

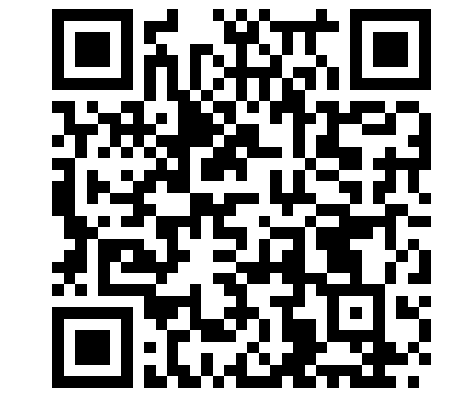
Management Options to Improve Drought Resilience in Sugar Beet

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Relevance

- Climate change → Weather-extreme events.
- Drought → Qualitative and quantitative yield reduction.
- Sugar beet → 20% of sugar production worldwide.
- Temperate regions.
- 60% of sugar beet yield → Climatic water balance deficit.
- Lack of water → Yield losses → Increase to 18% 2050.
- Average yield variability → Increase to 15%.
- Optimizing crop water resources.
- Drought-resistant varieties of sugar beet → Lower water requirements.
- Variability in drought resistance → Not found yet.

Objectives

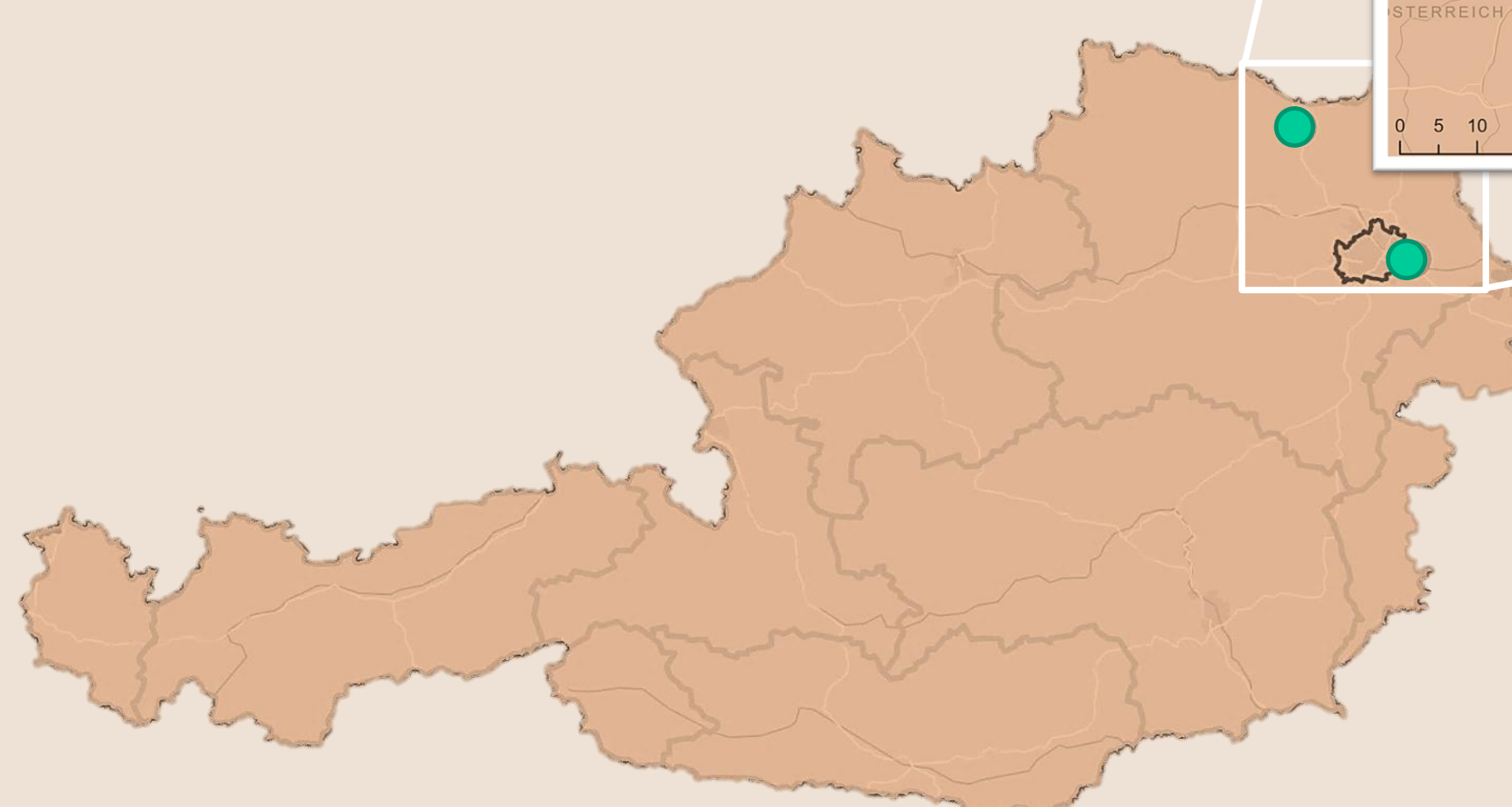
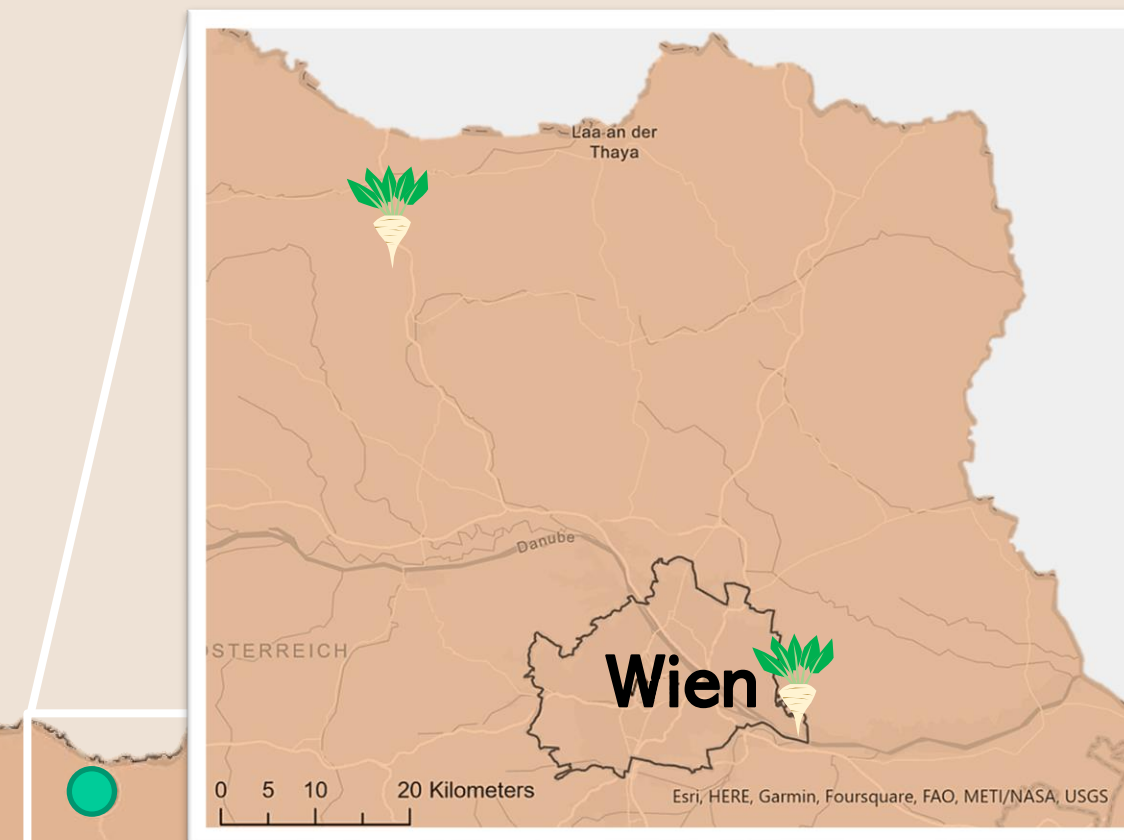
- Determine effective breeding and management strategies that help sugar beets adapt to drought stress.
- Identify reliable measurement methods to evaluate drought stress resistance.

