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SITE-SPECIFIC MECHANICAL WEED MANAGEMENT IN MAIZE (*ZEA MAYS*) IN NORTH WEST GERMANY

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EXPERIMENTIERFELD AGRO-NORDWEST

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ptble

INTRODUCTION

- **Weeds** are **main** cause of **yield loses** (Oerke, 2006)

- **Weeds** are **distributed heterogenous** (Metcalfe et al., 2019)

- **Positive** effects of **weeds**
  - **Protection** against **soil erosion** (Flügel, 2018)
  - **Habitat** for animal (Selfors et al., 2018)

- **Negative** effects of **mechanical weeding** (Woźniak, 2020)
  - Risk of **soil erosion**
  - **Newly** emerged **weed** seeds
  - Accidently **destruction** of **crops**

➢ **Site specific weed management** to decrease negative effects

RESEARCH QUESTIONS

- How does **site-specific** mechanical weed management **effects** the **maize yield** and **weed biomass**?
- **Which recommendation tools** are suitable?
- What are good **thresholds**?

MATERIAL & METHODS: **TREATMENTS**

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- **Uniform weeding** as control

- Site-specific: **Weed Cover Threshold** (WCT)
  - 0.25 %
  - 0.5 %
  - 1.0 %

Example WCT=0.5 %

Weed cover: 0.2 %

Weed cover: 0.5 %

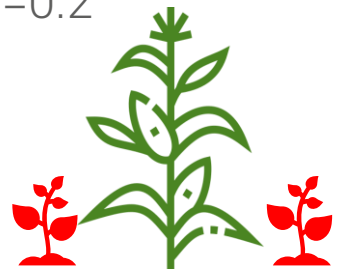
- Site-specific: **Relative Weed Cover** (RWC, Ngouajio et al., 1999)

  - $= \frac{Weed\ cover\ (\%)}{Weed\ cover\ (\%) + Crop\ cover\ (\%)}$

  - With **greater crop plants more weeds** can be **tolerated**.
  - 0.1
  - 0.2
  - 0.4

Example RWC=0.2

Crop cover: 10 %
Weed cover: 4 %
RWC=0.28



Crop cover: 22 %
Weed cover: 5 %
RWC=0.18

MATERIAL & METHODS: **STUDY AREA**

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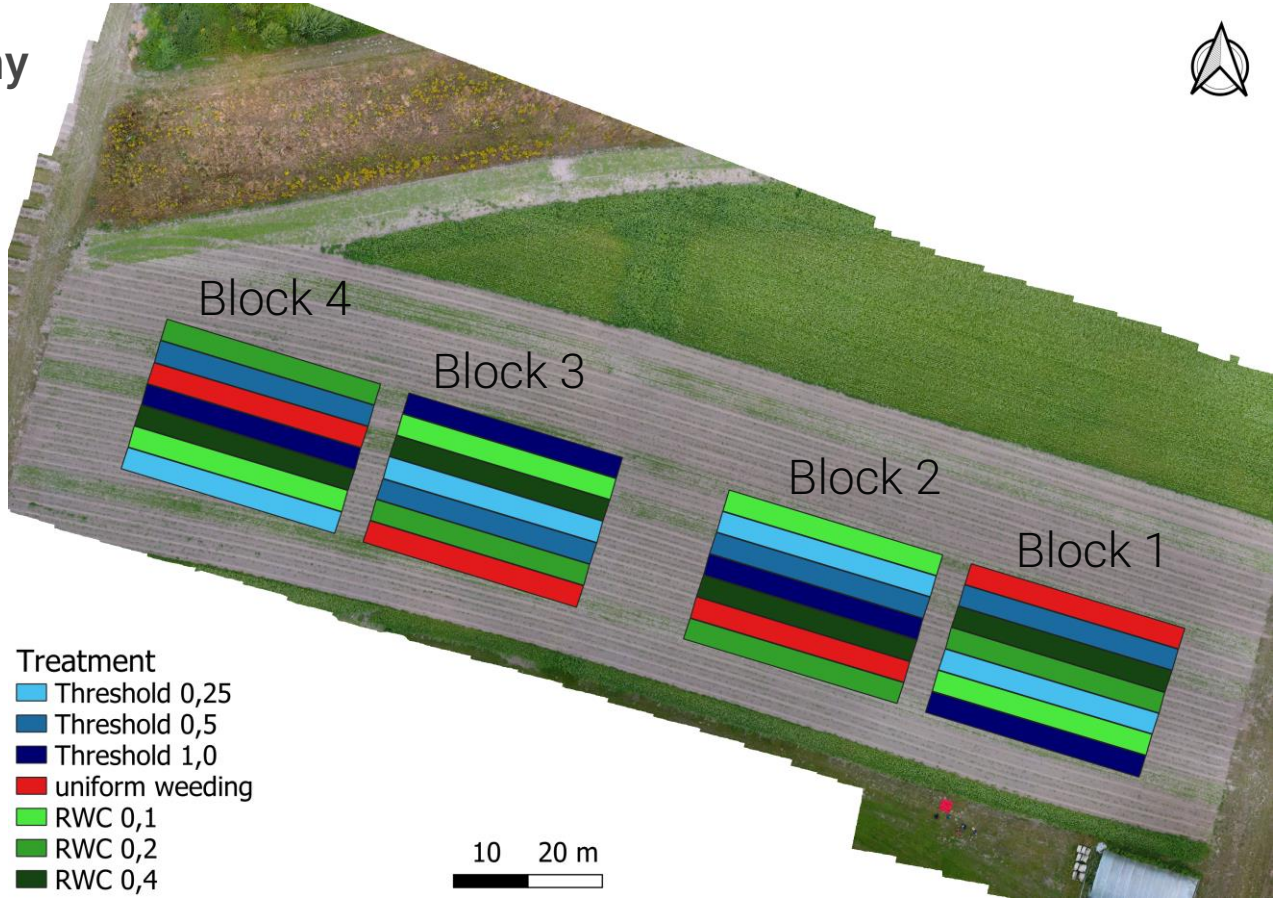
- Research station "**Waldhof**" of Hochschule Osnabrück
- **Osnabrück, Lower Saxony, North West Germany**
  - 52.310894, 8.025066
- **Cambisol** (WRB)

