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## Contrasting drought stress recovery strategies of rice breeding lines

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## Introduction

### Background

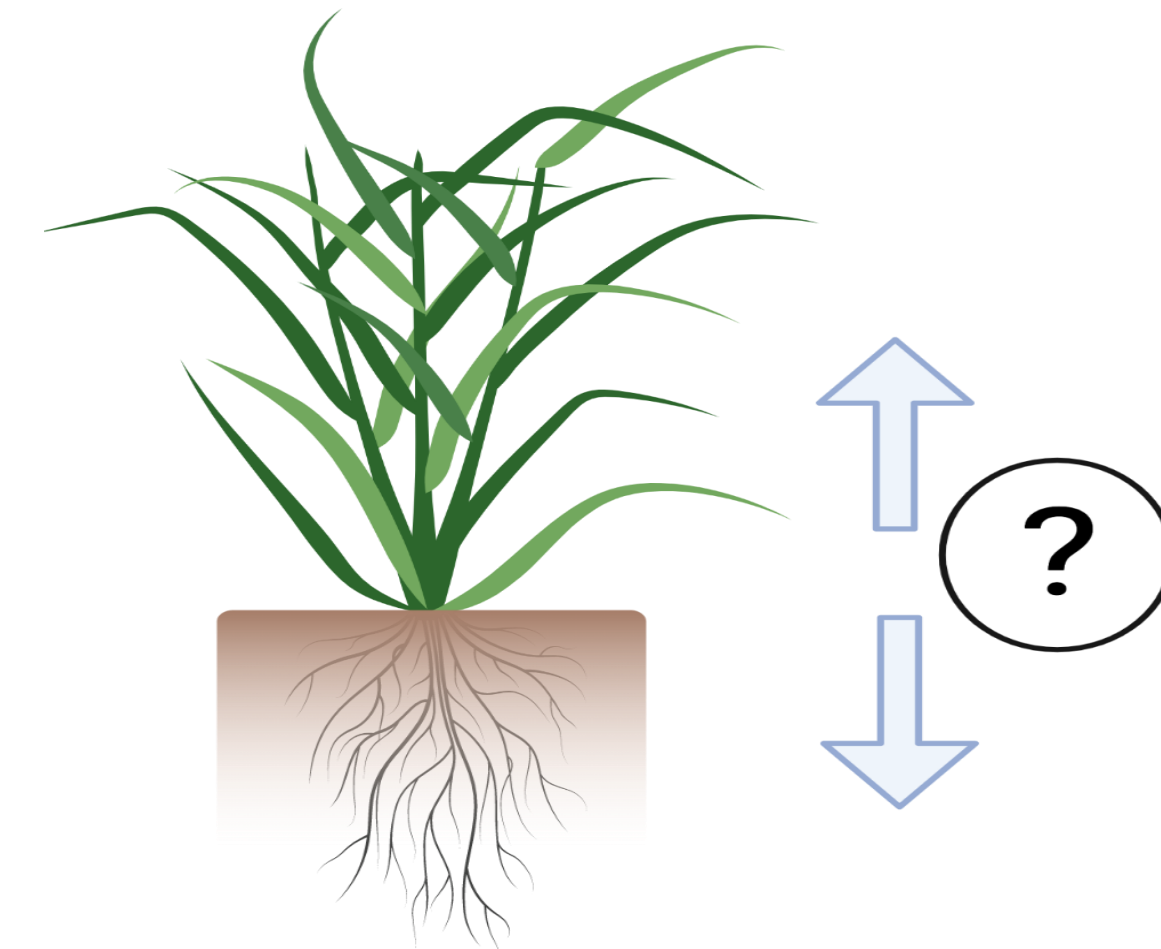
- 45% of the global rice production depends on rainfall.
- Water is a limiting factor for crop production.
- Shorter rainy seasons and longer dry spells in south-east Asia due to climate change.

### Questions

- Which root formation leads to higher drought tolerance in dry direct-seeded rice and why?
- How does re-watering influence rice root system architecture?

