

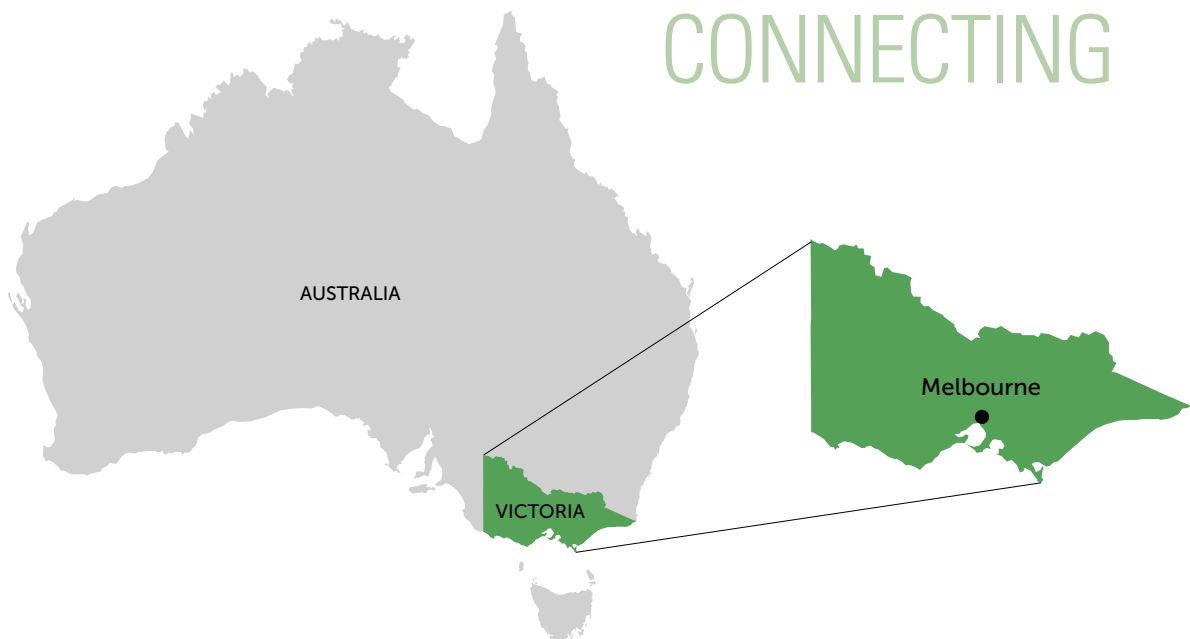
MELBOURNE

RESEARCH, EDUCATION AND TRAINING

AGRICULTURE &
FOOD SECURITY



MELBOURNE: LEADING INNOVATING CONNECTING





Melbourne and regional Victoria are a perfect blend of economic strength and dynamism, with a lifestyle that is envied around the world. Talented people, a world-class education system, supportive government and superior infrastructure make the state of Victoria a global leader in research, education and vocational training.

Victoria's research centres, universities and vocational training providers partner with industry, governments, non-government organisations (NGOs) and other educational institutions around the world.

They offer extensive opportunities for partnerships and program collaborations, including joint research initiatives, research and development services, licensing of materials, tailored curriculum development, joint program delivery, staff/student exchange, consultancy services and customised employee development programs.

For more information about Victoria's research, higher education and vocational training capabilities, contact your region's Victorian Government Business Office at: **invest.vic.gov.au/offices**.



AGRICULTURE AND FOOD SECURITY IN MELBOURNE AND VICTORIA

The state of Victoria is the food bowl of Australia. It accounts for 30 per cent of Australia's total food output on just three per cent of Australia's arable land mass. Its leading agricultural sectors include dairy, lamb, grains and pulses. Victoria accounts for some 10 per cent of the total of globally traded dairy products, including high quality products such as fresh milk, yoghurts, cheese and butter.

Victoria has excellent natural conditions for food production, but it also places great importance on research and development (R&D) to drive its competitive advantage and maintain its global competitiveness in the food and agriculture sectors.

Victoria is an international leader in agricultural biotechnology with research strengths including high-nutritional pasture grasses, dairy genetics, plant and animal disease diagnostics and freshwater aquaculture.

Victoria's reputation for innovation and productivity in the food and agriculture sector is also recognised both in Australia and internationally. Approximately 40 per cent of Australia's food processing research and development is undertaken in Victoria.

Victoria's food processing industry has an annual turnover of approximately A\$24 billion, employs more than 130,000 people and exports to over 100 countries. The sector provides a significant level of added value to a range of primary produce including meat, grains, cereals and other horticultural produce.

International food companies that have invested in Victoria include:

- Campbells Soups (USA)
- Heinz (USA)
- Kagome (Japan)
- Nestle (Switzerland)
- Unilever (UK).

RESEARCH AND DEVELOPMENT IN VICTORIA

Melbourne is a world leader in genomics research. Victoria also plays a lead national role in R&D in dairy, lamb, pulses, some cereals, temperate horticulture, climate change adaptation, plant biosecurity and water use in agriculture and a supporting role in other key sectors including beef.

Agricultural R&D in Victoria focuses on:

- improved productivity
- varietal and species breeding
- pest and disease management
- natural resource management.

Victoria is the home of the largest food industry R&D institution in Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Food and Nutritional Sciences. CSIRO assists in every stage of the food processing value chain, from concept through formulation and processing to full production.

CSIRO is one of a complex of internationally recognised universities and centres of excellence located in Melbourne and regional Victoria, bringing together Australia and the region's most skilled scientists and experts. Victorian researchers have a strong track record in partnering with their counterparts in overseas research institutions to deliver exciting innovations for the food and agriculture sector.

