We need a second green revolution.

By 2050 the world’s population is projected to surpass 9 billion people. To understand the challenge of feeding this growing population, consider that currently over 1 billion people are malnourished and nearly 800 million are unable to obtain even their minimum daily caloric requirements. To meet this challenge will require profound political, economic and cultural changes as well as scientific and technological innovation in the production, processing and distribution of food. It is estimated that farmers will need to double their yield in the coming decades. Yet, this challenge must be met at the same time arable land is being lost to desertification, salinization, urbanization and soil erosion. In the coming decades climate change will put additional strains on agricultural productivity.

The green revolution of the mid-twentieth century modernized crop breeding and farming techniques and led to tremendous increases in agricultural productivity, helping to stave off hunger in many parts of the world. Yet, the green revolution has had grave social and environmental costs. The benefits of the green revolution have not been shared equally, but over the past 60 years agricultural production has been consolidated to the advantage of a relatively few farmers and corporations. Additionally, these improved crops require large amounts of synthetic fertilizers, pesticides and herbicides leading to widespread environmental degradation and release of greenhouse gases.

How can we increase food production while limiting the environmental impact of agriculture and addressing the economic disparities of our current agricultural system? While scientific and technological solutions alone will not be sufficient; we must invest in research to develop crops with traits for improved nutrition, disease resistance and ability to grow on marginal farmland. Together with additional technological advances, crop improvement through genetic engineering must be part of a ‘second green revolution’. Techniques such as precision farming will allow us to apply the needed resources and reduce waste of water and nutrients; yet the primary factor that limits crop productivity is plant genetics.

Genetic engineering is the process of directly manipulating the genome of an organism allowing new traits to be selected more rapidly than through traditional breeding. The crops resulting from this process are referred to as Genetically Modified (GM); however, this term does not acknowledge that genetic modification of crops has been taking place for several millennia through domestication and plant breeding. Since the introduction of the first approved GM crop in 1994, GM plants have grown to occupy more than 10% of the world’s farmland. However GM crops have not yet delivered on the broad promises of the early proponents of this practice. To date the vast majority of GM crops are controlled by a few corporations and are focused on traits for herbicide-tolerance and pest-resistance. In the coming decades we must devote public resources to a second green revolution for the development of seeds that are freely available to farmers that carry traits allowing for high yielding, nutrient-rich, disease-resistant crops that can grow on marginal farmlands in developing countries.