## Contrasting lines

### Definition\*: conservative vs less-conservative

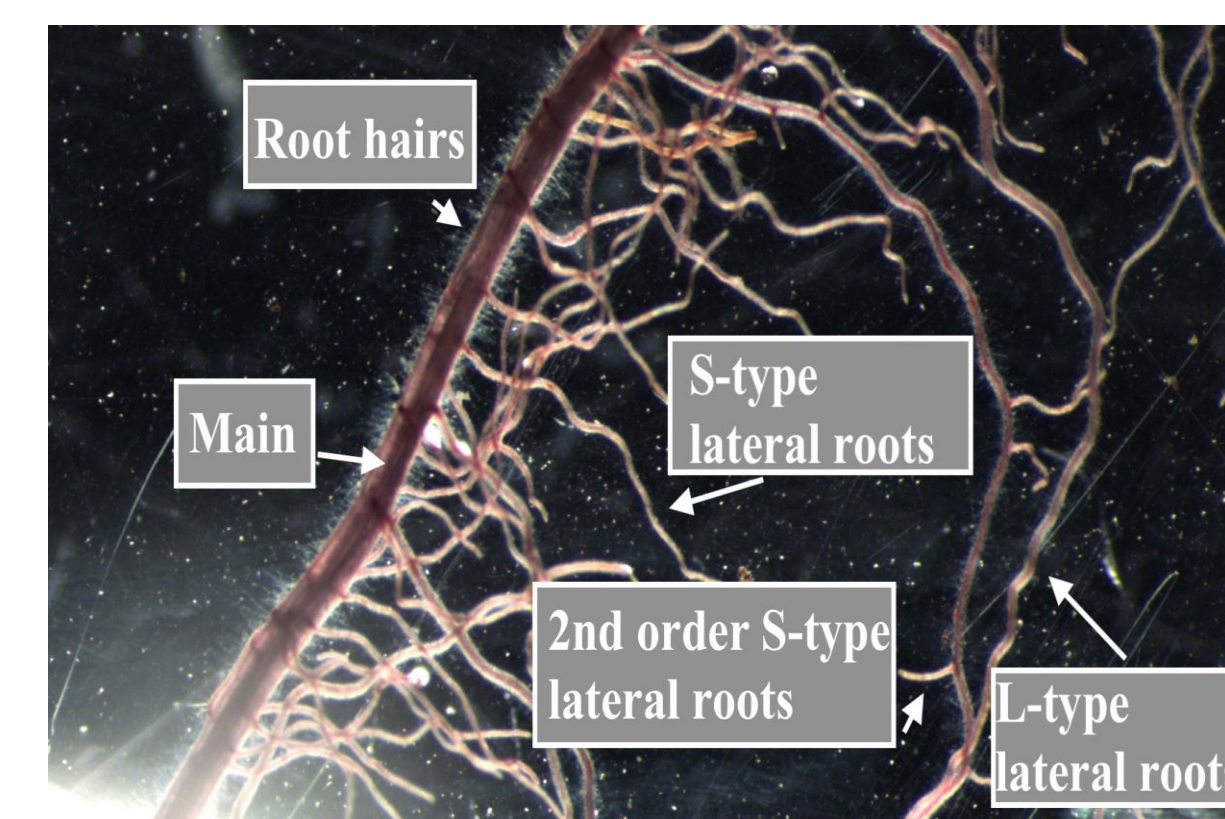


created with Biorender.com

Conservative	Less-conservative
Less shoot growth and more root growth under drought stress compared to well-watered	More or equal shoot growth and root growth under drought stress compared to well-watered

\* Marie Klein, 2018 (Masterthesis)

### Rice has an unique lateral root system



#### Rice lateral root classes:

- S-type (short): thin diameter (0-0.15 mm), non-branching.
- L-type (long): thick diameter (0.15-0.37 mm), branching in 2<sup>nd</sup> order L- or S-types.

