

## **Digitalisation and on-farm diversification**

**Matteo Metta**

### **The digital agriculture revolution**

Digital agriculture refers to the use of agriculture technology (AgTech) to integrate agricultural production from the paddock to the consumer. These technologies can provide the agricultural industry with the tools and information to make more informed decisions and improve productivity.

Historically, agriculture has undergone a series of revolutions that have driven efficiency, yield and profitability to previously unattainable levels. Market forecasts for the next decade suggest a 'digital agricultural revolution' will be the newest shift which could help ensure agriculture meets the needs of the global population into the future. Digitalization will change every part of the agrifood chain. Management of resources throughout the system can become highly optimized, individualized, intelligent and anticipatory. It will function in real time in a hyper-connected way, driven by data. Value chains will become traceable and coordinated at the most detailed level whilst different fields, crops and animals can be accurately managed to their own optimal prescriptions. Digital agriculture will create systems that are highly productive, anticipatory and adaptable to changes such as those caused by climate change. This, in turn, could lead to greater food security, profitability and sustainability. In the context of the Sustainable Development Goals, digital agriculture has the potential to deliver economic benefits through increased agricultural productivity, cost efficiency and market opportunities, social and cultural benefits through increased communication and inclusivity and environmental benefits through optimized resource use as well as adaptation to climate change. The potential benefits of digitalizing the agrifood sector are convincing but it will require major transformations of farming systems, rural economies, communities and natural resource management. This will be a challenge and requires a systematic and holistic approach to achieve the full potential benefits.

### **Digital divide**

Digitalization of the agrifood system involves the risk that the potential benefits will be unequally distributed between rural and urban areas, gender, youth population. Urban areas often have better developed 'digital ecosystems' (resources, skills, networks) compared with rural areas. Combined with global trends of urbanization and middle and rich classes settling in cities, there is potential for digitalization to exacerbate existing ruralurban disparities (UN DESA, 2018a) and populations to fall behind in the process of a digital transformation. FAO is committed to assist governments and partners bridging such multidisciplinary digital divides to ensure that everyone benefits from the emerging digital society.

### **Trends driving digital technology in agriculture**

While demand is set to grow, farmers are facing the challenges of a changing climate. Increased temperatures, changes in rainfall patterns, more frequent extreme weather events, and reductions in water availability are already impacting the agriculture sector. In this environment, farmers must continue to innovate to maintain and improve productivity to meet demand. Digital technologies have the potential to provide farmers with the information and ability to meet these challenges and seize opportunities for growth. But it is not just about farmers. Consumers both at home and abroad are becoming more informed about the products they buy. They demand high quality and

sustainably produced food and fibre, and want to know more about where their products come from. Digital technologies can enable improved traceability of agricultural products, providing peace of mind for consumers and increased value for farmers.

**Regional development** Digital agriculture can also support regional communities. Younger generations are keen to work with technology. Through increasing use of digital technology, agriculture can attract and retain younger generations to live and work in regional and rural communities. Digital agriculture provides an opportunity to create stronger regional and rural communities which are connected through the use of technology. This is a critical enabler for attracting and retaining local populations as well as start ups and other businesses. A key technology underpinning digital agriculture is sensor technology and the Internet of Things (IoT). Remote sensors can be deployed on farms to collect data on variables such as temperature, rainfall, humidity, wind speed, livestock tracking, and plant and animal health. This information can be relayed to farmers, to save time and cost from manual monitoring, provide greater insight into farm performance and improve farm decision making.

#### Examples\_

1)Robotics are being introduced to the dairy, poultry and beef farming industries. Applications include autonomous feeding and milking, egg collection and sorting, and autonomous cleaning. These technologies are reducing costs while helping early detection and treatment of animal health issues.

2)Less waste and higher yields are being generated by equipment programmed for variable seeding rates and depths based on soil property and moisture data, derived from satellite imagery. Digital infra-red light and heat sensors combined with drones are used to measure paddock crop health to inform decisions about irrigation, pest management, fertiliser applications and harvesting.

3)Integrated digital animal health sensors and electronic identification devices enable farmers to rapidly respond to animal stress or disease, increasing livestock production and improving livestock health.

