

The future of farming — Autonomous agriculture

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While autonomous vehicles are moving to our roadways, the agriculture industry's development of autonomous vehicles and machinery is also advancing rapidly. Autonomous farm and agricultural machinery promises to be an efficient and cheap method for farmers, although it receives far less publicity. This machinery is proving to be part of a significantly expanding industry, with global shipments of such equipment set to rise to \$87.9 billion by 2025.

The agricultural industry is uniquely suited to embrace autonomous vehicles, with less complex environments to operate within (i.e. fields versus highways). Agriculture applications have defined tasks and areas that bound operational requirements. It is not surprising that the design, manufacturing, and testing of autonomous agriculture vehicles and machinery is swiftly on the rise, with several manufacturers already deploying their autonomous equipment. For instance, the Dot A-U1 Power Platform was showcased at the Canada Outdoor Farm Show in 2019. The Dot A-U1 Power Platform is an autonomous platform with no cab and looks like a regular tractor. It is designed, however, to handle a large variety of agricultural tools at one time as well as perform rigorous farming tasks, such as tillage and harvesting. At the end of 2019, John Deere revealed their "driverless" tractor, which is also electric, boasting a total output of 500kW, allowing for more than 10,000 square metres of lawn to be mowed with one battery charge lasting four and a half hours.

In addition to tractors, autonomous "weeders" are also on the rise. This equipment aims to provide a solution to the ongoing struggle many farmers face: balancing the strenuous, but necessary, physical task of weeding and the lack of labourers willing to do the work. Autonomous weeders also have the potential to limit the use of chemical weed killers. A French company called Naïo Technologies has developed three different robot electric vehicles capable of removing weeds from row crops. Naïo already has 150 robots in use in Canada, Europe, and Japan, and has recently begun testing its autonomous weeders at 15 different commercial farms in California.

With these innovations, it is not surprising that human-free agricultural projects are appearing. In 2015, the Hands Free Hectare Project launched in the UK. The project aimed to farm a one-hectare field entirely with small, autonomous machines, without humans setting foot on the farmland. Since then, the project has successfully harvested

two seasons of grain using only using autonomous machinery, including tractors and drones.

Autonomous greenhouses are also in the works. [Researchers at Microsoft](#) are currently working to develop an autonomous system that can operate indoor farms quickly and efficiently, including managing temperature, lighting, irrigation, and so on. The idea is to enable farmers to control production facilities remotely, allowing the operation of several facilities at one time.

Similar to autonomous vehicles on our roadway, autonomy in agriculture certainly has appeal from an efficiency standpoint. For instance, autonomous agricultural vehicles could allow farmers to allocate human resources elsewhere and better focus their attention on running their business. According to the Canadian Agricultural Human Resource Council, Canadian farm sales losses from unfilled jobs reached \$2.9 billion in 2019. Labour shortages and rising labour costs are problems that autonomous agricultural equipment may solve.

In addition to cost savings, autonomous machinery may also increase overall productivity and efficiency. [Goldman Sachs predicts](#) that advances in agricultural technology could result in farm yields potentially rising by 70 per cent by 2050. In Canada, [agricultural output](#) could grow by \$11 billion by 2030.

There are still many unanswered questions. With the testing of autonomous vehicles on our roadways, safety will certainly be a key issue. Autonomous tractors, or similar types of machinery, must be able to detect anything that could cross its path, whether it be children or animals. Although autonomous agricultural machinery will be confined within a defined border (as opposed to navigating busy streets and intersections), it is certainly foreseeable that it will have to navigate and avoid unexpected obstacles in its path.

Questions of liability also remain. Indeed, the impact of a potential defect or breakdown in machinery may trickle down through the manufacturer to the producer to the ultimate consumer. This will undoubtedly raise questions of who will bear the brunt when it comes to issues of negligence, strict liability, misrepresentation, and breach of warranty, to name a few.

Like any other autonomous vehicle, there will certainly be concerns about privacy as well as data collection and protection. Similar to autonomous vehicles, autonomous tractors or other autonomous machinery will have the capacity to collect and retain data, such as soil and plant conditions. Such information could have incredible value to interested stakeholders. This may be especially true in the age of sharing economy, which could create new opportunities for farmers to rent autonomous machinery on an as needed basis.

At this stage, autonomous agricultural equipment does not appear to fit neatly in any regulatory or safety standards category. Although the federal government has developed a set of standards for testing autonomous vehicles on our roadways, there has been little attention given to autonomous farm machinery. Transport Canada does not regulate vehicles designed strictly for off-road use (such as farm tractors), nor do the Motor Vehicle Safety Regulations have a prescribed class for farm machinery. Although [Transport Canada](#) has recognized the production of autonomous vehicles could have a

positive impact on the farming sector, the current regulations, or lack thereof, are not caught up to present-day reality.

There will undoubtedly be more legal questions to consider, and address, as autonomous agriculture machinery makes its way to Canadian farmland. That said, there is much to look forward to as the future of farming begins to evolve before our eyes.

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