## Conclusion and Outlook

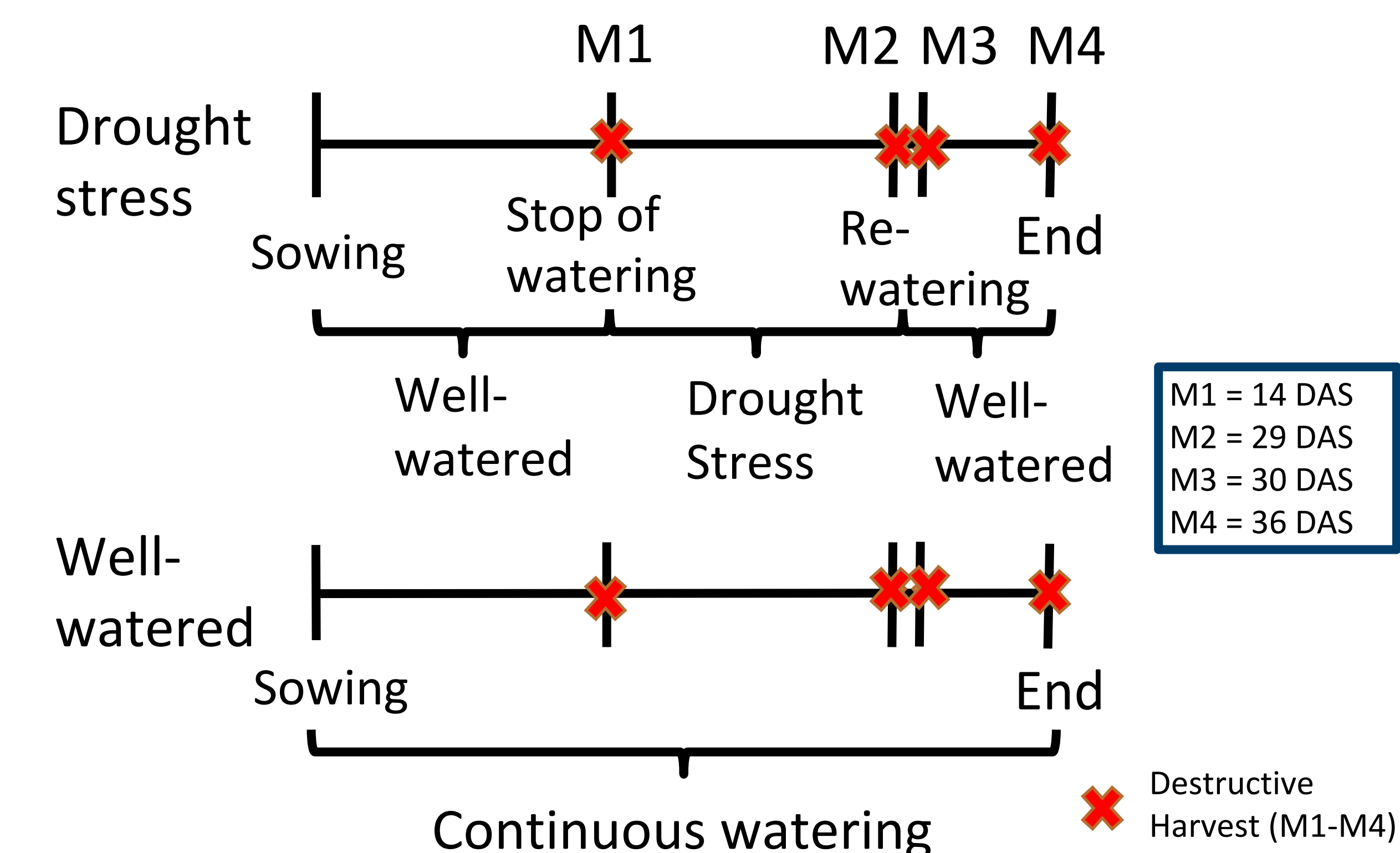
### Conclusion

- The conservative line had significantly reduced shoot and root dry weight under drought stress.
- The less-conservative root system was not significantly affected by drought stress. Hence, the less-conservative rice was affected less by drought stress.
- In areas with a high risk of drought the less-conservative line should be used, in areas with high water supply the Conservative line.

