



Digital Phenotyping

# *Using Sensor-Based Technologies for Measuring Crop Responses*



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# In Crop Protection Digital Phenotyping Is Playing A Key Role in Running Field Trials that Drive Decisions

Why we use digital platforms and assessments in crop protection development

## Harmonization at Scale

Provide **consistent and precise measurements**

Open opportunities for **new insights**

## Innovation

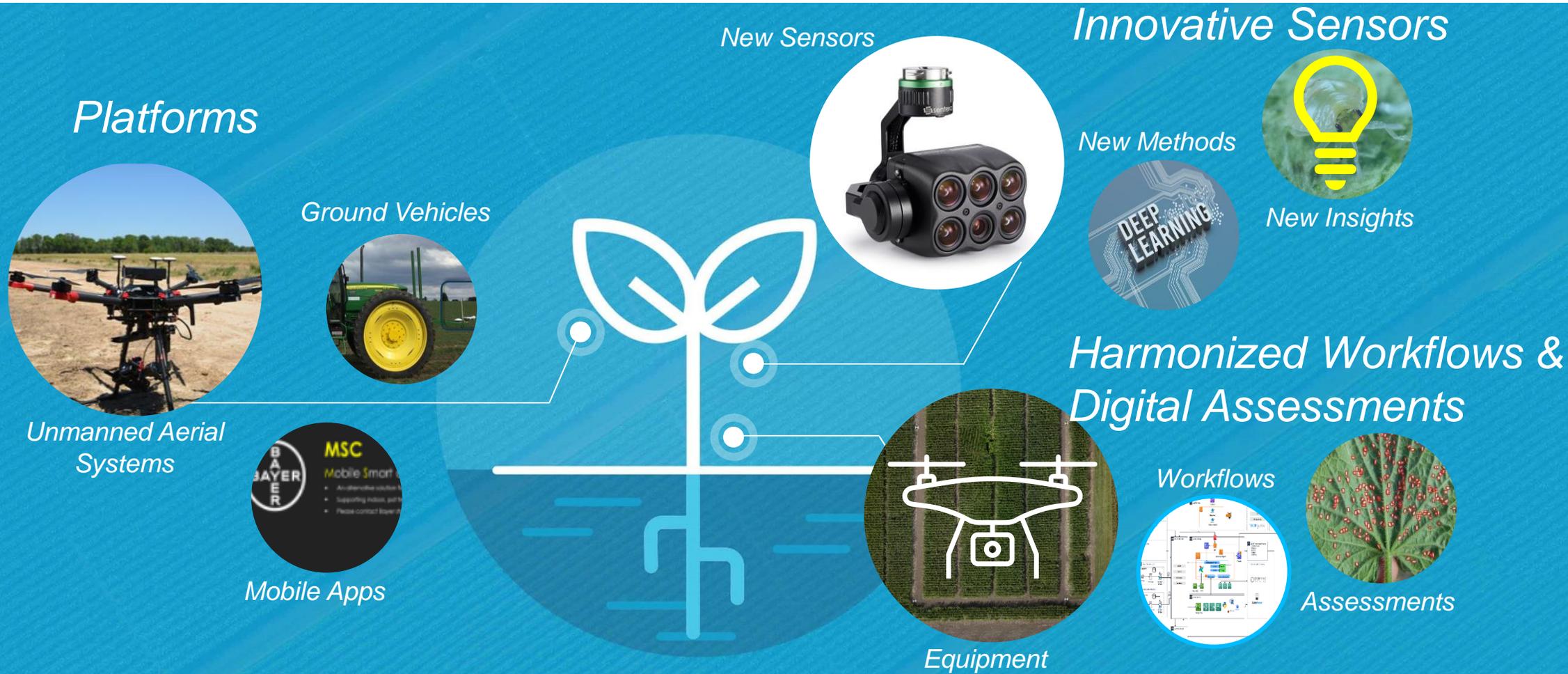
Going beyond state-of-the-art by **augmenting manual assessments**

## Better Decisions

Drive decisions by **bringing consistent data to decision bodies**

Digital Phenotyping technologies can help in **quantifying product efficacy** with insights on **plant growth and health.**

