

A photograph of a banana plantation with large green leaves and brown trunks. The ground is dry and sandy, suggesting a drought. A semi-transparent white box with rounded corners is overlaid on the image, containing the title and authors.

# Innovative physiological indicators for drought stress in banana

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Banana production in East Africa is threatened by **climate change**. Development of climate-smart **varieties** and **agronomic practices** is undergoing. But how to evaluate them **in the field?**

In theory...

**Carbon isotope discrimination ( $\delta^{13}\text{C}$ )**

often used as an indication of  
drought stress.

**Leaf temperature** known to increase  
during drought stress, due to closing  
stomata.

In practice...

Can  $\delta^{13}\text{C}$  and leaf temperature serve as **proxies for drought** stress in banana? Can they distinguish stress in a **field context**, where a multitude of other (environmental and plant-related) factors are of influence?

# In practice...

Tested in an experimental field in Arusha (Tanzania) with 2 irrigation treatments during **dry season** and 2 developmental stages present in the field.



# In practice...

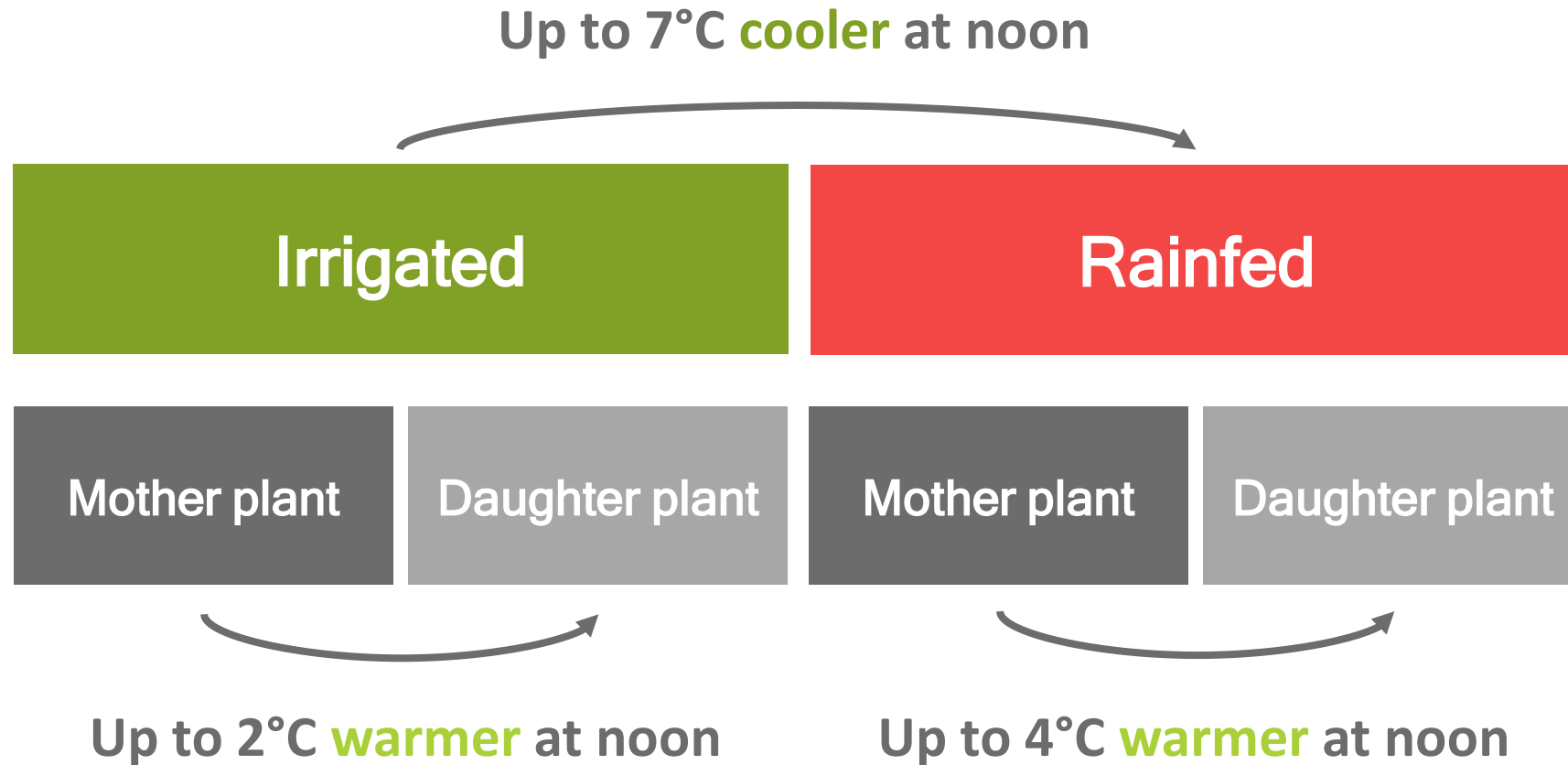