KEY FACILITIES

Melbourne and regional Victoria are home to a number of important facilities undertaking world-leading research to maintain the quality and commercial success of the State's most important agricultural products. These facilities are commonly partnerships between Victoria's leading universities, state and federal governments and, frequently, industry.

Dairy

The Dairy Futures Cooperative Research Centre: Located at La Trobe University and also partnered with Monash University and University of Melbourne, this A\$128 million centre drives innovation through pasture productivity, animal genomic technology and industry partnerships.

The Dairy Innovation Hub: A partnership between Dairy Innovation Australia Limited (DIAL) and the University of Melbourne, the Hub's key priorities include process innovation, food safety and product quality.

The National Centre for Dairy Education Australia (NCDEA): The Australian dairy industry's education and training provider, the NCDEA operates through a national alliance of partner Registered Training Organisations (RTOs). It provides strong leadership in industry education and sets new levels of excellence in agricultural education and training. The NCDEA also delivers short courses and customised programs for dairy farming organisations, individual farmers and people in the dairy service industry.

Grains

The Grains Innovation Park: Located in Western Victoria, the Grains Innovation Park is a national centre for productivity-driven research into grains, oilseeds and pulses as well as associated agronomy, plant pathology and grains chemistry.

The Chisholm Institute of TAFE National Precision Growing Centre: This Centre features the latest international technology in controlled environment crop production. It is visited annually by the Beijing Agriculture University and other visitors worldwide to view the latest practices in the industry.

Meat

The Red Meat Innovation Centre: A national leader in R&D for the lamb and beef industry, the Centre's new animal research facility is researching the growth responses of sheep and lambs to different feeds and forages, to improve productivity.

Food processing

The Asia Pacific Chocolate and Confectionery Centre of Excellence: Operated by Mondelez International (Kraft Food International), the Centre has Australia's largest food research and development team of 100 food innovators, dedicated infrastructure and world-class technologies. The Centre provides pilot manufacturing for new products, quality testing and access to world-class consumer research, brand-building knowledge and capabilities.

The CSIRO Animal, Food and Health Sciences' food science and manufacturing site: Ideally placed for its close interaction with food manufacturing and the dairy industries, the site has around 100 staff who are focused on various food processing and dairy research projects. Their skills include:

- innovative processing technologies
- separation technologies
- cheese processing
- microencapsulation
- microbiology and biotechnology.

The Food Industry Innovation Precinct: Hosted at La Trobe University, in partnership with RMIT University, the Precinct fosters collaboration between companies, experts in technology and business, research organisations, educational institutions and industry associations. Its charter also includes establishing new trade and innovation relationships and enhancing and forging new international networks and collaborations.

Food security

Agri-Bio: A major international A\$230 million facility for plant, animal and microbial biosciences and biosecurity research and diagnostics. A partnership between the Victorian Government's Department of Environment and Primary Industries and La Trobe University, its joint scientific programs include molecular breeding for disease resistance, drought tolerance, productivity and plant and animal health.

The University of Melbourne's Department of Agriculture and Food Systems: This department undertakes a variety of research in innovative and environmentally sustainable agricultural, horticultural and viticultural production systems and agribusiness processes.

WORKFORCE TRAINING

Victoria's standards of food safety and quality are recognised as among the highest in the world. They are underpinned by Victoria's highly skilled workforce, trained to meet the high levels of competency set by Victoria's vocational training qualifications system.

Many of Victoria's Technical and Further Education (TAFE) institutes and private registered training organisations (RTOs) offer international clients consultancy services and delivery of customised, accredited workforce training at every stage of the food processing value chain.





CASE STUDY

GENETICISTS IN SEARCH OF THE PERFECT STRAWBERRY

RMIT University researchers are a step closer to helping Australian farmers grow the perfect strawberry.

Researchers from the School of Applied Sciences are working to improve the quality of Australian varieties by investigating the impact of aroma compounds, genetics and environmental factors on strawberry flavour.

The researchers compared two popular Australian-grown varieties of strawberry to isolate the critical flavour compounds that make the short-day Juliette strawberry (which fruits early in the season) taste sweeter than the Albion strawberry, a day-neutral with a longer harvesting period.

Lead investigator Professor Eddie Pang said the research team analysed hundreds of strawberries over three seasons to identify the flavour compounds that were both high in heritability and vital in determining taste.

"We know the production of aroma and flavour compounds in strawberries is influenced by factors such as plant genotype and climate," Professor Pang said.

"But while these effects are reasonably well-documented for overseas varieties, we have very limited information for Australian-bred strawberries or overseas varieties that are grown under local conditions.

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them and help farmers in their quest for good strawberry yields that do not sacrifice appearance, aroma or taste."

Funded by Horticulture Australia with support from Strawberries Australia, the research led by Professor Pang and PhD candidate Kavitha Samykanno has been conducted in two phases.

Comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry were used to examine the effects of environment on flavour development of Albion and Juliette strawberries, with about 150 flavours compounds in the Juliette strawberry investigated to isolate those with most impact.

"We're now working to track the genes responsible for flavour and looking to extend the harvesting season of the better-tasting short-day strawberry varieties so they can be available for an extra few months of the year," Professor Pang said.

"We're also looking at introducing new flavours to the Australian market, comparing the flavour compounds in European and Japanese varieties to learn what makes them taste different and determining the heritability of those flavour compounds."

BETTER ENDOPHYTES FOR IMPROVED PASTURE

Researchers are using fungus to build pasture resilience and safe grazing options.

