Foreword

Similar to previous years, the booklet offers access to locally produced data and information which may help shape your soil, plant and animal management systems.

Recently we've seen many PIRSA projects roll out within our industry as a result of great federal and state government support post-fires. Some of these are summarised within this report: feral pig project, weed management/cape tulip, ramped up biosecurity, sheep blowfly eradication, biosecurity and animal health projects including footrot, campylobacter, sarcocystosis and toxoplasmosis.

You'll find continued work regarding improving soil health with local lime trials, soil testing data, soil carbon and pH monitoring. You can't beat independently produced local data!

This year's trials booklet is again backed by PIRSA and collated by Lyn Dohle who contributes so much to the local agricultural industry.

Rick Morris, Chair, AgKI.

Editor's Note: – *for those of you who keep a collection of the annual Ag Trial booklets, you may notice an anomaly with the year on the front cover. Due to the 2019/20 fires, the 2019 Ag Trial booklet was actually printed in July and not February as has been the norm. We've decided to keep with a winter publication date, so this year's booklet is the 2021 Ag Trial booklet which incorporates trial and project work from 2020 and 2021.*

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Contents

An Update from AgKI

Agriculture Kangaroo Island is the peak body for agriculture and primary production on Kangaroo Island. With approximately 150 members, we represent members across the breadth of the island, including both grain and livestock producers, along with other farming and production activities.

In 2020/21, AgKI:

- supported members in post fire support activities
- advocated relentlessly for funding, services and support for the agricultural sector on Kangaroo Island, post bush fires
- successfully worked with KIBBA and KITFWBA (now KITA) regarding LER (Local Economic Recovery) Funding
- represented views of members on the numerous reviews regarding the KI fires
- supported projects regarding feral pigs and feral cat eradication
- built a strong relationship with the new Landscape board
- continued to seek clarity on clearing of fence lines, paddocks, driveways and general fire management clearance
- represented members' interests on the Bushfire Recovery Committee
- reported to the Royal Commission regarding bushfires.

We have continued to deliver research and extension, as a result of grant funding, for the following projects:

- Healthy Soils
- Facts and Figures Project
- Producer Group
- Mixed Cover Cropping
- Technology and tools to increase adoption of smarter and more sustainable farming practices.

We continue to work with key partners to ensure that our members are well represented, recognising that the agriculture/primary production is the largest industry sector on Kangaroo Island.

Our Board Members have continued to work hard, in a very busy and challenging period. The current board members are:

Rick Morris (Chairperson)

Jamie Heinrich (Deputy Chairperson)

Steph Wurst

Caleb Pratt

Grant Flanagan

Tim Buck

Caitlin Berry

Cr Sam Mumford (Council representative)

Lyn Dohle (PIRSA representative)

Damon Cusack (Landscape Board representative)

We acknowledge our 2020/21 partners, whose assistance allows us to support and advocate for our members:

Platinum Partners

Meat & Livestock Australia (MLA)

Primary Industries & Regions South Australia (PIRSA)

Landscape South Australia Kangaroo Island

Gold Partners

NBN Co.

ANZ Bank

Nutrien Ag Solutions

Silver Partner

G. & J. East (Strathalbyn)

Join now

If you would like to become a member of AgKI and gain the many member benefits, please fill in the slip on this page and post it along with your payment. For more information or if you would like a membership brochure emailed to you with the BSB details, email to: admin@agki.com.au.

To Contact AgKI:

Phone: 0428 716 330

Email: admin@agki.com.au

Website: www.agki.com.au

AGKI
AGRICULTURE
KANGAROO ISLAND

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Ag Tools & Tech Demonstration Sites

Background

The use of technology in agriculture is rapidly advancing, but sometimes it's hard to keep up with the advances. It's always nice to be able to physically touch and see the items and learn from other farmers how useful they are and any pitfalls. For this reason, Agriculture KI sought funding to set up four local demonstration sites.

What was done

Site 1 - Farm Water Monitoring (S & M Veitch)

Simon and Marisa Veitch have set up a complete remote water monitoring system on one of their properties in MacGillivray. Simon has installed a tank water level monitor as well as flow meters on the inlet and outlet for leak detection on the header tank (refer to Figure 1), which supplies six troughs. He has also installed a salt meter as he shandies water in the tank from a salty bore. The meter allows him to know exactly how much salty water he can add.

The system enables complete remote monitoring of the water supply and pumping systems. The information can then be viewed online 24/7 or via a daily phone text.

Financially the system stacks up. Simon valued his labour costs to drive twice a week to the farm (some 10 km from the home farm) at $2880 per year. The cost of the system and install would pay for itself within two years.

Figure 1: Shane (Alpha Group Consulting) and the tank monitoring set up. Note the gravel in the tyres to protect the tank and equipment from cattle.

Site 2 - Moveable Soil Moisture Probe (S Childs)

Two AquaCheck® probes with a MEA data logger have been installed in a potato crop on Steven Childs' farm. The aim is to determine soil moisture levels, enabling more accurate irrigation scheduling and preventing yield loss from the soil being either too wet or too dry.The probes are removeable and reusable making them ideal for non-permanent crops.

The probes have shown the soil moisture trends at different depths, giving an excellent indication and early warning of drying soil, particularly at depths that cannot be easily dug by hand in a normal crop monitoring visit. Due to the results, watering was increased over the drier part of the pivot to prevent plants from being put under stress and potential yield reduction.

In Feb, after the early rains, the probe data was an essential decision-making tool to determine the required decisions around when or if to start watering again. This is a critical time for watering as the crop is desiccated and plant water use decreases. Additional watering may cause tuber disease, skin damage or vehicle bogging problems at harvest time.

By the end of the current potato season, it is hoped that sufficient knowledge will have been gained to set lines on the soil moisture graphs which will provide direction on when and how much to water on any given day.

Refer to Figure 2 (overleaf), showing soil moisture levels at different depths. The spike is the rainfall event on 5-6-7 Feb and the decline in soil moisture post that date shows the soil drying out pre-harvest.

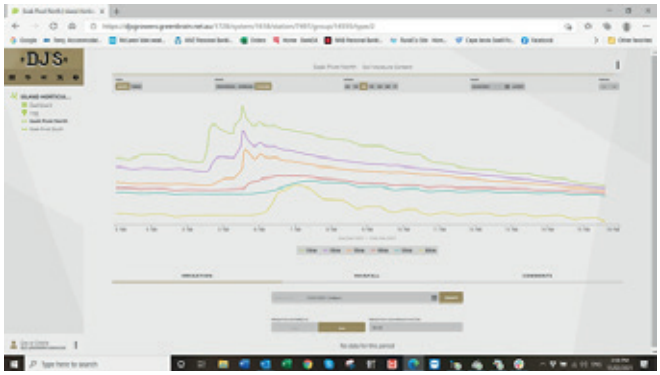

Figure 2: Soil moisture monitoring

Site 3 - Stanton - Auto Draft & Walk Over Weighing (Tru-Test)

The ability to be able to weigh, analyse and manage your livestock from wherever they are is a game changer in taking the guesswork out of decisions. The system enables producers to weigh, analyse and manage their livestock without a person in sight, be it:

- tracking animals against target weights or a range of other data
- filtering the data to identify top and bottom performers or monitoring weights by groups or individually
- setting up draft lists and viewing up-to-date draft numbers
- instantly sharing the latest data with third parties
- or even keeping an eye on the trough water level and livestock with images from the remote camera.

The collected data is cloud based, so you can access your data from any device. This allows you to weigh, analyse and manage your cattle remotely. Combined with a 3-way auto draft, this allows farmers to weigh, analyse and draft off the top or poor performers without even having to enter the paddock.

Will and Jenny Stanton are in the process of setting up the system and allowing the cattle to get used to it. Stay tuned for field days on site and results in next year's ag trial booklet.

Site 4 - DNA Trait Mapping in your Commercial Sheep Flock

Most producers are aware of the value of using ASBV when selecting rams and in a stud operation so that the full parentage of lambs is known. But how can you speed up genetic gain in a commercial flock when the progeny may come from any one of the rams put out in the mob? Neogen offers a commercially priced DNA testing program, allowing producers to test the rams' DNA. The producers can select the best weaners in the commercial flock, test their DNA and use that data to link the lamb to its sire, thus identify the rams throwing the best progeny.

Mitch and Ros Willson are trialling the concept by selecting a group of elite ewe hoggets and cull ewe hoggets that had previously been visually assessed. The hoggets were DNA tested for parentage then their fleece weighed and micron tested to place a dollar value on their fleece. These ewes will be followed through scanning to determine if there is any difference between various wool characteristics and fertility.

This project is in its early stages – more details to come!

