Sugar Research Australia

Cane Connection

Summer edition

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Welcome to the 2014 summer edition of Cane*Connection*

Dr Andrew Ward

Executive Manager

Professional Extension and Communication Unit

Welcome to the summer edition of Cane*Connection*. We feature updates on Sugar Research Australia's (SRA) strategy to enhance adoption; progress being made by our plant breeders; ways to maximise productivity and profitability while improving sustainability; and limiting environmental impacts related to nutrient management and Diuron. With the Bureau of Meteorology forecasting continued dry weather (let's hope they're wrong), our irrigation scheduling story is timely.

With the crush now over in most regions, we reflect on the season past and the season ahead. Whether on farms or in the sugar mill, we aim to maximise productivity and profitability. SRA invests your levy payments in a range of Research and Development activities to achieve this objective. Critical to maximising return on investment is the speed at which research outcomes are adopted across the supply chain – for example, new varieties or new farming systems.

SRA is focusing on ways to ensure research outcomes are adopted by the broader industry extension framework. After extensive industry consultation of the key elements and steps in the adoption process, SRA has developed a new extension model that could also help to accelerate adoption across our industry.

Recently SRA shared this draft strategy with our delegates, seeking their input, feedback and, ultimately, support before even wider industry consultation. We've included the draft strategy's key elements in this edition.

SRA's Professional Extension and Communications Unit recently hosted a workshop in Townsville, attended by over 100 extension personnel and growers, with the theme 'Producing high-yielding cane'. An accompanying SRA publication discusses the key building blocks for high yields. That publication is included in this edition of Cane*Connection* along with the latest industry update on Yellow Canopy Syndrome.

As always, SRA is your industry-owned organisation. If you have any ideas for future topics or suggestions for improving Cane*Connection*, please email us: communications@sugarreesearch.com.au

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Driving adoption of RD&E findings in our industry

Driving adoption of new and existing technologies is one of the key initiatives that SRA will focus on to improve the production, profitability and sustainability of businesses of our members and levy payers.

The development of SRA's new draft Adoption Strategy has been based upon feedback provided by a wide range of participants who represent the diversity of the SRA membership.

To confirm that the strategy will meet the needs of the growing and milling sectors, we are conducting a comprehensive consultation process.

Delegates were recently involved in a series of webinars in which the strategy was explained in detail.

The delegates also had the opportunity to provide their feedback, and overall the strategy was well received by this group.

Further consultation with SRA members and levy payers, industry representative bodies and key stakeholders such as the productivity service sector will take place.

The strategy comprises three main elements

1. Development Officers will spend approximately half of their time providing discipline-based expertise across 12 technical areas.

   Working with researchers they will also package the latest findings to produce extension materials for use by all extension providers.

   The other half of their time will be spent working collaboratively with local industry, including our grower and miller members, levy payers and extension providers, to identify productivity constraints, and develop tailored regional solutions to overcome them.

   To ensure equity among the regions, the officers will be spread throughout the industry with an allocation of one officer for each four million tonnes of cane produced.

   This will create a new position in the Herbert – already filled – and another position added to the Southern region.

2. The concept of Adoption Support Officers will also be piloted. These graduate positions will initially be recruited into two regions and will work alongside local extension providers to conduct on-farm trials and evaluations with interested groups of growers. Trial activities will be identified locally through consultation with industry.

3. SRA will accelerate adoption and develop capacity within productivity service groups and other extension providers by providing competitive funding for Regional Applied Research (RAR) projects.

   Each project will be supported with funding of up to $100,000 to enable extension practitioners and growers to develop experience by trialling and evaluating new technologies over two to three years.

   You can read more about two new RAR projects related to improving cane losses during harvesting by SRA Development Officer Phil Patane later in this edition.

The success of this strategy will be measured by the return on investment achieved in response to the level of investment made in the strategy. This will be determined through a comprehensive Monitoring and Evaluation program.

I look forward to receiving your feedback on the proposed strategy and working with everyone involved the industry to make this a success.

Dr Andrew Ward

Executive Manager

SRA Professional Extension and Communications Unit

2014 Variety wrap-up

Roderick Fletcher

Development Officers – Varieties

Professional Extension and Communication Unit

At this time of year SRA's Plant Breeding team is in the final stages of harvesting, measuring and recording all variety trials. The focus will shortly turn to the analysis of trial results in preparation for next year's Variety Adoption meetings – where potential new experimental clones are recommended for release, maximum propagation or to be accelerated for possible future commercial release.

A successful crossing season

Field and photoperiod crossing activities conducted in 2014 resulted in 1870 crosses. The crosses provide seed for a new cycle of selection to produce future new varieties in about 10 years' time.

Planting and harvesting of variety trials – first-selection stage Progeny Assessment Trials (PATs), second-selection stage Clonal Assessment Trials (CATs) and Final Assessment Trials (FATs) – at all locations have been completed. This year 32 variety trials were planted and 106 variety trial sites – approximately 17 714 experimental clones and 168 040 experimental seedlings – were harvested.

Outcomes of the 2014 Variety Adoption meetings

The Herbert committee was the only region to approve and recommend varieties. The committee approved two new varieties (Q226$^{\Phi}$ and Q250$^{\Phi}$) and recommended two blanket-approved varieties (Q252$^{\Phi}$ [limited release] and Q253$^{\Phi}$).

