



**RESEARCH &
DEVELOPMENT
PIPELINE**





**MEETING GLOBAL
DEMANDS
THROUGH
SUSTAINABLE
AGRICULTURE**



WE'RE WORKING WITH FARMERS TO MEET GROWING GLOBAL DEMANDS SUSTAINABLY

The world's population is growing. Demand for food and water is increasing. Over the next few decades, food production will need to increase dramatically to keep pace with population growth. To do that, farmers will need to grow as much food in the next 50 years as they did in the past 10,000 years combined, while managing with limited resources. While it may seem like a daunting task, it's our mission to deliver agricultural innovations that can help farmers do just that. That's why more than 6,100 research and development-focused employees around the world are working each day to discover and deliver products to help farmers produce more crops while conserving more natural resources for future generations.



OUR RESEARCH AND DEVELOPMENT PIPELINE

Our robust pipeline of innovative agricultural products spans numerous crops and agronomic solutions in various stages of development, or phases. Regardless of the type of pipeline product, each seeks to address a specific need such as increasing yield or decreasing the impact of pests and stress. Some of our pipeline products are brand new concepts in discovery that may not be commercially available to farmers for more than a decade. Others are in pre-launch, and could become a reality for farmers in a few years. As each product moves through our research and development pipeline, it becomes a part of a system of solutions that aims to make agriculture more productive, more profitable for farmers, and more efficient and sustainable for our planet.

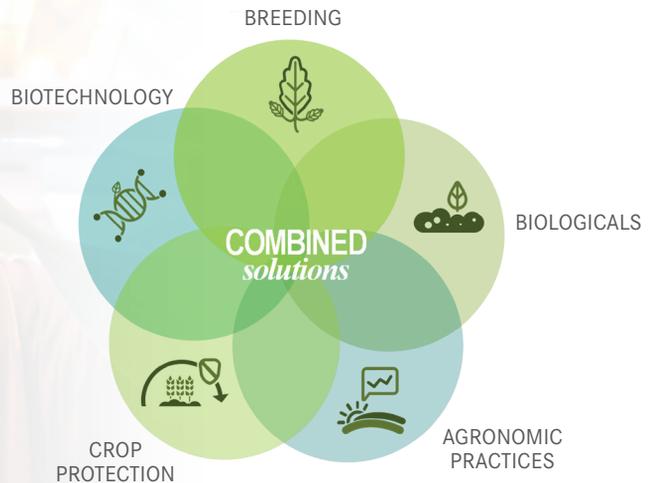
SYSTEM INTEGRATION





OUR APPROACH TO DRIVING YIELD

We believe increasing yield potential doesn't just happen in the lab. It is the combination of solutions farmers employ that help drive yield sustainably. In essence, it is about a total system working together in partnership with the grower to drive yield in a sustainable way.



BREEDING AND BIOTECHNOLOGY

The difference between plant breeding and plant biotechnology comes down to the way plants are improved. Breeding crosses two specific plants to produce an offspring plant that carries the most desirable characteristics of its parents. With biotechnology, key genes are inserted directly into the DNA of a single plant to make improvements. This can result in an improvement within the plant that normally would have been very difficult or nearly impossible to achieve through breeding. Often we can investigate a potential product target through both biotechnology and breeding. Then, depending on what we are hoping to accomplish and which particular research pathway shows more promise, we may choose one platform to pursue. We may also choose to use both—combining specialized germplasm developed through breeding and a biotechnology trait. Together, biotechnology and breeding innovations are what make it possible for Monsanto to deliver the crop improvements farmers need to sustainably meet growing global demands.



A CLOSER LOOK INTO PLANT BREEDING AT MONSANTO

Our plant breeders around the world are challenged each day with finding and developing seeds that have special qualities and can deliver a wide array of benefits to farmers. For example, we might be looking for a seed that has a high tolerance to drought conditions. To streamline and simplify the process, our researchers have created sophisticated diagnostic tools that allow us to peer into the core of millions of seeds—into their DNA—and locate the traits we need. Our global library of genetic material—or germplasm library—is leveraged by these breeders at numerous locations around the world and enables them to combine genetics from distant locations to create valuable new seed products for growers. For example, a leading North American corn hybrid may have in its ancestry plants native to multiple South American regions.





TECHNOLOGICAL REVOLUTIONS

SEED CHIPPING

Our innovative breeding technologies, such as seed chippers, enable researchers to know what characteristics plants will have before the seed is even planted. This enables Monsanto scientists to more efficiently conduct research trials in labs and fields each year, helping us to get the best seeds to farmers faster. This patented technology is a revolutionary way of testing seed and trait genetics.

