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Adapting crops for semi-arid-tropical (SAT) agricultural systems: progress in TE research

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Increasing the efficiency of water conversion into biomass (TE) is in focus for improvement of crop productivity under water-limited environments. The last ID conference highlighted that stomatal regulation under high vapor pressure can increase TE, which represented a new opportunity for crop improvement. While increasing TE leads to enhanced crop production under drought stress, managing water to assure its availability for the grain filling period is necessary. Particularly, we will focus on traits that alter the crop water-use profile during the season (e.g. canopy size and development), increase TE (e.g. canopy conductivity and structure), or achieve both. For these water-use related traits, the range of genetic variability has been explored and this allowed designing crops suitable for either agro-systems intensification or resilience. Yet, the interactions of physiological processes responsible for plant water use with environments are not fully understood and this talk will provide an update on these aspects. We will also show how the crop and socio-economic models are used to quantify the benefits and evaluate the trade-offs associated with different crop water-use strategies in semi-arid tropics agro-ecologies. Results indicate that variation in water-use related traits is frequently associated with grain versusstover production trade-offs. Therefore, the economic value of a particular technology intervention depends on the nature and type of commodity demand within the specific agro-system. We will discuss the possibilities of enhancing the crop value in the systems with high demand for staple food grains ormore complex dual purpose (food and fodder)crop production systems.