

AHUACATL: A COMPREHENSIVE NURSERY SOFTWARE MANAGEMENT SOLUTION

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A nursery management software package, appropriately named “Ahuacatl”, has been developed specifically for use in avocado nurseries out of the need that exists for the computerisation and automation of management processes in avocado nurseries. The software supports the implementation of the Micro Cloning technique, as developed by and implemented in Allesbeste Nursery, and has been used extensively as management tool in the nursery since 1999 throughout the development phase. It has not only proven its worth as an effective management solution, but has also evolved to address the needs specific to avocado nursery management.

The software package consists of the following fully integrated modules:

- Client database
 - Client contact information
 - Client farm/block information
 - Communication with client
- Stock database
 - Mother tree information
 - Seedlings
 - Nurse grafting
 - Cultivar grafting
 - Etiolation
 - Rooting
 - Planting out
 - Plant stock control
- Ordering and delivery
 - Enquiries
 - New orders
 - Allocation of plants to orders
 - Delivery
- Effectivity monitoring and reporting

The software has now entered the BETA stage in its development cycle and is ready to be production tested by other nurseries. Information obtained from these nurseries will be used to determine if further enhancement of the software is needed before official public release.

Keywords: Avocado, computerisation, automation, management, Micro Cloning technique, integrated modules, client, stock, orders, delivery, effectivity

AHUACATL: PROGRAMA DE COMPUTACIÓN DE SOLUCIONES PARA EL MANEJO DE VIVEROS

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Se ha desarrollado un programa de computación para el manejo de viveros, apropiadamente llamado "Ahuacatl", específicamente para el uso en viveros de palta / aguacate, cumpliendo la necesidad que existe de computarizar y automatizar los procesos de cultivo en viveros de paltas. El programa apoya la puesta en práctica de la técnica de microclonación, desarrollado e implementado en el Vivero de Allesbeste, y ha sido utilizado extensivamente como una herramienta de manejo en el vivero desde 1999 durante las etapas de desarrollo. No solamente se ha comprobado su uso como una eficaz solución de manejo, sino que también se ha evolucionado hasta el cumplimiento de necesidades específicas al manejo de viveros de paltos.

El programa de computación consiste en los siguientes módulos completamente integrados:

- Base de datos del Cliente
 - Información de contacto del cliente
 - Información de predio / parcela de cultivo del cliente
 - Comunicación con el cliente
- Base de datos de existencias
 - Información de árboles madres
 - Plántulas
 - Injerto del tallo con Raíz (Nurse)
 - Injerto de Variedad (cultivar)
 - Etiolación (Registro de enfermedades en el vivero y en cada planta cultivada)
 - Formación de Raíces
 - Trasplante
 - Control de reserva (stock) de planta
- Pedidos y Entrega
 - Información
 - Pedidos nuevos
 - Distribución de plantas para los pedidos
 - Entrega
- Control e informe de la eficacia

Ahora el programa ha entrado en su etapa BETA del ciclo de desarrollo y está listo para ser probado bajo circunstancias de producción por otros viveros. La información obtenida de estos viveros será utilizada para determinar si se necesita un mejoramiento adicional del producto antes de su lanzamiento oficial al público.

Palabras clave: Aguacate, computadorizar, automatizar, directiva, micro clonación, técnica, módulos integrados, cliente, reserva, pedidos, entrega, eficacia

1. Introduction

In order for a business to remain competitive in its marketplace it is necessary for that business to be highly efficient in its management. It is therefore extremely important for management to make use of streamlined processes and procedures, to assist them in their task, and using information obtained from these to ensure continued efficiency by streamlining these processes and procedures even further.

In making use of Information Technology it is possible to instantly put all relevant information at a manager's fingertips in such a form that he/she desires. This can be achieved by making use of computer software that integrate into the processes and procedures used in the business.

According to the above, the need for a computer software management solution in the Avocado nursery industry was identified in 1998 by Allesbeste Nursery (hereafter referred to simply as "the Nursery"). In reaction to this, a software program specifically for the above purpose has been developed and extensively used by the Nursery throughout the development process since 1999.

2. Materials and Methods

The project for the development of the nursery management software was started in November 1998. The first phase of development identified three main functions, which should be performed by the software. These were:

- Client database which stores only contact information
- Stock database
 - i. Seedlings
 - ii. Grafting
 - iii. Etiolation
 - iv. Rooting
 - v. Planting out
- Ordering and delivery
 - i. Enquiries
 - ii. New orders
 - iii. Allocation of plants to orders
 - iv. Delivery

The software also needed to support the propagation of clonal avocado trees using the Micro Cloning technique (Ernst, 1999).

