



Graduate School

Faculty of Water and Soil

Department of Water Engineering

Thesis Submitted for M.Sc Degree in Irrigation & Drainage

**Investigating spatio- temporal variability of soil moisture content during
wheat growing season under limited irrigation**

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Zwart, S. J., and W. G. M., Bastiaanssen. ۲۰۰۴. Review of measured crop water productivity values for irrigated wheat, rice, cotton and maize. *Agricultural Water Management*, ۶۹(۲): ۱۱۵-۱۳۳.

Abstract

The current research was conducted at the Sistan Dam research field of University of Zabol, with the aim of investigating the spatio-temporal changes of the soil water content during the growing season of winter wheat. For this purpose, three pieces of land with an area of about ۱۰۰۰ square meters (۵۰ meters x ۲۰ meters) with limited irrigation conditions corresponding to the sensitive stages of plant growth were selected as plot A irrigated ۳ times (in the stages of flowering and seed filling), plot B irrigated ۳ times (stem elongation, flowering and seed filling) and plot C irrigated ۴ irrigation times (tillering, stem elongation, flowering and seed filling). Sampling of soil (۰-۲۰ cm depth) was taken at ۱۴۴ points specified in the test plots from ۱۵ December ۲۰۱۸ to ۳۰ May ۲۰۱۹ once every ۱۰ days for measuring the physical and chemical soil characteristics. Soil moisture was measured by TDR, bulk density by metal cylinder method, soil pH by pH-meter, soil texture by hydrometric method, electrical conductivity (EC) by EC-meter. During this research, Moran's index (I) and semivariogram function (γ) of soil moisture data were used to examine and compare the pattern of spatial changes and degree of spatial correlation of soil moisture in different stages of wheat growth. The results of the correlation between the average soil moisture in parts A, B and C and the climatic parameters of the studied area during the wheat growing season showed that the average soil moisture of field A in ۱۱ sampling periods has a positive and significant correlation with the climatic parameters of maximum

temperature, minimum temperature and ۲۴-hours precipitation. Also, the average soil moisture in farm B had a positive and significant correlation with the climatic parameter of average temperature, and in farm C it had a positive and significant relationship with the minimum temperature. The spatial structure model of soil moisture was different in different stages of wheat plant growth. Considering the difference in irrigation treatments, soil moisture level, amount of water consumed and different climatic conditions in the soil moisture sampling rounds in three fields covered with winter wheat, the highest grain yield is related to field C (۳۳۰۰ kg/ha) with an increase of ۶۲,۵% relative to the A field, and with ۴ times of irrigation. Therefore, the best treatment in this research was the treatment of four irrigation times, and these results can be used to improve the use and control of irrigation water volume in Sistan region.

Keywords: Spatial correlation, irrigation volume, climatic variables, growth stages, winter wheat