



Digital agriculture boosts productivity, profitability

May 11, 2021

Multigenerational farms are more likely and quicker to adopt new technology than single-generation farms.

As part of our annual Agricultural Symposium, we dove into the real-world application of the research to be presented through stories like this. [Learn more about the Symposium.](#)

By Su Bacon

By all appearances, dirt is dirt -- until it's time to make a decision about buying farmland.

"If the dirt is depleted of nutrients, it could take truckloads of fertilizer to fix it," said Kevin Spencer, who owns and operates Spencer Farms in Ottawa, Kansas, with his sons Aaron and Brad.

For prospective buyers considering available land, the Spencers will test and analyze the soil and make recommendations about its potential as profitable farmland.

Soil analysis is among the farm management services Spencer Farms provides.

The Spencers manage farms for investors and they farm 11,000 of their own acres in east-central Kansas.

Spencer said they make use of all the technology available to them to grow their own crops and manage farms for others: automated guidance, aerial imaging, yield mapping and monitoring, grid soil sampling, variable rate seeding and whatever is newest and next.

"We have adopted all of the technology," Spencer said. "It starts with the young people."

Kevin Spencer is 62. His sons Aaron and Brad are 37 and 34, respectively.

"Without my children beside me, this old dog might not have learned new tricks," he said.

Next wave of farm operators

Research supports Spencer's sentiment. Terry Griffin found that multigenerational farms are more likely and quicker to adopt new technology than a single-generation farm.

Griffin is an associate professor and cropping systems economist in the Department of Agricultural Economics at Kansas State University. His paper, "Interacting with the Next Wave of Farm Operators: Digital Agriculture and Potential Financial Implications," co-written with *LaVona S. Traywick and Elizabeth A. Yeager*, is being presented at the *Federal Reserve Bank of Kansas City's annual Agricultural Symposium*.

He studied the demographics of Kansas farmers and their willingness to embrace digital agriculture. Overall, the readiness varied according to the age of the farmer. Mindset and money also were important.

Though eager to try new technology, for example, "a millennial alone might not have the funds," Griffin said.

But if the millennial works a farm with an older generation, such as a baby boomer, there tends to be money to invest in farm equipment and software.

"Millennials on multiple-operator farms adopted much more technology than millennials on sole-proprietor farms," Griffin said.

Griffin found that nearly half of the farmers in Kansas are baby boomers, born between 1946 and 1964. Their predecessors, the Silent Generation, own about 20%.

As the older generations retire in the next 10 years, Griffin looked ahead to the next wave of farm operators -- Generation X, born between 1965 and 1980, and the millennials, 1981 to 1996.

"There's no doubt that digital agriculture can improve productivity and profitability for farmers who have the energy and desire to make technology work for them," Griffin said.

Overcoming adoption barriers

Yet despite a strong interest in technology among the younger generations, there are barriers to adopting agricultural advances. Access to broadband in rural areas can be an issue.

"To fully use digital agriculture, broadband needs to be as ubiquitous as electricity and running water," Griffin said. "Do you want to buy land if you know you couldn't monitor your employees because there was no broadband there?"

Some, however, may balk if the technology seems difficult.

“Use depends on ease of learning,” said Traywick, associate professor at Arkansas Colleges of Health Education and one of the authors of the research.

Millennials expect technology to be as easy as a screen at their fingertips.

“They have never not known cell phones,” Traywick said. “They want to be able to see the results of moisture monitors in the field on their cell phones.”

Making technology easy to adopt, easy to use and easy to diagnose a problem are what guides agricultural advances at John Deere, said Deanna Kovar, vice president, production and precision ag production systems.

Digital agriculture was introduced in the late 1990s with automatic guidance systems, Kovar said.

The 2000s were all about guidance, 2010 about cloud computing and data collection and 2020, automating more elements of decision-making.

“By the mid- to late 2000s automation had improved productivity and the quality of life for farmers,” Kovar said.

Now the question has become “Where can automation make it easier for farmers?”

New John Deere equipment, for example, allows a farmer to spray herbicide selectively when fields are fallow.

“A camera is used that can discern the difference between green and brown -- weeds and dirt,” Kovar said. “This can reduce herbicide usage by 80 percent.”

Because farm debt-to-asset ratio tends to influence a farmer’s decision to invest in new technology, cost is a consideration.

But upgrading doesn’t have to mean buying a new fleet.

“It’s all retrofittable,” Kovar said.

Today’s barriers to adopting technology may change as farms change hands. The farmers of the future may be able to accept and use agriculture technology for its potential financial value, its practicality and its ability to allow the farm operator to meet specific needs, Griffin said.

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