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Introduction

Tropical forages (i.e., plants used to feed animals, mostly cattle) can lead to a more sustainable land management. Currently, the Alliance of Bioversity-Center for Tropical Agriculture, as part of the GROW Colombia project, is researching two aspects that have been somehow neglected in Colombia:

- 1) the ability to reclaim cadmium polluted land by the use of tropical grasses and;
- 2) the inclusion of multispecies pastures as a way to increase their resiliency under uncertainties such as the ones originated by the current climatic emergency.

This work is mostly performed from an eco-physiological point of view and aims to gather data from experiments under semi-controlled (greenhouse) and field conditions.

Objective

Cadmium phytoextraction potential

- To identify tropical grasses able to tolerate and uptake Cadmium.
- Test methods to extract cadmium from plant tissue that might allow the use of such tissue for another purposes (e.g., feed for animals, biofuel).

Multispecies pastures

- Testing whether there are synergies of trade-offs (e.g., productivity and tolerance to abiotic stress) in mixing different grasses and legumes.
- Test the effect of multispecies pastures on soil health (e.g., soil organic matter, soil aggregates, soil friability).

Methodology

Cadmium phytoextraction potential

1. Hydroponic solution culture experiments with 100 ppm Cadmium added (to mimic Cadmium polluted soils).
2. Harvesting of plants (fractioning of leaves, stems and roots) after 20 days of growth under solutions with or without added Cadmium.
3. Analyses of biomass accumulation under different treatments, Cadmium content in tissues and other relevant physiological responses (e.g., chlorophyll content, stomatal conductance, root elongation rates).

Multispecies pastures

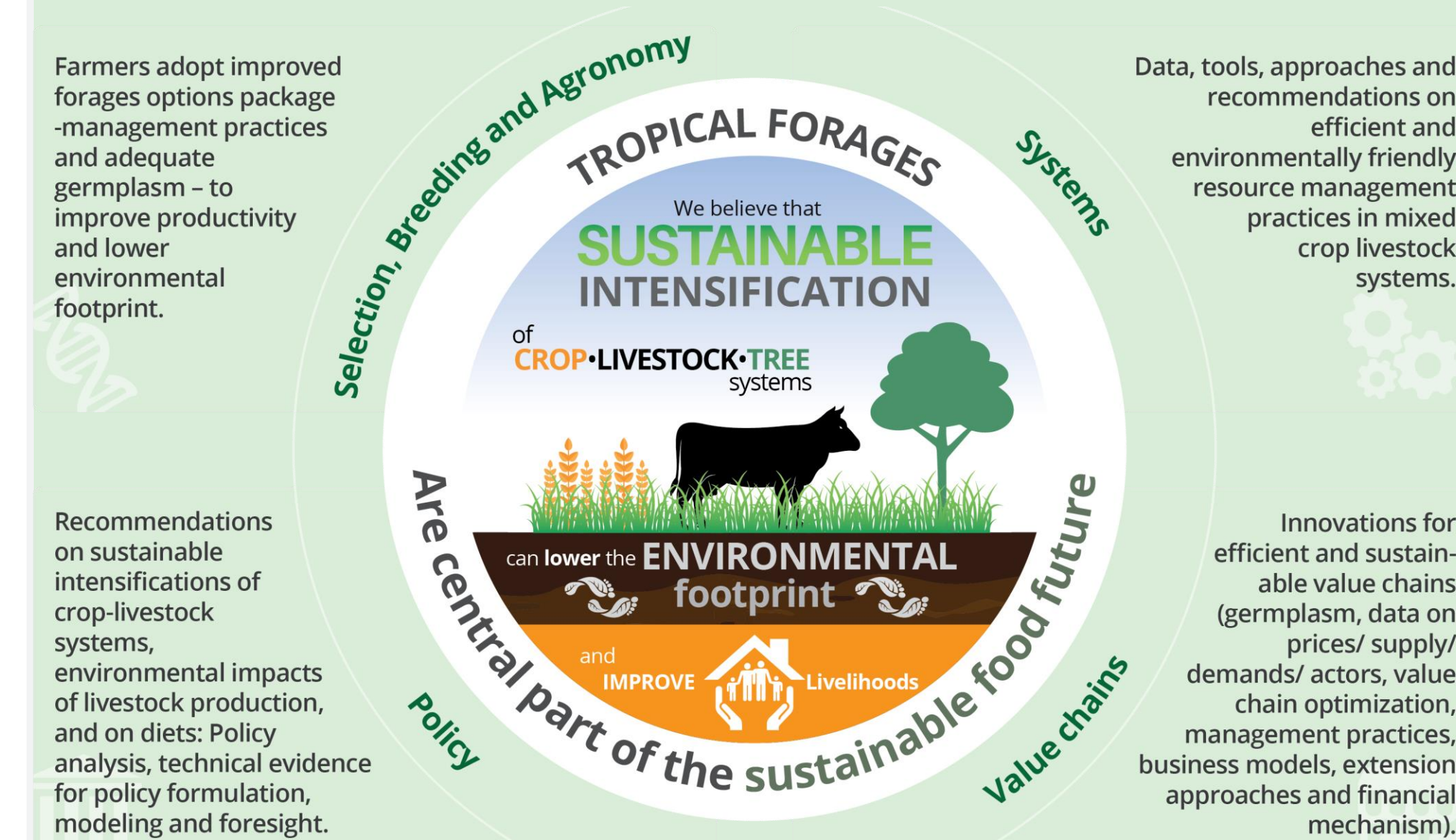
1. Greenhouse experiments: Short term experiments (~3 weeks). Different species are mixed to test if their responses under a particular stress are affected (e.g., mixing *Brachiaria humidicola*—tolerant to waterlogging— and *Brachiaria hybrid Mulato II*—sensitive to waterlogging—).
2. Field experiment: Longer term experiment recently established (November, 2019) where productivity and other parameters (e.g., protein content and fibers) will be recorded over time.

