

## ORIGINAL ARTICLE

# Crop Vigor fluctuation as affected by Irrigation water shortage Case study: Rahad Agricultural Scheme, Sudan

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### ABSTRACT

The national agricultural schemes are considered as major parameters in the distribution of the population density in most of the Sudanese regions. This study aimed at employing remote sensing techniques along with the crop evapotranspiration ( $ET_c$ ) to monitor the development of crops cultivated in Rahad Scheme and to assess the sufficiency of the scheme water supply (SWS) for crops satisfaction. The Normalized Difference Vegetation Index (NDVI) extracted from national oceanic and atmospheric administration (NOAA-15) satellite for the Rahad agricultural scheme was extracted and correlated with SWS and the crop  $ET_c$ . The study also intended to identify the periods of high water demand for crops according to the crop's growing stages throughout the season, NDVI and  $ET_c$ . Results obtained from the analysis revealed a consistent positive relationship between NDVI and  $ET_c$  with determination coefficients ( $R^2$ ) ranging between 0.67 to 0.73, indicating that as the NDVI raises the  $ET_c$  increases accordingly. A negative correlation was also observed between the SWS and  $ET_c$  during period from August to October, with  $R^2$  ranging between 0.64 and 0.69 over the two selected fields, which assured the existence of irrigation water shortage problem during the mid-season. Satellite NDVI has been proven as an efficient indicator for monitoring vigor and phenological statement of crops throughout their growth stages.

**Keywords;** Remote sensing, Rahad scheme, Irrigation, Evapotranspiration.

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## INTRODUCTION

Agriculture is among the most worldwide human economic pursuits, which is practiced in each and every physical environment where it's possible to increase crops or domestic animals. In certain areas of the world land holdings are very small and application of labor so rigorous that the farmer works less than one acre of land, as opposed to other places where one man plants hundreds of acres. There are nearly numberless variations in agriculture as a result of various combinations of physical environment, culture, economic systems, and individual practices in farming. The variety of agriculture generates a variety of demands for information. Agriculture in Sudan is an extremely economical provider financially and socially, due to the huge, flat and fertile areas as well as the good water resources [1]. The national agricultural schemes are considered as a major parameter in the distribution of the population density in most of the Sudanese regions. It shares in the settling of the population, livelihood of thousands of the families whose members work by these schemes as farmers, transporters or labors in the service sectors which belong to their schemes. The agricultural sector in Sudan is definitely the principal contributor to Sudanese economy in relation to GDP regardless of rising crude oil exports [2, 3]. Agriculture adds up about 39% of the GDP and 90% of non-oil exports. Agriculture is additionally demonstrated within the activities of some other areas for example transportation, business, and trade. Agriculture and associated