

RESEARCH IMPACT

Harnessing ecological expertise to develop novel pest management approaches



Challenge

Achieving food security whilst reducing dependence on non-renewable and environmentally hazardous inputs is one of the greatest challenges facing humanity. In response, a Charles Sturt University research team developed novel ecological tactics to reduce crop losses, lessening the need for insecticides whilst boosting yields.

Discovery

In one of the projects, a multi-site field study was conducted in Thailand, China and Vietnam over a four-year period. Nectar-producing plants were grown around rice fields to attract beneficial insects. Crops were monitored for levels of pest infestation, insecticide use and yields. This research led to widespread adoption by farmers in Asia. Related studies in Australia have led to impactful findings for commodities as diverse as cotton and forestry.

Impact

Use of the ecological tactics led to revised farm management practices by rice farmers in China, Vietnam and Thailand, as well as by pine and cotton growers in Australia. The research also led to the development of a novel crop protection product based on plant compounds used in Australia and Turkey.



Charles Sturt University researchers, in partnership with various Australian and international stakeholders, successfully developed and implemented a series of ecological techniques designed to reduce crop losses, lessening the need for insecticides and at the same time boosting yields:

Rice

Nectar-providing crop plants were planted at the borders of rice fields to enhance the activity of the natural enemies of pests. Farms using this strategy reduced insecticide use by two-thirds, compared with control areas that continued their normal practice. Rice grain yields increased by 5%, and profits by 7.5%, as a result. The environmental benefits of reduced insecticide use include reduced exposure of growers to insecticides, and a three-fold increase in animal species that feed on dead organic material and contribute to the nutrient cycle.

This research has had a strong impact both internationally and outside of academia. A 40-episode TV series screened in Vietnam in 2012, for which Charles Sturt University-led research provided the scientific foundation. It resulted in profound attitudinal changes and a 19% reduction in insecticide use among those who watched multiple episodes of the TV series. In China, the National Agriculture Technology Extension and Service Centre of the Ministry of Agriculture recommends the strategy at a national level.

Cotton

Charles Sturt University-led research revealed that perennial native vegetation provide a major source of beneficial insects that move into crops and boost biocontrol of cotton pests. Prior to this research, native vegetation was commonly viewed as an unproductive waste of space and was cleared. The Australian cotton industry now recommends preservation and expansion of native vegetation in cotton cropping areas.

Forestry

The exotic bark beetle invaded Australia's pine forests and disrupted a previously successful biocontrol program against a key pest, the Sirex Wood Wasp. This threatened the future of Australia's forestry industry, which contributes \$22.3 billion to Australia's economy annually and the livelihoods of an estimated 66,000 rural people. As a result of collaboration between Charles Sturt University, the NSW and Tasmanian Departments of Primary Industry, the National Sirex Coordination Committee and CSIRO, forestry managers changed their standard operating procedures. This led to a



reduction in the area affected by Sirex from 1.5% in 2007-2008 to 0.2% by 2014.

Chemical Ecology

Charles Sturt University researchers led a team of collaborators from Lincoln University (NZ), Washington State University (USA) and Organic Crop Protectants Ltd. The team discovered that spraying crops with natural compounds that plants release when under attack by pests attracted natural enemies of the pests. This resulted in lower levels of crop damage. As a result of this research a new commercial plant protection product called EcoOil was developed. EcoOil is widely and successfully used to combat horticultural pests and is sold in major retail outlets throughout Australia and overseas.

Further information

<https://researchoutput.csu.edu.au/en/persons/ggurr/sueduau>

Program Highlights

- Novel ecological tactics developed by Charles Sturt University researchers resulted in reduced crop losses and reduced need for insecticides for rice, cotton and pine growers
- The approach is now widely adopted in East Asia and is national policy in China
- The research resulted in revised farm management practices
- A new crop protection product based on plant compounds was developed and is now used in Australia and Turkey

Farmers can recognise the benefits [of the research], because on their own initiative, they're reducing spray intensity to less than one-third of conventional practice. It saves them money... they're also getting higher yields... for those reasons, this method has taken off in East Asia. It's now used by tens of thousands of growers and has become recommended practice...in China.

Professor Geoff Gurr
Charles Sturt University

Funding and Collaborators

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For more information
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