Through the Dairy Futures Cooperative Research Centre (CRC) Novel Endophyte program, researchers are identifying improved endophytes for use with commercial ryegrass and tall fescue cultivars. An endophyte is a naturally-occurring fungus that lives in a symbiotic relationship with a host plant, such as ryegrass.

The recent discovery of the significant role that endophytes can play in the performance of pasture grasses, particularly their persistence, has opened the door to new opportunities. Fungal endophytes protect key grass pasture species, including perennial ryegrass and tall fescue, against attack from insect pests so they can better tolerate external stresses such as disease and drought. This protection ultimately leads to greater productivity. However these same endophytes can be toxic to grazing livestock, for example, causing ryegrass staggers.

New DNA-based methods are allowing superior endophytes to be identified and consistently inoculated into commercial cultivars, improving pasture productivity while ensuring maximum livestock safety.

Through the Novel Endophytes program, Dairy Futures CRC researchers will:

- use genetic marker technology to identify superior lines of novel endophytes with increased grazing safety
- improve vigour, production and persistence of tall fescue and perennial ryegrass
- improve pest and disease resistance of grass pastures and reduce the associated pasture management costs.

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The Novel Endophytes program involves collaboration with a number of Australian and international organisations, and capitalises on existing relationships between geneticists, molecular plant breeders and commercial plant breeders, and agronomists to deliver innovative pasture options for Australia's dairy farmers.



CASE STUDY

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BEATING THE SALINITY CHALLENGE

The genes of the ancient acacia plant may hold the key to counteracting salinity.

Salinity threatens the world's productive farmlands, and fresh weapons are urgently needed in the continuing struggle to reclaim landscapes from salinity's destructive forces.

Salinity poses risks not only to food production, but also to landscapes and river systems. Salinity impacts an estimated 77 million hectares of land worldwide, affecting every inhabited continent and several of the world's key food-bowl regions. In particular, it is killing areas of farmland in India and Pakistan, sub-Saharan Africa and the Middle East.

At the forefront of that battle against salinity is a team of scientists from Swinburne University and the Royal Botanic Gardens Melbourne. Professor Mrinal Bhawe, doctoral researcher Shanthi Joseph and Dr Daniel Murphy are convinced the solution to salinity is to be found in Australia's hardy native acacias and saltbushes, which have successfully adapted and evolved to survive in the continent's salty conditions for more than 30 million years.

THIS KNOWLEDGE
MAY HELP TO DEFUSE
EMERGING SALINITY
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PARTS OF THE WORLD.

"Many Australian plants, especially the saltbushes and acacias, are highly salt-tolerant and can grow in conditions that cause most other vegetation and crops to die," Professor Bhawe explains.

"What we still do not know is how these salt-tolerant species do it. There is a great and complex biochemical secret within their genes and we are trying to work out what it is. This knowledge will lead us to new species and better methods in the fight against salt, as well as fresh opportunities in agriculture and landscape management."

Salinity is primarily a man-made problem: the clearing of trees and shrubs for rain-fed agriculture and the heavy use of water in irrigation has rapidly brought underlying salty groundwaters to the surface, rendering the soil unfit for food production. The answer lies in using the best plant species to 'pump out' the groundwater, lowering it to a safe level.

Professor Bhawe and Shanthi Joseph are carrying out intensive biochemical and genetic investigations with the aim of explaining just how incredibly tough plants like Australia's native saltbushes deal with salt.

"There appear to be several different pathways for handling salt. Some plants take it in and isolate or excrete it, others may filter it in the roots or exclude it at the roots," says Professor Bhawe. "The ability to deal with salt also appears to go with the ability to handle drought, which is of vital concern to the food-growing industry."

Acacias can yield a wide range of useful by-products turning the act of land reclamation from salt into a range of potentially profitable new farming and agro-forestry industries using a number of salt-tolerant species that can cope with different environments. All this depends, however, on a clearer scientific insight into how these plants function and what gives them their special attributes.

This knowledge will not only benefit Australian farmers and landscape managers, and consumers, but in time may help to defuse emerging salinity crises in many other similarly affected parts of the world.

IMPROVING DAIRY CATTLE FERTILITY

Researchers at Dairy Futures CRC are improving dairy industry fertility by making reliable and meaningful genomic information available for farmers to use in their breeding choices.

Fertility has low heritability which means that fertile cows and bulls do not necessarily produce fertile offspring. However, there are significant differences in the genetics of fertile animals compared with infertile ones. This means genetics offers an important way to improve fertility and in turn increase profits.

Australian dairy farmers use Australian Breeding Values (ABV) to select animals from which to breed the next generation. Genomic breeding values, also known as ABV(g), draw on the national genomic database and herd records to give farmers information to predict the genetic merit of bulls and cows.

With genomic information, the reliability of breeding values for bulls with female progeny is increased. Genomic breeding values are even available for very young bulls that do not yet have female progeny, so farmers can accelerate genetic gain by more quickly selecting sires that are likely to produce fertile female progeny.

Research at Dairy Futures CRC reached an important milestone in 2013 with the development and release of an improved model for calculating the fertility genomic breeding value using a larger number of fertility indicators than the previous model.

The new calculation model has increased the reliability of the fertility ABV by up to six to eight per cent for Holstein and Jersey cattle breeds and allowed many more bulls to get a publishable ABV, giving farmers a wider choice of breeding stock.

Dairy Futures CRC's genomic information herds (Ginfo) project will further improve the reliability of the predicted genetic merit of bulls

and cows by updating the national database with genetic information and herd records from around 100 dairy herds. The participating herds have been selected on the basis of excellent herd data, particularly for fertility, and represent around 30,000 Holstein, Jersey and cross-breed cows. The first 50 herds have already begun their participation.