Take home messages

- Technology is advancing rapidly, making many farm jobs quicker and easier.
- We now have four 'new technology' demo sites on KI, call the producers to learn more about its practical application and cost effectiveness

Funding/Sponsors

- **AGKI through the Australian Government National Landcare Program Smart Farms Small Grants**
- **S & M Veitch (Simon - 0457 137 283)**
- **M & R Willson (Mitch 0427 531 200)**
- **Steven Childs/David Oddie (DJ Growers) (David 0419 849 674)**
- **W & J Stanton (Will 0429 855 922)**

Further Information

Lyn Dohle, PIRSA Kingscote

M 0419 846 204
E lyn.dohle@sa.gov.au

Building Resilience & Profitability of High Rainfall Farmers

What's Happening

This was the second year in a three-year project that is focusing on building resilient farm businesses and strengthening farm decision making. It is based on the highly successful Grain & Graze decision making model which incorporates four key parameters with vital real time information. The parameters being - soil moisture, pasture availability, commodity prices and climate data.

Workshops are being run with a key focus on women and young farmers to build confidence and skills. The culmination of the project will result in a website dashboard, with optional push notifications of the four key parameters. This will provide information that increases farmer and agronomist ability to make better on-farm management decisions.

The restrictions imposed by COVID 19, combined with bushfire recovery, meant that no workshops were held on the Island during 2020. Meanwhile, the recalibration of the new and improved Pastures from Space continued.

QR: High Rainfall Zone Weather Monitoring: online updates for KI sites.

Soil Moisture Monitoring

The project partially funded the installation of up to 30 soil moisture probes across the high rainfall zone in Tasmania, Victoria and South Australia. On Kangaroo Island, three 120cm deep Adcon Telemetry soil moisture probes and weather stations were installed in April 2020. These are located at Buck's (Gosse), Heinrich's (Parndana) and Berry's (Birchmore). This information is uploaded every 15 minutes and can be found by scanning the QR code on this page.

The Buck Gosse site had the most rainfall during winter 2020 with several instances of saturation events down through the soil profile during August to mid-October. This was observed as the 'tabletop' effect where the graph lines flatten out for days/ weeks prior to the water moving down deeper in the profile to drain away (Figure 1). There is the diurnal fluctuation evident with pasture root activity extracting moisture during the latter part of November as temperatures warmed up and plants got growing (clover, kikuyu, fog grass and capeweed). The February 2021 rainfall event did infiltrate to around 80cm, but evapotranspiration saw most of this moisture removed by early April 21. Rainfall during April/May 2021 infiltrated to around 60cm but there was slightly less moisture than the same time last year.

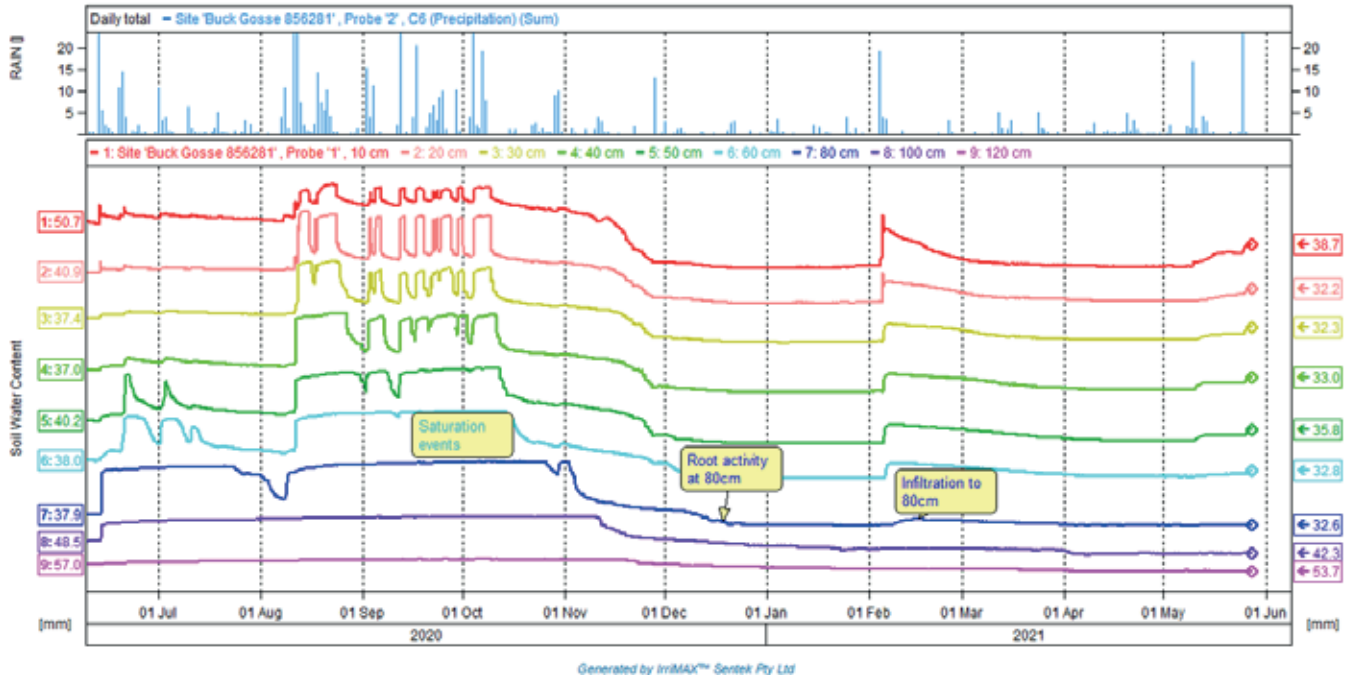

Figure 1: Buck Gosse site. Moisture sensor readings at varying depths in the soil profile.

The Heinrich Parndana site also saw saturation events during August to October (Figure 2). The nature of this soil type (more gravelly down the profile) saw more rapid infiltration than the other two sites and thus the graph appears more 'spiky' and not as smooth as others. Pasture root activity is less pronounced but is evident in the top 40cm during November.

The Berry Birchmore site did not see any saturation events last winter and the lines therefore look quite smooth (Figure 3). Root activity was observed down to 80cm during late November and there are nice curves prior to that showing the roots progressively extracting moisture down the profile which was very clear at the 50 and 60cm sensors. Again in March 2021, the root activity was clear at these two sensor levels, which was surprising given that it is an annual pasture.

And whilst not directly involved in the project, the Bell Cygnet River site is a long term site and we feel it's important to publish the data. Being a long term site means the data has enabled very accurate upper and lower thresholds to be established. The site was under grain crops and had wheat in 2020. The grain fill period during November only saw roots to 100cm due to the kind finish to the season, whereas in previous seasons roots have been observed extracting deeper than that (the probe goes to 160cm). Residual moisture from 2020 means that at May 2021 the profile was 50% full with a large part of that being at the 100cm and deeper which is observed in the Deep Summed graph (Figure 4) that shows only those sensors at 100 to 160cm. This will likely lead to saturation events at this site if there is average winter rainfall.

Pasture Availability

The recalibration of the new and improved Pastures from Space commenced ground truthing in 2020. The project aims to be able to provide estimates of pasture availability from satellite images, such as growth rates and feed on offer. Another feature being worked on is estimating historic pasture growth in the paddock. There are 22 paddocks being monitored on 22 farms. The paddocks are in South Australia (7 sites – 2 on KI), South West Victoria (9 sites), Gippsland (2 sites) and Tasmania (4 sites). The resolution of the new Pastures from Space is intended to be around 10m^2 pixels instead of the previous 6ha pixel.

On KI, pasture calibration cuts were taken from a perennial kikuyu pasture on Bucks' and an annual pasture on Berry's. Five pasture cuts were taken between August and December 20 at the Buck site with ~13tonne of dry matter recorded. The site was visited on the 25th Feb 2021, a fortnight after the February rain event but there was insufficient pasture to cut. Six pasture cuts were taken at Berry site between May and November 20 with 11.1tonne of dry matter recorded (Figure 5).

