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Concord (NH) Monitor
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Hundreds of thousands of American farmers wrestle with balky — or nonexistent — internet connections, the exasperating modern-day equivalent of the stubborn mule that wouldn't pull a plow.

Farmers who lack rural connectivity increasingly lag in a tech revolution that offers robots, drones, sensors and self-driving tractors to farms lucky enough to have robust broadband. It is a rural digital divide on America's farms that threatens to grow wider. Some farmers scrap for whatever limited connectivity they can pull together. That is the case at Valley Wide Farm, a small dairy operation in Pennsylvania's Centre County where Adam and Bethany Coursen deploy a milking robot. Their 60 cows, lured by special feed, enter a stall one by one throughout the day to be milked by a robotic arm. Around each cow's neck is a bovine Fitbit of sorts, an activity sensor that gives a constant readout of her movements, chewing, daily milk production and other health indicators.

But processing data from the sensors and the **Dutch-made milking robot** is a challenge. Commercial telecoms have not delivered broadband to their sparsely populated valley. So the Coursens use a "hotspot" device that relies on weak cellular signals to get that data to their computers. They use it 24 hours a day. "We've blown these things up because they're not meant to be used like this," Bethany Coursen said, pointing to the Verizon Jetpack device. "They are not meant to run all the time." "Everyone at the Verizon store knows us really well. 'Oh, you're the robot people,'" she added.

KDKA-TV/AM, Pittsburgh
Rep. Rob Matzie (D-Beaver) Proposing Opening Vote By Mail To All PA Voters

Pittsburgh Post-Gazette
It took a bit of pestering to get young people to vote in Pa., but group says its strategy worked

Philadelphia Inquirer
Bernie Sanders to visit Pa. on weekend swing through battleground industrial states

Wilkes-Barre Citizens' Voice
TV, radio host Smerconish urges moderation in politics, life

Lack of reliable internet is a source of vexation to her husband. Down the rural highway toward State College, home to Penn State University, residents get speedy internet. "Ten miles away, they have unlimited data," Adam Coursen said. "We're paying upwards of $75 for six gigabytes to have connection with our provider. So it's expensive."

The Department of Agriculture estimates that **29 percent of U.S farms have no access to the internet**. Those unconnected farms are getting left behind as some farms with broadband adopt new technology that allows them to sharply reduce use of herbicide and insecticide, fertilize fields more precisely and amass data from the liberal use of sensors. "Today, when you don't have connectivity, you're going to have reduced productivity. Ten years from now, if you don't have connectivity, it will be catastrophic," said Nick Tindall, senior director of government and industry relations at the Association of Equipment Manufacturers, a Milwaukee-based trade group for producers of machinery for agriculture and heavy industry.

New tractors and combines teem with sensors that can be fully utilized only if there is rural connectivity. "Tractors are just moving computers," Tindall said. "There are more lines of computer code in a tractor than there (were) on the space shuttle." Tindall said scientists expect greater productivity gains on farms in the next 100 years from the use of big data collected by sensors than the productivity gains seen in the past century from mechanization.

That's because every planted seed, every smattering of rainfall, every minute infestation or outbreak of plant disease, every variation of Ph or moisture in the soil and nearly every other factor affecting harvests is becoming a data point to be analyzed and harnessed. Start-ups proliferate in what is known as precision agriculture — the gathering and analyzing of data from fields to make exact farming decisions based on weather, soil, pest, fertility and rainfall. "A farm in the future is going to be equipped with hundreds of sensors throughout the field," said Duane Reese, president of AgIntegrated, a farm data management consultancy in State College. The chokepoint, he added, is "how are we going to handle all of the sensor data? That is going to need bandwidth."

Unless broadband arrives aggressively in more agricultural areas, use of high-tech sensors and connected machinery may only arrive initially at farms growing high-value specialty crops, or mega-farms able to pay for dedicated connectivity. In some ways, autonomous machinery is moving faster on farms than in cities. Self-driving tractors don't face the public backlash that autonomous vehicles on urban roads have confronted. Most farm fields don't have the sudden human obstacles — like pedestrians — that roads present.

All Jerrel Brubaker does with his self-driving John Deere tractor at his family's 900-acre Buffalo Valley Farmstead in nearby Lewisburg is to make an initial pass around a field, a second intersecting pass through the field, then allow the tractor to take over. Guided by a positioning system that is more accurate than those in smart phones or cars, the tractor makes precision rows better than any human could. "I could literally spray paint my windows black, and I could finish the field because I have all the information I need," Brubaker said. "I just push a

button on that machine that says ‘auto’ and then I set my speed, and I can just sit there.”

