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Genebank diversity as fuel for breeding

The tropical forages case

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Variety Development Pipeline (VDP)

Product Design

Pre-breeding & Breeding Tools

Breeding & Product Testing #1

Product Testing #2

Pre-production & Registration

Product Dissemination & Commercialization

¿Who is our target market?



Size? Is the investment justified?

Which are the needs of the stakeholders?

Which are the characteristics of our dream product?



Genetics

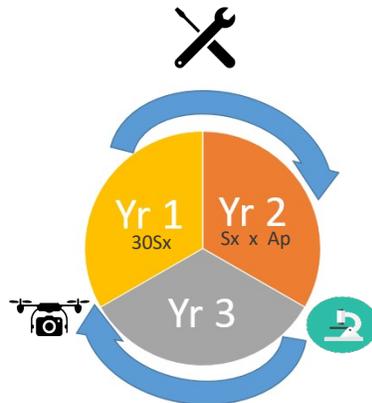
Biotic Resistance

Abiotic Tolerance

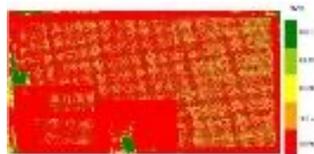
Phenomics

Marker-assisted selection (MAS)

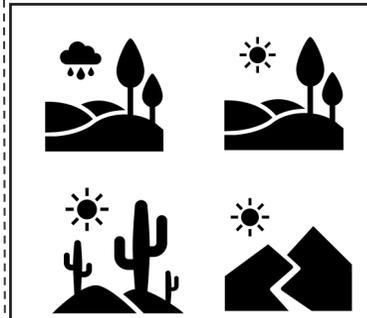
Nutritional Quality



~8000 Polyploid Apomictic Hybrids



~100 Polyploid Apomictic Hybrids

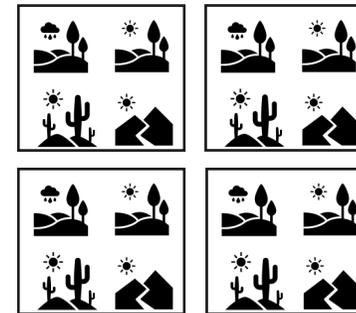
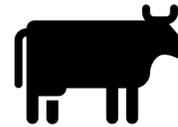


Biotic resistance

Abiotic tolerance

Forage Quality

~10 Polyploid Apomictic Hybrids



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Brachiaria interspecific:



Adaptation to acidic soils
U. decumbens (apomictic)



Spittlebug Resistance
U. brizantha (apomictic)



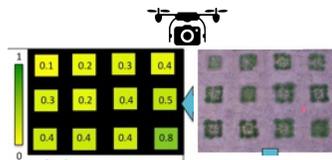
Basic Information
on cytology and
reproductive biology