Research Questions

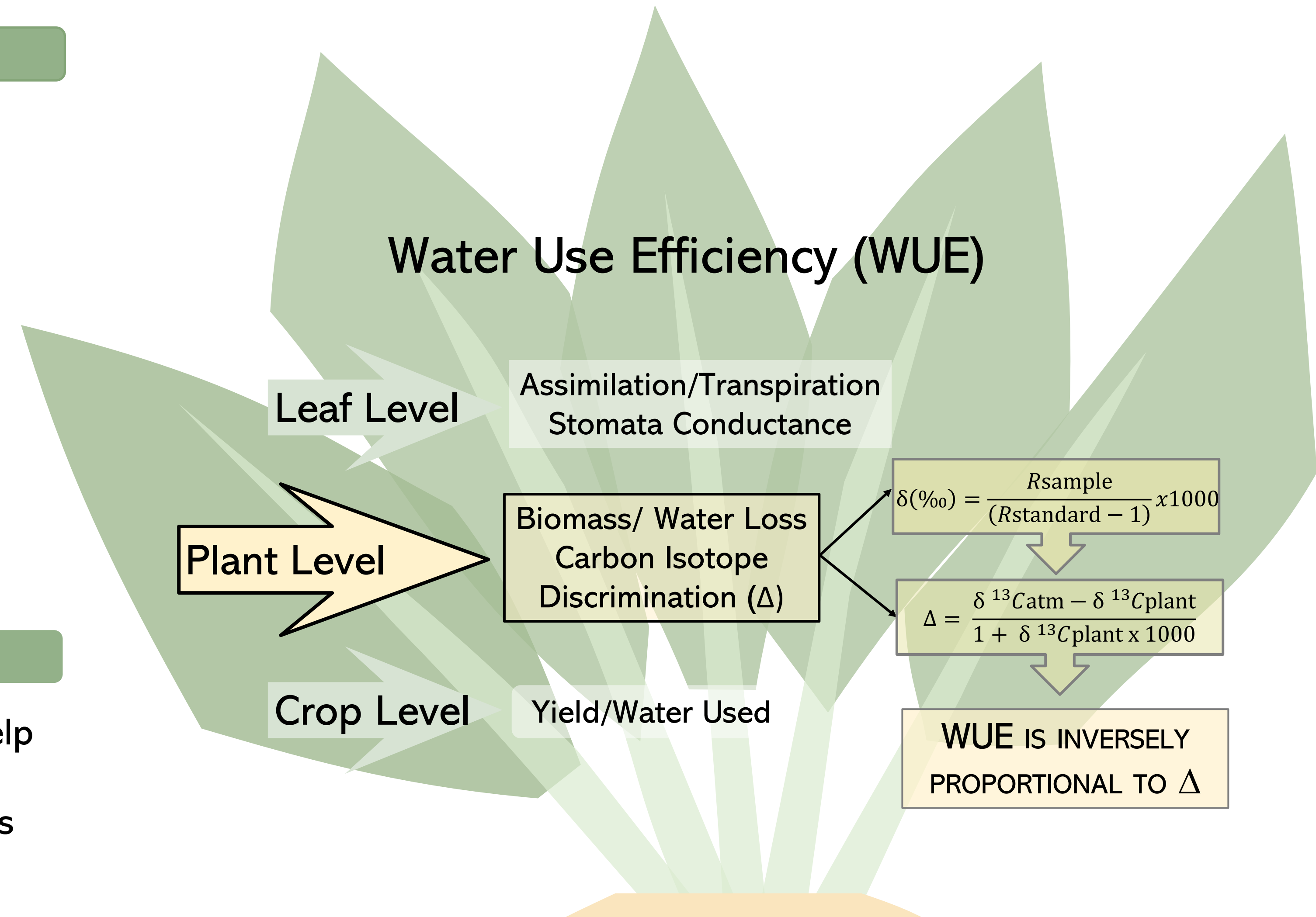
- What are the relevant plant traits explaining variability in drought resistance among sugar beet cultivars grown in Austria?
- Can surface coverage effectively conserve soil water and thereby mitigate the impact of drought on sugar beet?
- Can isotope analysis provide a high throughput method to identify plant functioning underlying higher drought resistance?