The Ginfo data will provide a superior cow performance database, driving more reliable breeding values for fertility and other key traits.

Dr Jennie Pryce of the Victorian Department of Environment and Primary Industries is leading the project, working closely with the Australian Dairy Herd Improvement Scheme, and with significant help from Holstein Australia and support from Jersey Australia.

Photo courtesy of the Australian Dairy Herd Improvement Scheme

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CASE STUDY



CAPABILITY STATEMENTS





Key areas of expertise

Agriculture

- Beekeeping
- Wool Classing and Wool Preparation
- Farm Chemicals
- Pest Control – Flora and Fauna

Horticulture

- Soils and Plant Nutrition
- Costing and Estimation
- Plant Identification
- Landscape Design and Construction

Conservation and Land Management

- Plant Identification and Health
- Water Management
- Safe Use of Chemicals
- Environmental Law

Research/program delivery capabilities

Bendigo TAFE offers a range of courses in Agriculture, Horticulture, Conservation and Land Management. These courses are delivered at the state-of-the-art facility located at Charleston Road Campus, Bendigo.

In studying agriculture, students learn basic farming skills in fencing, tractor operation, welding and machinery maintenance. There is also the opportunity to specialise in beekeeping and build on management and business skills in the industry. Other options include courses in wool classing and wool preparation.

Horticulture courses provide a wide range of knowledge and skills in areas such as complete landscape construction, soils and plant nutrition, costing and estimation, plant ID and recommendations.

Courses in conservation and land management programs have a strong industry focus and are highly regarded by industry. Courses encompass a wide variety of specialties and techniques including those related to biodiversity, plant identification and health, water management, safe use of chemicals and environmental law.

BENDIGO TAFE

Located in one of the largest regional centres in Victoria, only 90 minutes from Melbourne Airport, Bendigo TAFE is a large and diverse provider of vocational education, training and assessment services.

Bendigo TAFE is fully accredited with the Australian Skills Quality Authority to deliver nationally recognised qualifications from Certificate 1 through to advanced diploma. Bendigo TAFE has Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS) registration, which allows it to provide training to international students undertaking study in Australia.

Bendigo TAFE is experienced in providing delivery of vocational training in countries other than Australia, through auspicing arrangements with other institutions. Bendigo has tailored, developed and hosted skills-deepening study tours. It also provides articulations to Victorian universities including La Trobe University, Federation University Australia and Deakin University.

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Global Educators

Melbourne - Australia

Key areas of expertise

- Pharmaceutical Plant Operation
- Pharmaceutical Manufacturing
- Pharmaceutical Quality Assurance
- Good Manufacturing Practice (GMP)
- Animal Sciences

Research/program delivery capabilities

In 2004, Box Hill Institute was designated the Specialist Centre for Biotechnology Training by the Victorian State Government. The BioSkills Specialist Centre delivers tailored commercial short courses and contracted services to the biotechnology industry. It is a one-stop shop for biotechnology companies and through consultation can identify skills needed to operate and progress their companies and then deliver the appropriate training to fill these gaps. The BioSkills Specialist Centre can be a true partner of the biotechnology industry providing training that ensures workforce development and promotes a successful operational outcome.

BOX HILL INSTITUTE

Box Hill Institute is a leading Victorian vocational and higher education provider known for its collaborative and creative approach to education in Australia and overseas. Box Hill Institute offers a wide variety of courses to both local and international students and has been the recipient of many awards and achievements including the coveted Victorian Large Education Provider of the Year 2012, and the International Training Provider of the Year at the Australian Training Awards 2013.

Areas in which the BioSkills Specialist Centre routinely operates include:

- Bioprocessing, including aseptic techniques, fermentation and protein purification
- Real-time polymerase chain reaction (PCR), DNA analysis and other laboratory-based biotechnology techniques
- Regulatory standards for the biomanufacturing sector
- Business and management skills for biotechnology commercialisation
- Intellectual Property (IP) protection and licensing.

Box Hill Institute also offers pharmaceutical manufacturing training at both vocational and postgraduate level and nationally recognised vocation education and training for veterinary nurses, animal technicians, companion animal services, equine studies and zoo keeping.

The training team has considerable qualifications and current industry experience domestically and internationally, with key training personnel currently and frequently involved in local and international pharmaceutical manufacturing plant auditing.

Box Hill Institute is also undertaking research in Good Manufacturing Practice and has industry and organisational linkages with companies including Seerpharma, Sypharma and GlaxoSmithKlein. The Institute is delivering Certificate III Pharmaceutical Manufacturing at Shanghai Pharmaceutical School, with the Diploma of Pharmaceutical Manufacturing anticipated to also be introduced.

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Key areas of expertise

School of Exercise and Nutrition Sciences

- Food Science, Nutrition and Dietetics

School of Life and Environmental Sciences

- Environmental Management and Sustainability
- Fisheries and Aquaculture
- Zoology and Animal Science
- Biotechnology

Research/program delivery capabilities

The Centre for Regional and Rural Futures, in collaboration with a range of research institutions and industries in Australia and internationally, targets innovations through four key themes: food and food security, smart agriculture, sustainable industrial biotechnology, and regional competitiveness. Research projects include: use of plant microbes for disease control and enhanced seedling survival, evaluating new food compositions and consumer preferences, and governance and economic analyses of water management and utilisation in Australia.

The School of Exercise and Nutrition Sciences is the largest department of nutrition in Australia with strong national and international collaborative links. The food science major within the Bachelor of Food and Nutrition Sciences focuses on food analysis and food composition, food product development, manufacture and process innovation, and food safety and quality assurance.

