



Enabling digital transformation in agriculture

- Optimise crop yields
- Improve food quality
- Track farm-to-fork journeys



The third agricultural revolution will be powered by data →

3

From the field and road to the cloud →

8

Smart farming starts in the field →

4

Accelerate precision farming with Cubic³ →

10

Smart transport from farm-to-fork →

6

The third agricultural revolution will be powered by data

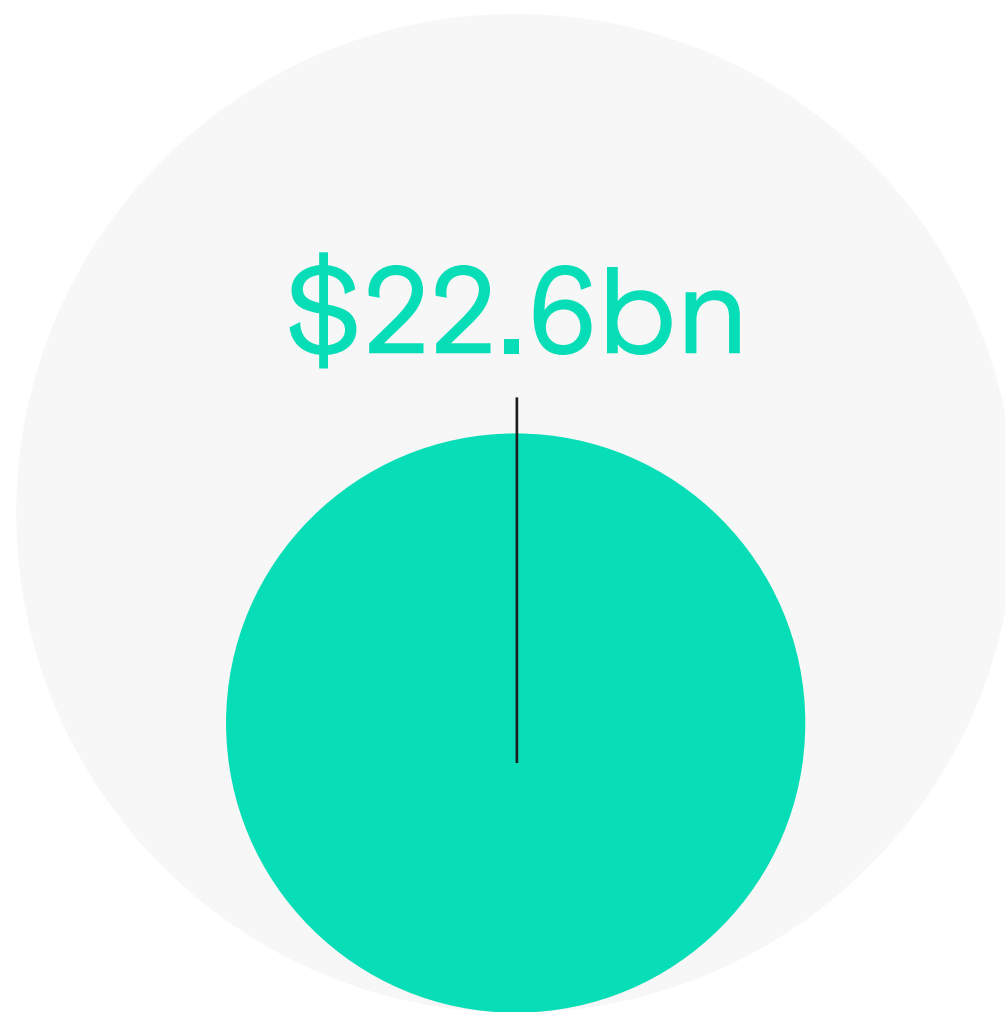
Like every sector, agriculture is undergoing a period of exciting digital transformation. The third farming revolution in a century – Agriculture 3.0 – has seen powerful digital technologies like smart sensors, the Internet of Things (IoT), and cloud-based systems enable innovative new precision farming techniques and optimise global supply chains.

Effective digital transformation gives organisations the ability to harness data and use it to support evidence-based decision making. For agriculture this relies on having intelligent connectivity, and the advantages it brings – bridging the digital divide between town and country and bringing a new wave of solutions to a rural-based sector.

