

Plant breeders improve seeds by identifying desired characteristics in specific plant varieties, selecting those with the greatest genetic potential, and combining them to produce offspring with those desired characteristics. They use expertise from a variety of scientific disciplines to measure and identify desired characteristics. This helps them predict which plants will have the greatest genetic potential.

Thanks to seed improvement, farmers can count on increased varieties of crops, consistent and reliable harvests, and food that stays fresher longer. The result is increased quality and quantity of our food supply, quality of life, and a more sustainable future – meaning that future generations will be able to meet their food needs too.



Yes, plant breeding is safe! Mankind has been breeding plants since the dawn of plant domestication, roughly 12,000 years ago, when they started selecting seed of the best plants for planting the next crop.



Fundamentally plant breeding has not changed. As our understanding of plants has increased, we have new tools to use and we better understand how the plant operates.

Historically, plant breeders focused solely on the observable characteristics of the plant and how those characteristics could be improved, such as increasing yield or creating disease resistance. Breeders' most valuable tools to select improved plants were their sense of sight, taste and smell.

Today, with an increased understanding of genetics, the capability to sequence plant genomes and the ability to link a specific gene(s) to a specific characteristic, plant breeders are able to more precisely improve a plant's characteristics by efficiently focusing on the underlying genetics. Breeders can also make specific changes in existing plant genes in a way that mimics the changes that occur in nature. Equally important, breeding improved varieties can be accomplished in far less time than ever before.



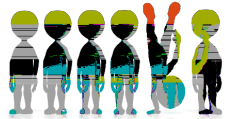
A GMO (genetically modified organism) is a plant that has been altered using genetic engineering methods that introduces a gene from another plant or organism to create a desired trait—such as healthier oils, resistance to an insect, or drought tolerance. For more on GMOs, visit www.GMOanswers.com.



Yes, GMOs are the most regulated and tested products in agricultural history. Hundreds of studies on the safety of GMOs have been conducted, and thousands of studies have been reviewed. Every leading health organization in the world stands behind the safety of GMOs.

In the 20-plus years on the market, GMOs have not caused or contributed to a single illness or death. Extensive and continuous studies on GMOs are being conducted to ensure their ongoing safety for consumption.

Again, for more on GMOs, visit www.GMOanswers.com. There is a wealth of information, and you can submit your own questions to be answered by an expert.



As with more traditional breeding methods, the newer methods used by plant breeders focus on using a plant's own genes, or genes from the plant's wild relatives, to create a desired trait, such as disease resistance or drought tolerance. It is a more precise way of creating genetic variation—a longtime goal of plant breeders. The improved seed does not have any "foreign" DNA.



Newer plant breeding methods like gene editing build on what we've been doing for years. These evolving methods allow us to work within the plant's own family – without the introduction of foreign DNA – to reach the same endpoint as through more traditional breeding, but in a more precise and efficient way.



Whether produced through traditional plant breeding, or through newer innovative breeding methods like gene editing, all new plant varieties go through rigorous testing for safety and quality before their seeds are ever sold to farmers. This includes everything from federal oversight and state laws, to plant breeder, grower and food company standards.



Yes, plant breeders develop varieties that are used specifically in organic production. These seeds must be bred and grown in compliance with USDA's National Organic Program (NOP) regulations. Because organic farmers are restricted from using inputs like traditional fertilizers and pesticides, plant breeders must select varieties that have high resiliency and natural resistance to disease and pest pressure.



The seed industry is committed to developing better seed for a better quality of life. Better seeds provide economic benefits, improve the environment, and enhance health and wellness.

For example, thanks to improved seed, Americans spend less money on food than their counterparts in many other developed countries; farmers can produce more crops from the same land; and families have access to more nutritious produce.

In fact, some of the biggest challenges our society faces – from food and energy security to protecting our natural resources – can be addressed through the smallest of solutions: improved seed.



The use of seed treatment technologies is an effective, precise tool to provide the necessary protection of seeds for a strong, healthy start. Farmers select seed treatments after assessing their farm's risk factors to shield the seeds from the insects and diseases that exist in the soil during early development. Seed treatments help America's farmers produce higher quality crops, while minimizing impact to humans, animals and the environment.



When used in accordance with label instructions, seed treatments have been determined to pose no detrimental effects to bee populations. After extensive research, USDA concluded that the parasitic mite *Varroa destructor* is the single biggest threat to honey bees, and is closely associated with overwintering colony declines (*Report on the National Stakeholders Conference on Honey Bee Health*, October 2012). For more information, visit www.GrowingMatters.org.



The global seed industry works to ensure farmers have the seeds they need today to feed the world tomorrow. Seed companies conduct research and product development that is intended to improve yield and quality. This is being done through improved disease resistance, better drought and/or salt tolerance, more consistent and uniform crop development, and improved nutrition.

By reducing the threats of crop failure through reliable and improved seeds, today's farmers, as well as future farmers, can better meet the food demands of a growing world population.



Different seeds have different requirements. Most farmers do not choose to save seed because they can be assured that newly purchased seed is free of disease and pathogens, and in the case of hybrids, demonstrates hybrid vigor, with consistent, uniform characteristics. Talk to your seed dealer about specific requirements for your variety.



Plant breeders invest a tremendous amount of resources in developing new plant varieties which create value for farmers, growers, gardeners and consumers. Patents are a form of protection that encourages continued investment in developing new seed varieties that benefit all of us.

It's important to note that patents have a limited term, and upon their expiration, unlimited access to once-protected varieties should occur as soon as is reasonably possible.



Yes, but it depends on what type of seed you are growing. Always refer to the seed-packet label instructions for specific requirements about the variety you are growing.

A hybrid seed, for example, combines the best characteristics of both parents into one offspring, giving better performance in desired traits such as insect and disease resistance, even ripening, etc. These characteristics will be lost in the next generation of planting. Therefore, to maintain the same level and consistency of performance, it is recommended to plant the new hybrid seed each year. On the other hand, an open-pollinated variety will maintain its characteristics from generation to generation, and many home gardeners successfully plant open-pollinated seeds they've saved from their gardens.



Certified seed is an official designation of genetic purity and identity earned by meeting specific requirements for production, storage and distribution. The standards for certified seed are verified through expert third-party field inspections and lab analysis in order to meet state, federal and international seed laws. Programs are in place for field crops, turf grasses and more.



In addition to connecting with _____, the following sources provide useful information:

_____ provides information and communications resources about gene editing.

_____ is an international organization working to safeguard crop diversity by promoting the conservation and availability of plant and seed diversity

_____ is a website dedicated to creating an open dialogue on the topics of biotechnology and GMOs in food and modern agriculture. From health and safety to a look at how GMOs are made, GMO Answers was created to make information about GMOs easier to access and understand.

_____ is the largest public seed testing laboratory in the world. It offers testing services for more than 300 species of crops, vegetables, flowers, and trees and also provides educational and training modules.

_____ is an official site of the Norwegian government and provides information on the Svalbard Global Seed Vault, the world's largest secure seed storage, opened by the Norwegian Government in February 2008. The vault holds the seeds of many tens of thousands of varieties of essential food crops such as beans, wheat and rice. In total, the vault now holds seeds of more than 864,000 varieties representing 4,000 plant species.



_____ mobilize the research, educational and outreach resources of UC Davis in partnership with the seed and biotechnology industries to facilitate discovery and commercialization of new seed technologies for agricultural and consumer benefit.

_____ is a non-governmental, non-profit making organization. ISF is widely regarded as the voice of the global seed industry.