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Advanced phenotyping in a breeding setup

Entering the post-genomics area, many breeders have acquired a number of molecular tools, which allows them to predict genotype performance, identify major QTLs for certain traits, and introduce breeding short-cuts. However, the development of these tools has also revealed a clear demand for higher trialing precision. At the same time there is a strong request from all markets to improve plant robustness to meet future climate challenges; of course without compromising yield or quality. The academic- and industrial response to this situation has been to invest heavily in highly controlled phenotyping facilities, either based on indoor systems, where single plants are monitored constantly from germination to maturity, or outdoor systems, where crop phenotypes can be monitored at plot level. Each of these systems have their strength and weaknesses. While indoor systems are made to magnify genetic differences and in some cases also the genetic interaction with certain environmental cues, they seldom account for plant-to-plant competition. Outdoor systems do take this factor into account, but if not scaled properly may fall short of statistical power to detect genetic differences and interactions with the environment. Crop breeding companies hold a century-long record of efficient field trialing with phenotyping based on both destructive measurements and visual assessment. This talk will discuss some of the new phenotyping methods as seen from a breeder's perspective. Emphasis will be laid on practical results in grasses, but several of the benefits (and short-comings) is applicable to any crop.