DEAKIN UNIVERSITY

Deakin University is one of Australia's largest and fastest growing universities providing learning, teaching and research opportunities across multiple campuses and innovative use of online technology through Cloud Deakin. World university rankings evidence Deakin's well established reputation for excellent teaching, innovative course delivery, high level student satisfaction and world-class research aligned to industry and community needs.

In collaboration with other institutions and industries in Australia and internationally, expertise located in Deakin's Schools and Research Centres comes together to provide solutions to world issues associated with agriculture, food security, human disease prevention and health.

Deakin University offers relevant study at undergraduate and postgraduate levels including PhDs.

Its nutrition and dietetics research is strongly focused on chronic disease prevention and management, and on improving population health.

deakin.edu.au/health/ens

The School of Life and Environmental Sciences undertakes research and teaching across a wide range of disciplines from biomedical science to environmental management, all centered around the biology of living organisms. Cutting-edge research programs are conducted in partnership with government departments, industry and leading international scientists.

deakin.edu.au/sebe/les

The associated Centre for Integrative Ecology has expertise and research projects in the area of climate change and its impact on natural resources and agricultural production.

cie-deakin.com/

The Centre for Chemistry and Biotechnology has key projects and relationships in the area of food and agricultural chemistry and biotechnology, including joint PhD students and postdoctoral fellows with India, New Zealand and China.

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Key areas of expertise

- General Agriculture
- Dairy Farming
- Dairy Processing
- Production Horticulture
- Meat Processing

Research/program delivery capabilities

GOTAFE's Rural Industries Campus is a A\$10 million purpose built facility catering to the needs of the animal science, agriculture, equine, horticulture and viticulture industries. The Agriculture Unit focuses on general agriculture and water management. It works with regional farming industries and organisations to provide relevant training for trainees and offer higher level courses for those wanting to move into farm supervision or management.

The National Centre for Dairy Education Australia (NCDEA) is an initiative of GOTAFE and Dairy Australia and delivers short courses and customised training for dairy farming and processing organisations across many regions of Australia. The NCDEA is driving the future of dairy education by promoting future developments, providing new thinking and developing the capability of the Australian dairy workforce.

ncdeagotafe.edu.au

GOTAFE

GOTAFE is the largest tertiary educational provider in north-east Victoria, Australia, delivering vocational education and training to more than 17,000 students annually.

GOTAFE's campuses are located in regional Victoria at Shepparton, Wangaratta, Seymour, Benalla, Terang, Warragul and Werribee. Activities are conducted locally, statewide, nationally and internationally. Education and training is delivered to the business sector, industry, community, local, state and national governments and to the non-profit sector.

It provides training on campus, off campus, online, in the workplace through a mix of these delivery methods.

Dairy processing involves the use of manufacturing technology to turn milk from the farm into products such as yoghurt, cream, butter, cheese, and condensed and powdered milk. GOTAFE offers accredited courses in food processing and food science and technology, plus customised short courses such as cheesemaking, milk powder production, and microbial and chemical laboratory analysis.

GOTAFE's Production Horticulture Unit encompasses the growing of food crops including orchards, greenhouse and hydroponics, and other fruit and vegetable production. It works with industry to identify training needs and tailors courses to suit.

GOTAFE's Meat Processing Unit provides on-the-job training and assessment of meat processing apprentices and staff. It can also source accredited training in areas such as operation (forklift operation), logistics, and Occupational Health and Safety.

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LA TROBE
UNIVERSITY • AUSTRALIA

Key areas of expertise

- Molecular and Developmental Endocrinology
- Molecular Interactions at the Plant-fungal Interface
- Nutrition and Reproduction
- Parasitology
- Plant Development and Biotechnology
- Plant Development and Physiology
- Plant Pathology and Mycology
- Plant-soil Science
- Plant-soil Systems
- Subsoil Manuring

Research/program delivery capabilities

Since 1966, La Trobe's Department of Agricultural Sciences has been providing students with the skills to solve the problems facing agricultural, environmental and resource industries.

With increasing pressure on these sectors in the twenty-first century, La Trobe continues to produce graduates who are ready to take up a diverse range of job opportunities, from working with local environmental protection agencies to improving farming practices in developing countries.

AgriBio is a A\$288 million world-class facility for agricultural biosciences research and development, creating better science outcomes for the benefit of Victoria and Australia. It is a strong feature of La Trobe's relationship with Nanjing Agricultural University and many other international partners. As part of its Future Ready plan to help address some of the major issues facing the community, La Trobe has a focus on cross-disciplinary research related to securing food, water and the environment. La Trobe and RMIT University have also partnered to create a new Food Industry Innovation Precinct on its Melbourne campus.

LA TROBE UNIVERSITY

La Trobe University is a multi-campus university that is ranked 11th in Australia and third in Victoria for research by the Excellence in Research of Australia (ERA) initiative.

La Trobe University is committed to delivering innovative food and agricultural research. It is partnering with the food production and manufacturing industry to translate research into real world benefits. La Trobe is undertaking world-class research in agricultural biosciences in its new facility – AgriBio, a joint venture with the Victorian Government to protect and enhance Australia's agricultural production.

The Department of Agricultural Sciences offers world-class teaching across all levels with a foundation of strong research techniques and practical learning experience.

Relevant research areas include:

- World-leading gene discovery and functional genomics in major plant and animal species of importance to Victoria and Australia
- Molecular breeding for disease resistance, drought tolerance, bioenergy and health
- Molecular diagnostics, biological control and other management strategies for weeds as well as plant and animal pests and diseases of importance to Victoria and Australia
- Physiology and genetics related to plant and animal bioactives and health
- Sustainable systems of animal and plant production.

