

Editorial for the special issue: optimization in agriculture

Petraq Papajorgji

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This special issue is another effort to bring together contributions from different disciplines with the common goal of applying the most advanced results in theoretical and applied sciences in agriculture and environment. This publication is a result of the hard work of many researchers from different disciplines and countries in the world.

The nature of the problems that need to be addressed by the scientific community in agriculture and environment is becoming more and more complex. Gone are the days when a problem is approached by single individuals. Currently, multi-disciplinary teams are required to address such issues provided with complex tools and the newest results in several fields of science and technology.

Generally, people may have a very simplified view of a cropping system as to be composed of a crop and the soil on which it is grown. Often, people may not realize that the physical, chemical, and biological environment as well as management actions are also integral determinants of a cropping system's performance and therefore need to be taken into consideration. There are many inherent complexities and especially the ways different factors interact and their final impact on the crop yield that is not quite well-known and require to be approached by multi-disciplinary teams. There are a few papers in this special issue that present the multi-facet approach to crop systems.

The paper “Modeling organic carbon and carbon-mediated soil processes in DSSAT v4.5” of C. H. Porter, J. W. Jones, S. Adiku, A. J Gijsman, O. Gargiulo and J. B. Naab addresses issues related to the demand for modeling more complex questions, including issues on sustainable production, climate change, and environmental impacts.

P. Papajorgji (✉)
Center for Applied Optimization, Industrial and Systems Engineering,
University of Florida, Gainesville, FL 32611, USA
e-mail: petraq@ufl.edu

The paper “Issues of spatial and temporal scale in modeling the effects of field operations on soil properties” of Jeffrey W. White, Jim W Jones; Cheryl Porter; Gregory C McMaster and Rolf Sommer describes how the Cropping Systems Model (CSM) was modified to simulate tillage and related field operations for single seasons or multiple years. Authors state that process-based models of crop production are widely used in decision support, but few explicitly simulate tillage.

The paper “Using an MDA approach to model and evaluate cropping systems sustainability” authored by Y. Sohbi, R. Reau; J-P. Müller uses advanced technologies such as the Model Driven Architecture (MDA) to design and evaluate a high number Cropping Systems (CS) in order to select the best ones before realizing experimental ex post evaluation. Authors state that to cope with the increasing social demand for sustainable development, it is necessary to use advance conceptual tools to develop agricultural information systems.

The continuous advancement of information and communication technologies creates a more favorable environment to create international interdisciplinary teams even when researchers are geographically far from each other. Along with the development of new information and communication technologies, comes a considerable increase in sources of georeferenced agricultural and environmental data. Sensors and remote sensing systems continuously acquire new data. These data require more adequate and effective storage methods, as well as effective integration and analysis methods. These issues are treated in this special issue as well.

The paper “Designing experiments to evaluate the effectiveness of precision agricultural practices on research fields. Part 1. Concepts for their formulation” of G. Milliken, J. Willers, K. McCarter; J. Jenkins states that a better method is needed to evaluate the effectiveness of a precision agricultural practice on a research farm field. Authors present a novel methodology for formulating the design of an experiment to evaluate the effectiveness of a precision agricultural practice. The method combines a georeferenced treatment structure and a georeferenced design structure to build a mixed model that describes and analyzes the site-specific experiment.

The paper “Flexible design of environmental data warehouses” authored by F. Pinet, M. Schneider describes the important role data warehouses play to support enterprise decision-making. Data warehouses provide architectures for extracting all the knowledge needed to optimize systems. Their design remains a complex task; flexible approaches are necessary to facilitate their creation and adapt their analysis criteria to the evolution of decision requirements.

The paper “Constrained minimum-k-star clustering and its application to the consolidation of farmland” of A. Brieden, S. Borgwardt, and Peter Gritzmann studies a new combinatorial clustering model for the consolidation of farmland. While the general problem turns out to be NP-hard even in quite restricted cases, the Size-restricted Minimum-k-Star Group Partition problem is solvable in polynomial time.

The paper “P2 hierarchical decomposition procedure: application to irrigation strategies design” of O. Crespo, J-É. Bergez and F. Garcia introduces an efficient hierarchical decomposition method to design irrigation management strategies that

is modeled as a continuous stochastic problem. Various combinations of selection (greedy, Pareto-based), division (middle, pivot, maximization) and evaluation techniques (global, standard deviation) are tested. Authors present results of an 8-continuous-parameter irrigation strategies design.

The paper “A simulation platform to support regulation settings of energy grids with distributed generation” of S. Silva, J. N. Fidalgo, and D. B. M. M. Fontes discusses the three main concerns namely energy security, economic development, and environmental sustainability that are important to the European Union (EU). The authors propose a decision aid tool, to be used by the regulator, to experiment with and analyze the impact on power systems of different regulation directives, being then able to decide upon the most adequate distributed generation (DG) connection rules.

We would like to thank all authors that contributed for the publication of this special issue. Their original work and results will be greatly appreciated by readers. We would like to thank the editor-in-chief of the journal, Prof. Constantin Zopounidis for his continuous support during the process of the production of this special issue. We hope readers will enjoy reading this special issue.