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HANAA ALY

MODELING OF ENGINEERING FACTORS FOR SPRINKLER IRRIGATION SYSTEM DESIGN IN THE NEWLY RECLAIMED SOIL

BY

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B.Sc. Agric. Sc. (Agricultural Engineering), Fac. Agric., Menoufia University, 2011

M.Sc. Agric. Sc. (Irrigation and Drainage Engineering), Fac. Agric., Ain Shams Univ., 2016

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ABSTRACT

Mohamed Gaber Mohamed Ahmed Alashram: Modeling of Engineering Factors for Sprinkler Irrigation System Design in the Newly Reclaimed Soil. Unpublished Ph.D. Thesis, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, 2021.

An expert system with all the design criteria could help decision maker, non-technical, inexperienced irrigation system installers and farmers. Therefore, this study was done with the objective of building, verifying and validating of an expert system model to benefit decision makers in designing solid-set sprinkler irrigation system. A rule-based program named EFSIS-ES (Engineering Factors of Sprinkler Irrigation System -Expert System) had been built, verified and validated. The inputs data included location data, climate data, pump data, crop data, soil data and technical data. The outputs of the expert system model were number of the sprinklers on a lateral, number of laterals in the irrigation system, length of each lateral, main line length, irrigation interval, required pump power, total dynamic head "TDH" and pump discharge output. Results indicated a high correlation (R^2 = 0.999) between EFSIS-ES model and the designed spreadsheet in regard to required pump power for verification process. The regression coefficient (R^2) was 0.998 between EFSIS-ES model and SSSDPS Expert regarding total dynamic head "TDH". High correlation (R^2 = 0.998) was detected between EFSIS-ES model and SSSDPS Expert regarding pump discharge output for validation process. It is clear that the value of total dynamic head "TDH" calculated by EFSIS-ES model (24.67 m) was close with that obtained by the SSSDPS Expert (24.64 m). Also pump discharge output calculated by EFSIS-ES model (19.44 m^3/hr) had the same trend comparing with that gained by the SSSDPS Expert (19.20 m^3/hr). A comparison was made between data calculated using EFSIS-ES model against the existed sprinkler irrigation system in the study region at El Nubaria for validation process. Results concluded that there are no significant differences between the field test data and EFSIS-ES model outputs.

Keywords:
Expert system, EFSIS-ES model, solid-set sprinkler irrigation, required pump power, total dynamic head "TDH", and pump discharge output.

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