THE FARM FANTA

BY SOME CALCULATIONS, THE PLANET'S POPULATION is projected to increase almost 20% to 9.15 billion by 2050. Such growth will present immense challenges. In 2012, the Food and Agriculture Organization of the United Nations reported agricultural production would have to grow by 60% to meet this increased demand for food.

Of course, such predictions have significant implications for the agricultural community, as well as the general public. Consider that producers have to increase yield on existing farmland since there is little arable acreage left to cultivate. Also, in an ironic twist, given the projections on increasing demand, commodity prices remain low and continue to pressure producers to be ever more efficient.

What follows, then, are predictions from business and academic experts of technological innovations that could change the face of global agriculture for generations to come.

Smaller Equipment, Greater Productivity

Matt Rushing, vice president, Global Product Line, AGCO Fuse

Farmers have grown somewhat accustomed to investing substantial capital into bigger and better equipment, and today there's discussion about making those machines autonomous as well. AGCO's Matt Rushing thinks that in just a few years we may see equipment resizing.

"In the future," says Rushing, "the cost of purchasing large, autonomous machine systems may continue to be very expensive, [even] without an operator. Plus, if that one large machine breaks down, the farmer experiences downtime until it's fixed again."

Enter small machines … and more of them.

AGCO® is looking at development of "robot swarms"—many smaller machines working at once that can perform tasks, like planting seeds, without an operator. "It's the same concept as the multiple row units on a planter," Rushing explains, "only there's no need for a tractor, which eliminates the cost of the tractor and the cost of a big planter bar."

Another advantage? If one robot in the swarm breaks down, others can keep planting.

The other big game-changer, in Rushing's view, will be sensor technology. "More and more sensors will be developed that will be capable of understanding everything from soil composition to temperature," he says. Sensors also will help producers and manufacturers better understand machine behavior and plant health, and maybe even account for the weather while performing field tasks. For example, researchers are currently using optical sensors that recognize differences between hues of green to help determine if plants are healthy at various stages of growth. The idea in a case like this is to enable the farmer to passively manage potential problems right away and correct them before they dramatically impact a harvest.

Rushing also sees machines becoming so smart they'll have "the on-board analytic capability to change their behavior based on real-time conditions [of the environment] as opposed to off-board theoretical analytics." These applications already exist in machines that can plant, weed and water plants on a limited scale.

PHOTO: JAMIE COLE

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Farmers increasingly use **technology** to improve efficiencies and profits. In the future, though, even more highly evolved ag IT solutions may be a key to feeding an ever-increasing human population.

BY DEBORAH R. HUSO

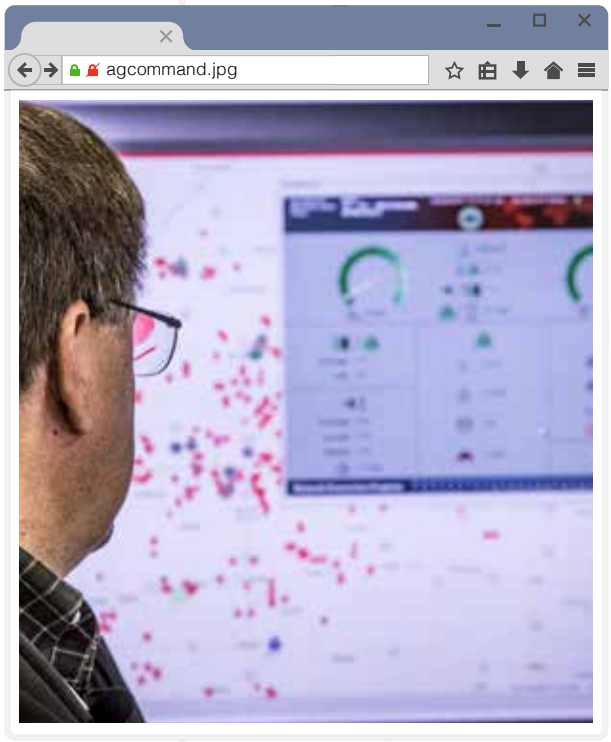
Moving Sensors and Real-Time Analytics

Ron Osborne, vice president, business development, Farmers Edge, and Jim Hughes, Ph.D., GeoMesa product manager, CCRI

Rushing's predictions may be closer than we think. AGCO is investing heavily in data management and analysis to help farmers improve yields and reduce wasted inputs. So are numerous other companies, including Winnipeg, Manitoba-based Farmers Edge.

"Modern farming really sits at the intersection of the sciences," says Ron Osborne. He believes the future of the industry will rely heavily on sensors—on board machines, in the field and even in space. The data collected from those sensors will monitor, in real time, soil and climatic conditions, pest proliferation, application and yield data, allowing farmers to change or adjust operations in the current growing season more quickly and accurately than current means.

