

Roadmap to Connectivity: 5G Integrations, Cloud Uplinks to Enable Smart Farming Technologies

Farmers today have an abundance of technologies to sort through that can help them be more efficient, grow more sustainably, and to collect, visualize, and analyze all the data to prove it.

To fully unlock the capabilities offered by many of these advanced technologies like sub-inch guidance, real-time yield mapping, and fully autonomous farm equipment, however, a robust internet signal locked onto each machine, implement, and connected sensor is a prerequisite.

In areas with solid cellular coverage, those farmers are already in a good spot. But what about the fields where fast and reliable coverage hasn't materialized yet?

To further illustrate, a recent study released by the University of Nebraska-Lincoln shows that only 26% of Nebraskans living on a farm report having very dependable internet. A 2023 USDA study found that 55% of farms in the Corn Husker state use precision ag practices (second highest adoption rate in the nation, behind only North Dakota) to manage crops or livestock. Those farmers need reliable and fast internet to realize the full potential of the ag tech adoption they've invested time and resources in. It's an issue that needs sorted, and quickly, if ag tech adoption is ever going to reach its full ceiling of potential.

Who is working to solve the problem?

Equipment manufacturers have taken note that coverage gaps do exist. Rather than waiting for cellular network build out to further penetrate the heartland, satellite providers are being tapped for partnerships.

First came the much-hyped John Deere-Starlink tie up. Then a couple months later CNH and Intelsat announced a deal to bring Intelsat's network of LEO and GEO satellite constellations into the farm equipment connectivity fray.

You may recognize the name Intelsat if you've flown the world's largest airlines around the world and connected to the inflight WiFi: the multinational satellite services provider with administrative headquarters outside Washington, D.C. proves its networks' prowess everyday by beaming inflight internet connectivity to thousands of airplanes every day.

One would figure that connecting planes flying at 20,000-plus feet altitudes at speeds upwards of 500 mph would make connecting ground-based farm machinery that plants, sprays, and harvests at around 10 mph a relative sinch.

However, both operating environments carry their own unique challenges. In farming, that means pushing a signal into areas without ample communications infrastructure already in place to support it. And having hardware robust enough to handle dusty, hot, and harsh operating environments for long hours.

The Deere and CNH connected machine projects are launching this summer in South America – Brazil, to be even more specific – due to that continent's spotty cellular coverage. Australia – another country with vast expanses of sparsely populated, underdeveloped farmland throughout its interior – remains another priority market. Plans to bring both services to North American farmers are currently slated for Q1 of 2025, according to reps from both equipment manufacturers.

“When you think about connectivity in farming it's really the foundation that enables all of the technology to work on the farm,” Marc Kermisch, CNH chief digital and information officer, told Schwab Network in a recent televised interview.

“And even though we have one of the largest cellular networks out there for our farmers that covers 160 countries, it reaches only about 33% of the total land mass globally that is farmed.”

“What we’re doing is bringing a megabits per second internet connection to farm machinery,” says Joel Schroeder, director of Business Development, Intelsat. “This can offer an enhanced level of telematics data – more data and information with more frequency. Now being able to direct information between the cloud and the machines, enabling the farmer to have real-time visibility to machines’ locations and what they’re doing, and being able to visualize real time yield data, it enables complete visibility of operations.”

Intelsat connects farm machines and moves data via a hybrid, multi-orbit network of both Low Earth Orbit (LEO) and high throughput GEO stationary (GEO) satellites that Schroeder describes as “very high reliability” combining the best of both constellations.

The Starlink network exclusively leverages its own LEO satellite constellations while promising comparable high speed, low latency connections.

Neither service has announced pricing details for its North America rollout yet.

Comparing apples to apples, according to Schroeder, Intelsat’s network offers a “wider range of service” and, here’s the big one: additional layers of redundancy, or fail-safe backups that ensure connectivity is always strong and available – even when unplanned events like solar weather temporarily disrupt other constellations.

“The more you can mitigate those kinds of interruptions for farmers, the better,” Schroeder admits, adding that Intelsat’s networks remained operational during the most recent solar flare events in May.

What is coming soon?

Schroeder and his team at Intelsat are working to make satellite connectivity even more accessible and vigorous. That could mean a convergence, or merging, of the various terrestrial (land-based) and satellite offerings that “will only benefit the farmer through a more seamless movement of data” he adds.

“As part of the ongoing 5G rollout globally you’ll start to see non-terrestrial networks like

Intelsat running on 5G core networks that will provide not only the ability to connect

(machines) but also we can start to leverage standards-based hardware being built at scale,” Schroeder says, noting such a setup could also mean lower costs for subscribers.

“There are just a lot of advancements (taking place) right now – this conversation around the convergence of satellite and terrestrial is taking place at a level that has never been seen before in the industry,” he says. “It’s about just being able to bring a consistent level of access to enable all of the advanced applications in addition to the various telematics services that the ag OEMs are offering.”