- Maize sowing: 2021-05-14,
  - **8 Seeds/m²**
  - **4.5 – 5 cm sowing depth**
  - **75 cm row width**

- **No chemical plant protection**

- For **site-specific** management each plot was **split** into three parts



RWC=Relative Weed Cover=$\frac{Weed\ cover\ (\%)}{Weed\ cover\ (\%)+Crop\ cover\ (\%)}$

MATERIAL & METHODS: **WEED COVER ESTIMATION**

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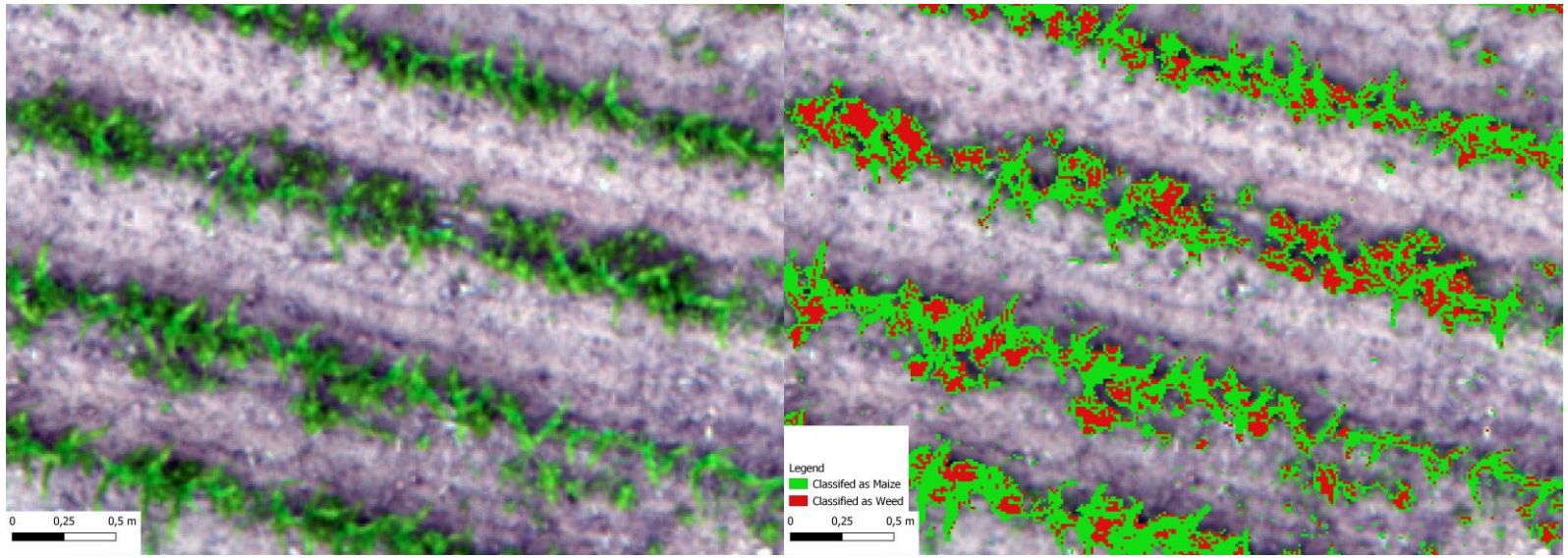
- **MicaSense Altum** (blue: 475 nm, green: 560 nm, red 668 nm, near infrared: 717 und 840 nm)
  - Flight height: **25 m → 4.7 mm pixel size** on ground

- **Convolutional Neural Network**

- Three classes:
  - **Bare soil**
  - **Maize**
  - **Weeds**

- Overall accuracy: **> 85 %**



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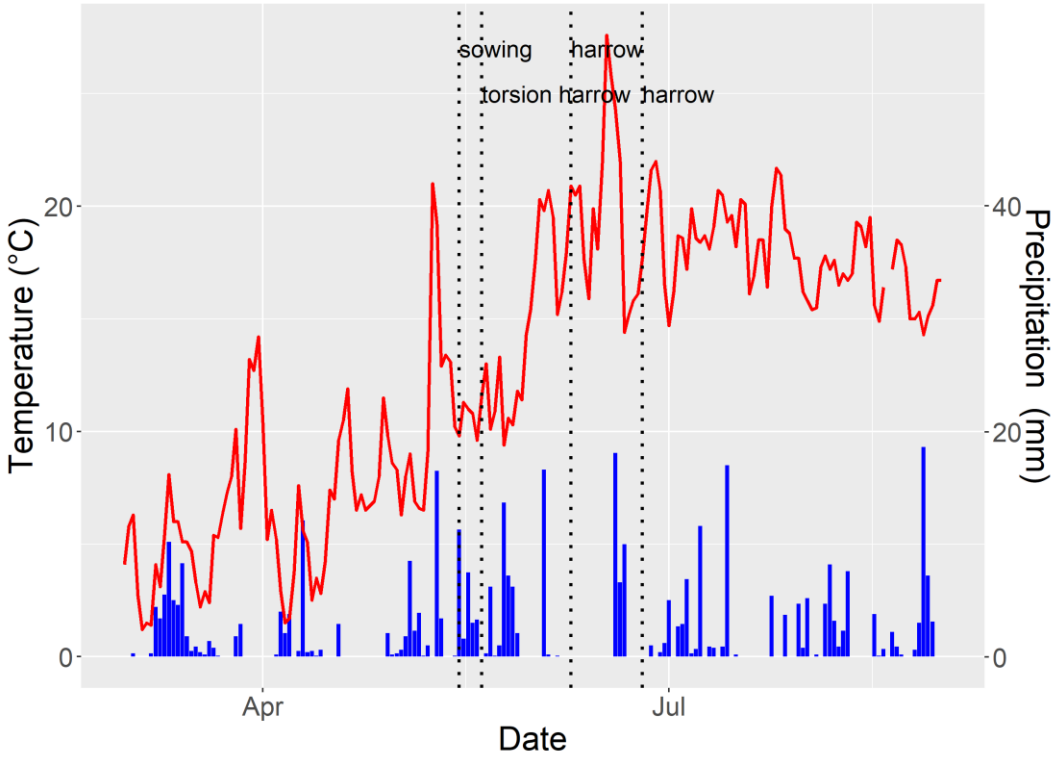
MATERIAL & METHODS: **WEED REGULATION**