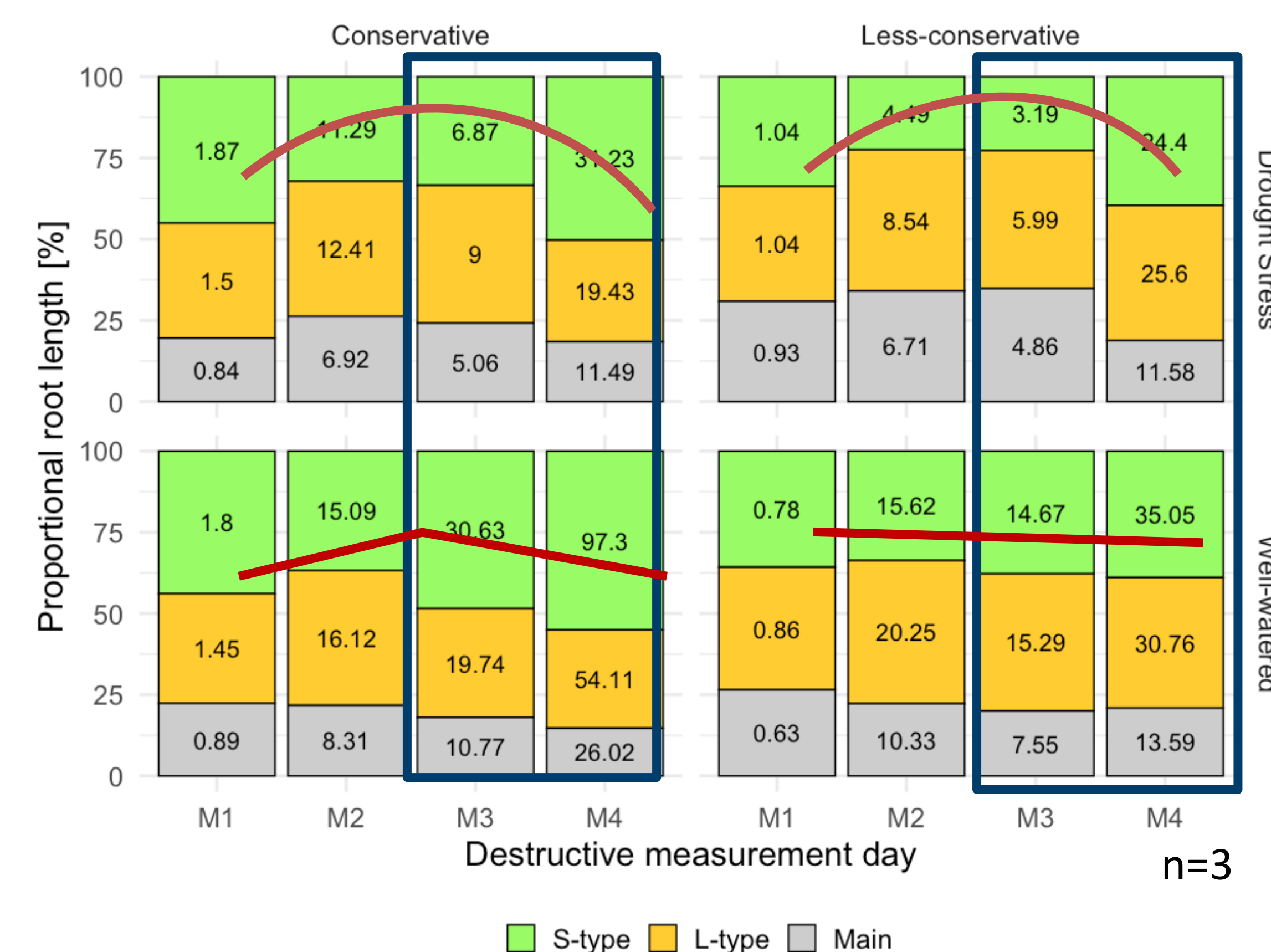
### Outlook

- Breeders have the possibility to breed high yielding and drought stress tolerant lines by in cooperating less-conservative lines into their breeding programs.

