

## **Crop Rotation Analyzer for Saskatchewan**

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### **Introduction**

Agriculture in Saskatchewan has been undergoing changes and adjustments in attempts to supply adequate income to farm operators. Farmers are adopting new cropping practices in order to diversify their farm operations, maintain income levels and expand into new product markets. Farmers often face new crops and cropping practices, new herbicides, and new soil considerations as they experiment with and utilize new crop rotations.

Unfortunately, these new rotations often present production problems which farmers have not previously faced or are unfamiliar with. Crops grown and chemicals used in previous years may affect management decisions for years to come. Agrologists and farmers require a quick and simple methods of checking for cropping options depending upon previously grown crops, herbicides applied, weed problems and soil conservation and fertility concerns.

Personal computers provide an excellent vehicle in which to extend production information to farmers. With the number of farm operators utilizing computers increasing, more and more information may be provided in the electronic format. Numerous farm accounting packages are available for farmers to choose from. These programs may be used to provide the farmer with an economic analysis of their farming operation. The number of software packages providing agronomic analysis however, is relatively small. The Crop Rotation Planner represents software which does provides such analysis for cropping sequences.

### **Project Design**

The development of the Crop Rotation Planner may be categorized into three specific areas.

- a) Data collection and data entry.
- b) Software design and computer programming.
- c) Technical content examination.

#### **a) Data Collection**

The major source of information upon which the program was based is the Crop Rotation wall chart as produced by Manitoba Agriculture. The chart contains codes which supply data on herbicide residue, plant diseases, problem weeds, soil fertility and conservation reminders for

various crop rotation combinations. This information was entered into a database structure designed to accommodate this type of information. New herbicide registrations have occurred or changed since the last publication of the rotation wall chart, the publication Weed Control Guide for Cereal and Forage Crops in Saskatchewan was used to update herbicide information. Recropping intervals were changed in some instances to reflect the recommended practices in Saskatchewan.

#### b) Computer Programming

The design of the computer program required to access the information was developed with the following principles in mind.

The program should be simple to understand and operate. The level of computer expertise varies greatly among farmers and agrologists. Because of this, a balance must be struck between capability and operability. To effect this, the main functions of the program are entirely menu driven. Typing is only required for limited functions in the program.

The Rotation Planner should be portable and not require the purchase of other software in order to operate. The Planner is compiled dbase code and therefore does not require the purchase of any database or spreadsheet software to operate. This allows the software to be purchased and operated with a minimum of cost.

The software is designed to be compatible with the most common computer hardware in use. The Planner will operate on all IBM or 100 percent compatible computers. This represents approximately 85 to 95 percent of farm computers operating today and the type of hardware being utilized by Extension Agrologists.

The type of output available from the software is also important. It was critical that the software would be able to produce information printouts which could be distributed to farmers or used in individual field files for future reference.

The continued support of the software was also a concern. In order for such a program to be useful, it must reflect the current database of knowledge in this particular area within the scope of the program. To facilitate this, literary searches are being conducted for various sources of information which will strengthen and present the current level of knowledge. As the database of this knowledge increases, the software will be updated to allow access to this information.

Farmers and Agrologists have not been conditioned to the use of computer software for analysis of agronomic practices. In order to facilitate the use of such software, the price was required to be enticing. To this end, the software has been made as affordable as possible for as wide a range of individuals as possible.

### c) Technical Content Examination

It is a priority that the information being presented by the Planner be technically accurate and applicable to Saskatchewan conditions. Literary searches are conducted to bring forth the data required to keep the Planner current. Rural Development staff have also supplied technical expertise in recommending changes which suit the Saskatchewan condition.

The Planner, in its present form, is limited in its ability to accurately reflect the extent of problems or concerns which may occur in any one field. With the cropping sequence as the only variable input, the Planner will present a probable scenario for the crop being grown. The actual existence of the problem and its severity may greatly depend upon the farmers management, regional climatic conditions and weather conditions within any one year, crop varieties, and rates of herbicide application.

