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Robots could be the future of fruit picking

Australia's next oil boom might just come from plants

NEW research is critical in fight against glyphosate resistance

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THE AUSTRALIAN AGRONOMIST

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AUSTRALIA'S NEXT OIL BOOM MIGHT JUST COME FROM PLANTS

THE CSIRO AND US-BASED COMPANY AMFORA RECENTLY SIGNED AN AGREEMENT THAT WILL ADVANCE DEVELOPMENT AND COMMERCIALISATION OF THE TECHNOLOGY TO PRODUCE ENERGY-RICH FEED FOR LIVESTOCK.

Innovation Leader with CSIRO Agriculture and Food, Dr Allan Green, said that this was the first of many applications of the technology, which could also be used for human food, biofuels and industrial uses.

"Previously it has only been possible to extract oil from the oil-rich seeds and fruits of some specialised plants, such as canola, soybean, sunflower, coconut and oil palm. What we have been able to do is switch on this high-level oil production in vegetative tissue, such as in stems and leaves, as well." Allan explained.

In some plants, the research team has been able to get around 35 per cent oil content into vegetative tissue, the same amount as in many oil seed crops.

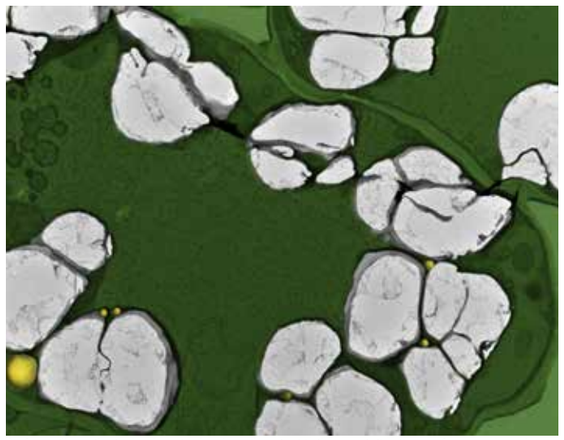
"If the technology were applied to existing oil crops it could potentially treble oil productivity and greatly expand renewable oil production worldwide," Allan said.

"We are using solar energy captured by the plant to convert the leaf's starch reserves into more energy-dense oil molecules, which significantly increases the energy value of the vegetative tissue where the oil accumulates," he went on to add.

CSIRO Chief Executive Larry Marshall said the work demonstrates the capacity of Australian researchers to develop innovative solutions for global industries.

"It is estimated that in 20 years' time we will need 50 per cent more plant-based oils just to meet the nutritional needs of a global population, and there is also a growing demand for renewable biofuels," Larry said.

"A transformational approach was needed to solve the increasing demand for plant oils within the limitations of our current agricultural footprint. CSIRO's relationship with Amfora, under which CSIRO will become a significant shareholder, is an excellent demonstration of our Strategy 2020 in action. We are driving profound global impact from this breakthrough innovation, benefiting Australian farmers and securing a revenue stream back to Australia to support further research that will keep Australia at the leading edge of competition," Larry explained.



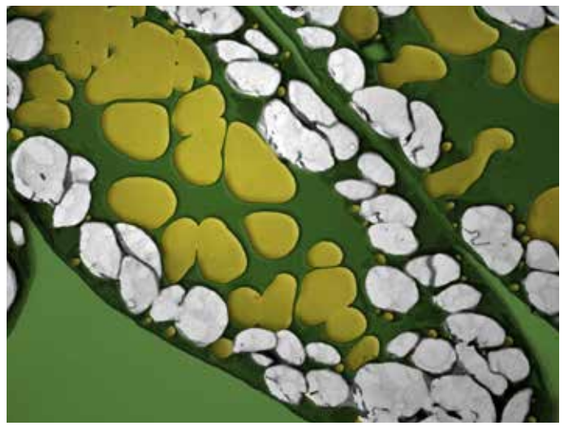
Amfora will use the technology to develop oil content in the vegetative tissue of corn and sorghum.

Amfora will use the technology to develop oil content in the vegetative tissue of corn and sorghum, meaning they can market a feed for dairy farmers that does not require them to purchase additional oils, such as tallow or cotton seed, to supplement feeds.

Dairy cattle require around seven per cent fat in their diet to produce milk. If their feed already contains this fat in the form of oil then this means less agricultural land is needed to produce feed and fewer greenhouse gas emissions are produced from feed production.

The agreement with Amfora is the first major application for the high oil technology. It provides a direct path to market as the oil does not need to be extracted from the leaves before it is fed to cattle.

Future applications, such as the production of industrial oils and bio-based diesel, will require further industrial supply chain development to customise techniques for extracting the oil and converting it to suitable products.



Research by CSIRO now makes it possible to produce oil in the leaves and stems of plants as well as the seeds which promises to be a game changer in the global production of renewable oils.

Dairy cattle feeding on sorghum. ©John Eveson/ FLPA/ Minden Pictures

"We are using solar energy captured by the plant to convert the leaf's starch reserves into more energy-dense oil molecules, which significantly increases the energy value of the vegetative tissue where the oil accumulates."

Dr Allan Green

ROBOTS COULD BE THE FUTURE OF FRUIT PICKING

IT'S POSSIBLE THAT ROBOTIC FRUIT PICKERS MAY HELP ORCHARDS WITH WORKER SHORTAGE.

For example, harvesting vast fruit orchards in the state of Washington in the United States each year requires thousands of farm workers, and many of them work illegally in the country. That system could eventually change dramatically, as at least two companies are rushing to get robotic fruit-picking machines to market.

The robotic pickers don't get tired and can work 24 hours a day.

"Human pickers are getting scarce," said Gad Kober, a co-founder of Israel-based FFRobotics.

"Young people do not want to work in farms, and elderly pickers are slowly retiring," he added.

While the demographic make-up of the Australian fruit picking may be different, the potential implications of mechanisation of the harvesting process could possibly have a similar effect.

This situation sees FFRobotics and Abundant Robotics, of Hayward, California, are racing to get their mechanical pickers to market within the next couple of years.

Harvest has been mechanised for large portions of the agriculture industry such as wheat, corn, green beans and tomatoes for some time. But for more fragile commodities like apples, berries, table grapes and lettuce, where the crop's appearance is especially important, harvest is still done by hand.

Members of Washington's US$7.5 billion (NZ$10.92) annual agriculture industry have long grappled with labour shortages, and depend on workers coming up from Mexico each year to harvest many crops.

But President Donald Trump's hard line against immigrants in the United States illegally has many farmers in the country looking for alternative harvest methods. Some have purchased new equipment to try to reduce the number of workers they'll need, while others have lobbied politicians to get them to deal with immigration in a way that minimises harm to their livelihoods.

"Who knows what this administration will do or not do?" said Jim McFerson, head of the Washington State Tree Fruit Research Centre in Wenatchee. For farmers, "it's a question of survival" he added.

"We are evolving the tree architecture and apple placement to be compatible with robotics," Karen said, a process called "robot-ready."

Karen Lewis

Washington leads the nation in production of apples and several other crops. Harvest starts in the spring with asparagus and runs until all the apples are off the trees in late autumn.

The work is hard and dangerous, and has long drawn Mexican workers to central Washington, where several counties near the Canadian border are now majority-Hispanic. Experienced pickers, who are paid by the bin, can make more than US$200 a day.

Advocates for farm workers say robot pickers will have a negative effect.

The eventual loss of jobs for humans will be huge, said Erik Nicholson of Seattle, an official with the United Farm Workers union. He estimated half of the state's farm workers are immigrants who are in the country illegally.

But many of them have settled in Washington and are productive members of the community, he said.

"They are scared of losing their jobs to mechanisation. A robot is not going to rent a house, buy clothing for their kids, buy food in a grocery and reinvest that money in the local economy," Erik said.

While financial details are not available, the builders say the robotic pickers should pay for themselves in two years. That puts the likely cost of the machines in the hundreds of thousands of dollars each.

FFRobotics is developing a machine that has three-fingered grips to grab fruit and twist or clip it from a branch. The machine would have between four and 12 robotic arms, and can pick up to 10,000 apples an hour, Gad said.

Gad said one machine would be able to harvest a variety of crops, taking 85 to 90 per cent of the crop off the trees. Humans could pick the rest.

Abundant Robotics is working on a picker that uses suction to vacuum apples off trees.

Plans for the robotic harvesters, including a goal of getting them to market before 2019, were discussed in February at an international convention of fruit growers in Wenatchee, Washington.

The two robot makers are likely to hit their production goals, said Karen Lewis, a Washington State University cooperative extension agent who has studied the issue.

"Both of them will be in the field with prototypes this autumn," Karen said, calling the robotic harvesters a "game changer."

But for the machines to work, apples and other crops must be grown in new trellis systems that allow robots to see and harvest the fruit, she said.

"We are evolving the tree architecture and apple placement to be compatible with robotics," Karen said, a process called "robot ready."

Large farming operations likely will be first to adopt the machines, but it might be decades before their use is widespread.

"I think for the next 10 to 20 years, they will be used by some growers to supplement regular picking crews and to serve as a backstop for picker shortages," said Mike Gempler of the Washington Growers League in Yakima. Reliability and cost will determine if their use expands.

Republican US Representative Dan Newhouse, whose family owns a large farming operation in Washington's Yakima Valley, said the industry is deeply interested in alternatives to human labour.

"We are absolutely looking at ways we can increase our efficiency," said Dan, adding his family's farm each year employs some 120 farm workers, many of them picking cherries and nectarines.

The industry has no choice but to embrace mechanisation, said Mark Powers, president of the Northwest Horticultural Council, a trade group for farmers in Yakima, Washington.

"We don't see some miraculous new source of labour appearing on the horizon," Mark said. "We think labour will continue to be a scarce resource," he concluded.

No doubt orchardists in Australia will pay close attention to the launch of these two new robotic harvesters with interest.

UNLOCKING THE GENETIC SECRETS OF LEGENDARY BULLS

The genes of 50 top bulls have been sequenced in an effort to understand how genes from temperate cattle have influenced important production traits in the modern Brahman breed.

The Sequencing the Legends project is led by Professor Steve Moore, Centre for Animal Sciences Director at the Queensland Alliance for Agriculture and Food Innovation (QAAFI), a combined University of Queensland and Queensland Government research institute.

“We are unpacking the entire DNA sequences of 50 influential animals then honing in on the genes associated with specific traits in order to capture the best genetics in the Brahman breed,” Steve said.

“Understanding the genetics underlying production traits in Australian tropically adapted cattle is essential for further breed development and crossbreeding strategies. Brahmans are adapted to tropical climates and there have been more than 300,000 years of separation between Bos indicus cattle such as Brahman and the Bos taurus cattle breeds that are important to temperate production systems,” he went on to explain.

Queensland is home to almost half of Australia’s beef cattle, with a mostly Brahman influence.

But the Brahman genome has been found to contain around seven to 10 per cent Bos taurus genes, a legacy of the breed formation.

“We were not sure how Bos taurus genes in the Brahman genome might affect the animals performance. Is it just a random mix or have specific taurine genes been retained in Brahmans because they were associated with desirable production traits?” Steve said.

Professor Moore, his QAAFI colleague Professor Ben Hayes, and Dr Brian Burns from the Department of Agriculture and Fisheries (DAF), lead the research team that is sequencing the DNA from Brahman sires, some dating as far back as the mid-1950s.

Steve, DAF and the Australian Brahman Breeders Association were instrumental in selecting and locating the most influential sires for the project.

Results from the Sequencing the Legends project are still being processed but indicate that the Bos taurus genes lurking in the Brahman genome may have been selected for important production traits associated with fertility, growth and temperament.

“This data will help us to better direct breeding decisions and thus boost the productivity and profitability of the northern beef industry,” Steve said.

NEW FORAGE VALUE INDEX FOR AUSTRALIA’S DAIRY INDUSTRY

Australian dairy farmers can now make more informed, profitable decisions when choosing the best perennial ryegrass for their farming system and forage needs, following the launch of the Australian Forage Value Index (FVI).

Developed by Dairy Australia, in partnership with Agriculture Victoria, Meat and Livestock Australia and the Australian Seed Federation, the FVI is an independently-analysed, industry-endorsed economic index based on seasonal dry matter production.

Using a simple banding system, the FVI ranks the performance of 20 of Australia’s most popular perennial ryegrass varieties relative to the typical climactic conditions within each dairy region, providing farmers with another tool to help lift farm profitability.

Dairy Australia’s Group Manager Farm Profit and Capability, Chris Murphy, said there was currently no independent method available to assess the agronomic performance of the myriad of perennial ryegrass cultivars commercially available in Australia, until now.

“With little independent information on the traits and capabilities of these existing cultivars, farmers tend to stick with what they know and have used, which can result in lost production opportunity and reduced incentive to invest in new pasture cultivars,” Chris said.

“The Forage Value Index scores are calculated by multiplying the seasonal yields of each cultivar as determined by experimental trial data, with the economic value as determined by case study farms in different dairying regions,” he explained.

The economic values for the increased dry matter yields in the trials ranged from $0.15 - $0.37 per kilogram of extra dry matter.

Economic values are the change in operating profit for every kilogram of dry matter increase. The economic value varies with the season, for example, pasture grown on farm is worth more in winter than spring.

To be included in the FVI, each cultivar must have seasonal yield data from at least three, three-year trials using strict experimental protocols. All trial data was analysed by an accredited statistician and reviewed by a Technical Advisory Committee to determine its place within the FVI banding scale.

