

Satellite-based estimation of herbage mass: Comparison with destructive measurements and UAV model estimation

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Introduction & Research Question

- Although some farmers use tools such as rising plate meters (RPM) to estimate herbage mass (HM) for pasture management, there is still considerable potential for optimisation.
- New technologies have brought new estimation methods, including aerial photos taken by unmanned aerial vehicles (UAV) (Sutter et al. 2021) or satellites.
- Study aimed to test Pasture.io under practical conditions on Swiss dairy farms and compare it to RPMs and UAVs.

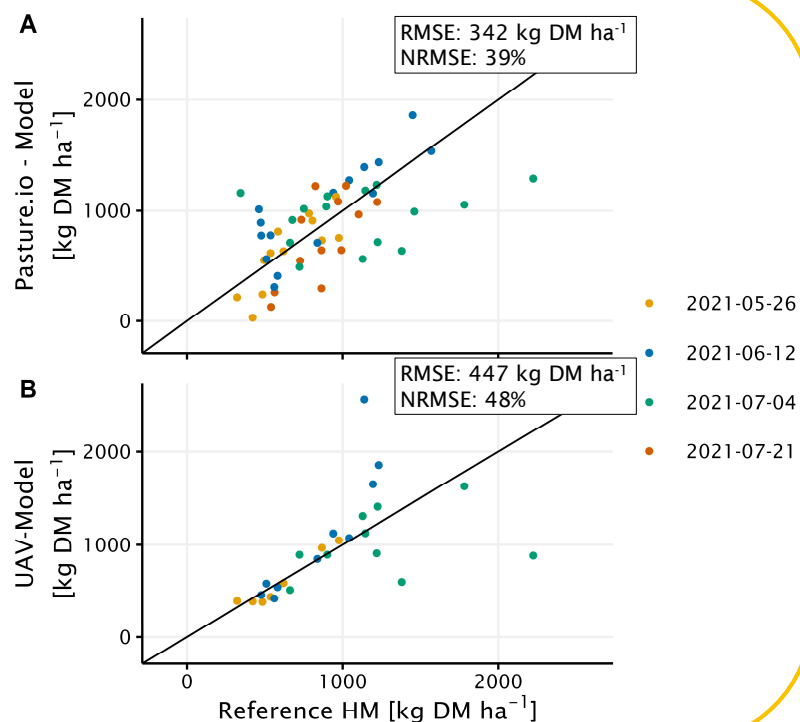
Materials & Methods

- Four paddocks on three different dairy farms were studied in May, June and July 2021.
- The input data for the Pasture.io model are satellite data, weather data and the amount of herbage grazed.
- The Pasture.io model corrects its HM estimations based on the amount of herbage ingested by the grazing animals.
- Five experimental plots per paddock were cut with a lawnmower at a height of 5 cm over an area of at least 1 m² and the herbage was dried to calculate the dry mass per hectare.



Results & Discussion

- A similar approach by Askari et al. (2019) based on the Sentinel-2 satellite data resulted in a RMSE of 600 kg DM ha⁻¹ or NRMSE of 32%, thus achieving comparable values to our Pasture.io results (Figure A).
- The deviation of HM estimation by the UAV-model had an NRMSE of 39%, substantially higher than observed in previous trials (Sutter et al. 2021) (Figure B).
- One possible explanation for the poorer performance of the UAV-model could be related to the botanical composition of the pastures (multi-species vs. fewer species).
- It is challenging to define five representative locations within a semi-natural multi-species pasture area of > 1 ha for field measurements.
- Therefore, it is possible that the field measurements did not fully represent the entire area.



Take Home Message

- The average paddock size in the study was 1.2 ± 0.46 ha. It thus seems possible to estimate HM adequately using satellite data, even on small farms as in Switzerland.
- Pasture.io was also compared to RPM measurements and both methods were found to estimate HM with similar RMSE (data not shown).

References

- Askari MS, McCarthy T, Magee A, Murphy DJ, 2019. Evaluation of Grass Quality under Different Soil Management Scenarios Using Remote Sensing Techniques. Remote Sensing, 11 (15), 1–23.
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