Smart phenotyping strategies for gene bank collections: a focus on crops with a long crop cycle and perennials

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Challenges

• What traits are determining a breeding product?
  • Conditional effects of traits!
    • What to measure?
    • How to measure it?

• Long crop cycle → huge influence of environment on the traits → spread of yield over time.
What to measure, how? → Infrastructure

Controlled conditions

Research field station

Citizen science in farmer’s fields

Images from: https://emphasis.plant-phenotyping.eu
To what extent are detailed traits related to yield?

Images from: https://emphasis.plant-phenotyping.eu
Challenge of scale of measurement

- Canopy/field: $M^2$ months/years
- Plant: $cM^2 \sim$ days/weeks
- Organ: $cM^2 \sim$ minutes
- Cell: $\mu M^2 \sim$ minutes

Images from: https://emphasis.plant-phenotyping.eu
Modeling fluctuating environments and future local climates

Image from: https://emphasis.plant-phenotyping.eu
Join forces across centers, countries and regions

Plant phenotyping initiatives to address the demand

Slide from Uli Schurr https://emphasis.plant-phenotyping.eu
Strategy

Genetic characterization

Controlled environment  Green house  Field

Market & climate research / Seed systems / (pre)Breeding
Clara Gambart
Integration of phenotyping and omics

Allele specific proteins

Carpentier 2020
General plant growth and behaviour

![Graph showing plant growth and behaviour over time for Cachaco and Mbwazirume. The graph compares normalized A (black) and g_s (orange) for Slow and Rapid conditions.]
Risk taking

Conservative

Eylan et al 2021 Plant physiology
https://kavive.shinyapps.io/rtbclimateportal/

Risk taking wins

Conservative one taking wins

Lewis Machida  Noel Madalla
Partnerships & funding