By the end of January 1999 a working prototype of the first phase software was ready for production testing by the Nursery, thus entering the second phase of the software development. As of February 1999 onwards, continuous feedback was received from the Nursery regarding problems experienced with the program as well as additional needs that developed while using the software in parallel with the existing traditional paper based management system which had been in prior use by the Nursery. By June 1999 the Nursery abandoned their old paper based management system in favour of the new software based management system. During this time the software was continually adapted and new functions was added to reflect the needs of the Nursery. These new functions included:

- Client farm/block information
- Communication with client
- Mother tree information
- Plant stock control
- Effectivity monitoring and reporting

3. Results and Discussion

During development the software application was appropriately named “Ahuacatl”, a name of Nahuatl origin meaning “avocado”. The BETA¹ stage in the development of the software has now been reached and it is thus ready to be production tested by other interested nurseries. The current features of “Ahuacatl” are as follows:

- Client database

The client database stores all information relating to clients. These include:

- Client contact information

Clients’ contact information is stored in a database and may be referenced when needed. Stored information includes business name, farm name, names of contact persons, contact numbers, postal address, e-mail address as well as country name. Clients’ VAT information can also be stored and used by the program to make certain calculations.

- Client farm/block information

In addition to the above basic contact information, extensive per-block information about every client’s farm can be stored and referenced when needed. The information includes block name, cultivar planted, number of trees, plant spacing, plant date,

¹ The BETA stage in software development refers to the stage where the software is released for the first time to outside parties. BETA software generally includes all functions, but may still have some issues or bugs and is not ready to be released for sale yet.

productivity (ton/ha), irrigation system type, fertilizer type, nursery of origin. Acreage is calculated automatically from plant spacing and the number of trees. The age of the block is also continuously calculated automatically from the plant date and given as a value in years, months and days.

- Communication with client

This function is used to keep track of all communication with the client. Every time contact is made between the nursery and the client, the user can enter the details of the communication into the program and reference it when necessary. Details that can be entered are date, action (what did you do? e.g. farm visit, discussed potential order etc.), reason (e.g. follow-up on problem, changing of order etc.), method (how did you communicate? e.g. telephonically, personally etc.), relevant order number (if any) and comments. A reminder can also be set to remind one to initiate certain communication with the client.

In addition to this it is also possible to send a particular e-mail to selected clients or to all one's clients at once.

- Stock database

The stock database incorporates all information and functions that relate to the stock of avocado plants in a nursery as it moves through the propagation process. Throughout the propagation process use is made of a batch number in order to keep track of plants. When working with Micro Clones an additional table number is used as well.

Plant stocks are organized into localities throughout the program. These localities describe where the plants can be found in a nursery. Localities can be set up by the user and is divided into specific categories (large bag area, greenhouse, etiolation room and liner area).

A plant stock batch, within large bag areas, can be categorized into one of three stages according to vegetative flushes, indicating the plants' maturity. Newly planted out plants are automatically added as stage 1 stock. The plant batches can then be manually changed to stage 2 and stage 3 as the plants mature.

Stocks can be moved between localities freely with a few exceptions. Stocks can only be moved within a specific locality category. Furthermore, in the large bag area, stocks can only be moved in such a way that one locality/row cannot contain different product types (seedling, standard clone, Micro Clone), different batches or different stages of plants.

Certain localities in the large bag area can be designated as loading areas from where deliveries of plants can be made. All plants within a loading area are necessarily stage 3 plants.

The stock database functions include:

- Mother tree information

Information can be stored about mother trees where seed are harvested. The information includes batch number, block name, cultivar, tree number, number of seeds harvested etc. This information is used by the program to keep track of how many seeds were harvested, subsequently used and ultimately how many seeds are left or have been culled.

- Seedlings

Whenever a new seedling batch is planted its information is entered and stored in the program. Information, which is entered, includes date, batch number, rootstock, mother tree number, locality (where it resides in the nursery), and number of trees planted. Whenever these seedlings are then planted out or grafted (by entering the relevant information into the specific program function), the amount of planted out or grafted plants are automatically registered as seedlings that successfully germinated in the program's seedling report.

