

14 Mar 2019 Bellarine Times, Bellarine



Author: Dean Webster • Section: General News • Article Type: News Item Audience : 19,000 • Page: 38 • Printed size: 218.00cm² • Region: VIC • Market: Australia ASR: AUD 208 • words: 406 • Item ID: 1092369939

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Drone technology to improve irrigation practices

BY DEAN WEBSTER

MONASH University engineers are working with Australian farmers to help them improve irrigation practices, reduce water use and maximise crop harvest by using autonomous drone technology.

As severe drought continues to devastate farmland and impact food supply across Australia, a Monash University research team, led by Professor Jeff Walker, has spent the past two years developing a drone-based autonomous soil moisture mapping system for irrigated paddocks.

The team has recently completed field experiments using optical mapping which can determine soil moisture levels in the near-surface.

The data taken from the drone can be downloaded and used to produce a map of ground soil moisture levels to inform the farmer on how best to irrigate the paddock.

While equipped with optical mapping as a proofof-concept, the drone has now advanced to passive microwave sensing technology using L-Band waves, with further research being conducted on the potential for using P-band waves.

P-Band waves are expected to be able to measure up to 15cm into the soil unimpeded by vegetation and tillage features.

Drones have the capacity to analyse soil moisture at

metre-level scales within a paddock, allowing farmers to focus on specific crop irrigation, and overcomes the challenges of aircraft or satellite mapping.

Testing has taken place across two farms in regional Victoria and Tasmania, one was at a dairy farm using a centre pivot irrigator and the other was a crop farm using a linear shift irrigator.

Professor Jeffrey Walker, Head of Civil Engineering at Monash University, said that we need to produce 60 per cent more food with the same amount of land and water, and we can only achieve this by being more efficient with the water we use through irrigation.

"We need to know how much the crop needs, how much moisture is already there and apply just the right amounts of water in the correct places to avoid wastage while keeping the crop at its peak growth."

Good soil moisture allows for the optimal growth and yield of crops, while at broader spatial scales also regulates weather, climate and flooding.

The water levels in the soil controls evaporation over land and thus the energy fluxes into the atmosphere. This drives the atmospheric circulation, which drives climate.

"If the soil is too dry, crops can fail due to a lack of water, but if the soil is too wet, crops can not only fail but pests and diseases can flourish," Professor Walker said.

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