Conclusions

Our preliminary results show that:

- Among a number of grasses tested (*Brachiaria* spp., *Megathyrus maximus*, *Napier grass*), the latter one can extract significant amounts of Cadmium, to the level of a hyper-accumulator plant.
- Greenhouse studies have shown that mixing species have great potential to increase tolerance to abiotic stresses (e.g., waterlogging).
- Research is underway to test responses of a number of grasses for Cadmium phytoextraction and mixtures of species under soil and field conditions respectively.

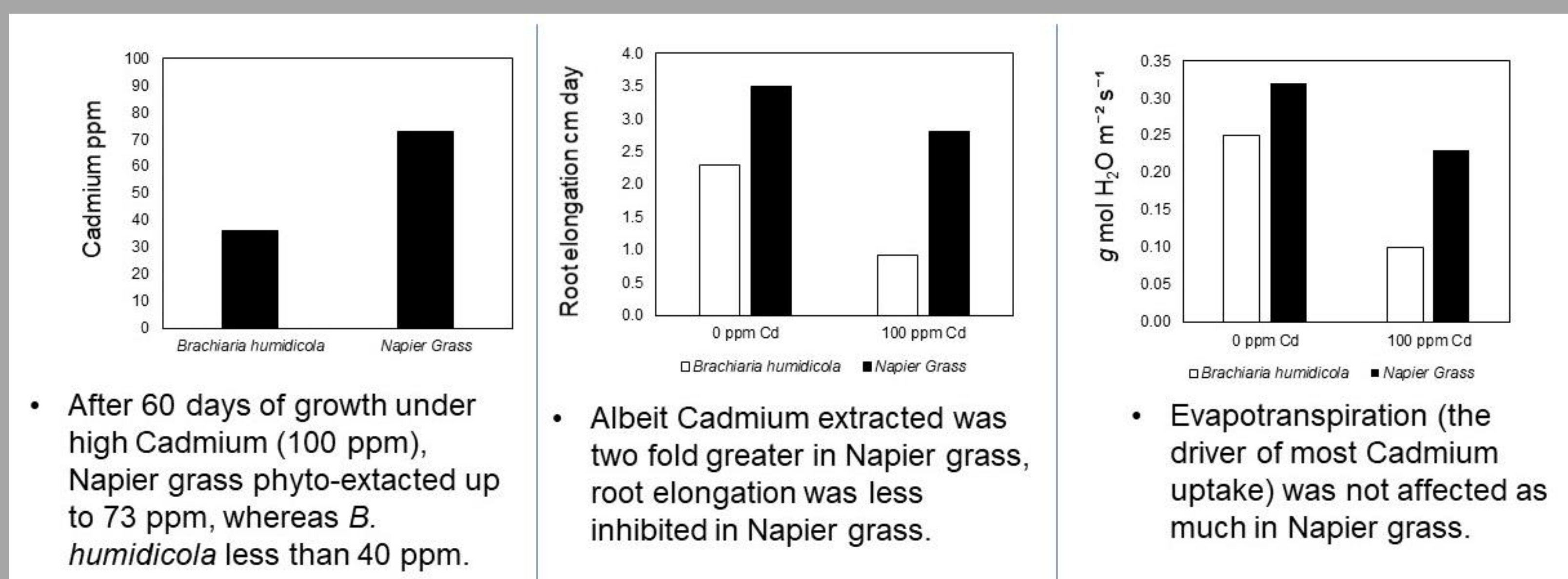
- **We expect that information originated from this project will increase awareness of the roles and utilities of tropical forages can brought up at farm, catchment and landscape levels, and also can further enrich their multifunctional use in Colombia and elsewhere.**