SCIENTISTS TWEAK PHOTOSYNTHESIS AND BOOST CROP YIELD, PROVING IT CAN BE DONE

BY DIANA YATES, LIFE SCIENCES

Researchers have reported that they can increase plant productivity by boosting levels of three proteins involved in photosynthesis.

In field trials, scientists saw increases of 14 percent to 20 percent in the growth of modified tobacco plants. The work confirms that photosynthesis can be made more efficient to increase plant yield, a hypothesis some in the scientific community once doubted was possible.

Many years of computational analysis and laboratory and field experiments led to the selection of the proteins targeted in the study. The researchers used tobacco because it is easily modified. Now they are focusing on food crops.

Stephen Long is plant biology and crop sciences professor at the University of Illinois. He led the study with postdoctoral researchers Katarzyna Glowacka and Johannes Kromdijk. Stephen said, “We don’t know for certain this approach will work in other crops, but because we’re targeting a universal process that is the same in all crops, we’re pretty sure it will.”

The team targeted a process plants use to shield themselves from excessive solar energy.

“Crop leaves exposed to full sunlight absorb more light than they can use. If they can’t get rid of this extra energy, it will actually bleach the leaf,” Stephen said.

He explained that plants protect themselves by making changes within the leaf that dissipate the excess energy as heat. This process is called non-photochemical quenching (NPQ).

“But when a cloud crosses the sun, or a leaf goes into the shade of another, it can take up to half an hour for that NPQ process to relax. In the shade, the lack of light limits photosynthesis, and NPQ is also wasting light as heat,” he went on to add.

Long and former graduate student Xinguang Zhu used a supercomputer at the National Centre for Supercomputing Applications at the University of Illinois to predict how much the slow recovery from NPQ reduces crop productivity over the course of a day. These calculations revealed “surprisingly high losses” of 7.5 percent to 30 percent, depending on the plant type and prevailing temperature Stephen said.

Long’s discussions with University of California, Berkeley researcher and study co-author Krishna Niyogi, an expert on the molecular processes underlying NPQ, suggested that boosting levels of three proteins might speed up the recovery process.

To test this concept, the team inserted a ‘cassette’ of the three genes (taken from the model plant Arabidopsis) into tobacco.

“The objective was simply to boost the level of three proteins already present in tobacco,” Stephen said.

The researchers grew seedlings from multiple experiments then tested how quickly the engineered plants responded to changes in available light.

A fluorescence imaging technique allowed the team to determine which of the transformed plants recovered more quickly upon transfer to shade.

“Crop leaves exposed to full sunlight absorb more light than they can use. If they can’t get rid of this extra energy, it will actually bleach the leaf.”

Professor Stephen P. Long

The researchers selected the three best performers and tested them in several field plots alongside plots of the unchanged tobacco.

Two of the modified plant lines consistently showed 20 percent higher productivity, and the third was 14 percent higher than the unaltered tobacco plants.

“Tobacco is grown for its leaves, which were substantially increased,” Johannes said. “But in food crops, it will be whatever we eat from the plant – the fruit, the seeds or the roots – that we will need to increase.”

Johannes said other experiments have demonstrated that increasing photosynthesis by exposing plants to high carbon dioxide results in more seeds in wheat, soy and rice.”

“Now we can do this genetically, and we are actively working on repeating our work in various food crops,” he added.

As computer models predicted, genetically modified plants are better able to make use of the limited sunlight available when their leaves go into the shade, researchers report. Graphic by Julie McMahon

Stephen P. Long, a professor of crop sciences and of plant biology, centre, with postdoctoral researchers Johannes Kromdijk, left, and Katarzyna Glowacka, increased plant yield by altering a mechanism plants use to protect themselves from excess solar energy. Photo by L. Brian Stauffer

“This finding offers some rare good news at a time of dire forecasts of future food shortages,” Katarzyna said.

“The United Nations predicts that by 2050 we’re going to need to produce about 70 percent more food on the land we’re currently using. My attitude is that it is very important to have these new technologies on the shelf now because it can take 20 years before such inventions can reach farmer’s fields. If we don’t do it now, we won’t have this solution when we need it,” Stephen explained.

The Bill and Melinda Gates Foundation funded this research, with the stipulation that any new agricultural products that result from the work be licensed in such a way that the technology is freely available to farmers in poor countries of Africa and South Asia.

This work was conducted as part of the Realising Increased Photosynthetic Efficiency program at the Carl R Woese Institute for Genomic Biology at Illinois. The findings were published in the journal Science.

IMPORTANT MERGER WILL REINFORCE MARKET LEADERSHIP POSITION

IT HAS RECENTLY BEEN ANNOUNCED THAT THE NUFARM AUSTRALIA AND CROP CARE SALES TEAMS WILL BE MERGED FROM 1 AUGUST 2017.

Nufarm Managing Director and CEO, Greg Hunt said the change is being made in response to customer feedback and a commitment to improve the overall service offering to the Australian market. The result will be a more streamlined and responsive customer experience.

“We want to be easy to do business with and believe that a single, focused sales organisation will enable us to better support and partner with our customers to grow their businesses,” said Greg.

“The Nufarm Australia and Crop Care sales teams have operated independently in the Australian crop protection market since Nufarm acquired the Crop Care business in 2002. The portfolio offerings of both brands today are complementary and can be more efficiently serviced by a single, coordinated sales organisation, which will now operate under the Nufarm Australia banner,” he explained more fully.

The rationalisation of the sales organisation follows other important changes made to the business in recent years.

“We have made many improvements throughout the business, including a recent investment of $14 million at our Raymond Road, Victoria production site, one of our three major Australian manufacturing facilities. Investments such as this enable us to reliably and competitively supply our local and international customers with the quality products they need to be successful,” Greg said.

He added that Nufarm is committed to providing customers with a valued range of products, and is investing in new product development that will result in an enhanced portfolio over coming years. He said the company is also assessing opportunities created by agribusiness industry consolidation.

Nufarm ANZ Regional General Manager, Peter O’Keeffe said that the changes announced are a direct result of listening to customers.

“Our channel partners have told us that they want us to be a major partner in their growth plans and that we can support them by being easy to do business with. By combining Nufarm and Crop Care we are creating one large but focused sales team, with stronger territory coverage and the ability to present customers with our full product portfolio,” Peter said.

“Both the Nufarm and Crop Care brands are synonymous with quality people, products, technical support and service and we believe the changes we are making will reinforce our market leadership position,” he added.

Peter emphasised the existing range of Nufarm and Crop Care products will continue to be available and, from 1 August 2017, products previously sold by Crop Care will be sold by Nufarm Australia. There will be no disruption to customers as these changes are implemented.

“We want to be easy to do business with and believe that a single, focused sales organisation will enable us to better support and partner with our customers to grow their businesses.”

Greg Hunt

MORE YELLOW SPOT RESISTANCE GENES DISCOVERED

Resistance to one of the most damaging wheat diseases, yellow spot, has been bolstered with the discovery of 11 new genes that will help make future varieties less susceptible to the fungal pathogen.

Western Australia's Department of Agriculture and Food has been working on a long running pre-breeding research collaboration, funded by the Grains Research and Development Corporation, which has identified a total of 19 genes with varying amounts of resistance to yellow spot.

Yellow spot is prevalent across the Western Australian grain belt every year, producing yield losses of up to 50 per cent and costing growers up to $30 per hectare in lost production and control costs.

Project leader, department senior plant pathologist Dr Manisha Shankar, said before the project commenced seven years ago there was only one known resistance gene within the Australian germplasm.

Manisha said the discovery of new resistance genes would give wheat breeders additional material from which to develop varieties with higher and more durable levels of resistance to yellow spot.

"Through this project we have been able to 'stack' a combination of three resistance genes into 32 lines which have been 'fixed' and are adapted to the western and southern regions," she said.

"Field and controlled environment trials have demonstrated that these lines are significantly more resistant than their parents and grandparents, providing confidence in the performance of the stacked genes. These lines are now being tested for yield and quality, while work has commenced on developing lines adapted to the northern region," she explained.

"In this second generation of the project, we are working on building gene stacks of four, five and six genes," Manisha added.

More than 1000 lines of novel germplasm from around the world have been screened to identify resistant material, mostly from Mexico, via the International Maize and Wheat Improvement Centre, and the Middle East, from the International Centre for Agricultural Research in Dry Areas project.

The research team is also exploring combining different sources of yellow spot resistance from Australian germplasm, using the four-way multiparent advanced generation intercross method, known as MAGIC.

"The use of MAGIC is to fine map resistance genes and incorporate the highly recombined lines directly into breeding programs," Manisha said.

Another spin-off research activity from the project is assessing how individual genes perform in isolation and different combinations.

"We are testing the performance of isogenic lines with one, two and three gene combinations in both long season and short season backgrounds," Manisha said.

"The results will give wheat breeders more information and confidence in how these genes influence each other in various combinations, aiding and accelerating the wheat breeding process," she explained.

The department continues to monitor the yellow spot fungal pathogen each year to determine whether it adapts to new resistant varieties.

"While tests have shown yellow spot is currently quite stable, it is important to stay ahead of the pathogen and to identify more genes and combinations of genes that can enhance resistance if it evolves," Manisha said.

The outcomes of the project's pre-breeding research are regularly provided to Australian commercial wheat breeders, which then take seven to 10 years to develop a new variety.

The project is currently in the second year of its second five year cycle with partners from the University of Adelaide, Agriculture Victoria, the University of Southern Queensland and Curtin University.

DAFWA technical officer Donna Foster (left), senior plant pathologist Dr Manisha Shankar and research officer Dorthe Jorgensen have been working to identify new yellow spot resistance genes to improve wheat production potential.

VIGILANT WEED CONTROL MAXIMISES PROFIT AT MARCHAGEE

BATTLING ANNUAL RYEGRASS IS AN EVER-EVOLVING PROCESS FOR FARMER MICK CALLAGHAN.

Herbicides once effective in controlling weeds on the family farm at Marchagee in Western Australia for Mick's parents, Molly and Bevan, have become futile over time due to resistance. It's meant Mick has had to become more vigilant when it comes to rotating chemicals and fighting resistance, as effective weed control is essential to maximising profit.

The property is farmed by Mick and his wife, Julia, as a total cropping enterprise using a minimum tillage system on predominately sandy soils.

The farm is situated near Coorow and receives an annual average rainfall of 350 mm, including 250-280 mm during the growing season.

Last year they cropped 7300 hectares and the program typically comprises 40% wheat, 20% canola, 20% barley and 20% lupins.

Mick has been farming full time since 1992 after a near 10-year stint working fly-in, fly-out at Argyle diamond mine and working on the farm during his rostered weeks off.

He said wild radish and annual ryegrass remained their biggest weed burdens, followed by brome grass, and over the years resistance to traditionally effective chemicals had become extremely obvious.

"As little as 10 years ago, we were using clethodim at what was considered a high rate of 200 mL/ha and now, 1 L/ha of the same product has no effect," Mick said.

"We've got to do anything we can to protect new chemicals that effectively control weeds like ryegrass and radish," he added emphatically.

Mick takes a keen interest in any trial work on resistance and new herbicides, particularly those done by independent farm groups such as the Liebe Group and West Midlands Group.

It was a trial that first introduced Mick to the pre-emergent herbicide, Sakura® 850 WG from Bayer, when he visited a small trial on a privately owned farm north of Coorow facilitated by the company's Customer Advisory Representative, Rick Horbury.

The same herbicide was also recommended by Mick's agronomist, Craig Topham from Agrarian Management in Geraldton.

"I went and had a look and spoke to the farmer who ran the trial. It was good to hear his feedback and he swore by it and that it effectively controlled annual ryegrass," Mick said.

"I'm someone who has to see a product in action before I believe it works, rather than just reading literature, which is why I like to look at independent trials. The main thing that stood out with Sakura was its flexibility," he added.

Alternative herbicides are applied pre-seeding and then they become active and attack germinating ryegrass, but they would stick to stubble and really need that soil contact. Sakura can wash off the straw and into the soil, which is a big advantage," Mick explained.

Containing the active ingredient, pyroxasulfone, Sakura controls annual ryegrass, barley grass, silver grass, annual phalaris and toad rush, and also suppresses wild oats (black oats) and brome grass in wheat (not durum wheat), triticale, chickpeas, field peas, lentils and lupins.

Bayer Commercial Sales Representative Ian Cook, Marchagee grower Mick Callaghan and Landmark Coorow Agronomist Andy Regan pictured discussing some of the latest developments in weed control in front of one of Mike's Miller Nitro self-propelled sprayers.

"I went and had a look and spoke to the farmer who ran the trial. It was good to hear his feedback and he swore by it and that it effectively controlled annual ryegrass."
Mick Callaghan

Mick said they never waited for rain to begin seeding, although last year was their earliest start on record, kicking off on March 28 with plenty of soil moisture. He said generally they would start around April 10, season dependent.

They began using Sakura when it became commercially available in 2012 and have been achieving a control rate of about 80% of annual ryegrass and brome grass in wheat crops.

"Sakura has its place here and seems to be working," he said.

"We use it to cover 1000 ha each year, which is one third of our wheat program and that is generally due to the cost. We would use more if we could. But it allows us flexibility during seeding and what value do you put on that?" Mick added.

"We'll ideally incorporate Sakura within two days of seeding, but we have the ability to spray it out and seed within three days, rather than four to six hours with trifluralin. It can wash off straw and into the soil, so I'm achieving good value with the product. Even though it's a high-priced product, you should get very good weed control. If I used trifluralin in a similar area, I may lose up to 50% if it stuck to the straw, and then a further 20-30% through volatilisation," he explained.