A total of 19 new experimental clones were collected by productivity boards for propagation and will be further analysed at the Variety Adoption meetings in early 2015.

Experimental Clones and QCanes received by regions

Northern region

Eight Accelerated experimental clones went to northern productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.

Southern region

Two Maximum Propagation experimental clones went to southern productivity boards. Successful experimental clones in this series will be considered for possible release in 2015.

NSW Condong Mill region

Four Maximum Propagation experimental clones and one Accelerated QCane went to Condong productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.

NSW, Harwood & Broadwater Mill regions

Five Maximum Propagation experimental clones and one Accelerated QCane went to the Harwood and Broadwater productivity boards. Successful experimental clones in this series will be considered for possible release in 2016.

Above: Q253$^{\Phi}$ grown in the Herbert.

Above: Q250$^{\Phi}$ grown in the Herbert.

Research and development

SRA funds 19 research projects that contribute to the plant breeding program; many are done in collaboration with our research partners.

1. Germplasm diversity

Sugarcane has a narrow genetic base, with most modern varieties originating from a restricted number of parents of the *Saccharum officinarum* and *S. spontaneum*. Some wild species, particularly *S. spontaneum* and *Erianthus arundinaceus*, have some valuable traits like disease and nematode resistance and stress tolerance, that would be valuable to transfer into the cultivated hybrids. This process, called introgression, requires considerable research and a long-term breeding commitment to be successful.

1. *Accessing stress-resistant sugarcane and research investment from China*
2. *New germplasm to develop more productive varieties*
3. *Exploiting introgression for the development of productive and regionally adapted varieties for NSW*
4. *Advancing yield, disease resistance and ratooning by exploiting new sources of genetic variability from wild relatives of sugarcane*

2. Trait selection

Yield improvement, a key breeding objective, is a high industry priority. However, selection for cane yield in early-stage selection trials is notoriously difficult, because of large inter-plot competition effects and environmental variation, and there are no easy solutions. Improving yield prediction accuracy in early-stage trials will greatly improve gains in breeding programs.

1. *More crop per drop: developing water-efficient and drought-tolerant sugarcane cultivars for irrigated and dryland farming* ***(Completed 2014)***
2. *SaveN Cane: Developing selection tools for N-efficient sugarcane* ***(Completed 2014)***
3. *Preparing the Australian sugar industry for threats from exotic pests and diseases* ***(Completion 2015)***
4. *Investigation of smut-resistance mechanisms in sugarcane* ***(Completion 2015)***
5. *Selecting for favourable plant x soil water interactions*
6. *SmutBuster II – accelerated breeding of smut-resistant varieties*

3. Pre-breeding tools

Sugarcane has a complex genome and little is understood about the genes that control its physical traits. Many of the research projects in this area stand to get a better understanding of its genome and the ability to target genes that may lead to a targeted approach to plant breeding.

1. *Towards a complete genome sequence of sugarcane; generation of data and development of bioinformatic resources* ***(Completion 2015)***
2. *Seed dormancy and establishment: a critical gap in the knowledge to support safe deployment of genetically modified sugarcane* ***(Completed 2014)***
3. *Faster flowering – new opportunities for genetic improvement* ***(Completion 2015)***
4. *Development and testing of an SNP marker platform in sugarcane and Applying the genome sequence for variety improvement: validation and implementation* ***(Completion 2015)***

4. Selection efficiency

In order to continue to increase the rate of genetic gain through new, more productive varieties, research to improve different components of the sugarcane breeding and selection programs are needed. Many outcomes of this research have already been implemented, making the SRA Australian sugarcane breeding program one of the best and most scientifically-based programs in the world. On-going research to improve parent selection using conventional and molecular marker methods as well as the effectiveness and efficiency of selection will result in further improvements in genetic gain and, ultimately, healthier, more productive varieties.

1. *Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability*
2. *Maximising the rate of parental improvement in the Australian sugarcane breeding program*
3. *Maximising genetic gain from family and within-family selection*
4. *Developing cytogenetic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids*

5. Post-release (adoption)

A large amount of information is collected by mills on the productivity of different varieties. However, these important and valuable data are not easily available and are not analysed in a routine way to provide good information on the relative performance of varieties in different situations. A project to collect, store and analyse mill data along with other agronomic information will provide better recommendations to growers and thus assist in increasing productivity.

1. *Optimising productivity and variety recommendations through analysis of mill data*

Improving nutrient application improves water quality and farm profitability

David Calcino
Development Officer – Nutrition
Professional Extension and Communication Unit

The maintenance of good quality water, whether drinking water, river water or ocean water, is in everyone's interest. Over the last couple of decades, the sugar industry has played a significant part in attempting to address water quality concerns. So how can recommended sugar industry fertiliser practices contribute to the improvement of both water quality and farm profitability?

The environmentally sensitive nutrients

Two of the nutrients required for cane growth are under the spotlight. Both nitrogen (N) and phosphorus (P) can have detrimental impacts on water quality.

This article focuses on N as it is very mobile – moving easily from the point of application – while P losses have been greatly reduced with the adoption of green cane trash blanketing in most regions – because P is usually lost when soil particles move off-site.

Why nitrogen can be a problem

Nitrate, which is a particular form of N, can be harmful to human health in drinking water. It exists in nature, but levels may increase due to a range of human activities, including the use of nitrogen-based fertiliser.

