



**GRAHAM
CENTRE**

for Agricultural Innovation

Research strengths

An alliance between Charles Sturt University (CSU) and the NSW Department of Primary Industries (NSW DPI)



Department of
Primary Industries



Graham Centre research

The Graham Centre for Agricultural Innovation is an alliance between Charles Sturt University (CSU) and the NSW Department of Primary Industries (NSW DPI), established in 2005 to strengthen the capacity of these organisations to undertake industry-relevant research and development.

The Graham Centre is located in Wagga Wagga in the centre of south-eastern Australia's mixed farming system. It is a temperate region that grows a range of winter crops including winter cereals, grain legumes and oilseeds, particularly canola. There is also a strong livestock industry comprising sheep (wool and meat) and cattle (meat), making pasture production an integral part of the system.

The centre is focussed on delivering solutions for crop and livestock systems, across value chains.

Australian farm businesses generate almost \$50 billion in production per year. Value adding increases this to over \$150 billion. The increasing demand for premium products from our agricultural sector from a growing middle class, especially in Asia, provides significant opportunities for Australia. However, increasing input costs mean that unless we innovate, competitors will capture these opportunities.

The key to achieving growth in the value of primary industries is innovation across the value chain and, more importantly, ensuring such innovation is capitalised on by industry. The Graham Centre has long valued partnerships with industry across agricultural value chains, and our intent is to strengthen existing partnerships and develop new ones to drive innovation.

Our activity is focused on three key areas:

- plant systems (crops and pastures)
- livestock systems (sheep and beef focus)
- grain and meat quality.



Plant systems (crops and pastures)

The Graham Centre's research in plant systems involves soil science (e.g. subsoil acidity research), crop physiology (e.g. canola water and temperature relations), pasture production and utilisation (e.g. pasture variety research, canola for grazing and grain), crop protection (e.g. understanding insect behaviour, management of crop diseases) and weed science and management (e.g. competitive crops, self-weeding crops, herbicide resistance monitoring and evaluation). Together we need to maximise the interrelations between parts of the farming system, particularly where it involves crop-pasture rotations.

Self-weeding crops. The continual buildup of herbicide resistance in weeds around the world, particularly in Australia, has increased the urgency to find alternatives to herbicides. Graham Centre researchers are exploring the need to preserve the efficacy of current herbicides, as well as the need to reduce the selection pressure against them by introducing new options. One option is using the crop's own defence mechanisms, with researchers working on this for nearly three decades. Research through the Graham Centre has identified some canola varieties that are effective against some of our worst weeds, with the opportunity to research the genetic identification of the trait to be incorporated in new varieties. This will not replace herbicides but will reduce the pressure that has been exerted on their functionality.

Applied ecology. Graham Centre researchers use ecological expertise to address the urgent need to make agriculture more productive and develop farming approaches that enhance the environment. The team has a number of projects in multiple continents, working with local stakeholders to develop biodiversity-based solutions to pest problems and enhance other ecosystem services.

Plant interactions. Research foci include the culture of productive crops and pastures, with emphasis on weed and pest management and breeding for competitive or weed suppressive crops; development of alternative management practices to overcome herbicide and pest resistance; weed biology, ecology and genetics focusing on the study of invasive weeds; natural products chemistry investigating primary and secondary metabolites involved in plant and livestock protection and those causing impacts on livestock health, and improved animal welfare outcomes; and microbial interactions in the soil and plant rhizosphere that impact crop and pasture health

Plant Systems Research Pathway Leader

Professor Jim Pratley

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Livestock systems (sheep and beef focus)

There is a strong livestock industry across our region, predominately sheep (meat and wool) and beef cattle. The Graham Centre's livestock research focuses on livestock production (nutrition and reproduction) and health and welfare (disease prevention, on-farm biosecurity and animal welfare practices), to encourage profitable and sustainable sheep and beef enterprises through improved management.

Biosecurity. The Graham Centre is leading research on biosecurity and animal health surveillance among livestock producers in Australia. This research investigates implementation of and drivers for engagement with biosecurity and animal health management practices, contributing to improving preparedness for emergency animal diseases and the management of significant endemic diseases. Our researchers continuously work with producers, industry organisations and government agencies to identify priorities in this field and to help maintain Australia's privileged animal health status.

Parasitology and epidemiology. The Centre is internationally recognised for its parasitology research and expertise in the biology, epidemiology, diagnosis, treatment and control of nematodes, cestodes, trematodes and ectoparasites of sheep, goats, cattle and horses. Supported by the Charles Sturt University Veterinary Diagnostic Laboratory, the current focus includes *Fasciola hepatica* diagnostic testing and control, the sustainable control of production-limiting gastrointestinal nematodes of sheep and goats, and best practice parasite control advice for commercial livestock production.

Livestock productivity. Graham Centre researchers are focusing on applied research in sheep and beef systems, although some work is undertaken in the dairy and pig industries. Research includes nutritional management for improving growth rate, such as mineral and vitamin nutrition for livestock to improve growth rates of young ruminants and evaluation of new forage options and combinations. Our researchers are also undertaking cutting-edge research on strategic supplementation to improve reproductive outcomes – including fertility, offspring survival and sex ratio, and long-term immunity. Our research also extends to plant secondary compounds and how these may act on animal performance in positive or negative ways. Research is also being undertaken for the beef feedlot sector to improve feed conversion efficiency and reduce health issues. Finally, whole farm bioeconomic modelling is being used to understand the long-term impact of our innovations on the profitability of livestock enterprises.

Livestock Systems Research Pathway Leader
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Grain and meat quality

Research is focused on increasing the value of grains and meat through improvements in processing and market-led product innovation. Key research strengths include nutrition and health attributes, consumer perceptions and innovation across the value chain (i.e. processing and market development).

Functional Grains Centre. The Australian Research Council (ARC) Industrial Transformational Training Centre for Functional Grains aims to train the next generation of grain scientists, and transform the Australian grains industry from a low-value commodity-based industry to a high-value food and feed industry. The centre provides funding for 10 PhD students and three postdoctoral scientists to work with industry partners to solve problems.

Expanding options for sorghum-food and distilling. This project aims to develop an understanding of the opportunities for Australian sorghum growers to access high-value markets. Australian sorghum varieties will be compared to competitor varieties in beverage and food applications to establish the basis of new high-value export markets for Australian sorghum.

Market intelligence for pulses. Graham Centre researchers are working to understand the key quality attributes of Australian pulses required by our export markets. This research is being undertaken in collaboration with the Australian Export Grains Innovation Centre.

Meat quality. The Graham Centre meat science laboratory enables us to research the entire value chain, to understand impacts upon on-farm and processing practices and on the quality, nutritional value and safety of meat.

Grain and Meat Quality Research Pathway Leader
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