This year, in conjunction with his agronomist, Mick said they would start to do some mixes with other chemicals such as trifluralin to avoid total reliance on Sakura.

He said they used other Integrated Weed Management (IWM) practices such as windrow burning to help control weed seed numbers, as outlined in the Diversity Can't Wait website.

"Weed control is our main priority. If you can control weeds eight years out of 10, you can make money farming in this area. I just appreciate that companies are out there trying to work on the resistance issue and we need more chemicals like Sakura, so I can maintain minimum tillage practices," Mick said.

According to Landmark Coorow Agronomist Andy Regan, Mick's story is not an isolated one, with Sakura being one of the most popular pre-emergent herbicides in the region.

Andy said he generally recommended to clients to use Sakura in a rotation with canola.

"I recommend using Sakura following a canola rotation, so you get a really clean crop during the canola phase and then go in with Sakura to get a really clean wheat crop," Andy said.

"It's such an effective product, but also growers don't have that pressure of a small window of incorporation," he added.

Andy said a grass control trial last year at four sites across Western Australia, including Coorow, highlighted just how valuable Sakura could be, and citing its impact on crop yield and the extended weed control achieved.

The trial, run by Bayer's Rick Horbury, compared the performance of a range of different pre-emergent grass control options, including prosulfocarb, trifluralin, Boxer Gold®, Sakura and Avadex® Xtra. Different tank mixes of some of the products were used and applications were performed at the lowest and highest label rates.

"Sakura achieved 90% control and yielded an average 2.14 t/ha, achieving an average $73.48/ha return on investment," Andy said.

"The return on investment is huge by using a premium product like Sakura, so while it can seem expensive up front, it's well worth the cost when it's making such a big difference to the bottom line," he concluded.

A NEW TOOL FOR SPRAY DRIFT MANAGEMENT

PESTS, WEEDS AND DISEASES ARE A CONSTANT THREAT TO OUR NATION'S FOOD, FEED AND FIBRE PRODUCTION MAKING THE USE OF CROP PROTECTION PRODUCTS ESSENTIAL IN AUSTRALIA AND AROUND THE WORLD. THEIR SAFE AND SUSTAINABLE USE IS OF CRITICAL IMPORTANCE TO FARMERS, CONTRACTORS AND THE AUSTRALIAN COMMUNITY AT LARGE.

With this in mind, CropLife Australia, the peak industry organisation for the plant science industry, has launched MyAgCHEMuse, a best practice reference guide that provides the most up-to-date advice and tools to help users of crop protection products manage spray drift.

This new reference guide consists of five key sections in an easy to navigate format which makes it effective for information to be reviewed and updated. This ensures MyAgCHEMuse is and will continue to be the most relevant and up-to-date source of information on managing spray drift.

Each section provides information on specific aspects of spray drift management and the use of crop protection products with a range of links to additional resources and the latest tools from leaders in the industry.

- **MyCROPprotection** focuses on the science and safety of all crop protection products, with key links to the Australian Pesticides and Veterinary Medicines Authority (Australia's agricultural chemical regulator) database and other relevant tools.
- **MyProduce** focuses on the safety and quality of farm produce, with key links to the National Residue Survey and various international standards databases.
- **MyFarm** focuses on the sustainability and future of the farming environment with links to tools such as GroundSpray and SnapCard spray app.
- **MyCommunity** focuses on farm practices that contribute to the wealth and vitality of the farming and broader community with key links to a range of spray application management weather forecasting tools among other relevant references.
- The final section, **MyFamily**, focuses on the health, wellbeing and financial security of working family farms with information on the safe application and distribution of crop protection products, and key links to chemical transport, storage use and disposal of crop protection products.

MyAgCHEMuse can be accessed via desktop, tablet or smart phone and is completely free to download. This easy to use digital format means accessing information is easier than ever.

MyAgCHEMuse has gained substantial partnership support from organisations that represent farmers and growers across Australia including Aerial Application Association of Australia, AgForce, Cotton Australia, Grain Producers Australia, Northern Territory Farmers Association, NSW Farmers' Association, Pastoralists and Graziers Association of WA, Queensland Farmers' Federation and Western Australian Farmers Federation.

"Australian farmers have a proud tradition of embracing world-class farming practices and its best practice reference guides, such as this, that equip farmers with advice and tools to ensure they maintain the effectiveness of crucial crop protection products."
Matthew Cossey

The Guide also brings together industry knowledge in one convenient location with key links to GRDC's tips on spraying and a key section on spraying tools and apps, which includes The Australian Performance Calculator.

The MyAgCHEMuse initiative continues CropLife's long standing and world recognised commitment to whole-of-life-cycle product stewardship.

Matthew Cossey, Chief Executive Officer of CropLife Australia said Australian farmers are excellent stewards of their land and now more than ever need to continue to deliver market and community confidence through best practice crop protection product use and demonstrated stewardship.

"Australian farmers have a proud tradition of embracing world-class farming practices and its best practice reference guides, such as this, that equip farmers with advice and tools to ensure they maintain the effectiveness of crucial crop protection products," he said.

"The purpose of these guides is to foster the responsible and sustainable use of crop protection products. Thereby assisting in their safe and proper use and extending the life of these vital farming tools, which continue to be crucial to the economic and environmental sustainability of Australian agriculture."

MyAgCHEMuse, is the latest installment in CropLife Australia's StewardshipFirst program, which also includes BeeConnected, a nation-wide, user-driven smart-phone app that enables collaboration between beekeepers, farmers and spray contractors to facilitate best-practice pollinator protection.

MyAgCHEMuse, BeeConnected and all other CropLife StewardshipFirst programs can be download for free on the CropLife Australia website: www.croplife.org.au

JOINT STATEMENT TO GROW AGRICULTURAL TRADE WITH CHINA

The Coalition Government recently signed a Joint Statement with China to deliver important market access for Australia's red meat and live animal export industries. The deal which also promotes food safety and security is a key outcome of the visit of Chinese Premier Li Keqiang and is estimated to be worth in excess of $400 million per year for Australia's meat industry, as well as helping to provide a boost for regional jobs.

Deputy Prime Minister and Minister for Agriculture and Water Resources, Barnaby Joyce, said the Joint Statement on Enhancing Inspection and Quarantine Cooperation between Australia and the People's Republic of China will expand and improve Australia's meat market access by allowing more meat and live animal exporters access to China and progressing new trade opportunities.

"The Coalition is committed to building on our record prices and record volume of trade with China. We won't ever rest on our laurels in pursuit of expanding Australia's trading partnerships," he said.

Minister Joyce said he was proud to sign this Joint Statement with China's Foreign Minister Wang Yi to deliver a valuable and mutually beneficial agreement that will support the relationship with one of our most important trading partners.

"Through the Joint Statement on Enhancing Inspection and Quarantine Cooperation, we are helping more Australian meat exporters expand access to China, including more chilled meat," Minister Joyce said.

"Industry has estimated that the trade this Joint Statement will facilitate could be worth in excess of $400 million per year to our meat industry, which could lead to significantly improved farm gate returns across the nation," he added.

There are currently 47 integrated meat processing establishments and 23 cold stores which can export meat to China, but only 11 are permitted to export chilled meat.

The Joint Statement will unlock a number of trade restrictions currently in place to support Australian meat and livestock exports including:

Expanding the chilled meat trade and expediting the listing of 15 additional establishments eligible to export meat to China.

Advancing Australia's access for tripe exports to China and initiating trade in donkey meat and edible skins to China.

Promoting a protocol for the export of Australian slaughter sheep and goats.

"China is already Australia's largest sheep meat market, worth $240 million in 2016, and is our fourth largest beef market worth $670 million in the same year," Minister Joyce said.

"Together Australia and China are focused on promoting food security and safety and ensuring continued access to safe, high quality and reliable produce," he added.

A Salmon Statement of Intent (SOI) was also signed between the ministers to progress negotiations on trade in salmon sourced from approved countries, processed in China, and exported to Australia.

Minister for Trade, Tourism and Investment, Steven Ciobo, said increasing the number of approved meat processing establishments will create more export opportunities for red meat trade with China.

"Australia's beef exports to China have grown from less than $100 million in 2011 to exceed $600 million in 2016," he said.

Minister Ciobo said agreement will enable Australian beef producers to continue meeting China's growing demand for high quality beef.

"This, alongside continued cuts under ChAFTA to the tariffs Australian beef faces in China, will bring further significant benefits for regional Australia and employment in the red meat industry," he added.

Assistant Minister for Trade, Tourism and Investment Keith Pitt said the agreement was a significant opportunity to increase the growth of the industry in regional Australia, leading to more jobs.

"The majority of meat production and processing facilities are located in regional areas, so this will have a flow-on effect also to suppliers for these businesses including equipment, feed stock, infrastructure and transport," Assistant Minister Pitt said.

PLANTING NATIVE VEGETATION FOR PRODUCTIVE CROPS

The University of Adelaide, working with South Australian industry groups, is helping farmers and growers design and implement native plantings to support bee and other insect populations needed to pollinate their crops and orchards.

This is the first such project in Australia and it is expected to be a win-win for both growers and biodiversity, with enhanced productivity through improved pollination and increased biodiversity through revegetation with native plants.

"We know that crop pollination can be improved by revegetation on or around farms that supports pollinators. It's a strategy used in major horticultural regions in Europe and the United States, but not yet in Australia," said project co-leader Dr Katja Hogendoorn, from the University's School of Agriculture, Food and Wine.

Crops such as lucerne, almonds, apples and cherries rely on insect pollinators to pollinate their flowers to produce seeds, nuts or fruit. Canola yield and quality can also be improved with good pollination services.

"Like humans, bees need a varied diet, so, in the case of bees, pollen and nectar from a range of flowers. Crops provide one-sided nutrition and when they finish flowering, there is often very little alternative food for pollinators present in the landscape. We are looking to improve the landscape to secure pollinator populations and their crop pollination services," Katya said.

Researchers from the University of Adelaide are mapping the activity of honeybees and native pollinators in areas of revegetation and native vegetation around different crops in South Australia. They will create a short-list of the most useful pollinating species and identify the plants used by the pollinators as sources of pollen and nectar. This will allow strategic choices in revegetation with a selection of the plants that benefit crop pollinators.

"An important outcome from the project will be planting guides and a web-based tool which will enable users to map vegetation plantings around their crops that will provide the best habitat for pollinators in order to maximise productivity gains," said project co-leader Professor Andrew Lowe, Chair of Plant Conservation Biology in the University's Environment Institute.

"This project is a great example of how the University is using innovative thinking to improve productivity and sustainability in cropping and food," he added.

Project partners include Lucerne Australia, Apple and Pear Growers of SA, Trees for Life, O'Connor NRM, Primary Industries and Regions SA (PIRSA), Department of Environment, Water and Natural Resources, Almond Board of Australia, Native Vegetation Council, Greening Australia, South Australian Apiarist Association, various NRM boards and Rural Industries Research and Development Corporation.

Susie Green is Executive Officer, Apple & Pear Growers Association of South Australia. "We are hopeful that the project will provide apple and pear growers with the knowledge and tools to boost their pollination efficacy by providing food sources for native bees, feral honey bees and hived bees," she said.

Jenny Aitken is Executive Officer, Lucerne Australia. She commented, "Lucerne Australia is hoping that this project will give growers the surety of understanding how to identify other pollinators, apart from honey bees and how to manage their cropping schedules and insect control to enhance their effectiveness."

The University of Adelaide will further collaborate with the University of Sydney to assess local densities of wild honey bees in pollination dependent crops and with the University of New England and ANU to understand the economic value of individual crop pollinating species for different crops.

This project is supported through funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit Programme. The total value of the project is $9M, of which $4.5M is allocated to activities in South Australia.

LESSONS LEARNT FROM BIG DATA USE IN AMERICA COULD CUT COSTS FOR AUSTRALIAN FARMERS

A STUDY OF BIG DATA USE IN AMERICA HAS REVEALED THE POTENTIAL FOR DECISION AGRICULTURE TO SIGNIFICANTLY CUT FARM COSTS AND IMPROVE OUTCOMES TO MEET CONSUMER DEMANDS AND REGULATORY REQUIREMENTS.

The Accelerating Precision Agriculture to Decision Agriculture research project is establishing international best practice in data use to develop frameworks, policies and guidelines for Australian farmers, that will remove current barriers and capitalise on the full impact of digital technology.

Australian Farm Institute General Manager Research, Richard Heath, said the landscape has changed significantly in America over the past two years, with the emergence of farm data cooperatives and new analytics frameworks that use aggregated data to deliver benefits across all farm operations.

"Decision agriculture is using analytical platforms, accessing aggregated data from different machines and digital technologies and from multiple farms, to help farmers get a faster, cheaper or better result," Richard said.

"By looking at case studies in the United States we can see how big data is being used to improve outcomes in all kinds of areas, from variety selection to chemical application and negotiating the right price for farm inputs. Some of the platforms we looked at were reporting input cost savings of up to 50 per cent for farmers," Richard went on to explain.

"Others are reducing the time and uncertainty involved in meeting compliance requirements in heavily regulated industries, by integrating farm and machinery data with stewardship programs," he added.

Richard said an interesting development in America is the adaptation of technology used in other industries, to address the needs of agriculture.

"One of the platforms we looked at uses a barcode to track products from the farm to the retailer. This has flow-on benefits for the producer, including meeting a greater consumer demand for product knowledge and quality assurance," he added.

Based on America's recent experiences, Richard said Australia might soon see the emergence of farm data cooperatives that operate independently to machinery or chemical companies.