Industry and organisational linkages:

- Department of Environment and Primary Industry (co-located on Melbourne Campus Research Park)
- Department of Agriculture

latrobe.edu.au/agriculture

latrobe.edu.au/agribio

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MONASH
University

Key areas of expertise

- Soil Biology/Ecology
- Soil Chemistry
- Plant Nutrition
- Plant Genetics
- Plant Ecophysiology
- Climate Change Adaptation
- Green Chemistry
- Biotechnology Development
- Empirical Development Economics
- Plant-animal Interactions
- Microbial Genomics for Animal Health
- Perspectives of Food Security
- Food Security in Cultural Pluralism
- Social effects of rural restructuring and governance of agriculture and natural resources
- Nutrition and Dietetics

Research/program delivery capabilities

The School of Biological Sciences offers research in ecology, genetics, and plant or animal biology. It maintains electron microscopes, analytical equipment, constant-temperature rooms, experimental areas and a field station. Research areas include methods of improving biodiversity in production and constructed environments, including farming and forestry landscapes.

Monash Science collaborates with industry in many ways, including contract research, collaborative research partnerships and licensing of technology.

The Development Research Unit (DRU) is a collaboration between Monash University and World Vision Australia. It comprises a group of academics in the Faculty of Business and Economics with common research interests in development economics, with particular expertise in understanding the status and international impact of Asia-Pacific's emerging economies, most notably Indonesia and the Pacific, South Asia and China.

MONASH UNIVERSITY

Monash University has become the largest university in Australia, renowned for its outstanding teaching, transformative research and international reach. Monash is a global university with campuses in Australia, Malaysia and South Africa and major partnerships with universities in China, India and the UK.

Monash is a key provider of research and education in areas of relevance to agriculture and food security. A diverse range of expertise can be found across the university in the Faculties of Business and Economics (The Development Research Unit); Science (The School of Biological Sciences); Medicine, Nursing and Health Sciences; and Law and Arts.

Bachelor, masters and PhD courses are available in the relevant study areas.

Monash University's development economists work with a wide range of partners, including government aid agencies and international organisations such as AusAID, Asian Development Bank and the Bill and Melinda Gates Foundation. Current research projects are focused on microfinance in South Asia, income of East Timorese coffee farmers, and food security in developing countries, notably India, Indonesia and Vietnam.

DRU can connect international postgraduate students with research projects that are not only of interest to them but also of direct benefit to their home regions.

The Department of Nutrition and Dietetics undertakes research at its new BASE facility (Be Active, Sleep and Eat), which combines a commercial kitchen with a translational physiology laboratory for clinical studies on energy metabolism.

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Key areas of expertise

- Quality Assurance
- Occupational Health and Safety
- Food Safety
- Packaging Laws and Standards
- Communication
- Management
- Lean Manufacturing
- Transport and Logistics
- Risk Management
- Sustainability
- SOP Verification

Research/program delivery capabilities

The National Food Institute provides workforce training at five levels under Australia's Food Training Package FDF10, offering a well-developed list of training options suitable for all product types and all levels of sophistication.

The Institute has provided extensive onsite workforce training across Australia for major food processing companies including Streets, Simplot, Coca-Cola Amatil and Kraft, and welcomes international enquiries for consultancies, partnerships and offshore delivery. It focuses on compliance, worker engagement and productivity as key ancillary goals to accreditation.

The National Food Institute also offers an extensive in-house publishing and filmmaking service built around best practice training. It has produced audio-visual training materials for companies including Nestle, Streets, SPC Ardmona and Caltex.

NATIONAL FOOD INSTITUTE

The National Food Institute of Australia is the most experienced, skilled and successful food processing training organisation in the country.

It customises creative, innovative training regimes that meet the needs of companies striving to provide high quality, internationally acceptable food products while supporting consistent, sustainable employment.

The National Food Institute has the experience to meet the need for cost-effective training and consultancy in all ASEAN countries as economic unification occurs.

The Institute's training provides the support required by workers and companies across Asia to modernise outcomes, performance, consistency and employment opportunity.

Staff include food engineers, food scientists, quality specialists, production specialists, leadership coaches and a film and media resource team.

Achievements include:

- Winners of the Industry Collaboration Award at both the Victorian and Australian Training Awards in 2011, for its work with SPC Ardmona, an Australian-based company that specialises in large fruit packing and owns and operates factories in regional Victoria
- Development and delivery of training and accreditation strategies with major companies including Heinz, Simplot, SPC Ardmona, Nestle, Ferrero, Vitasoy and Streets
- Partnering with companies on training quality and performance improvement activities over the past 15 years
- Delivery programs to over 3,000 people per year in various accredited courses
- Establishment and implementation of national food safety strategies with Franklins Ltd across 400 sites and Ampol/Caltex across 1,000 franchisees.

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Key areas of expertise

- Viticulture, Winemaking, Wine Marketing and Vineyard Management
- Freshwater Aquaculture and Hatchery Management, including recirculating and outdoor pond systems
- Beef Management and Production
- Sheep Management for meat and wool
- Equine Studies, Thoroughbred Racing Training and Farriery
- Agriculture and Land Management including natural resources

Research/program delivery capabilities

NMIT's Primary Industries programs range from basic vocational skills to full degrees and provide an excellent opportunity to delve into a hands-on learning environment that engenders innovation, impact and sustainable operation for future developments in Australian and international primary industries. Most programs are delivered in the context of NMIT commercial activities including a farm, vineyard and stud farm. NMIT is a producer and exporter of agricultural products.

