

European Infrastructure : Multi-scale Plant Phenomics and Simulation for Food Security in a Changing Climate

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Grand Challenges: Food security, Climate Change and Resources



Climate change



Food







Energy





Natural resources



Phenotyping is a bottleneck







- the bottleneck in basic plant science and plant breeding
- Novel opportunities for phenotyping develop from interdisciplinary approaches
- mechanistic, high-throughput and field-based platforms
- Europe has a global leadership in plant phenotyping

A rapidly developing research field with strong demand in infrastrucures



EMPHASIS

2008

A rapidly developing research field with strong demand in infrastrucures



CROP.SENSe.net

2015

EMP

Phenotyping requires cooperation















European projects/ networks



European Infrastructure

European Infrastructure for Multi-Site Plant Phenotyping And Simulation for Food Security in a Chancing Climate

EMPHASIS infrastructures



Phenotyping platforms for high resolution, high throughput phenomics

Intensive field sites for high throughput phenomics

Network of practical field experiments for lean-phenotyping

Modelling for improving phenotypic processes and for testing existing or virtual combinations of alleles in a variety of climatic scenarios and management practices







High-resolution phenotyping (controlled environment)



Root parameters



High-throughput phenotyping (controlled environment)





Root Carousel Jülich



PhenoArch, Montpellier



GrowScreenRhizo, Jülich

Intensive field sites for high throughput phenomics



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Stationary field sensor networks







Flying platforms

Lean-phenotyping sites close to breeders



Portable sensors

("cheap")





Easy carriers



Flying platforms



Modelling for virtual testing of crop-environment interaction



2800

Disentangling complex traits Genetic analysis of complex Crop – climate optimisation traits 20 Rª = 0.39 Spr 12 Aut 13 Spr 13 Leaf growth rate 5 0.5 C 0.0 20 R^a = 0.67 Spr 12 ŝ Aut 13 ÷ Spr_13 1.0 0.5 0.0

What is the relationship between root structure and nutrient use efficiency?

What is the sensitivity of leaf growth to drought?

PSI

-7

Which genotype would work best in which environment scenario?



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