**Leaf temperature** monitored throughout the day and leaf samples taken for  **$\delta^{13}\text{C}$  analysis**

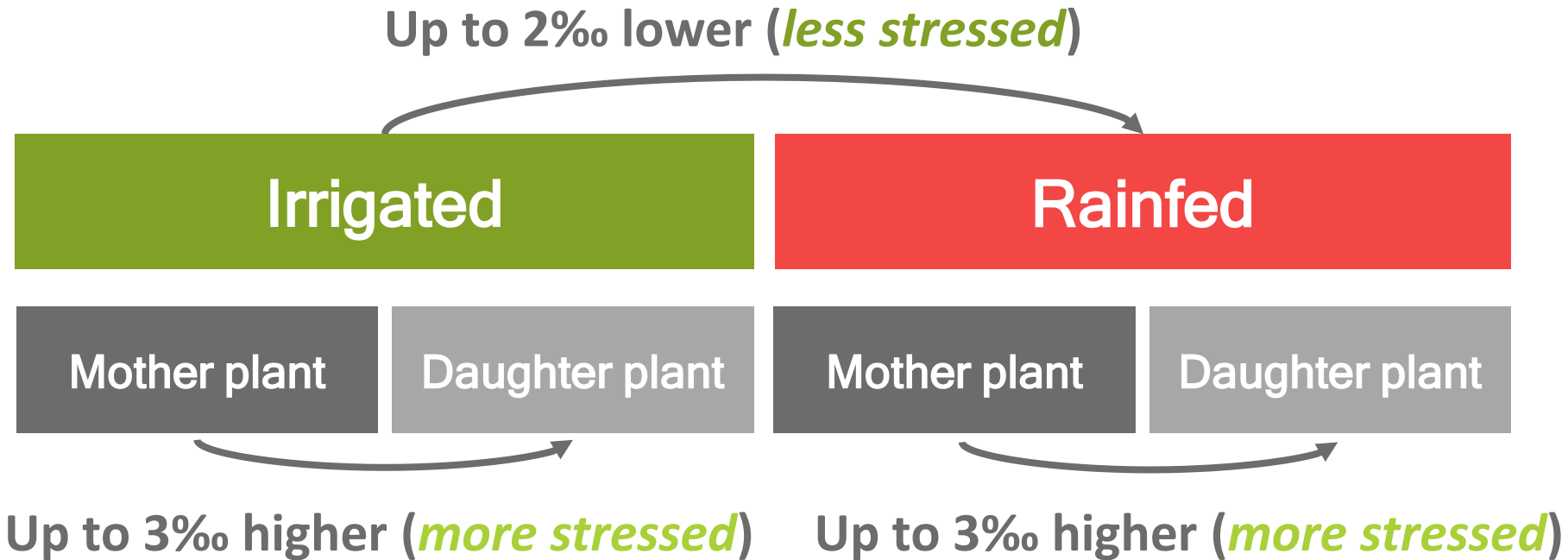
- Different positions in leaf
- Young and old leaves
- Mother and daughter plants
- Different treatments



# Preliminary results: leaf temperature



# Preliminary results: $\delta^{13}\text{C}$



- **Old leaves higher  $\delta^{13}\text{C}$  values** in all treatments and developmental stages
- **Variability within leaf fairly small**, with no systematic differences according to sampling position



# Conclusions & discussion

- Leaf temperature and  $\delta^{13}\text{C}$  both **significantly different in rainfed and irrigated** banana plants and show a strong **correlation**
  - Both good drought stress proxies
  - Which time scale do they represent?

# Conclusions & discussion

- Both proxies indicate that **daughter plants are less stressed than mother plants**
  - Less sun exposure?
  - Preferential carbon/water allocation?
  - Variety-dependent?
- **$\delta^{13}\text{C}$  varies within the plant** (different leaves), but not within a leaf
  - Difference young-old leaves merely consequence of growth period (further into dry season)?

# Many more questions to be answered...

# Thank you!

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