



## APPLICATION STORY

FLIR Thermal Imaging Camera enables scientists to capture and record thermal distributions and variations in crop canopy's.



*The FLIR SC645 IR camera with a 640 x 480 detector, allows both high resolution and high throughput canopy temperature sensing from the air, within the crop science community.*

*FLIR SC645 is a fixed mount thermal imaging camera for research and development applications*

The Canberra node of the Australian Plant Phenomics Facility, CSIRO Agriculture & Food, Canberra, offers a high resolution aerial thermography solution for the rapid measurement of crop canopy temperature in the field. Research has shown canopy temperature to be an excellent method of measuring crop stress through stomatal responses, and as such infrared imaging is becoming a popular technology within the crop science community.

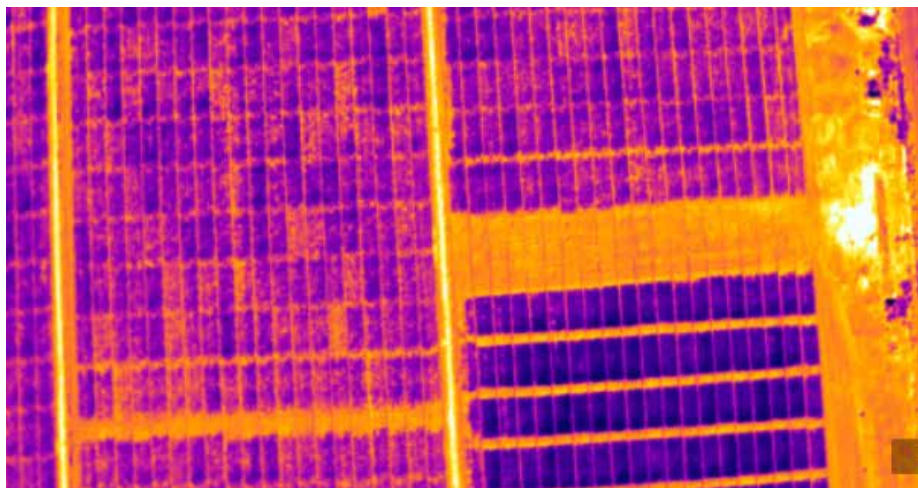
### APPF WORLD LEADING THERMAL RESEARCH

Dr. Xavier Sirault, Senior Research Scientist in CSIRO Agriculture and Food, and Director of the CSIRO node of the Australian Plant Phenomics Facility, says there are a number of Research Centres around the world that either have or are using the technology on a range of broad acre and horticultural crops (e.g. maize, rice, and grapes). However, none of these has operationalized the deployment of the technology at scale, to date.

### IR TECHNOLOGY CRUCIAL

Thermal imaging using airborne thermography has become an established technology for phenotyping plants for differences in stomatal behavior. Dr. Sirault explains, "Infrared technology has been used extensively in the research conducted at the CSIRO Node of the APPE. It has been applied to the study of stomatal responses in crops and for phenotyping plants for

differences in stomatal behaviour, e.g. for the genetic study of salinity or drought tolerance and/or water-use efficiency traits," "The technology is routinely used as part of the on-going services provided by the National Collaborative Research Infrastructure to screen tens of thousands of genotypes in breeding populations every year for variation in canopy temperature (surrogate for transpiration rate)."

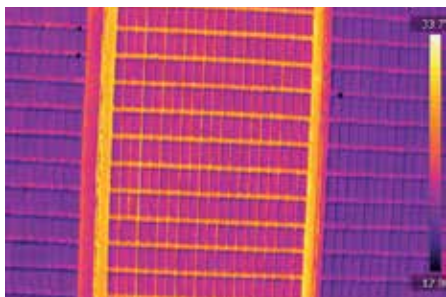


The World's Sixth Sense®



The imaging platform consists of a fully STC certified phenoAIR™ that can be fitted to any R44 helicopter.

Canopy temperature is a strong indicator of how well a plant is managing its water use through stomatal responses to environment conditions. The high resolution and high throughput capability of the phenoAIR™ thermal imaging system allows for small differences in temperature to be detected between plant varieties making it a powerful phenotyping tool for large-scale experiments.



## AERIAL IMAGERY

Agriculture Research is vital to managing climate change and ensuring that the food supply can keep up with the growing global demand.

“Currently, we are screening over 500k plots per year using this technology and the demand from the Research community and industry has been increasing steadily. Some of our industry partners today would not consider doing any experiments without deploying this capability.” “In the long term, genetic loci controlling transpiration rate in plants will be unraveled and this will allow the development of new crop varieties more resilient to climatic changes.” Dr. Sirault added.

The imaging platform consists of a fully STC certified phenoAIR™ that can be fitted to any R44 helicopter. The pod carries an advanced imaging payload consisting of a high resolution FLIR SC645 Infrared camera and 30MP RGB camera, with a fully integrated IMU and GPS. The imaging system is controlled by an onboard industrial PC computer, operated through a touchscreen monitor from within the cockpit. Provided with the imaging service is the ChopIt tool, a high throughput processing pipeline developed in-house by the APPF that delivers normalised and calibrated canopy temperature data on a plot-by-plot basis.

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## phenoAIR™ Technical

phenoAIR™	
Model	phenoAIR™
Certification	FAA STC #SR01817SE
Dimensions	48" x 18" x 18"
Door opening	26" x 12.5"
<b>Computer</b>	
Model	Advantech TREK-688
Screen	Touchpad TREK-306D
<b>Thermal Camera</b>	
Model	FLIR SC645
Thermal sensitivity	<0.05°C @ + 30°C/ 50 mK
Resolution	640 x 480
Frame rate	Up to 25 fps
<b>RGB Digital Camera</b>	
Model	Canon 5D Mark IV
Resolution	30.4MP
Lens	50mm f/1.4
<b>Navigation</b>	
GPS	Tersus Precis-BX305 GNSS System
IMU	
<b>Power</b>	
Battery	Rechargeable 24V Li ion battery
Power regulator	Input 24V Output 12V and 24V regulated, 24V unregulated

For more information about thermal imaging cameras or about this application, please visit:

[www.flir.com.au/science](http://www.flir.com.au/science)

The images displayed may not be representative of the actual resolution of the camera shown. Images for illustrative purposes only.  
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