



## **Rooty: A Root Ideotype Toolbox to Support Improved Wheat Yields**

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## **Abstract**

This project assembles a world-class team of leaders in root research and wheat genetic improvement from seven institutes and five breeding companies and brings this expertise into the IWYP programme. Our goal of optimising root systems is a critical component of the overarching IWYP aim of raising yield potential: higher yielding crops developed through IWYP will most likely demand more water and nutrients to support those yields, and roots must supply these in an efficient manner without draining any more carbon away from grain formation than is necessary to provide this function. The project builds on state-of-the-art developments in wheat genomic tools, germplasm resources, 'Speed Breeding', physiological and genetic understanding of root growth/development, high-throughput root phenotyping methods and the creation of novel genetic variation ready for exploitation. We establish a pipeline to validate the impact of root ideotype on yield, based on the use of: (1) recently cloned genes, (2) known QTL, and (3) de novo natural and artificial allele discovery. This pipeline provides staggered delivery of validated root ideotypes that will feed the breeding activities carried out by the IWYP Hub, participating breeding companies, and wider wheat breeding networks. By focusing on the often ignored 'invisible half' of the crop, this approach complements IWYP work on above ground traits, ultimately providing the knowledge and resources to allow above and below ground approaches to be combined in the future to maximize yield genetic gains.