One of the greatest water quality risks to the Great Barrier Reef is from N discharge. Excessive nitrogen runoff to the ocean can result in more frequent outbreaks of infestations of crown-of-thorns starfish that feed on coral. Although these are naturally occurring organisms, their increased numbers cause heavy damage to corals and the whole reef ecosystem.

While cane is far from the only contributor to N runoff, there are some well-established, recommended practices growers can continue to do that will benefit both farm profitability and the environment.

Ways nitrogen is lost from cane blocks

Runoff

The movement of water or soil across the surface of a block. The water may contain nutrients and sediment that are lost to the crop.

Leaching

The movement of water down through the soil profile and away from the main root zone. The water may contain nutrients, especially nitrate-N.

Volatilisation

The conversion of surface-applied, urea-based products to gases whereby N is lost to the atmosphere.

Denitrification

The conversion of all N fertilisers to gases where waterlogged conditions and a ready source of organic matter occur. In such circumstances, substantial amounts of N may be lost to the atmosphere.

What can be done to reduce environmental impacts of nitrogen while maintaining yields?

The overarching guiding principle is to stick to the SIX EASY STEPS nutrient guidelines. Fertiliser recommendations that have been developed and updated over many years of research are based on yield, profitability and sustainability over a full crop cycle.

The simple, one-page SIX EASY STEPS guide for your region can be obtained from your local productivity services officer or from the SRA website:

www.sugarresearch.com.au

While there are no recipes for farm management practices and there are isolated exceptions to the rule, the principles below apply to the entire industry.

Sometimes it cannot be avoided but fertiliser applied just before the wet season is at much higher risk of loss as the crop will not have had enough time to take up the fertiliser.

Above: Denitrification and leaching of nitrogen fertilisers will occur under waterlogged conditions.

Runoff

Apply fertiliser below the ground, not on the surface. A green cane trash blanket provides excellent added protection to the soil and fertiliser.

Leaching

Sandy soils are extremely prone to leaching. Do not over-irrigate. Consider splitting the fertiliser applications or using a controlled-release product. You should discuss these strategies with your advisor as timing and cost issues need to be considered.

Volatilisation

Subsurface-apply fertiliser into the middle or sides of the row. However, surface application may be acceptable when the canopy is about 50 cm high, which provides some protection to the fertiliser from the weather. Also, the leaves are able to absorb some of the volatilising ammonia-N.

Because volatilisation occurs only with urea-based products, an alternative strategy is to consider using a different N product such as sulphate of ammonia, just to be safe. Irrigating cane straight after surface application of fertiliser will ensure the fertiliser enters the soil and is not volatilised.

Denitrification

Subsurface-apply fertiliser into the middle or sides of the row where it is in the driest part of the profile. In areas that are regularly waterlogged, consider planting into pre-formed raised mounds or splitting the N application on early-harvested blocks. Good surface drainage is particularly important.

Nitrification-inhibiting products that slow the breakdown of N fertilisers in waterlogged conditions are showing some promise. They cost more than regular products so discuss their use with your advisor.

Simply adhering to basic, sound management practices will ensure that crops have the best chance of high productivity while at the same time minimising the impacts on water quality.

Above: Following the Six Easy Steps nutrient management guidelines will maximise profitability and minimise impacts on water quality.

Above: Under waterlogged conditions, nitrogen can be lost to leaching, denitrification and weeds.

Local industries to drive the improvement of harvesting practices

Each year the Australian sugar industry incurs avoidable cane losses during the harvesting process.

Two new Regional Applied Research (RAR) projects, funded by SRA and led by productivity services groups with their local industry, are looking at ways to tackle this long-standing issue.

Reducing harvesting losses in the Burdekin region

Data collected from shed meetings in late 2013 in the Burdekin region showed that harvesting loss is either the top or second-most important issue that growers feel is limiting the local production system.

A three-year project led by Burdekin Productivity Services – *Understanding the impact of harvester speed on subsequent ratoon performance in the Burdekin* – will measure the effect of various harvester speeds on ratoonability and subsequent yield.

This activity will produce information on the cost benefit or penalty of a range of harvester speeds of 6–12 km/h.

This information will then help growers, harvesting operators and advisors understand the effect that harvester speed has on productivity, profitability and subsequent crop performance, and whether a change in harvester speed can be justified.

All trial blocks have been harvested with shoot, stool and gap counts completed.

'The best thing about this project is that we will be able to quantify the effects of ground speed from local farms with a range of soil types producing real data.

The project is followed through a number of ratoons, allowing us to assess the effects of ground speed throughout the entire crop cycle.

This data then will be available to growers, harvesting contractors and operators and millers stating the economic benefit or cost that can be attributed to a range of harvesting speeds.'

Rob Milla
Manager of Burdekin Productivity Services

Improving HBP adoption in NSW

NSW Sugar Co-operative is leading the *Improving industry returns through harvest best practice* research project.

Working with harvest co-operative directors, harvesting operators and growers on a range of Harvesting Best Practice (HBP) trials and demonstrations, this project will build on the recommendations for HBP developed by SRA.

Recommendations include:

- Reducing pickup losses
- Improving row profiles and crop presentation
- Determining the effect of high ground speeds on productivity.

The groups involved in the three-year project will work to improve the adoption of HBP at farm level and use the information to develop modified commercial arrangements that ensure the viability of the harvesting sector and equitably distribute the benefits of HBP to the farmers, harvest groups and the mill.

