



EMPOWERING GROWTH:

INNOVATIVE SOLUTIONS FOR A REGENERATIVE AGRICULTURE FUTURE

*/// Vegetables
by Bayer*



ENHANCING GROWER'S RESILIENCE,

INCOME AND YIELD TO BOOST FOOD AND NUTRITION SECURITY



Yield increase and
Improved productivity

THE CHALLENGE

Addressing the critical issue of food security demands our immediate attention. In 2021, a shocking 783 million people worldwide struggled with hunger, underscoring the urgency of the situation.

With the global population set to reach 9.7 billion by 2050, our food systems are facing unprecedented pressure. To meet future needs, the FAO emphasizes the necessity of a staggering 60% increase in food production.

Fruit and vegetable growers face climate challenges such as extreme weather, temperature fluctuations, erratic rainfall, pests, and changing seasons, impacting their productivity and income. Additionally, they must meet quality standards for marketable yield, but climate-related issues, including quality problems, reduced shelf life, and production variability, pose obstacles to meeting these standards.

These multifaceted challenges call for comprehensive solutions to ensure nutrition access for all.



Almost 783 million
people in the world faced
hunger in 2022 [↗](#)

600 million people will be
chronically undernourished
in 2030 [↗](#)

On every continent, food insecurity
is slightly more prevalent for women
than men. [FAO ↗](#)

71% of farmers say that climate
change already has a large
impact on their farm, [see more ↗](#)



“ As Bayer,

we recognize our responsibility in helping growers achieve better harvests with fewer resources, all while fostering sustainability. Our goal is to enhance growers' capacity to adapt to climate challenges and boost their income by increasing their marketable yield and productivity, through innovative breeding solutions, crop protection, and digital tools. These innovations enable positive transformations in growers' practices, income, and well-being, all while contributing to global food and nutrition security in the fight against hunger and undernourishment.

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OUR SOLUTIONS

At Bayer Vegetable Seeds, we are helping tackle these challenges by developing varieties that enhance yield and productivity, benefiting both growers and consumers.

Our latest tomato varieties, like **Seminis® SVTM9037**, tailored for open-field production in North America has demonstrated a remarkable potential 29% yield increase in trials, compared to competitors.

Similarly, **Seminis® brand SVTM9036** showcased a remarkable potential **14% higher yield²** than its predecessor.

Half a world away, in the heart of India, **Manik**, an indeterminate tomato with exceptional quality, is changing lives for smallholder growers. Our trials unveiled not just impressive heat stress tolerance but also a staggering potential **~33% increase in yield³**.

It's not merely about statistics; this translates into more income, better opportunities, and brighter futures. What's more, it represents Bayer's dedication to building a future where no one has to struggle with hunger and malnutrition. Below you can find an example* of how our solutions come together to make it happen.

¹ In 51 grower trials from 2020-2022 seasons across California, Seminis® SVTM9037 showed 29% more yield than the competitor variety, H 1662.
² In 47 grower trials from 2020-2022 seasons across California, Seminis® brand SVTM9036 showed 14% more yield than Seminis® brand SVTM9021.
³ Data from 2020-2021, 10 Bayer trials, against the Heemsona variety, in Rajasthan and Haryana states in northeast India.



FARM OF THE FUTURE

In Almería, Spain, farmers have been innovating in protected agriculture for decades. Despite the climate, they harvest multiple times per year thanks to groundwater collection and innovative structures. Pablo, a local farmer, is using precision-bred De Ruiter tomato plants that are resistant to disease. He uses biological fungicides and plant activators, such as Serenade™, Nematool® and Ambition®, to enhance root development and manage pests. Through digital tools like PlantBalance, he is able to make efficient cropping decisions based on weather and disease forecasts. By employing Vynity Citrus® – a pheromone-based product that meets residue standards – Pablo ensures high-quality, marketable harvests. With these advancements and sustainable practices, Pablo achieves higher yields, decreased emissions and reduces his water usage, all while satisfying tomato consumers in Spain.

*Fictional story to illustrate how the farm of the future can integrate sustainable and regenerative solutions.

MITIGATING CLIMATE CHANGE



Mitigate climate change

BY DEVELOPING CLIMATE-RESILIENT SOLUTIONS AND MINIMIZING FOOD LOSS & WASTE.

