



The role of hydraulics FSPMs in the context of root breeding : a case study on Pearl Millet

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Developing a sustainable agricultural model is one of the great challenges of the coming years. The agricultural practices inherited from the Green Revolution of the 1960s show their limits today, and new paradigms need to be explored in the context of counter rising issues such as the multiplication of climate-change related drought episodes. Two such new paradigms are the use of functional-structural plant models to complement and rationalize breeding approaches and a renewed focus on root systems as untapped sources of plant improvement. Since the late 1980s, numerous functional and structural models of root systems were developed and used to investigate the properties of root systems in soil or lab-conditions. In this talk, we present a review on the use of multiscale functional-structural hydraulic root models in the context of drought tolerance breeding. We discuss how root models predictions can be linked to breeding studies to improve plant resistance to drought and how they can be validated to demonstrate models reliability and use. To illustrate this topic, we present a new structural model of pearl millet root system growth dynamics, combining stochastic and data-driven modules. The model is capable of simulating the development of observed root phenotypic variability of two millet genotypes chosen for their contrasted root traits. Model description, principle, assumptions, formalism and simulations will be presented during the talk.