



Sustainable Innovations from **Seed to Consumer**



INDIA | Cucumber Hybrids to Reduce Food Loss
CHINA | Flower Power for Grape Growers
UNITED KINGDOM | Partnering for Flavor
NETHERLANDS | Sustainable Glasshouse Innovation
SPAIN | Advancing Modern Vegetable Breeding

UNITED STATES | Vertical Farming
MEXICO | Digital Greenhouse Innovations
ECUADOR | Combatting Banana Disease
CÔTE D'IVOIRE | BayG.A.P. for Cocoa Growers
KENYA | Modern Breeding Project

INDIA



Reducing food loss with Bayer's Cucumber Hybrids.

Cucumber is the fourth most important vegetable crop grown across the Indian subcontinent. It is mainly grown as a warm season crop and cultivated across ~ 105,000 hectares with total production of 1.5 million metric tonnes. It typically takes about 5-7 days for cucumbers to be transported from the farm to consumers in different parts of the country. Seminis® (a Vegetables by Bayer brand) offers many varieties of high yielding, high quality cucumber hybrids bred for smallholders' geographies, like Malini and SV7298. These two hybrids have been performing excellently in India in terms of high yield, maturity and fruit quality, helping to improve smallholder farmers' lives.

Products like Malini and SV7298 provide early maturity and longer shelf life which help farmers get produce to market earlier, improving quality and avoiding food losses. Studies of Malini, for example, presented only 10% physiological loss in weight (PLW) after 6 days post-harvest, while SV7298 showed only 12% in PLW even after 10 days of harvest. As a result, Malini and SV7298 cucumber hybrids demonstrated an extended shelf life of 10-12 days. The combination of early maturity, longer shelf life, high yield and fruit uniformity translates to higher market price and hence increased income for smallholder farmers in India. These innovative solutions from Bayer's vegetable seeds brands are just a few examples of ways we are adding value to millions of farmers and consumers in South Asia and Southeast Asia.



CHINA



Luna® FLOWER POWER: Fungicide boosts table grape growers' incomes in China.

Chinese table grape growers have always preferred to apply high-end crop protection products at the fruit stage, when disease pressure is high. The fruit stage, it has been said, is a kind of battlefield in Chinese horticulture. If not controlled early enough, diseases can remain latent in the developing fruit before growing and damaging the grapes close to or after harvest. Applying Luna® fungicide at the flowering stage demonstrably improves produce shelf life and table grape quality.

"A key challenge was to convince farmers to apply Luna® at the flowering stage when no symptoms can be found," said Peng Wang, Bayer China's Crop Manager of Grapes. "Our customers generally prefer to apply fungicides at the fruiting stage as it can impact their income very much. But we were able to prove to them that when Luna® is applied at flowering, grapes have a much better fruit setting rate and build a strong foundation for high-quality grapes to develop a better shape and fruit skin." The time spent demonstrating the benefits of applying Luna® to blooming grape vines was well invested: Grape growers who have been using the FLOWER POWER solution are already reporting a rise in annual incomes of 2-5%. That is certainly a powerful argument for application at the flowering stage.



UNITED KINGDOM



Success found in partnership to bring Bayer's most prestigious tomato variety to market.

Delisher, Bayer's most prestigious tomato variety, was launched in 2016 under the De Ruiter® brand after years of nurturing by scientists and breeders and in grower trials. "Delisher is a delicious cherry plum tomato that outshines other varieties with its sweet taste, appealing texture and appearance," says Nico Van Vliet, Global Value Chain Development Lead at Bayer. "What's more, the tomatoes are strongly attached to their truss – which is a huge benefit that ensures the product will stay intact after harvest." The variety produces naturally shiny fruits and creates a strong truss that stays attached to the vine for easy transportation. According to Bayer, Delisher is the world's first snacking plum tomato on the vine, and since the tomatoes stay firmly attached to the truss, there is no plastic packaging required.

The Delisher variety has its origins at FlavourFresh Salads Ltd., one of the key introducers of the variety to the UK market. Founded in 1997, FlavourFresh Salads operates in four locations, with approximately 17.3 hectares of glasshouse production that yield more than 2,700 tons of tomatoes annually. This partnership reinforces Bayer's commitment to partnering with growers and the value chain in building healthier business and a healthier, more sustainable world.



