RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

INRAE

Genomic selection of *Miscanthus sinensis*
Deal with age effect in modeling

UMR Transfrontalière BioEcoAgro
Manuel Derrien, Séverine Monnot, Maryse Brancourt-Hulmel

Objectives

Miscanthus x giganteus is a **C4 perennial rhizomatous** grass used for **biomass** and **ecosystem services** that takes up to four years to reach its 'plateau' yield**.** This PhD aims at **accelerating miscanthus breeding** by **predicting mature traits** since the first year from genotypic data, enabling to fasten breeding cycles while enhancing breeding efficiency.

M. sinensis is studied as a potential **biomass crop** and as one of the parents of the **monoclonal** interspecific **hybrid *M. × giganteus*** and thus serves as one of its **genomic diversity base**.

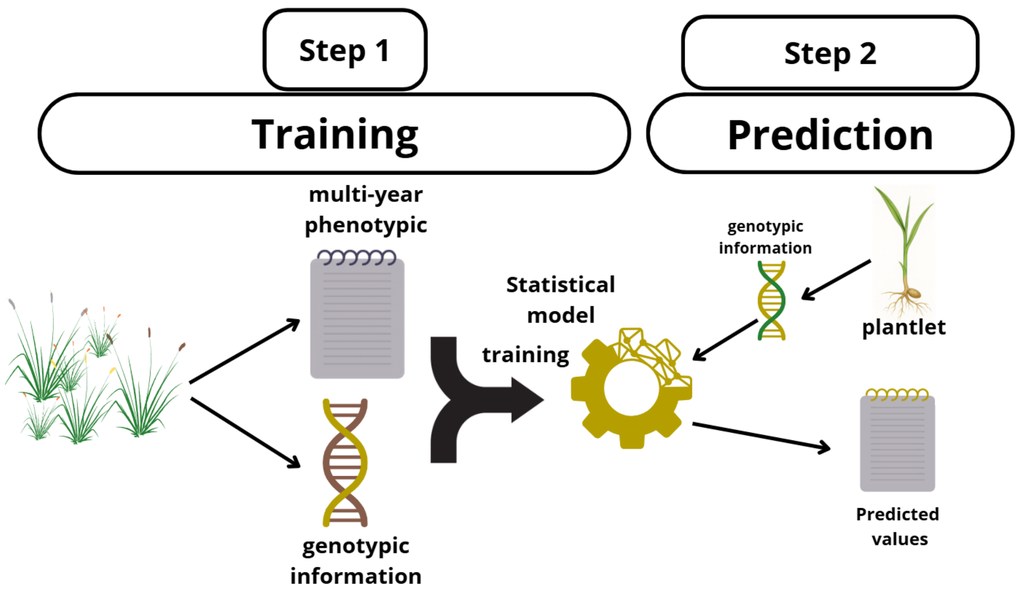
Introduction on *Miscanthus sinensis*

• Biology	• Agronomy
Perennial	Up to 25 years in field
C4	High biomass potential
Rhizomatic	Clonable
Heterozygous & allogamous	High diversity and adaptability at F1 pop
Nitrogen recycling	Low nitrogen need & input
Parent of cultivated interspecific hybrid	Potential candidate to broaden varietal offer

End Uses & Applications

Introduction genomic selection

Genomic selection uses historical genomic and phenotypic data to predict the genetic value of new genotypes from their genomic information only.

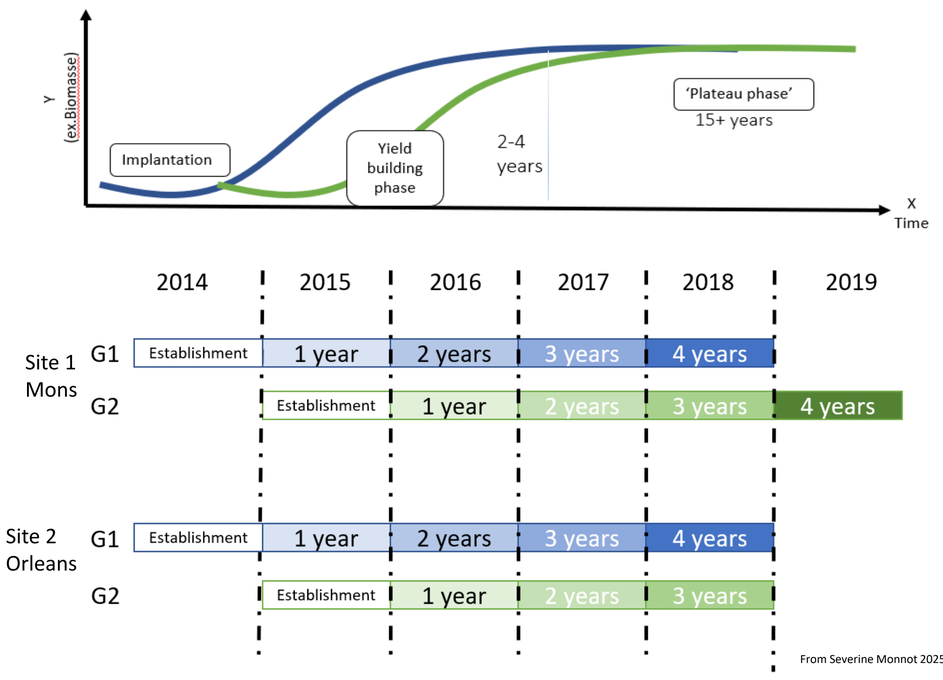


Predicting phenotypes and **prioritizing crosses** in **perennials** is highly valuable due to the **extended time** required for the plants to **express a mature phenotype**.