"A key benefit for growers is more control over how farm data is used. These cooperatives offer a central data repository with protections around access and privacy, and in some cases, help to negotiate with organisations who want the data. Some offer analytics services as a value add, providing management insights on key issues like yield by soil type or fertiliser regimes," Richard explained.

Richard said the more complex cooperatives give individual growers access to anonymous, accumulated data, in an easy to use format, which is used as a benchmark for making critical operational decisions, around agronomic practices, pricing and finance.

"Big data use is going to be critical to profits in agriculture in the future and Australia can't afford to get left behind," Richard said.

Learning from successes overseas is just one part of a broader project to give farmers the confidence, legal guidance and tools they need to access datasets, analytical platforms and data systems.

Led by the Cotton Research and Development Corporation, the project is jointly funded by the Department of Agriculture and Water Resources Rural R&D For Profit Programme and all 15 Rural Development Corporations, contributing more than $3.5 million over 18 months.

Accelerating Precision Agriculture to Decision Agriculture is the first research project to have all Australian RDCs as partners and has engaged research support from three universities, CSIRO Data 61, the Australian Farm Institute and the Data to Decisions CRC.

"Big data use is going to be critical to profits in agriculture in the future and Australia can't afford to get left behind."

Richard Heath

NEW WEED CONTROL FOR LUCERNE AND FENCE LINES

Farmers now have a new option for controlling tough weeds in established lucerne and along fence lines.

For the first time, Nufarm's Terrain WDG herbicide has been registered for controlling annual ryegrass, sow thistle, fleabane, shepherd's purse, deadnettle, silver grass and winter grass for autumn and early winter application in lucerne.

Terrain has also been registered to control these and other tough weeds along fence lines.

Nufarm research and development officer for New South Wales, Mitch Allen, said the new registrations for Terrain (flumioxazin) open the door to more effective weed control programs in lucerne and along fence lines.

"Terrain's new registrations allow farmers to control problem weeds in autumn and early winter, rather than the current practice of waiting until winter or spring when the weeds are larger, more competitive and harder to control," Mitch said.

"Instead of using a paraquat-diuron tank mix on dormant lucerne in winter, we are asking channel partners to recommend farmers apply Terrain just as weeds germinate at the break of the season. This removes weed competition from the start of the season and keeps lucerne clean for three to four months, thanks to the residual activity of Terrain. Terrain also has excellent crop safety and the lucerne recovers far better than traditional winter cleaning options," Mitch explained.

Mitch said while Terrain is best used for its residual activity and knockdown activity on small broadleaf weeds, he recommends the use of a knockdown herbicide such as Revolver for a clean start in lucerne if emerged weeds are present.

A Group G herbicide, Nufarm research and development shows that Terrain has excellent residual activity in the soil, but it is non-volatile and can be incorporated by rain or irrigation up to three weeks after application.

"To maximise its effectiveness, we recommend that Terrain is applied after the lucerne is grazed or cut with less than 15 cms of growth, so there is good contact with the soil," Mitch said.

He recommended the same early approach to cleaning fence lines with Terrain, when weeds are small and easier to control than waiting till spring, especially for problem weeds like Group A and glyphosate resistant annual ryegrass and fleabane.

"We know that weeds growing along fence lines become problem weeds when they spread into the crop, so it's good practice to go in early in April or May when the weeds are small and before the main flush in winter," Mitch said.

"An early tank mix of Terrain and weedmaster ARGO or Revolver targets tough and resistant weeds when small, and uses the residual activity of Terrain to give season long control," he added.

Registered for fence line spraying at the higher 700 g/ha rate, Terrain gives effective control of annual ryegrass, barnyard grass, sow thistle, feathertop Rhodes grass and fleabane and suppresses a range of other weeds.

The non-volatile formulation of Terrain means it is stable in the soil and has a three-week incorporation period.

"This soil stability means channel partners can safely recommend Terrain for use around trees on fence lines, because the herbicide is not translocated," Mitch said.

Terrain is packaged in 8 x 300 gram water soluble sachets, which dissolve easily in the spray tank without any residue in the spray tank.

Shirquat 250 + Terrain (3 L/ha + 700 g/ha) 8 weeks post application

INTERNATIONAL REPORT CONFIRMS GM CROPS ARE DELIVERING BENEFITS

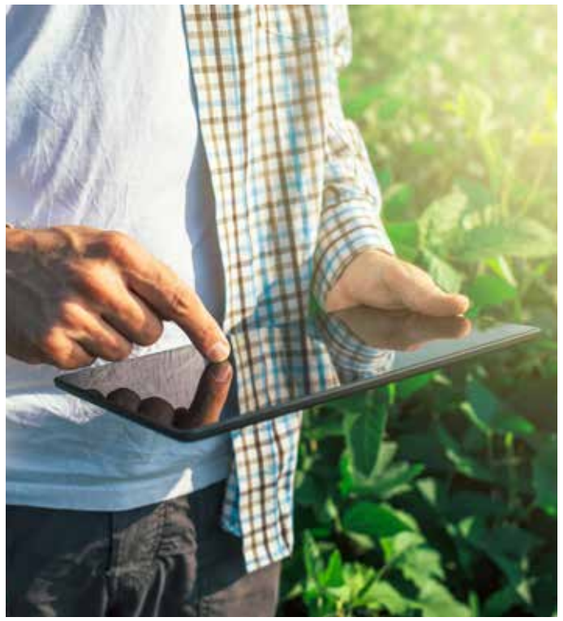
The latest independent report published by the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) confirms that twenty-one years of plant biotechnology has had significant benefits for farmers, communities, consumers, economies and the environment, both in Australia and globally.

"The report confirms the importance of Australian farmers being able to choose innovative, safe and approved technologies to remain globally competitive, meet the requirements of increased food demand and farm sustainably in a changing and challenging climate," said Matthew Cossey, Chief Executive Officer of CropLife Australia.

"Modern farming using biotechnology innovation will play an increasingly crucial role in food, feed and fibre production in Australia. This report highlights the need to ensure non-science based and unnecessary costly regulation doesn't hold Australia back from reaping the benefits and being a world leader in agricultural innovation. This is further evidence that the remaining state moratoria on genetically modified (GM) crops are antiquated and serve no purpose," Matthew explained.

"The ISAAA report marks twenty-one years of successful commercialisation of GM crops with more than 5.3 billion acres of GM crops planted since 1996 across 19 developing and seven industrialised countries representing more than 60 per cent of the world's population. This 110-fold increase in plantings since 1996 makes GM crops the fastest adopted crop technology in recent times," he added.

The report also highlights that since 1996 GM crops have improved the sustainable use of pesticides, saving 620 million kg of active ingredient, and conserved biodiversity by saving more than 430 million acres of land from being placed in agricultural production. They have alleviated poverty for 18 million small farmers and farm families, totalling more than 65 million people, and reduced CO2 emissions from agriculture by 26.7 billion kg in 2015 alone (equivalent to removing 12 million cars from the road for one year). "Australian farmers continue to embrace crop biotechnology with an increase in GM crop plantings of 29 percent, to a total of more than 2.1 million acres in 2016.



This improvement is mostly from GM cotton which saw a significant increase in plantings due to the introduction of new GM varieties. GM cotton is one the great success stories of Australian agriculture, comprising nearly 100 per cent of the Australian cotton crop. Adoption of GM technology has resulted in greater water use efficiency and has greatly improved the cotton industry's sustainable use of pesticides," said Matthew.

"GM herbicide tolerant canola was grown on over one million acres in 2016, planted by more than 1000 Australian farmers with more than 180 growers planting it for the first time. Since 2008, the average yield gain from GM canola in Australia has been 11 per cent, resulting in an additional 226,000 tonnes of canola being produced," he went on to add.

"The repeal of the GM crop moratorium in Western Australia provided WA growers with the certainty they will have access to the full range of innovative tools and opportunities the plant science industry has to offer. Industry will also now be more inclined to invest research dollars into new varieties in WA which will become increasingly suited to the local environment and will encourage further adoption," Matthew explained.

"With more than 21 years of successful use of GM crops being grown side-by-side with non-GM crops in Australia and internationally, it's not surprising to see the Productivity Commission recommend the repeal of the remaining State moratoria on GM crops in New South Wales, South Australia, Tasmania and the Australian Capital Territory," he concluded.

TAKING SOME OF THE GUESSWORK OUT OF CHOOSING THE RIGHT FERTILISER

Sugar Research Australia (SRA) has developed a new tool for sugarcane growers to help select the right fertiliser blend that matches the nutritional requirements of their paddocks.

The tool is called FertFinder and is available via the SRA website. It is aimed at assisting sugarcane growers and advisors to filter through the hundreds of fertiliser products available on the market.

The tool was developed by SRA Adoption Officer Gavin Rodman, who said FertFinder had been tailored for use in all regions of the Australian sugarcane industry.

"The current practice used to find a fertiliser that will meet your crop's nutrient requirements relies on experience, multiple calculations, plenty of time and sometimes a little bit of luck. Trawling through fertiliser product cards from your local suppliers can take time, particularly if your crop requires multiple nutrients," Gavin said.

"Finding a fertiliser blend that has each of these nutrients in the right proportion can also be frustrating, as you may find something that meets your crop's nitrogen and potassium requirements, but not the phosphorus, for example. The development of this tool will make this task simpler by highlighting fertiliser blends that are available in your region and that meet the nutritional requirements of your crop," he went on to explain.

Soil testing and choosing the right fertiliser are crucial aspects of the SIX EASY STEPS approach to nutrient management, which continues to be validated by SRA across a range of soil types, farming systems, and climatic conditions.

SIX EASY STEPS is a science-based nutrient management tool that enables the adoption of best practice nutrient management on-farm.

It is acknowledged as industry best-practice for nutrient management to optimise productivity and profitability without adversely influencing soil fertility or causing off-farm effects.

Mulgrave district grower Jeff Day said that he farmed on a diverse range of soils including red volcanic, heavy clay, and sandy clays, which also meant that he required a range of fertiliser rates based on soil tests and use of the SIX EASY STEPS.

"Based on the soil tests, I then follow the recommendations for the required nutrients. Quite often I require a custom blend, so that does cause me to wonder if that impacts the price of my fertiliser," Jeff said.

"A tool like this would really help with decision making in terms of choosing the right blend, and shop around for the best price," he concluded.

WHICH LUCERNE TASTES THE BEST?

Agriculture Victoria is currently evaluating 47 different lucerne cultivars for 'grazing preference' of sheep. Agriculture Victoria Senior Research Scientist Dr Meredith Mitchell said this project was evaluating all currently available commercial lucerne cultivars, as well as pre-release material from seed companies and some material from China.

"These experiments will help identify traits, for producers to potentially take advantage of," Meredith said.

"Lucerne is a highly diverse species with large variation in traits and restrictions, such as seasonal growth variations, growth patterns, and tolerance to stresses such as grazing, heat and drought," she added.

The experiment is being conducted in small plot experiments at Agriculture Victoria's Rutherglen and Hamilton sites. The locations represent contrasting grazing districts in Victoria and the experiment sites were sown in spring 2015.

"The varieties in this experiment represent the full range of winter dormancy ratings available in Australia. Also included are several grazing-tolerant varieties, two that have a rhizomatous habit, which means the plant will grow runners across the soil surface, plus several with a degree of water logging tolerance," explained Meredith.

"This project will explore the large diversity of traits within the lucerne species, once identified, could provide the opportunity to exploit them," she added.

Meredith said observations are being recorded at six week intervals.

"Grazing preference is being assessed using sheep in each plot area. The sheep are on the plots for 27 hours, and the plots are rated on how much plant is eaten at 3, 6, 24 and 27 hour intervals. We are trying to correlate grazing preference with plant form (upright verses prostrate), pasture height, forage quality and leaf:stem ratio," she explained.

"We will be repeating this grazing preference experiment at both sites during winter," Meredith said in conclusion.

CROPS UNDER THREAT FROM AN OLD FOE

A wet spring on 2016 may have produced the best conditions for one of the cropping industry's biggest yield thieves, the Cereal Cyst Nematode (CCN).

Agriculture Victoria research scientist Dr Josh Fanning said CCN could cause yield losses of up to 70 per cent in intolerant varieties.

"CCN was a huge issue for Victorian growers in the 1970s and 1980s, however the use of resistant varieties meant the disease was largely forgotten, until now," Josh said.

The past wet spring produced ideal conditions for CCN to increase and scientists are now beginning to see the pest re-emerge, as farmers are using varieties that are susceptible to the disease and have been including less break crops in their rotations.

Five per cent of paddocks in the Mallee and 12 per cent in the Wimmera had CCN present when surveyed during 2014 and 2015.

Varieties susceptible to CCN that are widely grown in the Wimmera and Mallee include Gairdner and Scope barley, and the wheat varieties Axe and Cosmick.

Josh said CCN should be taken as a serious issue for croppers growing susceptible varieties.

"Although it has not been a major problem in recent years, it can still cause severe yield losses. However there are ways this can be avoided and farmers need to ensure they are doing everything they can to manage the disease," Josh said.

"Farmers need to check the levels of CCN in their paddocks. This test can be organised through a local agronomist and can deliver an answer on CCN levels within a couple of weeks. Identifying low yielding paddocks or washing cereal plant roots can also help detect paddocks with issues. Growing resistant cereal varieties, or non-cereal break crops in a rotation, and controlling cereal weeds early in break crops reduces CCN populations," he explained.