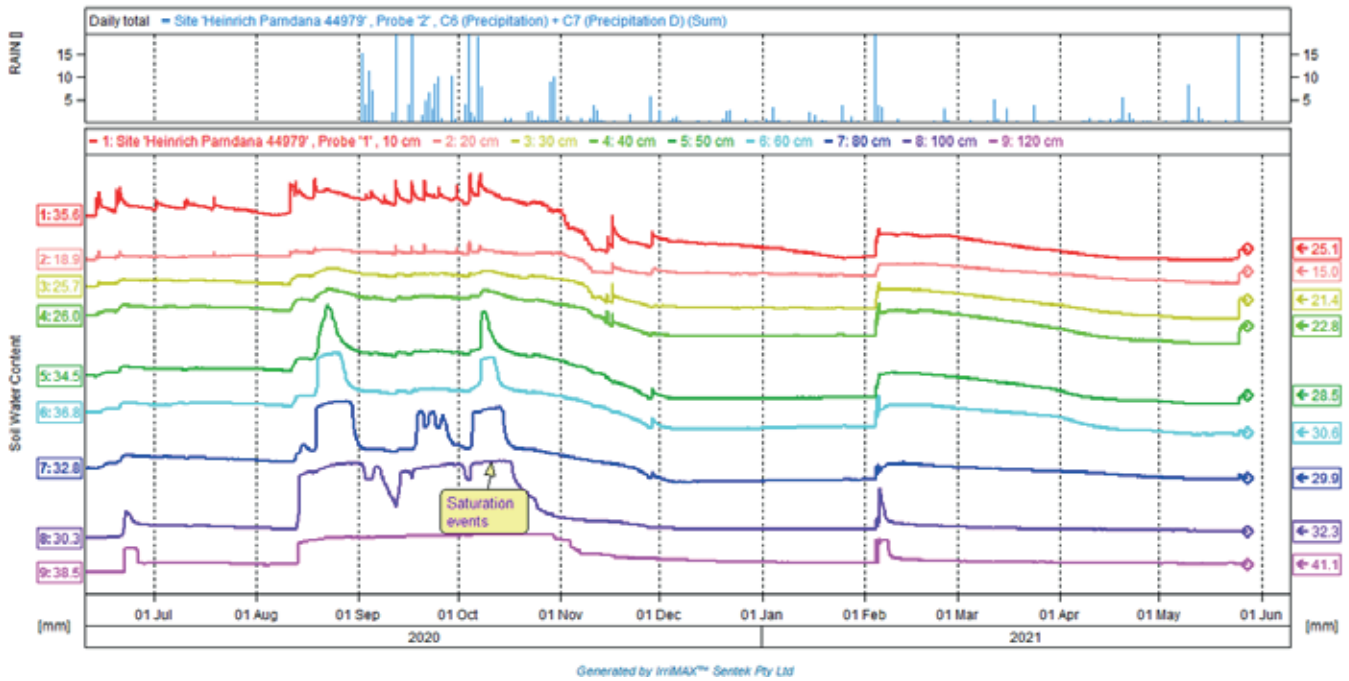

Figure 2: Heinrich Parndana site. Moisture sensor readings at varying depths in the soil profile.

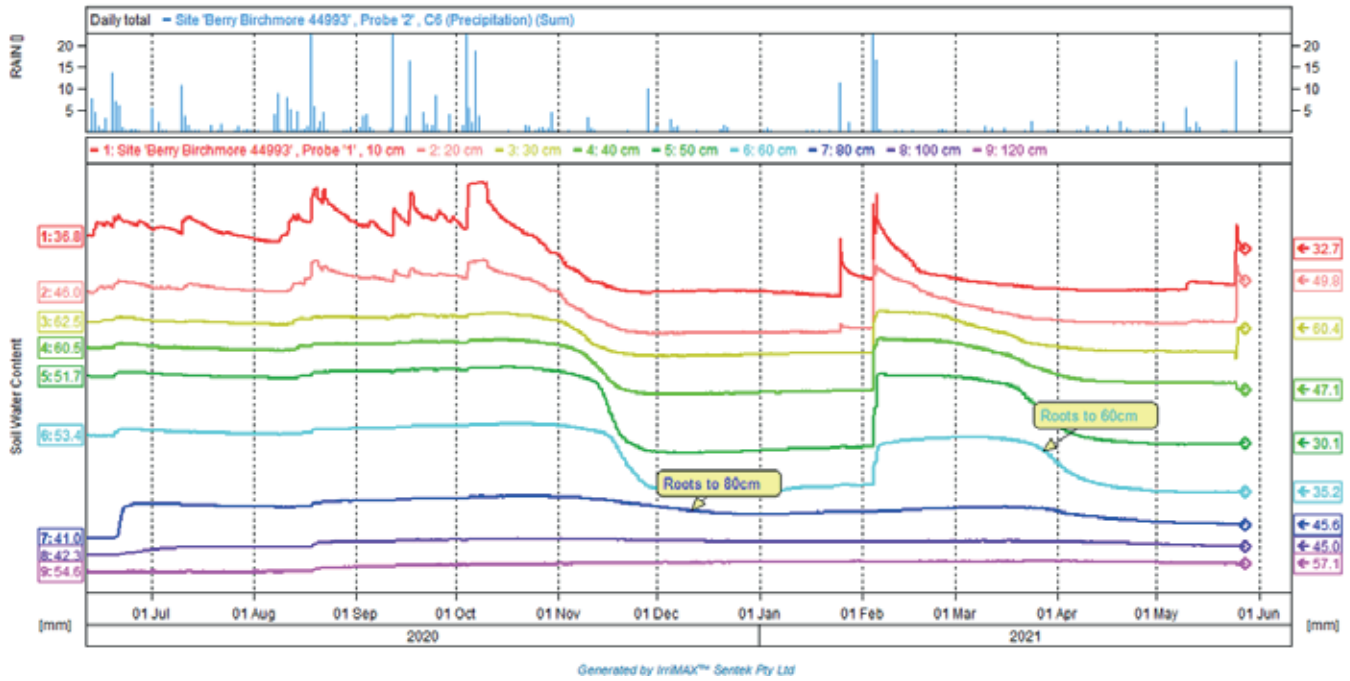

Figure 2: Berry Birchmore site. Sensor readings at varying depths in the soil profile.

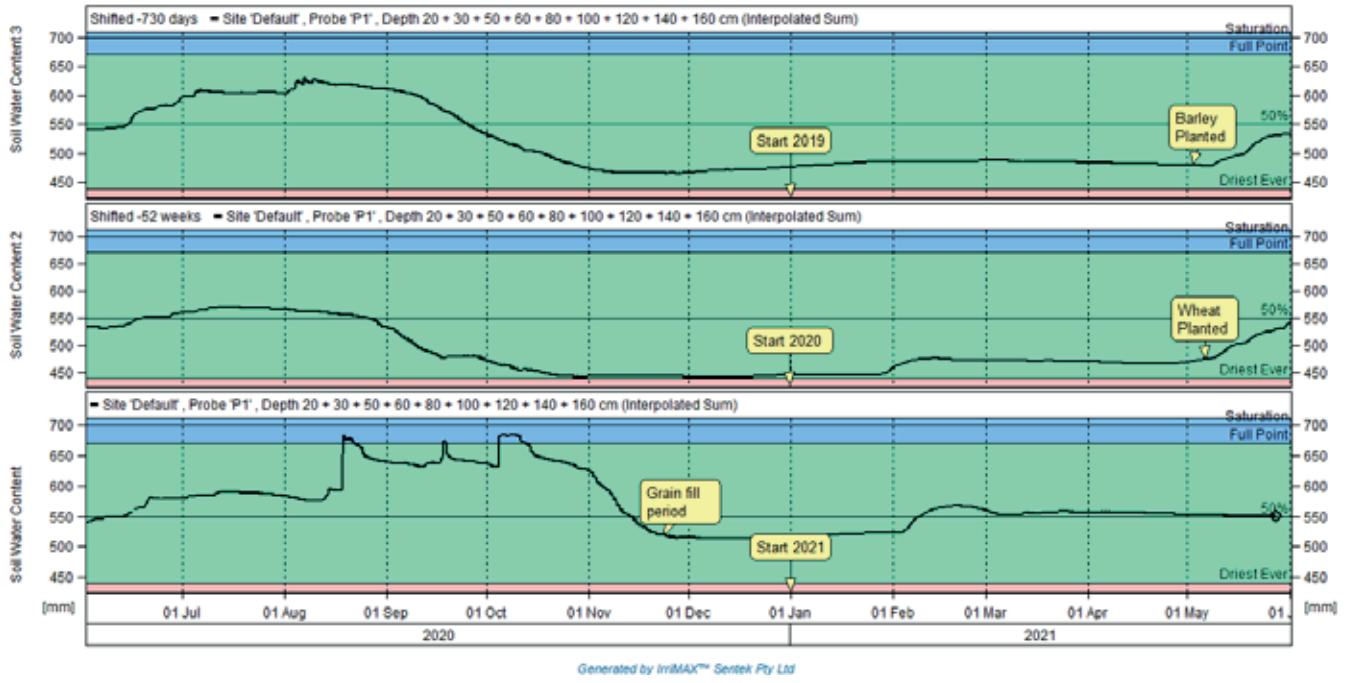

Figure 3: Bell Cygnet River Site. Graph shows summed moisture levels of the sensors at varying depths over two years.

