

## Workshop Robotic weeding in sugar beet

**Date:** June 10-14, 2024

**Location:** Ihinger Hof Research Station in Renningen

### Organizer:

Prof. Dr. Roland Gerhards

Weed Science

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### Expected participants:

1. Students (Master and PhD) of the Euroleague of Life Sciences partner Universities
2. Members of the EWRS working group 'Site-specific weed management'
3. Members of the EWRS working group 'Physical and Cultural Weed Control'

### Description of the workshop

At Ihinger Hof, we will set up **two** field experiments in sugar beet as randomized complete block design for **four** repetitions. The plot size is **3 m x 20 m**.

| 100 m (including borders between blocks for turning) |   |         |         |         |
|--|---|---------|---------|---------|
|  | 20 m  | 20 m    | 20 m    | 20 m    |
| 3 m  | Test plot   | Block 2 | Block 3 | Block 4 |
| 3 m  | Test plot   |         |         |         |
| 3 m  | Conventional hoe                                      |         |         |         |
| 3 m  | Farming Revolution Farming GT (hoe)                   |         |         |         |
| 3 m  | Farm Droid FD20 (inter-row + in-row hoe)              |         |         |         |
| 3 m  | Farm Droid FD20 (inter-row hoe plus band spraying)    |         |         |         |
| 3 m  | Naio-Tech Orio (hoe)                                  |         |         |         |
| 3 m  | Smart spraying (sprayer)                              |         |         |         |
| 3 m  | K.U.L.T. Vision Control inter-row hoe                 |         |         |         |
| 3 m  | K.U.L.T. i-Select inter-row hoe + intra-row hoeing    |         |         |         |
| 3 m  | K.U.L.T. Vision Control inter-row hoe + finger hoe    |         |         |         |
| 3 m  | K.U.L.T. Vision Control inter-row hoe + band spraying |         |         |         |
| 3 m  | Conventional herbicide                                |         |         |         |
| 3 m  | Untreated control                                     |         |         |         |
| 3 m  | Test plot   |         |         |         |
| 3 m  | Test plot   |         |         |         |

During the workshop, we will analyse and compare the sensor systems for weed/crop identification and machine guidance. We will use Neural Networks to train weed species for automatic classification. We will select, mount and adjust the hoeing implements and decide on the appropriate herbicide mixture. Weed density, crop density, weed coverage and crop coverage will be assessed before, immediately after and 4 days after each treatment. Chlorophyll-Fluorescence Imaging will be used to measure stress on sugar beets due to the treatments. Soil temperature, soil water content and weather data will be recorded during the study. Weed control efficacy and crop losses will be calculated for each treatment. Driving speed of the robots, width and number of passes will be assessed during the treatments. The companies will be asked to provide costs and machine data to allow an economic analysis of the systems. Weed species diversity and greenhouse gas emission will be determined for each treatment to make an ecological evaluation. It is intended to summarize the results in a scientific paper.

**Agenda for June 10-14:**

| Time  | Monday                     | Tuesday  | Wednesday  | Thursday                              | Friday  |
|-------|----------------------------|--|--|---------------------------------------|---|
| 7-8   | Arrival, accommodation     | Breakfast  |  |                                       |   |
| 8-12  | Introduction and farm tour | Lectures 'Sensor systems and AI in Weed Research', work with sensors of the robots | Assessments, Lectures 'Physical and cultural weed control' | Second treatment, assessments         | Visit of weed biodiversity field, dam cultivation |
| 12-13 | Lunch                      |  |  |                                       |   |
| 13-17 | Introduction of Robots     | Adjusting robots, first assessment, first treatment                                | Excursion to K.U.L.T. and winery                           | Data analysis, structure of the paper | Students present results, Exams for students      |
| 18 -  | Dinner                     |  |  |                                       |   |

**Participation fee:**

160 € - this includes food on Ihinger Hof and accommodation for ELLS-students in dormitory at Ihinger Hof.