Josh contributed to the development of a Grains Research and Development tips and tactics note on CCN, which is available at Grains Research & Development Corporation website.

A HERBICIDE THAT HELPS YOU GET IT RIGHT

Weed management is just one of many factors to "get right" in order to be successful. While there is (rightly) much research in non-herbicide weed management strategies and tactics, effective herbicides have unparalleled cost benefit ratios. Weed management strategies are generally built around planned cropping sequences that are often adapted depending on seasonal conditions and commodity prices. The program could be built around managing the most difficult weed to control, however, in practice, agronomists are often faced with a diverse population of weeds. Hence the need for herbicides in most integrated weed management strategies.

Rexade™ herbicide with Arylex™ active is a new post-emergent cross-spectrum herbicide for use in wheat and triticale. It contains pyroxsulam and Arylex and is typically tank mixed with MCPA LVE.

The grass control in Rexade is provided by pyroxsulam, which is a Group B (ALS) herbicide. Pyroxsulam is from the TPS (triazolopyrimidine sulfonamide) family of chemistry, which makes it significantly different from other Group B herbicides such as SU's (e.g. Atlantis®) and IMI products (e.g. Intervix®). It is an effective grass herbicide, but is also a capable broadleaf herbicide in its own right.

Arylex is a new and unique Group I herbicide (subgroup Arylpicolinate). It is active at low rates, has a novel weed spectrum for the MoA and chemistry, and a short soil half-life. Research from the University of Warwick has found that Arylex binds to different target sites than other Group I herbicides however, the practical implications of this in Australia are not yet fully evident.

Bringing these two powerful active ingredients together into one product provides advisors and their growers many benefits. Rexade will control a very large spectrum of grass and broadleaf weeds in wheat. It can be tank mixed with a range of broadleaf herbicides without compromising grass weed activity and has a short soil half-life, regardless of soil pH, which allows winter rotational flexibility in most situations.

Rexade based applications may be an appropriate choice in wheat or triticale crops that have grass weeds including brome or wild oats in combination with a wide range of broadleaf weeds including brassicas, a range of volunteer legumes, thistles, fumitory, deadnettle, and bedstraw. Like all of the alternative options, Rexade performs at its best in competitive crops on grass weeds that are small, actively growing and in low to moderate densities.

Resistance levels of grass species will vary within shire boundaries and even within paddocks. There are a number of brome grass populations that are resistant to either or both Group A and Group B chemistries. Group A herbicides registered for use in cereals are often ineffective at controlling brome grass, whereas the Group A products that you can use in pulse crops continue to be effective.

Group A herbicides are becoming less effective at controlling many wild oat populations around the country. Advisors will know which paddocks they need to watch and with few options for post-emergent grass control it is essential that chemistries are rotated within paddocks to extend the useful life of each product. One option could be to use Rexade in the wheat phase and then use a Group A chemistry in the barley or pulse rotation as needed. All post-emergent herbicides will be more effective following sound paddock management in the preceding rotation (both chemical and cultural) that reduce the seed bank and weed density in the following crop.

While Rexade may not fit every wheat paddock, it does suit many situations as part of an overall integrated weed management programme. Rexade can provide a "one pass" grass and broadleaf weed management, allowing growers to get their spraying programme completed in a timely manner and move onto other activities.

NATIONAL PLANT BIOSECURITY EFFORT SHIFTS TO NEXT GEAR

Off the back the nation's plant Research and Development Corporations (RDCs) announcing they would unite efforts to strengthen Australian plant biosecurity recently, the partnership has appointed a Chair, implemented a management plan and is in the process of recruiting a program director to oversee operations of the new initiative.

The group – comprising Wine Australia, Forest Wood Products Australia, Cotton Research and Development Corporation, Grains Research and Development Corporation, Rural Industries Research and Development Corporation, Sugar Research Australia and Horticulture Innovation Australia – elected Plant Health Australia chief executive Greg Fraser as Chair.

John Lloyd, chief executive of lead plant biosecurity RDC, Horticulture Innovation Australia, said the move marked the next step in creating a more efficient and effective plant biosecurity network that addresses investment gaps.

"The new stronger plant biosecurity approach is taking shape. Our efforts have been shaped by the advice of an independent expert after an examination of our current biosecurity investment activities and how they are prioritised," John said.

"We have consulted with industry and have now appointed a Chair to ensure the partnership runs smoothly and resource priorities are better met. A program director is also coming on board to oversee the finer details of the initiative.

The next step is to get on with the job of determining a list of key threats to Australian food and fibre products, based on industry and government advice and research conducted so far," he went on to explain.

The Chair, Greg Fraser, said this collaborative approach is a step change approach utilising a more contemporary investment model that will safeguard the future of our food and fibre industries.

"Plant biosecurity in Australia has become highly reactive and fragmented in recent years, largely because there are many unconnected players. Through this initiative, the seven plant RDCs will provide an environment for better coordination and action," Greg said.

"As Chair of this cross-sectoral biosecurity partnership, my sole focus will be bringing all of these stakeholders together to ensure they are applying their respective skills and resources in the best possible manner. This initiative is a first in Australian biosecurity history," he added.

The director position is expected to be filled in the coming weeks with a wide selection of applicants being considered from Australia and abroad.

In the meantime, Greg and representatives from the seven plant agencies are compiling a list of funding priorities and developing their approach to attract additional research investment to bolster the nation's biosecurity approach.

SURVEILLANCE UNDERWAY FOR TOMATO POTATO PSYLLID IN VICTORIA

Biosecurity officers from Agriculture Victoria began surveillance and sampling for Tomato Potato Psyllid (TPP) at 99 properties across Victoria in early May.

Chief Plant Health Officer Dr Gabrielle Vivian-Smith said there have been no confirmed reports of TPP in Victoria.

The surveillance and sampling of field crops, glasshouses and nurseries will provide assurance that Victoria remains free of TPP and will validate the state's 'area freedom' certificate.

Agriculture Victoria continues to ensure adherence to Victorian entry requirements for produce coming into the state through surveillance and targeted compliance patrols of businesses trading in host fruit and vegetables or nursery stock at the Melbourne Wholesale Fruit and Vegetable Market and the Melbourne Wholesale Flower Market.

Gabrielle said the recent detections of TPP in Western Australia should serve as a sharp reminder to all growers of the importance of best practice biosecurity protocols.

"Victorian horticulturists are advised to implement best practice biosecurity measures and to regularly check their crops," she said.

Victoria has imposed restrictions on the importation of any risk material from Western Australia as a precautionary measure to prevent the pest from entering Victoria.

The restrictions extend to plant or plant products which TPP affects from the Solanaceae family, which includes capsicums, tomatoes, eggplants, potatoes, tamarillos, and chillies. TPP can also affect plants from the Convolvulaceae family, which includes sweet potato.

TPP is a small sap-sucking, winged insect, which resembles a tiny cicada (3 mm long). TPP causes yellowing of the leaves, wilting, misshapen fruit and reduced crop yield.

A noticeable sign is the presence of small insects jumping from the foliage when disturbed. Adult psyllids are sometimes called jumping plant lice as they readily jump and fly when disturbed.

TPP can also transmit a bacterium called CLso (Candidatus Liberibacter solanacearum) that is associated with the zebra chip disease in potatoes. The bacterium is also a serious pest and can cause stunting, stem death, yellowed leaves and yield losses in capsicums, chillies and tomatoes. The bacterium does not pose a risk to human health and has not been detected in Victoria.

INNOVATIVE OMEGA-3 CANOLA ON ITS WAY

PREPARATIONS HAVE BEEN COMPLETED FOR REGULATORY APPROVALS OF NEW AND INNOVATIVE LONG-CHAIN OMEGA-3 CANOLA.

Australian filings have been submitted Nuseed, a wholly owned subsidiary of Nufarm Ltd, with United States and Canadian submissions anticipated to be filed this month. Pending regulatory approvals, commercialisation is expected to commence in 2018 or 2019.

“Reaching these regulatory milestones in all three countries gives us both timing and location options as we commercialise canola based long-chain omega-3,” said Brent Zacharias, Nuseed Group Executive.

Nuseed’s proprietary canola will provide long-chain omega-3 oils, similar to those found in fish oil, using a sustainable land-based source. It has been developed through collaboration between Nuseed, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Grains Research and Development Corporation (GRDC).

Nuseed, CSRIO and GRDC formed a research collaboration in 2011 to develop a high quality, sustainable, renewable and reliable source of long-chain omega-3 oil for human consumption.

These healthy omega-3 oils typically originate in ocean microalgae. Fish consume the microalgae-derived oils via their food-chain and are the current primary source of long-chain omega-3 oil for direct or indirect human consumption. This project adds microalgae genes to canola, using world-leading genetic breeding technologies, so that the crop is rich in these higher-value higher-nutrition oils.

“These submissions reflect our confidence in and commitment to the science, safety and global potential of our omega-3 program,” said Brent.

The regulatory submissions are being made to the Office of the Gene Technology Regulator (OGTR) and Food Standards Australia and New Zealand (FSANZ) in Australia, to the Canadian Food Inspection Agency and Health Canada in Canada, and to the US Department of Agriculture (USDA) and the Food and Drug Administration (FDA) in the USA.

The company also announced commercial brands for the resulting oil product, specific to key end-use markets. These are AquaterraTM for aquaculture feed use, and NutriterraTM for human nutrition application.

Long-chain omega-3 DHA and EPA are essential for human and fish health. This new proprietary product aims to help relieve pressure on wild fish stocks, which are the current source for this important nutrient.

“Reaching these regulatory milestones in all three countries gives us both timing and location options as we commercialise canola based long-chain omega-3.”

Brent Zacharias

By providing a proven land-based source of these oils, Nuseed will help maintain adequate supply to meet strongly increasing global demand.

It is anticipated that one hectare of this canola has the potential to provide the omega-3 yield from 10,000 kilograms of fish.

The unique profile of the Nuseed oil ensures that it will easily fit with current market practices and meet the needs of multiple end-market applications on a commercially viable basis. The crop will be produced under a closed-loop grain handling and oil processing system. In 2017 Nuseed intends to grow up to 4,000 acres of omega-3 canola in the US for pre-commercial production under the stewardship of the USDA notification process.

The project represents a significant advancement in the development of crops that deliver additive downstream consumer benefits. Initial work has successfully achieved high levels of DHA in the oil, which is a prominent requirement for many potential end-use markets for the product.

More than 25 million hectares of canola are grown worldwide every year. It is a crop that performs well in several growing regions and is familiar to many Australian, US, Canadian and European farmers. This good agronomic understanding of canola, and its already high oil production, made it the perfect plant to select for the omega 3 project.

Australian and North American growers and markets will benefit from this innovative product, with pre-commercialisation processes already underway.

NEW RESEARCH IS CRITICAL IN FIGHT AGAINST GLYPHOSATE RESISTANCE

THE USE OF A SUPERIOR GLYPHOSATE PRODUCT AND COMMITMENT TO INTEGRATED WEED MANAGEMENT HAS THE POTENTIAL TO DELAY THE ONSET OF GLYPHOSATE RESISTANCE ON FARMS ACROSS AUSTRALIA.

In a trial conducted by Plant Science Consulting, of Adelaide, South Australia, there was a clear difference between the efficacy of two different glyphosate formulations applied to susceptible and glyphosate resistant annual ryegrass biotypes.

Dr Peter Boutsalis, who conducted the experiment, pitted Roundup Ultra® MAX against a glyphosate 540g/L formulation.

Each formulation was applied to three annual ryegrass biotypes which included one susceptible and two that were resistant to glyphosate (one with weak resistance and one with strong resistance).

“Roundup Ultra MAX exhibited superior control at lower to intermediate rates on susceptible and glyphosate resistant biotypes compared to the glyphosate 540g/L formulation,” Peter concluded.

The trial measured herbicide damage (biomass reduction) and survival of annual ryegrass plants sprayed with herbicide at a three-leaf growth stage.

Of particular note was the ability of Roundup Ultra MAX to control ryegrass with weaker glyphosate resistance at rates that were relatively low.

Roundup Ultra MAX produced 100 percent biomass reduction and 100 percent control at a rate of 800 g ai/ha compared to the glyphosate 540g/L formulation which needed a rate of 1995 g ai/ha to achieve the same result.

“These results suggest that on ryegrass with weak resistance, common in the initial stages of resistance development, using a product such as Roundup Ultra MAX with the unique Transorb II surfactant technology can result in greater control and therefore delay the onset of resistance,” Peter reported.

As could be expected, both herbicide options were unable to completely control the ryegrass with the stronger glyphosate resistance, although there were some significant differences in the amount of control that was achieved.

Peter’s research showed superior results from Roundup Ultra MAX, particularly when the rates were increased to 1995 g ai/ha and 2850 g ai/ha.

“Roundup Ultra MAX caused significantly greater biomass reduction and improved control compared to the generic Glyphosate 540g/L product at equivalent rates,” he said.

Of particular interest was the percentage of biomass reduction and control between the two herbicide options on ryegrass biotypes that were susceptible to glyphosate.

Roundup Ultra MAX achieved 100 percent biomass reduction and control at a lower rate than the 540g/L Glyphosate formulation.

At rates above 400g ai/ha susceptible ryegrass was controlled,” Peter said. “However, at 200g ai/ha the control and biomass reduction with Roundup Ultra MAX was significantly greater than Glyphosate 540g/L.”

“This indicates that under sub-optimal conditions, where efficacy could be reduced, using a product such as Roundup Ultra MAX will ensure greater weed control than less effective glyphosate formulations,” he added.

