

SORTINFO: AN INFORMATION AND DECISION SUPPORT SYSTEM FOR VARIETY SELECTION

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Abstract: Selection of a suitable variety is an important step in the farm planning process but the availability of a large number of varieties makes the selection of variety for a given field difficult. Increased demands and legislation on the reduced use of chemical input make the selection even harder. Furthermore, information on varieties is constantly being updated. At DIPS, a project has been initiated in co-operation with the Danish Agricultural Advisory Centre to develop an information and decision support system for selection of varieties. The prototype, developed for Windows 95 using Borland's Delphi and Microsoft Access DBMS, is currently under user test. The final goal is to implement the system on the WWW. In this paper the data flow, system design and database model as well as the user interface in relation to the project goals and requirements is described. The short and long term dissemination strategy and the selection of appropriate IT is also discussed.

Keywords: Database, Internet.

1 Introduction.

Selection of variety is crucial for the level of success in crop production. New varieties come and go in a steadily increasing amount and speed. Also, there are many aspects and a lot of demands have to be taken into account before it is possible to make an opinion of which one of the available varieties in the market will probably be most suited for growing in the coming season. Some of these factors are; yield, quality, susceptibility, agronomic characteristics, climate, soil type, pests, marketing conditions, settling, helper substances and the availability and price of seeds for sowing.

Today, all information used for variety selection are accessible in a variety of printed publications. In some cases also on the Internet but in the same printed paper style. It is difficult to compare the variety trial results and obtain the general view because different varieties and variety characteristics are published in different publications. Comparison between years becomes even more difficult.

To ease the problems of variety selection a project is being carried out at the Danish Institute of Plant and Soil Science in order to develop a decision support system for advisers and farmers (Boesen *et al.*, 1996). A prototype is currently being tested by a group of end-users. The project task is to gather and systematise all relevant information of the varieties in a database and to make an informative and supportive user interface. Emphasis is placed on presenting information in a well-arranged manner by options set by the user as well as enabling the user to select varieties by individually chosen criteria.

To secure that the system becomes a tool that will be used for variety selection in the future it is important that such a system is always up-to-date and contains the latest results possible. It must also be easily expandable with new data and as flexible that individual user needs can be met.

2 System description.

2.1 Dataflow.

There are two main outputs from the system (Fig. 1). A general report and a report based on variety trials. The general report lists, general information about selected varieties such as origin, breeders and agents address, general variety description, additional information provided by breeder, and marketing information about demands, recommendations, etc. The trial data report lists the performance of the varieties in selected traits such as quality, diseases and yield calculated and grouped according to selected options.

The user begins by selecting which crop and data sources to work with. A data source is a means to recognise from where data originates, e.g. official performance tests, advisory centre tests, breeders, foreign countries and areas. The user can also begin by defining certain criteria acting as a filter to separate fit from not fit varieties, or he can begin by setting format options for the trial data report.

Selecting a new crop, data source or criterion triggers an update of the list of potential varieties. From this list the user can select the varieties of interest for the general report or the trial data report. Selecting a new crop or data source will also trigger an update of the actual characteristics and locations from which the user can choose to view all or some of them in the trial data report. Additionally, it is possible to choose a range of years from which to view results.