Study Area

- Semi arid - Pannonian climate.



Water Use Efficiency (WUE)



Field Trials

- Location: Oberhausen, Groß-Enzersdorf
- Years: 2020, 2021
- Sugar Beet Varieties: Heston, Vandana
- Soil Management: Covered Wood Chips, Not Covered
- Water Management: Irrigated, Rain-fed
- Nitrogen Fertilizer: 70 kg N/ha, 140 kg N/ha

Measurements

- Plant Measurements: Leaf Temperature, Stomata Density, Stomata Conductance, Beet and Sugar Yield
- Isotopic Measurements: Leaf Carbon Isotope Discrimination (Δ)
- Soil Parameters: Soil Temperature, Soil Moisture
- Climatic Data: Groß Enzersdorf Experimental Farm, Hollabrunn Agricultural College

Results

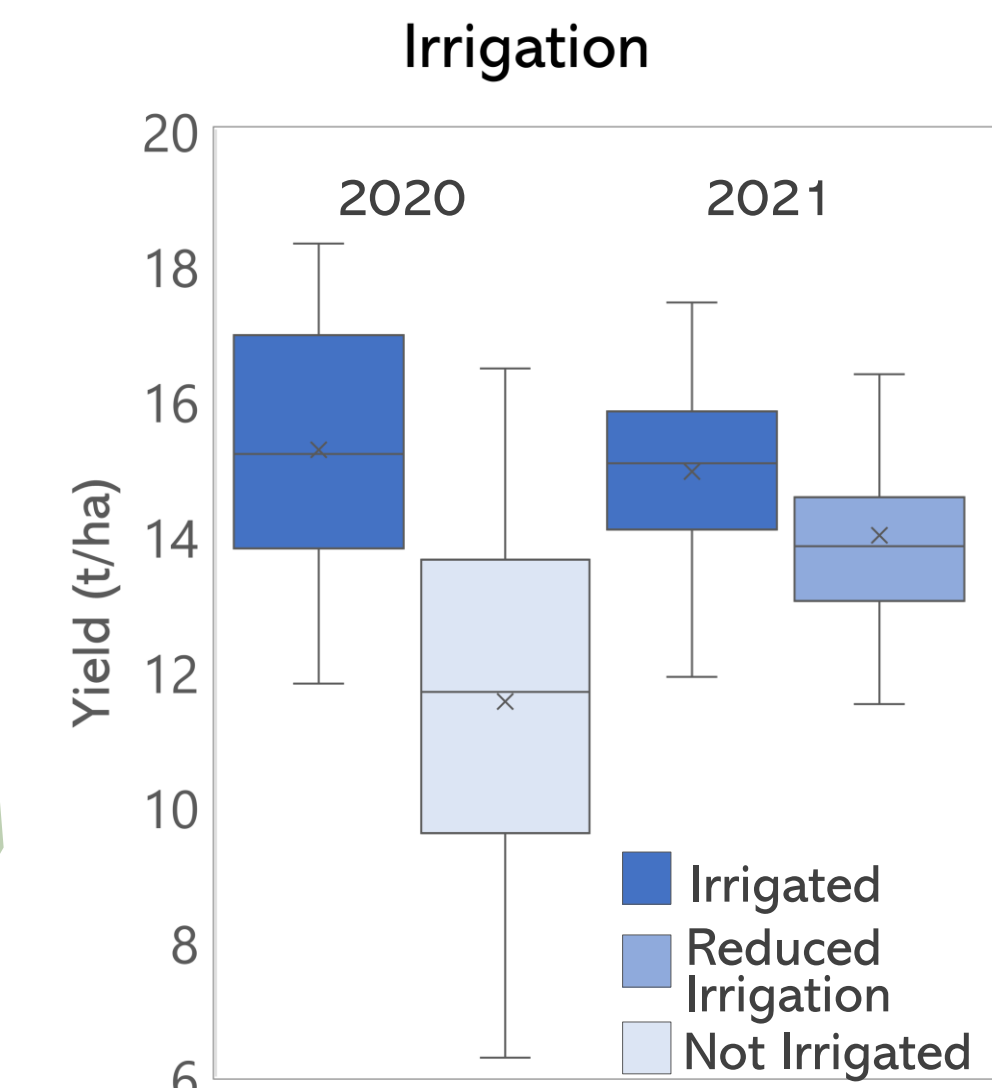


Figure 2 Yield in irrigated and non-irrigated plots Oberhausen in both years.