# Automation and Harmonization of Phenotypic Data through Next-gen Sensors and Platforms will Improve Decision Making



# Digital Data Acquisition to Assessments and Insights

Flow of Raw Data to Meaningful Assessment

## Data Processing Flow

*Trials Planned*



*Trials designed and data collection strategy prepared*

*Data Collected*



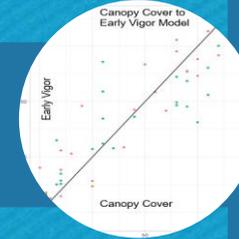
*Data collected over trials*

*Metrics Generated*



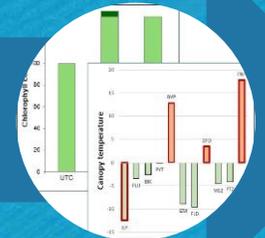
*Data processed to get plot level metrics*

*Assessments Modeled*



*One or more metrics modeled to provide a treatment assessment*

*Value Added Analysis*



*One or more assessments used to make product advancement decisions*

# Aerial Phenotyping

Consistent and precise assessments of field trials from aerial imagery

## Phenotyping Platform

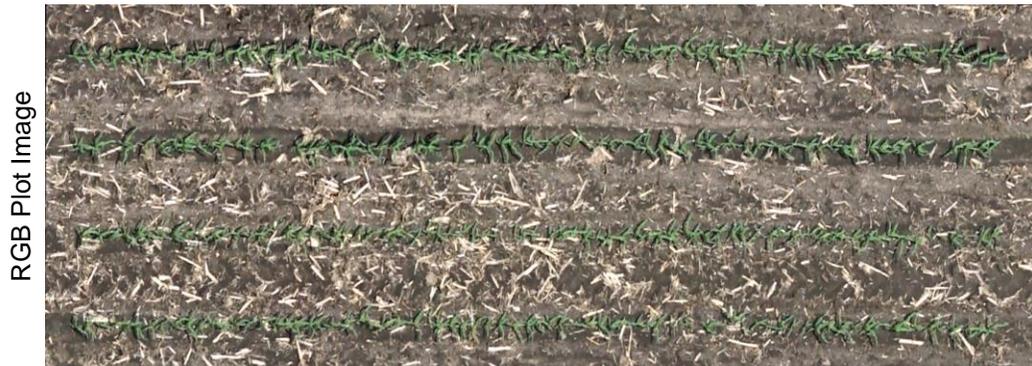


RGB, Multispectral & Thermal

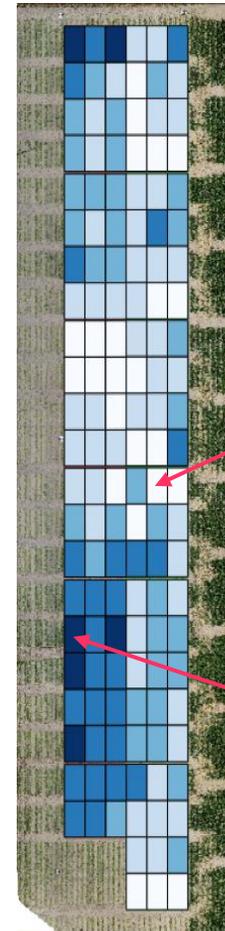


// Some assessments of interest:

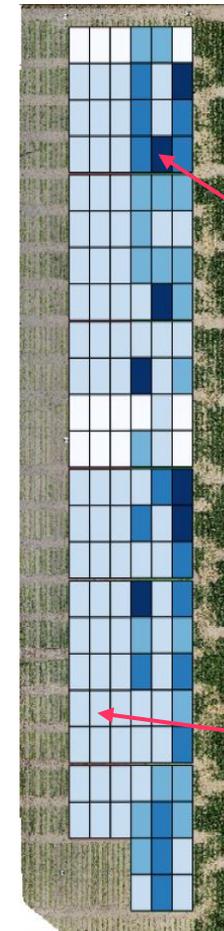
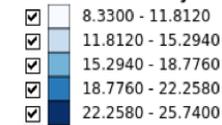
- // Early Vigor
- // Stand Count
- // Phytotoxicity
- // Plant Height
- // Biomass