'While some losses associated with mechanical harvesting are unavoidable, there is a growing body of evidence that suggests that not only are these losses greater than originally thought but that poor practices in the field are having a significant impact on future productivity as well.

This project is intended to adopt a whole-of-industry approach to addressing these issues and coming up with strategies and solutions that fit NSW conditions.'

Ian McBean
Manager of Corporate Services with NSW Sugar

Above: In the field, NSW Sugar co-operative directors, operators and farmers discuss the harvesting project with SRA and Sunshine Sugar employees.

Phil Patane

Development Officer – Harvesting and Machinery

Professional Extension and Communication Unit

Ingham welcomes SRA Development Officer

Phil Patane has accepted a transfer from Ayr to Ingham.

Phil's contact details and role will remain the same. However his new address is SRA, 181 Fairford Road, Ingham QLD 4850.

Recruitment to appoint another SRA Development Officer based in Ayr will begin in early 2015.

About the RAR projects

Regional Applied Research projects are an industry-first initiative of the SRA Board. The projects fund on-the-ground research that addresses locally identified priorities.

Carried out by local extension providers and growers, with support from SRA's extension and engineering teams, the projects will help to drive adoption rates of new practices and technologies and grow industry skills.

A third RAR project that seeks to improve the adoption of tissue-culture plantlets by managing issues that stop growers from using it has been contracted with Tully Productivity Services Ltd.

With the interest shown in the RAR project scheme, SRA will seek further expressions of interest from the productivity sector in the future.

Diuron – can we keep it?

Good weed suppression in ratoon cane with a trash blanket.

Phil Ross

Development Officer – Weed and Pest Management

Professional Extension and Communication Unit

Although good progress was made towards achieving the Reef Protection Plan's 2013 target of a 50 per cent reduction in pesticide loads, with water quality improvement continuing to be a major priority, a new target of 60 per cent reduction has been set. This could mean that diuron-based herbicides run the risk of further restrictions on use if run-off levels are not brought under control.

Diuron use rules

Product label changes followed the release of the Australian Pesticides and Veterinary Medicines Authority (APVMA) review of diuron in 2012. These included:

- region-specific 'no-spray' periods for rates more than 450 g/active/ha
- no application in waterlogged areas
- no use if greater than 50 mm rainfall is expected within three days of application
- no irrigation within three days of application
- no application where the slope exceeds three per cent
- spot spraying to be not more than five per cent of total farm area
- only one application per calendar year.

Why diuron is still being monitored

Diuron is still under scrutiny as it is one of the PS11 herbicides being monitored under the Reef Protection Plan – a joint Federal and Queensland government program to improve water quality over the Great Barrier Reef.

The Reef Rescue program, which many farmers have participated in, is also part of the Reef Protection Plan.

This program assists farmers to make farm management changes that help to improve water quality leaving farms and, hence, improve the water quality within the Great Barrier Reef.

The Reef Protection Plan has specific targets for pesticide load reductions over time. To monitor progress, actual measurements of riverine and marine pesticide levels and modelling are used. Targets are based on reductions compared to a base year (2008-2009).

The 2013 target for pesticides was a 50 per cent reduction in loads found in Great Barrier Reef waters. This target has since been raised to a 60 per cent reduction by 2018.

Marine water quality performance

Figure 1 shows the modelled pesticide load reductions achieved by June 2013 compared to the base years of 2008–2009. Although the target of 50 per cent reduction was not achieved, good progress has been made.

Actual measurements of herbicides at 11 marine sites from Sarina Inlet to Low Isles generally supports this modelling.

There are, however, some regional differences, with the Wet Tropics showing more fluctuation between years, probably due to rainfall variations.

Although diuron is of most concern, monitoring has also detected other herbicides used in sugarcane: ametryn, atrazine, hexazinone, metolachlor and imazapic as well as the insecticide imidacloprid. A number of other herbicides used in other crops have also been detected.

Most marine detections for all regions have been at levels either at which there are no known effects on plants or animals, or slightly higher levels, which may compromise photosynthesis by some phytoplankton called diatoms.

However, the relatively low-level presence of herbicides may interact with other marine stressors, such as sediment, increased temperature, ocean pH and elevated nutrient levels, to slow the recovery of marine ecosystems after some stress event. Marine scientists are investigating these interrelationships.

Above: Diuron based herbicides like Velpar® K4™ DF® give reliable residual weed control.