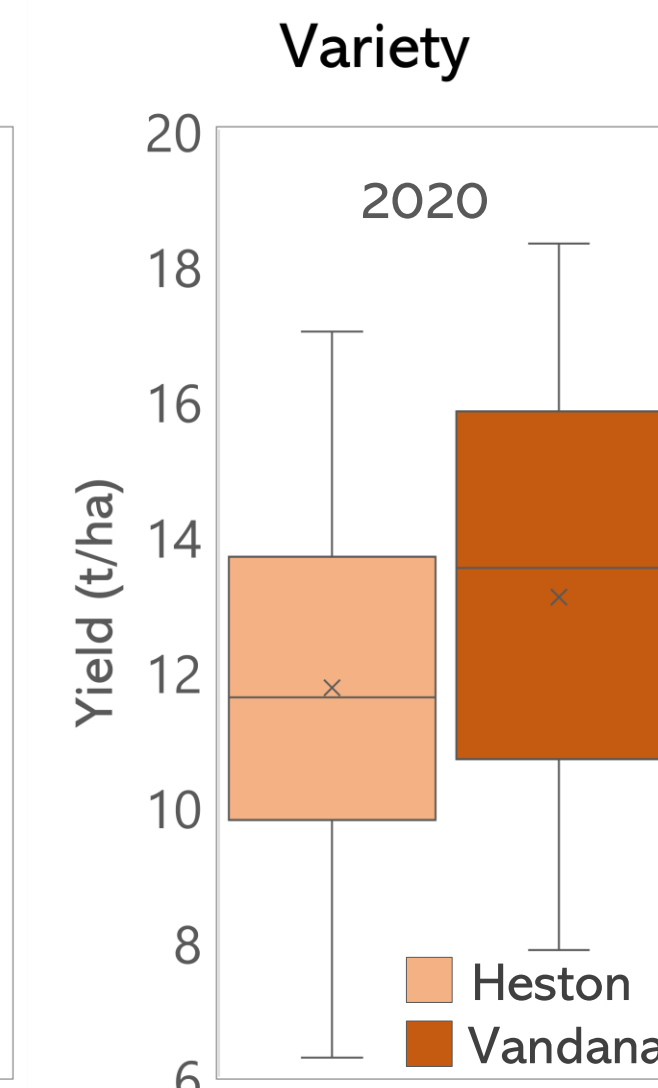


Figure 3 Yield of the varieties Heston and Vandana in Oberhausen

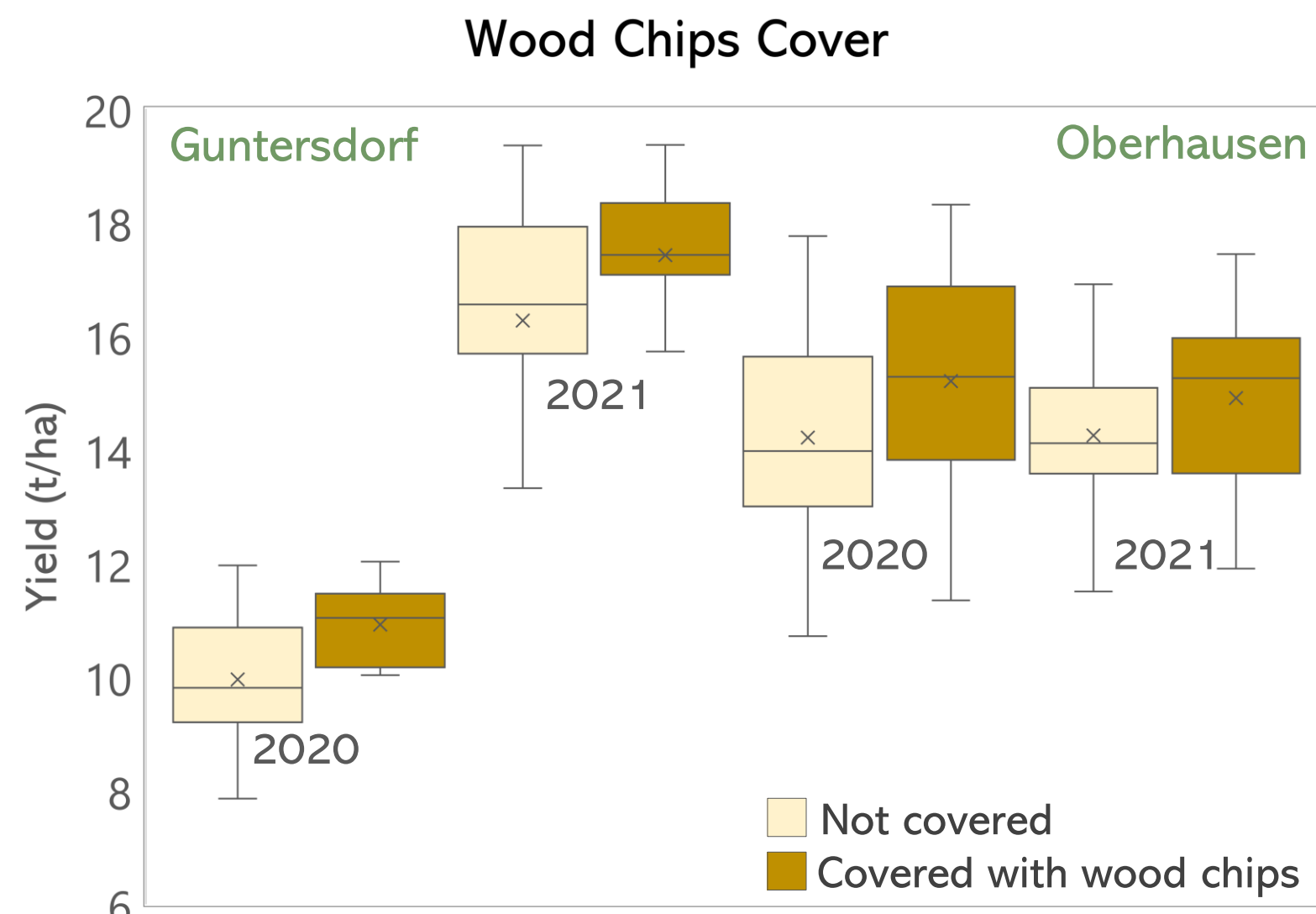


Figure 4 Sugar beet yield of plots covered and not covered with wood chips in both trial locations and years.