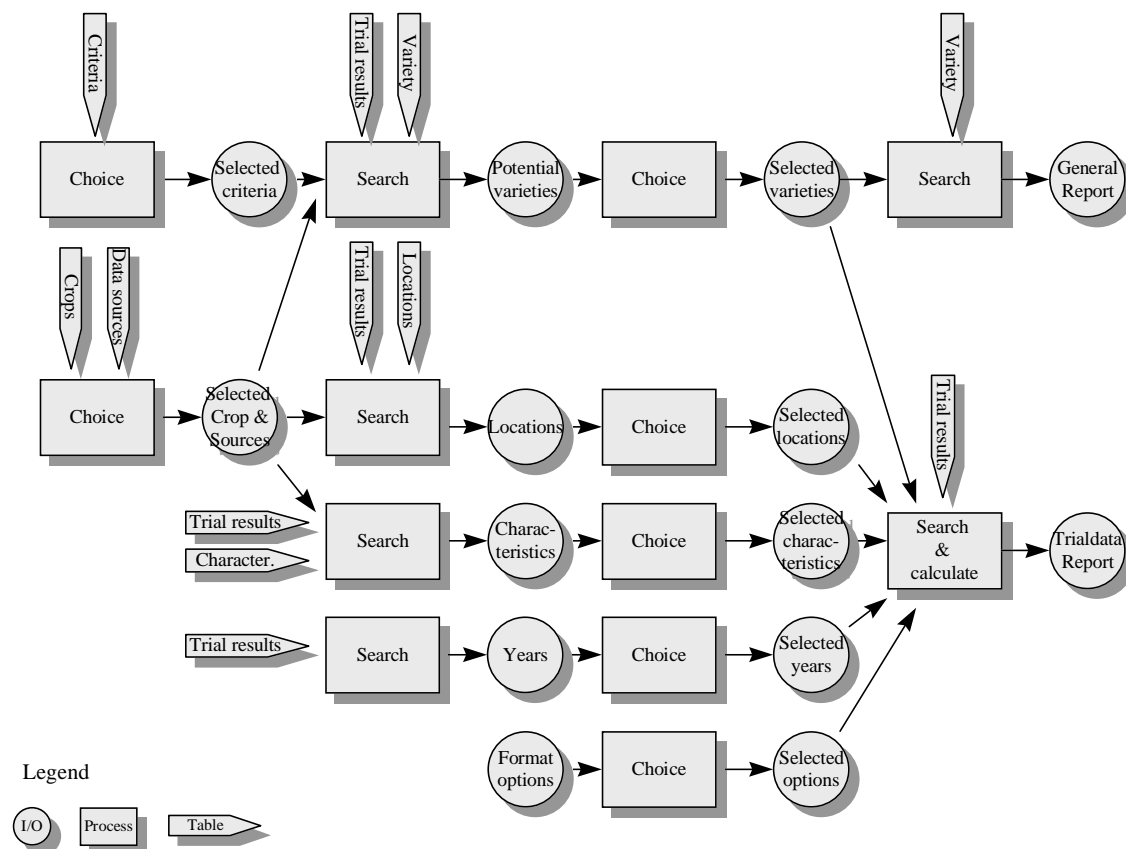


Figure 1. Data flow in SortInfo

2.2 Implementation, user interface and dissemination.

A PC-platform was chosen for the prototype. The relational database is designed and implemented using Microsoft Access for Windows 95, Version 7.00 whereas the user interface is programmed using Borland Delphi Developer Version 2.0 with database access through ODBC.

Design of the user interface reflects the data flow in Fig. 1 and has been programmed as a multiple document interface. There are four fixed documents. One document handles showing and the choice of crop and variety. Another document handles showing and selection of criteria, a third document handles showing and selection of options for the reports, and a fourth handles showing and selection of data source. An unlimited number of reports can be created and no window is closed before the user chooses to. This way, it is possible to see the choices and compare many different reports simultaneously.

As the system and especially the database needs frequent update, a natural choice of platform in the future is the Internet. JAVA is the contemplated language to be used. The conversion will most likely occur when a proper database interface to JAVA is market available.

2.3 Database design.

The entire database consists of 30 entities and relations. A summary of three main tables will be presented.

Table 1. Definition of Trialresult table

Column name	Description
Source	Data origin identification
Location	Location identification
Serial number	Logical unit number
Year	Year of measurement
Treatment	Treatment identification
Crop	Crop identification
Variety	Variety identification
Characteristic	Characteristic identification
Value	Value measured or estimated
Standard variety	Standard variety identification

Table 2. Definition of Variety table

Column name	Description
Variety	Variety identification
Name	Name of Variety
Preliminary name	Name given by breeder
Origin	Inheritance information
Maintainer	Maintainer of variety
Agent	Dealer of sowing seeds
Description	Variety description (HTML)
Breeders information	Information given by breeder (HTML)
Marketing information	Marketing demands and recommendations (HTML)

Table 3. Definition of Criteria table

Column name	Description
Species	Species identification
Criteria	Criteria identification
Characteristic	Characteristic identification
Minimum	Minimum value
Maximum	Maximum value
Basis	Economic settling limit

Table 1 shows the table on which the trial data report is based. One measurement or estimated value is identified by 8 key fields. Implementation wise, the keys have been divided into three sub keys. Most experiments concerning yield are designed using a mixture of four high yielding varieties as a measure for today's standard. This way, comparison between sites using relational numbers of varieties to the mixture is possible. In the structure, repetition of the standard means redundancy. However, performance is noticeably slowed down in a structure where data occurs only once.

The general report is based mainly on information from the variety table as defined in Table 2.

As indicated in 1.1, the user can combine and modify a variable number of predefined criteria (Table 3) in order to select varieties with the desired traits. Demands to certain characteristics, that is a minimum or maximum value, are often individual to the plant species as there can be several characteristics within one criterion. Therefore, restrictions for the characteristics are grouped within plant species and criterion. An example is the criteria, Malting. Of small grains, only the species, barley is used for beer brewing and several characteristics are important in malting. Restrictions are imposed on both extract, nitrogen, viscosity, β -glucan and diastolic force.

2.4 Status and perspectives.

By March 1997, the database contains a full yield trial data set for two years, protein contents and general information. Data of other characteristics is only present in a limited amount for testing but will be implemented in April and May 1997. Data of virulence, certifications, variety mixtures, official variety list status is also implemented later.

Functionality wise, the system will be expanded with advisory models to rank varieties with respect to baking and malting quality etc. Another future functionality is prediction of expected individual variety needs for helper substances related to region and soil type. In all new functionality, an open and flexible structure will be in focus.

A fast and little resource demanding update of the database is possible if update can occur distributed at servers by the data providers. This is also going to be a task for future research.

3 Conclusion

The advantages by developing a system in a flexible and open way are obvious. Problems encountered in the present developmental process are that the format of existing data and experimental planning practice complicates the design and functionality of the system. The system has to be designed to contain various data formats and adapted to existing data. The reverse process would be easier. In developing the system, co-operation with advisory service, breeders and other relevant institutions has proven essential.

4 References.

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