- Before maize seeds emerged: **torsion harrow** of all plots
  - 2021-05-20

- GS 12: **site-specific harrow** with camera steering system
  - 2021-06-09

- GS 15: **site-specific harrow** with camera steering system
  - 2021-06-25



MATERIAL & METHODS: **APPLICATION MAPS**

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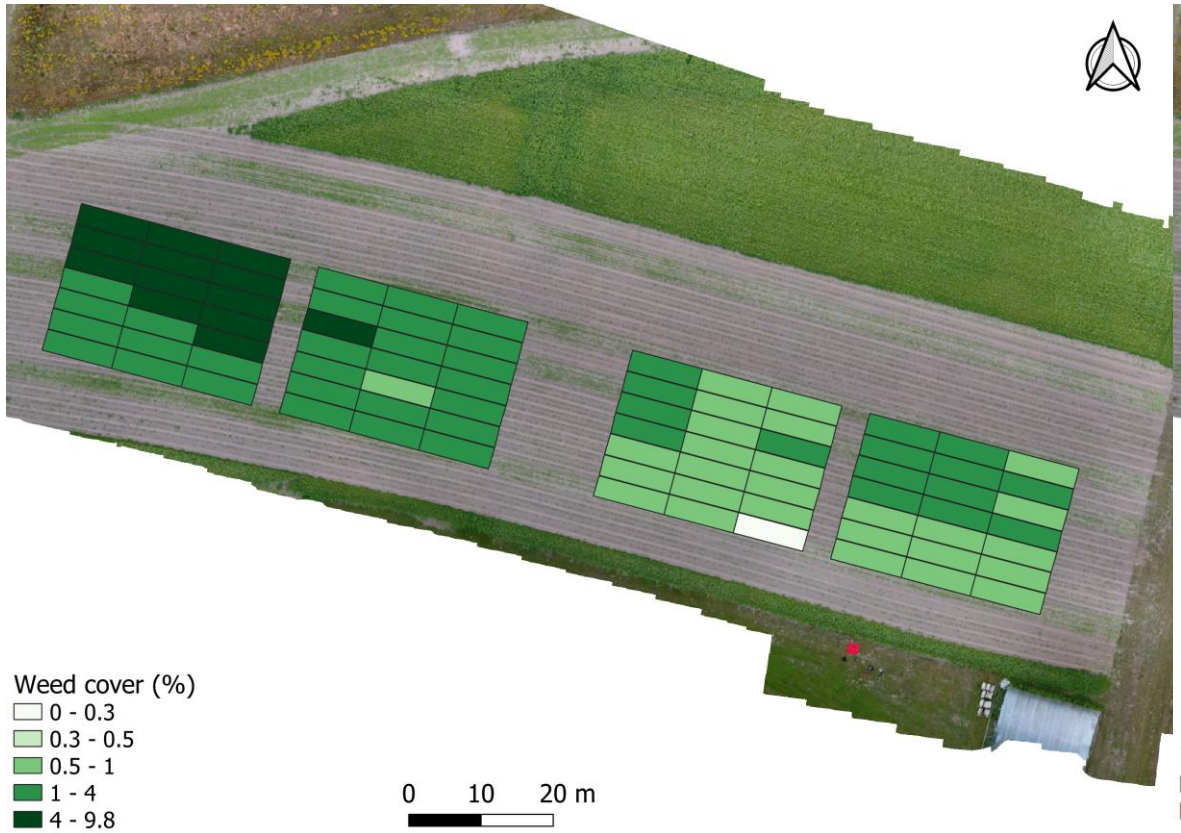
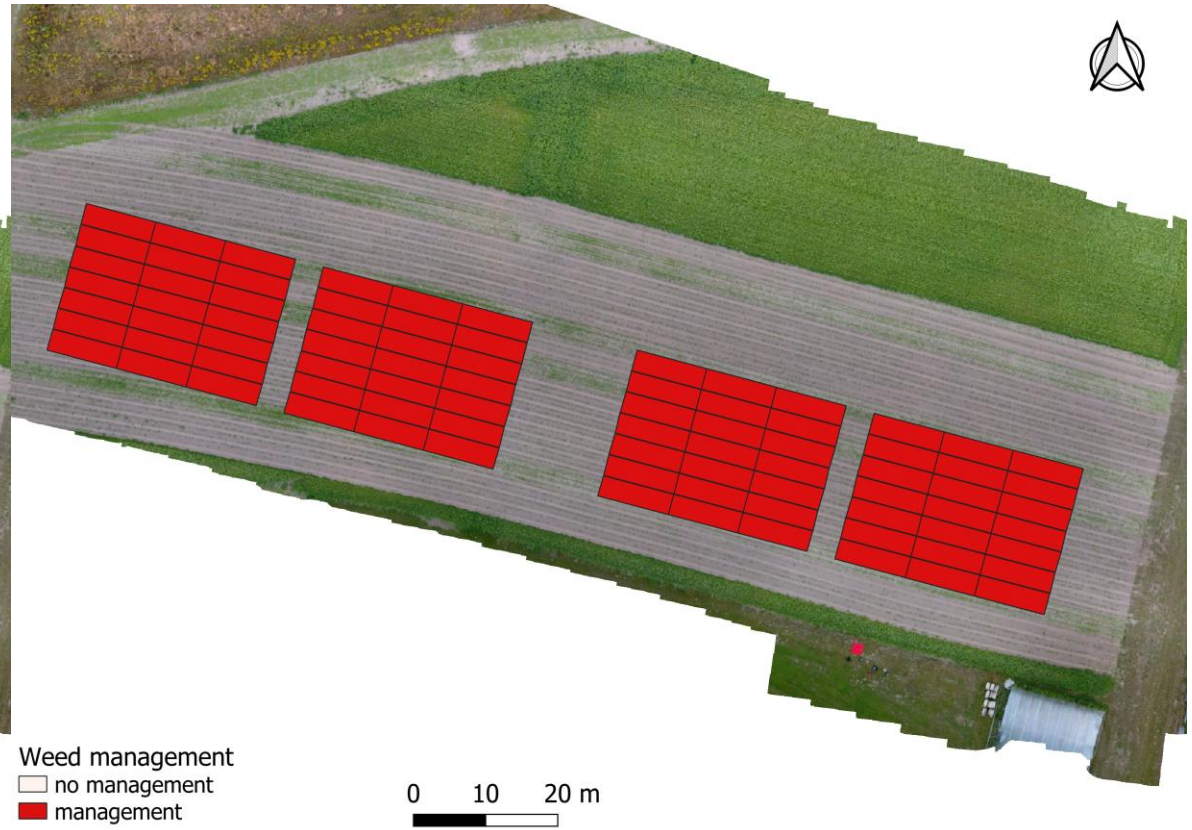
- GS 12
- 2021-06-09





