

Review: Accelerating Plant Breeding for the Purpose of Enhancing Food Security Worldwide

Abstract

With a normal 9 billion individuals by 2050 and normal pay on the ascent in the creating scene, meeting future food request will be a test. The food supply is being further strained by urbanization, climate change, and land degradation. The challenges are multifaceted and self-reinforcing; necessitating a fundamental shift in the food system. Crop improvement through breeding has historically been the primary method for alleviating poverty and expanding global food supplies. As a partial solution, new, improved crop varieties must be developed and made available to farmers sooner in order to adequately address these issues with food security. In this survey, we center around different demonstrated traditional and biotechnological speeding up plant reproducing techniques that don't need hereditary design in or quality altering. Particular focus is placed on the short term viability of implementation by national agricultural research systems in developing nations. We argue that it is justifiable to immediately implement accelerated breeding practices in the public sector and those postponing technologies that can accelerate breeding makes no economic sense. Taking into account a large number of variables including the financial matters of sped up reproducing, we advocate the utilization of a technique called fast age advance (RGA) as the most achievable strategy for speeding up reproducing in the public area.

Keywords: Food security • Accelerated plant breeding • Rice • Rapid generation advance • Technology adoption

Introduction

Global hunger has decreased as a result of an unprecedented rise in cereal production in recent decades. The force of the food shortfall has diminished by half beginning around bringing the number of people who are malnourished to 820 million, which is still a significant number. Although impressive, this historical trend may mislead people into thinking that food security has improved recently. Interestingly, on-going proof has shown that the quantity of undernourished individuals has ascended beginning around — both in outright and in relative terms. There are now more people in Africa, Western Asia, and Oceania who are malnourished than there were a decade ago. Population growth and climate change pose the most immediate threats to food availability in the present and in the future. Global demand is being furlled by rapid population growth, which is also putting pressure on land due to urbanization. Access to food is very much

dependent on economic growth, which is still important for reducing poverty and hunger (both chronic and hidden), though it may not be enough to reduce hunger and malnutrition faster. Environmental change is generally viewed as a significant danger to future food security. Although it is impossible to accurately predict the effects of climate change, the general consensus is that global crop production will suffer. Increasing levels of CO₂, temperature, pests and diseases, decreasing head and milling yield, as well as quality attributes, are all potential sources of negative effects. Environmental change additionally builds the recurrence of outrageous climate occasions, for example, dry spells and floods. As a result, there are four obstacles to future food security: demand is going up, supply is going down, and there is a need for production that is both resilient and sustainable. Besides, these elements don't just add up; they are

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anticipated to amplify the overall burden of food insecurity and the resulting need for systemic change in the food system because of their interaction and collective reinforcement.

Material Method

Phonemics and geological data frameworks. We looked at the literature in the two following sections with the specific goal of determining which tried-and-true technologies for accelerated breeding are suitable for short-term use in public breeding programs. Technologies that do not require genetic engineering or gene editing are the sole focus of our investigation. Lastly, we concentrate on rice because of its global significance, particularly in developing nations, and the public sector's predominant role in rice breeding. Additionally, because rice is a species of model crop, research results can typically be applied to other species.

Breeding Method

Plant reproducing is a tedious interaction because of the science of crop species. A new rice variety typically needs at least ten years to be developed and made available. The rearing system for the most part comprises of three stages: field tests, line fixation, and hybridization. In the initial stage of line fixation, plant breeding is a large-scale logistical operation that involves thousands to hundreds of thousands of plants. By the end of the process, however, the number of plants involved is drastically reduced to a select few advanced breeding lines. Approximately 99 percent of a breeding program's initial starting material is rejected and discarded as a result of selection occurring during the breeding process. For comparing the "best" advanced breeding lines to current varieties, the majority of nations have a separate, government-led system that typically takes two years to test.

Selection by genetics

One explicit strategy called genomic choice (GS) has as of late arisen. Genomic selection is a method that works in conjunction with MAS. Instead of concentrating on specific genes or quantitative trait loci, genomic selection relies on making predictions about the genome from a large number of DNA markers. Pilot concentrates on in rice, wheat and maize during the last ten years have given empowering results to abbreviate rearing cycles and assortment advancement times. The application of genomic selection to the precise selection of complex traits like

yield and the shortening of the breeding cycle to accelerate genetic gain has enormous potential. However, in practice, public sector breeding programs in developing nations face significant economic and technical obstacles to actual implementation. Additionally, prior to implementation, the most cost-effective and effective method of implementing genomic selection must be evaluated.

Conclusion

Breeders and crop scientists may face unprecedented challenges this century; consequently, it is hoped that technological advancement will, as in the past, guarantee sufficient food production for the global population. Implementation of technology adoption can take years. It is hoped that the justification presented in this paper will motivate breeders working in the public sector to implement faster breeding methods in the near future to reduce risks from potential scenarios. Be that as it may, even with the arrival of the freshest superior assortments, there will constantly be a requirement for solid agronomy exploration and expansion furthermore, solid seed frameworks. The breeding of plants is only one, though crucial, component of the larger system for producing food. Elective ways to deal with increment food creation as well as strategies that guarantee supportability of food creation, including relief systems, need to be considered simultaneously. Premonition data on business sectors, climate and environment, pre-rearing examination and especially effective dispersal methodologies are required too since low degrees of reception seriously limit worked on assortments' capability to further develop food security.

Reference

1. AG Labortea, CAJM de Bie, EMA Smaling, *et al.* Rice yields and yield gaps in Southeast Asia: past trends and future outlook. *Eur J Agron.* 36, 9–20 (2012).
2. AM Stuart, ARP Pame, JV Silva, *et al.* Yield gaps in rice-based farming systems: insights from local studies and prospects for future analysis, *Field Crops Res.* 194, 43–56 (2016).
3. BCY Collard, JC Beredo, B Lenaerts, *et al.* Revisiting rice breeding methods – evaluating the use of rapid generation advance (RGA) for routine rice breeding. *Plant Prod. Sci.* 20, 337–352 (2017).
4. E Birch, A Nicholas, Graham S Begg, *et al.* How agro-ecological research helps to address food

- security issues under new IPM and pesticide reduction policies for global crop production systems. *Journal of experimental botany* .62.10, 3251-3261(2011).
5. Lenaerts, Bert, Bertrand CY Collard, *et al.* Improving global food security through accelerated plant breeding. *Plant Science* .287, 110207(2019).
 6. He T, and Li C . Harness the power of genomic selection and the potential of germplasm in crop breeding for global food security in the era with rapid climate change. *The Crop Journal* . 8, 688-700 (2020).
 7. Bouis, H E, & Saltzman A . Improving nutrition through biofortification: a review of evidence from HarvestPlus, 2003 through 2016. *Global food security* . 12, 49-58(2017).
 8. Ahmar S, Gill RA, Jung KH, *et al.* Conventional and molecular techniques from simple breeding to speed breeding in crop plants: recent advances and future outlook. *International journal of molecular sciences* . 8, 21-2590(2020).
 9. Wikandari, Rachma, *et al.* Application of cell culture technology and genetic engineering for production of future foods and crop improvement to strengthen food security. *Bioengineered* .12.2, 11305-11330(2021).
 10. Harfouche, Antoine L, *et al.* Accelerating climate resilient plant breeding by applying next-generation artificial intelligence. *Trends in biotechnology* 37.11, 1217-1235(2019).