What is required to close the gap between greenhouse and field phenotyping?

Plant and Animal Genome | San Diego 2015

Grégoire Hummel
Yield is not a trait!

Which "building blocks" are linked to yield improvement in target agro-ecology?
How we developed FieldScan
Water extraction pattern in Millet

Stress

Flowering

WU (kg plant$^{-1}$ week$^{-1}$)

0 1 2 3 4

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

Weeks after panicle emergence

Vadez et al. 2013 – Plant Soil
Water use dynamics = LA x LA conductivity

Kholová et al. 2010
Journal of Experimental Botany
Requirements

• Field/Semi-field approach
• Experiments with at least 500 genotypes and 5 replications
• 10 measurements of leaf area/day
• Rapid access to water use dynamics (24 measurements)
• Rapid evaluation of environmental effects
FieldScan – High Throughput Phenotyping

PhenosPex
FieldScan – Carrier Device
PlantEye F300
3D Raw and Segmented Maize Plant

Automated computation of:

- Height
- Total leaf area (3D)
- Leaf/plant count
- Leaf angle distribution
- Leaf coverage
- Biomass Estimation
- Growth rates
- Early vigor
- Germination assays
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FieldScan – Gravimetric Module
FieldScan – Environmental Module
Transpiration response to soil drying (Peanut)
Phenotyping Pipeline

PlantEye
- Access parameters
- Perform further analysis in R
- Advanced Tool

DroughtSpotter
- Access parameters
- Perform further analysis in any language
- Expert tool

Environment
- Check data quality
- Access Parameters and RAW data
- Export data to CSV or PLY
- Beginner tool

Further Plant Sensors
- Check data quality
- Access Parameters
- Portable beginner tool

R
- The R Project

SQL
- SQL Statement

Browser Access

Tablet
Thanks for your attention

phenospeX
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PlantEye – Mobile Device for testing on site