FERTIGATION MANAGEMENT BASED ON SIMULATION MODELS

By

AYMAN SAMIR OSMAN EL-ABD

B. Sc. Agric. Sc. (Agricultural Engineering), Ain Shams University, 2012

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Approval Sheet

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This thesis for M.Sc. Degree has been approved by:

Dr. Hazem Sayed Mehawed …....…………

Chief Researcher, Agricultural Engineering Research Institute, Agriculture Research Centre

Dr. Ahmed Abou El-Hassan Abdel-Aziz ………………..

Prof. of Agricultural Engineering, Faculty of Agriculture, Ain Shams University

Dr. Yasser Ezzat Arafa ………………..

Prof. of Agricultural Engineering, Faculty of Agriculture, Ain Shams University

Dr. Abdel-Ghany Mohamed El-Gindy ..………………...

Prof. Emeritus of Agricultural Engineering, Faculty of Agriculture, Ain Shams University

Date of examination: / /

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Under Supervision of:

Dr. Abdel-Ghany Mohamed El-Gindy
Prof. Emeritus of Agricultural Engineering, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University (Principal Supervisor).

Dr. Yasser Ezzat Arafa
Prof. of Agricultural Engineering, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University.

Dr. Mohamed Morsy Hussein
Research Prof. Emeritus of Water Relations and Field Irrigation, Department of Water Relations and Field Irrigation, National Research Centre.

ABSTRACT

Ayman Samir Osman El-Abd: Fertigation Management Based on Simulation Models. Unpublished M.Sc. Thesis, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, 2018.

Although, fertigation technique is ordinarily used to guarantee a stable productivity of crop-unit area and also to improve yield quality, but on the other hand, fertigation became undesirable due to its critical effect on agro-environmental resources and human beings. Furthermore, disability of irrigation systems because of clogging and energy-head losses enlargement due to chemical involvement in different equipment which represents a serious problem for applying such technology and assigned techniques, In addition to its impact on either yield production and assigned quality parameters or agro-physical resources. The above-mentioned problems could be avoided by the following: good management practices of each parts of fertigation technique, i.e. irrigation systems; water, fertilizers and injecting equipment.

Fertigation system management requires a substantially-specific database of available resources and convenient field status and conditions. Management information systems (MIS) plays a crucial role and can be effective tool to be used efficiently. One of these tools is called Simulation Models (SM) which represents designing a model for a real system and doing experiments over this model for the purpose of understanding the behavior of the system of the system or to evaluate strategies for the operation of the system.

The aim of this investigation was to build, verify and validate a simulation model for managing fertigation technique under arid ecosystem conditions of Egyptian agriculture.

Results and system indicated that it is possible to use the simulation model for estimating the fertigation management parameters

accurately. In addition, some of the observed results can be summarized as following:

1- There were improving and increasing in the yield of potato based on simulated irrigation water and fertilizers rate by using Fertigation Mag-SM in both seasons where it increased of 19.5% in the 2015 season and 11.4% season in the 2016 season compared to conventional methods.
2- The highest yields of potato at 75% of full irrigation (FI) and 100% of full fertilizers (NPK) were (14.05 ton fed^{-1}) based on simulated water and fertilizers using Fertigation Mag-SM and (13.21 ton fed^{-1}) using the conventional control during 2015 season and Were (14.5 ton fed^{-1}) based on simulated water and fertilizers using Fertigation Mag-SM and (13.78 ton fed^{-1}) using the conventional control during 2016 season.
3- Maximum value of WUE of potato yield was (5.77 Kg m^{-3}) at 75% of FI and 100% of NPK based on simulated water and fertilizers using Fertigation Mag-SM and (5.14 Kg m^{-3}) using the conventional control in 2015 season and were (6.77 Kg m^{-3}) based on simulated water and fertilizers using Fertigation Mag-SM and (6.02 Kg m^{-3}) using the conventional control in 2016 season.
4- Maximum value for FUE for potato was at 75% of FI and 50% of NPK, as NUE (268.9 Kg Kg^{-1}), PUE (372.3 Kg Kg^{-1}) and KUE (169.8 Kg Kg^{-1}) based on simulated water and fertilizers and were NUE (242.0 Kg Kg^{-1}) PUE (372.3 Kg Kg^{-1}) and KUE (161.3 Kg Kg^{-1}) using the conventional control in season 2015, and were NUE (274.5 Kg Kg^{-1}), PUE (417.2 Kg Kg^{-1}) and KUE (183 Kg Kg^{-1}) based on simulated water and fertilizers and were NUE (260.8 Kg Kg^{-1}) PUE (401.2 Kg Kg^{-1}) and KUE (173.8 Kg Kg^{-1}) using the conventional control in season 2016

Key Words:

Irrigation systems, Fertigation, Vegetable crops, Soils, Management criteria.

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