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R&D Yields Drought-Tolerant Corn Technology

Monsanto researchers like Mohammadreza Ghaffarzadeh are supporting the development of our first-generation drought-tolerant corn technology. This project, which is in Phase II of our pipeline, is the first of several drought-tolerant projects that we have under development.

This year, we saw continued progress in the field trials supporting this project. The research demonstrates that our product consistently delivers yield improvements compared with controls in water-stressed environments.

This research is a centerpiece of our technology collaboration with BASF. This collaboration is poised to expand our drought-tolerant platform, allowing us to discover and deliver third- and fourth-generation products.

Monsanto representatives Mohammadreza Ghaffarzadeh, Zhiling Zhang, and Ken Gruys monitor the performance of our first-generation drought-tolerant corn technology. Their work allows us to analyze the product in field-testing environments to ensure that farmers will benefit once the product is commercialized.





Monsanto's high-performance products and innovative approaches to market are supported by our industry leadership in product development. This work creates a pipeline rich in products and supports new growth opportunities well into the next decade.

In an increasingly competitive marketplace, our ability to extend our leadership through continuous development of higher-yielding seeds and yield-protecting trait technologies rests upon two crucial attributes:

- First, our outstanding record of turning good ideas into high-impact commercial products.
- Second, our broad range of alliances and collaborations increases the flow of promising projects into the pipeline — enabling us to stock our pipeline with projects that have the greatest potential impact and highest probability of success.

Simply put, our R&D leadership has created a constantly renewing pipeline rich in projects with the potential to fuel new growth.

Leadership in Research and Development

We have built our R&D leadership through a long-term focus on the science of agricultural yield and an ongoing commitment to invest about 10 percent of our revenues in research. The building blocks of our leadership are our advanced breeding technology, an unmatched global germplasm library, and biotechnology knowledge and skill.

Underlying our R&D leadership is a culture of teamwork and collaboration. Throughout the company, we combine a focus on product development with an openness to new ideas and an emphasis on bringing those ideas to market. We measure success by our ability to move projects steadily through the pipeline, and over the last two years more than 70 percent of products in our pipeline moved from one phase to the next, with the rest passing key milestones in the development process.

Taken together, these attributes have established us as the leading innovator in seeds and traits. Monsanto was the first company to launch stacked and second-generation traits. These attributes are among the reasons Monsanto was selected by *Science* magazine as one of the top 10 places to work in the biotechnology industry.

Discovering Innovation for the Farm

Our R&D work begins in discovery. We have built a gene-screening engine with the ability — unmatched by our competitors — to screen thousands of genes efficiently and to identify those with the greatest potential.

This year, our biotechnology program will screen and test more genes in crops than in any other year in our history. Combined with our advanced breeding techniques, this work enables us to generate tens of millions of critical data points that are the raw material for real enhancements across our crop platforms.

While we're constantly enhancing the high-throughput capabilities of our in-house R&D discovery work, we're also enriching our discovery flow with an extensive network of third-party collaborators. We currently have active agreements with more than 500 entities in the private and public sector around the world.

Monsanto has become the partner of choice for discovery companies both large and small because we are recognized as an established path to market for their best ideas. Our multiyear collaboration with BASF, discussed on page 17, is dramatic evidence of this.

TAPPING INTO THE NEXT WAVE OF INNOVATION

Each year, we work with companies throughout the world to discover the next wave of innovation for the farm. Our approach ensures that we're constantly feeding our pipeline with rich, new discoveries — discoveries that complement our research and deliver a series of upgrades to the farm. For example, we're working with Evogene Ltd., based in Israel, to improve nitrogen use efficiency in corn, soybeans, canola and cotton. Nitrogen fertilizer represents one of the largest input costs in U.S. agriculture, accounting for approximately one-fifth of a farmer's operating costs. On average, U.S. corn farmers spend more than \$3 billion annually on nitrogen fertilizer applications, with plants typically absorbing less than half of the application.



Our third-party alliances deliver real benefits:

- First, they increase the flow of high-performing genes into the pipeline, which enables us to identify better product candidates to advance.
- Second, alliances give us low-risk access to emerging technologies that have the potential to increase the efficiency of the development process.
- Finally, our alliances in developing international markets such as Europe, China, India, and South America allow us to establish relationships with the best and brightest people throughout the scientific and commercial community. These relationships not only complement our R&D program, but also provide allies who can be valuable advocates in the regulatory process and in gaining acceptance in areas where adoption of biotechnology is still nascent.