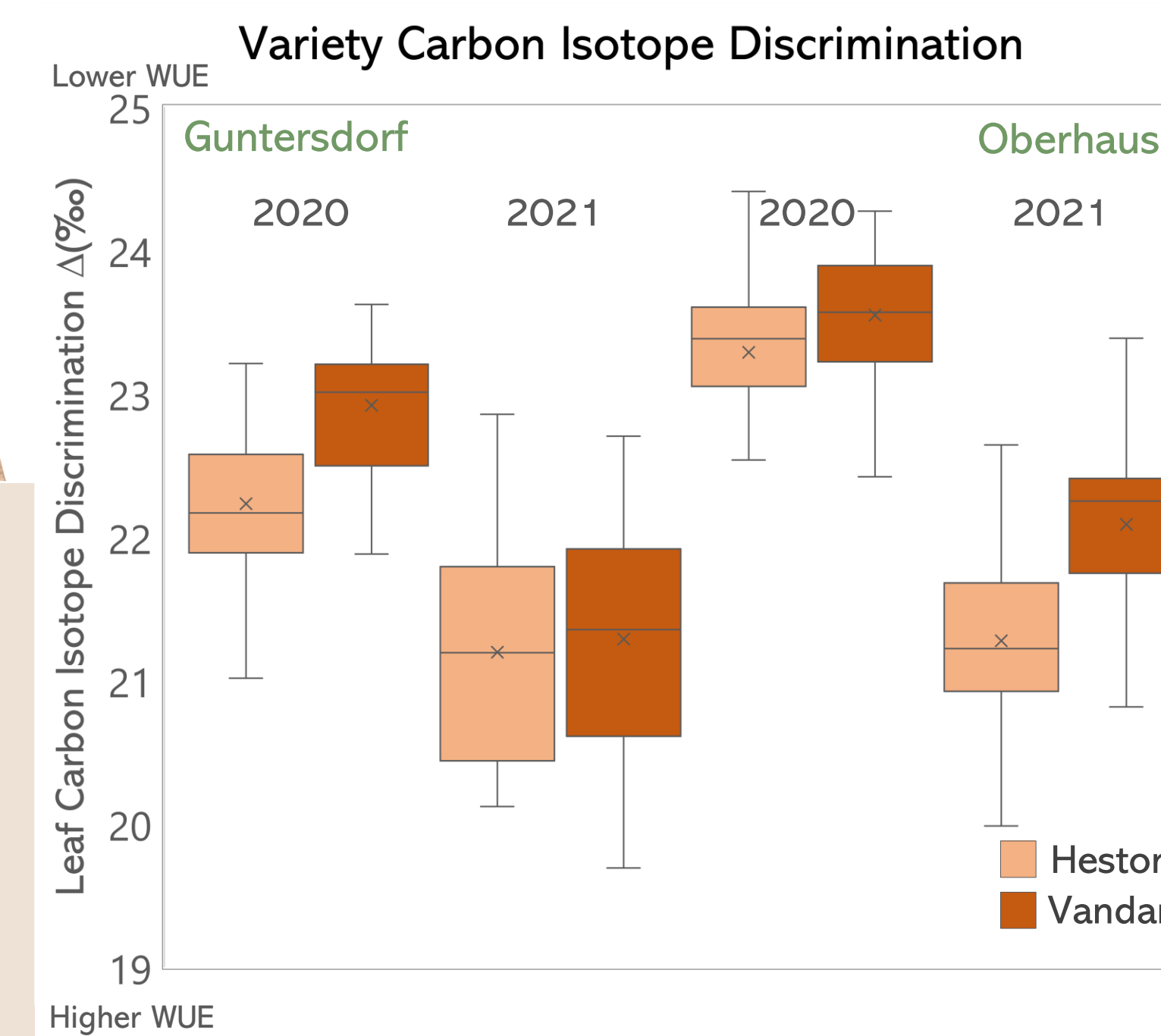


Figure 5 Carbon Isotope Discrimination of sugar beet varieties in both trial locations and years.