MATERIAL & METHODS: **APPLICATION MAPS**

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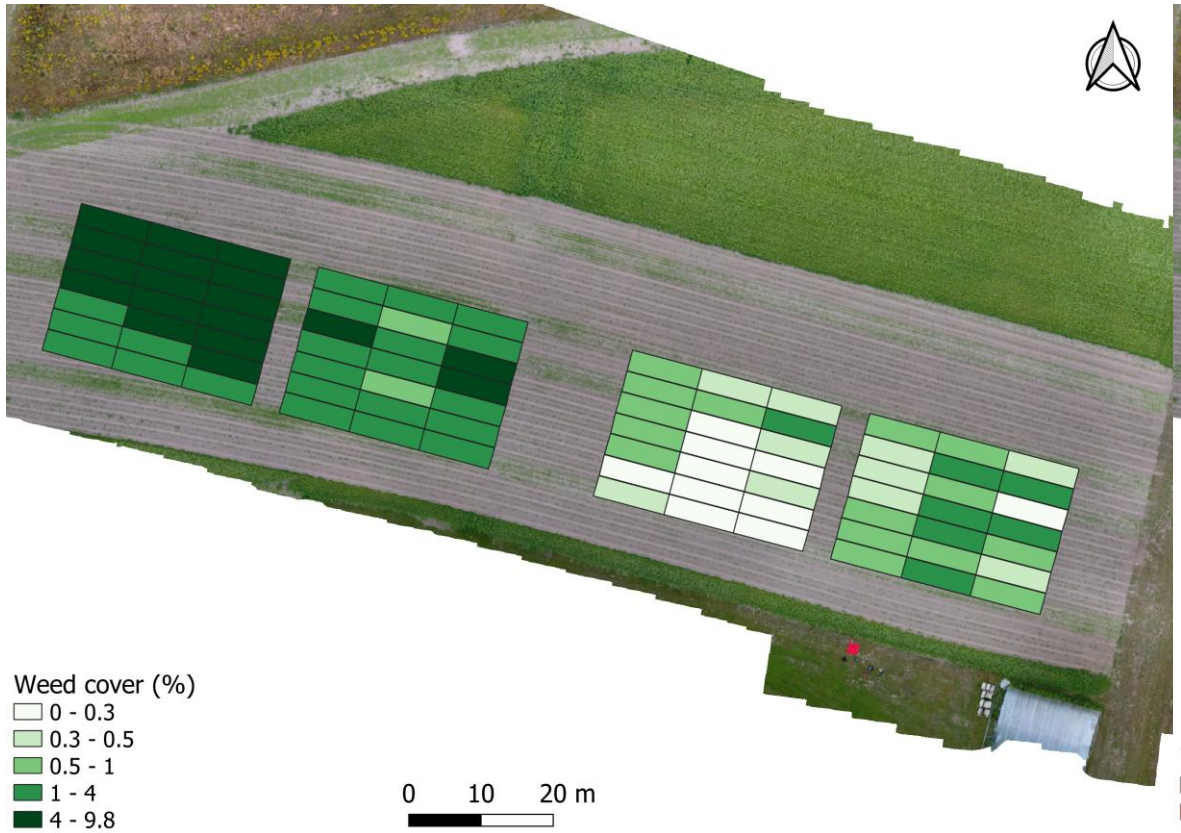
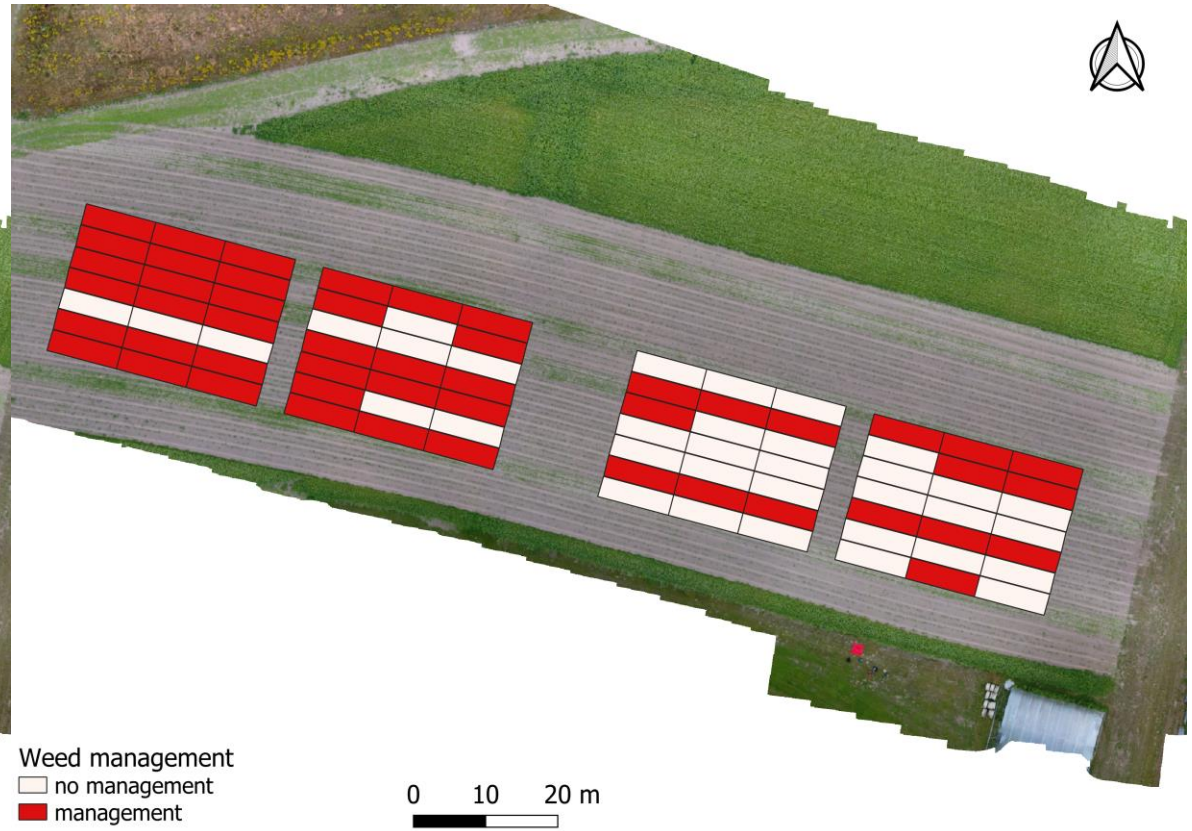
- GS 15
- 2021-06-25





