

How Bayer is unearthing agronomy's future with generative AI

Large language models are planting the seeds of the future.



■ The better the question

How can you harvest the potential of AI?

Bayer Crop Science has a history of providing agronomic advisors with crop production information, now they deliver it faster and broader.

Bayer Crop Science (BCS), a division of Bayer AG, is committed to leveraging innovation, data and cutting-edge technology, and collaboration to unlock solutions that can help enhance the decisions farmers make every day and shape the future of agriculture.

Offerings consist of a vast array of seeds and traits, crop protection products, and digital solutions for agriculture. In addition, BCS provides comprehensive customer service through its field teams and distribution partners, helping farmers make more informed decisions through expert advice on product features, performance and use.

In relentless pursuit to expedite the provision of this highly specialized information to its agronomic advisors and subsequently farmers, BCS is determined to unlock the potential of generative AI (GenAI).

"We recognize that AI holds tremendous potential to assist our agronomists to positively impact farmers worldwide," says Dan Kurdys, Global Business Lead, GenAI at BCS. "As a company, we have tremendous depth and breadth of agronomic knowledge, but convenient synthesis of that knowledge to specific needs has been a challenge. Farmers turn to us, as a trusted advisor, to help them answer questions. Typically, accurate answers require years of specialized expertise or consulting reference manuals," he says.

GenAI has helped organize the agronomic knowledge in a way that makes retrieval easy and accessible.

"We are confident we can train GenAI models on our agronomic and product knowledge and empower our people to answer a vast majority of agronomy and product questions faster and more completely than ever before. This can revolutionize the way we serve our customers, allowing us to both build our institutional knowledge and make highly technical information readily available to our employees, partners and customers."

BCS enlisted the help of Ernst & Young LLP (EY) professionals to help create a proof-of-concept (POC) GenAI system. The goal was to help enable Bayer's agronomic advisors to quickly access a wide range of technical knowledge.

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Together, the team built the POC in just 90 days.

A large language model learns to think like an agronomy expert

Maximizing the performance of a GenAI system starts with quality data and advanced prompting techniques.



The BCS and EY teams, supported by alliance partner [Microsoft](#), set out to assess the true agronomy capabilities of a large language model (LLM).

"Our established relationship with BCS served as a sturdy foundation for innovative collaboration in this emerging field," says Michael Seemann, Life Sciences Partner, Ernst & Young LLP. "We quickly assembled a team comprised of experienced people in agribusiness, strategic planning, and GenAI technology to identify the business opportunities and potential value of AI within Bayer."

The LLM, built in the Microsoft Azure environment, was grounded with decades of aggregated agronomy content, product research data and proprietary insights. With additional information stored on BCS's legacy systems in traditional formats (i.e., spreadsheets and tables), the team worked hard to translate the information into a structure the GenAI system could comprehend. But the information discovery did not stop there. The team used algorithms to format information from different sources into digestible data to further inform the GenAI system.

"The success of a GenAI solution depends on two critical factors: the quality of the data used as foundational elements within the technology, and the relationships and patterns established within that dataset," notes Dan Diasio, EY Global Artificial Intelligence Consulting Leader. "Bayer's GenAI solution excels in both aspects."

The team needed to construct the GenAI system to understand the context and detail of natural language queries. For example, the system had to be able to answer, "What is the greensnap rating for the DKC25-15RIB corn seed?" which relates to a seed corn product's ability to withstand high winds during the period of rapid growth.

The team employed Retrieval Augmented Generation (RAG) methodology that could dynamically retrieve relevant information to respond, in real time, to prompt inquiries. Prompt engineering was also used to further tailor the GenAI system's responses to help ensure accuracy and subsequently outperform open-source LLMs currently serving the market on applied agronomy questions.

To assess the system's capabilities, the team designed a sophisticated scoring system that compared responses from the GenAI system, open-source LLMs and subject-matter experts (SMEs). The question set was then further expanded, and an automated validation process was built. The results were impressive. By the end of the 90-day POC, the GenAI system was answering with accuracy across every topic building great confidence in the team and users.

"It's our obligation to apply the benefits of AI responsibly and conscientiously," says Edward Bobrin, Executive Director, Technology Consulting, Data and AI Leader, Ernst & Young LLP. "EY teams have a profound understanding of both the potential of AI and associated risks."

"In some respects, the system is able to surpass what a single individual can store in their brain," said Kurdys. "It may not supersede the knowledge of an expert on a specific topic. However, it is a powerful aid in the hands of agronomists based on its knowledge recall speed and breadth of information accessible. This illustrates the true potential of the technology."

Scaling the impact of GenAI propels sustainable yields

Bayer is helping democratize agronomic knowledge.

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The GenAI system is accelerating and easing the flow of information, assisting agronomic advisors by promptly offering advice and product information at their fingertips, within seconds.

In just a few months, a few hundred BCS employees have started using the GenAI system. "I have asked some very specific questions and gotten very specific answers. In most cases, the answers have been 100% correct," said one user.

The tool's use has even extended beyond its initial purpose. BCS employees have used the tool to put together marketing materials and train new sales reps. "Users continue to uncover ways to leverage the tool for microtask efficiency, which is great because that's the mark of a sticky technology product," noted Kurdys.

The POC cemented Microsoft's continuing commitment to agriculture and instilled confidence in BCS using the Azure platform to deliver value.

"This is one of the most successful GenAI deployments I've seen on the Azure platform," says Phillip Renfro, Strategic Account Executive at Microsoft. "And that's in large part because the EY team drove business and customer value in the deployment of our world-class technology."

Throughout the process, BCS was thinking about the next horizon, and the success of this POC has amplified its vision for GenAI and automation. In fact, Bayer aims to expand the pilot of the GenAI system across the organization, to partners.

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Dan Kurdys, Global Business Lead, GenAI Bayer

In the long term, BCS is considering how GenAI could address a much broader set of challenges – empowering those responsible for feeding the world.

"One constraint limiting food supply throughout the world is a shortage of agronomic and product knowledge in areas where subsistence farming is prevalent," says Kurdys. "If we can translate the insights and product knowledge from this system into languages used in developing countries and provide both voice and mobile outputs, it could substantially improve global food security. The potential to better and more precisely inform farmers globally is extraordinary – far exceeding anything we've seen before."

The ability to sustainably increase yields and impact food supply is a great example of how GenAI is helping to build a better working world.

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