

GRDC GRAINS INDUSTRY EDUCATION RESOURCES



FOOD, FARMING AND FUTURES IN THE AUSTRALIAN GRAINS INDUSTRY

Here's some food for thought ... behind every meal, there's a farmer. In fact, throughout Australia, we are lucky to have about 134,000 farm businesses that work to produce high quality fruit, vegetables, grains, livestock and fibres.

It has been estimated that each Australian farmer produces enough

food to feed about 600 people. Of these, 150 live in Australia and 450 live overseas. That's right – Australian farmers produce food which helps feed people all over the world.

But it's not just farmers involved in producing our food. The food production sector is a vibrant and thriving industry. Research scientists, agronomists, agribusiness experts, engineers, food technicians, communicators, logistic

teams and many others work to get food from the farmer's paddock to your plate. There's room for you in this industry – with more than 1.6 million jobs in the sector, we are sure you can find one to suit!

This booklet profiles a range of careers and opportunities available in the Australian grains sector. If you would like to find out more, please visit: www.grdc.com.au

We love grain ...

The Grains Research and Development Corporation (GRDC) is focused on grain crops. These include cereal crops (wheat, barley, oats, millet and rye), pulses and legumes (peas, beans, chickpeas, lentils and soybeans) and oilseeds (canola, sunflower, safflower and linseed).

The grains industry is important for Australia. Australia's grains industry produces an average of 43.5 million tonnes of grain each year. The average area sown to grains each year is about 23.3 million hectares, and the industry has an average annual gross value of production at the farm gate of more than \$14 billion.

The grains industry plays an important role in the health of Australia's community through its contribution to healthy foods, food security and environmental stewardship.

The challenge for the grains industry is to continually produce more grain from the same area of land by being innovative, sustainable and productive. Each year the GRDC invests around \$194 million into research, development and extension to benefit the Australian grains industry. There are about 1300 research projects on the go! The GRDC's investment helps to increase the quantity and quality of food produced to ensure farm businesses remain profitable and productive.

DID YOU KNOW?

**Australian universities produce
700 agricultural graduates a year
for a job market exceeding 4000.**

The Australian Farm Institute.

To ensure the GRDC, and wider grains industry, continues to deliver innovative research and farming solutions, Australia needs a highly skilled and motivated workforce.

At present, there is an industry-wide skills shortage. The latest statistics suggest there are about five to six jobs for every graduate in agriculture.

To help engage and retain people in the grains industry, the GRDC invests in a diverse range programs and activities. We encourage students and teachers to contact us to learn more about grain careers or how to incorporate grains into teaching.

For research information visit www.grdc.com.au

Industry snapshots

Farmer, innovator and adopter of new technology

Brett Tucker: Farm Manager

After completing high school at an agriculture college, young grower Brett Tucker returned to the family farm to manage the cropping enterprise.

“I have always been interested in farming so was excited to move back to our family business and pursue this as my career. We farm wheat, barley, lentils, beans and oaten hay,” Brett says.

“Since moving home, I have been driving the adoption of new technologies to improve our business productivity and efficiencies.”

“We have embraced a number of innovations including new varieties, new farming systems such as no-till, and precision agriculture technologies.”

No-till cropping has been a major influence on the continued growth of the business.

No-till cropping is important in countries like Australia where large areas of grain growing land have a soil structure that can be damaged by tillage (or ploughing). Practices that minimise soil disturbance and avoid the soil being bare provide great benefits to both the land and the farmer.

“We have been using no-till since 2004 and found that this has increased productivity, improved our soil, reduced erosion and overall helped us produce better crops.”

“A no-till system retains the stubble from the previous year’s crop. This is great over summer where we have hot north winds blowing continuously.



The stubbles anchor the soils and prevent erosion.”

“Not only does the stubble prevent erosion but it act as a shelter to the emerging seedling and it contributes to the soil organic matter. It’s a really clever concept.”

Brett says farming has been a rewarding career.

