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ENABLING DIGITAL TRANSFORMATION IN AGRICULTURE

Optimise Crop Yields • Improve Food Quality • Track Farm-to-Fork Journeys





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The Third Agricultural Revolution Will Be Powered By Data

Like every sector, agriculture is going through a period of digital transformation. The third farming revolution in a century - Agriculture 3.0 – builds on mechanisation and genetic modification to combine sensors, IoT technology and cloud-based systems that enable precision farming and more efficient supply chains.

As with other industries, a big win with digital transformation is the ability to collect and analyse data to support evidence-based decision making. The difference for agriculture has revolved around connectivity, and the advances needed to bridge the digital divide between town and country and bring a new wave of solutions to a rural-based sector.

That revolution is now well underway, courtesy of IoT (Internet of Things) devices. The agriculture segment of this market is expected to grow at a CAGR of 10.8% from 2021 and reach $22.6 billion by 2028. IoT software in autonomous farm vehicles and drones is already accessing data at the point of production; connected cold store vehicles are starting to extend visibility across farm-to-fork supply chains and increase efficiencies around perishable goods.

In this eBook, we dig down into the transformational technologies making a new wave of smart farming possible and explore the best ways for agricultural vehicle and machine manufacturers, farming consortia, and food production companies to take advantage of them.





Smart Farming Starts In The Field

The collective benefit of IoT solutions is that they help agribusiness to address global challenges, not least a growing gap between supply and demand. According to the UN Food and Agriculture Organisation, the world will need to produce 70% more food in 2050 to keep up with a growing population, a task made more difficult by shrinking agricultural lands, climate change, and a depletion of natural resources.

Smart farming is one way to enhance farm yield and drive productivity, optimising the potential of arable land while reducing waste around water and electricity. Data generated from IoT sensors will also help navigate the tricky path between profitability and environmental sustainability by optimising resources. Automation, powered by IoT devices, will also become more important and help 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, farming machinery that has gradually transformed a labour-intensive industry. The next stage of that transformation will happen faster now that key technology components are in place: IoT software and sensors embedded in machinery and eSIMs that connect to licensed wireless radio spectrum provided by Mobile Network Operators (MNOs).
This combination enables the collection and collation of data out in the field, quite literally, captured by different machines for multiple use cases.
The pursuit of new data sources has also seen the agriculture industry appropriate 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, some IoT scenarios are already bringing efficiencies to the sector and helping meet new market demands:

Autonomous vehicles – a new breed of unmanned tractors, weeders, and planters bring benefits to a sector previously precluded from advances in automation. Science and Technology Daily claimed an unmanned tractor and smart planter can cut costs by 60%.

Drones – from more efficient crop spraying to optimising field management, aerially captured data can dramatically improve yields. With Randomised Grid Mapping (RGM), farmers can spot problem crops two weeks before physical evidence would appear, according to Go Intelligence

Livestock tracking and geofencing – not confined to machinery, IoT sensors can be attached to animals to monitor their wellbeing – a Nedap monitoring solution claims to have increased cow pregnancy rates by 30% – or 'smart fences' to track livestock movement.

Smart fields – measuring soil parameters like temperature, moisture and pH are an essential crop management activity, now made easier with IoT solutions. BeherTech claims to deliver 40% savings on the use of inputs like nitrogen and biocides.

Smart greenhouses – growth conditions in controlled environments can be optimised with sensors, actuators, and remote monitoring software. The University of Georgia found that predictive lighting alone could reduce electricity consumption by up to 33%.

Smart irrigation – combining remote soil and weather monitoring with automated sprinkler control systems helps optimise the effectiveness of watering. Research shows that water savings of 30-50% can be achieved.



Unmanned tractors and smart planters can cut costs by 60%



Smart Transport From Farm-To-Fork

According to the United Nations, around 14% of food produced globally is lost between harvest and retail, and there is a growing gap between what consumers want and what agriculture supply chains can deliver. The appetite for fresh, traceable and sustainable food is increasing across developed economies, but perishable goods are the hardest to transport. 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. The combination of connectivity software and sensors make complicated supply chains more visible, with data providing insights that can drive continuous improvement.

Automatic data capture over mobile networks enables real-time information gathering, providing insights into problems around farm-to-fork logistics. As well as helping meet the challenge of delivering fresh produce in a timely way, solutions can address regulatory requirements and complicated consumer expectations around the transparency of ingredients.

Multiple use cases include:

Real-time route analysis: tracking tools help logistics companies calculate estimated delivery times and make real-time adjustments if weather or traffic conditions change.

Regulatory compliance: from drivers required to meet tachograph regulations to journey logs for the transportation of live animals, accurate and up-to-date record keeping has become essential.