THE CHALLENGE

Climate change threatens our ability to ensure global food security, eradicate poverty, and achieve sustainable development, especially affecting vulnerable countries and populations. Agriculture is, **responsible for 19–29% of total greenhouse gas emissions**, resulting from deforestation, livestock production, soil and nutrient management, and food loss and waste. Food loss and waste, often overlooked, contributes significantly to emissions. Roughly one-third of food produced for human consumption is lost or wasted globally, **44% of which are fruits and vegetables**.

These emissions intensify global warming, leading to erratic rainfall patterns, temperature fluctuations, and increased extreme weather events that directly affect growers' food production. Agriculture is both a major contributor and a major victim of climate change, yet it offers a potential solution.

Growers are increasingly striving to adapt to changing weather patterns, reduce greenhouse gas emissions, and embrace regenerative agriculture practices, focusing on improving soil health and reducing or sequestering carbon emissions on farms.

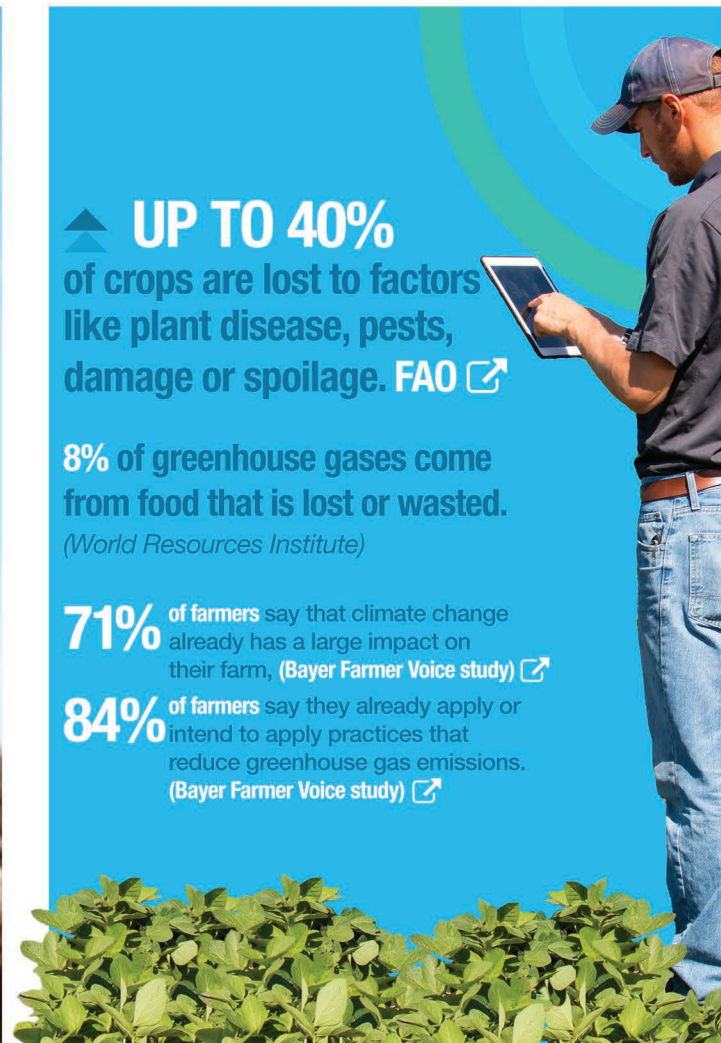


UP TO 40% of crops are lost to factors like plant disease, pests, damage or spoilage. [FAO](#)

8% of greenhouse gases come from food that is lost or wasted. *(World Resources Institute)*

71% of farmers say that climate change already has a large impact on their farm, [\(Bayer Farmer Voice study\)](#)

84% of farmers say they already apply or intend to apply practices that reduce greenhouse gas emissions. [\(Bayer Farmer Voice study\)](#)



Our approach



We are

developing innovative solutions that not only benefit growers but also combat climate change, leading towards a climate neutral future for agriculture. Our focus is on enhancing grower resilience to extreme weather, reducing greenhouse gas emissions from food losses, and promoting regenerative agricultural practices that boost soil health and carbon reduction and sequestration on farms.

Through innovations that increase marketable yield and reduce food losses in the market, growers increase food production without expanding land use. This leads to reduced use of natural resources, inputs like fertilizers, while fostering biodiversity and opportunities for regenerate nature.



OUR SOLUTIONS

MELON

Bayer's range of seed varieties is making a significant impact in the battle against climate change and food loss. These innovative varieties, like our Manchester, Albizu, and Belcanto open-field melons, have demonstrated substantial reductions in field losses. Manchester, for instance, has displayed a remarkable 22% loss reduction¹ in Spain compared to its regional competitor, primarily due to its production of fewer deformed and smaller fruits. Meanwhile, Albizu showcased an impressive 59% reduction in field losses² in Spain, mainly attributed to the fruit's uniformity. In France, Belcanto contributed to a 10% reduction in field losses³ due to its outstanding field flexibility. These improvements are essential for helping reducing food loss and waste, thereby promoting resource efficiency.



