



Global Engage 

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## The GRAIN Platform: A unique platform to identify genome editing targets

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Developing technologies to achieve step change increases in crop yield remains a critical unmet need in agriculture and a key challenge for future global food security. Crop yield in a given season is impacted by three interacting vectors: 1) the metabolic system within the plant 2) gene regulation through transcription factors and 3) the environment itself. Yield10 is focused on achieving step change increases in the inherent yield of the major crops, corn, soybean and canola. This will likely require multiple gene modifications to increase photosynthesis and efficiently deliver the increased photosynthate to seed. At Yield10 Bioscience we are leveraging our unique expertise in metabolic engineering to tackle this challenge. From our perspective, the CRISPR system was the missing gene modification tool and its availability completes the technology tool box to enable advanced synthetic biology approaches to increase crop performance. This raises the key question, what genes or gene combinations should be edited to deliver the next generation of agricultural traits? Yield10 Bioscience is developing the GRAIN (Gene Ranking Artificial Intelligence Network) Platform to identify the unique gene combinations that will be required to increase crop yield. The metabolic modeling component of GRAIN, based on flux balance analysis, thermodynamics, and kinetics, allows the user to examine plant metabolism, determine the importance of individual genes to a trait, and determine theoretical yields upon gene modification. The regulatory modeling component, based on transcriptome-based regulatory association networks, converts large amounts of data into actionable gene targets. Using this approach, Yield10 is identifying and de-risking yield traits for major agricultural crops. Examples of observed yield increases that may be achievable through editing will be discussed, including a 150% increase in biomass production in a C4 monocot and a 23-65% seed yield increase in an oilseed, to demonstrate the power of Yield10's approach.