

# Satellite Applications

SME Case Study

## AgSpace Agriculture

Developing satellite-enabled  
technology for the precision  
agriculture market



We work with  
**Innovate UK**

**CATAPULT**



### The Company

Company Name	AgSpace Agriculture Ltd
Managing Director	Vincent Gillingham
No. of Employees	15
Launched	2013
Location	Swindon, Newbury and Harwell, Oxford
Sector	Precision agriculture

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AgSpace provides farmers with satellite derived data that helps them to decide how much seed and pesticide to buy, and how best to use them.

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### Overview

AgSpace Agriculture was founded by a team from precision agriculture specialist firm The Courtyard Partnership in 2013, in order to provide the agronomy sector with software similar to that which provided the foundation for Courtyard's success. Since then AgSpace has gone from strength to strength, acting as software wholesaler for several notable businesses and winning development grants to further develop the precision agriculture market.

- Toolsets use satellite data to provide farmers with information that enables them to decide how much seed and treatment products to buy, and how best to use them.
- Has received funding from Innovate UK, the Science and Technology Facilities Council and the European Space Agency.
- Enables agri-tech research by providing large-scale, aggregated, anonymised data.

### Making the Best Use of Land Using the View from the Skies

According to the United Nations, the global population is predicted to grow to 9.6 billion by 2050, requiring production of 70 per cent more food for an additional 2.3 billion people.<sup>1</sup> At the same time, the available arable land per person is shrinking – it has already declined from 0.38 hectare per person in 1970 to 0.23 hectare in 2000 and is projected to fall to 0.15 hectare per person by 2050. Clearly, there is a need to use what land there is as efficiently as possible.

Among those seeking to find ways of maximising food production from limited resources is AgSpace. Despite being launched just three years ago, the company has a strong heritage in the agri-tech field, having been founded by staff from soil and crop management consultancy The Courtyard Partnership to focus on the technology behind precision agriculture. It now provides the technology platform and data behind the services of a number of businesses in the farming sector, such as UK and international agronomy companies and corporate farms.

AgSpace tailors its decision support toolkit to meet the requirements of each business it supplies, and provides training and second-line support. With bespoke tools developed on request, no two implementations are the same, allowing suppliers to differentiate the services they offer to farmers. AgSpace also provides data for large-scale agricultural research.

### Adding a Bird's Eye View

Farmers evaluating their fields can only get a limited view when 'crop walking'; checking for damage, weeds or pests, and so on. An aerial view can add a significant extra layer of information, allowing the farmer to make quicker and more accurate assessments of the status of their crops. Although aircraft and unmanned aerial vehicles (drones) can provide some additional data, satellites can offer even more valuable information.



Optical satellites can show how well crops are growing by measuring the near-infrared sunlight reflected by plants.

Satellite data combined with other data sources allows the farmer to identify the near-realtime status of crops in any of their fields.

Multispectral optical and synthetic aperture radar (SAR) data can each give unique information about crops. Optical satellites, for example, can show how well crops are growing by measuring the visible and near-infrared sunlight reflected by plants to produce a 'normalised difference vegetation index' (NDVI), which is effectively a measure of the 'greenness' of each plant. Similarly, when fields are bare the soil 'brightness' can be measured, allowing maps of soil type and variance across fields, which then determine how crops are likely to grow and allow a farmer to create homogenous management zones.



AgSpace seeCrop software

In the AgSpace software, the satellite data (currently optical but soon to include SAR as well) is added to the embedded data, such as soil analysis provided by the precision farming retailers and data from Ordnance Survey, including degrees of slope and aspect, which both affect how crops grow. The combination allows farmers to generate reports showing the near-realtime status of crops in any of their fields.

If the results suggest they need to spray their fields, they can then combine them with GPS data to instruct the tractor or sprayer exactly how much treatment to apply at what rate at every point in the field, enabling true precision farming.

The suite of tools is available on smartphones as well as computers, allowing it to be used out in the field. As well providing guidance on crop health and treatment, it can tell a farmer how much seed and treatments to buy, all while according to relevant regulations and legislation.