RESULTS: **WEED BIOMASS** AT HARVEST

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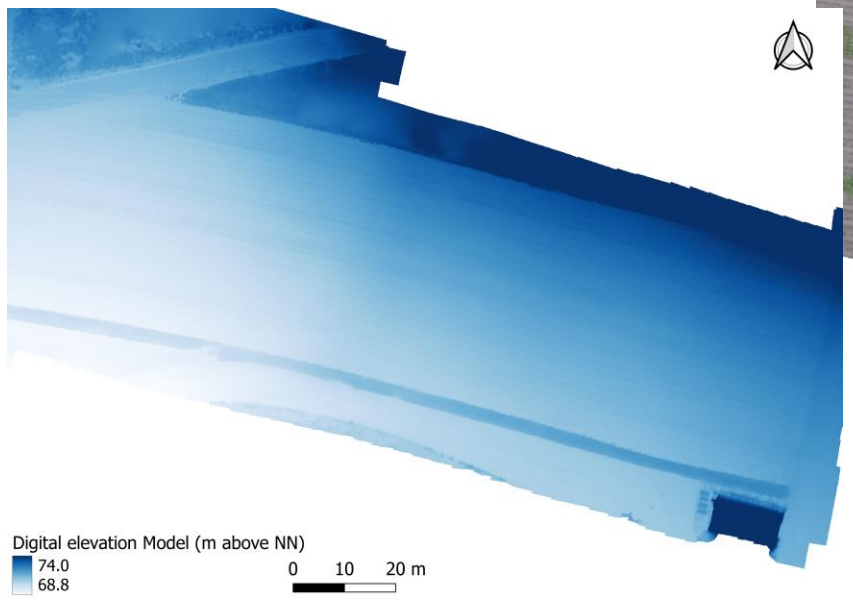
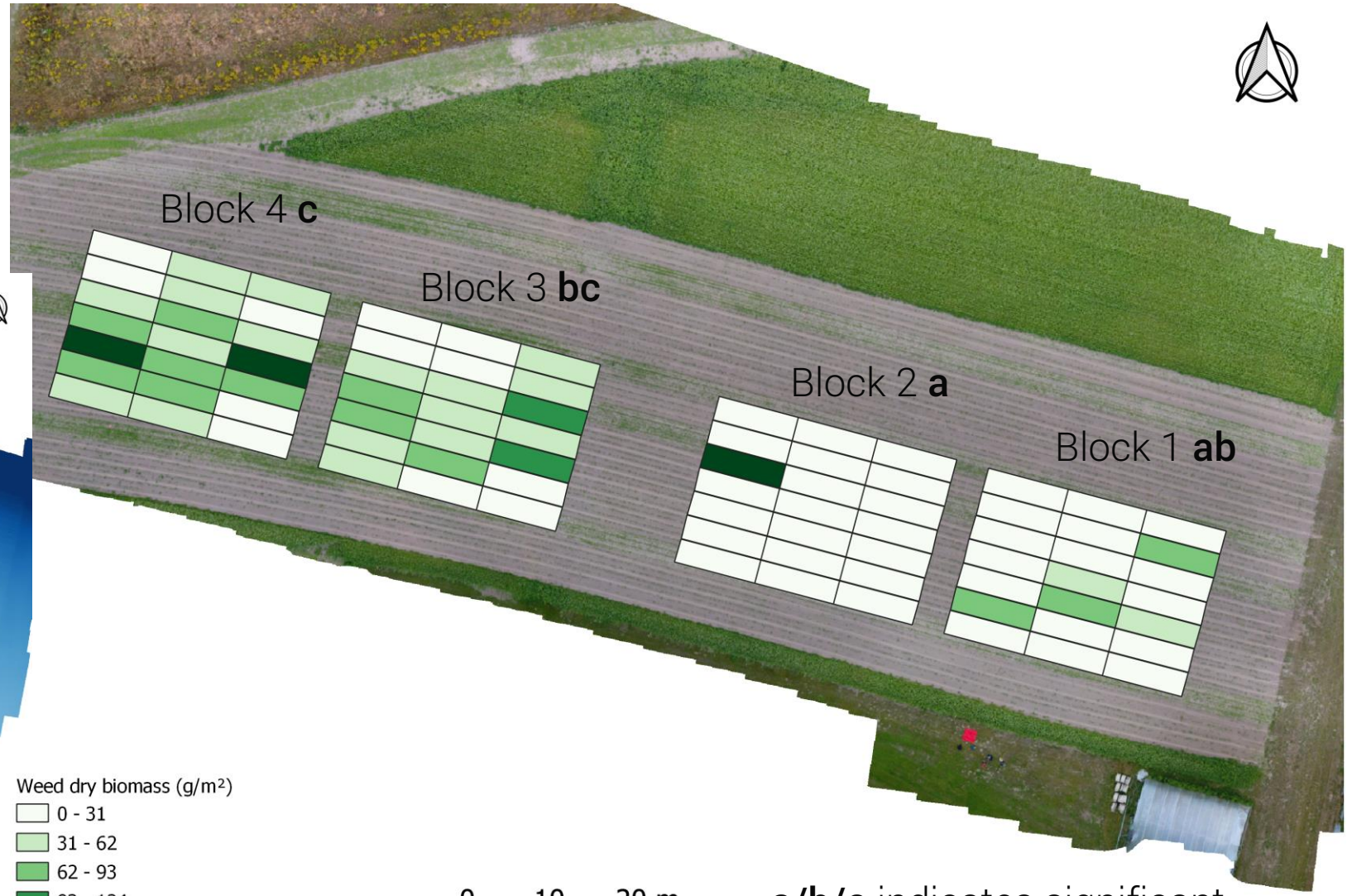
- No significant differences between treatments
- Block 4 higher weed biomass than block 2





