The Policy

Synopsis

**S 2343** [13]/**HR 4881** [14], the Precision Agriculture Connectivity Act of 2018, would require the Federal Communications Commission (FCC) to establish a task force to investigate, report on, and offer policy recommendations about improving current access to broadband internet access service in croplands and ranchlands of the United States.

Access to broadband is necessary for wider adoption of precision agriculture (PA) technology, a suite of tools including soil & crop sensors, GPS, unmanned aircraft systems (UAS/drones), and agricultural robots, which together enable farmers to increase crop yields while minimizing resource use. The task force would comprise various stakeholders, including agricultural producers, Internet service providers, PA equipment manufacturers, and state and local government. While not the first time that Congress has considered PA, this bill does represent one of its first explicit efforts to facilitate and bolster the use of PA technologies.

Context

The agricultural industry **directly contributed $136.7 billion** [15] to the US gross domestic product (GDP) in 2015, or about 1 percent. However, if related industries that depend on agricultural output—such as food and beverage products, stores, and services—are included, this contribution...
increases to $992 billion, or 5.5 percent of GDP. In addition, the agricultural and food sectors employed 21.4 million full- and part-time workers in 2016, or 11 percent of total US employment.

Precision agriculture technologies have the potential to enable farmers to operate more efficiently, increase crop yields, and reduce input costs (such as from seed, fertilizer, and fuel). These positive impacts have led to increased adoption of PA technologies [16] in recent years, although adoption rates vary by technology and are still generally less than 50 percent. Increased efficiency and productivity will be increasingly important as demand for agricultural output rises with steadily increasing population size: the US population is expected to increase from the current 325 million to 400 million [17] by 2050, with a projected world population of 9.7 billion [18].

Much of PA technology depends on the ability to send and receive data between different systems and devices via the Internet. For example, remote soil and crop sensors need to be able to send that information to a central system for storage, analysis, and control. However, “broadband Internet access service (47 CFR 8.2 [19]) is not consistently available where needed for agricultural operations” (Sec. 2.6). The FCC [20] notes that 39 percent of rural Americans (23 million people) lack access to the benchmark Internet service speed of 25 Mbps download/3 Mbps upload; by contrast, only 4 percent of urban Americans lack access to such service.

Resolutions in both the Senate (SRes 242 [21]) and the House (HR 521 [22]) were introduced in 2017 in support of the “deployment and advancement of fifth generation (5G) mobile networks to encourage economic growth and reduce the digital divide between urban and rural areas.” PA is explicitly stated as one of the areas that will benefit from this investment.

The Science

Science Synopsis

Precision agriculture encompasses many different technologies related to robotics and artificial intelligence (AI). The following are some of the most widely used and important technologies.

Enhanced soil and crop sensing technology [23] is perhaps the most integral aspect of PA development. These sensors—which include optical, mechanical, and electrochemical sensors, among other types—can be used to control variable-rate, location-specific (when paired with GPS; see below) application of inputs such as fertilizer and pesticide, leading to greater efficiency and less waste. Examples include simple combine-mounted yield monitors in use since the 1990s, which measure crop yield during harvesting and are the most widely adopted PA technology [24]. More advanced electrochemical sensors can provide information on soil nutrient levels and pH, while dielectric sensors can measure moisture levels in the soil. In combination with other tools discussed below, these sensors allow farmers to have detailed insight and control over the state of their farm.

The global positioning system [25] (GPS) is a US-owned satellite system that provides users with positioning, navigation, and timing services. GPS has been paired with several other PA technologies and are among the most widely adopted. For example, GPS is used to guide autonomous technologies such as UAS and auto-steering combines and tractors. Perhaps most importantly, GPS is used in combination with soil and yield monitors to develop precise maps that can be used to customize crop management across and within fields. Such GPS-enabled soil and yield mapping is estimated to have the largest economic [24] impact among PA technologies.