Methodology

M. sinensis requires **2–4 years to establish in the field** before maintaining a **production plateau.**

A **staggered-start design** was established to distinguish **plant age effect** from **year effect.**

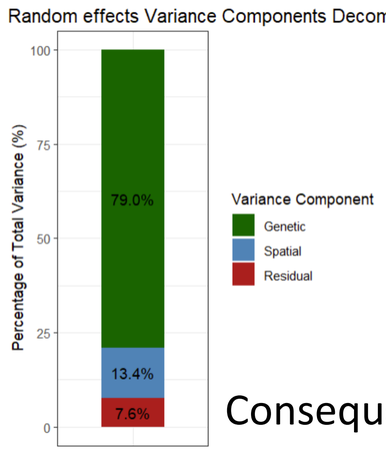


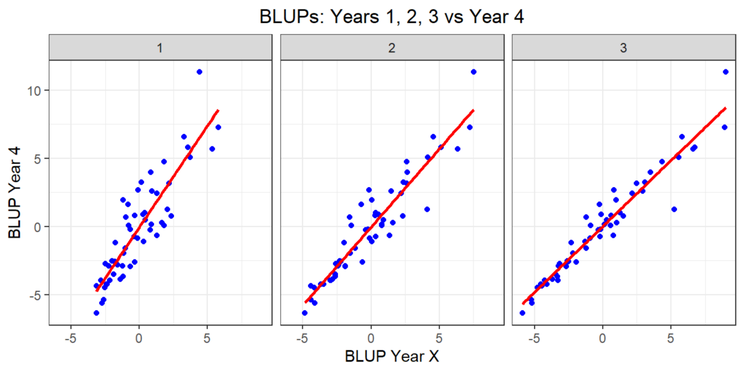
This study focuses on 11 traits related to biomass: **composition**, **production** and **phenology**.

We used a **GBLUP** model with the Van Raden relationship matrix fitted with the mmes function of **sommer** R package.

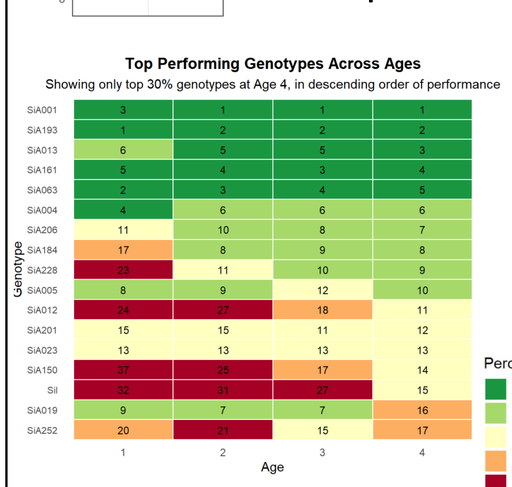
Preliminary results (on biomass)

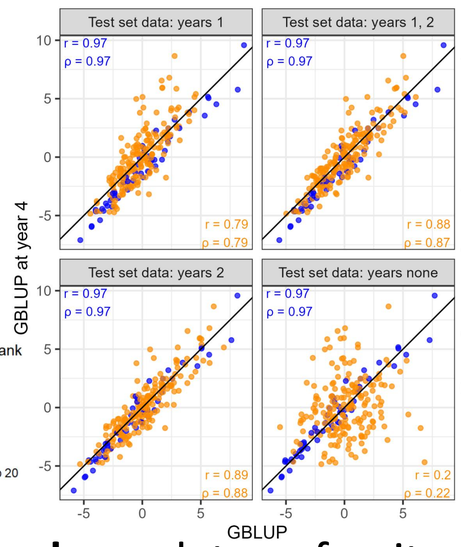
The **GBLUPs** models show excellent **heritability and consistency**, thus supporting the quality of the dataset and further decomposition.





Consequence on **breeding strategy** to **prioritize crosses:**





Year 1 data degrade plateau-yield predictions.

Year 2 phenotyping alone supports a two-year selection cycle.

To extend the **two-year cycle** and transfer its gains to ***M. × giganteus***, the other parent, ***M. sacchariflorus***, must be screened for similar **age–genotype–phenotype relationships**.

Centre INRAE **Hauts-de-France Estrées-Mons**

INRAE
2 Ch Brunehaut,
80200 Estrées-Mons
manuel.derrien@inrae.fr