The trial was conducted in mid-spring 2016 and designed to simulate field conditions.

Plants were grown outdoors and sprayed in a spray cabinet with a twin boom using agricultural nozzles and a water rate and pressure similar to farmer spray equipment. No additional non-ionic surfactant was added to any formulation. Herbicide was applied at the three-leaf stage and assessments made on the level of biomass reduction and the percentage of plants that survived.

Previous published studies have identified that the ryegrass biotype with strong resistance to glyphosate was due to an altered translocation mechanism where target site resistance conferred resistance to the biotype with weak resistance.

Sinochem is heavily focused on assisting growers to improve weed control to achieve better outcomes in the short and long term.

Growers and advisors should target 100% weed control using the best product available and by integrating other weed control measure to ensure the sustainability of glyphosate into the future.

The research conducted by Plant Science Consulting demonstrated the ability of Roundup Ultra MAX to effectively control susceptible and even ryegrass with weaker resistance to glyphosate.

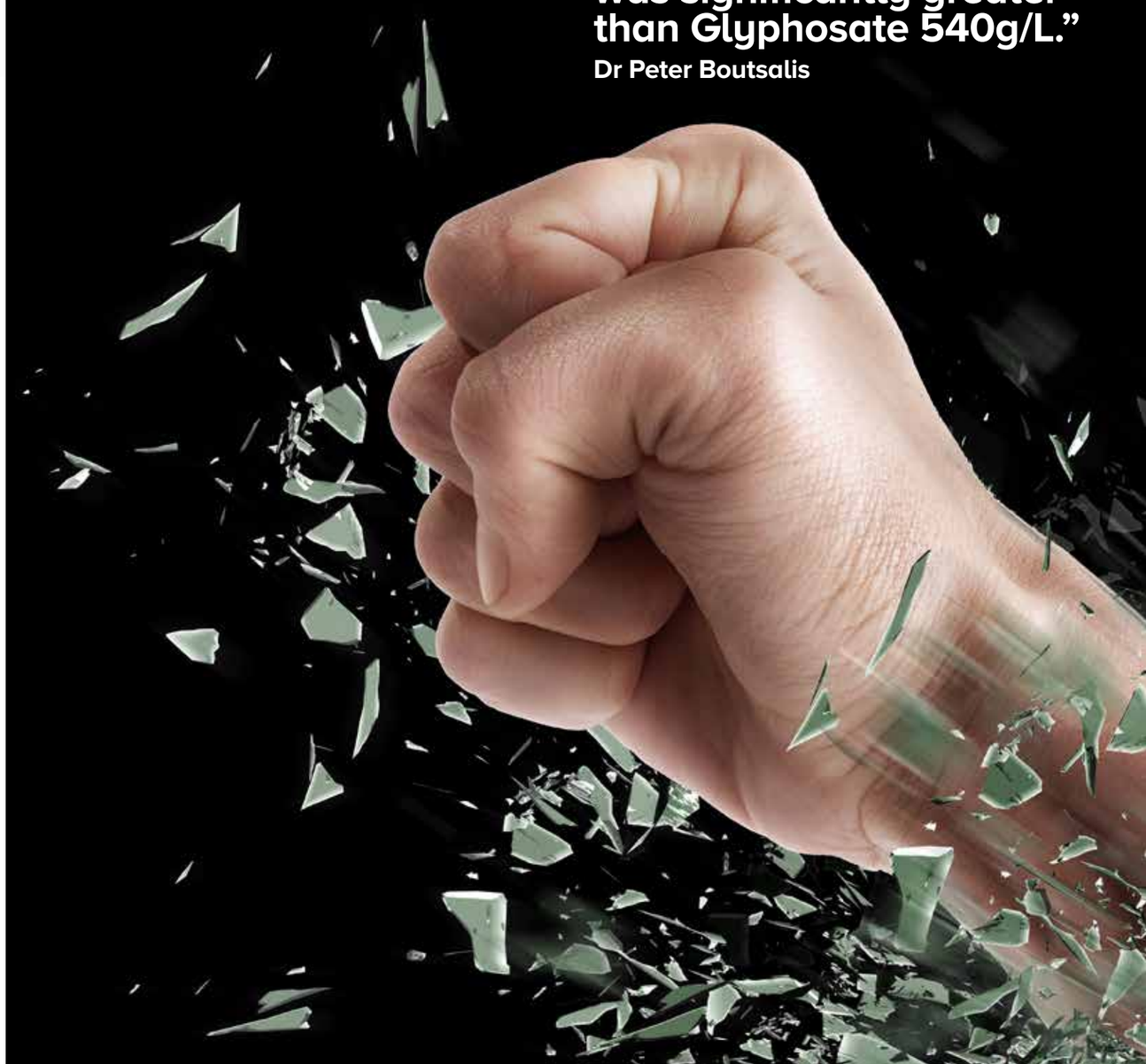
It also had a positive effect on ryegrass biotypes with strong resistance to glyphosate and demonstrated the importance to using higher rates of good quality glyphosate in paddocks known or suspected of containing ryegrass with resistance.

Growers should be targeting 100% weed control in every paddock for both the short and long-term benefit.

A ryegrass biotype that survives a herbicide application because of an inferior product, a sub-lethal rate, or unfavourable environmental conditions, has the ability to flower and cross pollinate with other survivors and accumulate weak resistance mechanisms that can lead to elevated glyphosate resistance.

“At rates above 400g ai/ha susceptible ryegrass was controlled. However, at 200g ai/ha the control and biomass reduction with Roundup Ultra MAX was significantly greater than Glyphosate 540g/L.”

Dr Peter Boutsalis



QUEENSLAND MACADAMIA INDUSTRY TO HIT RECORD HIGHS

Queensland's macadamia industry is booming, with this year's harvest expected to bring record returns for growers and the release of four new varieties that are predicted to deliver up to 30 per cent higher yields.

Minister for Agriculture and Fisheries Bill Byrne said Queensland supplies half of Australia's macadamia crop, with orchards situated from Mackay to the New South Wales border.

Queensland's native nut has captured three per cent of the global nut market and Minister Byrne said there was excellent potential to grow export markets. Seventy per cent of this year's Australian crop is destined for consumers in the United States, Japan, China and Europe.

The Department of Agriculture and Fisheries' AgTrends forecast Queensland's production to be worth $140 million in 2016/17, 17 per cent higher than DAF's final estimate for 2015/16 and 97 per cent greater than the average for the past five years.

Minister Byrne said the Palaszczuk Government was supporting the growth of the industry through research and development of new varieties, quality evaluation of the new nuts and agronomic techniques to boost yield and reduce input costs to be more competitive on the world market.

"The four new tree varieties that have just been released are the culmination of nine years of research by experts from my department. These new varieties have shown potential to increase yields by up to 30 per cent and perform extremely well in the Bundaberg area, which is great news for this regional economy especially," the Minister said.

Bundaberg and Gympie were established as the processing hub for the Australian industry, with significant investment underway along the supply chain leading to more job creation in the region, Minister Byrne said.

He said DAF agronomists were also working with industry to increase the performance of existing trees through improved soil health practices to keep trees productive for longer. They are also working with researchers from the Queensland Alliance for Agriculture and Food Innovation (QAAFI) in some macadamia projects, with QAAFI to lead future breeding work for this crop.

"We will continue to make a significant investment in Queensland's macadamia industry, including working with industry to benchmark the practices of 269 farms across Australia, with a view to identifying industry best practice," Minister Byrne said.

"Macadamia is one of the crops scientists are investigating as part of the long-term 'Small Tree High Productivity Initiative' that aims to greatly boost productivity by developing more intensive growing systems and improving the understanding of the science behind macadamia growing," he added.

The Macadamia variety research work was co-funded by Horticulture Innovation Australia using industry levies and funds from the Australian Government.

NITROGEN STABILISER COULD BE A WIN:WIN IN VEGETABLE SYSTEMS

Vegetable growers know too well that crop nutrition is a key driver for achieving high yields and maximising returns from every land unit they farm.

They simply can't risk the failure of under doing nutrition, given their crop's elevated nutrient demands, the short turnaround times between crops and the high value of their produce.

While yield responses taper off to relatively small gains at the upper end of fertiliser rates, the cost of slightly oversupplying fertiliser might just be considered a cheap form of insurance compared to the risk of under supplying fertiliser and risking yield penalties and lower returns.

Understandably, fertiliser programs are often based on sticking to a set recipe based on previous success with select products and rates for specific vegetable crop types.

While this is reasonable considering the complexity of intensive vegetable production, the question remains. Can we do better and why might we need to?

From a producer's perspective, doing it better equals improvements in productivity and profitability. From a consumer's perspective, there is a growing expectation for clean, green, environmentally sustainable food production.

Ideally, improvements in nutrition programs would address both goals, creating a win:win situation.

This is particularly true for nitrogen management, which requires a greater level of monitoring and constant re-evaluation due to its high mobility in the soil and the variable ways it can be lost.

Nitrate nitrogen is prone to leaching losses, especially in sandier soil types, and to surface runoff when irrigation is used (or over used), or when irrigation coincides with heavy rainfall.

In waterlogged soils, nitrate nitrogen is converted to nitrous oxides and dinitrogen gas, a process referred to as denitrification. The end result is gaseous loss of nitrogen to the atmosphere.

Clearly, there is a close link between water and nitrogen management for optimising efficiencies, or alternatively, for negating losses which are a cost to both production and the environment.

While best nitrogen management practices depend on local soil, crop and environmental conditions, constant measurement and monitoring are the keys to better management as opposed to 'set and forget' programs.

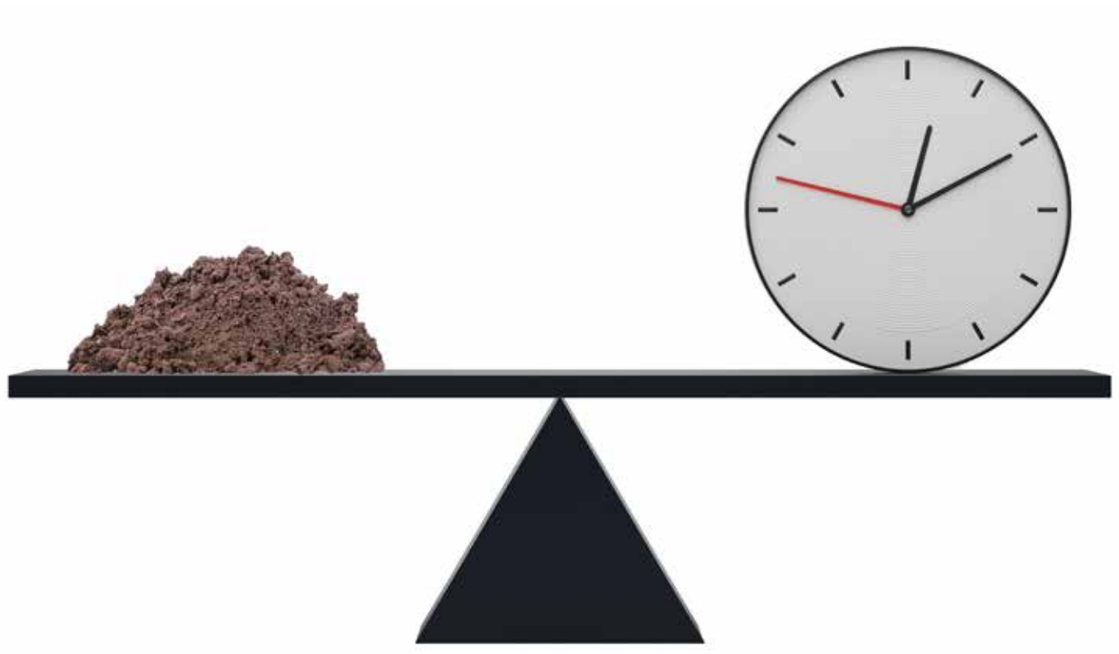
Automated weather, soil moisture and temperature, and even soil nitrate monitoring technologies calibrated with soil and tissue analysis now allow growers and their advisers to refine nitrogen rate and timing decisions more easily and more accurately.

Even so, weather predictions are never precise and research has demonstrated that using nitrogen stabilisers, such as ENTEC® from Incitec Pivot, can provide growers with additional help in guarding against potential nitrogen losses and improving nitrogen use efficiency.

Applied to ammonium and urea based fertilisers, ENTEC works by delaying the activity of the bacteria which oxidise ammonium to the nitrate form of nitrogen for a period of time.

While the nitrogen is stabilised in the ammonium form, it is safe from denitrification and leaching losses and the crop can still use the applied nitrogen.

A two-year study co-funded by DAFF and the Victorian DPI conducted between 2011-2013 demonstrated consistent reductions in nitrous oxide emissions by around 60% when ENTEC was applied to NPK and urea based fertilisers.



CHICKPEA GROWERS ADVISED TO PROTECT CROPS

Growers and agronomists are reminded to take the appropriate management strategies to protect chickpea crops from the impact of Ascochyta blight disease this season.

NSW Department of Primary Industries (DPI) Plant Pathologist Dr Kevin Moore said following the higher incidence of Ascochyta blight in chickpea crops in 2016, growers are reminded to be vigilant as the first incidence of Ascochyta blight has been found in a chickpea crop in Queensland already this season.

"The diagnosis by a local agronomist was based on symptoms and the presence of pycnidia in leaf and stem lesions with samples being sent to NSW DPI for confirmation," Dr Moore said.

"The crop was planted in the last week of April and received 15mm of rain in mid-May. However the crop was not sprayed with a fungicide before the rain."

