PROJECT TITLE

Root aeroponics in African rice

CONSORTIUM

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SUMMARY OF THE REPORT

Root system architecture determines the distribution of root surface area within the soil profile and so the plant's capacity to capture nutrients and water and thus has a direct bearing on crop productivity. Improvement in root architecture can have profound impact in improving resource use efficiency particularly under low in put agriculture.

With generations of breeding for high yield under high inputs, the root system of modern crop varieties is not optimised for low input agriculture. Here we aimed to exploit natural variation in ancient African rice *Oryza glaberrima* that retains many properties specific to challenging African conditions of soil and climate, including limited water availability, abiotic stress, pest and diseases tolerance. Several *O. glaberrima* lines are completely sequenced for genome-wide association studies. Identification of genes underlying key root traits may provide novel genes for translation into crop breeding programme.

We used the RootPhAir platform at Universite catholique de Louvain for high throughput root phenotyping in *O. glaberrima*.

Plants were germinated and grown over 3 weeks on the platform. Imaging was performed every 2 hrs. Images were analysed using a software developed by Prof. Draye's team to estimate the parameters of a mathematical model of root architecture (RootTyp). This model-based approach ensures that the data analysis step targets biologically meaningful variables instead of conventional shape descriptors.

Results from this experiment revealed a large natural variation for root and shoot traits in *O. glaberrima*. We will now analyze and exploit these data to identify genes controling interesting root traits by association genetics.

Moreover, data from the aeroponics root screen will be correlated with other large scale phenotyping experiments performed on the same panel such as above ground architectural trait screening using INRA PhenoArch platform by IRD group (MycoRice project -PI R. Aroca) and will enable us to test the hypotheses that key root traits can alter (1) tolerance to abiotic stresses, (2) efficiency of nutrient and water uptake, (3) partitioning between root and shoot and (4) resource use efficiency and total plant biomass.