Fera UAV

Using Fera's UAV to produce an automated potato crop count

Case Study

Project Background

Fera have teamed up with Strawson Ltd to investigate the use of Fera's fixed-wing Unmanned Arial Vehicle (UAV) in estimating potato yields.

Strawson Ltd grow potatoes for crisp production. Every year Strawsons estimate potential yields based on the number of potato crops that emerge after planting. Strawsons and Fera were keen to investigate the use of very high resolution UAV imagery and image analysis to look into producing an automated count of potato crops after initial crop emergence.

Flight Planning

Strawsons provided Fera with the locations of fields that had been recently planted with potatoes. It was decided with Strawsons that the same fields would be flown on two separate occasions, about seven days apart, to identify at what stage the newly emerged crops were most distinguishable on aerial imagery.

The most suitable imagery could then be used to produce an automatic crop count. Care was taken not to fly too late in the crops development when it was likely that neighbouring plants leaf cover would merge and make the accurate identification of individual plants difficult.

Before conducting any flights the Fera UAV team undertook a number of desk based pre-flight surveys and developed flight plans to ensure that imagery covering the entire area of interest was collected safely and in-line with CAA regulations. Once on site, an additional onsite survey and risk assessment was completed to ensure that all dangers and hazards were identified and mitigated prior to launch.

The UAV flights conducted consisted of two single flights coving approximately 30ha, each flown a week apart (see figure 1). For both flights the Fera fixed-wing UAV was flown with a twin sensor payload consisting of a RGB and a Near Infrared sensor at an altitude of 250ft. This allowed Fera to collect 4 band multispectral imagery at a resolution of 2.9cm.

Figure 1 – The RGB imagery from the UAV flights conducted on 3rd June (left) and 9th June 2016 (right).
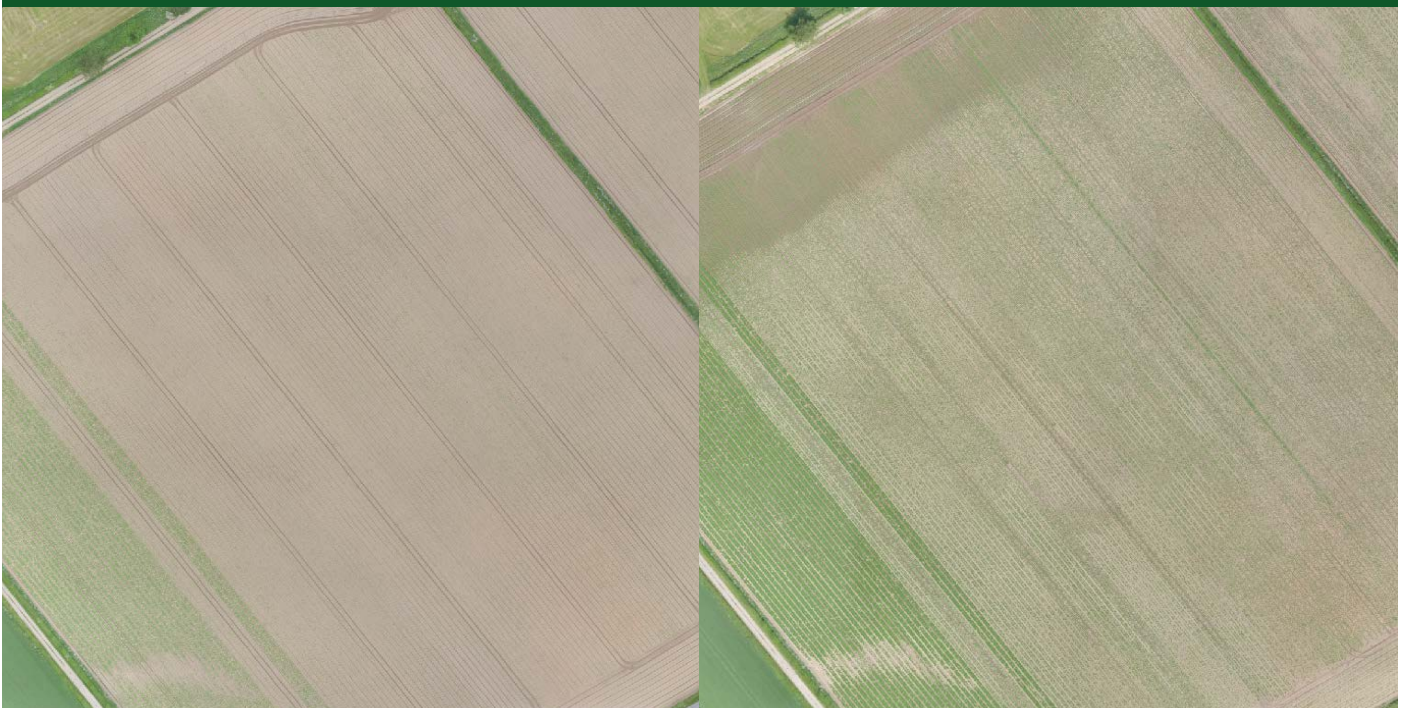
Image Processing & Output

The collected imagery was processed and mosaicked into a single 4 band image using Pix4D photogrammetry software and ERDAS Imagine image processing/analysis software. Once processed the imagery was then analysed in eCognition. eCognition is an image analysis package that allows Fera to perform advance object-based data analysis. Using image segmentation and recognition methods, Fera was able to develop a rule set to automatically identify individual potato plants from UAV imagery. Using this rule set each plant was extracted out from the collected imagery into a spatial dataset that contained every individual identified feature (see figure 2).