NMIT's unique degree structure promotes valuable interaction amongst students via the same core subjects and the added opportunity to tailor degrees specialising in areas including Agriculture and Land Management, Equine Studies, Aquaculture and Viticulture and Winemaking. NMIT is cooperating with La Trobe University to deliver industry focused agriculture degrees under the brand of Melbourne Polytechnic.

NMIT's transnational programs include a program providing training for skilled farriers in Malaysia and Singapore and specialised equine training in China and the Middle East.

NMIT

NMIT's Agriculture and Animal Sciences Department facilitates practical training via a number of fully operational award-winning properties to provide the best career outcomes for every student in: winemaking, wine marketing and vineyard management; freshwater aquaculture and hatchery management, including recirculating and outdoor pond systems; beef management and production; sheep management for meat and wool; thoroughbred racing training and farriery; and natural resources.

nmit.edu.au/departments/agriculture_and_animal_science

In addition, NMIT's Primary Industries Department offers an exciting suite of degrees focusing on three specialised study areas: Agriculture and Land Management, Equine Studies, and Viticulture and Winemaking.

nmit.edu.au/departments/primary_industries

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Key areas of expertise

RMIT's Food Industry Innovation Precinct has expertise in:

- Food and Beverage Manufacture – including product development, process design and development, non-thermal food processing technologies, texture and rheology of foods, food microbiology and safety, consumer testing, shelf-life studies and sensory evaluation
- Nutrition and Health
- Packaging Design and Development
- Chemical Engineering
- Supply Chain Management and Logistics
- Food Regulation and Market Insights

School of Applied Science's key research expertise:

Biosciences

- Biotechnology and Microbiology
- Industrial Microbiology
 - Biofilm formation by coagulase-negative staphylococci
 - Mastitis in dairy cows caused by streptococcus uberis
 - Microbial safety of biosolids by analysis of a range of pathogens and indicators

- Environmental Sustainability
 - Aquaculture
 - Biofuels
 - Bioremediation
 - Ecotoxicology
 - Geophysics
 - Marine Biomedical Sciences and Health
 - Marine Ecology and Environmental Science
 - Water Pollution and Soil Environment
- Food Science and Nutrition
 - Probiotics, prebiotics and symbiotic functional foods
 - Nutrition (nutrient bioavailability, obesity, gastrointestinal and immune health)
 - Non-thermal processing technologies
 - Impact of sustainability on food production and health
 - Glass transition in food and biopolymers
 - Structural properties of biopolymer co-gels

RMIT UNIVERSITY

RMIT is a global university of technology and design with campuses in Australia and Vietnam, and international partners worldwide. RMIT is ranked 20th in the world among universities less than 50 years old.

RMIT and La Trobe University are foundation members of the Food Industry Innovation Precinct – an Australian Government initiative focusing on cross-disciplinary research related to food security, water and the environment.

RMIT's School of Applied Sciences is concerned with the handling, processing and storage of food. Study areas include microbiological issues related to food spoilage and safety, and development of new food products.

Chemical Sciences

- Advanced Technologies
 - Advanced materials
 - Genetic engineering
 - Plant science
 - Agricultural technologies
 - Biomaterials
 - Industrial science and technology
 - Composites and polymers
 - Alumina technology
- Molecular and Analytical Sciences
 - Separation science
 - Chemometrics

Research/program delivery capabilities

The Food Industry Innovation Precinct will deliver innovative food and agricultural research and partner with the food production and manufacturing industry to translate research into real-world benefits for industry and consumers.

The School of Applied Sciences carries out multidisciplinary projects in close collaboration with four research institutes and colleagues from other Australian and international universities, industry, government and partner organisations.

Food Science at RMIT regularly works with 3M, Envestra, Goodman Fielder, Heinz Wattie's, Kraft Food, McCormick Foods and Nestle giving our students and researchers firsthand experience of the food industry within Australia.

rmit.edu.au/appliedsciences

RMIT Research Institutes:
rmit.edu.au/research/institutes

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Key areas of expertise

- Meat Training Australia (MTA), a specialist meat training centre endorsed by the Victorian Government which specialises in meat processing, slaughtering and retailing
- Cookery Skills and Kitchen Operation, Knowledge and Application
- Retail Bread, Cake and Pastry Baking
- Horticulture and Arboriculture

Research/program delivery capabilities

South West TAFE has a proven track record of achievement in providing innovative and high quality education and training in Australia and internationally.

South West TAFE graduates acquire the skills, knowledge, understanding and qualifications to work in a variety of food areas including meat processing, baking, commercial cookery and horticulture. South West TAFE continually evolves its courses to meet current industry and market demands.

The Institute delivers highly recognised industry courses and provides students with state-of-the-art equipment and facilities including an onsite fully-equipped commercial kitchen and an operational training restaurant.

MTA has purpose-built learning centres on-site at processing plants and in retail butcher shops across Victoria and South Australia.

South West TAFE is a preferred provider and has links with processing plants, butchers, restaurants, bakeries and nurseries. These partnerships equip students with practical training and experience.

SOUTH WEST TAFE

South West TAFE is a multi-campus institute located in south-west Victoria and is the largest provider of vocational education and training in the region with approximately 14,000 enrolments annually.

South West TAFE has provided industry recognised training solutions including customised skill-based and nationally-accredited and non-accredited training for more than 150 years.

South West TAFE has a long history of providing VET training for agriculture and food industries domestically and abroad. It specialises in providing students with skills in meat processing and retailing, baking, horticulture, hospitality and food safety. South West TAFE is the home of Meat Training Australia (MTA), a specialist meat training centre endorsed by the Victorian Government.