The revolution is now well underway, courtesy of IoT devices, with the agriculture segment of this market expected to reach \$22.6bn by 2028. IoT software in autonomous farm vehicles

and drones is already being used to access data at the point of production, while connected cold storage vehicles are extending visibility across farm-to-fork supply chains, greatly increasing efficiencies around perishable goods.

This eBook will explore the transformational technologies making a new wave of smart farming possible and identify the best ways for agricultural vehicle and machine manufacturers, farming consortia, and food production companies to capitalise on them.



By 2028, the IoT segment of the agricultural market is expected to reach **\$22.6bn** in total value¹

1. <https://ai-techpark.com/agriculture-iot-industry-is-expected-to-reach-22-6-bn-by-2028/>

Smart farming starts in the field

A key benefit of IoT solutions is their ability to help agricultural producers and distributors address global challenges, not least the growing gap between supply and demand. According to the Food and Agriculture Organization (FAO), the world will need to produce 60% more food by 2050 if we are to keep up with the growing global population². This task will be made even more difficult by shrinking agricultural lands, climate change, and a depletion of natural resources.

Smart farming will enable farmers to significantly enhance yields by optimising the potential of arable land and reducing water waste. Data generated from IoT sensors will also help navigate the tricky path between profitability and environmental sustainability, while growing use of automation will offset a global decline in the agricultural workforce.

Next-generation farm equipment

Tractors, harvesters, loaders, and bale stackers have been a part of the rural landscape for decades, gradually transforming a labour-intensive industry through technological advancement.

The next stage of this transformation will happen even faster now that key technology components are becoming more commonplace. These include IoT software and sensors embedded in machinery, and eSIMs that connect to licensed wireless radio spectrum provided by mobile network operators (MNOs). Together they enable the collection and collation of data out in the field, by different machines for multiple use cases.

The pursuit of new data sources has also seen the agriculture industry adopt other types of equipment, most notably unmanned aerial vehicles (drones), and innovate with new types of autonomous vehicle.

Though it's still early days in terms of the type of data collected and analytics use cases being identified, some IoT scenarios are already set to meet many new market demands:

2. <https://www.un.org/en/chronicle/article/feeding-world-sustainably>



1.

Autonomous vehicles

A new breed of unmanned tractors, weeders, and planters bring benefits to a sector previously precluded from advances in automation. Agricultural machinery manufacturer John Deere estimates that the combination of driverless tractors and precision fertilisers will increase yields by up to 9% while reducing the fertiliser costs by almost two thirds (60%)³.

2.

Drones

From more efficient crop spraying to optimising field management, aerially captured data can dramatically improve yields. With Randomised Grid Mapping, farmers can spot problem crops two weeks before physical evidence appears.

3.

Livestock tracking and geofencing

Not confined to machinery, IoT sensors can also be attached to animals to monitor their movement and wellbeing, while ‘smart fences’ can help farmers track the location of their livestock in real-time.



4.

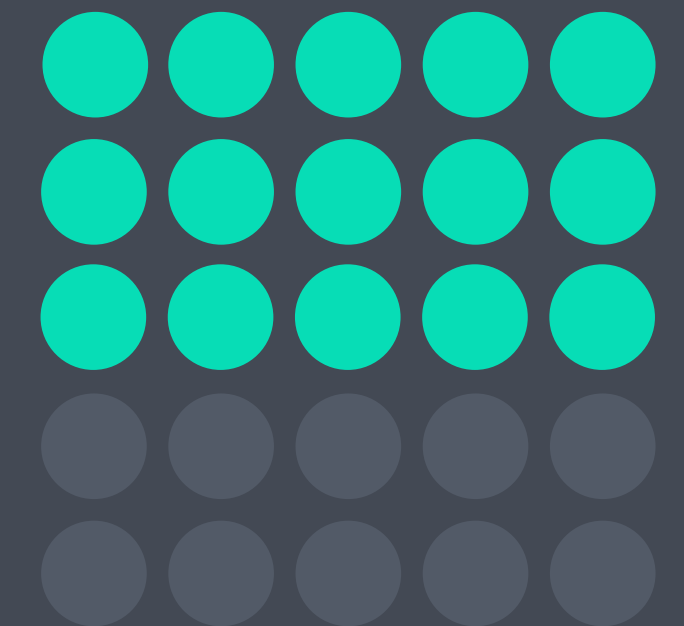
Smart fields

Essential crop management activities like measuring soil temperature, moisture, and pH are made much easier by IoT solutions. Smart greenhouses can use sensors, actuators, and remote monitoring software to enhance growing conditions and conserve resources throughout the year. In fact, the University of Georgia found that predictive lighting alone could reduce electricity consumption by up to 33%⁴.