“At peak times, like seeding and harvest, you can work long hours but it is a great job. I get to work outdoors and manage a sustainable and productive business. I look after everything from variety selection, agronomy, grain marketing and storage. I am producing a food product which all consumers get to enjoy and that’s pretty satisfying.”

“Even if you do not own a family farm, there are so many jobs available for farm managers and farm workers. I can recommend it for sure.”

DID YOU KNOW?

Autosteer has allowed Brett to establish inter-row sowing, a feature of a no-till farming system.

Inter-row sowing means the new crop is sown in between last year’s stubble.



Computer programming combined with GPS technology mean the tractor steers itself down a mapped pathway. In fact, a series of satellites guide the tractor up and down the paddock, creating rows which are perfectly straight - down to an accuracy of 2 centimetres!

Plant gene knowledge leads to world-first discovery

Associate Professor Rachel Burton: Molecular Biologist

“Working as a Plant Molecular Biologist is a rewarding career - I look at things at a minute level but know they make a huge difference to so many people’s lives - I can definitely recommend a career in science”.

DID YOU KNOW?

Did you know there are about 30,000 genes in barley but humans only have about 24,000 genes!

Cereal crops have a gene for everything – plant height, the angle the leaf faces the sun, dealing with frost and even producing sugar for food. There is even a gene for producing cell walls!

Associate Professor Rachel Burton is a molecular biologist who is working to understand how plant genes operate. Her main role is understanding the genes involved in cell wall development in barley.

“The cell wall not only holds the cell together but it gives the plant its strength,” Rachel says. “It acts as a barrier, controlling what goes in and out of the cell, such as water or sugar.”

“As well as its structural and functional roles, the cell wall of barley is very nutritious. It contains a special form of dietary fibre called beta-glucan, which has many health benefits for both humans and animals.”

“Fibre from barley dissolves in your digestive tract. This makes the contents thicker and slows sugar absorption – which is good if you are a diabetic. Once fibre reaches your large intestine, the microbes ferment it, producing chemicals which can protect against cancer.”

“After 15 years of research, I discovered the gene for beta-glucan – a highlight of my career!”

“It is very important for food processors to understand as much as they can about beta-glucan because its role is different for humans and livestock. Humans need high levels to keep their digestive tract healthy, but chickens can’t have too much or they get sticky poo!”

Learn more about plant breeding at
Get into Genes www.getintogenes.com or www.plantcellwalls.org.au/

Modern plant breeding for better noodles

Dr Dan Mullen: Plant Breeder



Innovative wheat breeder Dan Mullen is using modern plant breeding technologies to develop new wheat varieties for Australian growers. In turn, these will be used to make nutritious breads, noodles and pasta for global consumers.

Dan completed a degree in science (agriculture) then followed it with a PhD in molecular genetics and physiology.

“My research focus is on understanding the key traits that will make the greatest difference to Australian wheat growers, like improved tolerance to drought, frost and salinity, and disease resistance such as rust, crown rot and nematodes,” he says.

“New varieties are integral to any farming system as they enable growers to grow more grain with less inputs – it’s all about

developing innovative solutions which have sustainable outcomes.

“At the moment I am working on developing a new noodle wheat variety which has superior yield potential and stability. This means better bread and Udon noodles for dinner. It’s an exciting project as there are incredible export opportunities for this wheat.”

Located in Western Australia, Dan works full-time as a wheat breeder with InterGrain. His skills have allowed him to travel the world, working as a scientist in Mexico and North Dakota in the United States.

“The opportunities in plant breeding are endless,” he says. “The travel, professional development and opportunity to develop new wheat products which give growers improved on-farm benefits as well as export opportunities is satisfying. I also enjoy getting to try the noodles made from my wheat variety – it’s science in action!”

DID YOU KNOW?

Grains are extremely nutritious, particularly whole grains.

Cereal grains are high in carbohydrates, low in fat, are a good source of protein and contain fibre, vitamins and minerals. The amounts vary depending on the grain.