CAULIFLOWER

In the realm of regenerative agriculture, Ivex, a white cauliflower variety, offers a promising solution. With its whiter color and reduced curd pinking, Ivex has the potential to decrease food loss and waste by maintaining product quality⁴. Furthermore, it has exhibited approximately 7% more marketable heads⁵, thus helping reduce food loss and waste and potentially contributing to reduce GHG emissions from losses.



BROCCOLI

For growers in Poland, Seminis® broccoli variety Andersia presents an opportunity for reducing food waste and increasing income potential. Andersia has shown a remarkable 40% potential reduction in hollow stem⁶ when compared to its competitor variety. This reduction not only translates into reduced food waste on the field but also opens doors for increased income for growers.



TOMATO

Yoddha tomato variety, mainly produced by smallholders in India, emerges as a potential high-yield hybrid (~20*)⁷ with unique features, that performs well in Rainy & Winter season. With firm fruits that help provide great transportability through long distances⁸, and remains firm even at sudden spikes in temperature, it is helping growers to become more resilient to climate changes.



¹ Based on nine internal trials from 2019-2021 in Murcia & La Mancha in Spain.

² Based on 12 internal trials, under open field conditions, from 2018 and 2019 in Murcia (Spain) versus internal check Verdasco.

³ Data from 20 internal trials from 2019 to 2021 in France versus Bayer's previous variety, Funambul.

⁴ Ivex has shown whiter color and up to 3.4% less curd pinking³ than Freedom, according to 78 and 69 Bayer trials in North West Europe from 2020-2022, respectively. These color features could help reduce food loss and waste by keeping it whiter. Curd color Rating (1 best - 9 worst): Ivex rate 3.75 versus 5.62 Freedom | % Curd Pinking: Ivex 1,26 versus Freedom 4,66% | 4,66%-1,26%=3,4%.

⁵ According to 43 trials in North-West Europe from 2020-2022, compared to the Freedom variety from Bayer.

⁶ - Calculation reference for average marketable heads: Ivex: 85.50% | Freedom: 77.84% | 85.50-77.84=7,66%

⁷ Data from six Bayer trials across Poland compared with competitor variety. Seminis® variety Andersia: 50% heads with hollow stem | Parthenon: 70% heads with hollow stem. Calculation: [(70-50)/50]*100.

⁸ Harvested Amount Yield (tonnes) per Area (Acre): Yoddha: 35 tonnes / Trishul 24 Tons / TO 1458 (Syrgenta): 28 Tons.

⁸ Based on 50 Bayer trials in West Bengal, Assam & North East India (2020-2022) in comparison with the main competitors.

SUSTAINABILITY AT THE CORE



For three generations Huntington Farms, a Vegetables by Bayer customer, has been growing fruits and vegetables in California's Salinas Valley for its Nature's Reward brand. During that time, the Huntington family has built a vertically integrated business that not only grows quality produce, but also harvests, sells, ships and distributes it across North America to make it easier for their customers. But at the core of everything they do is sustainability. From pollinator habitats and grassed waterways to advanced spray technologies and reduced pesticide use, they're putting our environment and consumer health first.

"I want customers to know how much we care about the land that we farm, the people we all work with. We really want day in and day out to bring nutritious high-quality vegetables to families across North America", says Greg Beach, Vice President of Sales at Nature's Reward. [Learn more](#)



IMPROVING SOCIAL AND ECONOMIC

WELL-BEING OF FARMERS AND COMMUNITIES



Social and economic well-being of farmers and communities

THE CHALLENGE

Smallholders, who champion the world's **500 million small farms**, are the backbone of food supply in many developing areas, contributing significantly to poverty reduction and food security. Despite challenges posed by remote locations and limited resources, their crucial role is undeniable.

These resilient farmers face hurdles like limited resources, climate impacts, and market barriers. Yet, the positive impact of smallholder agriculture on the economy, food security, and poverty reduction hinges on well-functioning ecosystems. These ecosystems provide essential services like soil fertility, freshwater delivery, pollination, and pest control.

By addressing challenges effectively, smallholders not only enhance their economic well-being but also play a pivotal role in ensuring food security and alleviating poverty in their communities.