Cold chain monitoring: precise temperature-controlled transportation helps ensure perishable goods arrive fresh. The UN estimates that 30% of fruit and vegetables are wasted due to a lack of proper storage and transport delays.

Farm-to-fork transparency: food supply chains are under growing pressure from consumers to improve traceability and transparency around ingredients – 64% of people would switch to a brand that provided more in-depth information, according to an FMI survey.

Warehouse and inventory management: tracking goods across the supply chain, including warehouses, is increasingly driven by digital technology. In the Zebra 2020 Warehousing report, 52% of respondents said IoT investments were now a priority.

Capacity management in trucks: according to the OECD, 27% of European trucks run almost empty. Tech-driven solutions include real-time bidding services to fill up trucks and optimise capacity to get more value out of shipments.





From Field And Road To The Cloud

In the field and along the supply chain, sensors and IoT software are key components of Agriculture 3.0, but the great enablers for smart 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 are crucial for IoT and smart farming; these have increased from 10Mbps with 4G to nearly 20Mbps with 5G.

These are real world speeds, as opposed to theoretical speeds achieved in lab tests, where 4G rises to 50Gbps and 5G reaches 1Gbps. Physical infrastructure constraints create the gap, such as network contention caused by multiple users accessing bandwidth from the same cell sites. Rural areas are also more 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. Rural coverage will come over time and that’s when advanced technical capabilities in the standard will bring significant new benefits to smart farming. 5G can connect millions of IoT devices simultaneously, for example, and has network slicing capabilities that will support separate services over the same infrastructure, facilitating 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 Radio Access Networks (RANs) 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. Captured by IoT sensors, data is transformed in the cloud for visualisation and trend analysis, surfacing insights that enable evidence-based decision making.

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.

An evolution towards real-time and predictive analytics, powered by AI and machine learning, will put the agriculture sector in a much better position to address its biggest challenges.





Crossing The Digital Divide With Cubic's Connected Software Solutions

Connected software and analytics platforms play a crucial role in the success of smart farming. They enable rural, harder-to-reach regions to connect to cloud services and make the most of enhanced data insights and automation. Connected software and analytics platforms for agricultural vehicles and machines help farmers to extract the 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. That's a complex task at the best of times, but when you factor in cost management and consistent quality of service, it's a big ask for a sector that's both geographically diverse and vulnerable to unique market forces. Cubic Telecom cuts through complexity to deliver a single, global solution.

ACCELERATING PRECISION FARMING

Cubic Telecom's connected software technologies are delivering intelligence to the field, enabling precision farming and digital transformation for globally recognised agriculture manufacturers. Our technologies connect, manage and analyse data for agricultural vehicles and machinery across Europe, Brazil, North America and Asia-Pacific, providing seamless global device connectivity to over 9 million devices in more than 190 countries worldwide.

PACE

The PACE global connectivity management solution provides a single point of access to mobile network services around the world. Highly scalable, with zero-touch onboarding, the platform simplifies regulatory compliance – legal, tax, security – in accordance with each country's requirements.

PLXOR

The PLXOR data classification and intelligence platform is a one-stop global solution for optimising vehicle performance, personalising connected services, enriching customer experience and unlocking revenue streams. Gain actionable insights into application and feature usage, while making informed decisions that generate new business value.

INSIGHTS

INSIGHTS brings state-of-the-art data analytics to agriculture OEMs, collecting and correlating millions of data points to drive real-time performance monitoring and advanced reporting. On-demand dashboards enable a rapid response to issues and opportunities, driving an evidence-based strategy.



Cubic Telecom cuts through smart farming complexity to deliver a single global solution, comprising:

Data-driven insights: collected and collated data is surfaced from an ecosystem of connected services to inform multiple agricultural use cases.

Scale and agility: cloud platform-as-a-service capabilities give a rural-centric industry access to the same technological advantages as a tech-driven business.

Customisation and control: the use of open standards mean new devices and services can be added to Cubic's PACE platform with front and backend integration.

Device lifecycle management: from preconfiguring single vehicle connectivity at the point of manufacture to fleet management of machines at scale, Cubic connectivity software put clients in control of their hardware.

Regulatory and tax compliance: connected devices are pre-configured for telecom and tax regulations in destination countries and kept current with Over-The-Air updates.

Global coverage: with zero-touch registration for LTE, 5G, and satellite, Cubic provides high quality connections in the remotest corners of the planet.



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ABOUT CUBIC TELECOM

Cubic's PACE, PLXOR and Insights solutions help some of the world's leading automotive, agriculture and transport brands to maximise customer lifetime value by providing insights, analytics, visibility and connectivity across any device, globally. Cubic surpassed 9 million connections in more than 190 countries in 2022, enabling more than 1 billion data transmissions daily.