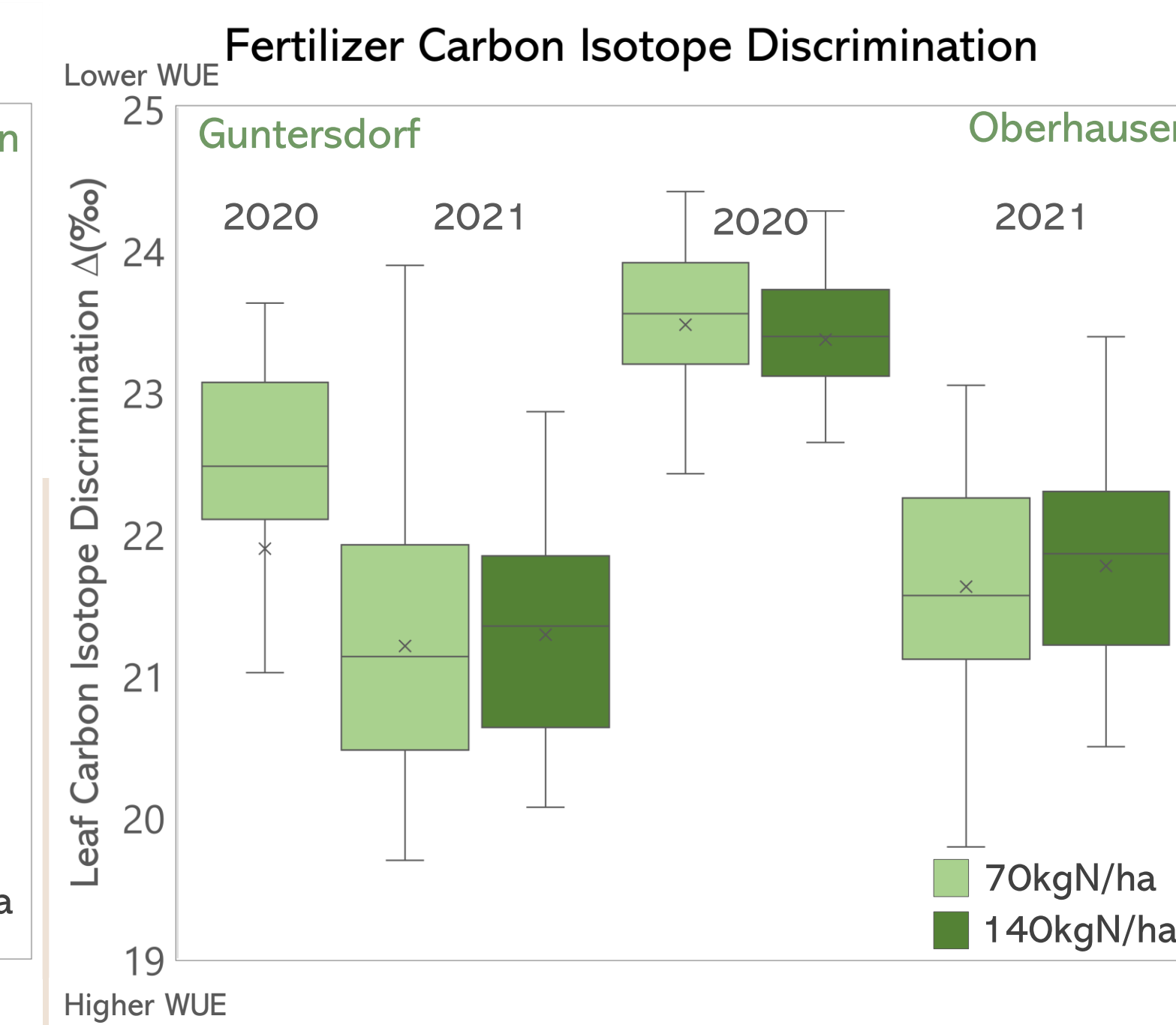


Figure 6 Carbon Isotope Discrimination of the different fertilizer applications in both trial locations and years.

Summary

- The results of this study highlight the importance of various agronomic practices in achieving optimal sugar beet yields.
- Irrigation significant impact on yield.
 - Sugar beet variety.
 - Vandana higher yield specially when irrigated.
 - Heston higher WUE – higher stomata density.
 - Wood chips cover higher yields increased soil moisture content and decreased soil temperature.
 - Fertilizer application increases WUE until a threshold before plateauing.

Overall, these findings can aid farmers in making informed decisions regarding sugar beet production variety and management practices.

References

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