The spatial data along with the collected imagery was hosted in an online web application that allows the customer and other interested parties to view and interact with the data over the internet. Using this application, Strawsons can identify exact crop numbers across the whole field or in specific areas and estimate yields from this information. The web application can be viewed via the following URL:

https://uav.fera.co.uk/PotatoCount

Key Information
Size of study area: **30ha**
Total number of flights: **2 – study area flown on two separate occasions**
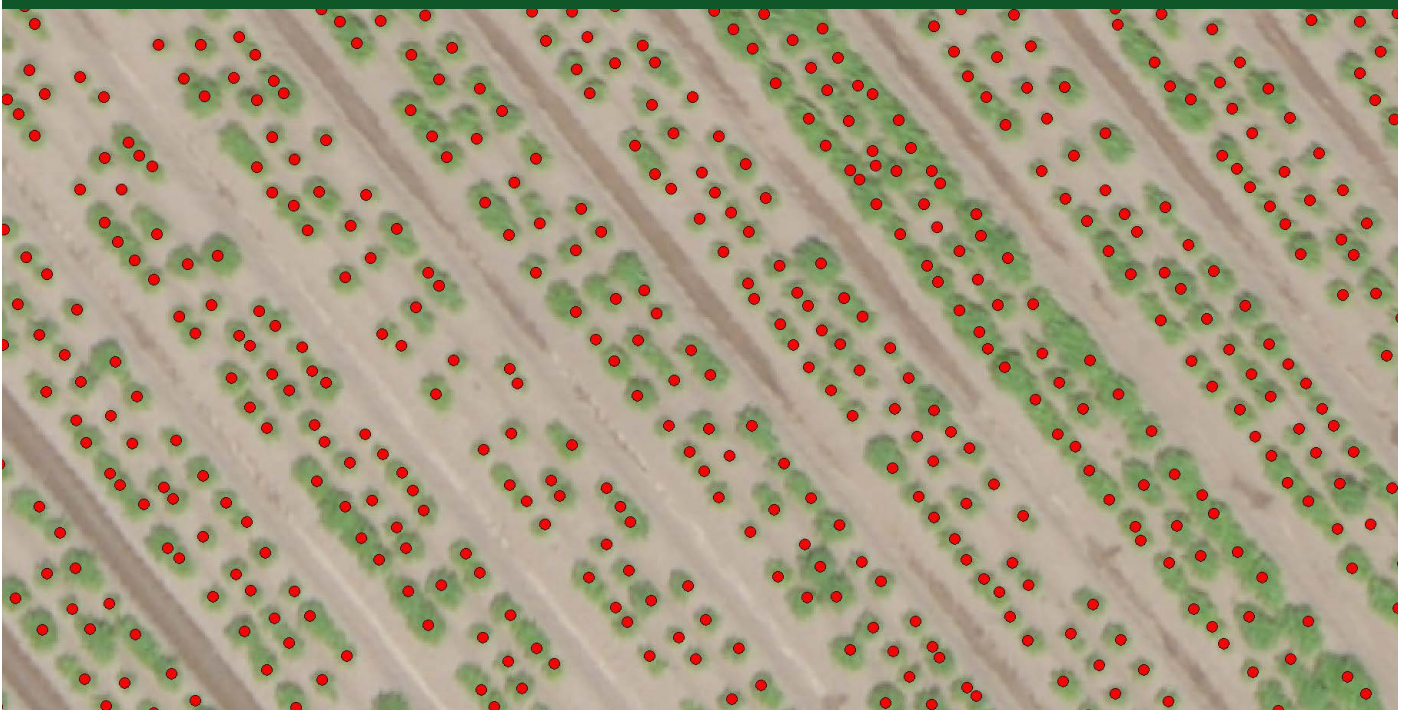Total number of images: **2650 (both flights)**
Total distance flown: **27.66km**
Imagery collection altitude: **250ft**
Ground Sample Distance: **2.9cm**

Figure 2 - Zoomed in view of the resulting crop identification after image segmentation. Each point represents a potato plant.

Want to know more about Fera's UAV, GIS and Remote Sensing Services?

Contact us
Tel: +44 (0)1904 465731
Email: UAV@fera.co.uk
www.fera.co.uk/remote-sensing-and-mapping