

## Estimating In-situ Soil Water Content by Applying the Grey Level Resolution in Digital Imaging by Using the Unarmed Aerial Vehicle

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Soil water content (SWC) is a vital factor for soil sciences. Nowadays, there are many methods for estimating SWC, including the Time-domain reflectometry (TDR) and Gravimetric method. Nevertheless, most of them may cause damages to soil structure and require large manpower and resources. The optical method is a non-destructive method and as it cost-efficient, it is recommended for SWC estimations.

This study analyses soil samples at the field site, as well as it uses aerial photo-shooting to obtain the digital image distribution of surface soil. Both soil samples and digital images were categorized into groups; 8 in total, depending on time parameters (one group equals to one day). More specifically, the gravimetric method was selected for the SWC measurements in laboratory, while the images were modified in such a way so to match the grey level (GL) resolution for further calculations. By comparing the GL data (negatively correlated) with the Soil Water Content correlation (i.e., square of SWC) of 6 randomly selected groups, their digital model was estimated; the remaining 2 groups were used for validating the received results.

According to the findings, the sensitivity of GL in SWC alternations is high. Additionally, it can be observed that the SWC result data of the model are similar to the SWC measurements; therefore, the GL method can applied to agriculture and disaster prevention, and it is a cost-efficient method for SMC estimations and it can provide several benefits.

Keywords: Surface soil , Aerial photo-shooting, Optical method, Grey level analysis, Digital image processing