

Corteva Agriscience and AI: Forging New Ground in the Seed Industry

It seems artificial intelligence (AI) comes up in the news everywhere you turn. From medicine to cars to social media, AI is involved somehow, and the seed industry is no exception. Recently, *Groundwork* spoke with Matthew Smalley, R&D Data Science Leader, Corteva Agriscience, to learn how Corteva uses AI in its research and development.

Q: Let's start with a definition: What do we mean by AI in general and in the seed business in particular?

A: In general, AI involves using advanced analytics to automate and drive decisions. In the seed business itself, Corteva uses AI in discovery to find and create new products. In development we use it in analysis and evaluation of field-testing data for potential new seed products. We also use it in seed production and even in the product launch phase.

Q: How might AI aid licensees?

A: We're working on a whole series of game-changing traits that I'm sure will be of great interest to customers when they ultimately reach the market.

In the big picture, AI helps do two important things in R&D. First, it expands the amount of discovery work we can do. We can look at many more possibilities. And secondly, we can use AI as a tool to advance new products through the pipeline with the goal of bringing them to market more quickly.

Q: When it comes to AI, where do people come in? Will computers do all the work?

A: I'm glad you brought that up, because that's a common misconception. Even as we get more automated and AI-driven, humans sit at the center of the process. This is what separates us from the competition: our knowledge and experience with germplasm and seed coupled with advanced analytics. We understand farming. We understand seed production. That's our starting point for our company and our people. AI can help us come up with more information and do it more quickly with greater reliability. However, it's up to our people to turn that information into relevant solutions that help our customers.

Q: How are you using AI to develop new germplasm?

A: AI helps us automate decision processes. Here's what I mean: Instead of conducting and analyzing initial crosses in the field, we are now able to do this early phase work in the computer with AI. We call this "in silico" research. AI can tell us which combinations of parents we should take to the field and test. Prior to AI, we had to do the field test first. The benefits are dramatic. AI can help us determine which crosses not to make. And so, we don't make them. This means our year-one trials contain vastly more

potential winners. Today, more than 90% of the germplasm we screen is done in silico. The result is improved productivity. We've made our pipeline bigger, widening that plant breeding funnel, and we can also shorten the time it takes to develop new products. AI helps us shave years off the front end. We can also conduct in silico research in multiple environments across wide areas over multiple years. From here we still do the intensive late-stage field research testing and analysis. We don't rely solely on AI to fully assess our pipeline products.

Q: How can AI be used in product development?

A: One example is satellite and drone imagery. Thanks to improved resolution, we can now use this imagery at the plot level. Contrast this with the early days of imagery where you could basically just see an overall farm. In the past, to see the progress of the plants you had to physically walk plots and fields. In the case of one individual plot, you could do that, what, maybe once a month? With this improved imagery we can check plots and fields much more frequently! This allows for close observation and analysis of the plant in its environment. AI coupled with satellite and drone imagery gives us high precision plant phenotyping. The bottom line is, we're speeding up the collection and processing of data and doing more observations. All of this is producing results. The proof is that our products are much more agronomically sound than they were ten years ago.

Q: Is yield potential going to improve with AI?

A: That's always the goal, of course. And AI can help us get there in several different ways. The first, which we've discussed, is by broadening the pipeline and speeding the development processes. The second area is one we haven't talked much about – providing more information and better information about our seed products and how to manage them in the field. For years, we've been providing product information through scores of mostly 7, 8 and 9 on plant characteristics. Now, with AI, we will be able to share in-depth breeder knowledge of our hybrids and varieties to licensees for them to use with customers in a form that's easy to understand and use. Nobody wants to learn ten different software packages. What they want is relevant and usable information they can readily incorporate into their production practices.

“ AI expands the amount of discovery work we can do. ”

Matthew Smalley | R&D Data Science Leader



Q: What other progress can we expect from AI?

A: Novelty – the ability to create new, original, never-before-seen products. Let's face it, we've been mining *Bt* proteins for, what, 20 years now? That's given us some really good traits. But things evolve. Insects evolve. And with AI, we can now better understand the insect biology and then conceive of novel ways of addressing the problems these insects create. Understanding insects, fungal pathogens, weeds – once you can do that then you can design control traits, gene edits or biologicals that go right to that site. With AI, there's a lot less trial and error. We can also use gene editing to put multiple disease-resistant genes together to create a higher level of disease tolerance in our hybrids and varieties. One example of gene editing success can be seen in our second generation reduced stature corn that was made possible, in part, by AI.

And in crop protection, pick your favorite herbicide class and using AI we can consider all the possible derivatives and do it more efficiently.

Q: It seems like this development of AI has required a considerable financial investment from Corteva. What can you say about that?

A: It's true. And yet, my feeling is that when a customer buys a Corteva product, they're actually investing their dollars back into us. And so, a purchase from Corteva comes with a promise that we will deliver a better product, one that will enable farmers to get more out of their investment in us.

Q: Any final thoughts on AI?

A: Yes, I think there is this common fear that AI is going to take over our jobs. I don't see it that way. The way we use AI, the computers don't do all the work. Instead, we're putting the information generated through AI into the hands of our people, our best resource. AI is great, but ultimately it can only deliver these amazing contributions when it is combined with the knowledge and experience of our people.

