Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

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NITROGEN ESTIMATION IN SUGARCANE FIELDS FROM AERIAL DIGITAL IMAGES USING ARTIFICIAL NEURAL NETWORK

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Abstract

Knowing the nitrogen status of crop is essential for agricultural operations management, nevertheless conventional methods are time consuming and expensive. In this research, possibility of using digital aerial images as a remote sensing method to determine the nitrogen content of sugarcane plant was studied. Arial images were captured from 3 sugarcane fields using a 12.9-megapixel digital camera mounted on a Phantom 3 quad-copter from 5 and 10 m heights. At the same time, four healthy top branches of sugarcane plants were cut from imaging points as plant samples. The nitrogen value of the samples was measured using Kjeldahl test at laboratory. Multilayer perceptron (MLP) artificial neural network (ANN) algorithm was used to estimate nitrogen status in the crop from the aerial digital images. Color indices of images were extracted using image processing in MATLAB software and their correlation with the nitrogen value were determined. The indices that had correlation with nitrogen were selected as inputs of the ANNs and the nitrogen value was the output. There was no significant difference between the nitrogen values predicted by ANNs and its actual values. The average errors of the ANNs training were 0.145 and 0.022 and the correlation coefficients of the predicted and actual values of nitrogen were 0.89 and 0.94, for 5 m and 10 m heights respectively. Also, the RMSE values of nitrogen estimation was 0.181 and 0.174, at 5 m and 10 m heights respectively. So, nitrogen estimation of sugarcane fields is possible by aerial digital imaging.

Keywords: artificial neural network, digital aerial image, image processing, nitrogen content, sugarcane field

Received: March, 2020; Revised final: July, 2020; Accepted: October, 2020

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