

Professor Kretschmar is working to address one of agriculture's biggest challenges: How to feed billions while reducing water use and reducing greenhouse gas emissions

# FEEDING THE FUTURE

IN THEIR  
WORDS

## Professor Tobias Kretschmar

### Qualifications:

PhD from University of Zurich, Switzerland, in Molecular Plant Physiology with a thesis on characterising plant secondary metabolite transporters. Received a Diploma in Biology (MSC equivalent) from the Technical University of Kaiserslautern, Germany

### Institution:

Southern Cross University, Faculty of Science and Engineering

### Research Field:

Developing new crop varieties that use less water and produce fewer emissions – particularly in rice and emerging crops like hemp – helping farmers grow food more sustainably while adapting to a changing climate



**I'm an applied agricultural researcher with a focus on plant genetics and breeding, and an interest in plant-based natural products for nutrition and health. My training in molecular biology and plant physiology took place in Germany and Switzerland.**

I work at the interface of basic and applied crop science to support breeding of crops that are sustainable and climate-smart, while providing nutritional benefits to consumers.

After my PhD I joined the International Rice Research Institute in the Philippines with the intent to translate research into real world impact. From 2011 to 2018, I contributed to the overall IIRRI mission of improving livelihoods and nutrition among those who depend on rice-based agri-food systems.

This involved providing breeders of Southeast and South Asia with traits and technology to develop novel climate resilient rice varieties suitable for sustainable management systems.

Since joining SCU in 2018, I mainly support emerging crop industries in regional Australia.

With experience in translating research into impact, I co-developed and now co-lead the SCU Harvest to Health Research impact cluster delivering cutting-edge, cross-disciplinary research that spans plant science, functional foods and human health. Focusing on rice, hemp and coffee, we deliver genetic resources through import, development and characterisation of diverse germplasm and their use in pre-breeding, breeding or variety assessment.

This has resulted in building confidence in these established and emerging Australian industries and strengthening their market position. I currently lead the nation-wide AgriFutures-funded Australian Industrial Hemp Program of Research.

It's the staple that keeps millions of people fed around the world but as global water scarcity grows, research being carried out at Southern Cross University has the potential to secure essential future rice production.

When Professor Tobias Kretschmar arrived at Southern Cross University, he brought with him a vision shaped by years working with the International Rice Research Institute in the Philippines – to revolutionise how one of the world's most essential crops is grown while protecting precious resources.

Three years into a groundbreaking breeding program, his work is positioning Australia – and ultimately the world – to address one of agriculture's most pressing challenges: How to feed billions while reducing water use and cutting greenhouse gas emissions.

Rice feeds half the world's population and is the only staple cereal crop that is grown solely for human consumption. But it comes at an environmental cost. As the most water-intensive crop and a contributor of approximately 12 per cent of global methane emissions,

traditional flooded rice cultivation represents a significant climate challenge. In Australia's Riverina region, where 95 per cent of the country's rice is grown under irrigation from the crucial Murray Darling Basin, mounting water restrictions and rising costs has forced the industry to reckon with how to continue rice farming in an increasingly water-scarce future.

Professor Kretschmar's answer lies in the NSW Northern Rivers, where innovative growers are already practising aerobic cultivation – dryland, rain-fed rice that eliminates both excessive water use and methane emissions.

Along with local company The Natural Rice Co, he is developing Australia's first rice varieties specifically adapted to aerobic conditions. Using advanced molecular marker techniques to accelerate traditional breeding timelines, the program is introgressing three critical traits: drought tolerance, cold tolerance and early vigour.

"Rice doesn't like the cold at all – it becomes sterile below 18 degrees Celsius," Professor Kretschmar said. "When rice sits in standing water, it

acts like a warm blanket. Without that water, you need cold tolerance built into the plant itself."

The results are promising. While it typically takes seven to 10 years to release a new variety, the team expects to deliver improved varieties within the next few years, potentially boosting yields for Northern Rivers growers by 50 per cent.

More importantly, these climate-smart varieties represent a blueprint for the future of rice cultivation across Australia and beyond.

"People will keep eating rice irrespective of how it is cultivated. So it's up to us as researchers to make it as environmentally friendly and low emission as possible," Professor Kretschmar, who is working with researchers in East Asia, Southeast Asia and Europe, said.

And his research portfolio extends well beyond rice. Currently, he leads a five-year AgriFutures Australia-funded program on industrial hemp – a crop with extraordinary potential for carbon sequestration.

With fibre varieties producing 13 to 15 tons of high-value biomass within months, and that biomass capable of

being locked away in construction materials, hemp offers a powerful tool for carbon drawdown. The program addresses three critical areas:

developing improved varieties, linking production to diverse end products from hempseed oil to construction materials and substantiating sustainable supply chains.

Additionally, he's spearheading efforts to establish a comprehensive Australian Coffee Program of Research, aiming to reduce the country's 98 per cent import dependency while building resilience against climate-related pests and diseases affecting traditional coffee-producing nations.

"Only about 2 per cent of the Australian coffee we drink is Australian-produced, and we have potential to produce much more," he said. "High quality coffee is getting more and more expensive because traditional producing countries are really struggling with climate-related pests and diseases."

"We don't have any of those in Australia, and there's a biosecurity risk importing coffee, so we might end up importing not only the coffee, but the diseases associated with it."