Results

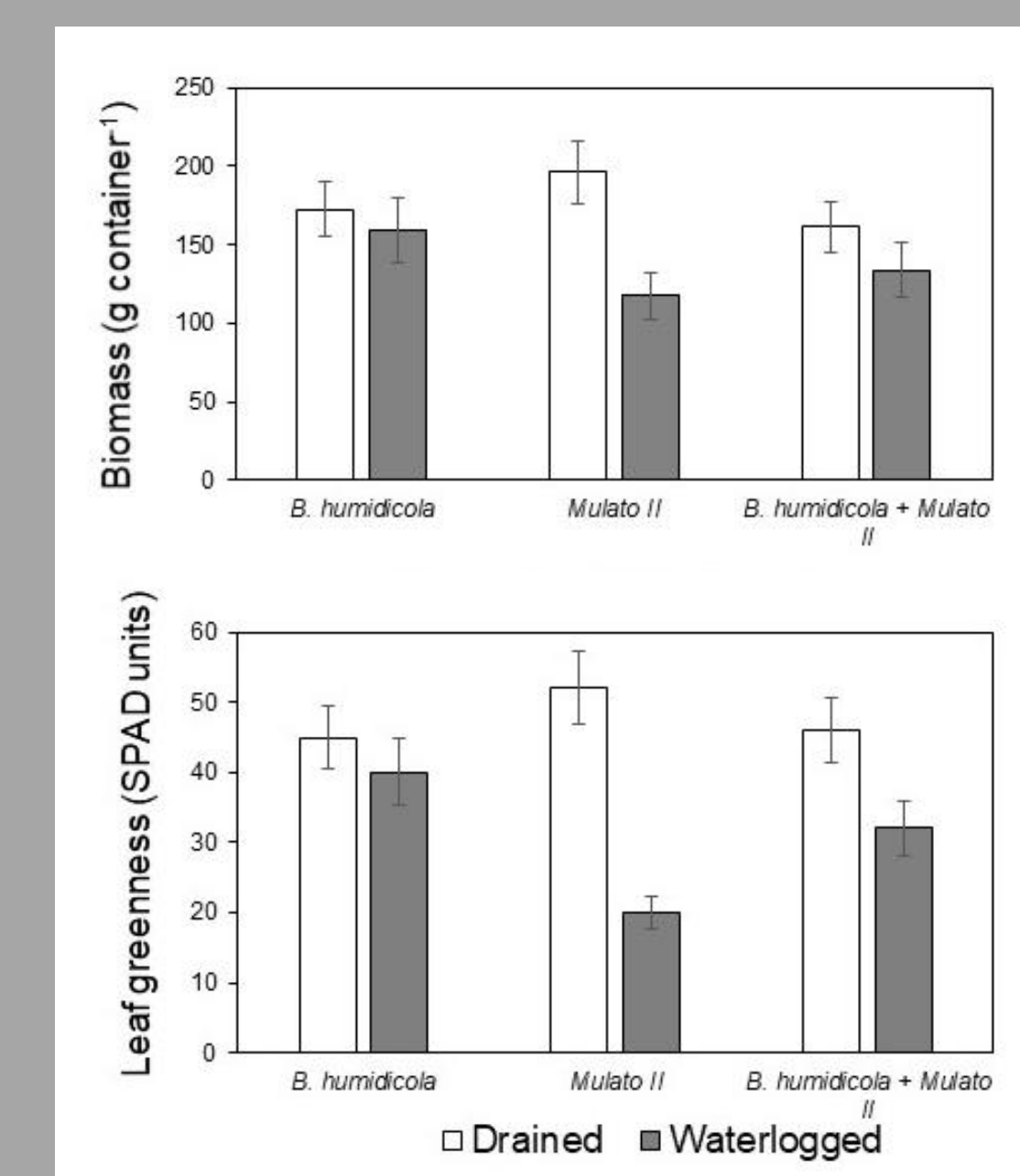
Cadmium phytoextraction potential

- Two plants with contrasting type of growth were tested (*B. humidicola*, creeping plant; Napier grass, erect one)



