“DIGITAL PRECISION AGRICULTURE”, a Software to Manage Soil Information for Establishment of Integrated Management Zones

Gertsis, A. [1]

[1]*Perrotis College (partner of Cardiff Metropolitan University), American Farm School, Thessaloniki, Greece*, agerts@afs.edu.gr

ABSTRACT

Management decisions for agro-environmental systems demand compilation of multiple kind of information in the entire continuum “soil-plant-atmosphere” in order to provide the most effective and sustainable solutions. Cutting-edge technology is becoming a cornerstone of any contemporary management system and new developments greatly facilitate decision making and best management practices to be applied. Precision Agriculture (PA), also termed Precision Farming or Site Specific Management Agriculture in literature**,** is a set of management practices and cutting edge technologies used to identify spatial and temporal soil and crop variability and to provide optimum crop and soil management practices for inputs per uniform unit areas established known as management zones (MZ).

Educational aspects of this approach are also emphasized to demonstrate that simple or advanced technologies can be used efficiently enough to provide better management of crops and soils, using the principles of PA, resulting in a more sustainable use of soil, water and crop resources. Criteria for establishment of MZs to be used for PA applications is a diverse and vaguely defined subject. The criteria used are depending on various factors and mostly on user personal experience but based on single variables.

The lack of a commercial or research software to integrate basic and easily measured soil properties that affect crop growth and productivity is a gap in the area of PA. A software was developed through a field research project to attempt establishment of Integrated Management Zones (IMZ) which include simultaneously more than one fundamental soil properties affecting crop growth and yield. The model requires inputs from fundamental but easily measured soil properties affecting crop growth and yield taken from sampling an appropriate number of points per farm. Currently the model accepts data on four soil: pH, SOC, EC, soil texture. The software provides also for future use of climatic factors and so rainfall and temperature data could be implemented in the next version of it, since there is provision in the source code of the model for these two variables. The current version of the model considers the variability of the soil system and provides an integrated methodology to weigh each parameter measured, in order to provide the “integrated management zones” (IMZ) and a map of each field. The critical values and ranges for each of the four soil properties were established based on soil science literature related review but are adjustable at the user’s choice. It outputs integrated digital maps of relative homogeneous Management Zones (MZ) of the input soil properties, which can be used for optimization of Input Use Efficiency (IUE) and therefore provide higher income and cause less adverse environmental effects. In addition the software inputs the used crop species and determines the appropriateness of the given crop under the soil properties, based on a initial database of crop species. It suggests alternative crop species that are better adaptable at the given soil environment. This is an area of expected more development in a next phase. This paper describes the overall conceptual model used to build the software and provides some application case studies.

Keywords: Precision Agriculture, Integrated Management Zones, pH, Electrical conductivity, soil texture, soil organic matter