

Livestock production

Improving production along the supply chain

Expertise

Our objective is to address constraints along the supply chain, from paddock to plate, to improve production efficiency and product quality. This comprises the general production principles associated with livestock husbandry and management as well as attention to processing and the resulting end-product. There is increasing pressure on the livestock industries to be more efficient in their use of resources, ranging from the ingredients used to feed livestock to production processes enabled by digital technologies. The aim of the livestock production and animal nutrition researchers within the Sydney Institute of Agriculture is to improve stakeholder productivity and profitability in a sustainable manner. Our broad research scope includes:

- **multi-species:** in addition to mainstream species such as cattle (beef and dairy) and sheep (wool and meat), our research teams are working with buffalo, goats, camels and alpaca
- **on-farm:** considerable on-farm research is conducted under commercial conditions, including working with primary producers in northern and southern Australia as well as smallholder livestock producers in developing countries
- **intensive production and processing:** more intensive forms of production, such as backgrounding operations and feedlots, and processors are included due to their importance within industry and the potential gains achievable in productivity
- **product quality and consumer perception:** the impacts of on-farm and feedlot management, transportation, processing and product storage are assessed to determine the impact on product quality and consumer perception
- **developing reproductive technologies:** improving conception and weaning rates in natural joining and artificial breeding systems provide efficiency gains for the livestock industries and contribute to enterprise profitability
- **efficient utilisation of existing feed resources:** efficient and sustainable livestock production developed through investigating the role of currently underutilised feedstuffs and by-products

- **in-lab:** *in vitro* screening methods (batch culture and RUSITEC in vitro systems) are used to define dietary treatments before testing *in vivo*
- **high-tech dairy:** advanced automatic (robotic) dairy systems and dairy tech; and the application of translational data science into dairy management
- **sustainability:** research on the environmental and economic sustainability of livestock production including greenhouse gas emissions, grazing land management, biodiversity and profitability.

Tools and methodologies used

We have excellent facilities that underpin research at different stages of the supply chain, and extend from farm to lab and processing, including:

- **Commercial farms, feedlots and processors:** includes access to large scale university farms at Marulan and Cooma as well as livestock units (including a robotic dairy) for farm-scale experiments located at the Camden campus, plus numerous commercial collaborators in northern and southern Australia
- **Nutrition, reproductive technologies and meat science laboratories:** includes equipment for bench-scale nutrition, reproduction and meat science research as well as the capacity for sensory evaluation of meat products
- **Ruminal fermentation lab:** includes access to a brand new rumen simulation technique (RUSITEC) as well as batch culture in vitro systems.



AgTech and Food: Industry Capabilities

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Industry links

- **Improved nutrition:** Examples of recent research project tackling real world problem such as food wastage involving one of the biggest vegetable producer in Australia (KalFresh, Kalbar QLD) as well as Grevillia Ag (silage specialists) are under way. This involves the novel approach of using vegetable waste into silage using second generation inoculants (e.g.: conserved feed used to feed animals different times of the year).
- **Reproductive technologies:** strong linkages exist with artificial breeding companies, stud societies, pharmaceutical and animal health companies to maintain a strong practical focus during the development of new reproductive technologies such as sexed semen and remote sensing of oestrus.
- **Meat science:** collaboration with the NSW DPI meat laboratory at Cowra has facilitated foundation research in the attributes of Alpaca meat and appropriate processing techniques in Australia. A current MLA DC funded project partners directly with industry to link objective measures of welfare to carcass quality across the beef supply chain.
- **Health and welfare:** research partnerships with pastoral companies to reduce losses of cattle in northern Australia and sheep in southern Australia, and feedlots and abattoirs to improve detection and management of diseases and welfare problems.
- **Breeding and genetics:** collaborations with breeding companies for biomarker discovery to improve meat quality and profitability of feedlot cattle and livestock phenomics based on digital technologies.
- **Sustainability:** research with pastoral companies and non-government organisations exploring rangeland management practices to improve productivity and sustainability, and feed companies to increase production and reduce greenhouse emissions.

Our experts

Professor Sergio (Yani) Garcia (Research Capability Coordinator): a globally recognised leader in pasture-based dairy systems, feedbase, use and application of data, modelling and technologies into dairy production; and automation in dairying. Yani led the industry-driven program FutureDairy for over a decade.

Associate Professor Russell Bush: improving domestic productivity and profitability through developing best practice along the supply chain. Russell is an internationally-recognised leader in meat production systems with extensive experience in livestock research for development in China, Indonesia, Pakistan, Cambodia and Laos.

Associate Professor Alex Chaves: internationally recognised researcher in animal nutrition, sustainable ruminant production systems, the mitigation of greenhouse gases within those systems, and management approaches to utilising existing feed resources more efficiently.

Associate Professor Simon de Graaf: recognised globally as an authority on sheep reproduction and the world's foremost expert on sperm sexing and artificial insemination in this species. His research interests focus on the controlled breeding of livestock, the development of new reproductive technologies and understanding the fundamentals of fertility.

Associate Professor Luciano Gonzalez: internationally recognised as an expert in the application of digital technology and mathematical models into all areas of beef and sheep production, natural resource management, sustainability, climate change, animal health and welfare, and animal breeding.

Associate Professor John House: internationally recognised expert in bovine health and reproduction and their effects on farm productivity. John and his team provide professional services to commercial farms all over Australia, currently looking after well over 10,000 dairy cattle. His research interests are primarily on salmonellosis and infectious diseases in cattle.

Dr Lachlan Ingram: with a strong background in native grass ecology, and sustainability of extensive, grass-based production systems, his research seeks to understand the many factors, and the interactions between these factors, that make up a grassland system: soil-roots/plants-animals-atmosphere.

Dr Melanie Smith: interested in sustainable best practice animal production across the whole supply chain with research interests in the area of on-farm animal production, meat processing, meat quality and consumer sensory evaluation of meat.

Associate Professor Cameron Clark: an internationally recognised leading researcher in animal production with research areas focus on turning existing, and new sensor derived, farm data into information that farmers (dairy, beef, poultry) can use to improve profit, lifestyle, welfare and animal health.

Dr Sabrina Lomax: research expertise in animal behaviour, welfare and production across sheep and cattle (dairy and beef). She leads the University of Sydney program on virtual herding of cattle.

For further enquiries contact:

Pro-Vice-Chancellor (Research – Enterprise and Engagement):
pvcresearch.ee@sydney.edu.au

Sydney Institute of Agriculture Director:
sia.director@sydney.edu.au

