



High tech mapping informs disaster response for agriculture

New mapping technology has emerged as a game-changer, enabling farm-level decision-making and faster response to agricultural disasters.

Project overview

Disease and natural disasters take an immense toll on the Australian tree crop industry, impacting farmers' livelihoods, community well-being and damaging infrastructure.

Visualising the location and extent of the country's commercial avocado, macadamia and mango orchards on an interactive, online map helps stakeholders respond faster when disasters hit.



Client in focus

Tasked with protecting and sustainably managing Queensland's natural resources, the Department of Environment and Science (DES) works with national agencies to deliver scientific expertise that enhances local ecosystems across the state.

The DES Queensland Land Use Mapping Program (QLUMP) maps and assesses land use patterns and changes, contributing nationally consistent data to the Australian Collaborative Land Use and Management Program (ACLUMP).

This provides accurate and consistent datasets for environmental and natural resource management, monitoring and planning.

The challenge

Disease and natural disasters take an immense toll on the Australian tree crop industry, impacting farmers' livelihoods, community well-being and damaging infrastructure – Tropical Cyclone Debbie that crossed the coast of Queensland in March 2017 caused damages of nearly A\$450 million.

To effectively manage the impacts of natural disasters or biosecurity threats, it's essential for stakeholders to be able to access accurate and comprehensive information on the crops in high-risk zones.

This not only helps monitor and quantify the extent of damage, but also facilitates the coordination of recovery efforts and rapid deployment of field staff, while providing data to support insurance claims and recalculate annual production forecasts.

This information would be compiled into a new portal on the location and extent of Australian Tree Crops that would be open and accessible to multiple stakeholders.

Following a severe thunderstorm in Bundaberg, a spatial query highlighted the potential impact zone covered 19% of Australia's total macadamia orchards, 9% of avocados and 3% of mangoes.

Craig Shephard, Principal Scientist, Remote Sensing Centre
Queensland Land Use Mapping Program (QLUMP), Department of Environment and Science



Using web-based maps and apps was a key enabler for us. The shift from desktop to an online environment using web GIS made spatial data accessible to anyone, anywhere, on any device.

Craig Shephard, Principal Scientist, Remote Sensing Centre Queensland Land Use Mapping Program (QLUMP), Department of Environment and Science

The solution

The Australian Tree Crops Rapid Response Map was developed to fulfill the crucial need for a better understanding of the country's tree crop industries – including commercial avocado, mango and macadamia orchards from around the country.

Compiling data from multiple sources – satellite imagery, land use data, 'citizen-science' data, field work and peer reviews – the map displayed anonymised data on crop locations, types, geographical size as well as information on where, when, and how the feature was recorded.

With a number of base maps to choose from, users could also view crop data in relation to roads, topography or terrain.

GIS technology underpinned the map as well as the tools used to collect data on the ground – farmers and industry experts used the Land Use Survey app "Get the app, improve the map!" to contribute data and images, allowing for accurate identification of each individual type of tree crop.

Being hosted online, the Australian Tree Crops Rapid Response Map allowed users to access the map and collaborate from diverse locations, at any time and on any devices.

The innovation

In moving existing crop data to an online platform, the Australian Tree Crops Rapid Response Map completely shifted the way the tree crop industries respond to natural disasters and biosecurity events.

While in the past it was common for the damage to be assessed by studying paper maps during a storm from the back of a car, now online, this information can be viewed by multiple users, in any location, at any time and on any device.

As farmers continue to use the map and tree crop industries expand their use of GIS, growers are expected to be able to use GIS tools to better understand the variability in their crops and to inform decisions around irrigation, pest control and fertiliser usage.

Engaging directly with industry and drawing on multiple sources of information, the map has not only demonstrated how valuable it is, but also serves as a benchmark for other Australian horticulture and agriculture industries to follow suit.



The outcomes

The Australian Tree Crop Rapid Response Map has been commended by multiple industry leaders and has recorded a rising number of views as its maps and apps continue to be refined.

The map was used with considerable success during 2017's Tropical Cyclone Debbie, where high-resolution satellite imagery was compared to existing imagery to rapidly assess the damage and even gauge individual trees that were affected.

Broadly, the map has delivered a range of outcomes, including:

- Reducing the impact of disease on crops by giving government agencies, growers and industry players the ability to instantly plan quarantine areas following any incursions.
- Expediting disaster response and recovery by allowing growers, industry bodies, responders and insurance companies to easily identify farms impacted by severe weather events. For example, after a natural disaster, the tree crop map can be overlaid with a map of the weather event to determine which crops have been damaged.
- Integration with other research and development in the greater project - for mapping yield, health, and quality in tree crops.
- Industries now have a 'baseline' spatial dataset of orchards which they can add to for their own purposes to inform decision-making.
- Supporting government catchment scale land use mapping programs to inform natural resource management and monitoring in Australia.

Compiled by the Queensland Land Use Mapping Program, the map is a component of the National Tree Project: Multi-Scale Monitoring Tools for Managing Australian Tree Crops which creates tools to support Australia's tree crop producers' decision-making.

The National Tree Project is funded through the Australian Government's Rural Research and Development for Profit program, managed by Horticulture Innovation Australia Ltd and coordinated by the University of New England.

Solution mix

- Web App Builder for ArcGIS
- Survey123 for ArcGIS
- Collector for ArcGIS
- ArcGIS Pro

The development of the map is extremely exciting, it has the additional potential of supporting the rapid derivation and distribution of crop vigour mapping for all commercial Australian orchards.

Associate Professor Andrew Robson,
Principal Research Fellow - Agriculture Remote Sensing Team, Precision Agriculture Research Group, University of New England

Project partners included:

Horticulture Innovation Australia;
The University of New England;
Avocados Australia; Australian Macadamia Society; Australian Mango Industry Association;
The University of Queensland;
The University of Sydney;
Central Queensland University;
Joint Remote Sensing Research Program; Australian Government; Queensland Government; Plant and Food Research; Agtrix; Simpson Farms.

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