Biotech In focus

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Do we need GE crops?

If current trends hold, by 2040 we will be sharing the planet with 9 billion neighbors. This amounts to about 2 billion more people than are alive today. To put this in perspective, the number of people we'll add to the global population during the next 25 years is larger than the total number of people alive 100 years ago!

1850

75%

Despite the fact that populations have grown and economies have industrialized, the popularity of farming as a profession has fallen sharply. In 1850, the U.S. population was just over 23 million, about three-quarters of the U.S. population worked in agriculture.

2014

2%

Today in the U.S., we have 317 million people but less than 2% of U.S. residents are engaged directly in farming.

During the past 150 years, the invention and refinement of farm machinery and improved inputs—fertilizers, pesticides, and herbicides—and the breeding of high-yielding plant varieties has helped feed a rapidly growing population. We now use more than 40% of the planet's land to farm. In addition, some of the best agricultural land in many countries is also being converted for cities. Clearing of new land for agriculture to grow food has limited potential in the future and would results in loss of habitat for wild plants and animals.

The crops we eat have changed as well. Prior to reliable refrigeration, produce had to be grown nearby to consumers, and eaten in season or preserved. Today, many of us are fortunate to have options that range from local farmers' markets and community supported agriculture to stores that reliably stock imported fruits and vegetables that add flavor and nutrients to our diet year-round.

Consider the technologies we've discussed throughout this bulletin series. The process of crop improvement started with saving seed and expanded through advances in plant breeding to create the high-yielding varieties on which we rely for abundant, affordable food. At the same time, there is growing interest in heirloom crop varieties that were popular when food was grown by larger numbers of individuals on smaller plots of land. These heirloom plants, while being attractive for many reasons, aren't well-suited to large-scale production and frequently lack the resistance to many diseases and insect pests. They are most often valued for their culinary traits and often for their hardiness in tolerating tough environments such as drought, though with lower yields.

For more information and past issues, please visit our website at www.ctahr.hawaii.edu/biotechinfocus

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Diversity Is The Goal

If we eliminate the current farming model of larger integrated farms, frequently growing a single crop, it will become much, much harder to produce the food we need at prices we can pay. At the same time, if we let non-commercial varieties die out, we could lose what makes them unique and will have fewer places to look for useful traits when the next pest, disease, or environmental stress threatens a widely planted commercial crop. We shouldn't eliminate either type of crop, since they both have current and future value. The goal is to have the greatest diversity in crop plant types or varieties for all breeding programs.

The same reasoning of having variability in crop varieties available can be applied to the latest development in plant breeding—genetic engineering—which dramatically expands the types and range of traits that can be potentially added to a crop plant. Thus far, the most widely adopted GMO crops—varieties of corn, soy, cotton, and canola that resist herbicides, produce Bt insecticide, or both—have shown measureable benefits.

Reducing Insecticides

Bt crops have provided higher, more consistent yields while allowing farmers to significantly reduce their use of chemical insecticides. Some Bt crops have been so effective that even growers who don't use them need less insecticide, because pest populations are now lower overall. Farmers who plant herbicide-tolerant crops (especially glyphosate-resistant RoundUp Ready® soybeans) are more likely to adopt soil conservation practices, because plowing (tillage) isn't necessary to kill weeds. No-till and low-till agriculture conserves soil and helps prevent silt damage to watersheds. Both herbicide-resistant and Bt crops also require less labor than conventionally grown non-GMO crops.

Developing Resistance

These GMO crops may ultimately fall victim to their own success, however. An important drawback is that overreliance or inappropriate use promotes the rapid evolution of pests that can resist Bt or herbicides such as glyphosate. Resistance has developed in non-GM crops and insects by simple selection and was describe for Bt sprays before GM Bt-crops were released. Many non-GMO plants are tolerant to glyphosate.

Multiple Options

It is helpful to all growers that multiple pest control options be practiced, including methods approved for organic agriculture and the multipronged approaches employed in integrated pest management. As new technologies become available, including new GMO crops with new traits, each should be evaluated on its individual merits and risks, not upon the technology used.

Genetic engineering has the potential to contribute to the development of high-yielding, drought resistant crops for example, or crops with reduced fertilizer requirements, benefits that can be hugely important given the need to produce more food on less land with fewer farmers!

The question we face is this: How can fewer farmers feed more people a wider array of foods while using the same amount of land? It won't be easy to answer. Eliminating a powerful tool like genetic engineering could make this daunting task even more difficult.