"The outbreak may have involved seed borne ascochyta, but the multiple lesions on infected plants indicate a high level of ascochyta inoculum was in the paddock at planting as infected chickpea residue from the 2016 crop (ie chickpea on chickpea)."

"This case highlights one of the risks of planting chickpea back into its own residue. Other risks are Sclerotinia and Phytophthora, which unlike Ascochyta, cannot be controlled in-crop. As Sclerotinia and Phytophthora are soil borne diseases, once they have established in a paddock they pose on-going threats."

"It is recommended that all varieties, including PBA Seamer and PBA HatTrick should be sprayed with a registered ascochyta fungicide prior to the first rain event after crop emergence, three weeks after emergence, or at the three-branch stage of crop development, whichever occurs first."

Dr Moore said the best practice recommendations for disease control in chickpea crops are to maintain a 1-in-4 year rotation; avoid planting next to last year's chickpea stubble if possible; ensure all planting seed is pickled and follow the recommended in-crop ascochyta fungicide strategy for the sown variety."

"The successful disease management in chickpeas relies heavily on an integrated management package involving crop sequencing, variety choice, seed treatment, strategic fungicide use and hygiene.

"Growers are advised that back to back chickpea production can also impact on the chickpea industry through the risk of changes in the pathogen, reduced commercial life of varieties and the resistance to fungicides."

Information on chickpea disease management can be found in the DPI publication Winter crop variety sowing guide available on the DPI website

FUNDING FOR INNOVATION IN PEST ANIMAL AND WEED MANAGEMENT

The nation's farmers and land managers can look forward to new pest animal and weed control technologies such as automated traps, thermal sensors and weed spraying robots, with 23 innovative projects to share in $10.5 million of Coalition Government funding.

Deputy Prime Minister and Minister for Agriculture and Water Resources, Barnaby Joyce, said the funded projects under the Control Tools and Technologies for Established Pest Animals and Weeds Programme would strengthen the management of some of Australia's most significant agricultural pest animals and weeds.

"The Coalition Government programme is funding 23 projects put forward by universities, state, territory and local governments, research organisations, natural resource management groups and a private company," Minister Joyce said.

"The funding will be used to develop technologies such as herbicide spraying devices, automated traps and thermal aerial imaging for pest monitoring and optimise the use of chemicals, biological control agents," he added.

"These new technologies will help to strengthen the fight against pests such as wild dogs, rabbits, foxes, feral pigs and donkeys and improve our management of established weeds, such as blackberry, gorse, prickly acacia, rubber vine, parkinsonia, mesquite and Chilean Needle grass," Minister Joyce said.

"One project undertaken by Invasive Animals Limited in the ACT will develop 'Intelli-Traps', which are next generation automation technologies for control of wild dogs. It will develop devices that can see, think and act to target specific pest animals, including a sentinel automated baiting station for wild dogs, which will result in less labour intensive work for land managers," he explained.

A recent survey undertaken by ABARES and funded through the Agricultural Competitiveness White Paper found that agricultural businesses spent an average of $19,620 a year on managing pest animals and weeds.

It has been estimated that pest animals cost Australia around $620 million a year in production losses and weeds cost an estimated $4 billion a year in control costs and production losses.

Pest animals and weeds not only reduce agricultural productivity, they cause damage to the environment and natural resources.

"Going forward, this initiative will ensure our farmers and land managers are on the front foot in the fight against pest animals and weeds to limit the impact they can have on our land, produce and industries," said Minister Joyce.

The Established Pest Animals and Weeds Measure is a $50 million investment over four years to 2018-19 as part of the Agricultural Competitiveness White Paper, the Australian Government's plan for stronger farmers and a stronger economy.

WA AGRICULTURAL EXPERTISE AIDS BANGLADESHI FOOD SECURITY

WESTERN AUSTRALIAN INNOVATION HAS HELPED TO TRANSFORM AGRICULTURAL PRODUCTION IN BANGLADESH THROUGH AN INTERNATIONAL CAPACITY BUILDING PROJECT TO AID THE ADOPTION OF MORE EFFICIENT, EFFECTIVE AND SUSTAINABLE FARMING SYSTEMS.

The long-running Conservation Agriculture (CA) project, led by Murdoch University with support from the Department of Agriculture and Food, Western Australia and funds from the Australian Centre for International Agricultural Research (ACIAR), has recently come to an end.

The project worked closely with the Bangladesh Agricultural University, government and non-government agencies and the private sector to replace traditional multiple cultivation practices with CA minimum tillage systems.

As a result, Bangladeshi farmers, who grow two to three rice and/or grain crops a year, have reduced production costs and water use, while increasing yields.

Project leader, Murdoch University Professor Richard Bell, said the adoption of CA farming systems had enhanced the capabilities of Bangladeshi farmers to meet the challenges of feeding an increasing population.

“With a population of 164 million people, which is expected to reach 205 million by 2050, it is essential for Bangladesh to improve overall land use sustainability, while decreasing production costs to increase farm profitability,” Richard said.

“The adoption of CA principles has improved soil fertility and soil moisture use, while more Bangladeshi farmers are now using herbicides effectively to control weeds. Together, these measures have reduced the turnaround time between crops, as well as greenhouse gas emissions, while boosting crop yields up to 20 per cent. The integration of mechanised planting has reduced fuel costs by 65 per cent and labour costs by 30 per cent,” he explained.

The up-take of a range of minimum tillage planters to operate on the back of the two-wheel tractors has been a key achievement of the project.

The project also facilitated the formation of a network of farmers, service providers, extension officers, non-government organisations and machinery manufacturers across the country to accelerate the adoption of farm machinery and CA practices.

The Department of Agriculture and Food provided agronomic advice to the project on the ramifications of changing from a multiple to minimum tillage farming system.

Department principal research officer Dr Abul Hashem and his colleague Ross Brennan contributed to the development of a CA agronomic package for the Bangladeshi farmers, which incorporates information on weed and plant nutrition management.

“While a CA system is more beneficial, it is not without some management challenges,” Abul said.

“Minimum tillage requires good stubble, weed and herbicide management practices to ensure adequate soil moisture and nutrients for the crop, and to guard against the risk of weeds, pests and disease. Western Australia has been a world leader in the adoption of minimum tillage and we have been able to employ the lessons we learned to assist Bangladeshi farmers to manage their crops,” he explained.

DAFWA research officers Dr Abul Hashem (left) and Dr Ross Brennan (second from right) talk to Bangladeshi students and researchers on increased production potential of lentils from the use of Conservation Agriculture as part of an international CA project near Alipur (Rajshahi.)

Part of the project research was conducted at the Western Australian No-Tillage Farmers Association’s Cunderdin site and the department’s Merredin Research Facility.

This research also assisted Western Australian farmers to address local issues with Group A herbicide-resistant annual ryegrass and soil nutrition management.

The project collaborators also implemented an education program on safe use and handling of herbicides for Bangladeshi scientists and growers.

Seven doctorate and 17 masters students from Murdoch University and Bangladesh Agricultural University have been involved in the project in weed management, soil nutrition management, spray technology and greenhouse gas emissions.

The Bangladeshi scientists will lead the weed and soil management research in their country in the near future, to improve the farm productivity and profitability.

“This ACIAR project is a wonderful example of the power of scientific collaboration to generate change that results in an improvement in the quality of life of a nation’s people,” Richard said.

“It has also created an opportunity to further examine CA and the benefits and challenges it presents to farmers in both Bangladesh and Australia, while providing research opportunities for future professionals,” he said in conclusion.

“Together, these measures have reduced the turnaround time between crops, as well as greenhouse gas emissions, while boosting crop yields up to 20 per cent.”

Professor Richard Bell

Bangladeshi farmers and DAFWA research officer Dr Abul Hashem (centre in yellow) and Dr Ross Brennan (adjacent left) listen to a talk on Conservation Agriculture at Alipur (Rajshahi) at a trial site of an international CA project led by Murdoch University.

Scientists learn about the capabilities of a Versatile Multi-planter at a demonstration held during the CASH-II conference at Bangladesh Agricultural University, held as part of a long-running Conservation Agriculture ACIAR project.

TROJAN WHEAT SHOWS ADAPTABILITY

Going from 150mm of growing season rainfall to 580mm in the space of a season has given grower Anthony Lees a better snapshot of crop adaptability.

Anthony, his parents John and Bev, and wife Rebecca, crop about 480ha of wheat, 460ha of canola, 160ha of barley, 90ha of peas and 70ha lupins across 1200ha, which includes some lease and share country, at Diggora in Victoria.

The family, which have been National Variety Trials co-operators for about 30 years, grow different varieties of crops each year in an attempt to beat the long-term performers in their program.

Anthony said the moisture stressed season in 2015 produced some interesting results in terms of yield and screenings in wheat.

"We didn't make any money that season, but we still managed to get a crop off," Anthony said.

"Our best performing wheat for 12 years, an early-maturing AH suited to low and medium rainfall environments, was finally beaten by Trojan, a mid-late APW. We planted a tonne of it alongside our long-termer, and the Trojan was 200-300kg/ha better, at 1.7t/ha," Anthony explained.

"It was also a lot easier to harvest, which kept our tonnes per hour on the header up, and screenings were just under one per cent, very minimal," he added.

Then in 2016, the cold and wet season helped them produce a record wheat harvest.

"Trojan was the biggest wheat crop we'd ever harvested. The paddock around our trial plots yielded 8.5t/ha. Our other paddock didn't get a late application of nitrogen, but still went 7t/ha. It was previously planted to field peas, which provided the nitrogen," Anthony said.

The grower works with Rodwells agronomist Dan Andrews to plan crop choices and chemistry, last season opting for herbicides Sakura and Opus, and fertilisers MAP 80kg/ha and urea in-crop at 80kg/ha.

Mr Lees said Trojan's screenings again fell under one percent.

"It was good size, quality seed. Dairy farmers like a bigger seed for their dairy crushers. We don't try and push too hard on the high grades. We try and push more on yield so if we get ASW and maybe a bit of APW, we're really happy. I think yield is king around here," Anthony said.

Anzac Day signals the start of planting for the Lees, with harvest usually kicking off in mid-November.

However, late-April rain did not eventuate, forcing them to start sowing dry.

"From Anzac Day we dry sowed 160ha of canola, wheat and lupins, then got a few rains and planted a bit more. The amount of dry sowing did make us nervous, but lucky we did, because things got damp so we couldn't get in the paddock. The spraying operation after sowing was a struggle. Later in the year with in-crop spraying, we had to pick dry paddocks to avoid making wheel tracks. We got the plane in late for the rust, just for insurance, then things dried off and headers came out of the shed," Anthony explained.

He said harvest ran six weeks later than normal, and added, "We usually sit down and have Christmas dinner, but this time it was flat out until February due to big yielding crops."

Anthony said after the low of 2015 and the high of 2016, he would be happy with an average season this year.

Based on Trojan's performance, he will be planting 80 per cent of his wheat crop to the variety.

SOAK UP GROWER KNOWLEDGE ON SOIL MOISTURE

Growers in Western Australia's eastern grain belt are implementing practical methods to conserve precious soil moisture in response to increasingly fluctuating rainfall and variable soil types.

A new Grains Research and Development Corporation (GRDC) Regional Cropping Solutions Network publication Managing Soil Moisture outlines how a number of growers in this region are optimising production and reducing risks in the face of these challenges.

The case study booklet was initiated by the Kwinana East port zone RCSN group whose primary role is identifying the top locally-specific grains issues to improve grower profitability.

GRDC RCSN coordinator Julianne Hill said that since its inception in 2011, the group's members had consistently identified soil moisture management as one of the top two priorities in this region, along with business management.

"GRDC has significant investments in soils, water use efficiency and soil moisture conservation and the Kwinana East RCSN was interested in identifying and extending information about practical methods that could be employed to address these issues under local conditions and on local soil types," Julianne said.

"The group initiated the production of the soil moisture case study booklet as a way of highlighting what growers in lower rainfall areas are doing differently to utilise available soil moisture and boost crop productivity and profits. Managing Soil Moisture includes information about a range of techniques being used by 10 growers profiled in case studies that explore how they are optimising production and reducing risks in their lower rainfall area," she explained.

"It identifies and explains practical and zone-specific measures being used successfully by growers or being tested by advisers and researchers to improve water use efficiency and boost resulting crop production," she added.

Julianne said the tactics being used by the case study growers included:

- Spraying summer weeds straight away, even at harvest if need be
- Measuring and monitoring soil moisture content
- Paddock preparation and agronomic management to increase the soil water 'bucket' size
- Tactical spray fallows

"Across the Kwinana East region, there has also been increasing interest in trialling new technologies such as soil moisture probes, with some growers feeding the data into crop modelling and prediction tools such as Yield Prophet®, and looking at alternative summer weed control options. This booklet explores some of these developments," Julianne said.

Julianne said many of the growers featured in the booklet had experienced consecutive years of drought or low growing season rainfall. "In the Merredin area, for example, five of the lowest rainfall years in the past century occurred in the decade to 2015," she said.

WET YEAR BRINGS NEW SET OF CHALLENGES FOR STATE'S BROAD ACRE FARMERS

A wetter season in 2016 brought with it a whole new set of challenges and the need to check and check again: "Am I growing the best variety for my situation?".

The annual collection of National Variety Trials (NVT) data has once again been put together by Agriculture Victoria and the Grains Research and Development Corporation (GRDC) to assist farmers with assessing varieties based on yield, disease ratings and quality characteristics.