The cab of his tractor has three monitors on which he can see exact yields from past harvests at any precise point in his field and loads of other data. Periodically, Brubaker inserts a flash drive into the monitor and downloads the data to take to his office computer, a slightly cumbersome process that would be avoided if wireless broadband were available. The dilemma for farmers is that while precision agriculture can save them money, telecommunications companies don’t see profit in extending broadband systems to sparsely populated areas. “The companies say, ‘if we lay cable there, we’ll never get our money back’,” said Steve Pavelski, a representative for AllFlex livestock intelligence, with U.S. headquarters in Irving, Texas.

It is a dilemma for society at large as well since advocates say broadband-reliant precision agriculture is better for the environment than traditional agriculture, in which herbicides and fertilizers are blanketed on fields. “A farmer … can apply water only where it is needed, pesticide only where it is needed, nutrients only where (they are) needed,” Ranveer Chandra, head of Microsoft’s FarmBeats project, said at an event in Washington in December. “They can plant seeds closer together in the more fertile parts of the farm. It can help them reduce costs when they use less water, less pesticide. It’s better for the environment.” Some emerging agricultural technologies require especially robust broadband.

Aker Technologies, a tech start-up in Winnebago, Minnesota, provides drones that drop probes into the canopy of crops, mainly corn, to monitor insects, diseases and plant health. The drones cover thousands of acres in a day, snapping high-resolution images. Humans at most can cover 100 or 200 acres a day. Problem is, the sensors on the drones generate a lot of data. “By the time you get that many high-resolution photos and a database of environmental data, it adds up,” said Todd Golly, founder of Aker Technologies, noting that a busy drone can easily generate “several gigabytes” of data in a day.

Other high-tech agricultural start-ups leverage deep learning algorithms and technologies to locate and spray individual weeds. Blue River Technology, which was bought by Deere & Co. in 2017, uses such “see and spray” technology, which it says can save 80 percent of the herbicides sprayed each year. Farmers in the U.S. use more than one billion pounds of pesticide alone each year. Another start up, Harvest CROO Robotics, makes a robot that can pick eight acres of strawberries a day, replacing 30 laborers. A Canadian company, VineView, says its drones can check 50 acres of vineyards in 24 minutes for telltale signs of mold, bacteria or other diseases.

As the market grows for such services, the need for broadband in rural areas will soar. “We are now creating mobile broadband demand in areas that are not only not on anyone’s map, they are not even in anyone’s thought processes,” said Mark N. Lewellen, an engineer who is manager of spectrum advocacy at John Deere. “The demands for data are only going to increase.”

On large farms, connectivity can save major costs at harvest time, when combines, grain carts and tractor trailers all must coordinate to avoid idling. If the vehicles are digitally linked and integrated, a network

can calculate “who does what at any point in time rather than have people sitting around and waiting,” said Michael Sama, a biosystems engineer at the University of Kentucky. Farms of the not-distant future may well employ autonomous tractors without cabs or swarms of drones that work day and night, said Reese of AgIntegrated. By working around the clock, productivity jumps. “A swarm of equipment may fire up at midnight and head out to the field because they don’t require daylight,” Reese said.

Elements of precision agriculture will come first to orchards, vineyards and other high-value crops, he said, but the use of autonomous sprayers to apply herbicide and pesticide is just around the corner. “That’s just a couple of years off, to be honest with you. I’ve seen the technology at a lot of our innovation summits. I’ve met with the companies that are developing these technologies. And it is actually much further along than anyone realizes,” Reese said.

The onrush of technology may change the social complexion of farms, he added. “It is going to bring youth,” Reese said. “We’ll begin to bring in a new breed of growers that are relying heavily on technology and not relying on human labor. … It’s becoming cool.” The newer tech-savvy farmer “will turn into an overseer rather than a manual operator,” said Rob Zemenchik, manager of global precision farming for Case IH, a big equipment maker.

Other changes may be slower to unfold but equally far reaching in their impact. “In the past, the metropolitan areas kind of had the power over us because we were getting all the information from them ... whether it’s from a university or a lab or a large corporation,” said Golly, the Aker Technologies founder. “Now, that we’re the ones collecting and providing the data, and due to broadband, we can pipe that back to these companies. There’s a shift in that power.” – ***McClatchy News***

Victims of the Pittsburgh synagogue attack that killed 11 people last year will be remembered during a memorial service in the Pennsylvania Capitol. The unusual joint session Wednesday will bring together the House and the Senate for prayers and speeches about the Oct. 27 shooting at the Tree of Life.

Members of the three congregations that were holding services that day are expected to attend. The service comes a day after the Pittsburgh mayor signed new gun control measures that were introduced weeks after the massacre. The legislation was immediately challenged in court by gun rights advocates. A truck driver named Robert Bowers faces charges for the attack that could bring the death penalty. Authorities say Bowers expressed hatred of Jews during the rampage that also injured seven people. – ***Associated Press***

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