The agri-food system is under pressure to achieve the UN Sustainable Development Goal (SDG) of a “world with zero hunger” by 2030. It is being impacted by from all sides by digital technologies, changing consumer preferences, e-commerce, climate change and other factors.

Digitisation is key for farmers to react, adapt and survive in an increasingly complex world, enhancing their productivity, making them more competitive and ultimately making the entire food system more resilient. Satellite communications can help.

Global Challenges | Satellite Answers

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The Need to Digitize Farming

Nearly a billion people across the world experience the effects of food insecurity.¹ The World Bank notes that agriculture can help reduce poverty, raise incomes and improve food security for 80% of the world’s poor, who live in rural areas and work mainly in farming. It can impact the GDP of countries to up to 25%. At the same time, it is vulnerable to climate change and is responsible for about 25% of greenhouse gas emissions.² According to FAO, vital digital transformation of the agri-food sector depends on diverse factors including availability, connectivity, affordability, ICT in education and supportive policies and programmes for digital strategies.³

The Role of Satellite Communications

Half of the world’s habitable land is used for agriculture ⁴ and around half the world’s population remains unconnected. Even if the penetration of smart phones continues to increase around the world including among farmers, the reality remains that most farmers are located in rural areas that lack basic infrastructure and are beyond the reach of mobile networks.

Satellite communications reach more than 90% of the globe and can play a key role in bridging this existential digital gap.

Today satellite communications are successfully relied on by many millions around the world for broadband and narrowband applications and services. Some users are farmers or those otherwise engaged in the agri-food sector. Satellite communications allows them to access faster, reliable, accurate and timely information for better decision-making and automated practices that directly impacts their output. With the economics of terrestrial broadband deployment for rural communities and areas of high agricultural production being prohibitive, the use of satellite communications for precision agriculture is critical to the future of agriculture operations on farms and ranches across the globe, be they in mountainous, rural and/or remote areas.

Satellite operators have already invested in satellites in space, that are enabling a new generation of services with higher throughput and lower latency across the world, including its northern most regions. As a result and given that only a terminal is required to receive the signal to connect to the Internet backbone, satellite solutions can be cost-effectively installed within days and weeks compared with land-based connectivity solutions that necessarily require months if not years, and huge investments, to deploy.

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¹ https://www.peacecorps.gov/educators/resources/global-issues-food-security/
⁴ https://ourworldindata.org/land-use
Use Cases

Satellite communications for Crop Management & Precision Farming

**Spain**

International agri-food company Florette has partnered with a satellite operator to bring broadband satellite connectivity to crop fields in Alicante in Spain. Thanks to this project, farm workers can transmit crop management data from their mobile devices in real time, without having to travel to far-away areas to access the Internet. In Spain around 3.2 million people are still unable to access a high-quality network and the problem is more pressing in areas dedicated to crops or livestock, where terrestrial networks are not rolled out. The problem is even greater in regions like Latin America, where terrestrial coverage is even less than in Spain and the areas dedicated to agriculture are much larger. This lack of connectivity means effective digital processes cannot be applied to manage farms in these areas, preventing farmers from taking decisions that could increase productivity and reduce water, fertiliser and plant sanitary product usage. Satellite technology ensures that products are traceable and helps minimise the impact of agricultural-livestock activity on the environment. IoT data transmission, connectivity for devices thanks to satellite WiFi and data transmission from mobile agricultural machinery.

**USA**

100-year-old Rebman Farms located in rural Frederick, Illinois, USA produces grain for delivery to domestic and international markets and relies on satellite to share ideas, concepts, videos, and data streams. Rebman uses satellite broadband to access an online weather radar and send photos of crops from across a 1500+ acre farm to an agronomist, specialized in plant and soil science who checks the crop for disease. Satellite connectivity also supports front- and back-end business operations, including accounting, sales, and marketing. As a next step, Rebman intends to explore e-commerce for selling farm produce online.

**Germany**

The German Agricultural Society (DLG), John Deere and Telespazio VEGA Deutschland partnered on the Agriloc project to develop satellite communication test services, solutions for steering systems, and a hybrid modem respectively, to assist continuous precision-farming operations where mobile network coverage is lacking. The modern, that can send and receive data via both mobile and satellite networks, can be installed on agricultural vehicles. Agricultural machinery manufacturer John Deere and Telespazio VEGA Deutschland partnered on the Agriloc project to develop satellite communication test services, solutions for steering systems, and a hybrid modem respectively, to assist continuous precision-farming operations where mobile network coverage is lacking. The modern, that can send and receive data via both mobile and satellite networks, can be installed on agricultural vehicles.

**After four years of work, we can now present concrete results that even exceed the goals of agriloc. What originally started as a demo project went far beyond the prototype status and meets today’s hot topics in agriculture: Smart Farming, Digitisation, Broadband Expansion.**

Osman Kalden, “agriloc” project manager

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Satellite communications for Livestock & Crop Monitoring & Welfare

Brazil

In 20 locations across São Paolo state in Brazil, satellite communications are powering autonomous field connectivity units mounted on trailers that are used to connect multiple agricultural vehicles during critical operations such as harvest and planting. The data from the tractors and harvesters is used to predict maintenance and monitor activity so that the central operations teams can dispatch engineers and others effectively to minimise downtime and machine breakdowns.