### Software Operations

The Rotation Planner relies on an internal data set to determine possible cropping problems between crops. All information within the Planner is related to these crops. Therefore information selected is accessed by selecting crop names. The 26 crops presently stored within the Planner include Alfalfa, Barley, Buckwheat, Canary Seed, Canola, Canola (Triazine Tolerant), Corn, Faba Beans, Fall Rye, Field Beans, Field Peas, Flax, Forage Grasses, Lentils, Mustard, Oats, Potatoes, Soybeans, Spring Rye, Sugar Beets, Summerfallow, Sunflowers, Sweet Clover, Triticale, Wheat and Winter wheat.

By selecting 2 to 4 year rotation sequences of these crops, the program displays what may be agronomic concerns. The present crop or most recent crop, is the crop which is analyzed for possible production concerns.

The planner considers production concerns in the following areas:

- 1) Plant Disease
- 2) Herbicide Residues
- 3) Fertility concerns
- 4) Problem weeds

For any of the categories above, the program assumes that a particular problem may exist or residue may be present based on the possibility that the herbicide may have been applied, the disease may exist or the problem weed may exist in that type of rotation. It is the responsibility of the user to determine if the herbicide was actually applied in the previous crop or if the climatic conditions were conducive to disease development.

Plant diseases presently listed within the Planner include Ascochyta blight, Bacterial Blight, Blackleg, Black stem, Cyst Nematodes, Corn Smut, Damping off, Downy mildew, Early Blight, Ergot, Head Blight, Leaf Spot, Net Blotch, Pasm, Powdery Mildew, Root Rot, Rust, Spot Blotch, Sclerotinia disease, Septoria leaf and glume blotch, Snow mould, Seed Piece Decay,

Stalk rot, Tan Spot, Verticillium Wilt, and White Rust.

Herbicides which are checked for residual effects are Ally, Atrazine, Avadex BW, Bladex, Glean, Laddok, Lexone, Lontrel, Princep, Primextra, Sencor, Sinbar, Tordon 202C, Trifluralin, Edge, Fortress, Velpar, Assert and Muster.

The Planner deals with fertility and problem weeds in a much less comprehensive manner than with the disease and residue concerns. This relates directly to the amount of base information supplied within the Manitoba wall chart. It in no way indicates a lack of importance in these areas. These areas do however require considerable effort in building suitable databases in order for these topics to be treated more comprehensively.

Weeds are defined as problems by the Planner when the cropping sequence does not allow for the effective control of the weed in the crop to be grown. Weeds included in the Planner are Perennial Thistles, Mustard and Volunteer Crops.

Fertility concerns deal mainly with the growing of a cereal crop after a legume or root crop.

The Planner will display, on screen, all possible concerns for a particular rotation. These concerns are categorized by residue, disease, weed or fertility grouping. Each concern under the grouping displays the concern name (ie Disease or herbicide name), the risk factor involved with the concern, the previous crop relating to the concern, and a description of the problem. This information may be viewed on screen, printed or saved to a file.

### **Technical Specifications**

The Rotation Program is a compiled dbase program written in the Clipper dialect. The program will run on all IBM or 100% compatible computers with a minimum of 640K RAM. The program must be installed onto a hard disk in order to operate. The program is available on 3.5 or 5.25 inch disks.

### **Future Directions.**

The future development of the Rotation Planner will depend greatly upon the feedback and input of ideas by the users of the program. The ability to analyze field records from existing field record keeping system or to include a new field record keeping system are examples of suggestions being considered at this time. The inclusion of insect problem analysis and soil conservation recommendations are also being considered. Crop interaction between sequentially grown crops is being evaluated at this time.

Economics have been suggested as a possible addition to the Planner, however, with the availability of quality Economic analysis software on the market, this role may be left to economic analysis software, leaving the Rotation Planner dedicated to agronomic factor analysis.