOMAN project. The inclusion of commercial growers in the project has been formalised through the creation of 12 regional productivity groups (RPG's) throughout production areas in Australia. These groups, to which any Australian commercial avocado grower can belong, were primarily established to provide feedback to the project team, however, in most cases they are now self-sustaining and often meet to discuss other issues. With over 120 commercial growers now belonging to RPG's, this feedback and extension mechanism is invaluable to the project.

## 3. The Program

The AVOMAN software is designed to operate on personal computers using the Microsoft® Windows™ operating system.

### 3.1 The farm recording module (AVOREC)

The AVOREC software module was created to facilitate the storage of information relating to the management of an avocado orchard. AVOREC uses a relational database management system to efficiently access the potentially large volume of information that can accumulate in a farm business. Access to the underlying database is controlled by a multi-document user interface. A typical AVOREC screen showing one block record (referred to as a production unit) is shown in figure 2. In addition to descriptive information, regular recording of applications of fertilisers, pesticides and other activities on each production unit enables the AVOMAN program to develop a historical management profile of the farm.

### 3.2 The farm management module (AVOGRO)

AVOGRO provides farm management recommendations that are customised for each production unit defined in the AVOREC module. Detailed timing and application rate information is calculated by combining descriptive farm information with intrinsic physiological and phenological knowledge. Where adequate quantitative farm records exist, these can also be incorporated into the decision process to seasonally customise the recommendation. Several growers participating in the project are recording growth information for each of their major cultivars. This data is modeled to produce location and cultivar specific phenological cycles which are incorporated into the AVOMAN software.

Recommendations in the initial software prototype focus on nutrition and disease control, specifically root rot, nitrogen, boron and zinc management. An example of a boron recommendation from the AVOMAN software is illustrated in figure 3. Each recommendation that is developed undergoes several stages of validation among the project team, agribusiness professionals and collaborating growers. Software prototypes incorporating these recommendations are released to interested members of the Australian industry annually for wider scale evaluation and feedback.

## 4. Discussion

Initial development work has concentrated on defining procedures for organising specialist research and development information into decision frameworks which can be built into credible recommendations in the software. Several more nutrition recommendations are planned, along with recommendations to facilitate irrigation scheduling, integrated pest management and quality control.

The first wide scale release of the AVOMAN prototype software to industry occurred in May 1995. Over 100 growers throughout Australia are currently evaluating the software and will be called on to provide direct feedback via a series of questionnaires. Extensive training of collaborating growers has been undertaken since the release of the prototype.

In addition to on going development, refinements and modifications are being made to the existing AVOMAN software based on industry feedback. Great effort is being made to ensure that the regular process of recording farm information is easy and intuitive. Similarly, despite their underlying complexity, farm recommendations must be simple to access and easy to understand. To this end, work is under way on an improved program interface which exploits the capabilities of modern visual programming languages and computer operating systems.

An undertaking such as this project requires a multi-disciplinary team approach as the level of detail which must be built into each recommendation necessitates input from a variety of specialists. The size of the Australian continent presents numerous challenges when working in such a team, as some team members are separated by thousands of kilometers. The diversity of the Australian climate and environment also presents challenges to the development team as farm recommendations must accommodate the majority of conditions under which the sub-tropical avocado is grown.

The first commercial version of the AVOMAN software is scheduled for release in 1998.

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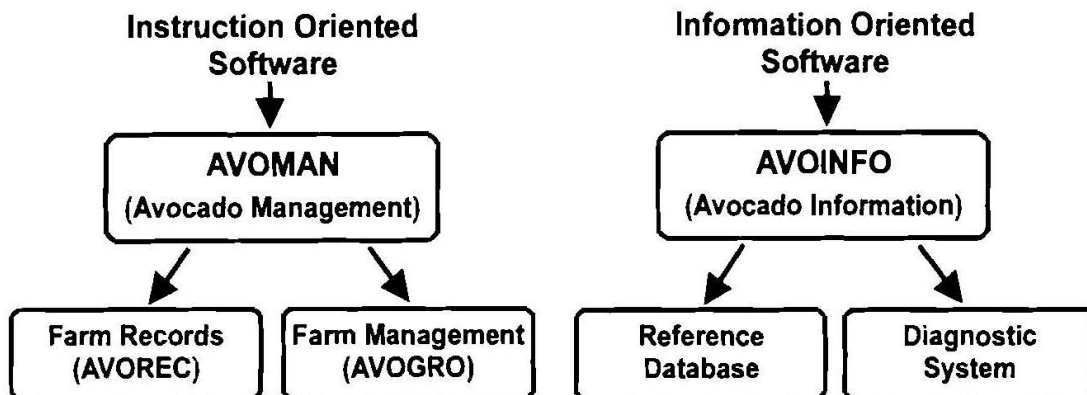