- Nurse grafting

Nurse grafting is used in the Micro Clonal propagation process. Nurse grafts can be entered into the program and will automatically register successful germination of the relevant seedling plants. Information stored here includes date, batch number, table number, cultivar, locality, number of plants and grafter name. When nurse grafted plants are moved to etiolation in the program a graft take percentage is calculated and bonuses can be calculated according to this as incentives to grafters.

- Cultivar grafting

Cultivar grafts can be registered in the program by entering information such as date, batch number, table number, product type (micro clone or standard clone), cultivar, from locality, to locality, number of plants and grafter name. As with nurse grafting, a graft take percentage is also calculated. This is automatically done by the program when Micro Clones are cut, or when seedlings are planted out.

- Etiolation

Etiolation is done before rooting in the Micro Clonal propagation process. Information that is stored here includes date, batch number, table number, from locality, cultivar, etiolation room and number of plants. The program automatically registers successful etiolation when the plants are moved to rooting by performing the relevant program function.

- Rooting

Information stored in the rooting function includes date, batch number, from locality, cultivar, number of plants and rooting area. Likewise, the program automatically indicates successful rooting when Micro Clones are cut by using the relevant program function.

- Planting out / Cutting

Planting out of clonal plants or the cutting of Micro Clones is registered in the program by using this program function. Information gathered here includes date, product type, cultivar, batch number, locality, number of plants, worker name etc. When plants are planted out it is added to the general stock of the nursery within the large bag area.

- Plant stock control

It is sometimes necessary to reconcile stock levels in the computer database with actual stock levels within a nursery. This can be done by using the stock take function of the program. All stock within the large bag area can be reconciled in this way. Whenever a deviation occurs between the database and the actual stock the program will ask for a reason for the occurrence. The deviation is then registered in the program together with its reason for future reference. Reasons that are available for losses include mortality, culling, unexplained and correction. Reasons that are available for gains include unexplained and correction.

- Ordering and delivery

The software is capable of, among others, recording new orders as well as deliveries. Specific functions are:

- Enquiries

When a potential client makes an enquiry about plants to a nursery the software is capable of recording that enquiry for future

reference. This will assist in planning with regards to potential future orders from clients.

- New orders

Whenever a client would like to place a new order an order form can be printed out in duplicate by the program to be filled in by the client. After receipt of the completed order form from the client an order can be placed within the program. The order will be saved initially as a pending order until the required deposit has been received, if applicable. After receipt of the deposit the program will convert the order to a pending delivery.

- Delivery and allocation of plants to orders

Once delivery of the plants is made to the client the user should issue a delivery note by using the program. In issuing the delivery note to the client the plants will be allocated in the program by the user. In allocation the relevant amount of plants of the ordered product type and cultivar will be automatically subtracted from the plant stock and registered in the program as being sold.

- Effectivity monitoring and reporting

Through the use of program functions the software records certain effectivity data, for example graft take percentages, successful rooting, number of plants sold and stock gains and losses, to name just a few. Reports can then be generated from the recorded data for use in nursery management.

4. Conclusion

“Ahuacatl” can be successfully used in the computerization of management tasks in an avocado nursery, thereby relieving a large part of the administrative burden on managers. This is accomplished by the automation of client, stock and sales administration as well as putting a wealth of information at the fingertips of an avocado nursery manager. The advantages over a paper-based system, or even using Excel or similar applications, are clearly evident.

Allesbeste Nursery has already demonstrated the successful use of Ahuacatl through their extensive reliance on the software for their day-to-day management tasks.

Ahuacatl is continually being improved upon. New features are constantly added and old features improved and user-friendliness is kept in mind throughout. New features and improvements which are currently being worked on, or will be developed in future, include:

- Utilization of SQL technology therefore making the software faster and more network-friendly. Simultaneous use of the program by different users on a computer network will then be possible.
- An Internet-based extension to Ahuacatl that will enable clients to update their information and place enquiries and orders online. Online payments could also be accepted for payment of deposits and orders. This feature will require a nursery to have a permanent Internet connection to their Ahuacatl database server. A credit card merchant account may also be needed to accept online credit card payments.
- Better reporting of the information that is gathered by the program. More graphs should be drawn to make the information more usable and better interpretable by a nursery manager.

5. References

ERNST, A.A. 1999. Micro cloning: a multiple cloning technique for avocados using micro containers. *Revista Chapingo Serie Horticultura Num. Especial V*, 217-220.