Fueling Growth Across Our Pipeline and in the Field

While our high-throughput screening capabilities and extensive technology network have fueled the discovery of new projects into our pipeline, they have also allowed us to extend and enhance our families of product offerings.

Monsanto's first-generation products focused on protecting crops from insects and weeds. Our R&D focus now is on seeds and traits that deliver increased yield and stress protection. The pressures of finite resources and a growing population are putting great strain on water and other resources. The ability to better manage water and nitrogen resources will be a huge area of investment — and opportunity — for the next decade.

The intensity of our research is reflected in the fact that we have more second- and third-generation products in development than any other company invested in agriculture biotechnology.

While our promising technologies progress steadily through the pipeline, results from field trials of our near-term technologies continue to demonstrate that our products will deliver real value to farmers and our business. This year, we tested more product concepts in the field than any other company and any other year in our history.

The near-term projects that promise to deliver the greatest value to our farmer customers and our business include those that we have designated as High Impact Technologies (HIT) — high-potential, high-value projects that are given priority to accelerate their movement through the pipeline.

This year, we saw tremendous progress in our HIT projects.

Roundup RReady2Yield soybeans, our second-generation herbicide-tolerant soybean project, was approved by U.S. and Canadian regulators. These approvals brought this technology one step closer to delivering new value to farmers and our business, and they pave the way for the first stacked offerings in soybeans.

Vistive III soybeans combine breeding and technology to create oil with characteristics similar to olive oil, including a lower linolenic acid and saturate content. Our Southern Hemisphere field research continued to demonstrate that our lead event is meeting our oil composition targets and agronomic yield targets. We anticipate that the product's health advantages could give it a strong presence on the 40 million U.S. soybean acres that are crushed for oil annually.

Drought-tolerant corn, one of the yield and stress projects included in Monsanto's R&D collaboration with BASF, applies technology that has consistently delivered yield improvements compared with controls under water-stressed conditions. Drought tolerance will become increasingly critical as population pressure and climate change combine to make water an increasingly scarce resource in many parts of the world.

BASF COLLABORATION

Drought conditions and other environmental stresses occur throughout the world. These challenges have the potential to impact yield regardless of where one farms. Monsanto's collaboration with BASF is working to identify and commercialize novel yield and stress trait technologies which offer farmers hope in the face of these challenges. By pairing our prowess in breeding and biotechnology with BASF's highly-efficient gene-discovery platform, our collaboration is expected to deliver valuable technologies to corn, cotton, soybean, and canola farmers around the world. Together, our work has the potential to deliver substantial value, as it effectively doubles the risk-adjusted net present value of Monsanto's yield and stress trait technology pipeline.

OFF TO A STRONG START

Our early work already confirms that our collaboration with BASF can accelerate the discovery of novel technologies, generating more viable research projects than either company could have achieved on its own. To date the companies have seen tremendous differentiation in the projects each is delivering, with less than 10 percent overlap in priority gene leads emerging from each company's discovery programs. Research at Monsanto and BASF facilities has enabled the collaboration to get off to a strong start. In just the first few months, the companies have exchanged thousands of data points and developed hundreds of new gene constructs — product concepts that will be field tested in the coming years.



Yield and Stress Trait Pipeline

Collaboration creates a new joint pipeline focused on increasing the volume of leads and certainty of commercial success in the category of "yield" traits for corn, soybeans, cotton, and canola.

Discovery

- Pairs two separate, but complementary discovery engines
- Increases rate of discovery, unlocking more sources of genes than ever before
- Combined effort allows us to advance novel products at faster-than-average development timelines

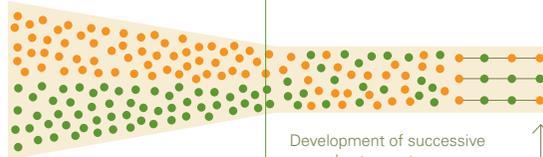
Development

- Greater volume of leads and cost sharing reduces risk of failure, increasing probability of commercial success
- Successive upgrades emerge sooner, creating steady stream of traits in a "product family" in each crop

Commercialization

- Broad licensing approach allows products to reach broadest market possible, allowing farmers to choose traits in the seed brands they prefer for the greatest performance

Monsanto Discovery Program



BASF Discovery Program

Development of successive upgrades to create a "family" of products

Licensee Brands
Corn States

Regional Brands
American Seeds Inc.

National Brands
DEKALB • Asgrow