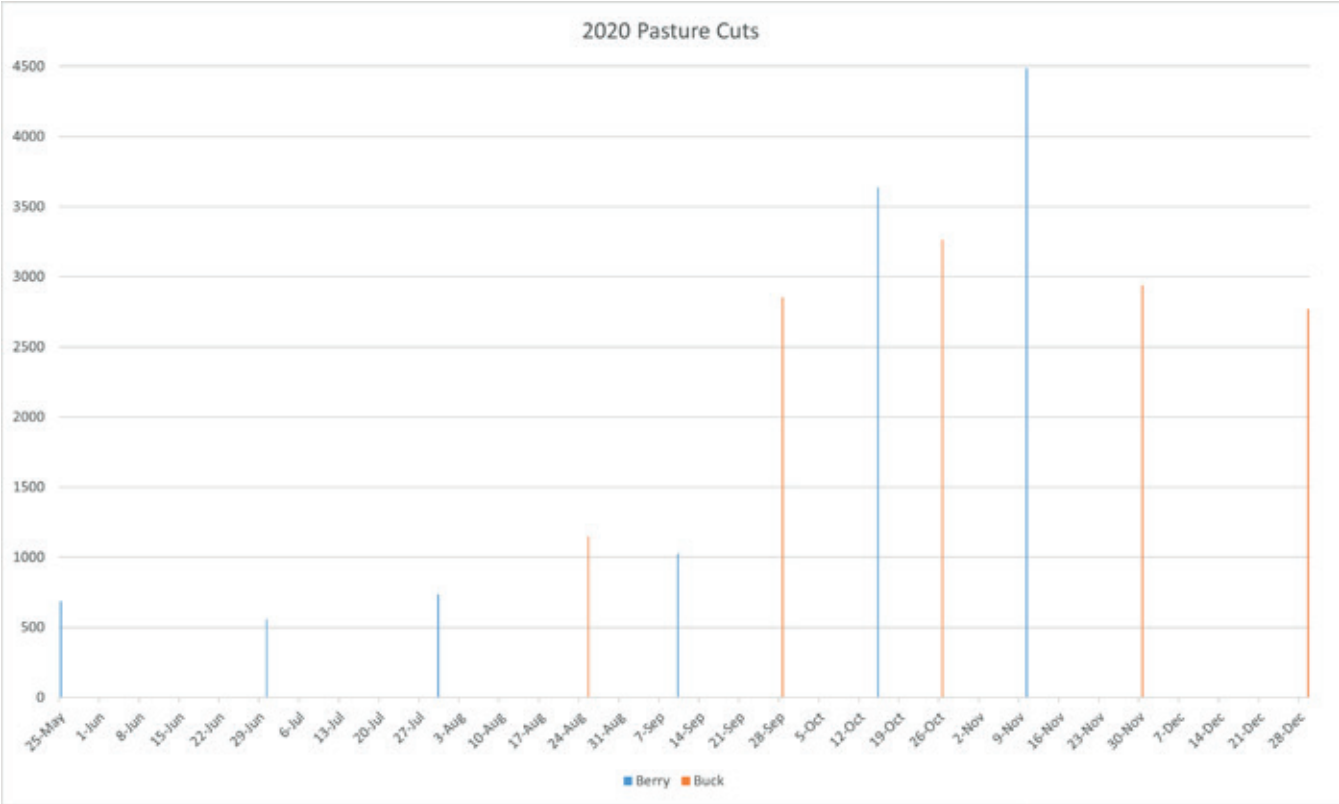

Figure 5: Kg/ha dry matter removed at the Buck & Berry sites during 2020.

Acknowledgements

- National Landcare Program (Smart Farming Grants)
- Berry Parnters
- Buck Pastoral
- A, T & J Heinrich
- Ag KI for Administering the funding

The project involves a collaboration between Southern Farming Systems, Federation University (Ballarat), Glenelg Hopkins Catchment Management Authority, MacKillop Farm Management Group and Agriculture Kangaroo Island.

Further Information

Jenny Stanton

M 0484 602 946
E jennybehenna@hotmail.com

Leet Wilksch

M 0408 428 714
E leet@agbyte.com.au

The OneBiosecurity Program

Livestock Biosecurity and the OneBiosecurity program

The terms “Bio” meaning biological or living and “security” referring to safety, combine to create a term that can be used to describe the practises that are undertaken to combat threats to the health and wellbeing of any living thing. Biological threats are disease causing agents such as bacteria, parasites, protozoa and viruses. These threats can be relocated from place to place, carried around by living things (humans, pets, pest animals) and can also be carried around on everyday objects such as the soles of shoes, equipment, and machinery.

In the livestock production sector, a basic practise like erecting and maintaining boundary fencing, which serves to contain and separate stock, is a biosecurity practice. To actively practice livestock biosecurity is to undertake regular daily protocols that are aimed at protecting your livestock from disease causing agents. It can take time to get into the habit of practicing new biosecurity protocols but once implemented they can be of extreme benefit to the health and welfare of your stock and the overall financial viability of production systems.

The One Biosecurity web portal was developed in partnership with LivestockSA and PIRSA. The portal was created as a multifaceted tool for SA livestock producers to assist them to:

- understand and build upon their current biosecurity practises
- develop biosecurity plans (which is a requirement of LPA accreditation)
- advertise current disease status
- market livestock
- access abattoir surveillance data from stock slaughtered and inspected at TFI Lobethal
- create National Sheep Health Declarations.

Producer responses are audited for verification on the portal.

How does the One Biosecurity Program support the SA livestock Industry?

Australia’s geographically isolated location serves to benefit the integrity of our biosecurity; however, it also means that our products have to travel further and be more competitively attractive to international buyers. If an international market were to ask for evidence that SA has strong biosecurity practices, we have evidence from the number of production enterprises engaging with our programs (like One Biosecurity) to support our claims that our biosecurity standards are world class. By signing up to the One Biosecurity program, your enterprise can contribute to strengthening market access and use the program to benchmark your biosecurity practises against the industry standards and other producers.

How to create your One Biosecurity account:

Livestock producers can access the One Biosecurity website through your myPirsa account or simply visit the OneBiosecurity website (see QR code below) and create an account.

- Once you have created an account the first step is to fill out the Biosecurity Rating questionnaire. The outcome of the questionnaire will be a rating out of five stars. This will provide you with a benchmark upon which to reflect on the standard of current practises.
- Secondly, the Disease Risk Ratings section allows the producer to assess the specific risk of disease in their stock. They can also upload certificates or verification of their compliance and involvement with market assurance programs such as SheepMAP.
- Thirdly, there is space for producers to describe their enterprise, discuss routine animal health practices, advertise enterprise contact details and, after verification of input data by a One Biosecurity program auditor, producers can even print One Biosecurity branded sale placards.

Further Information

For assistance with signing up or operating the One Biosecurity program:

E 1BSupport@sa.gov.au
P 08 8429 3300 (business hours)

Alternately, you can contat your local PIRSA Animal Health Adviser, Kate Buck.

P 8553 4949

Photo Credit: Francois Maritz: Yards and Race, KI. More images by this artist can be found in Higgs, A. (Ed) *Kangaroo Island*, Wakefield Press, 2021.

Take Home messages:

- OneBiosecurity program supports the individual producer to benchmark their current biosecurity practises, access abattoir surveillance data, generate sheep health statements and market their livestock.
- The portal data supports the whole of the SA livestock industry through domestic and international market security.
- The information on the website is credible because the data supplied is audited, reviewed, and validated. Look for the tick of verification.

Sheep Blow Fly Eradication on Kangaroo Island

Background

Sheep Blow Fly (SBF) causes significant economic losses for Australian livestock producers. South Australia Research and Development Institute (SARDI) researchers are developing the Sterile Insect Technique (SIT) for Sheep Blow Fly. The sterile insect technique is based on the use of sterile male flies to compete with wild males in the field, resulting in females not able to lay eggs. This technique is already widely used successfully for many fly species (such as fruit flies and screw-worm flies).

Kangaroo Island wool and sheep meat producers would gain market access and economic advantage from a SBF eradication, further re-enforcing the "clean green" image of the island and its potential for attracting tourism. Animal welfare will be improved and the WHS risk for farmers reduced.

With current knowledge (SARDI and Macquarie University collaboration), available technology (SITplus facility Port Augusta used for Queensland Fruit fly) and existing capacity (SARDI), SIT for Sheep Blowfly could be deployed on Kangaroo Island very rapidly (starting Spring 2022). We estimate that, if a longer-term program can be implemented, we would be able to achieve eradication of SBF from KI in 4-5 years (aim 2025).

The Sterile Insect Technology for Sheep Blowfly could be deployed on KI rapidly and cost-effectively (with timely funding and contracting) based on the following model:

1. Setting up of a modular and mobile SBF production facility on KI
    - This can be done at relatively low costs using shipping containers or similar.
    - Staff will be recruited for this facility and receive training at the SITplus facility in Port Augusta.
2. Start of initial small-scale aerial release of sterile insects (pupae) in spring 2022 (September)
    - SBF will emerge in spring following hibernation. This small spring generation initiates flystrike.
    - Initial population of SBF will be low; based on previous work we estimate a release of 50-100 sterile males per ha and per week will be sufficient.
        - To cover all of KI around 30-50 million flies would be needed.
        - This production capacity will not be reached by September 2022 but is possible by spring 2023
    - Depending on production capacity the rearing releases can start from the east side of KI (Dudley Peninsula) in 2022
    - In the year after, the release areas can be moved west, covering all of KI, aiming at a successful eradication over three years maximum. This is dependent on further funding for the program
    - Aerial release can be organised from Kingscote Airport or any other existing airstrip suitable for the plane.
3. On ground surveillance of SIT efficiency (trapping, flystrike observations) will be organised. This would require on-ground (local) staff that can be trained through SARDI.
4. The risk of blowflies entering KI can be limited with appropriate biosecurity protocols.

