# JAPAN

## NEC optimizes agricultural processes with AI-powered platform

All around the world, agricultural businesses face similar challenges. Not only must they meet a rapidly growing demand for agricultural products, they are expected to do so while overcoming a number of complex, intertwined obstacles – climate change, soil degradation, pests and diseases, expensive machinery, limited access to financial support, reduced workforce, to name but a few.

The sector's reliance on large quantities of water and fertilizer also creates sustainability challenges. According to the Food and Agriculture Organization (FAO), "Satisfying increased demands on agriculture with existing farming practices is likely to lead to more intense competition for natural resources, increased greenhouse gas emissions, and further deforestation and land degradation."[i]

In short, existing farming operations can no longer meet demand in a sustainable manner, and it is urgent to find a more adequate and responsible approach.

### *Using technology to overcome challenges*
A number of technological solutions have been developed to overcome productivity and sustainability challenges. Agricultural biotechnologies, for example, have yielded results for decades. From low-tech approaches (artificial insemination, fermentation techniques, biofertilizers) to more high-tech methods (advanced DNA-based methods, genetically modified organisms), a range of solutions are at the disposal of agricultural businesses.

In this context, AI is emerging as a viable and reliable way of improving agricultural processes and mitigating their impact on the environment. Through automated data collection and data-based decision-making, AI-augmented agriculture allows corrective measures to be made automatically and in real-time.

Whether it is the detection of crop diseases or the nutrition levels of livestock, AI can help increase resource efficiencies at all levels of the value chain – from lowering the use of water, fertilizers, and pesticides to increasing yields and outputs.

### *Leveraging AI to improve tomato-growing processes*
In Japan, IT and network solutions company NEC has partnered with food manufacturer KAGOME to launch CropScope, an AI-powered system that uses sensor data and satellite images to help farmers visualize tomato growth, monitor soil conditions, and receive specific farming recommendations.

While CropScope can be applied to a range of agricultural products, tomato-growing was selected because demand for tomatoes in their raw form as well as in various processed forms is significant, and because it is a difficult crop to grow with yield varying widely among producers.

**Process and key stakeholders involved**
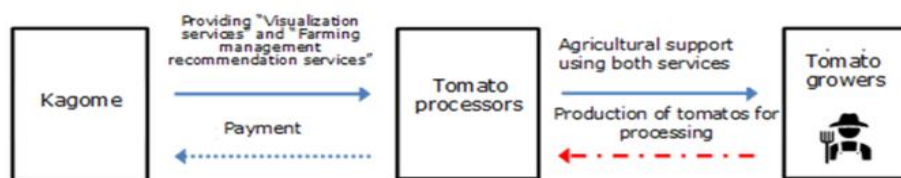


*Source: NEC-KAGOME*

Five years in the making through a transnational proof-of-concept (POC) across Australia, Portugal, and the United States, the joint project helps tomato growers leverage the vast amounts of data they may not even be aware are at their disposal.

The AI-based farming recommendation service automatically aggregates and analyzes a wide range of data points – weather, soil, water quality – and keeps tomato growers informed on a number of micro-decisions they must make to ensure their crops are healthy, their yield is stable, and their cultivation costs are lowered. To account for challenges in accessing vast amounts of agricultural data, the AI's learning process was modelled in such a way that it could be effective even with a relatively small amount of data.

**Big data enables large farms to quickly grasp crop conditions, detect irregularities, and make swift agricultural decisions**
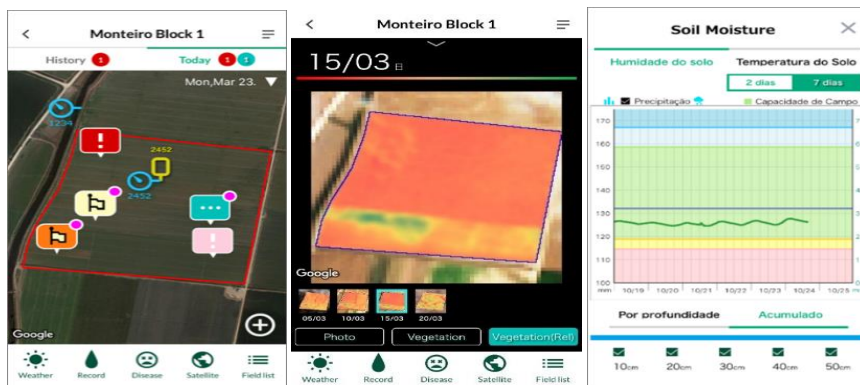


*Source: NEC-KAGOME*

This allows even the smallest of tomato-growing operations to access the type of specialized expertise that bigger or more experienced businesses possess. A 2019 experiment in Portugal saw KAGOME's farmers requiring 20% less fertilizer to yield 30% more tomatoes than the domestic average.

### *Accessing knowledge for greater opportunities*
In addition to enabling a range of cost-saving efficiencies, CropScope also makes environmentally sustainable agriculture more accessible for small, young, or local farming organizations.

By reducing the need for farmers to rely on experience and intuition, the barriers to agriculture are significantly lowered. Enabled by AI, this democratization of sustainable agriculture makes it less daunting – and far more economically viable – for younger populations to take up jobs in tomato farming.

In the long term, these shifts can help mitigate the impact of rampant urbanization and rapid population ageing on the agriculture sector. Japan, as many other economies, is facing severe labor shortages in agriculture, with 60% of farmers above the age of 65.[ii]  In addition, significant cost savings and productivity gains help level the playing field for small farms and co-operatives, allowing them to compete more effectively with large farming corporations.

Moreover, these benefits are not limited to tomato farmers and can be enjoyed down the tomato production supply chain. For example, tomato processors also enjoy lower procurement costs and predictability of yields, helping them minimize risks and streamline their production processes.

### *Beyond productivity, the promise of food security*
Around the world, the COVID-19 pandemic has highlighted major gaps in everything from healthcare systems' resilience to protection mechanisms for the most vulnerable members of society. Chief among populations' preoccupations was the governments' ability to maintain a stable and continuous provision of food products through the crisis.

In Singapore, where imports account for a significant part of food products, panic-buying and hoarding were seen early in the pandemic.[iii] And economies with strong agricultural sectors were not spared, as similar scenes were observed in France, Japan, and the Netherlands.[iv]

Reduced input costs and entry barriers resulting from the adoption of AI can help increase the stability and continuity of agricultural outputs in the global marketplace. This is important for the long-term sustainability of economies' agricultural sectors, as well as for their overall future food security.

[i] Food and Agriculture Organization (FAO), www.fao.org/3/a-i6583e.pdf
[ii] Embassy of Switzerland in Tokyo, www.stofficetokyo.ch/sites/default/files/2018-11/SmartAgricultureJapan2018.pdf
[iii] Straits Times, www.straitstimes.com/singapore/health/coronavirus-fairprice-chief-urges-calm-amid-panic-buying-of-groceries-singapores
[iv] Business Insider, www.businessinsider.sg/coronavirus-panic-buying-france-japan-netherlands-poland-2020-3?r=US&IR=T