Effects of no-till and conventional tillage practices on the health and canopy cover of winter wheat using drone data

Wheat canopy cover and health are important crop related parameters which provide information about crop performance and yield. Understanding the effects of soil tillage practices on wheat health and canopy cover is key for small grain production, forage availability and soil moisture conservation. Although the effects of conventional tillage practices, reduced tillage and zero tillage on other crop related bio-physical parameters have been investigated, very limited research has been conducted to determine the effects of soil tillage on canopy cover and health in winter wheat production. Therefore, the aim of this study was to determine the effects of soil tillage on the health and canopy cover of winter wheat. To achieve this, the normalized difference vegetation index (NDVI) and normalized difference red edge index were used to monitor and determine the health, greenness and canopy cover of winter wheat crop, during early and late growth stages. This study utilized UAV (unmanned aerial vehicle) based vegetation indices, otherwise known as drone-based indices to retrieve and monitor crop related parameters based on the spectral response of winter wheat crops to visible and infrared light in no-till and conventional tillage systems. The study revealed no significant difference in canopy cover and health of winter wheat in both tillage systems. The total mean wheat health by NDVI for no-till systems was determined to be 2.75 $\pm$ 0.06 (mean and Standard error) while wheat health, determined from NDVI in conventional tillage systems was 2.75 $\pm$ 0.1, indicating no significant difference in wheat health and performance in both systems. Similarly mean wheat health in late stages of wheat growth, determined from the NDREI was 2.17 $\pm$ 0.09 in no-till systems and 2.17 $\pm$ 0.07 in conventional tillage systems. Given the high costs of tillage implementation, the findings of this study are beneficial for cost-effective decision making in winter wheat production and can also improve precision mapping using geospatial applications.