High-Throughput Phenotyping of yield parameters in the vineyard – first steps

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Complementary to genotyping techniques like Marker-Assisted-Selection (MAS), faster methods for plant phenoltyping need to be established permitting high quality, objectivity, and precision in phenotypic data recording. Furthermore, for a woody crop plant like grapevine high throughput-(HT)-phenotyping needs to be developed for applications in vineyards rather than in the lab or greenhouses. Adaptable image based phenotyping techniques will be one way to receive plant features non-invasive and with high-throughput.

Quantifying yield parameters is challenging, particularly when measurements need to be done on large samples. Complex shapes and slight variations between genotypes make it difficult and very time-consuming. Objective manual screenings can be done on small samples but this method is rather vague especially when done by multiple persons or varying descriptive standards.

Therefore, as an intermediate step two high-throughput image interpretation tools for the lab (CAT-Cluster Analysing Tool; BAT-Berry Analysing Tool) were developed.

Building up on a Prototype-Image-Acquisition (PIA) system developed in CROP.SENSe.net, PHENOvines aims at the implementation of a HT-phenotyping platform for field application to be used within a breeding program. Including an improved Image-Acquisition-System which consists of five cameras, RTK-GPS (GPS position accuracy around 2 cm), and an adjusted prototype software to take geo-referenced RGB images.

These phenotyping platform facilitate a non-invasive and contactless detection of phenotypic traits of grapevines. As a first step to detected yield parameters directly in the field a high-throughput image interpretation which enables a fast acquisition of grape berry size from RGB images was tested.

It is anticipated that in future the phenotyping platform will be based on an autonomous robot that drives through experimental and production vine-yards. In its final version pictures shall be taken automatically depending on the GPS position.