

## Impact Case Study

# Increasing the efficiency of nitrogen fertiliser use on Chinese potato crops

A private/public partnership is developing the use of remote sensing to assess how efficiently potato crops use nitrogen. This will help farmers manage fertiliser use, and accelerate the development of new potato strains that need less nitrogen, leading to increased yields, improved food security and less environmental pollution.

### CHALLENGES

The potato has an irreplaceable role in China, ensuring food security and supporting the rural economy. In 2013, the Chinese Government designated potato as a key staple crop, alongside rice, wheat and maize. Furthermore, it requires 30% less water than other traditional crops and it provides more calories and vitamins per hectare.

While potato yields worldwide have doubled, this has come at the cost of a seven-fold increase in the use of nitrogen fertilisers and environmental damage as a result. China is currently facing major land degradation and chronic water and air pollution as a result of intensive farming and overuse of fertilisers. Farmers are also facing increasing costs of fertilisers.

### SOLUTIONS AND IMPACT

Through the Network+, a private/public partnership is using remote sensing with low altitude unmanned aerial vehicles (UAVs) to identify potato crops which use nitrogen more efficiently. This could help to



### IMPACT FACTS



- **Technology is lacking in China for fast, accurate and non-invasive assessment of potato crops.**

accelerate potato breeding programmes in China and help farmers manage their application of fertilisers. Ultimately the project could contribute to **increased potato yields, with reduced use of nitrogen fertilisers and reduced environmental damage.**

One of the factors limiting current potato research and commercial production in China is the **lack of technologies for accurate and rapid evaluation of crop characteristics under field conditions.** China is still largely reliant on ground-based manual assessment, which is labour-intensive, sometimes inaccurate and destructive. Using low altitude UAVs avoids these problems.

This project will link the remotely sensed images to potato canopy traits that are associated with efficient use of nitrogen. This will provide breeders with a **fast and accurate way to select strains of potatoes that are productive and use nitrogen efficiently.** It could also enable farmers to **dynamically monitor crop growth and nutrient requirements.**

## PARTNERSHIPS AND KNOWLEDGE SHARING

Our Network+ partnership with the Institute for Vegetables and Flower (IVF) and the Xisen Potato Group will **help maximise project impacts** by providing contacts with **Chinese research and commercial production communities**, as well as relevant **government organisations in China**, such as:

- the National Engineering and Research Centre for Potato, Yanqing;
- UK-China Potato Innovation Centre, a joint initiative between the Xisen Group and the Chinese Government.

The project will include on-farm workshops in China **to demonstrate the use of the UAVs in practice**; organised through **government agricultural support (extension) services**.

The project also benefits from NIAB's experience in communicating with and delivering solutions to researchers and growers, the ARTIS ([www.artistraining.com](http://www.artistraining.com)) training infrastructure and links with Agrimetrics (<https://agrimetrics.co.uk>)

## MORE PROJECT DETAILS...

A low altitude unmanned aerial vehicle (UAV) fitted with high resolution RGB and multispectral imaging capability will provide images of potato crops at key growth stages in a trial hosted at the Institute of Vegetables and Flowers (IVF).

Researchers from NIAB and Aberystwyth University will analyse the UAV images to measure characteristics such as canopy height, chlorophyll content, biomass and flowering time.

The output from the UAVs will be integrated with potato genetic information, nitrogen status, water use, yield and other data to identify the key canopy traits that are associated with high nitrogen use efficiency and productivity.

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Potatoes require **30% less water** than other Chinese traditional crops



This remote sensing technique will help Chinese potato breeders select the most nitrogen efficient potato strains and help farmers manage their fertiliser application (e.g., applying at the best time in the growing season, quantity to apply, mix of plant nutrients to apply etc.).

## ABOUT THE AGRI-TECH IN CHINA NEWTON NETWORK+ (ATCNN)

- Developing and supporting new UK-China partnerships
- Translating UK excellence in remote sensing, agri-tech and data-intensive innovation for enhanced productivity and sustainability in rural China
- Funded under the UK's Science and Technology Facilities Council (STFC) innovation programme, coordinated by STFCs Rutherford Appleton Laboratory
- Lead by Prof John Crawford, Rothamsted Research, UK

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