Unmanned aircraft systems [26] (UAS), commonly referred to as “drones,” are defined by statute (14 CFR 1.1 [27]) as any “aircraft operated without the possibility of direct human intervention from within or on the aircraft.” UAS are typically used by farmers to take multispectral (both visible and infrared light) images of their fields from the air. These images can then be stitched together into a high-resolution map to monitor the fields and guide operations, among other uses [28]. UAS-collected imagery generally provides superior quality at a lower cost than alternative methods, such as using satellites or manned aircraft flights. Some UAS can follow pre-programmed paths [29], flying from takeoff to landing and controlling the onboard camera for optimal image-taking.

Agricultural robot development is advancing rapidly thanks to large-scale investment [30] from both established agricultural companies as well as new, technically oriented market entrants. These robots could serve a diverse array of functions on modern farms, helping to improve efficiency and productivity compared to traditional, manual methods. Examples include cow-milking robots, which are touts as being better for cows [31] by lowering their stress and improving longevity. Many robots capitalize on recent advances in computer vision, allowing selective detection of both weeds for removal and fresh fruits for picking [32]. While robot dexterity still lags behind human levels, recent advances [33] suggest that this will change in the near future, potentially revolutionizing both the agricultural industry and many others as well.

Relevant Experts

Ramon Leon Gonzalez, PhD [34], is Assistant Professor of Crop and Soil Sciences and Director of the Weed Biology and Ecology Laboratory at North Carolina State University. His research focuses on describing how agricultural management affects weed behavior at the community, population, and species levels.

“We will definitively benefit on data acquisition and transfer if such [an] approach is implemented at large scale. From our perspective, we think that growers and especially crop consultants will be collecting more high resolution imaging of their fields, and this requires uploading and downloading large files. Currently, we work with UAVs and all [our] data collection has to be preserved in external hard-drives when we are out in the field. If a
widely available broadband network was available, we could streamline our flow of information to our servers and be more efficient during image
collection. Having a platform that facilitates those processes to operate in real time will greatly favor adoption and implementation of Precision
Agriculture tools.”

Relevant publications:

  https://doi.org/10.1017/wsc.2017.84 [35]

Kyle Snyder [37] is Director of the NextGen Air Transportation Center (NGAT) at North Carolina State University. NGAT is a consortium of academic, industry, and government partners that provides a research and application-oriented, technology transfer-focused organization for conducting aviation technology development, investigations, and field trials.

“The NextGen Air Transportation Consortium (NGAT) is aware of the Precision Agriculture Connectivity Act of 2018. The intentions of this bill align well with the goals of our Consortium of developing a digital, connected air transportation infrastructure. Connectivity provides multiple benefits to the aviation community including increased use of aerial imagery for precision agriculture, but also greater situational awareness of the air traffic environment for improved safety. Expanded integration of small unmanned aircraft systems for applications such as farming require increased access to communication infrastructure for data transfer and safe airspace management. Our industry and community members will continue to monitor the progress of this bill for its alignment with our consortium objectives and the state’s Department of IT Community Broadband Playbook [38].”

The Debate

Endorsements & Opposition

The American Farm Bureau Federation [39], an independent, non-governmental organization representing US farmers and ranchers, strongly supports [40] passage of the bill.

Earlier this year, news reports [41] stated that the Trump administration has plans to build a secure, government-owned 5G network. These plans have been largely met with rejection [42], including from FCC Chairman Ajit Pai, who issued a statement [43] that he “oppose[s] any proposal for the federal government to build and operate a nationwide 5G network.” Instead, Chairman Pai and others are in favor of developing policies to encourage the private sector to develop and build the network.

Status

S 2343 was introduced in the Senate on January 25, 2018, and referred to the Committee on Commerce, Science, & Transportation [44]. On April 25, 2018 it was ordered to be reported with an amendment in the nature of a substitute favorably.

HR 4881 was introduced in the House on January 25, 2018, and referred to the Subcommittee on Communications and Technology [45] by the Committee on Energy and Commerce [46]. On July 13, 2018, an amended HR 4881 was reported and on July 23, 2018, HR 4881 passed in the House of Representatives.

Recommended Citation


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