NETHERLANDS



Advancing sustainable glasshouse innovations in tomato.

The De Ruiter Experience Center in Lansingland, Netherlands gives the tomato industry a hands-on look at the future of protected culture growing and sustainable, digital innovations. Founded in 2001, Paul Zantman and Rob Brabander have grown their BraZander operations to just over 12 hectares spread over five locations in the area. BraZander partnered with De Ruiter in 2018 to build the De Ruiter Experience Center, a glasshouse demonstration and production center dedicated to commercial tomato production and to testing and demonstrating new tomato varieties. The center includes a state-of-the-art demo glasshouse where visitors can get a glimpse of our precision horticulture practices, and a market space to sample and see our varieties on the shelves, bringing in-depth insights on modern breeding technology as well as the benefits of these new varieties to customers, the value chain and consumers.

BraZander recently expanded its collaboration with the De Ruiter Experience Center to become the first glasshouse to join the Bayer ForwardFarming network of more than 17 other independent farms across 10 countries and 3 continents. This presents a new opportunity to demonstrate for the tomato industry how tailored solutions, modern tools and practices, proactive stewardship measures, and strategic partnerships are enabling farmers to run successful businesses, while providing enough food for a growing world, in a way that preserves the environment.



SPAIN



Advanced breeding techniques for innovative success.

In a world of exponential change and uncertainty, growers and value chain partners can't afford to wait around for solutions to new disease pressures, unpredictable weather patterns or rapidly changing market demands. The success of each crop, each season, can have significant impact on the bottom line and long-term sustainability of an operation. As one of the world's leading producers of vegetable seeds, Bayer is committed to providing growers with best-in-class seeds and solutions to address the needs of consumers and the entire food value chain. Through investments in R&D and advanced breeding technologies, we are not only bringing new innovations to market, but doing so faster than ever before.

At its new Product Design center in San Nicolás, Spain, Bayer is expanding its high-tech greenhouse space and vegetable breeding capabilities in several areas, including double haploid (DH) technology. DH technology is a valuable tool that can shorten breeding cycles, accelerating the time it takes to bring new commercial hybrids to market, while improving genetic uniformity. This increased speed and genetic uniformity can have a significant impact on growers' operations. By using advanced breeding techniques that help speed up the time to market for new varieties, we're helping growers respond to unexpected challenges of today while staying ahead of changing market and environmental dynamics well into the future



UNITED STATES



Unfolding breakthroughs in vertical farming.

Vertical farms, also known as indoor farms or plant facilities with artificial light (PFAL), utilize indoor growing facilities that leverage artificial light, reduce dependency on synthetic chemistry and other crop inputs, optimize water use and allow food growth in challenging environments with limited arable land. Unfold, a joint investment from Leaps by Bayer and Singapore investment company Temasek, is a new venture that focuses on innovation in vegetable varieties with the goal of lifting the vertical farming space to the next level of quality, efficiency, and sustainability. While most start-ups in the vertical farming market are focusing on the development of more efficient infrastructure, Unfold is the only company with unparalleled assets to unlock the genetic potential of vertical farming.

Led by CEO John Purcell, Unfold is a U.S. entity headquartered in the Davis, California area with commercial and research and development operations in both California and Singapore. By utilizing the seed genetics (germplasm) from vegetable crops, Unfold will focus on developing new seed varieties coupled with agronomic advice tailored to the unique indoor environment of vertical farms. It aligns with Bayer's vision of "Health for All, Hunger for None", a commitment to the Sustainable Development Goals the United Nations has set for 2030, especially the goals of assuring healthy lifestyles and putting an end to hunger.



For more information about the promise of vertical farming, check out our [The Tomorrow Farm podcast episode](#).

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MEXICO



Artificial intelligence to help growers sustainably meet global needs.

Bayer has been working to pilot a transformational tool based on artificial intelligence (AI), machine learning and data insights to help growers sustainably meet increasing global needs. This digital farming system continuously collects real-time farm management data to help vegetable greenhouse growers leverage tailored insights and optimize the growing process. The initial roll out and in-field exploration began July 2020 in Mexico with a group of growers trialing the offering, with the intent to expand globally in coming years based on growers' needs and changing consumer demand. By monitoring numerous data points throughout their operation, growers can gain access to custom solutions and insights into which plants need additional natural resources, crop protection or other treatments.