a/b/c indicates significant groups P<0.05

RESULTS: **MAIZE YIELD**

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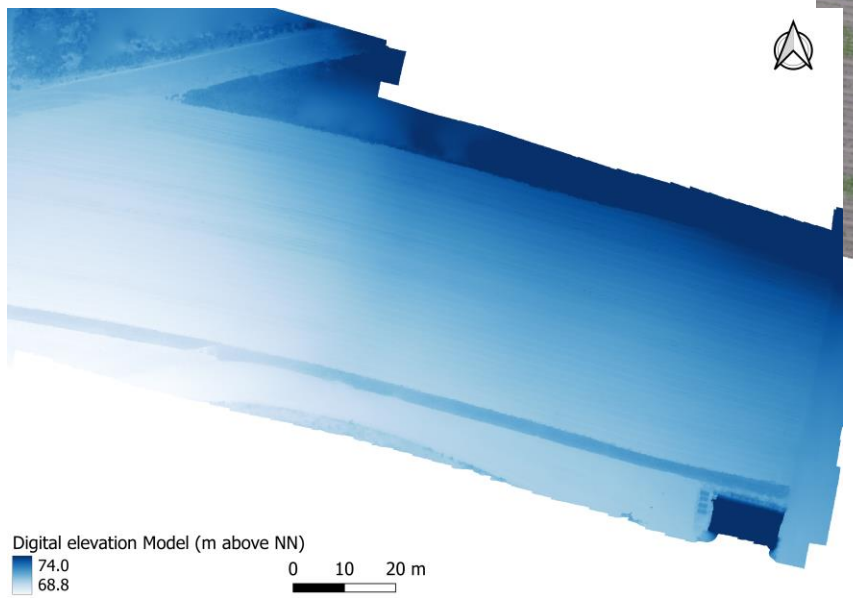
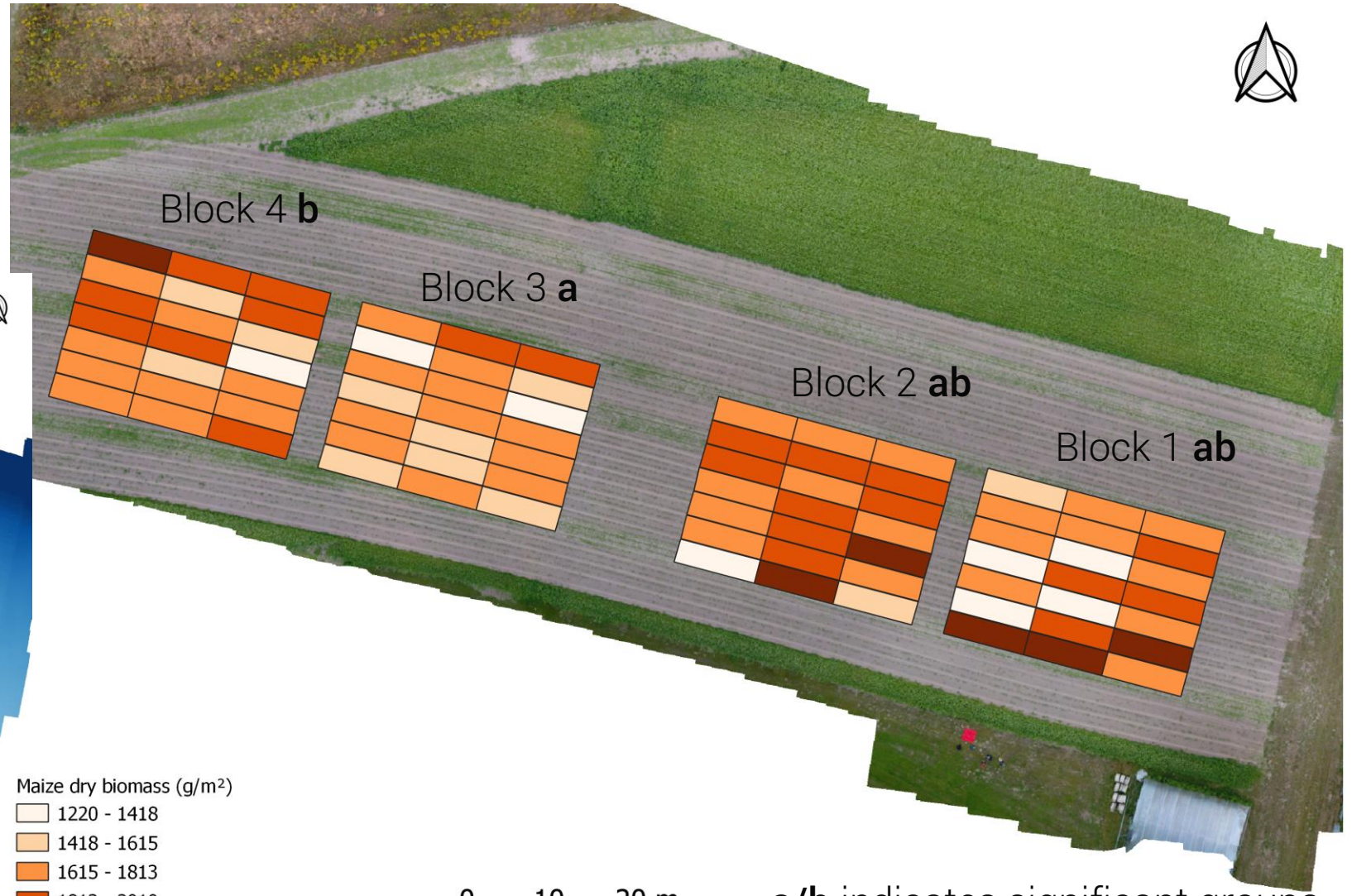
- No significant differences between treatments
- Block 4 higher total yield than block 3





