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GENETIC YIELD IMPROVEMENT FORECAST AND WATER-LIMITED PRODUCTIVITY OF SIGNIFICANT AGRICULTURAL CROPS

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ABSTRACT

In the next 4 decades, when growth of this segment, feed, and biofuel feedstock is expected to stabilize, improve crop yields under potential (Yp) as well as water scarcity (Yw) conditions will be important to enhancing food security. To meet predicted demand in 2050, the three main cereal crops (cereals, maize, and rice) will require 1.16–1.31% yearly increase in Yp and Yw. They may fall much more if current absolute yield increase rates continue steady, or if recent indicators of agricultural production halting in certain parts of the world become widespread. There are a variety of methods for increasing Yp and Yw genetic improvement rates, including photosynthetic genetic engineering, above-ground awareness and high design, and boosting root levels of water uptake. Because time is limited, the time scales required to progress potentially advantageous features to field prototype system, farmer-ready cultivars, and widespread farmer adoption are given special attention. The value of molecular breeding methods as tools for improving fundamental and complicated genetic features is highlighted. Only a small percentage of useful features are integrated into the breeding process, and information is not widely shared between research teams. Increasing financing for targeted research, as well as identifying and removing or decreasing roadblocks at different stages of the concept to farmer-ready cultivar chain, might help to accelerate the exploitation of these prospects. Possible genetic advances in Yp or Yw, such as using hybrid vigor in rice or genetically engineering photosynthesis, are unlikely to alter this prognosis. No amount of optimism can hide the reality that without sustained investment in genetic improvement and breeding aids, unfulfilled demand for grains in 2050 will be much higher.

KEYWORDS: *Bio fuel, Breeding, Crop Yield, Cultivar, Genetic Improvement.*

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