PREDICTING WATER AND FERTILIZER DISTRIBUTION UNIFORMITY UNDER GATED PIPES IRRIGATION SYSTEM USING MATHEMATICAL MODEL

By

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التنبؤ بانتظامية توزيع المياه والأسمدة تحت نظام الري بالأنابيب المبوبة باستخدام نموذج رياضي

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صفحة الموافقة علي الرسالة

التنبؤ بانتظامية توزيع المياه والأسمدة تحت نظام الري بالأنابيب المبوبة باستخدام نموذج رياضي

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ABSTRACT

Hani Mohamed Ibrahim Mehanna: Predicting Water and Fertilizer Distribution Uniformity Under Gated Pipes Irrigation System Using Mathematical Model. Unpublished Ph.D. Thesis, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, 2010.

Surface irrigation is considered one of the most common and important irrigation systems, and will remain as one of the most extensive methods used for irrigation in the old valley in Egypt. Surface irrigation uses ditches and canals to carry irrigation water from the source of supply to one or more farms. For that, surface irrigation in Egypt has earned a reputation for being inefficient and wasteful for water and land. Although well designed and managed furrow irrigated systems have the potential to operate at application efficiencies above 90 %. The aim of this study was to maximize water and fertilizer efficiencies under surface irrigation system (furrow) based on simulation model techniques. Therefore, different simulation models (**G-Pipe**, **SIRMOD**, and **SALTMED**) had been used for evaluation processes. This work has been carried out at the Experimental Farm of the Faculty of Agriculture, Ain Shams University, Kalubia Governorate to represent the old alluvial soil of the Nile Delta during 2007 and 2008 soybean (Giza 22) summer growing seasons.

Generally, results could be summarized in the following points: (1) using of simulation models is a good aid tool to maximize the net return of irrigation and fertigation practices under Egyptian clay loam soil conditions. (2) using of G-Pipe, SIRMOD, and SALTMED simulation models is acceptable for predicting water distribution uniformity for gated pipes irrigation system, water distribution uniformity for furrow irrigation, and salinity distribution profile, respectively, after irrigation and fertigation practices under Egyptian clay loam soil conditions for determining the appropriate practices of irrigation to maximize irrigation water unit productivity, and (3) using of 0.2 % field slope and 75 m furrow length are the optimal field conditions for maximize soybean

growth and productivity under the Egyptian clay loam soil conditions which determined by using SIRMOD simulation model for example of using simulation models to decide the optimal procedures of field management to maximize productivity.

Key Words: Simulation model - Water distribution uniformity – Soil salinity distribution - Alluvial soil – Nile Delta Valley - Soybean – G-Pipe - SIRMOD - SALTMED - Gated pipes.

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