AgSpace currently uses PlanetLabs and Landsat data, and will add Sentinel-2 data as soon as it becomes available.

## Supporting Research

Another agri-tech channel supported by AgSpace is research. Aggregated anonymous data is available to researchers to answer diverse questions, such as how different crop varieties grow in different soil types.

By using aggregated data, researchers can find answers that otherwise would have taken years of normal trials to produce, with the additional benefit that the results are drawn from working farms, not artificially created plots.

## The Future

AgSpace is planning to keep developing its toolkit, in particular by incorporating SAR data (see Case Study below). It is also looking further afield for new opportunities.

"International markets are where we are focused for the future," confirms AgSpace Director Vince Gillingham. "We've got a good foothold in the UK, but that's a tiny drop in the ocean of farming globally, so we're establishing links around the world to develop and expand."

"You need local relationships, so we work with local partners who we train to use the system. However, there's more to international expansion than that. Getting the satellite data tends to be quite easy and there's good local coverage almost everywhere now. But you also need to translate everything into the local language, which is a major task."

One key market for AgSpace is Africa, where the firm is now entering its second year and has already got a presence in several countries including South Africa, Zimbabwe, Zambia, Botswana, Kenya, Tanzania and Mali. AgSpace is also running trials in Europe for a major international firm and China is another target market, following on from the STFC-funded project (see Case Study).

AgSpace is also looking beyond its own business by getting involved in new agri-tech ventures such as the Agriculture Engineering Precision Innovation (Agri-EPI) Centre, for which it will provide a commercial perspective in its role as a director, and Agrimetrix, a centre focussing

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on the use of big data in agriculture. Although it knows that there are great opportunities in the agri-tech market, AgSpace also understands that the sector needs to move forward together in order to achieve the promises proffered by precision agriculture.

#### Case Study:

### Adding Sentinel SAR Data to Precision Farming



Optical NDVI imagery

In 2013 the UK government announced £70 million of funding for the Agri-Tech Catalyst, set up by the Biotechnology and Biological Sciences Research Council and Innovate UK to support collaborative

research between scientists and businesses in order to boost UK agriculture. In March 2015, a project proposed by AgSpace and the Satellite Applications Catapult was one of 25 to benefit from the £16 million third round of funding.

The joint feasibility study focused on the use of SAR data from the European Space Agency's Sentinel-1 satellite, part of its Copernicus programme, to aid arable food production. Previous studies had shown that SAR data could be useful for identifying stages in crop growth, but the data itself was expensive. In this project, however, free Sentinel SAR data was successfully used alongside existing optical NDVI imagery and field data to model a new crop growth index.

Data was gathered on over 100 sites across around 30 farms throughout 2015, with the Catapult contributing its specialist knowledge of processing SAR data. The results showed very clear trends in crop 'signatures' throughout the growth stages, which AgSpace plans to use to provide an extra level of service to farmers.

This information will be added to knowledge gained in earlier trials, including another smaller scale joint trial with the Catapult that was carried out in China with funding from the Science & Technology Facilities Council's Newton Fund.

The next stage is to demonstrate the service and make it commercially available. This application development work, which started in December 2015, will be aided by €990,000 funding from the European Space Agency's Integrated Applications Promotion (IAP) programme, enabling AgSpace to carry out this phase faster than it would otherwise have done and get the additional tools to farmers as quickly as possible. SAR data will be added into the toolbox by May 2016 for a subset of farms to trial and then made available to all farmers by the end of 2017.

### Catapult Support

“We have an excellent relationship with the Catapult,” notes Vince. “The network effect is probably its biggest ‘pro’ and the promotion it has given us has been very helpful. The team in your corner fighting as you try to promote your business, which is a huge help at any time. That can include marketing, PR, inviting us to events and asking us to talk at events.”

“The Catapult is also very helpful on the technical side. For example, it has helped us to develop tools that we've been working on, such as the SAR product, which we would never have been able to develop on our own, because it has the experts and links to help us deliver and develop this properly.”

“The team also sends us proposals for new projects that might be of interest and if they come across problems that people have brought to them, they will come to us if they think it's something we can solve.”

#### Source

1. Food and Agriculture Organization of the United Nations

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