The Grains & Legumes Nutrition Council works with a team of scientists who investigate the nutritional content of grains, legumes, pulses and oilseeds. The team then provides scientific and evidence-based dietary advice for students, teachers and the community.

To learn more about grain nutrition research visit www.glnc.org.au



The Crop Doctor

Dr Grant Holloway: Plant Pathologist



A healthy wheat crop - this is what we strive for.



Leaf rust - note the pustules covering the plant leaf.

Dr Grant Holloway is a Senior Plant Pathologist working for Agriculture Victoria.

Based at Grains Innovation Park in Horsham, Victoria, Grant is constantly on the lookout for diseases which affect the growth and development of cereal crops.

“Often people forget that plants catch disease and get sick too - you would be surprised at their symptoms,” he says. “If a plant has caught rust it will be covered in orange-brown pustules that are raised above the leaf surface; if it has septoria it will be covered in black fruiting bodies and if it has take-all, then it has caught a soilborne fungal disease which will destroy its roots and emerging stems.”

“There are more than 15 diseases known to attack wheat crops in the

Wimmera region alone and without appropriate management, they can severely impact on the yield and quality of cereal crops.

Fortunately, many plant diseases can be effectively managed with the adoption of an integrated disease management approach.

“Our research is integral to determine how agronomists and growers manage their crops. Depending on the disease, we might advise growers to choose different varieties which are resistant to the disease or to apply a seed or fertiliser treatment. Growers can also rotate their crops to prevent or minimise disease build up.

“Correct disease identification is the first step in the effective management of crop diseases and our team provide this advice and information to the grains industry.”

In fact, Dr Holloway and his team have provided more than \$400 million in research to the grains industry. Significantly, Dr Holloway was honoured with the 2014 Victorian Wheat Research Foundation’s Award for Excellence and was a winner of the Victorian Department for Agriculture’s Norman Borlaug Impact Award 2011.

“There are so many opportunities in plant pathology – from supporting growers and advisers to better manage disease on farm, to implementing national disease biosecurity plans and developing disease management guides,” he says. “It’s a job where you know you are making a difference to thousands of growers each day and helping ensure our food supplies are not lost to disease.”

Extension, Communication and Outreach

Alli Elliott: Extension and Communication officer

Alli Elliott works as a science and research translator. This means she takes the latest research and development findings and delivers them in a user-friendly format for growers and agronomists.

Alli (pictured below) works as an extension and communications officer with the Birchip Cropping Group, located in Victoria. She has completed a Bachelor of Agriculture.

"I am currently working to communicate best practice crop nutrition management to growers. Crop nutrition considers the application and management of macro and micro nutrients, such as nitrogen, potassium and copper. Having this information in an accurate and user friendly format is essential as it is a major determinant of crop health, yields, quality and profit," she says.

"It could potentially be a dry topic but crop nutrition is one of a grower's biggest annual expenses, representing about 13 percent of their total costs. Effective, accurate and engaging communication is a must.

"We work to communicate relevant nutrition information in a variety of ways – we host workshops and field days for face-to-face engagement plus deliver written publications such as newsletters and reports. Communication via social media is also becoming increasingly important so we deliver bite-size pieces of information via Facebook and Twitter."

Alli is leading the development of a new website and app using her graphic and visual design skills.

"Marketing and communication are essential in the grains industry – there is so much information that growers and



"My Bachelor of Agricultural Science helped open so many doors - there are great opportunities in this industry just waiting to be explored".

advisers need to know to make informed decisions," she says. "We need to ensure our communication outputs are engaging, well-branded and interesting."

With a range of crop nutrition communication projects on the go, there is never a dull moment in Alli's day.

A career in agricultural communication is perfect for anyone interested in writing, communication, journalism and event management.

Discover more about primary industries careers... GRDC are proud supporting partners of Career Harvest

Career Harvest is a one-stop-shop for prospective students to discover more about rewarding careers in the primary industries sector. This website profiles a wide range of agricultural and agribusiness jobs, both in Australia and overseas, that you could consider. It also profiles internships, scholarships and pathway information.