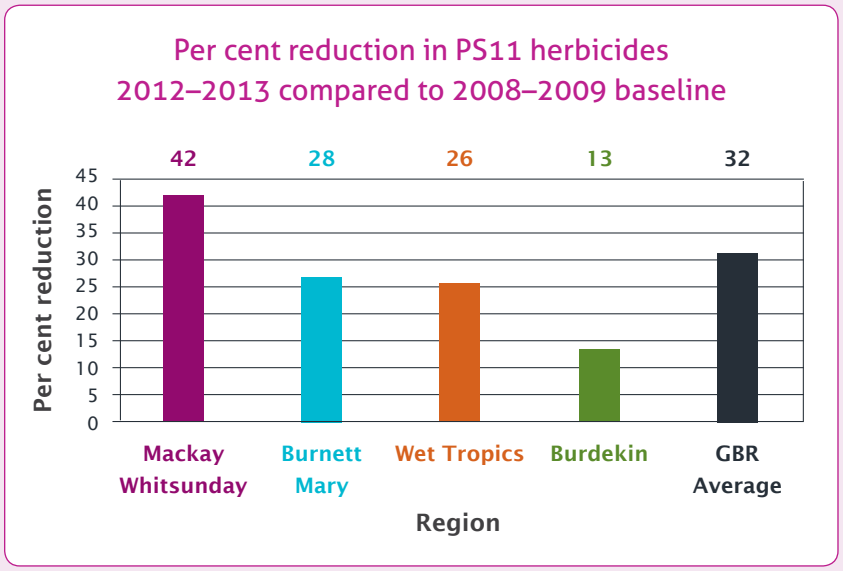


Figure 1: Progress towards achievement of the 2013 target of 50 per cent reduction in pesticide loads varied across regions. *Source: Great Barrier Reef Report Card 2012 and 2013 Reef Water Quality Protection Plan Results.*

Freshwater quality performance

Herbicides from farms find their way into the marine environment by way of rivers and creeks. Monitoring of water quality of rivers and creeks within cane-growing areas shows the results of farming practices more readily, as there is a much faster 'cause and effect'.

Monitoring of river systems indicates we still have a way to go. River and freshwater ecosystems have a lower tolerance to herbicide levels than marine systems.

Monitoring by the Queensland Government's Department of Science, Information, Technology, Innovation and the Arts (DSITIA) revealed the highest levels of diuron in the Mackay region (Sandy Creek and Pioneer River) in January 2014 and in the Burdekin region (Barratta Creek) from October to December 2013.

Levels were above the freshwater ecotoxicity threshold and also above the irrigation water quality threshold. Diuron concentrations also spiked above the ecotoxicity threshold at the Tully River and Herbert River monitoring sites during the 2014 wet season, but did not exceed the irrigation water quality threshold. The Johnstone, Burdekin and Burnett River's diuron concentrations have all been below the ecotoxicity threshold. Programs are in place in the high-risk catchments to reduce the risk of high concentrations recurring in the coming wet season.

What growers can do to meet the new target

Growers can do their part in helping to protect the environment and retain diuron-based herbicides by applying them according to label instructions.

Remember that there are region-specific no-spray periods for rates of active ingredient above 450 g/ha.

Except for the Wet Tropics where rates above 450 g/active/ha are banned all year, there are slight differences within regions depending on whether a diuron-only herbicide (e.g. Diurex® WG) or a diuron plus hexazinone herbicide (e.g. Barrage or Farmoz Bobcat® Combi WG) is being used.

Growers can also participate in the Smartcane BMP program to reinforce the industry's commitment to self-regulation. Contact your local productivity service group or CANEGROWERS to find out who your local Smartcane BMP facilitator is.

With the new 60 per cent reduction target now in place, monitoring of both marine and river environments will continue. There are 15 freshwater and 11 marine pesticide monitoring sites within the sugarcane production region. If the levels do not improve, this will have an impact on the chemicals that can be used in the future.

Ongoing chemical reviews

The APVMA reviews chemical registrations from time to time, in response to new knowledge or to submissions by other organisations or individuals.

Current reviews include 2,4-D and chlorpyrifos. Future reviews planned by the APVMA include hexazinone, MCPA and propiconazole – a fungicide for pineapple disease.

In addition, Australia is likely to ratify the Minamata Convention, a global initiative to phase out mercury-based products by 2020. Shirtan® is the only mercury-based fungicide registered in Australia and is registered for use only in sugarcane. Registrations for all other mercury-based products were cancelled in 1995. The existing Australian registration for Shirtan® will expire on 30 June 2015.

Irrigation scheduling

Bradley Hussey

Development Officer – Farming Systems and Irrigation

Professional Extension and Communication Unit

Scheduling irrigation can help growers apply the right amount of water, in the right place, at the right time, to produce optimum yield. A range of tools are available to help with this important process.

The optimum level of irrigation

The frequency and amount of water to be applied will vary depending on soil type and crop growth stage.

Actively growing crops with a full canopy will require more frequent watering than small crops or those that are maturing for harvest. Different soil types will influence how much water the soil can hold and therefore how often irrigation will need to occur.

When determining an irrigation schedule you should aim to replace the readily available water (RAW). This is the amount of water held in the soil between the full point and the refill point.

The full point is the maximum amount of water the soil can hold against gravity. The refill point is the soil water content at which crops begin to stress. As a rule of thumb, it is halfway between the full point and permanent wilting point (**Figure 1**).

The RAW will vary, depending on soil type, the effective rooting depth of the crop and the crop itself.

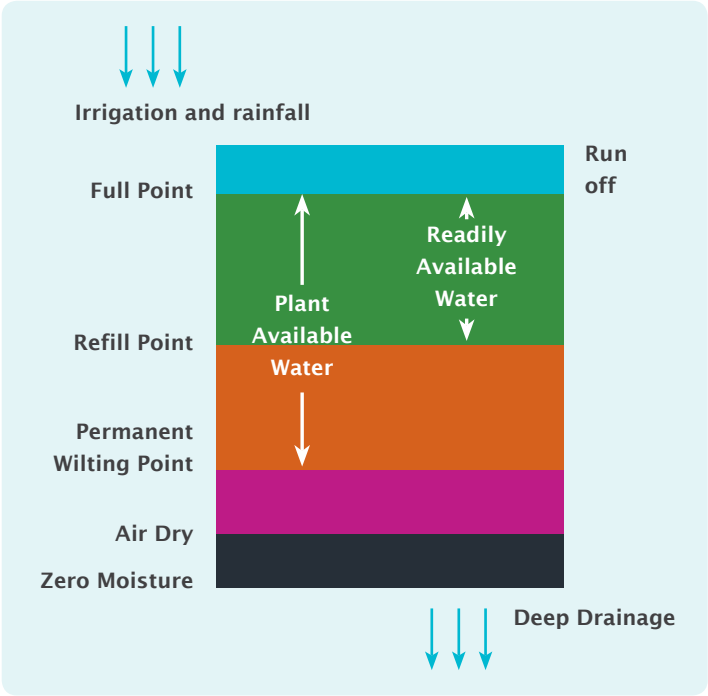


Figure 1 (above): Soil water types.

