**Precision phenotyping reveals beneficial drought responses in faba bean**

Scheer L1 , Wittkop B1 , Stahl A 3 , Sass O2 , Welna G2, Snowdon R1

Lennart.scheer@agrar.uni-giessen.de

1 Department of Plant Breeding, Justus Liebig University, Giessen, Germany

2 NPZ Hans-Georg Lembke KG, Holtsee, Germany

3 Institute for Resistance Research and Stress Tolerance, Julius Kühn-Institute (JKI), Quedlinburg, Germany

Drought stress is one of the most crucial abiotic stress factors threatening worldwide cultivation of faba beans. In the face of climate change, breeding for drought stress tolerant genotypes is gaining further importance under increasing temperatures and prolonged drought periods. Here we screened a diverse *Vicia faba* genotype panel under controlled, field-like conditions, using a unique precision drought phenotyping platform to identify morphological and physiological traits associated with relevant drought stress tolerance characters, along with interesting genotypes as crossing partners for future for breeding.

80 diverse genotypes were grown in 240 large containers with a 90 cm deep soil profile in a fully-automated drought phenotyping platform (*DroughtSpotter XXL*) which accurately measures the weight of each container every five minutes 24/7, enabling precise gravimetrical recording of water use patterns and stress responses throughput the entire plant lifecycle. Furthermore, an automated watering system individually maintains containers at a preset field water capacity, allowing simulation of specific drought stress scenarios. Simultaneously, high-resolution plant images are captured daily throughput the entire vegetation period by a fully automated, vertical, multispectral PlantEye 600 dual 3D scanner. The scanner not only enables three-dimensional assessment of temporal changes in plant morphology and architecture, but also of spectral indices indicative of stress responses (NDVI, NPCI, PSRI, Hue). Connecting precise phenotypic and plant performance data obtained under relevant drought stress conditions help pinpoint useful target traits for efficient field selection and identification of breeding lines capable of maintaining high yield under limited water availability.