Project planning:

Currently we are working on the choice of the best site where we can install the facility for the duration of the project. The design of the facility is essential to be able to produce the volume of sheep blowflies needed for the project with optimal staffing and equipment.

To develop the mass-rearing we are aiming at developing contracts with local suppliers where needed, to produce custom made rearing equipment.

Australian Sheep Blowfly, Lucilia cuprina.

After-Project Life

After this project, the resulting rearing facility (container based) will be re-employed for SBF suppression in other areas of SA where needed. This will also allow for eradicating possible hot-spots or re-introductions on KI. We propose, during this project, to establish a plan for the rest of Australia's sheep production areas.

SIT on the 'mainland' would require a regional approach to achieve blowfly regulation (not eradication). The economic feasibility will depend on the production costs and the density of sheep in the areas under SIT, and the re-colonisation from the environment.

We expect that, through the KI project SBF management through SIT will become more efficient and cost effective, resulting in a direct economic advantage for farmers and subsequent deployment over other sheep production regions.

The project will also be used to conduct research that would further develop the potential for SIT nationally and build capacity within Australian livestock and entomological research institutions.

Take home messages

- SARDI Entomology is developing a large-scale pilot for the use of Sterile Insect technique for Sheep Blow Flies on Kangaroo Island
- Funding through the Bushfire Recovery program will allow us to set up a production facility on KI in 2021/22 and develop the technique
- With additional funding we hope to be able to do large scale releases and eradicte Sheep Blowfly from Kangaroo Island over a 4-5 year period.

Funding

This project is jointly funded by the Commonwealth and Government of South Australia under the Disaster Recovery Funding Arrangements through the 'building back better agriculture and landscapes' project (Bushfire recovery program).

Further Information

Maarten van Helden, SARDI Entomologist

M 0481 544 429
E Maarten-vanhelden@sa.gov.au

Footrot on Kangaroo Island - Update

Across South Australia the spring of 2020 provided ideal conditions for the bacteria *Dichleobacter nodosus* to express as the disease footrot (FR) in sheep and goats. On Kangaroo Island these conditions continued well into the summer. The combined effects of ideal weather conditions, the chaos of stock movements during the fires and mass restocking has resulted with double the number of virulent FR detections compared to previous years.

Hidden costs to producers' profits:

- In a controlled two year experiment undertaken in NSW, the mean body weight of merino wethers was 11.6% lower in a mob of FR infected stock compared to an uninfected control group.[1] For a 75kg wether a drop of 11% body weight equates to: 8.25kg per head (2.23% drop in dressing weight/head). The equivalent of a merino wether valued at $180 at 75kg with FR would equate 66.75kg and $160.20/head, overall, in a 4000 head enterprise this would equate to a production loss of **$80,000.00.**
- In the same experiment FR also depressed wool growth by 0.4kg/8% per wether per year. *For a 4000 head merino wool producer a 0.4kg wool loss/head equates to a total loss of 1.6 Tonne of wool per annum.* Based on 5kg end yield fleece weight of 21 micron wool valued at 1277ac/kg a loss of 0.400g per head from a flock of 4000 would result with an annual loss of **$20,432.00 in wool sales**, for 18 micron wool at 1913ac/kg the loss is greater at **$30,608.00**.
- Footrot is a notifiable disease with serious animal welfare implications. There are movement restrictions imposed on flocks affected with footrot. Stock with virulent FR can only be sold direct to slaughter or to an approved feedlot in SA. Therefore, the sales options for producers with stock infected with virulent FR are limited compared to non-infected flocks and premium markets may not be accessible.

These are hidden profit losses enterprises with FR may not be aware they are experiencing. When considering the annual losses to production the cost of running an eradication program should also be weighed up.

Assistance

For assistance to develop a property disease management plan or for recommendations to find footrot contractors, please contact the Animal Health team at the Kingscote PIRSA office on 08 8553 4949.

Cost to Eradicate FR:

Some contractors charge around $10/head to run a footrot eradication program, if we add an extra $2.50/head for treatment materials (vaccination or antibiotics and foot-bathing etc) then at $12.50/head the estimated eradication cost for a 4000 head flock is roughly $50,000.00.

Other financial variables that have not been considered in the eradication costs mentioned above are highly variable and dependent on individual enterprises. These variables can include costs associated with the need for possible fencing improvements and/or costs associated with cull animals and replacement stock.

Costs of Annual control measures:

Effective control needs to be undertaken during every spread period to reduce the severity of lesions and improve animal welfare. Control can be achieved through foot paring followed by foot bathing, vaccination, antibiotics, or a combination of these controls. In 2006 MLA estimated the cost to control footrot in an endemic flock to be $3.54 per head, with inflation this rounds to $4.78/head[2]. For a 4000 head flock the estimated cost is: **$19,120.00** per annum.

[1] Marshall DJ, Walker RI, Cullis BR, Luff MF. 'The effect of footrot on body weight and wool growth of sheep.' Australian Veterinary Journal 1991 Feb; 68 (2): 45-9. doi; 10.1111/j.1751-0813.1991.tb0126.x. PMID: 2025200.

[2] Final report, *Animal Health and Welfare: Assessing the economic cost of endemic disease on the profitability of Australian beef cattle and sheep producers.* Meat and Livestock Australia Ltd, 2006, ISBN: 9781741910025

Take home message:

- From a financial perspective, it is reasonable to conclude that successfully eradicating FR can have a significantly positive impact of the future profitability of a livestock enterprise.
- A successful program requires attention to detail and a professionally trained eye, for this reason, before embarking on an eradication program, seek professional assistance.

OJD - 'The Silent Disease'

Changes to the management of Ovine Johne's disease (OJD) in sheep in South Australia have been phased in since July 2019.

A reminder of the state OJD program that producers should note:

- Testing for OJD is voluntary. Producers can now Opt-in to OJD abattoir surveillance at TFI. Routine Enhanced Abattoir Surveillance does not include OJD testing, and will continue as normal.
- Movement restrictions relating to JD for sheep entering SA are no longer in place. To minimise the risk these animals may pose, it is recommended that all sheep entering SA should be vaccinated for Johne's Disease, either before entry or on arrival in SA.
- Completed National Vendor Declarations (NVD) and National Sheep Health Declarations (NSHD) remain mandatory for all sheep entering and moving within SA.
- Johne's disease in sheep remains a notifiable disease and must be immediately reported to PIRSA Animal Health.
- Without movement restrictions there is increased ability for producers with JD-infectd floks to trade sheep. Producers need to check the status of animals **BEFORE** purchasing - check the NVD and NSHD and ask questions. Be aware that properties with OJD infection do not need to declare this on their NVD. If you do not understand the OJD risk, seek advice from PIRSA or your local Veterinarian before purchasing animals.

Voluntary OJD testing

Producers can choose to investigate or monitor for OJD in two ways:

- voluntary abattoir inspections (producer requested)
- voluntary on-farm testing by private veterinarians and producers (producer requested).

Abattoir testing new OPT-in System

SA producers can permanently opt in for OJD inspection on mutton lines processed through SA TFI abattoirs (currently only at Lobethal). This means that every mutton line sent to TFI Lobethal from your PIC will be inspected for OJD. Previously, inspection and feedback had to be requested for each line prior to sending animals to TFI. Once opting-in you can opt out of OJD inspections at any time by emailing:

PIRSA.OJDAbattoirSurveillance@sa.gov.au

It is important to note that all data collected by the abattoir and PIRSA is confidential and no producers are identified when data is used for reports or research.

Voluntary Abattoir surveillance can be used to:

- provide low disease risk assurance; abattoir 500 and 150 status
- monitor the levels of the disease in a known infected flock
- alert producers to new infections.

Voluntary inspections can also be arranged at participating abattoirs interstate.

On-farm testing

Voluntary on-farm testing of flocks with symptoms of Johne's Disease can be conducted by private veterinarians or PIRSA Animal Health staff.

Flocks showing signs of a distinct 'poor' tail end of the mob, weight loss or increased mortality can sometimes be confused with nutritional diseases or internal parasites. Thorough disease investigations are recommended to ensure accurate diagnosis and minimise the economic impact of endemic diseases.

Subsidised disease investigations may involve either post-mortems of clinically affected animals or pooled faecal testing from 50 to 100 high risk animals.

How to manage OJD risks after detection

A Property Disease Management Plan (PDMP) can be individually developed for each property to assist producers to manage their OJD risks.

Animal Health Officers work with producers and/or private veterinarians to develop pathways to lower the impact of the

disease and help achieve a low risk status. Depending on best practice related to individual production symptoms, the PDMP may include recommendations regarding:

- vaccination with Gudair
- strategic grazing practices
- straying animals
- trading options
- property declarations and tagging of sheep.

If producers fail to meet reasonable biosecurity measures to manage OJD, orders may be placed on the property under the Livestock Act 1997.