Irrigation scheduling tools

Capacitance probes

A capacitance probe can help to identify daily water use and to predict when a crop will require the next irrigation. When the soil moisture is maintained in the ideal range, crop yields will be maximised and water loss from deep drainage will be minimised.

A range of capacitance probes is available to purchase. These include but are not limited to products such as the EnviroSCAN from Sentek, the Field Connect from John Deere and the EnviroPro from Envirotek.

Making irrigation decisions from online data

Many of these systems work in a similar way because the information from the soil moisture monitoring equipment is sent from the infield equipment via a phone network to a computer server. The information is then made available to the user through a website that is password protected.

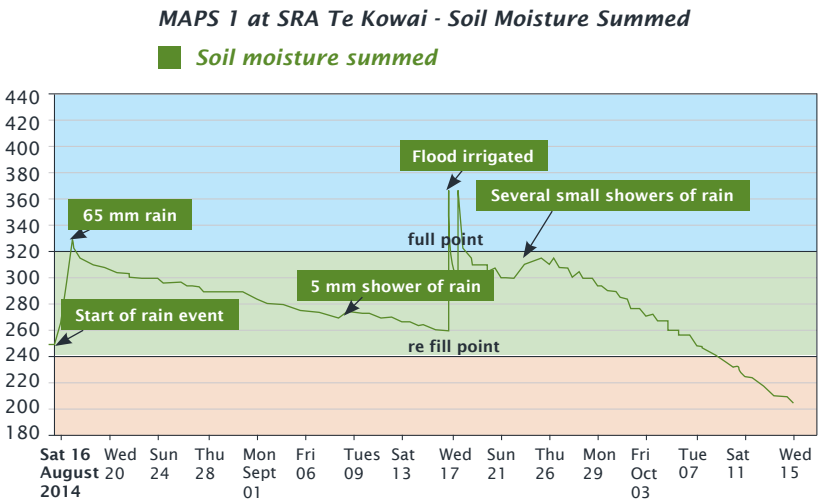


Figure 2 (above): An online chart shows the total soil water in the top 80 cm over the length of the probe. *Source: Mackay Area Productivity Services.*

Using a system like this enables the grower to see how much soil moisture is available for crop growth and when the next irrigation will be required.

This takes the guesswork out of irrigation scheduling and allows the grower to maintain the soil moisture in the zone that will maximise crop growth.

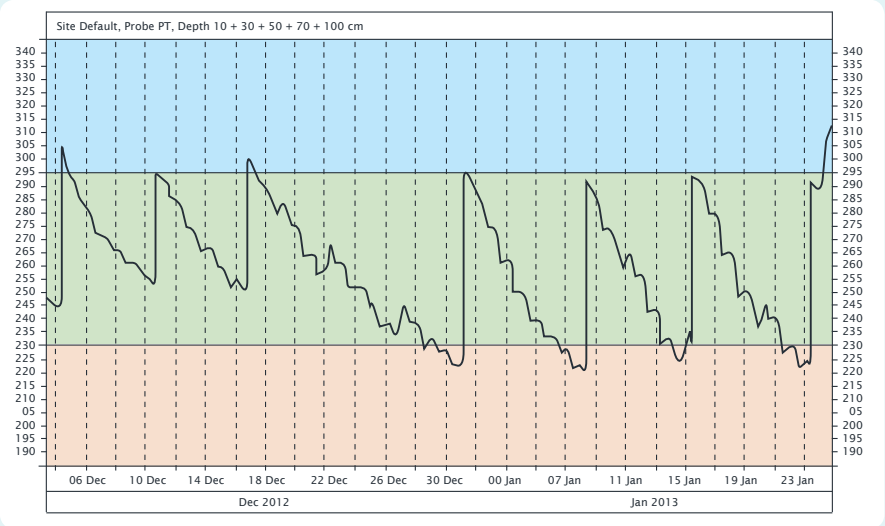
When deciding to buy a capacitance probe irrigation monitoring system, you need to consider the following points:

1. How robust and reliable is the infield equipment?
2. Is there a local service and support agent for the equipment?
3. How will you access the data from the system – a website or other system?
4. What is the annual cost of website access?
5. How user-friendly is the software on the website or on your computer?
6. What is the purchase price and ongoing cost of maintaining the system?

The cost of capacitance probes

The cost varies, depending on the size and complexity of the system. A single probe system will cost $3000–$5000 and the annual subscription to a website for data collection will range from $132 to $900.

Figure 3 (right): A capacitance probe chart showing daily water use. The blue zone on the chart is too wet, the green zone is the ideal range and the red zone is too dry.



