

On the Search System for Selection of Plants According to Environment Conditions

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Abstract— This article has been devoted to creating an interface for input of characteristics obtained as a result of soil analysis and creating a database showing peculiarities of plant cultivation and required financial expenses.

Keywords— *plant; search system; database*

I. INTRODUCTION

Every farmer tries to make maximum profit on the land he owns. For that, he fertilizes the soil, increases supply of nutrients, improves irrigation system, imports seeds producing high quality crop, etc. And it turns out eventually that some other plant can give richer crop and more profit with less expenses. Naturally, there are experts who study the specific nature of soil of the farmer's land and determine what plants are most appropriate for this particular piece of land. Involvement of such experts, however, requires considerable expenses, efforts and, most importantly, time. Unfortunately, those kinds of research do not always prove to be efficient either, unlike algorithmic presentation of sequence of processes and providing user with it in the form of special software. Besides, such a method will cost a farmer much less and take him much less time.

Due to certain climatic changes, some plants previously were optimal for certain land plots cannot be appropriate for the same land anymore. Environmental characteristics are the basic criteria for selection of land plots for particular plants or selection of plants for particular land plots. For instance, we can measure thermal balance of soil, PAR (photosynthetic active radiation), but their change do not depend on us and we cannot adjust them to our demands. The same can be said about soil moisture, which is calculated based on the amount of precipitation in the area; while it is possible to adjust plants to a place with low level of precipitation, excessive precipitation can damage future crops immensely. The present program in question is designed to solve the problems in question.

II. PROBLEM STATEMENT

The main aim is to develop software package facilitating selection of plants, which are most appropriate for the farmer's land and can yield maximum profit, based on specific characteristics of soil. Specific parameters of the soil are entered into the system, as a result of which user gets a list of plants ordered according to the degree of their appropriateness.

Expenses on plant cultivation and estimated profit on crop sales, that is, information on user's demands, should also be taken into account to make it possible to perform analysis of compatibility of plants alongside with their compatibility with the land characteristics. Here, one must consider product market value and product demand.

A. Selection of plants for a particular land plot.

First, plants database has to be created in the described program [2], i.e. the following parameters are input: optimal temperature conditions required for growth of every plant, PAR (photosynthetic active radiation) and day length. Only after that and after entering soil parameters of a specific owner's of farmer's land plot, comparative analysis is performed and user is provided with the sequential list of plants. Plants most appropriate for the given land plot are to head the list.

Besides, the program has a feature of calculation of financial expenditure related to cultivation of plants on the list.

III. SOLUTION CONCEPT

Plant cultivation process consists of the following phases: sowing, sprouting, growing and cropping. Plant's demands to vegetation factors can change at any of these stages, which will require extra expenses. Furthermore, some soil characteristics are dependent or independent on the season and controllable or uncontrollable. Also, the period from sprouting to cropping can be different depending on biological peculiarities of plants. Due to this difference, several crops can be gathered in during one period, or vice versa, crop is gathered in after several seasons, which should also be taken into account in the described program.

For now, annual and biennial plants will be considered in the program.

IV. SOLUTION

First of all, plants database has to be created and information on the conditions necessary for plants cultivation is to be input.

Our research allowed determining the following basic parameters of relation between plants and environment:

1. sprouting temperature

2. lowest permissible temperature
3. temperature at the beginning of tillering stage
4. temperature at the end of tillering stage
5. soil moisture in sprouting and tillering periods
6. soil moisture in growth period
7. optimal soil moisture for yielding heavy crop
8. soil PH balance
9. optimal soil type
10. soil appropriate for fertilizers being applied
11. basic fertilizers for plowing period
12. fertilizers for seeds during sowing
13. nutrients (macro- and microelements)
14. sowing duration
15. sowing method
16. seeding method
17. seeding depth
18. irrigation system
19. cropping method
20. transpiration coefficient (evaporation)
21. resistance to salt
22. accumulated effective temperatures
23. compliance with soil grain-size composition

The above-listed parameters have to be entered into a separate database for their storage in the program memory. Supporting tables are to be created for that in the first place. For instance, soil types (black soil, cinnamonic soil, brown soil), mechanical composition (clay, clay loam, sand), macroelements (N, P, K), microelements (Mn, Mg, Fe) and fertilizers tables are drawn.

A. *Input of soil characteristics.*

Every plant undergoes different development stages depending on its certain biological characteristics. At each of those stages, plants have certain demands, which should be met to ensure normal development process. Such vital demands are as follows: light, heat (effective and comfort temperature), water, air, nutrients and vegetation factor [1]. But in addition to vegetation factor, soil in different zones has its own peculiarities. That is, soil composition and peculiarities play an important part in the process of plant development. Those peculiarities are as follows[1]:

1. effective air temperature (over 100 S)
2. soil moisture
3. soil PH balance
4. nutrients (nitrogen, phosphor, calcium and other microelements)
5. mechanical composition of soil (stone, crushed stone, coarse sand, medium sand, fine sand, coarse dust, medium dust, fine dust, dense silt, thin silt, colloidal silt)
6. amount of organic substances (humus, mulch)

A database for input of these parameters must be created, which should also include comparison of characteristics of different plants. Program interface is created to provide input of all parameters.

B. *Input of information on demands of plants.*

Plants also have their classification: legumes, grains, annuals and perennials, short-day and long-day plants, etc. But generally, one might say that they all have the same demands:

1. comfort sowing temperature
2. comfort growth and development temperature
3. accumulated effective temperatures
4. air humidity
5. soil density
6. grain-size composition
7. PH level
8. organic composition
9. nutrients

V. CONCLUSION

The program is designed for the following tasks:

1. creating an interface for input of characteristics obtained as a result of soil analysis
2. creating a database showing peculiarities of plant cultivation and required financial expenses

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