**Review of Urochloa breeder’s toolbox with the theory of change and stage gate system approach**

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Stage 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>Informed development of Product Profile and makes the case for investment.</td>
<td>Design of an optimized breeding strategy, development of high throughput phenotyping and genotyping tools, trait introgression through deployment, and identification of core breeding germplasm.</td>
<td>Develop and evaluate hybrid progenies</td>
<td>Assessment of hybrids with best broad adaptation to TPE</td>
<td>Seed Production and registration</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>Literature » Historical data » Funding » Socioeconomic and GIS data</td>
<td>Product Profile: clear understanding of the product characteristics that needs to be pursued through breeding.</td>
<td>Tools according to Product Profile desired traits: Phenotyping, genotyping, elite germplasm</td>
<td>Population of new elite breeds with desired traits</td>
<td>Candidates for registration</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>» Review previous projects » GIS studies » Multi-environmental trials for germplasm » Value chain studies » Policy Analysis » Basic Socioeconomic Analysis</td>
<td>» Optimized breeding design » High Throughput Phenotyping » High Throughput Genotyping » Trait Deployment</td>
<td>» Recombination of sexual clones » Formation of testcross progenies » Parental reaction to MAS » MAS apomixis » Field evaluation hybrids » Per se performance in parents » Forage quality » Data analysis » Progeny testing</td>
<td>» Multi-Environmental trials » Phenotyping for seed production at commercial scale » Phenotyping for persistence, palatability and animal interaction</td>
<td>Candidates for registration</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>Alignment based on information organized in a centralized data system providing a clear understanding of the product characteristics that needs to be pursued through breeding.</td>
<td>Necessary tools have been developed/adapted according to desired traits on product profile</td>
<td>New breeds with desired traits</td>
<td>Candidates for commercial seed production and registration</td>
<td>Necessary components of the product have been developed/adapted and are ready for launching: Not only hybrid genetic and seeds but also registration and management information.</td>
</tr>
</tbody>
</table>

**Impacts**

- New product with all components available: Genetic + Seed + Information + Registration
- Launching: Communication pieces at technical level
- Logistics: National and international shipment of seed
- Supply chain and quality control
- Commercialization and product stewardship

**Acknowledgments**

We thank Gonzalo Rios, Jerson Velasco, Hector Mondé, and Nelson Amaya of Forages Team for their assistance in conducting these trials. This work was possible thanks to the funding from CGIAR Research Program on Livestock.

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**Outcome Activities**

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- **Stage 2**: Design of an optimized breeding strategy, development of high throughput phenotyping and genotyping tools, trait introgression through deployment, and identification of core breeding germplasm.
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- **Stage 6**: Launching and Dissemination.

**Input**

- Literature
  - Historical data
  - Funding
  - Socioeconomic and GIS data

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