Career Harvest was created in 2011, thanks to a collaboration between the Australian Council of Deans of Agriculture (ACDA) and various bodies across the agriculture and education industries.

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**To discover more about career pathways visit:
www.careerharvest.com.au**

Grains education for students and teachers

Sarah McDonnell: Education Specialist



Sarah McDonnell works as an education officer and is passionate about promoting the science behind food and fibre production.

Sarah (pictured above) is a qualified teacher and has spent time in the classroom, as well as a range of education officer positions working with school students to engage them in primary industries and grain science.

"My role is to take the latest grain or agricultural research and develop classroom activities for teachers and students," she says. "I take the scientist's experiments and turn them into a student practical which is hands-on, curriculum-linked and engaging – it also

has to fit into one double lesson rather than a year so we need to get creative!

"As an education officer, I travel Australia visiting schools delivering grains workshops. We mill grain, view nematodes under the microscope, use computer programming to develop temperature sensors and more.

"We also run competitions, exhibits, shows and field days so the community can engage with grains too.

"After completing a degree in food science, I knew I wanted to move more into agriculture and teaching, so my post graduate studies in education set me up perfectly. I now have a job which combines my love of food science, talking, agriculture and teaching – it's the ideal career for me."

INNOVATOR

Did you know? Agricultural engineers and farmers are working to develop new technologies which help manage weeds without chemicals.

Weeds compete with crops, taking valuable soil moisture and nutrients. A new machine called the Harrington Seed Destructor has been developed to destroy weed seeds collected in chaff during harvest.

As the grain is harvested, the seed destructor sifts the grain from smaller weed seeds. The weed seeds are channelled to a high speed rotor which crushes and destroys them so they cannot germinate. This reduces the number of weed seeds in the soil, called the seedbank, and reduces the potential for weed growth, which can compete with crops.

Find out more about careers like agricultural engineers at:
www.careerharvest.com.au/possibilities/engineer/





On Farm Innovation

James Barr: Agricultural Engineer

James Barr chose to study mechanical engineering with the aim of becoming an agricultural engineer.

After completing his degree, he won a PhD scholarship supported by the GRDC, the South Australian Grains Industry Trust and University of South Australia. He is now studying soil movement and designing a new seeding system which may enable growers to increase the speed of seeding while minimising soil disturbance.

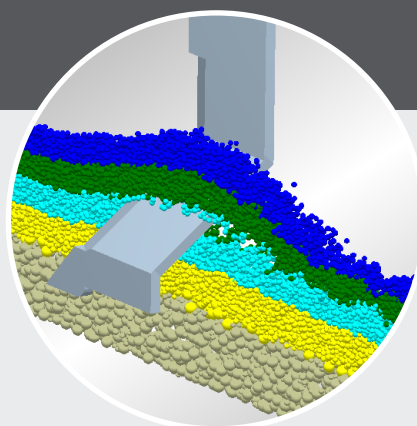
James' research uses a 'bent leg' seeding tyne which is the part of the seeder which cuts a groove into the soil to place the seed. This design allows the grower to operate at the same ground

speeds as other seeders. It means seeds are placed at an ideal depth in the soil and it minimises any issues when soil is moved during seeding.

"The research is exciting as I am using the latest computer simulation models to predict soil throw under different seeding regimes," he says. "The development of these computer models will work towards improving soil-tool interaction modeling across a range of industry and research areas.

"My work is all about creating innovative solutions to improve the efficiency and accuracy of farming.

"A PhD is an incredible career move for someone interested in research. The overseas travel to research conferences is a bonus of doing a



A computer simulation model helps James understand how the bent leg tyne will operate in the field.

PhD – I have had the opportunity to present my research to international audiences in France, the United Kingdom and America. While I am learning a great deal, it is satisfying to see that our Australian scientists really are at the forefront of agricultural research."

