

Smart Agriculture Research

2023 Summary: Moisture Deficiency Insurance with Soil Moisture Measurements & Planet's Soil Water Content Variable

INTRODUCTION

Olds College Centre for Innovation (OCCI) continued its work from 2022 with Agriculture Financial Services Corporation (AFSC) on improving forage biomass estimations for its Moisture Deficiency Insurance (MDI) product.

In 2023, the project included an expanded scope of work to include Planet's Soil Water Content Variable as an additional dataset for forage yield modeling. OCCI also conducted a study to measure environmental variability within a township, specifically of environmental factors that influence forage growth.

OBJECTIVES

- Continuing the development of forage yield estimation models using AFSC datasets.
- Inclusion of Planet's Soil Water Content Variable (SWC Variable) into the forage yield estimation models.
- Comparisons of soil moisture measurement methods and tools.
- Calculating the variability of environmental factors within a township that are expected to influence forage yields.
- Identifying relationships of measured environmental factors to forage yields.

STUDY DETAILS

- Data modeling used 12 years of historical AFSC data.
- 10,000-acre dataset of Planet's SWC Variable.
- Six sites with township 32-1-W5 (surrounding Town of Olds) equipped with sensor equipment and used for monthly plant and soil measurements.
- Site equipped with Pessl Metos ECO D3.
 - Precipitation
 - 2 x soil water tension sensors (5 cm, 50 cm)
 - 2 x 60 cm soil temperature and moisture probes (capacitance)
- Monthly measurements.
 - Physical soil moisture for lab analysis at two depths
 - Forage NDVI
 - Forage yield via clips

RESULTS

- Four forage yield prediction models were produced, informed by AFSC historical datasets and Planet's SWC Variable from 2010-2022.
- Using data collected from township 32-1-W5 for the 2023 growing season, a regression analysis produced an R-squared value of 0.86 for forage yield - it included NDVI, 5 cm soil water tension and precipitation.
- Precipitation and Planet's SWC Variable measurements were not significantly different across any of the 6 sites within the 32-1-W5 township.
- All other variables measured were statistically different for at least 1 of the 6 sites, including measurements such as NDVI, soil moisture, forage yields and soil temperature.
- Planet's SWC Variable values for the buffers of 100 m and 200 m were very comparable for the entire season.

FUTURE RESEARCH

AFSC and OCCI are defining a project for 2024 to assess and include additional datasets within the developed forage yield estimation models.



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