- ▶ **5 out every 6 farms** in the world consist of less than 2 hectares.
- ▶ They produce roughly **35% percent** of the world's food, (FAO)
- ▶ **88%** of farmers say they are critical to ensuring food security but don't get the credit they deserve.
(Bayer's farmers voice survey)

Our approach

“ At Bayer,

we've long supported smallholder farmers, offering tools and knowledge to empower them and enhance their farms, families, and communities. We have committed to support over 100 million smallholder farmers in low- and middle-income countries globally by enhancing access to agronomic knowledge, products, and services. In partnership with others, we strive to amplify the social and economic impact of smallholder farmers, addressing poverty, hunger, health, and fostering economic development. Specifically, within Vegetables by Bayer, we work to expand solution access for growers in Asia, Africa, and Latin America.

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OUR SOLUTIONS

At Vegetables by Bayer, we work to develop varieties that address some of our smallholder farmers' more pressing needs, along with knowledge transfer, training, partnerships and technological solutions to help them improve their social and economic well-being.

Pepper

SV7864 is a vibrant red pepper variety embraced by smallholder farmers across Asia. Our studies reveal a remarkable 8%-10% boost in yield¹, coupled with significant loss reduction both on and after harvest². This isn't just about peppers; it's about transforming farms, elevating productivity, and unlocking new income possibilities.

Tomato

Atharva, a tomato hybrid crafted for the summer heat in India's North and Western regions, boasts consistent fruit size, vibrant colors, and a robust structure³. Perfect for long-distance transportation⁴, it ensures a steady supply of fresh produce and opens up new market possibilities for smallholders looking to increase their income. With a sturdy pericarp, minimal scars, and high productivity even in hot conditions, Atharva brings practical benefits: higher yield⁵, a longer shelf life, reduced losses⁶, all of which sum up to a potential income boost of 30-34% for smallholders⁷.



1- Based on 38 Bayer trials in three years (2014-2016) in Pakistan (Punjab & Sindh), compared to a market-leading competitor. Calculated average yield/ha – SV7864: 10 tonnes/ha while the high Fly average yield is 8.5 tonnes/ha which is an external competitor & widely sold hybrid in the past.

2- The damaged fruits ration in SV7864 was less than 5% while the competitor High Fly had more than 10% damaged fruits with them. SV7864 is more qualitative and mold resistant during the floor drying process in Pakistan with only 2-3% mold damage compared to competitor high-fly which shows 5-10% mold damage during floor drying/processing.

3- According to 115 Bayer trials from 2020-2021 in Maharashtra (India) in comparison with the main competitor Syngenta – 6242

4- Loss percentage during long-distance transportation (500-1200 km) Crack/ mechanical damage in boxes: Atharva: 6-8% | Syngenta-6242: 8-15%.

5 -12-13% increase in yield. Harvested Amount Yield: Atharva: 40 tonnes/ acre | Syngenta-6242: 35 tonnes/ acre

6 -7-13% total loss reduction (harvest+ transportation) This range considers the loss due to small/ discolored/uneven ripened fruits at harvest, as well as wastage due to transportation and reach to consumers, which is less in Atharva due to its long shelf life. Calculation reference: Atharva: 8-12% | Syngenta-6242: 15-25%

7- Based on Atharva's market price estimation and its trial performance regarding higher yield performance as well as food loss and waste reduction. Assuming all the other factors remained equal or proportional to yield. Calculation Reference in Indian Rupees | Net Income: Atharva:310400 | Syngenta-6242: 197900

TRANSFERRING KNOWLEDGE FOR SUCCESS

- ▶ TechCampo project consists of a trailer that travels through cities in Brazil, supporting smallholder growers in the main fruits and vegetable production areas to access solutions and knowledge. Since 2018, the initiative has reached more than 5,800 smallholder farmers and covered 65,000 kms.
- ▶ In India, our solutions support regenerative agriculture by promoting the Moraleda pole bean variety and emphasizing the practice of intercropping leguminous crops. This practice enhances soil health through nitrogen fixation and increased yields while simultaneously improving the livelihoods of smallholder farmers.

HELPING DREAMS COME TRUE

Meet Shankar, a farmer in India with a 5-acre farm, two kids, and dreams. Recently, he faced stress from a loan he had taken. Then, in 2022, he discovered Atharva at a local agricultural exhibition. Choosing to plant it brought a turnaround—Atharva yielded more, needed less work, and became a hit in the market. This success story not only helped Shankar clear his loan but also made his dream of owning a four-wheeler come true. Now, he drives through his fields with a smile, showing that a good crop can turn worries into dreams fulfilled.