Crop models

Crop water use can be estimated from evapotranspiration readings and crop factors. This will give an estimate of the amount of water being used daily or weekly by the crop. If the RAW and amount of water supplied by the irrigation system is also known, it is relatively easy to calculate when the crop will next require watering.

Tensiometers

Tensiometers consist of a hollow tube joined to a ceramic tip at the base, and a vacuum gauge and reservoir at the top. They measure the force that plants need to exert to obtain moisture from the soil.

As the soil dries, water moves out into the soil from within the tensiometer through the ceramic tip. The loss of water creates a vacuum in the tensiometer and is recorded as a suction reading. The higher the suction reading, the drier the soil. Irrigation begins again when the tensiometer gauge reads a predetermined level. After irrigation or rainfall, water moves back through the ceramic tip and the vacuum in the tensiometer is reduced.

A range of tensiometers is available in both manual and electronic formats. Manual tensiometers have a gauge on the side to show the level of soil suction. Electronic tensiometers can be connected to data loggers to measure soil tension over time. Tensiometers are at the lower price point for moisture monitoring equipment, with a range of models available between $200 and $300.

GDot: a new style of tensiometer

The GDot is gypsum block-type soil moisture sensor that uses a large dot display to show how hard it is for the plant to extract water from the soil. The large display on the unit allows them to be read from up to 15 m away, so a unit placed at the edge of the crop can easily be read from a vehicle on the headland. When all yellow dots are displayed, the crop has adequate soil moisture. As the soil dries out, fewer dots are displayed, showing that the crop requires irrigation.

The GDot unit was developed by Measurement Engineering Australia, and is available for purchase through Farmacist. The units are easy to install – all that needed is to auger a hole and bury the sensor in the active root zone and hang the GDot on a post. At around $300 per unit, the GDot is a low-cost option.

Right: A GDot system installed in the field. The yellow dots show that the crop has adequate soil moisture.

Helpful hints

- Irrigation scheduling allows you to match the water supplied to the crop with the water used by the crop.
- Tools are available to help with the management of soil water.
- Correct matching of water supply to water demand results in the best possible yield.

The following helpful information sheets can be found on the SRA website www.sugarresearch.com.au:

- IS13107: Soil water-holding capacity has more information on calculating RAW
- IS13023: Crop water use
- IS13027: Capacitance probes

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Using the 'off-season' to get your farming equipment right for the season ahead

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Bradley Hussey

Development Officer – Farming Systems

Professional Extension and Communication Unit

The 'off-season' – December through to April – is a great time for growers to repair and maintain farm machinery. It is also an excellent time to find out what other growers are doing, and to think about modifications to existing equipment and purchasing new equipment that might improve farming operations in the season ahead.

Equipment modifications and machinery decisions to consider

Planter

Setting up your planter with proper press-wheels will help germination and remove the need for separate pressing operations.

The ideal press-wheel ground pressure varies, depending on soil texture, tilth and soil moisture. A down pressure of 2-4 kg/cm of press-wheel width is generally best. Use the lower pressure on sandy soils.

Right: Good press-wheel set-up will improve germination.

Herbicide sprayers

Consider which herbicides you intend to use after the wet season and check that the nozzles on your rig match label recommendations.

Check nozzle performance and replace any if output is more than 10 per cent. Some growers replace the nozzle if the variation is more than 5 per cent.

Some growers have fitted dropper legs directly over the row, allowing flexibility in applying pre-emergents to rows only.

If using glyphosate through shields or hoods, check nozzle choice and set-up to make sure that there is no drift and, importantly, that there is no drip line of herbicide from the shield or hood sides.

The Department of Agriculture, Fisheries and Forestry (DAFF) has developed a dual herbicide spray system. This system could be useful on your farm, especially if you have problems with perennial grasses in older ratoons.

The spray leg applies knockdown herbicides such as glyphosate to the inter-row without the use of shields or hoods. It also applies residual herbicides to the cane row only.

For more information on this system, contact Allan Blair at allan.blair@daff.qld.gov.au

Above: Dual sprayer leg. (Image courtesy of DAFF).

Seed cane harvester

Billet quality for planting is very important for germination; high-quality billets can reduce the planting rate. Ideally, dedicated seed cane harvesters should have their roller train optimised and rollers rubber-coated to prevent damage to eyes. If you rubber-coat rollers, make sure that the roller speeds match the chopper speed. Harvesters manufactured from 2000 onwards should already have factory-set optimised rollers.

Rubber coating services are provided by Tastex Linings, 07 3271 6303.

Hilling-up implements

Row profiles that do not match the harvester basecutter action result in increased dirt levels in cane, poor pick-up, stool shattering and poor ratooning. As well as the physical set-up of your hilling-up implement, timing is also important.

Hilling-up operations should aim to achieve:

- Consistent hill-up profile across the farm, matching the basecutter angle; avoid flat or hollow profiles.
- No volcano effect, which is caused by hilling-up after excessive shoot growth with shoots impeding the soil flow into the centre.
- Clod-free profiles as much as possible as clods increase soil in cane supply.
- A flat, smooth inter-row free of tine marks to give the harvester a level base to work on.

If you treat for one-year canegrubs, ensure that your hilling-up profile does not leave any insecticide treatment too deep, as this will reduce its effectiveness.

Above: Appropriately hilled-up cane.

