Improving Corn Nitrogen Use Efficiency Using Unmanned Arial Vehicles Linked to Crop Modeling and Yield Mapping Technologies

2013 - 2014 Research Report

Project Leads:

Dr. Bruno Basso and Mr. Ryan Nagelkirk

Dept. Geological Sciences

Michigan State University

This research group set out to use remote sensing (drones, plans and satellite) to detect reflectance changes correlated with yield.

This work is a step toward developing a system in which remote sensing is used to detect early season crop stresses and crop modeling is used to determine treatments with the highest probability of increasing yields while also minimizing environmental impact.
Farmer's yield maps were used to create a stability map which can describe the areas of a field that are consistently high or low yielding over time and unstable areas where yields are more variable from season to season. Veris soil conductivity maps were also generated.

Data from remote sensing was then collected to provide a third level of information. Visible spectrum imagery with the Red Vegetative Index (RVI) provides value (color) differences that correlate with the yield map from the same year. This indicates that the RVI could serve as an indicator of crop performance during the season. Unfortunately, the indicators become most apparent late in the season, when it might be impractical to change management

Imagery from satellite data also showed promise. The differences are most apparent when using the Green Normalized Vegetation Index (GNDVI) and the Combined Vegetation Index (CVI). The early detection of crop performance would allow sufficient time for a change in management to address issues in the field.

Interestingly, by the end of the season (September) CVI was no longer a good indicator, whereas GNDVI, the Normalized Difference Vegetation Index (NDVI), and the Normalized Difference Red Edge Index (NDRE) were good indicators. This suggests that different indices should be used at different times in the growing season, with GNDVI being useable at any time. For this reason, GNDVI is likely to be the best index of the four to use when assessing performance in maize.

Click here to access the full research report for this project.

Corn Marketing Program of Michigan
13750 S. Sedona Parkway, Suite 5
Lansing, MI 48906
888.323.6601
corninfo@micorn.org