Declaration of OJD Risk - buyer beware

Before purchasing sheep you are urged to review information in the National Sheep Health Declaration. This will help you decide if it's suitable to introduce the animals to your property.

The National Sheep Health Declaration is required for all sheep movements between properties in South Australia and contains information on the:

- history of the flock
- OJD testing
- abattoir monitoring
- vaccination.

Sheep Market Assurance Program - SheepMAP

Producers can purchase sheep from flocks participating in the SheepMAP program as these flocks have been objectively assessed as having low risk of being infected with Johne's disease. The Sheep Market Assurance Program (SheepMAP) is part of the National Johne's Disease Control Program. SheepMAP is voluntary and the costs are borne by the participating flock owners.

'Approved Vaccinate' Status

To be eligible for 'approved vaccinate' status on the National Sheep Health Declaration, sheep must be:

- vaccinated with an approved OJD vaccine before 16 weeks of age and marked with a 'V' National Livestock Identification System tag
- vaccinated after 16 weeks and from a flock that meets one of the following criteria:
  - registered to a SheepMAP flock
  - has returned a negative Pooled Faecal Culture 350 or High Throughput Johne's 350 in the two years before being vaccinated
  - has a current Abattoir 500 status.

KEEP VACCINATING

Vaccinating retaining sheep with Gudair is highly recommended in high rainfall climates such as KI. This is especially important given the history of the disease on KI and the fact that many replacement stock from the mainland have been introduced since the fires. Many sheep without a known OJD status have been introduced, some from areas interstate with a high prevalence of disease. When you notice a problem, or 'a tail', the sheep will most likely have had OJD for a few years already. That's why it's known as the 'silent disease'.

Vaccinating does not eradicate the disease and the bacterium can stay in the soil for many months, so if vaccinating discontinues clinical signs are likely to increase. Vaccination must be complemented with sound biosecurity practises. The new One Biosecurity program provides a credible framework for risk based trading. It also places biosecurity as a key factor for decision making in your livestock enterprise. All sheep and cattle producers in SA can be registered on the One Biosecurity web portal.

Take home message

- Buyer beware.
- Know the disease status & risk of livestock introductions and keep vaccinating.

Further Information

Visit PIRSA website: http://www.pir.sa.gov.au/biosecurity/animal_health/sheep

Kate Buck, Animal Health Advisor

PH 08 8553 4922 | M 0419 091 156

E kate.buck@sa.gov.au

Campylobacter Fact Sheet

Campylobacter and other Infectious causes of abortion in sheep

As a follow up to the Campylobacter (Campy) abortions diagnosed in early 2020, testing of sheep has been undertaken on Kangaroo Island farms. The following information has been made available to assist primary producers with decision making prior to the next joining period.

What is Campy and how is it spread from farm to farm?

- Campy is a bacteria that causes late-term abortions, still-births and weak lambs in otherwise healthy ewes.
- Campy can be carried and shed in the faeces of healthy sheep.
- As infected sheep move between flocks and from property to property, the bacteria can be spread.

What is the prevalence of Campy in Australia and on Kangaroo Island?

- Campy is found Australia wide. Up until 2020, only two ewes had tested positive on Kangaroo Island, and no abortion outbreaks had been diagnosed due to Campy.
- There were three properties where Campy abortions were confirmed in early 2020.
- Since then a further twelve properties that had links to the infected flocks and suspicions of abortions/lamb losses were tested, and exposure to Campy was found on each property. Other infectious diseases causing reproductive losses were not tested for at this time so could have contributed to the losses.
- Testing of twelve other flocks with abortions/lamb losses, but without links to the confirmed infected properties, showed three flocks with blood test results suggesting exposure to Campy and nine flocks with no evidence of exposure to Campy.
- Campy is expected to continue to spread to more naïve Kangaroo Island flocks.

What might make you suspect you have an infectious agent causing lamb losses?

This can include Toxoplasmosis, Campylobacter, Salmonella, Listeria, Leptospirosis, Yersinia….

- Finding aborted foetuses in confinement pens, in the paddock or during yarding.
- Blood stained breeches and hanging afterbirth on ewes.
- Scanned in lamb ewes not lambing.
- Ewes scanned with twins only having single lambs.
- Birth of stillborn lambs, or weak lambs that subsequently die.

What to do if you see any of the above:

- Consult your local veterinarian at the Kangaroo Island Vet Clinic as there are many factors that can contribute to lamb losses.
- Emergency treatment of ewes may be required prior to diagnostic results becoming available.
- ***Act early as this can prevent significant numbers of dead lambs.***
- For a diagnosis to be confirmed many lambs will need to be examined by post-mortem (fresh is essential!)
- Most causes of stillborn or dead lambs are ***contagious to people*** so be sure to wear gloves.
- If possible isolate ewes that have aborted to prevent the spread of disease to other ewes.
- ***Ewes that have aborted should be blood tested early to detect infectious causes.***

What to do now?

Consult your vet to arrange for blood testing of a sample of the following if indicated:

- Ewes that were scanned pregnant and were dry at weaning.
- Recently introduced rams and/or ewes.
- Ewes that will be joined for the first time e.g. ewe lambs/hoggets

A positive campy blood test will confirm whether your sheep have been exposed. Your vet will discuss whether this was the likely or only cause of lamb losses in your flock.

Analysis of scanning and/or lamb marking data is crucial in the decision making process. Most infectious diseases don't have an available vaccine so diagnosis and effective management is crucial to preventing lamb losses.

There is no blanket recommendation for Campy vaccination.

With consideration of your management risk factors and evidence of exposure your vet may recommend vaccination of at risk ewes with Ovilis Campyvax prior to joining.

Management of risk factors that contribute to the spread of infectious diseases:

Campy and other causes of infectious abortion can be shed in faeces by healthy carrier sheep. Infectious diseases can be spread by close contact with faeces, aborted materials and dead lambs. To minimise the risk of spread of disease consider the following practices:

- Maintain isolation of introduced ewes from the rest of the flock during joining and gestation.
- Use confinement feeding only if seasonal conditions demand it during the joining and gestational periods.
- Where possible feed stock off the ground to reduce accidental consumption of feed contaminated by faeces and infective material.
- Pick up aborted materials and dead lambs whist wearing gloves, put into disposal containers (i.e. old seed bags/garbage bags) to reduce contamination of you and your vehicle and dispose of all materials away from stock access.
- Isolate and make aborted ewes identifiable from other stock.

Target lesions in liver of lamb aborted due to Campy.

Further Information

Contact your sheep health veterinarian at Kangaroo Island Veterinary Clinic

PH 08 8553 2485

This information has been compiled collaboratively by local veterinarians, government advisors and an industry technical veterinarian.

KANGAROO ISLAND Veterinary Clinic

Toxoplasmosis & Sarcocystosis Update

Toxoplasmosis

Toxoplasma gondii is a microscopic parasite that causes the disease Toxoplasmosis. The parasite can only reproduce in the gastrointestinal tract of cats. Infected cats spread the parasite as the eggs (oocysts) are excreted along with faeces. Once in the environment these microscopic oocysts mature into the infective stage of the parasite. This (still microscopic) parasite in the environment can be consumed together with pasture, ingested with water, or transferred to a host through other exposure means and can infect almost any animal (intermediate host) including humans. Once in the intermediate host the parasite encysts in various locations, the muscles, the brain or in the placenta which can cause the host to abort. This is of particular concern for pregnant women as well as for livestock producers. For this parasite to mature and reproduce it needs to be re-eaten by the cat (to get back to the gastrointestinal tract) to complete its life cycle. Cats become infected with toxoplasmosis by eating infective cysts from aborted materials, from hunting and from scavenging.

Due to the high density of feral cats on KI Toxoplasmosis is a significant issue for livestock producers on the island. Currently there is no Toxoplasmosis vaccine for sheep available in Australia. Many animals can harbour Toxoplasmosis, including humans. By removing dead animals and aborted materials from your production areas and burying or burning them as soon as plausibly possible, you are removing possible infective materials from the environment upon which feral cats can feed thus preventing them from becoming infected and spreading Toxoplasmosis.

Take home messages:

- To prevent spread of Toxoplasmosis pick up/ remove/bury/burn any aborted materials or dead animals from your production areas. **Wear gloves** when handling carrion as toxoplasmosis can infect humans. This is particularly important for pregnant women.
- Co-ordinated feral cat control should be actively managed whenever possible.
- Ongoing investigative research is being carried out by scientists from the University of Adelaide. Stay tuned for more information.

