

Kukurūzų augalinės biomasės energetinio potencialo nuotoliniai tyrimai

1. Keywords: biomethane potential, remote sensing, unmanned aerial vehicles, maize, vegetation indices

2. Area: Crop production

3. Subarea: Remote sensing of plants

4. Theme: Remote sensing of the energy potential of maize plant biomass

5. Year: 2022

6. Summary: This study aims to predict the theoretical biomethane potential (TBMP) of maize by combining aerial field data and machine learning algorithms. To achieve this goal, periodic flights with unmanned aerial vehicles were used in the maize field experiment, and the vegetation indices of plants were calculated from the data obtained. These indices were subsequently used to develop machine learning algorithms and thus to predict TBMP values.

7. More detailed version of the summary: When growing maize as an energy crop, it is important to predict future energy yields, which can be measured by laboratory analysis using a biochemical methane potential test. However, these studies are quite time consuming and other less time consuming methods are needed to determine the energy potential of the maize crop at different stages of growth. This study aims to predict the theoretical biomethane potential (TBMP) of maize by combining aerodynamic field data with machine learning algorithms. Unmanned aerial vehicle (UAV) flights over the maize fields were carried out at different stages of maize growth. Remote sensing images were collected during the flights. Separate images at different wavelengths of the electromagnetic spectrum (R, G, B, NIR and RED-EDGE) were used to create seamless orthophotos. Using the composite orthophotos, each point (pixel) of the orthophotos was converted into vegetation index values and their average values were extracted from the maize field areas under study. Once the maize had reached physiological maturity, a chemical analysis of its dry biomass was carried out and the theoretical methane potential calculated. The vegetation indices and the theoretical methane potential were then used to build machine learning regression predictive models. The models were used to predict the energy potential of maize biomass and the results were visualised in maps. The results showed that the GLM prediction model accurately predicted TBMP values throughout the maize growing season, with the most accurate prediction results obtained during the R3 maize growth stage.

8. Technology readiness level: 4. Technology validated in lab

9. Effect:

10. Argumentation: A method has been developed and tested to predict the energy potential of maize biomass at different growth stages by combining aerodistance and field data and using machine learning algorithms.

11. Project description: -

12. Project: Remote sensing of the energy potential of maize plant biomass

13. Education institution : -

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15. URL: -

16. Images:

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17. YouTube: -

18. Documents: -