Figure 1 Software products to emerge from the AVOMAN project

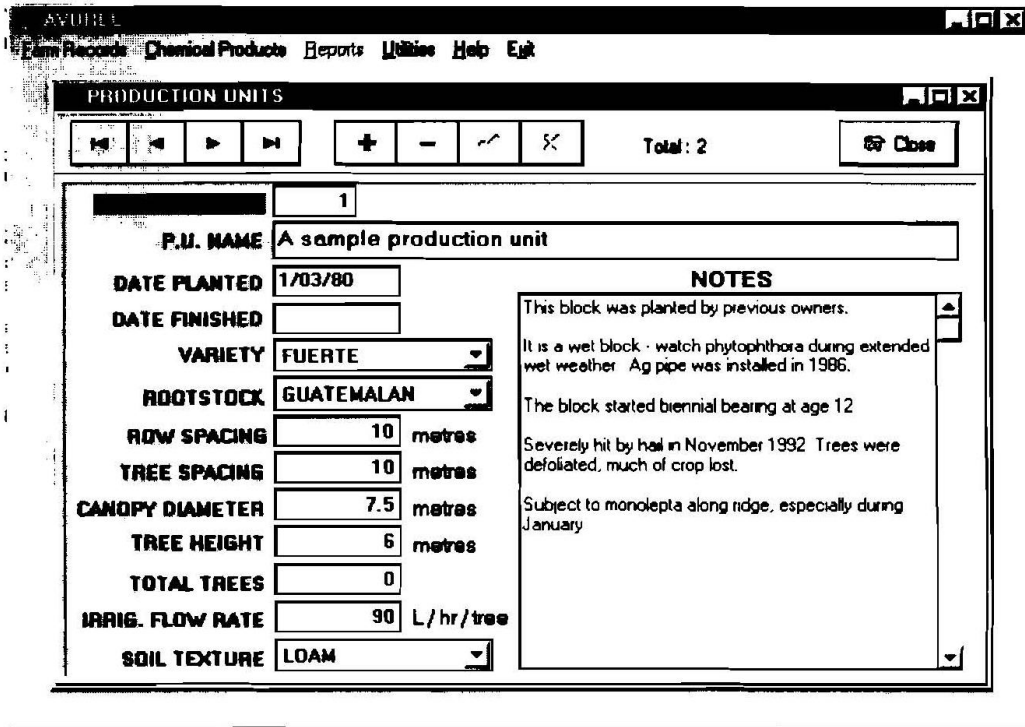


Figure 2 An AVOREC screen showing details of one production unit

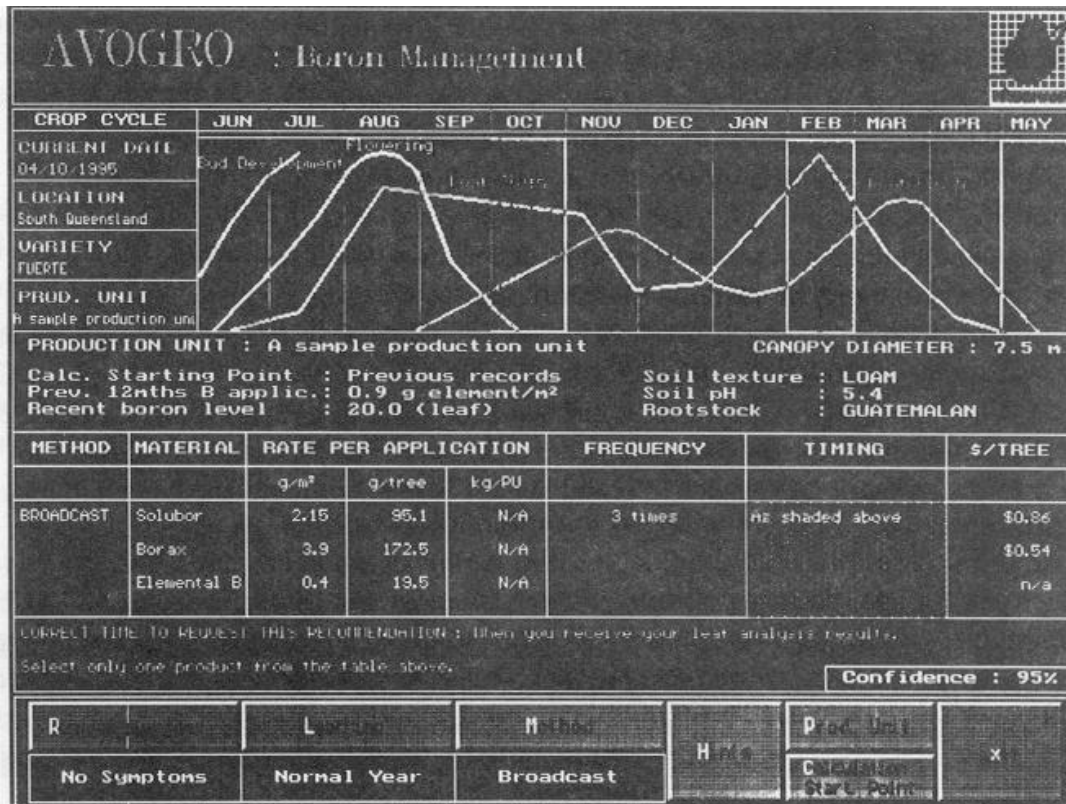


Figure 3 A boron recommendation from the AVOMAN software