# RPA CONFIGURATION FOR AUTONOMOUS CLOSE-UP FIELD SURVEILLANCE

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## Outline

Current RPA (Remotely Piloted Aircraft, also known as drone) technology is capable of a wide range of applications. Detailed crop inspection has become possible as RPAs become cheaper and can easily carry light-weight cameras. This research will design a RPA system to autonomously monitor cotton fields, and explore the improved camera capabilities for new navigation techniques. This method of surveillance will give more frequent in-crop information than currently-available crop surveillance methods. The autonomous capability of the RPA will enhance on-farm useability.

## Anticipated Results

Current RPA technology has been reviewed (Figure 1). The following research requirements for an autonomous RPA for cotton inspection have been identified.

- Mission planning and logistics - currently, RPA flight missions are defined manually pre-flight. There is potential for flight missions to update autonomously, based on field conditions detected during the flight.
- High precision localization - camera-based navigation for RPA (e.g. row detection, Figure 2) has potential to improve positioning accuracy compared to standard GPS.
- Image data management - required to enable real-time processing of imagery for autonomous navigation and storage for later high spatial resolution analysis.

## Impact

The anticipated impacts of the RPA for crop inspection include improved water management in irrigation (from monitoring of real-time irrigation progress, Figure 3) and general crop growth monitoring.

In autonomous operation RPA systems are adaptable for other monitoring functions with a broader impact of the cotton industry, e.g. for specific early pest and disease detection and weed coverage detection to inform management decisions (e.g. pesticide and fertiliser application).


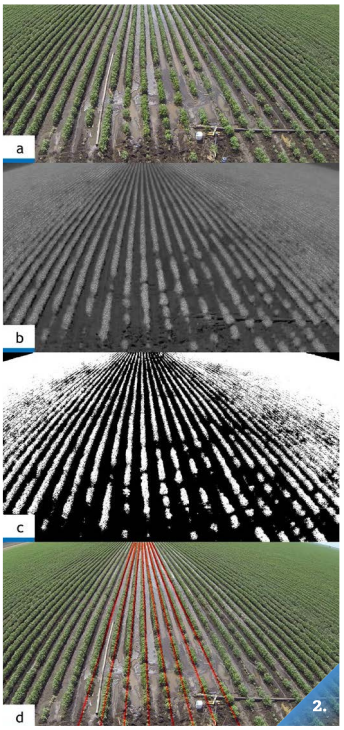



**FIGURE 1** Typical RPA systems currently in research use for precision agriculture.

**FIGURE 2** Captured image (a); represented in 'excess green' (b); binary thresholded (c); with row-detection (d).

**FIGURE 3** Irrigation water use can be optimised with real-time aerial monitoring.