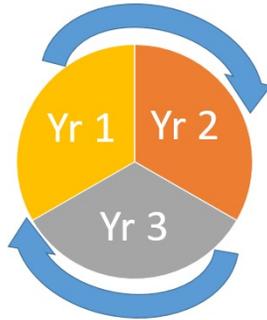
Ploidy Variation



Apomixis and MAS:
Seed asexual reproduction



Recurring
Selection



Br19 on the field 300
hybrids

1988



2001



MULATO II
2004



CAYMAN

2010



COBRA

2014



CAMELLO
2018

Br15

Br09

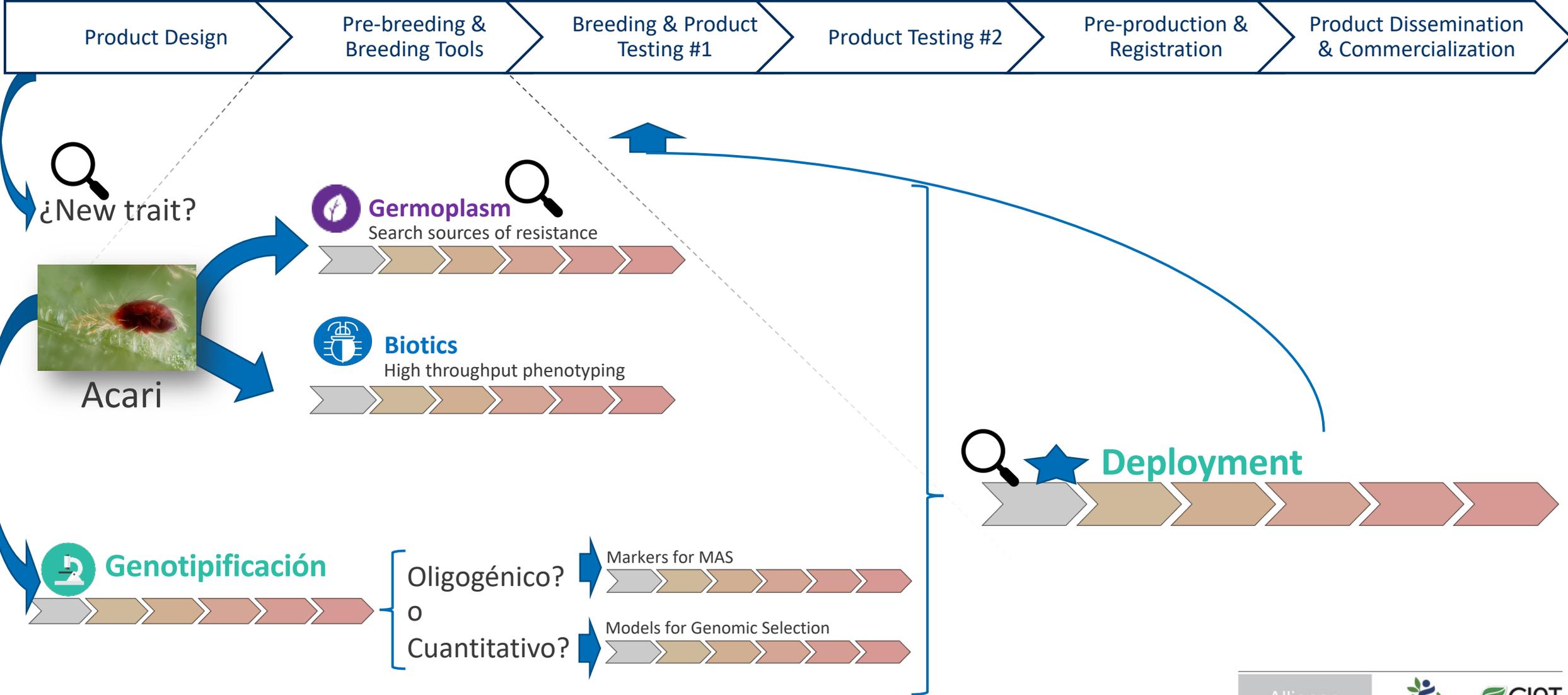
Br12

Br04

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One Example: Spider mite plans for the future: Africa



Suggested activities for the Product Design phase:

Review Previous Breeding Project Procedures and Outcomes

- Lessons learned from previous projects?

Geographic Information Systems (GIS) Studies

- Demand driven product. How many clusters of environments are we targeting? Traits required?

Multi-environmental Trials

- Are those clusters related? Can one unique product serve them all?

Value Chain Stakeholder Studies

- Describe value-chain and how our dreamed product relates to it. Traits required?

Policy Analysis

- Describes policy environment for the future product

Basic Socioeconomic Analysis

- Describes integral return of investment análisis. Traits required?

Suggested activities for the Pre-Breeding phase:

Breeding design and optimization

- Biology of reproduction – Flowering and dormancy
- Reciprocal recurrent selection – Decumbens sexual tetraploid
- Speed Breeding – Light flowering induction
- Diversity análisis and conformation of heterotic pools – Dominance/Additive effects?

High throughput phenotyping

- According to the traits defined at Stage 1 develop phenotyping tools
- Screening and search for trait donnors (Indicators: trials with heritability/repeatibility ≥ 0.3)

High throughput genotyping

- Understanding genome and SNP discovery
- Quantitative – Genomic Selection Models
- Oligogenic – QTLs identification for mapping populations and stable across breeding populations

Deployment

- Introgression (Series of BC) with the purpose to introduce a trait/QTL into an elite material



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Thank you!



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