a/b indicates significant groups P<0.05

RESULTS: **TREATED AREA SECOND HARROW TREATMENT**

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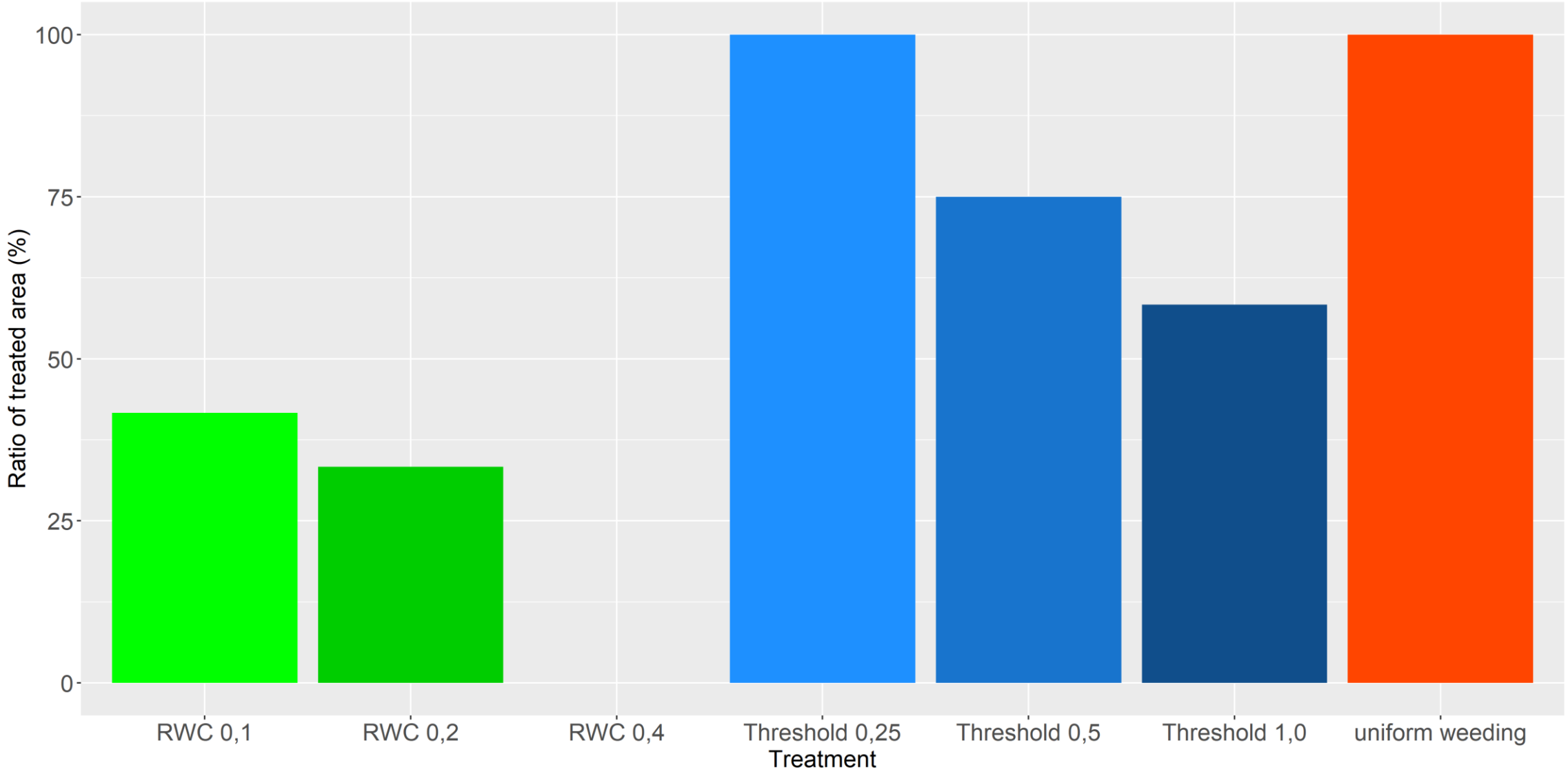