BREEDING INNOVATIONS

Advances in plant breeding are helping increase the rate of improvement in key plant characteristics, such as grain yield and disease tolerance.



MONSANTO RESEARCH SPANS THE GLOBE

Farmers around the globe seek innovation to optimize yields sustainably on their farms. Our research and testing spans over 275 locations around the world supporting breeding and biotechnology research. This comprehensive testing in multiple geographies ensures our crop technologies meet the needs of farmers in areas with diverse environmental characteristics such as soil types, insect pressures and moisture levels.



VEGETABLES



RESEARCH & DEVELOPMENT

PRODUCT PIPELINE

MONSANTO'S VEGETABLE SEEDS DIVISION

The vision for our Vegetable Seeds business is to contribute to a healthier, balanced diet by helping growers produce tastier, nutritious vegetables while improving the lives of families and communities worldwide.

The combination of our strong brands, technology and breeding capabilities is expected to lead to vegetables with better quality and better flavor, more resistance to diseases and higher productivity in the greenhouse and the field, whether it is for a large scale commercial grower or a home gardener. Monsanto brings the same high quality to all its customers, enabling them to grow great-tasting fruits and vegetables.

VEGETABLE PROJECTS

	D	1	2	3	4	L
	CURRENT PHASE					
ANNUAL GERMPLASM UPGRADES*	>	>	>	>	>	>
PHYTOPHTHORA-RESISTANT PEPPERS*	>	>	>	>	>	
BACTERIAL WILT-RESISTANT TOMATO*	>	>	>			
GEMINI VIRUS-RESISTANT TOMATO*	>	>	>			
DOWNY MILDEW-RESISTANT LETTUCE*	>	>	>			

D = Discovery / L = Launch
*Denotes a Breeding Product

BREEDING INNOVATIONS IN VEGETABLES

Farmers around the world plant a wide array of fruits and vegetables that have already been improved using traditional plant breeding techniques. Monsanto breeders are increasingly using advanced breeding techniques, such as marker-assisted breeding, to bring additional benefits to producers and consumers of fruits and vegetables. These benefits include better disease resistance, higher yields, better flavor, convenience and other desirable consumer characteristics, such as color and texture.

Innovative breeding techniques are improving vegetables for two main reasons: We believe we can bring more products to market faster and more cost effectively. Within vegetables, the vast majority of our R&D focus is on advanced breeding efforts — more than 98% in fact and that's where our research focus will remain. However, there are some cases where a destructive virus or other pest can't be controlled through breeding and is impacting a significant number of acres. Those are the opportunities where biotech could have a role to play and could be considered as a tool. There are examples of biotech in vegetables already in the market today, including virus-resistant squash and papaya, and insect-protected sweet corn.

In addition to growers benefits, we are focused on better consumer characteristics such as flavor, sensory appeal, texture, fruit size, shelf-life and nutrition.



MONSANTO



VEGETABLES

IMPROVING RESISTANCE TO DAMAGING DISEASES

Resistance to Phytophthora Blight in Peppers

Phytophthora blight is one of the most destructive diseases facing pepper producers worldwide as it can attack the roots, stems, leaves and fruit. Total crop loss can occur in severely affected fields. Commercial hybrids with improved resistance would enable increased productivity and reduced risk through more effective and reliable phytophthora blight management. Marker-assisted breeding approaches are being used to introduce resistance into multiple pepper types. Initial product launches are targeted for pepper types in North America with subsequent launches in India and China.

Bacterial Wilt-Resistant Tomato

Imagine a produce aisle without tomatoes. For areas of the world where high amounts of bacterial wilt disease is present, whole tomato crops could be destroyed, devastating the farmers who grow them, significantly reducing the supply and adversely affecting prices. Thankfully Monsanto is working on a solution through its naturally-bred bacterial wilt resistant tomatoes.

Gemini Virus-Resistant Tomato

Gemini viruses are the most significant threat to tomato farmers in many world regions and can result in a total yield loss in severely affected fields. Our scientists are currently developing new tomato hybrids, bringing together multiple sources of resistance to this devastating virus which would create the opportunity to improve marketable yield and fruit quality under disease pressure.

Phytophthora resistance incorporated into a broad range of pepper types through advanced breeding techniques.



Control

Resistant

Downy Mildew Resistance would allow durable resistance to help reduce fungicide use.



Susceptible

Resistant

Downy Mildew Resistant Lettuce

Downy mildew is a common fungal disease of lettuce and a significant threat to lettuce farmers. This fungal disease diminishes quality, appearance and yields. Our scientists are currently developing lettuce designed to provide a broad resistance to downy mildew, which would reduce overall fungicide use.