The 2017 Victorian Winter Crop Summary contains important changes to disease resistance ratings for all chickpea varieties due to a change in virulence of the Ascochyta blight pathogen in southern Australia.

"All chickpea varieties are now rated susceptible or moderately susceptible and will require proactive fungicide management strategies," report editor Johanna Couchman said.

Also new this year are root lesion nematode ratings for faba beans. The state's major grain growing regions received above average growing season rainfall in 2016. Following drought conditions in 2015 this was a welcome relief and brought high yields but also challenged growers with high disease pressure, water logging, a lengthy harvest period and low cereal prices.

For the first time, the Summary presents NVT long-term predicted yield data across a number of years for each region.

"Growers can now compare variety performances across several years and see which varieties have yield stability across different seasonal conditions, rather than just comparing a long term average predicted yield for a variety in a region" Ms Couchman said.

New varieties in this year's Summary include: Durack* – a new oat variety from the national oat breeding program, bread wheats Coolah* and LRPB Arrow*, Bread/Dual purpose wheat LRPB Kittyhawk*, Feed wheat TenFour, two new barley varieties Alestar and RGT Planet* and a number of new canola varieties.

Hard copies of the Winter Crop Summary are being mailed out to GRDC GroundCover subscribers this week and the publication is available online at www.grdc.com.au//NVT-Victorian-Winter-Crop Summary.

Growers can also access NVT long term yield data via the Long Term Yield Reports App and NVT website www.nvtonline.com.au

*denotes that Plant Breeder Rights apply.

TECHNOLOGY IS DELIVERING NUTRIENTS TO WHERE THEY NEED TO BE

Enhanced micronutrient technology that helps plants more efficiently mobilise and utilise nutrients that are already within the plant. This delivery system creates healthier plants throughout the growing season which can lead to higher yields and a better return on your investment. Loveland Agri Products; exclusive to Landmark, are specialists in the Plant Nutrition space driving technologies to make good crops better.

Part of the range includes NutriSync and this is how it works. NutriSync is powered by inositol, a naturally occurring compound that helps crops mobilise nutrients to areas of vigorous growth and better utilise nutrients to fulfill nutrient demands.

Inositol binds strongly to mineral nutrients and organic compounds like auxin, amino acids and lipids, transporting them to areas of high demand to support plant growth and development. It also directs important processes within the plant, including cell division, cell wall production and response to salt stress.

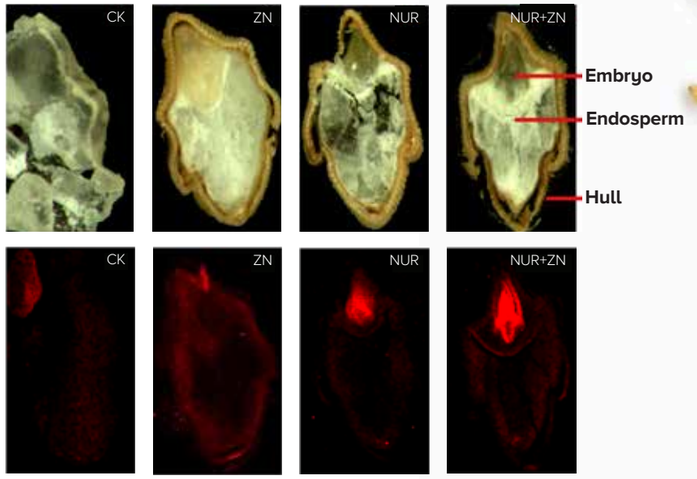
In addition to inositol, NutriSync contains nutrient packages to address the specific nutrient requirements of dicot and monocot crops. NutriSync D is specifically formulated for the needs of Dicot crops and include boron and molybdenum. Similarly, NutriSync M contains boron, manganese and zinc to address the specific nutrient requirements of monocot crops. The inositol formulation helps efficiently mobilise and utilise these and other key nutrients. The boron and molybdenum in NutriSync D along with the boron and molybdenum and zinc in NutriSync M are chelated to ensure that they remain in the optimal form for rapid absorption and mobility throughout the plant.

The NutriSync technologies used in this study show much greater concentrations of Zinc in the embryo of newly formed seeds, supporting the products ability to more efficiently mobilise and utilise nutrients to areas of peak demand. In this case the embryo where protein synthesis is so important.

The Benefits include:

- Excellent crop tolerance
- Easy to handle and mix
- Compatible with other foliar nutrients (including Nitrogen) on all dicot crops
- Compatible with leading herbicides (including glyphosate), fungicides and insecticides
- Flexible application timing across a wide variety of crop growth stages

Rice Grain - µ-XRF images (Zn distribution)



Synchrotron X-Ray Microprobe Results from Dr. Patrick Brown, University of California-Davis.

1. Zinc mainly accumulated in embryo.
2. Loveland products enhanced zinc accumulation in embryo

MISSION TO MARS FOR AUSTRALIAN VEGETABLE INDUSTRY

The Australian vegetable industry is on a mission to MARS, with robotics and automation emerging as key pillars of the production process, according to a new study evaluating innovations in vegetable production.

The study, funded by Horticulture Innovation Australia with co-investment from and conducted by the Queensland Department of Agriculture and Fisheries (QDAF), took an industry-first approach to evaluate developments in mechanisation, automation, robotics and sensing (or MARS) based on growers' needs and the potential applications of new technologies.

QDAF extensively engaged growers at the regional level regarding prospects for integrating new technology in their businesses.

"Through this study, we found the vegetable industry has never had a stronger appetite for mechanisation, automation, robotics, and remote sensing on-farm," said John Lloyd, Horticulture Innovation Australia chief executive.

John said that cost pressures, labour issues and the need to find efficiencies are driving these changes, with better water efficiency, reducing environmental impacts, more flexible management and market and product diversification also playing a role.

"The project also found wide technology adoption among growers with innovations like GPS guidance and colour vision graders already being used by many growers. Across horticulture, growers are also hugely positive about the benefits that innovations in automation, robotics and sensing could bring," he added.

Levy-funded research is looking to help usher in the next phase of Australian vegetable production, with the research and development national vegetable levy funding a range of projects relating to robotics and automation – including practical on-farm applications.

"There are tremendous opportunities for vegetable growers to improve their productivity and profitability by utilising current and future R&D," said AUSVEG CEO James Whiteside. "It also offers the best, most sustainable solution to the industry's biggest challenge of finding a suitably sized and skilled labour force to pick and pack a range of different crops and product, he added.

"The programs which are developing the Ladybird and RIPPA, two intelligent farm robots for the vegetable industry developed at the University of Sydney's Horticulture Innovation Centre for Robotics and Intelligent Systems, are great examples of how growers are investing in the industry's future to ensure Australia is at the front of the pack when it comes to on-farm automation," James explained.

"These practical applications of R&D are supported by a range of industry research, from investigations of autonomous systems that can guide on-farm decision-making to QDAF-led research into vision systems, sensing and sensor networks to manage risks and increase productivity in vegetable production systems," he concluded.

SCHOLARSHIP WINNER PICK OF THE BUNCH

Better quality Victorian table grapes should arrive at export markets thanks to a local agronomist's visit to a world leader in the field.

A scholarship from Food Source Victoria allowed Elders Robinvale agronomist Tristan Smith to travel to South Africa to look at how grapes were handled and treated before export.

South African exporters are seen as world leaders in this field given the grapes have some of the longest export sea voyage times to reach their destinations.

Mr Smith's visit allowed him to meet with leading growers in South Africa, who shared the packing methods they use to allow their fruit to have maximum air flow.

Specifics included the use of use of moisture absorbent material or corrugated plastic wadding to allow condensation to go underneath the grapes without touching them in the event of temperature fluctuation, and how to manage potential issues like rot.

"Seeing first-hand how different countries treat their fruit pre and post-harvest and how they pack their fruit for long voyage export was a valuable experience," Tristan said.

"As an agronomist I am now better able to advise my clients how to maximise the integrity of their fruit. Understanding more about how to best preserve fruit integrity for long-haul voyages will consolidate Victorian fruit as high quality in overseas markets. This will have a flow-on effect with increased business, potentially opening new export markets," he explained.

Tristan said new business could be generated in Europe, Asia and the Middle East, markets which had previously been difficult to supply with Victorian fruit given the long voyage times.

He said some growers had already started to adopt the methods used in South Africa.

Food Source Victoria program manager Susan Findlay said the ability for Victorian producers to benefit from scholarships like this showed the value of the program. To date, 19 people have been successful in gaining Food Source Victoria scholarships.

"These scholarships are delivering real results based on the needs of individuals and the industry," Susan said.

"We are already seeing information gained from Tristian's visit being put into practice. There is the potential to open up new export markets, which is great for those growers and for Victoria's reputation as a high quality source of fruit," she concluded.

SOWING THE SEEDS OF GOOD CROP HEALTH

With the 2017 growing season already underway, Australian grain growers are reminded to sign up to a free tool delivering timely management advice on crop diseases, pests and weeds.

The free GrowNotes™ Alert system, which includes an app for smart devices, offers growers the chance to get on the front foot with diseases, pests and weeds, as well as highlighting healthy crops to promote market access.

Being on top of issues throughout the growing season is vital for a healthy crop, which is why the Grains Research and Development Corporation (GRDC) and Agriculture Victoria continue to urge growers to get on board with the GrowNotes™ Alert priority notification system.

GrowNotes™ Alert directs users to available, up-to-date information regarding an identified issue and delivers notifications at a critical time to ensure immediate action can be taken.

Last year, alerts were released on Russian wheat aphid as well as blackleg and sclerotinia in canola, ascochyta in chickpeas and foliar rust pressure on barley and wheat.

The GrowNotes™ Alert team is preparing for season 2017-18, liaising with grains experts in preparation of management material. GrowNotesTM Alert notifications are only sent out when the issue is urgent, actionable on-farm or economically important, so you will only get an alert when it is important.

Just recently, a mouse alert was sent out to growers to encourage monitoring and reporting, given build up in parts of southern Australia.

Agriculture Victoria Program Manager for the GRDC GrowNotes™ Alert project, Kellyanne Harris, said there is now increasing demand for the service.

"More than 4000 people saw the GrowNotes™ Alert on sclerotinia, with most hits coming from the Northern Region, and a large number of those visitors clicked through for further information," Kellyanne said.

"Critically, the system is two-way, allowing growers to upload photos on the spot, and feed relevant and immediate information back to our extensive range of experts across Australia," she added.

Growers who subscribe are also given a free macro lens and are encouraged to send in issues with their crops to allow for early action to be taken if there a problem is identified.

Tom McCue, GRDC Manager Digital Products and Services, Regional Grower Services, emphasised that GrowNotes™ Alert is a system designed to enable timely and relevant alerts for pest, weeds and disease information across Australia.

"GrowNotes™ Alert links users to information and sources to enable action on the farm," Tom said.

Subscribers can choose to receive that information as push notifications to their smart phones, tablets or computers, as an SMS and/or email, an app alert, or by logging into the GrowNotes™ Alert subscriber website portal.

IRRIGATORS URGED TO APPLY FOR FARM MODERNISATION GRANTS IN NSW BORDER RIVERS AND LOWER NAMOI CATCHMENTS

Irrigators are urged to take advantage of the farm modernisation funding on offer through the NSW Sustaining the Basin Irrigated Farm Modernisation (STBIFM) program.

Infrastructure funding is now available to irrigators with regulated river (high or general security) and supplementary water entitlements in the NSW Border Rivers and Lower Namoi catchments.

The aim of the STBIFM program is to improve the long term sustainability of country communities by helping irrigators maintain or improve their productivity while also returning some of the water savings to the Murray Darling Basin.

“We work with irrigators to fund up to 80% of the cost of projects that save water on farm that would otherwise have been lost to their irrigation enterprise,” explained Project Officer, Peter Verwey.

“We can help with projects like upgrading pumps and equipment, deepening storages or switching to overhead irrigation technologies,” said Peter.

The program provides financial support for eligible irrigators to modernise infrastructure and upgrade equipment in order to recover water lost through evaporation, leakage and system inefficiencies. At least 50% of the water saved is then transferred to the Commonwealth for environmental use with the remainder staying on-farm for productive purposes.

“There are usually significant water savings that can be made in most irrigation operations, and these can be identified by carrying out an Irrigated Farm Water Use Efficiency Assessments (IFWUEA). When the irrigator works with their irrigation consultant or advisor to do the assessment and discovers just how much water is seeping away through leaky channels for example, or how much water is lost to evaporation in a shallow storage, the results can be surprising,” explained Peter.

The STBIFM program provides support and financial assistance at every stage of the process, from the initial assessment of water use efficiency through to the installation of new equipment and completion of infrastructure projects.”

The STBIFM program also provides training and development opportunities. These support irrigators in making informed investment decisions about infrastructure improvements and build knowledge and skills in the operation and maintenance of systems to maximise water use efficiency.

Since June 2012 the Irrigated Farm Modernisation program has committed almost $70 million towards 108 irrigation modernisation projects.

The farm modernisation projects will result in 32 gigalitres of water savings. From this amount, 22 gigalitres will be used to improve river health in the Murray Darling, while 10 gigalitres will remain on-farm to improve productivity, helping to generate economic benefits for rural communities.

Applications for infrastructure funding can be submitted at any time up until 30 June 2017. More information can be found by going to www.dpi.nsw.gov.au/info/sustainingthebasin

The Commonwealth Government has invested $111 million into the STIBFM program. The program is funded through the Sustainable Rural Water Use and Infrastructure Program as part of the implementation of the Murray Darling Basin Plan and is delivered by NSW Department of Primary Industries.

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