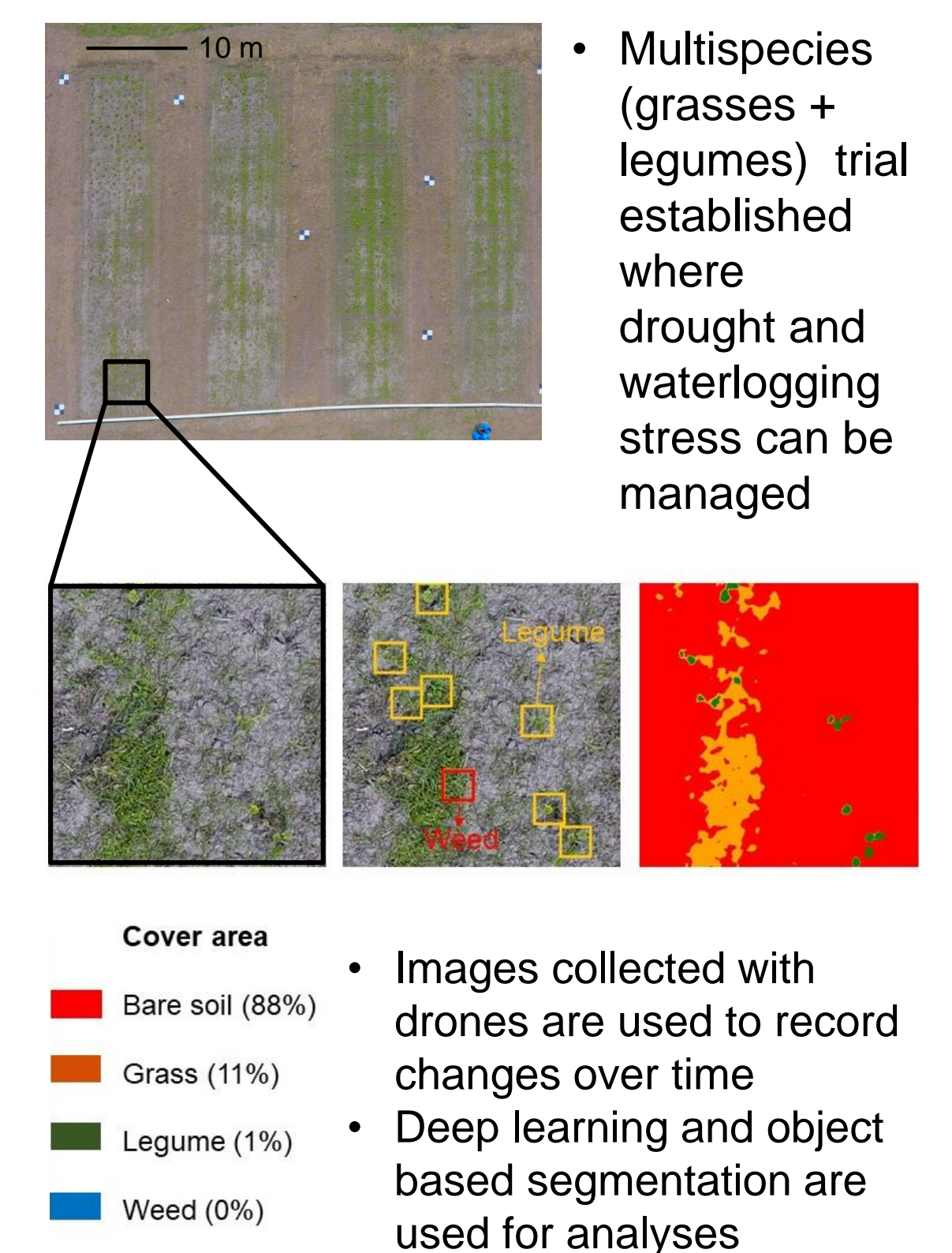
Multispecies pastures

Greenhouse experiment



- Mulato II (sensitive to waterlogging) benefits from growing together to *B. humidicola* (tolerant).

Field experiment



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