Sarcocystosis

Sarcocystosis is a disease caused by the protozoan parasite *Sarcocystis gigantea* or *Sarcocystis medusiformis*. These parasites are related to *Toxoplasma gondii*. The lifecycle of both *Sarcocytis spp* is the same as for *Toxoplasma gondii*; it reproduces in cats, cats shed eggs (oocysts) that are excreted along with the cat's faeces and they become infective in the environment. Unlike Toxoplasmosis, only sheep can serve as an intermediate (secondary) host to *Sarcocystis* species. Sheep consume the infective parasite directly from the environment through eating or drinking infected food/soil/water. *Sarcocystis spp* then form cysts in the oesophagus and/or muscles of infected sheep. These cysts are comparatively large and can be easily seen in the carcasses by the naked eye. The cysts are of a particular concern to livestock producers as the cysts must be trimmed out of the carcass and this reduces carcass weights. Sometimes if the intensity of the parasite infection is high (older sheep who graze pasture over many years may have heavy cyst burdens throughout their muscles) then the whole carcass can be condemned at the abattoir. Kangaroo island has 10 times the density of wild cats compared to the mainland and Sarcocystosis is a significant problem for livestock producers.

Take home messages:

- To prevent spread of Sarcocystosis, pick up/ remove/bury/burn any dead animals (infective materials) from your production areas.
- Co-ordinated feral cat control should be actively managed whenever possible.
- Ongoing investigative research is being carried out by scientists from the University of Adelaide, stay tuned for more information.

Further Information

Ashleigh Baker, PIRSA Animal Health Advisor
M 0429 523 469
E ashleigh.baker@sa.gov.au

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Mixed Cover Crops for Sustainable Farming

What's It About

There has been much discussion around the globe about mixed species cover crops and their benefits - improving soil organic carbon, structure and health, along with decreasing weed and disease levels for following crops. Whilst cover crops are a key component of some farming systems overseas (e.g. parts of the USA) it is yet to be adopted widely in southern Australia.

The project which runs until July 2022 is a collaboration between the South Australian No Till Association (SANTFA), the Grains Research and Development Corporation (GRDC) and Ag Ex Alliance grower groups of which Ag KI is a member. It aims to support grower groups to identify and demonstrate the establishment and management of suitable multi species cover crops across a range of environments and assess the impacts of cover cropping on soil health, nutrient cycling, organic carbon, invertebrate populations and soil moisture.

In addition, whilst many potential cover crop species and varieties exist, there is a distinct lack of local knowledge to make informed decisions in appropriate cover crop species selection. Each grower group has the opportunity to assess the suitability of potential plant species with a species evaluation screening. There was also an opportunity to assess the optimum timing and alternative methods to terminate cover crops.

More information about the project can be found on CSIRO's website. Please use the QR code on this page.

What's Happening

On Kangaroo Island there were two farmer demonstrations and a species evaluation screening.

Farmer Demonstrations: Pontifex Site

One of the farmer demonstrations was located on Boundary Road, Royston Park in the Hundred of Haines, belonging to Pontifex Farming. On December 4th 2020 a cover crop mix consisting of sunflowers, shirohie millet, plantain, sorghum, chicory and sunn hemp was aerially spread by plane at 22kg/ha prior to harvesting the beans with the expectation that the chaff would cover the seed. A large 150m wide strip was not spread. Within this large area, a strip approximately 12m wide spread was spread with straight French white millet at 15kg/ha via bait spreader. The remaining unseeded area was the fallow (control).

The site eventually received 10mm rain on the 25th January 2021 and then 70mm on the 4th February leading to a successful establishment.

On March 30, dry matter cuts and normalized difference vegetation index (NDVI) readings were taken from the respective treatments (Table 1). Expectantly there was more dry matter growth for the multi species and single species compared with the control which was volunteer beans, capeweed, plantain (from last year's cover crop trial) and ryegrass.

On April 12th, four x 85cm deep soil samples were collected from each treatment - multi species, single species and the fallow (control) to evaluate any changes in the soil arising from the various plant species combinations. Each soil core was divided into 0-10cm, 10-20cm, 20-30cm, 30-60cm and 60-85cm sections for analysis. The results from this soil sampling were not ready at the time of publishing. Anecdotally the control soil was wetter at depth. Conversely the soil from the multi species was drier and there was evidence of roots at 85cm.

The paddock was aerially sown to canola in April and yields from the various treatments will be collected at harvest.

TREATMENT	NDVI	DM kg/ha
Multi	0.398	535
Single	0.48	523
Control	0.27	157

Table 1: Average NDVI & dry matter readings from Pontifex site.

QR: More information is available on the CSIRO website.

Figure 1: Pontifex Multi

Figure 2: Pontifex Single

Figure 1: Pontifex Control

Figure 4: Soil coring & sampling at Pontifex site

Stanton Site

The second farmer demonstration was on the property Dalmore at Stokes Bay, Will & Jenny Stanton. The site was sown to a mix of AGF Summer Max (tillage radish, fodder rape, sorghum and shirohie millet), french white millet, kikuyu and sunflowers at 17.5kg/ha on the 13th October with a John Deere single disc machine into an annual pasture that had been knocked down. Four strips of straight French white millet were sown at 10kg/ha in the paddock as the single species with 4 x 30m length strips left unsown as the control. The site received cumulative rainfall post seeding of 26mm to end of December 2020. But from January 25th it received 10.5mm followed by 52mm in February and 7.5mm in March giving a total 96mm between sowing and the start of April.

Dry matter cuts were taken on 29th March 2021 (Table 2) with the multi species growing significantly more dry matter than the single species and control. Soil cores were taken on 12th April to a depth of 70cm due to clay layer constraints, the results of which were not ready at the time of publishing. (NDVI was not taken at this site.)

TREATMENT	DM kg/ha
Multi	1547
Single	1120
Control	125

Table 2:
Average dry matter readings from Stanton site.

Figure 1: Stanton Multi

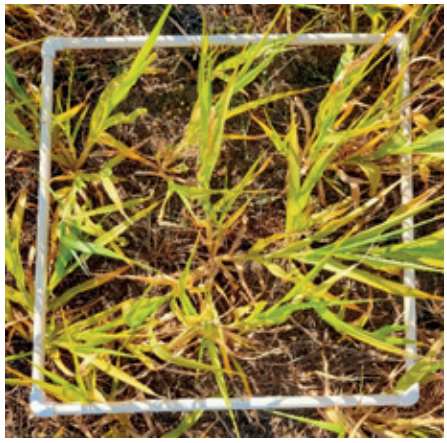

Figure 2: Stanton Single

Figure 1: Stanton Control

Take Home Messages

- At the aerially sown Pontifex site, there was no difference in the amount of biomass between the single and multi-species cover crops; both grew significantly more than the control.
- The Pontifex site germinated after the February rain and grew approximately 520kg DM/ha until the end of March (~ 2months).
- At the Stanton site, the multi species grew more biomass than the single species; both significantly more than the control.
- The Stanton site established in November and grew little until the February rain. Between November and the end of March (5 months) the site multi species grew ~ 1500kg DM/ha, the single species ~1100kg DM/ha whilst the control produced ~125kg DM/ha.

Species Screening Evaluation

A second attempt at establishing the species screening evaluation trial (due the previous year's incinerating) was carried on the 14th November 2020 on the property Lot 2, Pratts Road, Stokes Bay owned by W & J Stanton. The site was sown to 14 x treatments with 4 repetitions totalling 56 plots. The species chosen were tillage radish, Red Caloona cowpeas, safflower, linseed, Shirohie millet, French white millet, buckwheat, turnips, sunflower, the mix "Summer Max" which was a blend of Greenland forage rape, tillage radish, Crown sorghum and Shirohie millet and "Warm Cover" which was a blend of millet, sorghum, brown teff, buckwheat, tillage radish, leafy turnip, rape, sunflower, phacelia, sunn hemp and linseed.

18mm rainfall was received post sowing until the January and February rainfall events mentioned earlier for Stokes Bay giving cumulative rainfall to the end of March of 88mm.

Unfortunately there was a mechanical issue with the seeder resulting in inconsistent emergence across the plots. It also appears that the knife points stimulated the emergence of blackberry nightshade and melons. The uneven emergence of the plots meant that the species screening was more of a demonstration as opposed to a trial.

Despite the challenges imposed firstly by bushfire and secondly by seeder mechanical issues, there were some outstanding performers amongst the species screening trial. The most resilient winners were – drum roll please – French white millet, sunflowers, tillage/daikon radish, turnips and buckwheat.

A field day was held on the 11th March 2021 with 13 people in attendance and some great conversations were had about various plant species and their benefits to the soil. In particular, there was a discussion about how buckwheat increases soil phosphorous levels. It was unearthed from later research that buckwheat produces root exudates that solubilise P from the soil matrix. Buckwheat also has fine fibrous roots which would assist with the plants ability to scavenge P.

The grain millet - French white millet (FWM) has found to be a more reliable performer on KI soils given its better drought tolerance compared with Japanese millets such as Shirohie. Shirohie is a forage type millet and can grow more biomass than FWM under moist conditions. However, Shirohie will perish quickly in dry conditions a lot faster than FWM which tends to hang on.

Entomologist Michael Nash spent a bit of time after the field day counting bees. His counts revealed that the greatest number of bees visited the tillage radish and sunflowers with significantly less on the buckwheat (Figures 8, 9 and 10). Lady birds could be found feasting on aphids on the tillage radish (Figure 11).

And of course it wouldn't be a cover crop without the obligatory photo of someone holding a large tillage radish (Figure 12).