5.

Smart irrigation

Combining remote soil and weather monitoring – that allows farmers to observe their crop anytime, anywhere – with automated sprinkler controls delivers greater watering efficiency, producing savings of up to 50%.



Autonomous tractors and smart planters can cut costs by up to 60%.

3. <https://www.verdict.co.uk/john-deere-autonomous-tractors-ai-robotics-spacex/?cf-view>

4. <https://research.uga.edu/news/smart-greenhouses-could-slash-electricity-costs/>

Smart transport from farm-to-fork

According to the United Nations, approximately 14% of food produced annually is lost between harvest and retail⁵, and there is a growing gap between what consumers want and what agriculture supply chains can deliver. The desire for fresh, traceable, and sustainable food is increasing in developed economies. However, perishable goods have always been the hardest to transport. Likewise, moving chilled and frozen goods is equally challenging, despite advances in cold chain logistics.

IoT-enabled vehicles and smart containers make it possible to track freight anywhere, at any time, across land, sea, and air. This use of smart connectivity software and sensors provides a clear view of supply chains, while the data insights they deliver help drive continuous improvement.

Automatic data capture over mobile networks also enables real-time information gathering that can help solve problems associated with transport logistics. This not only meets the challenge of delivering fresh produce in a timely way but also can address regulatory requirements and complicated consumer expectations around the transparency of ingredients.



5. [https://food.ec.europa.eu/safety/food-waste_en#:~:text=Globally%2C%20approximately%20a%20third%20of,stage%20\(FAO%2C%202019%20\).](https://food.ec.europa.eu/safety/food-waste_en#:~:text=Globally%2C%20approximately%20a%20third%20of,stage%20(FAO%2C%202019%20).)

Smart transport farm-to-fork use cases:

1.

Real-time route analysis

Tracking tools help logistics companies calculate estimated delivery times and make quick adjustments if weather or traffic conditions alter.

2.

Regulatory compliance

From drivers required to meet tachograph regulations to journey logs for the transportation of live animals, it assists in keeping accurate and up-to-date records.

3.

Cold chain monitoring

Aids precise temperature-controlled transportation so that perishable goods arrive fresh and food wastage is reduced. The FAO estimates that one third of all food produced is wasted due to a lack of proper storage and transport delays⁶.

4.

Farm-to-fork transparency

According to a 2022 Food Marketing Institute (FMI) Survey, 64% of people would switch to a brand that provided more in-depth food information⁷. Real-time information gathering will assist food supply chains that are under growing pressure from consumers to improve traceability and transparency around ingredients.

5.

Warehouse and inventory management

Tracking goods across the supply chain, including warehouses, is increasingly driven by digital technology. A recent Warehousing Report by Zebra supports this, with 52% of respondents saying IoT investments were now a priority.

6.

Capacity management in trucks

According to the Organisation for Economic Cooperation and Development (OECD), 27% of European trucks run almost empty⁸. Tech-driven solutions include real-time bidding services to fill up trucks and use the capacity more effectively, getting more value out of shipments.

6. <https://www.fao.org/4/mb060e/mb060e.pdf>

7. <https://www.fmi.org/blog/view/fmi-blog/2022/02/09/consumers-continue-to-value-transparency-as-perspectives-evolve>

8. <https://www.itf-oecd.org/sites/default/files/docs/decarbonising-europes-trucks-minimise-cost-uncertainty.pdf>



From the field and road to the cloud

In the field and throughout the supply chain, sensors and IoT software are key components of Agriculture 3.0, but the great enablers of precision farming are mobile networks and cloud computing. Together they provide access to network and compute capacity that will bring true digital transformation to the sector.

Mobile networks

Each new iteration of licensed wireless radio spectrum, from 2G to 5G, has advanced the data-driven capabilities of mobile networks. Upload and data speeds – crucial for IoT and smart farming – have increased from 10Mbps with 4G to nearly 20Mbps with 5G.

These are real-world speeds as opposed to theoretical speeds like 50Gbps for 4G and 1Gbps for 5G, which are only achieved in lab testing. The constraints of physical infrastructure – for example network contention caused by multiple users accessing bandwidth from the same cell sites – have created this gap.