## Lateral root formation is a key function in drought stress recovery processes



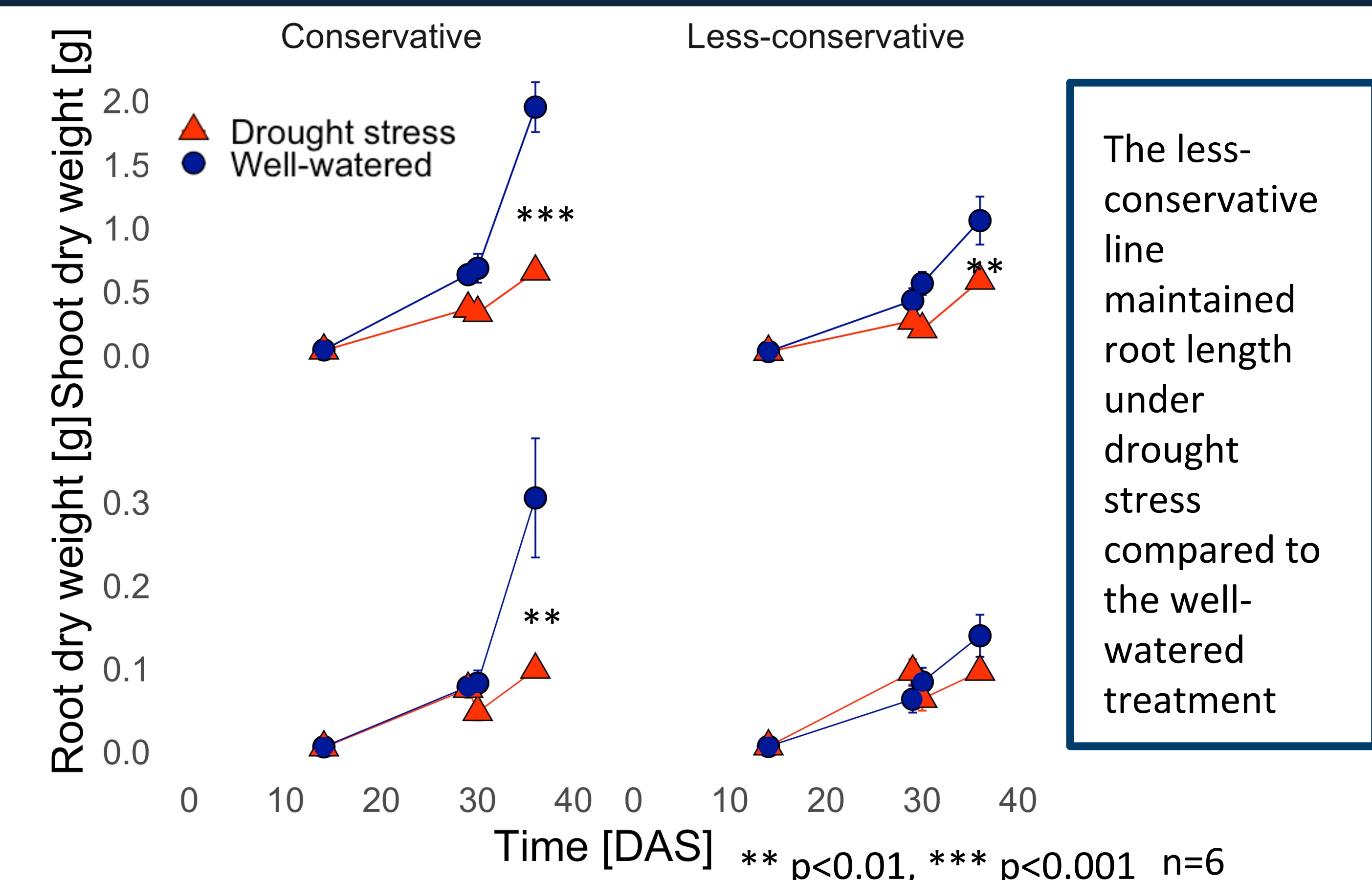
## Experimental Design



Drought stress: reduction of S-Type lateral roots & increase of L-type lateral roots.

Re-watering: drought stressed plants regain the same root length proportion as the well watered plants.

## Lateral root plasticity



The less-conservative line maintained root length under drought stress compared to the well-watered treatment

## Dry weight difference