WESTERN SYDNEY
UNIVERSITY

Hawkesbury Institute
for the Environment

RESEARCH CAPABILITY

Crops of the Future

Ensuring food security for a sustainable future

Acknowledgement

Western Sydney University acknowledges the peoples of the Darug, Tharawal, Eora and Wiradjuri nations. We acknowledge that the teaching, learning and research undertaken across our campuses continues the teaching, learning and research that has occurred on these lands for tens of thousands of years.

Researchers

To contact HIE Protected Cropping scientists, please go to:
www.westernsydney.edu.au/nvpcc

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Innovative research for a sustainable future

Environmental challenges and a rapidly increasing population demand action to provide food security and ensure a sustainable future. Innovative solutions that support our already fragile natural resources and agricultural systems are needed to meet these demands.

As the climate becomes more volatile, we are witnessing longer droughts and extreme weather events that undermine the reliability of food production. Our researchers are investigating how plants respond to a changing climate, including variations in carbon dioxide levels, temperature, water and nutrient availability, and extreme climate events, to develop technologies that could help improve productivity in an increasingly uncertain future.

Main research topics

Pest management

Integrated pest management – advances in biological control.

Pathogens

Crop pathogens – utilising symbiotic fungi for biocontrol.

Glasshouses

Glasshouse films – heatblocking and light-shifting films to reduce energy, water and nutrient use.

Crop health

Soil and crop health – development of traditional and biologically-based products to maximise health.

Farming

Precision farming – wireless sensor-based monitoring of irrigation and plant water status.

Synthetics

Synthetic biology – technological solutions to improve crop response to climate change.

Genotypes

Superior genotypes – identifying elite crop cultivars in variable climates and soils.

Cropping

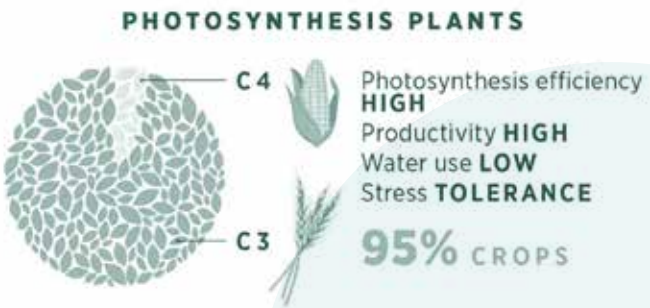
Protected cropping – advancing sustainable food production.

RESEARCH DIRECTIONS

Boosting plant productivity to feed a growing global population

Annual productivity in wheat and rice grain yield is now limited to approximately 1% per year, which is far below the 3-4% annual rise in productivity required to feed the rising population of the planet. Synthetic biology can contribute new tools and approaches to increase yield by regulating biochemical pathways to increase carbon gain and allocation to grain production in our most important staple crops.

Gains in wheat and rice from breeding has fallen to roughly 1% annually. Our researchers are investigating how to increase plant biomass by controlling sugar regulation during photosynthesis for staple crops.



RESEARCH DIRECTIONS

Climate proofing our crops for the future

Australia's cotton production is increasingly challenged by rising air temperatures and vapour pressure deficit (drier air), in addition to climate extremes of drought, flooding and heatwaves that have become common in recent decades. These climate conditions require developing or improving cotton cultivars to withstand the severe climate conditions of today and tomorrow. Our researchers are assessing potential improvements in plant morphology and biochemistry that lead to increased photosynthetic carbon gain, reductions in water loss, and greater fibre yield, even under sub-optimal growing conditions.

RESEARCH DIRECTIONS

Managing disease

Our researchers are improving the management of root rot disease in chickpeas by developing new tools to increase our screening capacity for disease resistance in breeding programs as well as developing microbial-based management practices to promote crop health and to reduce yield loss. These new tools will provide growers with more stable yields, thereby increasing the profitability of chickpea production in central and northern NSW and southern Queensland.

The outbreak of fungal diseases in pulse crops results in an annual loss in Australia of over $55 million per year. Our researchers have differentiated chickpea varieties that are resistant to diseases, without impeding the symbiotic relationships that benefit plant nutrition.

Main research topics in protected cropping

Energy use reduction

Glasshouse films that block heat-generating light to reduce energy use.

Increasing crop yield

Glasshouse films that shift light spectra to increase crop yield and quality.

Crop monitoring

Crop monitoring using advanced sensor and analytical systems.

Pest management

Integrated pest management systems utilising biological control organisms.

Pollination techniques

Pollination techniques including acoustic, drones, and a variety of biological organisms.

Environmental controls

Advanced environmental control systems matched to plant developmental stage to maximise productivity.

RESEARCH DIRECTIONS

Protected cropping

The National Vegetable Protected Cropping Centre (NVPCC) was established in 2017 as an integrated hub for training, education and research in protected cropping. The NVPCC seeks to find solutions for sustainable food production with a minimal carbon footprint in an increasingly climate-challenged environment.

The NVPCC works in direct partnership with industry, growers, research and development corporations, and universities to address complex problems of secure food production. A primary objective is to reduce energy, water and nutrient use, while increasing crop yield and quality, using advanced horticultural technology systems that will be adopted by industry.

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We invite researchers and investors to explore future opportunities to work with the **Hawkesbury Institute for the Environment.**

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