In addition, rural areas are particularly susceptible to another physical constraint – ‘black spots’ in network coverage where it is impossible to get a signal. So far the rollout of 5G has predominantly been in urban areas, with rural coverage to come in time. For the latter, 5G will bring significant new benefits to smart farming such as the ability to connect millions of IoT devices simultaneously as well as network slicing capabilities that will support separate services over the same infrastructure. This will facilitate the assignment of different speeds, latency, and even security to different use cases.

With a cloud-native microservices-based architecture and access to distributed edge computing, 5G has the potential to bring cloud resources closer to farms and fields. No longer tied to base station proximity, it uses RANs (Radio Access Networks) that can connect to devices via small cells located on buildings or even fences.



Cloud computing

The evolution of cloud platforms means that all data captured ‘in the field’ has somewhere to go. Gathered by IoT sensors, data is transformed in the cloud for visualisation and trend analysis, producing insights that enable more informed decision making. In short, data is the key that unlocks precision farming.

Advanced analytics can be applied to any use case – whether it’s raw data from soil analysis, land images from mapping drones, or sensor readings from cold storage trucks – and deliver deep insights that were once the sole preserve of technologically mature businesses. It signals an evolution towards real-time and predictive analytics – powered by AI and machine learning – that will put the agriculture sector in a much stronger position to address its biggest challenges.



Accelerating precision farming with Cubic³

Intelligent software solutions and analytics platforms will play a pivotal role in the success of, smart farming, enabling rural regions to connect to cloud services and capitalise on the enhanced data insights they offer. Connected agricultural vehicles and machines will also help farmers extract the key insights they need to inform farm-to-fork strategies and address fast-changing demands in the food industry.

To achieve this on a global basis, vehicle and machine manufacturers, farming enterprises, and food production companies have traditionally had to negotiate mobile contracts with multiple carriers in multiple territories. A complex task at the best of times, but when you factor in cost management and consistent quality of service, an even bigger ask for a sector that's both geographically diverse and vulnerable to unique market forces. Cubic³ cuts through this complexity to deliver a single, streamlined, global solution.

Our powerfully smart software solution enables precision farming and digital transformation for the world's biggest agricultural manufacturers, unlocking new insights that will enable you to make better business decisions and drive revenue.



Cubic³

Smart, scalable, and empowering. Our cloud-based solutions lay the foundations for enhanced insights, scalable growth, and operational efficiency for the world's leading agriculture brands, unlocking new opportunities and providing strategic edge through continuous innovation.

Cubic³ Cloud

Intelligent, secure, and truly global Cubic³ Cloud ensures compliant connectivity for vehicles and mobile assets worldwide. We support your future growth by unlocking the full potential of the software-defined vehicle, now and in the future.

Explore³

Delivering advanced insights into vehicle data usage, customer engagement, and network performance, we help you reduce costs and personalise in-vehicle experiences.



Cubic³ cuts through smart farming complexity to deliver:



Access everywhere

Integrate with next-gen technologies, including 5G and satellite, and gain secure, reliable connectivity anywhere in the world, even in the most isolated regions.



Increase productivity

Optimise performance, ensure continuous data flow, and maintain productivity, with our seamless connectivity, no matter how challenging the environment.



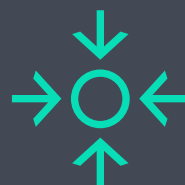
Data-led decision making

One user-friendly dashboard, delivers data analysis from multiple sources across your fleet. These actionable insights mean you can optimise farm-to-fork strategies, adapt quickly to market demands, and enhance crop performance.



Automate tasks

Empower farmers to reduce inefficiencies and adopt automation. Delivery of real-time data analysis, helps them increase profitability while at the same time reducing environmental impact.



Unified control

Gain full control and visibility over your vehicles and equipment with one integration, one platform, and one contract.



Remote updates

Scale across vast areas with remote updates, managing thousands of connected assets to minimise downtime and maximise productivity..



Our connected software solutions ensure the world's leading automotive, agriculture, and transport brands are harnessing the power of software-defined vehicles, delivering enhanced customer experiences and driving revenue.



Enabling digital transformation in agriculture

Dublin

The Hive, Carmanhall Road,
Sandyford, Dublin 18, Ireland

+353 1 486 06 00

Munich

Rosenheimer Strasse 116,
81669 Munich,
Germany

Detroit

418 N Main St, Suite 206
Royal Oak, MI 48067
United States