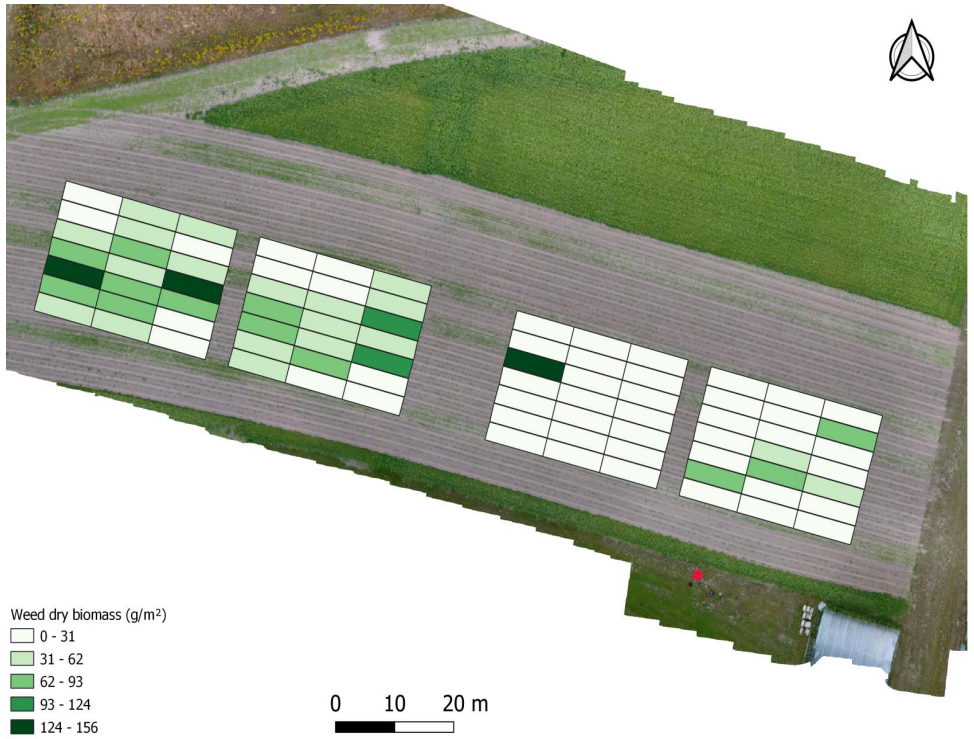
RWC=Relative Weed Cover=$\frac{Weed\ cover\ (\%)}{Weed\ cover\ (\%)+Crop\ cover\ (\%)}$

CONCLUSION

- **Weed distribution** is **heterogenous**

- Site-specific mechanical weed management:
  - **Doesn't effect** maize **yield**
  - Leads to **less treated area**

- The concept of **Relative Weed Cover** is **suitable** as a **recommendation tool**
  - Further research for right **thresholds values**



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MATERIAL & METHODS: **APPLICATION MAPS**

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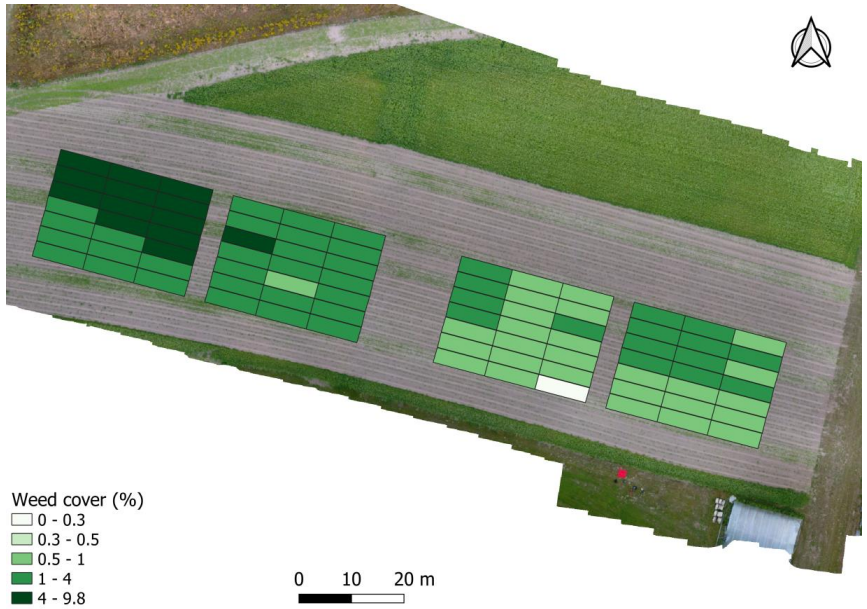
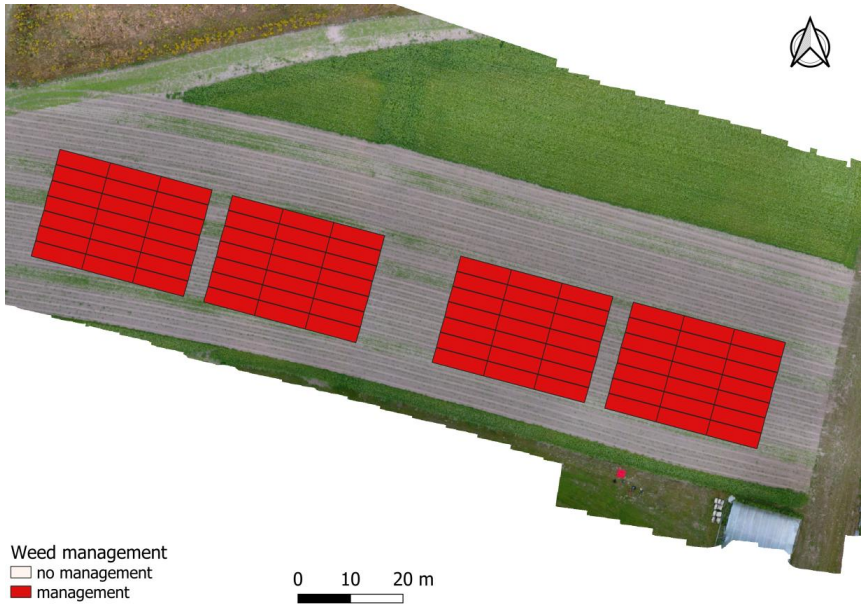
- GS 12
- 2021-06-09





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- 2021-06-25