The tool focuses on driving greater productivity, boosting yields and reducing inefficiencies by enabling growers to make more timely and insightful decisions that help optimize both the profitability and sustainability of their produce and operations. The pilots have produced positive results, including 18-20% water savings from irrigation recommendations, a projected 14% improvement in seed usability, and digitization of farm records saving time and increasing transparency. For consumers, this leads to greater access to high-quality fruits and vegetables year-round. Growers around the world face increasingly complex challenges in their fields and greenhouses, and digital technologies allow us to create tailored solutions that help overcome these specific obstacles and can lead to more efficient use of natural resources.



ECUADOR



Combatting an aggressive disease threatening one of the world's favorite fruits.

An aggressive fungus, Fusarium Tropical Race 4 (TR4), is threatening banana plantations worldwide. Plantations in Colombia, for example, were hit for the first time in summer 2019, where bananas account for 36% of exports and 12% of agricultural jobs. Additional cases were recently reported in Peru in April 2021, triggering emergency measures to prevent further spread. If attempts to combat the disease fail, the livelihoods of many will be under threat. So far, there is no way of effectively treating this pathogen. The only hope of combating this disease right now is international collaboration and educating growers.

Scientists and researchers have joined forces and formed a consortium, The Global Alliance against TR4, to collaborate on the development of possible solutions to this complex problem. As one of the members in this steering committee, Bayer is actively involved in partnering with various players in the banana value chain and sponsoring collaborative events to protect banana production in Latin America and the Caribbean. One of the initiatives in the region known as Todas Unidos contra el Fusarium R4T (Together against Fusarium TR4) has been running partially on the ground and via digital channels. Through training events with internal and external experts, Bayer is informing farmers, partners and distributors about the most effective ways of preventing the spread of Fusarium TR4 through successful biosecurity measures. Bayer has also developed means of strengthening the banana plants' roots to lower the risk of the fungus penetrating them and is researching new active substances to potentially stem the transmission of the disease.



CÔTE D'IVOIRE



Leading the way in capacity building with smallholder farmers in Côte d'Ivoire.

70% of global cocoa bean production happens in West & Central Africa, and most of the hard work, planting, cultivating, and harvesting of cocoa crops is done by small-scale farmers. Through the BayG.A.P. program, these farmers are learning good agricultural practices (G.A.P.), such as proper pruning of trees and application of crop protection products, to improve the yield and quality of their crops. They also gain skills in food safety and traceability to meet the requirements of global food chain partners. The cocoa farmers themselves are not the only ones who benefit from this training. BayG.A.P. also works with their wives who cultivate the land to grow diverse food crops. The wives of many cocoa cooperative farmers apply selected G.A.P. tailored to their growing needs, such as integrated crop management and fertilization to protect their vegetable crops from disease and get a bountiful harvest. With BayG.A.P. training, these smallholder women can provide food not just for their families but also sell up to 95% of their produce at market, thereby diversifying their income source and generating the much-needed living income that the farmers cannot consistently generate by selling cocoa alone.

BayG.A.P. is currently helping develop knowledge on sustainable, modern agricultural practices among 95,000 smallholder farming families in the region. The Food Chain Partnership program is proving so successful that we are scaling it up to reach even more farming families, tailoring our training to suit the challenges of other cropping systems, such as potato, tomato, and banana/plantains worldwide.



KENYA



Building effective plant breeding systems to develop superior cultivars.

Yield improvement of important African food crops will receive a significant boost with the launch of a new project to be implemented by the International Institute of Tropical Agriculture (IITA) and Bayer. The Modern Breeding Project (MBP) will focus on ensuring that IITA mandate crops—cassava, maize, cowpea, banana, yam, and soybean—achieve the highest yield possible, leading to increased crop productivity on farms. Michael Abberton, Head of CGIAR-IITA's Genetic Resources Center and the project lead, explains that the 30-month project “will build a more effective plant breeding system that develops superior cultivars for critical African crops through a partnership with a leading seed company—Bayer.”

Through this \$1.2 million crop improvement project funded by the Bill & Melinda Gates Foundation, IITA will modernize its suite of breeding programs. Crop breeding is central for achieving IITA's goals of increased productivity, economic growth, and poverty reduction to support the agricultural transformation of Africa. The project expects to improve both technical and organizational elements patterned after models and best practices from Bayer.