Charlottesville, Virginia-based technology firm Commonwealth Computer Research (CCRI) is currently employing a big-data solution it developed called GeoMesa to store trillions of pieces of geo-time data that allows for the visual analysis of events over time and space, and makes it available for rapid querying and analysis tasks. CCRI's Jim Hughes says the product, which Farmers Edge is working to draw into its existing precision ag tools, "would let one quickly calculate the amount of fertilizer spread or size of harvest in a field, for example."

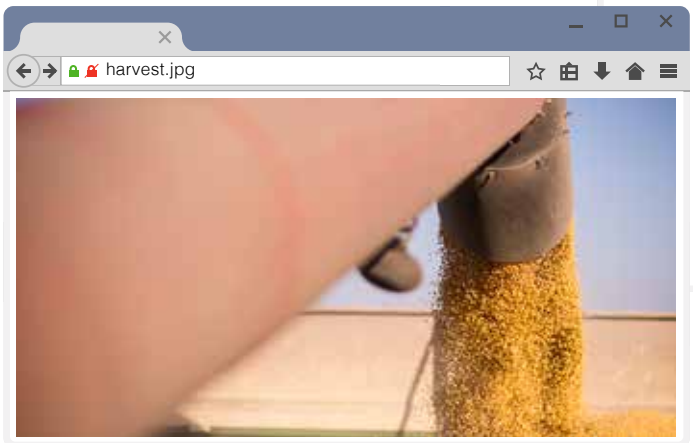


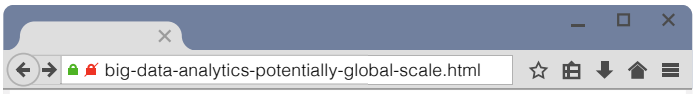
As Hughes explains it, generating spatial data on such a grand scale requires a moving sensor to produce it. He says GeoMesa will enable Farmers Edge to have a continual stream of data that will support a wide array of queries, allowing farmers to restrict both space and time. For example, if you want to run a query on nutrient content in a particular field at a particular time, you'll be able to do that.

"Farmers Edge's goal is to present farmers with where they are in their growing cycle," he adds. "Week 3 should look a certain way, and week 12 should look a certain way. If you look at satellite imagery and take a bunch of observations from that, as well as weather and sensor data from the tractor, you can really start to answer a lot of questions."

AGCO has similar technologies in its FUSE® products like AgCommand.® "More telematics used in farming will drive new levels of precision and services that will benefit the entire farming value chain," says Rushing. "From reduced farm waste to improved yields, farmers, processors and consumers will reap the rewards."

How far will such solutions take producers in the years and decades to come? Hughes says that's the big question: "Data analytics-powered farming has a lot of potential," he says, "but we don't know yet if it will help us farm 5 or 50% better."





Big-Data Analytics on a Potentially Global Scale

Terry Griffin, Ph.D., cropping systems economist, Kansas State Research and Extension

As sensor technology improves and collects more precise data, Terry Griffin believes big data analytics, as opposed to just data collection, will be one of the next big things in ag. "Precision ag has been a conduit for collecting a lot of data," says the economist. "But for the last 20 years, if it's been used at all, it's been isolated to a single field or farm.

"In the last five years, a lot of different groups have been working to aggregate that data to discover truths [about what's happening in the field]," he adds. The current problem is a lack of dedicated tools for data analysis in the ag industry. Instead, the focus has been on creating a collective data repository. "Most of the … 'analytics' they've been doing have been queries related to benchmarking: 'How do my yields compare to my neighbors'?'"

And while individual equipment manufacturers, and chemical and seed retailers may use those data analytics to build better equipment or pinpoint where to use certain inputs, Griffin sees the uses being even bigger–and needing to be bigger. He thinks there will eventually be vast government, public or private repositories of data to support analysis and help fine-tune production on a national or global scale, especially in developing countries.

"Right now, we're producing at pretty much optimal level in developed nations," he explains, "but in developing nations, yields are not as high because of simple things like failure to properly manage fertilizer and pest control." Big-data analytics could be the key to helping developing countries build production capabilities like those found in the United States, Canada, South America and Europe.

The future, says Griffin, will not be "looking at how a product performs in a given environment for a given farmer, but looking at all the products and all the farmers." One day we may be able to see which specific regions represent the best environment for which crops, and farmers will be able to customize, for example, their crops to environmental conditions or even manipulate the crops (through biological engineering) to suit a specific environment. FL

For more on future innovations in agriculture, see **myFarmLife.com/farmfantastic**. Also, check out **agcocropcare.com/data** for another look at how innovations in data management and analysis are making farming more efficient and profitable.

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