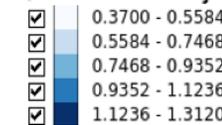
RGB Plot Image



Canopy Cover



Uniformity



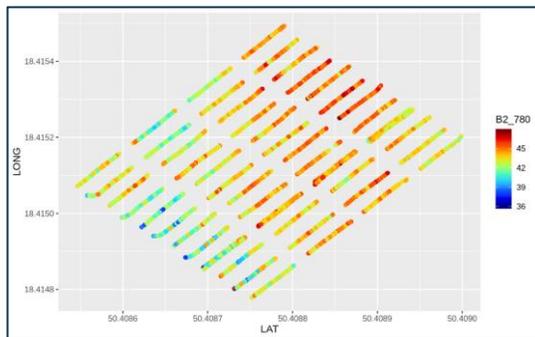
# Ground Phenotyping

Deriving new insights on field trials through sensors

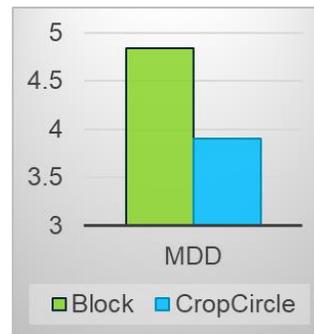


## Crop Circle - IoT Device

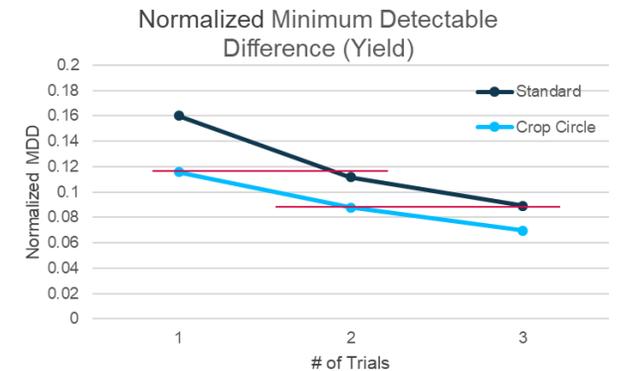
- // **Environment conditions:** solar energy, canopy reflectance, temperature, humidity and pressure
- // **Physiological metrics:** canopy chlorophyll, Leaf Area Index, fraction of absorbed radiation, canopy temperature departure



Capture crop health variation prior to application



Include plot health aggregates as covariate in model

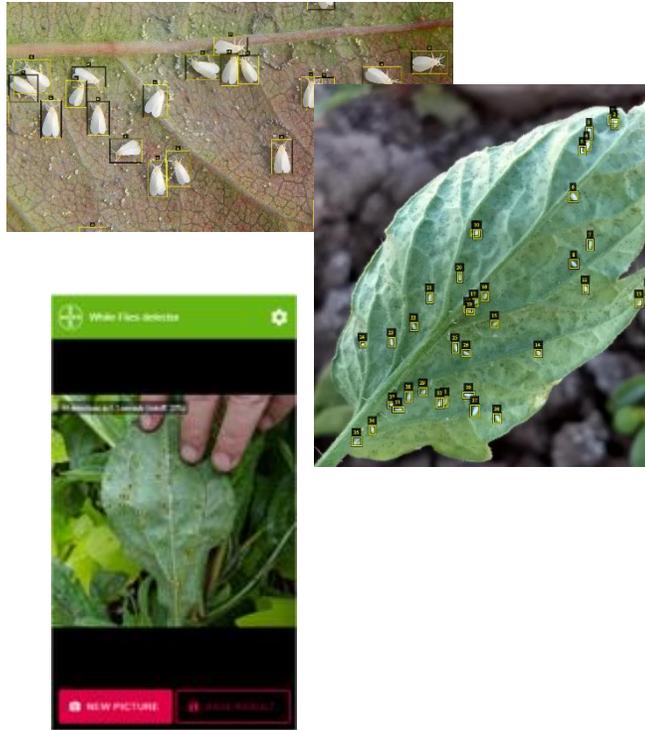


Improve detectable differences in yield comparable to running an additional trial

# Mobile Phenotyping

Driving efficiency through in-field objective assessments

## Whitefly Counting



Assessment of pest infestation

## Fusarium Head Blight



Assessment of disease severity

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## Summary

### Harmonization

Provide **consistent and precise measurements**

Open opportunities for **new insights**



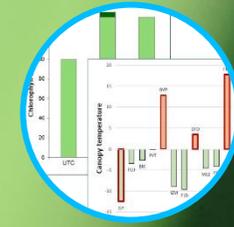
### Innovation

Going beyond by **augmenting manual assessments**



### Decisions

Drive decisions by **bringing consistent data to decision bodies**



Harmonized assessments through innovative technologies will create a more robust decision support system for product advancement.



*Thank you!*



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