Production, Sustainability and Productivity Advice

Kate Wilson: Agronomist

As an agronomist, Kate Wilson works as a specialised soil and plant scientist advising growers how to improve their on-farm productivity.

Kate (pictured below) has been an agronomic consultant for more than 20 years and is in a senior position with AGRIVision consultants, based at Swan Hill.

"I am particularly interested in soil science and helping growers manage their soils sustainably," she says.

"Since soils host a quarter of the world's biodiversity, are important for food security and are essential to support many diverse ecosystems, it is essential

they are managed well. In fact, the FAO (Food and Agriculture Organization of the United Nations) estimates that 95 percent of the world's food is directly and indirectly produced on soils. They also state that healthy soils are the basis for healthy food.

"I work with growers to drive the adoption of no-till cropping systems. No-till means growers do not disturb the soil by ploughing, also known as tillage, and they retain the stubble through

each season to minimise erosion."

Along with improved farm management solutions, Kate takes a lead role in supporting growers to use farm management software.

"With so many growers generating large amounts of data, such as variety choice, fertiliser and pest management applications, grain marketing and managing business cashflow, using new business management systems is a must," she says.

DID YOU KNOW?

Soil is one of the most diverse habitats on earth.

Soil biota have an important role in maintaining soil structure, nutrient cycling, decomposition of organic matter, gas exchange and plant growth.

A single gram of soil may contain millions of individuals and several thousand species of bacteria.

A healthy soil contains "tens of species" of nematodes.

Soil communities are amazing - nowhere else in nature are species so densely packed.

Reference: www.soils.org/IYS



"Overall, I have loved working as an agronomist, its a rewarding career that sees me working outdoors, with people and making decisions which results in more productive and sustainable businesses,"



Innovator and Technology Guru

Leighton Wilksch



With concerns about the risks of farming due to climate variability, many growers are turning to technology to help guide their farming decisions.

To assist with the technology and decision-making, ag innovator Leighton Wilksch (pictured above) started his own business specialising in precision technologies.

Growing up on a dryland cropping farm at Yeelanna on Eyre Peninsula, Leighton saw his father Max implement practices such as full stubble retention, pulse rotations and continuous minimum-till cropping many years before they became mainstream. It was on his family farm that Leighton had his first introduction to how innovation could be used to build yields and profitability.

After completing a Bachelor of Agriculture, Leighton worked as an agronomist then followed his passion for technology.

“Working with soil moisture probes has opened my eyes, and now many growers’ eyes, to how science, technology, engineering and maths can be used to improve agriculture,” he says.

“Since rainfall is one of the greatest variabilities and therefore risk factors on-farm, growers need a sound understanding of how much and when it is likely to fall. They then need to know if the rain is making it into the soil profile to a region where plant roots can use it.

“The timing and amount of rain affects decisions such as what variety to plant, what time of year to plant it, when to

apply fertilisers, what diseases will be present and yield.”

Leighton says soil moisture probes track moisture at 10-centimetre intervals through the soil profile using a series of sensors. Data is then sent to growers via text message or email.

“Collecting multiple years of data can give a clear picture of how much soil moisture there was at any point in time compared to previous seasons. It also tells the grower where the moisture is in the soil profile and from where the plant roots are actively drawing moisture.

“My role is to develop the technology and support growers to manage and interpret the data. Each day I use critical thinking and problem solving. The opportunities for new technologies are endless!”

Could this be you?

The Grains Industry – Full of Opportunities



Australia's grain industry is projected to be affected by a changing climate in the future. The GRDC is investing in research to increase growers' knowledge and ability to apply new on-farm solutions to manage their farming enterprise in a changing climate and reduce greenhouse emissions.

Since most Australian farms rely on rainfall alone with limited irrigation in broadacre cropping, there is a need for new research solutions to help farmers manage periods of low rainfall or drought, new weather forecasting systems, better on-farm weather monitoring and drought tolerant varieties.

We also need to be producing more food using the most sustainable farming practices possible.

Can you help?

For more information visit:
www.grdc.com.au