#### **Barriers**

Despite the potential benefits, agriculture is the least digitised industry in Australia. Agriculture Victoria has been talking with farmers and industry leaders to understand the barriers to greater uptake of digital technologies in agriculture. Key barriers to adoption: 2 Digital literacy 3 Cost and investment rationale 4 Data sharing 5 Interoperability of data sets 1 Connectivity Appropriate connectivity is fundamental to digital agriculture with digitised farms needing widespread and reliable coverage. Many farmers have not had opportunities for practical learning and exposure to technology to identify the right technology options for their farm, or how to reliably use it. The value of digital agriculture has not been proven to farmers. Demonstration of return on investment is needed to boost adoption rates. There is a lack of confidence in data privacy and security among farmers. Agreed data sharing protocols and governance arrangements are required to encourage the sharing of data across the value chain. It is currently difficult for farmers to analyse data generated from multiple technologies. The ability to incorporate diverse datasets into a shared platform would allow farmers to gain greater insights and benefits from digital technologies.

#### **Research and development**

Supporting AgTech entrepreneurs SmartFarms form part of Agriculture's 'innovation ecosystem,' which delivers science and technology innovations through a 'hub and spokes' model. The 'hub' is the AgriBio Centre which delivers core capability, knowledge and innovation infrastructure in plant, animal, and microbial systems biology, as well as 'big data' capability. State-of-the-art SmartFarms create, test, and prove smart technology solutions for agriculture, in partnership with industry, at five major sites: Ellinbank, Horsham, Tatura, Mildura, Hamilton for the dairy, grains, horticulture, and red meat industries. SmartFarms provide a forum to understand on-farm technology integration, and find new applications for AgTech. Testing the impacts of these solutions in a farm environment allows for a better understanding of the return on investment for AgTech solutions. SmartFarms also provide regional benefits by attracting AgTech businesses and the world's best science across agriculture regions. A virtual SmartFarm will connect and display technology across the innovation ecosystem, enabling lessons to be quickly shared between industries. AgTech startups are critical to innovation in agriculture. Startups can deliver new and creative ways of solving problems and improving farm performance.

The two-year trial will establish a number of IoT enabled farms across four farm types and regions:

- Dairy (Maffra) • Horticulture (Tatura) • Sheep (Serpentine) • Broadacre cropping (Birchip).

Agriculture Victoria will deliver IoT network connectivity in each of the four regions and will partner with participating farmers to select IoT solutions to trial. The trial will break down barriers such as lack of connectivity, digital literacy and capital to invest. The impact of IoT on farm performance will also be measured and will provide the agriculture sector with a clear rationale for investment in on-farm IoT. How the trial will work

1. IoT network deployment in each trial region
2. Testing the AgTech market to discover on-farm IoT solutions for each of the four trial farm types.
3. Agriculture Victoria will partner with participating farmers to complete a digital farm plan and select IoT solutions to trial.
4. Agriculture Victoria will assess the impact that the IoT solution has on farm performance and profitability, and publish its findings.

An additional \$15 million has been allocated to support uptake of digital technologies across Victoria's agriculture industries. This program will be informed by the findings of the IoT trial.

### **Skill and education**

More work needs to be done to demonstrate the value of digital technologies to Victorian farmers. We know our farmers are innovators and we want to make sure they have the skills needed to make the most out of technology. Formal learning opportunities will help address this need for future farmers. However, there is also a need to upskill those already working in the agriculture sector. This will enable a faster transition toward digital farming practices so that the full benefits of technology can be realised. Agriculture Victoria is developing a program to address skills gaps in agriculture, with a focus on enabling the adoption and use of digital technology. This includes linking Agriculture Victoria's SmartFarms with industry to demonstrate the capability of AgTech, and with schools to promote technology-based careers in agriculture.

### **Digital government**

Government also has a role to play in adopting digital technologies. As part of the On-farm IoT trial, Agriculture Victoria will look to make its agricultural data more readily accessible to researchers and other parties to spur innovation in the sector. Regulatory frameworks need to keep track with innovative farm businesses and processes. Government will actively work with industry and

regulators to achieve this. We will also explore opportunities for regulators to use digital technologies to improve regulatory outcomes and reduce red tape for industry.

### **Digital agriculture in the Islands**

Work in progress