Fertiliser boxes

Double-disc openers with press-wheels behind the single coulter stool splitter allow better placement and less choke-ups from trash. The openers allow operation over a wider range of field conditions, meaning fertiliser can be applied earlier after rain.

Many growers have modified their fertiliser applicator to apply either liquid or granular imidacloprid for canegrub control. This eliminates a separate field operation and ensures that insecticide application equipment is available when you need it.

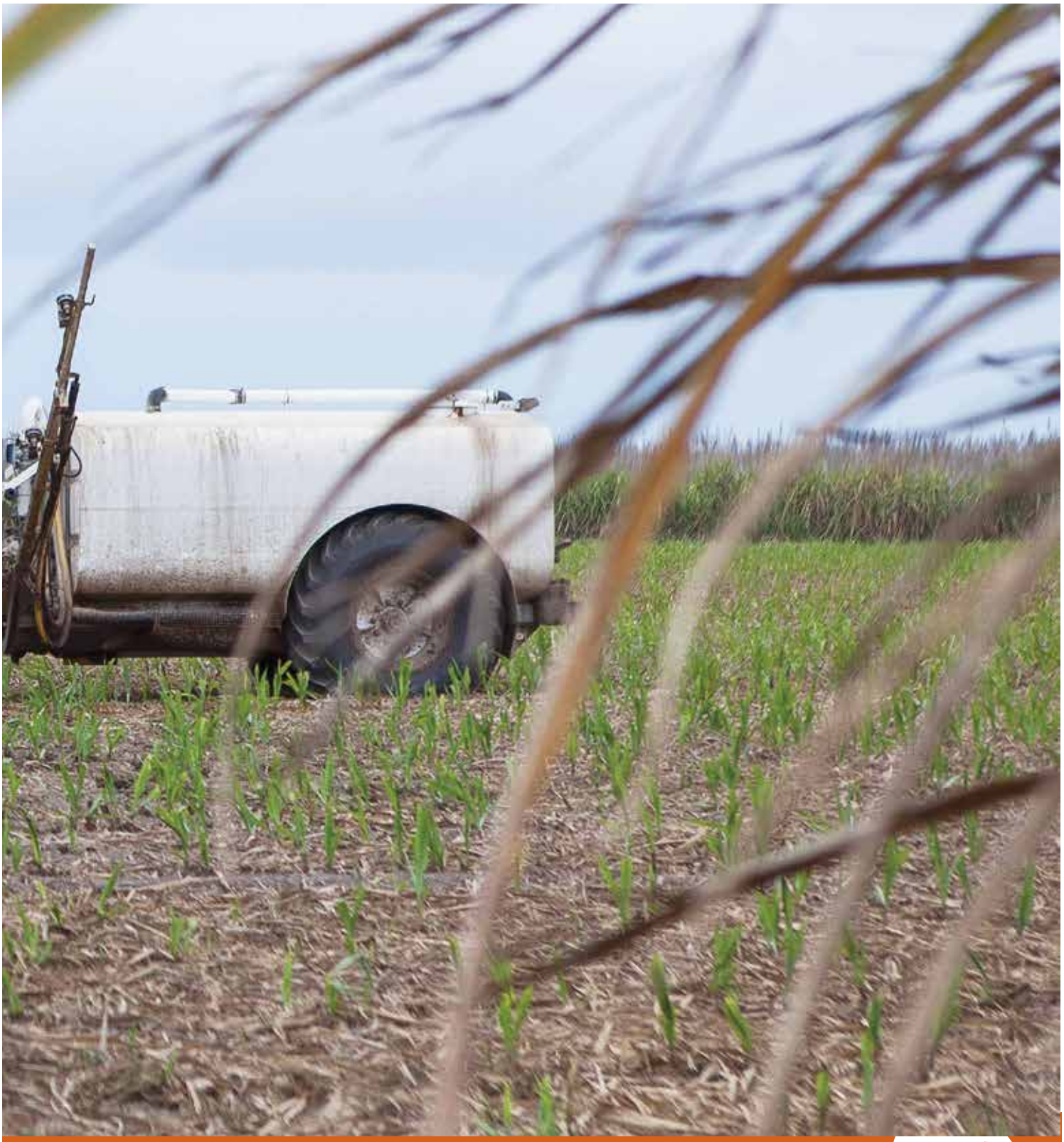
Right: Double-disc openers with press-wheels behind the coulter on a fertiliser applicator.

Metering systems for liquid insecticide

Dosatron® metering systems inject liquid insecticide concentrate directly into the water supply line from the original insecticide container. The system eliminates carryover insecticide tank mixes and provides for easy rate adjustment. The system can be easily retrofitted to existing applicators or supplied fitted to new equipment.

For more information, visit the Dosatron website www.dosatronsales.com.au or call Hodge Industries on 07 4955 0500. If you treat for one-year canegrubs, ensure that your hilling-up profile does not leave any insecticide treatment too deep, as this will reduce its effectiveness.

Right: The Dosatron® metering system on a billet planter.



Sugar Research Australia Ltd
ABN 16 163 670 068

Head Office
50 Meiers Road
Indooroopilly QLD 4068
Australia

Postal Address
PO Box 86
Indooroopilly QLD 4068
Australia

Tel 07 3331 3333
Fax 07 3871 0383
Email sra@sugarresearch.com.au
Web sugarresearch.com.au

For letters to the editor or to change your address please email communications@sugarresearch.com.au or write to us at the address above