In Pakistan, Mazher Abbas chose to grow Pepper SV7864 at his farm. He gained around 30% more of dry pepper per acre.

With what he earned, he built a small guest room at his farmhouse, helping his family and friends feel comfortable when visiting.



CONSERVING AND REGENERATING

NATURAL RESOURCES



Strive to maintain, preserve, or restore biodiversity



Conserve water resources

THE CHALLENGE

As the global population heads towards 8 billion by 2030, the challenge is clear: produce enough food for an additional 2 billion people while preserving and restoring the environment. Worldwide, the strain on land and water resources is pushing agricultural ecosystems to their limits, threatening global food production and worsening poverty (FAO). [↗](#) If we don't change our habits now, global water demand could **increase by 50 percent by 2030.**

The solution lies in sustainable and regenerative agricultural practices. These practices not only can help to meet rising food demand but also contribute to water and soil conservation, sustainable land management, and environmental benefits. It isn't just about food; regenerative agriculture is a potent force to alleviate environmental pressures and contribute to broader global objectives: Producing more and restoring more.



Agriculture accounts (on average) for **70%** of all freshwater withdrawals globally.

World Bank [↗](#)

33% of farmers have experienced droughts. (Bayer Farmer Voice study) [↗](#)

77% of farmers who have experienced losses of 20% or more had experienced any heat or drought effects.



Our approach




Our outcome-driven


approach towards regenerative agriculture supports food security, secures farmer incomes and livelihoods, and aims to regenerate nature. Bayer is committed to minimizing the climate footprint of farming, reducing the environmental impact of crop protection, enabling smallholder farmers, and improving water use. We see our solutions as enablers to support farmers implementing regenerative agriculture practices. They are actively supporting nature-positive outcomes by enhancing soil health, using land sustainably, conserving water, and reducing and sequestering carbon. Furthermore, we are assisting growers in boosting productivity and incomes through climate adaptation solutions contributing to a more sustainable and resilient future.



OUR SOLUTIONS



Our new Seminis® processing tomato varieties in California demonstrated increased yield potential using 20% less water – a major advantage for Californian growers who are experiencing increased irrigation restrictions due to extreme drought¹.



Strabini, a glasshouse tomato variety from the De Ruiters® brand with very good taste and truss hold – combined with Intermediate Resistance to Tomato brown rugose fruit (ToBRFV). It has strong truss attachment which can help reduce the need for plastic packaging required to keep the fruit in a salable unit and protect against losses during processing and handling. With those characteristics, it helps tackle both food loss and plastic usage².

¹ Based on earlier trials performed in 2022 in Woodland, CA, with five Seminis® processing tomato varieties. Preliminary findings show that yield was preserved, and yield stability observed for certain varieties.
² High resistance (HR): plant varieties that highly restrict the growth and/or development of the specified pest and/or the damage it causes under normal pest pressure when compared to susceptible varieties. These plant varieties may, however, exhibit some symptoms or damage under heavy pest pressure. Intermediate resistance (IR): plant varieties that restrict the growth and/or development of the specified pest and/or the damage it causes but may exhibit a greater range of symptoms or damage compared to high resistant varieties. Intermediate resistant plant varieties will still show less severe symptoms or damage than susceptible plant varieties when grown under similar environmental conditions and/or pest pressure.

A FAMILY LEGACY

For family-owned, third-generation **Wholesum**, their mission seems like a simple one – to nourish a healthy world. But the way this Vegetables by Bayer client is doing it, has made it one of the fastest-growing grower-distributors of organic vegetables in North America. It began just before World War II when grandfather Miguel Crisantes Gatziones emigrated from Greece to Mexico and started growing tomatoes. Since then, they've been trailblazers in the organic space pioneering with high-tech greenhouses and equipment, growing practices and natural management solutions. But the family may be even more proud of their fair trade certification as they work to elevate and create a more noble food system that fully engages with their workers, the community and consumers.

[Learn more](#) 



INNOVATIVE PARTNERSHIPS



Vegetables by Bayer is partnering in the USA with the **International Fresh Produce Association (IFPA)**. Our Climate Smart project, 'A Vibrant Future,' seeks to collaboratively pursue a holistic systems approach that promotes climate-smart production practices. Our solutions can enable growers to address the pressing challenges of climate change. 



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LEARN MORE 



Performance may vary, from location to location and from year to year, as local growing, soil and environmental conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on their growing environment.

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