Spain

Digitanimal, a company that manufactures systems to locate and monitor livestock has, in collaboration with local farmers and ranchers, partnered with a satellite operator to connect a 400-hectare farm located on a mountain in the province of Ávila in Spain. The small, energy-efficient, easy-to-install satellite antenna sends data received from sensors placed on 130 cattle to a control centre. The antenna is capable of transmitting continuous and real-time data sent from the sensors that monitor the livestock’s location, weight, well-being and more.

Netherlands

PinC Agro a Dutch insurance company developed AgroAlarm®, a satellite-based solution to notify farmers on large farms in case anything happens to their buildings, knowing that they cannot be everywhere at once. Greenhouses, stables and grain silos all provide a fundamental part of a farmer’s operations and any faults or damage can seriously impact the wellbeing of animals, the quality of products and ultimately the revenues that a farm generates. The satellite solution enables secure, reliable monitoring and alarm notifications based on data collected every 60 seconds in case something goes wrong.


performed research on further developments of even more accurate steering systems for tractors and tools, and demonstrated that the technology enabled a highly precise, automated, absolute positioning of actuators for single plant treatment. This allows farmers to sow, fertilise or water ‘centimetre-perfect’, saving time and production costs, while increasing quality. The technology will be used for boom sprayers in the future, so optimising chemical plant protection, minimising the use of pesticides or even eliminating chemicals by mechanical weed removal.
Livestock farmers across Australia are struggling to meet weight targets which is a key element of the market specification, costing them hundreds of millions of dollars each year. Regular weighing helps the farmer decide when to sell cattle to achieve the target weight and avoid penalties, as well as optimise the feeding regime, which is a major cost of the operation. Traditionally, weighing cattle was done manually but this is neither practical nor cost-effective in Australia, where farming is often carried out over huge areas of remote land without reliable 3G/4G coverage. Optiweigh partnered with a satellite operator to enable remote weighing of cattle without the cost, time and live-weight loss associated with manually weighing. The system depends on reliable 24/7 internet connectivity so that data can be continually collected, analysed and transmitted to farmers. Optiweigh launched in early 2019 and now has 24 units placed across every state in Australia, allowing farmers to improve the live weight gain of their cattle and the time to market. In turn this can help to lower ‘greenhouse gas’ emissions (in terms of methane from cattle and the extra fossil fuels used in the day-to-day operation) for each Kg of beef produced.

Chris Salimans, farmer, Netherlands

We house livestock in controlled environments so it’s important to maintain these to ensure the well-being of animals … power outages from lightning strikes and consequent high temperatures can quickly present a dangerous situation. … it’s important to farm responsibly and we need to be doing everything within our power to prevent cases of animal suffocation. Therefore … reliable technologies that provide immediate warnings are vital, especially for farms that are made up of dispersed and remote locations that can’t be reached by staff instantaneously.

Chris Salimans, farmer, Netherlands

The remote locations of many farms, coupled with concerns over the reliability and performance of terrestrial networks, present challenges in consistently monitoring faults. One farmer has used the solution to monitor the ventilation within buildings on his farm, to measure whether the emergency power is on or off, and to determine the temperature in his stables and other buildings. The solution has been deployed across multiple farms in the Netherlands and gives farmers peace of mind that their assets are protected.
Satellite communications and the future of agriculture

Aquaculture

Chile

Aquaculture is one of the fastest growing food industries in the world, due to a steady increase in the demand for fish and the continuing depletion of wild fish stocks. OXZO, part of Fiordo Austral S.A., is a Chilean business specialised in providing oxygen and ozone solutions to the salmon farming industry. Fish farmers seek to accelerate the growth of their stocks and optimal levels of oxygen in their sea cages (large nets attached to floating platforms anchored offshore) is essential. These platforms are often miles out at sea, making connectivity for remote control and operation critical. Partnering with Tesacom, an integrated communications provider, OXZO uses the reach and 99.9% availability of satellite communications to monitor the level of oxygen in the water and distribute additional oxygen if required. The solution enabled OXZO to significantly reduce its operational costs and become more productive.

Scotland

A similar system is in place in Scottish fish farms, where data sensors collect the water temperature to assess the conditions the nets, essential to help fish farmers and senior managers make operational decisions about the farm environment, harvest timings, the health status of the fish or feeding levels.

Satellite communications for distribution of Data collected at the Poles

Antarctica

Agriculture relies on essential data about climate, environment, weather, etc. which is observed by multiple satellites flying close to earth. Satellite earth stations located at the Poles present the most advantageous point from which to collect and distribute this data. The Troll Satellite Ground Station in Antarctica collects data which is transmitted back to relevant meteorological and other users via a high throughput satellite. This data provides a fundament of knowledge that underpins agriculture and the agri-food industry.

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11 https://enterprise-managed.inmarsat.com/2019/07/05/case-study-oxzo/  
12 https://www.ksat.no/services/ground-station-services/
Conclusions

Satellite-based broadband and IoT solutions aimed at meeting the specific demands of the agri-food sector are paving the way for the arrival of ‘Agriculture 4.0’.

This requires processes that are digitised, automated, and more flexible promoting competition thanks to a more suitable use of resources: intelligent fertiliser use, reduction of water consumption, crop monitoring, disease and pest control, etc.

To support these objectives, achieve greater food security and make the world’s agri-food sector more resilient in an increasingly complex world, appropriate policies should foster the adoption of broadband connectivity and precision agriculture leveraging all available technologies, including satellite.

Satellite communications is an important way of maximising digital connectivity that should receive increasing attention given its reach and immediate impact.

Government and NGO programs, as well as funding dedicated to expanding rural development, should promote satellite to meet the needs of rural farmers and the agri-food sector globally.

#satellite4life