

Worksheet 6: New technology in agriculture

By Dan Sodergren

Artificial intelligence (AI) in farming

The temptation for everyone in AI at the moment is to believe it is a silver bullet and can be amazing at everything. I do not believe this is the case (just yet) but the advances in this area are impressive. Whilst the potential to use AI for methods such as [precision agriculture](#) are intensifying as farmers can use AI to can monitor:

- Crop moisture
- Soil composition
- Temperature in growing areas

Enabling farmers to [increase their yields](#) by learning how to take care of their crops and [determine](#) the ideal amount of water or fertiliser to use. Additionally, AI can help locate and therefore protect [carbon sinks](#), forest areas that absorb carbon dioxide from the atmosphere. Some AI is even being developed that can [find and target](#) weeds in a field with the appropriate amount of herbicide, eliminating the need for farmers to spread chemicals across entire fields and pollute the surrounding ecosystem. Many countries are already implementing AI into their agricultural methods. Some farmers in [Argentina](#) are already using digital agriculture; there are already AI farms in [China](#).

5G in farming

You can write a lot about 5G and its potential and I have done. I am also a remote reporter occasionally for Huawei. Who are one of the world's leading manufacturers of this technology. [And there are lots of other companies vying in this space too](#). Due to political reasons we can't use Huawei equipment in the UK. But you can in Europe.

And so, it was interesting to see that in 2021, Dronetech and Huawei launched the first "5G Smart Farming" project in Austria. Aiming to tackle the major issues facing farming: high labour intensity, soil pollution caused by pesticides and other chemicals, increasing energy costs, and low management efficiency.

It is just [one example of how 5G can be used in farming](#). There are [many more here](#).

Soil sensors

Australian start-up [Agri-EPI Centre](#) manufactures sensors that monitor carbon from soil and crops at different times of day, month, season, and year. The sensor differentiates variations in respiration (positive flux) and sequestration (negative flux) of carbon from soil emission periodically. This allows farmers to actively monitor and manage or reduce their carbon emissions and receive rewards from governments for doing so.

But this is just [ONE example of soil sensors](#) which is a technology very particular to your industry.

Robotics and autonomous tractors

I put these together but they could be tackled separately. And of course, there is an overlap with AI here as well – as the machines need to use machine learning and potentially AI for them to be successful.

Looking at [robotics for agriculture](#) you have the simple logistical nature of many of them. To the more future facing humanoid versions that Tesla wishes to produce.

But right now many industries use robots. So why not agriculture. The Verified Market Research, says that the agricultural robots market is expected to touch \$11.58 billion by 2025, becoming one of the well-invested markets in the upcoming decade.

According to [Alpha Brown's report, Agriculture Robotics Harvesting Solutions: Early Adopter Market Potential](#)

- Twenty-seven percent of the 1,300 growers surveyed said that they are considering purchasing a robotic machine to help with harvesting
- And thirteen percent of the growers said they would invest in robotics to offset the cost of labour

But what could you use robots for in agriculture? The possibilities are almost endless. The Alpha Brown report where these stats come might be based (and therefore biased) in America. But they show the potential thinking around this highly emotive topic.

Harvesting Robotics for different Crops:

To work in greenhouses:

The greenhouse sector has managed to pull the keenest interest in harvesting robotics among all the crops. 34 percent of the growers have made their mind to invest in them. Robots could be utilised to their fullest in greenhouses as they provide stable and tailormade conditions for robotics machinery. What's more, greenhouses do not operate on a seasonal basis which leads to a higher number of permanent employees and a substantial likelihood of a robotic harvester being used throughout the year.

Size of operations has put off 66 percent of the growers to invest in robotics as they think their farms are small enough to be managed by human harvesters.

To work on your vegetables:

30 percent of the vegetable growers have demonstrated their interest in investing in harvesting robots. It's slightly more compared to the average (27%). A key reason is that vegetable growers maintain a steadier workforce than other field crops, with 40% of vegetable farms having permanent employees. Application of robotics would not only cut the labour cost, but it will also enhance the quality of the harvest.

To work with fruit crops:

Twenty seven percent of the fruit growers who have shown interest in this technology believe that fruit-specific harvesting solutions could help in picking the best fruit without harming it. Fruits are among the most delicate produce, and therefore it is necessary that they remain attractive and blemish-free all the way to the grocery floor. The introduction of robotics in fruit crops could make it possible.

What are the different types of robots:

- Weed Destroyer: Bosch, the German manufacturers have invented a robot capable of killing 120 weeds/minute, which is significantly faster than any human or herbicide.
- Fruit Picker: Abundant Robotics Inc, a start-up has developed robots that would pick apples only when they are ripe. The software enables the bot to identify and pick apples without damaging the fruit or the tree.
- Lettuce Bot: Blue River, a California based start-up introduced a device which farmers can attach to their tractors. It would help the farmers in detecting/killing insects and weeds by spraying pesticides only on the affected area of the field.
- Prospera Bots: The latest robotic system, Prospera, utilise the camera and sensors to alarm the grower when their crops are sick. The app allows farmers to rectify the issue before it's too late.
- Hornet Bot: The robotics start-up Agribotix created a flying bot which captures aerial photos and videos of fields from above and analyses crop health using infrared sensors. It works through an app and alerts the farmers as soon as it detects an issue on any particular part of the field.
- Autonomous tractors: Equipped with radio navigation and a laser gyroscope, the tractor follows the route previously drawn up by the driver. AI learns to carry out instructions with minimal human intervention or no intervention at all.

What about drones in agriculture?

[Drone technology is not limited to agriculture](#), of course – but it is quickly becoming one of the most useful for plant cultivating operations. And it is interesting to think whether drones are operated or not by humans. I put this part separately to show the difference. As presently I see drones as being human operated.

But... Drones can be equipped with thermal and infrared imaging technologies that are increasingly operating and relaying data autonomously. [Some of the most relevant applications of autonomous drones](#) and the data they provide are:

- Crop monitoring
- Soil assessment
- Plant emergence and population
- Fertility
- Crop protection
- Crop insurance reporting in real time

- Irrigation and drainage planning
- Harvest planning

This is one area I think of as the easiest for farmers to adopt presently. Another one is more about the industry AROUND the product and this is Blockchain.

Blockchain-enhanced traceability

I don't normally like to talk about Blockchain. As is it linked to Cryptocurrency. But using Blockchain technology pioneered by [cryptocurrency is being utilized in agriculture](#) operations. And seems to be a force for good.

As the technology allows the industry to enhance the "traceability" from farm to fork. This traceability is not only preferred by consumers, but increasingly being demanded in the wake of health-related incidents.

Blockchain works by mapping data and providing it to users along the value chain simply by scanning a barcode. These barcodes are applied and linked throughout the value chain automatically by grading and sorting robotics.

Data on seeds, farm location, harvest, storage, supply chain and end users provide detailed descriptions of the product through its life cycle. This information is not only providing the consumer with transparency and a farm-to-fork timeline, but also reduces risks for producers and provides a cost-effective supply chain analysis to optimize profits.

The future of technology in Agriculture

Which of the technologies do you already use?

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Which ones will you look into using?

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What are your next three steps as the leader of your business?

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Who will be responsible for the advancement of technology in your business?

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What kind of budget are you willing to give to this in time, money and energy?

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