South West TAFE's international offerings include short courses to certificate level in meat processing, baking, commercial cookery and horticulture.

MTA was named Meat Industry Training Provider of the Year at the 2012 MINTRAC National Training Awards and a finalist in two other categories.

During the past 20 years South West TAFE has worked with China, Malaysia, Fiji, Samoa and the Philippines to deliver a diverse range of courses.

South West TAFE has secured a number of international agreements with companies recognised for excellence in training including Woolworths, GlaxoSmithKline and Alcoa. These agreements have helped South West TAFE to develop and deliver diverse learning opportunities abroad.

South West TAFE's experienced staff provides effective responses to international delivery requirements and ensure clients' needs are met with culturally appropriate communication strategies.

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Key areas of expertise

- Analytical Chemistry
- Food Safety
- Molecular Biology
- Physical Chemistry
- Plant Biotechnology

Research/program delivery capabilities

Swinburne's Environment and Biotechnology Centre has 14 academic staff and more than 30 research students, possessing expertise in fields as diverse as bioactive compound production and extraction, surface and colloid science, molecular biology, bioremediation and composting, public and environmental health, biosensors, enzyme technology, heavy metal removal, tissue engineering, nanotechnology, and pulp and paper bioprocessing.

Relevant research areas

- Environmental biotechnology and sustainability
- Environmental health
- Food safety
- Molecular biotechnology

SWINBURNE UNIVERSITY OF TECHNOLOGY

Swinburne is an internationally recognised research-intensive university. Its emphasis is on high quality, engaged teaching and research in science, technology and innovation – teaching and research that makes a difference in the lives of individuals and contributes to national economic and social objectives.

In the Australian Government's *Excellence in Research for Australia (ERA) 2012* report, Swinburne was awarded an ERA 5 (well above world standard) rating for research in physical sciences. It is the only university in Victoria to receive an ERA 5 rating in this category.

Swinburne offers master, graduate diploma and bachelor-level courses in science and health science.

Industry and organisational links

- Australian Synchrotron
- bioMérieux Australia
- Centre for Green Chemistry
- CRC for Polymers
- CSIRO
- Dairy Food Safety Victoria
- Department of Health
- Department of Primary Industries
- Elettra Sincrotrona (Italy)
- Institute of Chemistry (Chinese Academy of Sciences)
- Lions
- Max Planck Institute for Plant Breeding (Germany)
- Nanjing Institute (China)
- Royal Botanic Gardens (Melbourne)
- Saga University (Japan)
- Sarawak Biodiversity Centre (Malaysia)
- Visy Industries

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Key areas of expertise

Agriculture and Food Systems

- Agriculture, Water and Climate

Zoology

- Animal Science and Welfare

Forest and Ecosystem Science

- Bushfire Science
- Water Quality
- Ecosystem Services
- Biodiversity
- Biosecurity
- Tree Genomics
- Renewable Resources
- Biomass Energy
- Sustainable Forest Management
- Forest Operations

Resource Management and Geography

- Social and Environmental Change

Botany

- Plant Biology and Improvement
- Soil, Nutrients and Greenhouse Gases

Research/program delivery capabilities

Research at the University of Melbourne is highly interdisciplinary; it included collaboration with universities, governments, industry and communities worldwide to further developments cooperatively. Some key examples of initiatives in agriculture and food security research include:

Food Sensitive Planning and Urban Design

Food Sensitive Planning and Urban Design (FSPUD) recognises that access to healthy, sustainable and equitable food is an essential part of achieving liveable communities. The Victorian Eco Innovation Lab at the University of Melbourne, in partnership with David Locke Associates, was commissioned by the National Heart Foundation of Australia (Victorian Division) to raise the awareness of planners, architects, urban designers, engineers, policymakers, community members and elected representatives of the need to integrate food considerations into urban land use and development.

UNIVERSITY OF MELBOURNE

The University of Melbourne is a public-spirited institution that makes distinctive contributions to society in research, learning and engagement. Ranked number one in Australia and 34 in the world for the quality of its research, the University of Melbourne harnesses interdisciplinary research to solve some of the most difficult problems facing the world.

There is expertise in Agriculture and Food Security in the Melbourne School of Land and Environment, Melbourne School of Engineering and the Faculty of Veterinary Science. The University of Melbourne takes an interdisciplinary approach to tackling some of the most difficult issues facing the planet.

Students interested in careers in agriculture and food security may undertake relevant bachelor, masters level and research degrees across the sciences and environments.

Department of Zoology

Scientists from the University of Melbourne and the Institute of Marine Research in Norway have shown for the first time that salmon can be artificially stimulated to leap through the surface of water (containing a de-lousing agent), opening the door to effective sea lice treatment. Sea lice infection costs the global industry more than \$500 million each year.

Carlton Connect Initiative

The University of Melbourne is leading the development of the Carlton Connect Initiative. The Initiative is an ambitious strategy to unite world-class researchers, industry partners, key government departments and community organisations to tackle some of the biggest sustainability and social resilience challenges and design new ideas and technologies to help secure Australia's prosperity.

At the heart of the Carlton Connect Initiative agenda are four activity domains: Water, Food, Energy, and Urban Futures.

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The Melbourne: Research, Education and Training series profiles the capabilities of Victorian education providers across 13 sectors:

Advanced Manufacturing
Agriculture and Food Security
Business, Governance and Finance
Clean Energy
Creative Industries
Education and Development
Health and Communities
ICT
Infrastructure and Urban Design
Mining
Tourism and Hospitality
Transport
Water Management

For more information on Melbourne's research, education and training capabilities contact your local Victorian Government Business Office at: invest.vic.gov.au/offices

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