Figure 8: Flowering Buckwheat; 2 [s.d. 0.7, n=6] European Honey Bee visits in 5 minutes

Figure 9: Flowering Sunflowers; 27 [s.d. 4.1, n=6] European Honey Bee visits in 5 minutes

Figure 10: Flowering Tillage Radish; 31 [s.d. 6.7, n=6] European Honey Bee visits in 5 minutes

Figure 11: Ladybird feasting on aphids

Figure 12: The biggest tillage radish!

Take Home Messages

- Most suitable summer crop species for Kangaroo Island soils are tillage radish, French white millet, sunflowers, turnips and buckwheat
- Bees have a higher preference to forage on sunflowers and tillage radish flowers compared with buckwheat.

Acknowledgements

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Further Information

Jenny Stanton
M 0484 602 946
E jennybehenna@hotmail.com

Winter Wedge Trial

Background

Traditionally, winter can be a time when feed on offer is low due to low pasture growth rates arising from a combination of short sunlight hours and low temperatures. A trial was funded by BioAg Pty Ltd to investigate options for filling this winter feed gap.

What was done?

The trial site was located at the corner of Pratts Road and North Coast Road, Stokes Bay. The soil was sandy loam and has a light density of kikuyu.

The site established following the opening rains on the 24th April 2020, giving rise to a mix of self-regenerating subterranean clover, capeweed, barley grass and kikuyu. There were 8 treatments replicated 3 times with each plot measuring 3m wide by 10m long.

The site was grazed down to ~800kg DM/ha before the treatments were applied on the 8th July by trial plot sprayer and mowed with a push behind lawn mower, weighed and sampled for feed tests 34 days later on the 11th August. The site wasn't grazed – mowing was used to measure pasture growth. Subsamples of each treatment were submitted to Livestock Logic for feed test analysis.

	DM kg/ha
A	Control
B	15L UAN
C	15L UAN + 50g ProGibb
D	2L Balance & Grow + 50g ProGibb
E	15L UAN + 2L Balance & Grow + 50g ProGibb
F	2L Balance & Grow
G	50g ProGibb
H	15L UAN + 2L Balance & Grow

Table 1: Treatments

- UAN (42.5%N w/v basis) is a liquid form of nitrogen which is important for stimulating and supporting the enormous growth potential of pastures in spring.
- ProGibb is an organically certified product with 400g/kg of the active ingredient/hormone gibberellic acid that can be used to stimulate production of winter dormant grass-dominant pastures for high intensity grazing.
- Balance & Grow is a BioAg proprietary product that could be thought of as akin to a multi-vitamin benefitting a range of key areas such as vegetative growth, root development and beneficial soil microbial activity. It is reported to stimulate and support vegetative growth by delivering a broad range of nutrients and trace elements, improving overall health of the plant.

TREATMENT	DM* kg/ha	DM %	Digestibility % DM	Digestibility Calc % DM	Energy %	Crude Protein %	Neutral Detergent Fibre	Acid Detergent Fibre	Ash %
Untreated Control	1050 a	18	72	68	10.7	23.3	45	24	11
15L UAN	1074 a	20	79	69	10.9	20.9	46	24	12
15L UAN + 50g ProGibb	1178 b	21	72	67	10.7	21.3	49	25	11
2L Balance & Grow+ 50g ProGibb	1167 b	20	72	68	10.8	21.7	48	24	12
15L Uan + 2L Balance & Grow + 50g ProGibb	1158 b	19	70	66	10.3	21.4	46	26	11
2L Balance & Grow	1061 a	21	70	66	10.3	21.8	48	27	12
50g ProGibb	1184 b	19	69	65	10.2	21	47	26	11
15L UAN + 2L Balance & Grow	1108 a	19	73	69	10.9	23.4	46	25	11

* letters a and b denote statistically different treatments

Table 2: Results

What Happened

As can be seen in Table 2, all treatments that received 50g/ha ProGibb grew statistically more feed than those that did not. The four treatments that received ProGibb grew an average 98.5kg/ha more dry matter than the remainder. The addition of UAN and/or Balance & Grow with ProGibb failed to produce additional growth despite visual observations suggesting otherwise. The pasture growth rate over the 34 days for the control was ~7.4kgDM/ha per day. The inclusion of ProGibb lifted this growth rate to 10.8kg DM/ha per day equating to a 31% lift in growth during July - the coldest month of the year.

There was no response to the application of straight UAN. It is possible that the rate of 15L/ha was insufficient to produce a result despite there being an obvious change in plant colour. Additionally, July 2020 was the lowest July rainfall on record so there would have been very little 'washing in' of the foliar applied N.

The low rainfall in July may also reflect the lack of response from the proprietary product Balance and Grow. Like all living organisms, moisture is required for biology to prosper and it is likely the dry July hampered their activity/performance.

Take Home Messages

- Application of 50g/ha ProGibb increased pasture growth by 30% or ~100kg DM/ha over a 34 days during July – KI's driest July on record.
- It's possible that the lack of July rainfall constrained the performance of UAN and Balance & Grow on pasture growth.

Further Information

Jenny Stanton
M 0484 602 946
E jennybehenna@hotmail.com

Phil Toy, BioAg Pty Ltd
M 0458 440 225
E ptoy@bioag.com.au

Soil Health Report 2019-21

Background

From 2019 to 2021 Agriculture Kangaroo Island (AgKI) received funding and support from the Australian Government National Landcare Program, 'Smart Farms Small Grants' (through the KI Landscape Board) and PIRSA, to assist landholders to undertake soil testing on their properties and provide interpretation of soil test results. Soil test kits are available to all producers from the Kingscote PIRSA Office and soil augers available for loan. From 2019 to 2021 43 KI farmers submitted 173 soil samples for testing.

Results

Soil pH

Soil pH is important for optimum production of crops and pastures. If the soil pH falls below pH 5.5 (CaCl2) then nutrients such as phosphorus, magnesium, calcium and molybdenum become less available; microbial activity starts to decline (including Rhizobia) and toxic amounts of aluminium can be released into the soil solution (refer to Table 1 for minimum pH targets).

LAND USE	pH ($CaCl_2$)
Extensive grazing	5.0 – 5.5
Broad-acre cropping/grazing	5.5
Most horticultural crops	5.5 – 6.5

Table 1: Target for minimum soil pH.

Almost all the soil samples taken during the 2019-2021 seasons were below critical pH levels. Figure 1 shows that the average pH in all Hundreds was below 5.5 (pH CaCl2), except for Menzies. Seven of the eight Hundreds had an average pH of 5.2 or below. At these levels, pH will be limiting farm productivity and profitability and therefore liming should be a high priority.

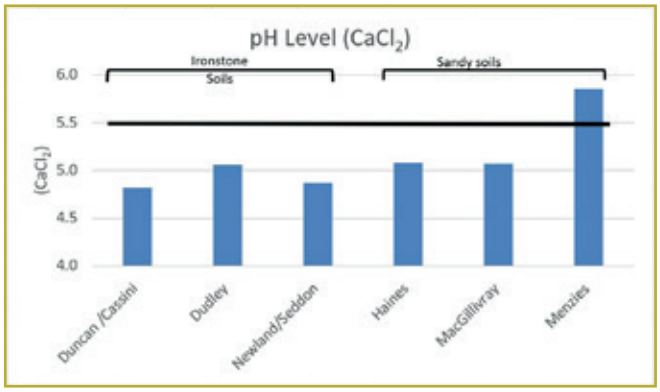


Figure 1: Average sil pH ($CaCl_2$) results for each Hundred during the 2019-2021 seasons.

Salinity

Saline soils are defined as soils that contain a high enough level of soluble salts in the root zone that can adversely affect plant growth. Ideally, soils should have a salinity level of less than 2 dS/m (for salt sensitive plant species). Of the soil samples taken the majority were below 2 dS/m.

Organic Carbon

The organic carbon test is a useful indicator of organic matter status, therefore of overall soil fertility, microbial activity, and the structural stability of the soil. The ideal target level of organic carbon varies with soil type i.e. sandy soils greater than 1% is desired, through to greater than 2% in clay soils. Of the soils tested, all were well above critical values.

Soil Nutrients

Maintaining an adequate nutrient status in the soil is paramount to determining the productivity of the soil. Phosphorus, potassium and sulphur are essential nutrients for plant growth and yield (see Table 2 for target levels).

SOIL NUTRIENTS	TARGET LEVELS	
	IRONSTONE SOILS	SANDY SOILS
Phosphorus (Colwell)	35-45 mg/kg	>20 mg/kg
Broad-acre cropping/grazing	>120 mg/kg	>120 mg/kg
Most horticultural crops		5.5 – 6.5

Table 2: Target levels for phosphorous, potassium and sulphur

During 2019-2021, almost all samples collected from the Hundreds with predominantly sandy soils, had phosphorus levels greater than 20 mg/kg. Of the Hundreds with predominantly ironstone soils, more than half of the samples had phosphorus levels lower than the recommended level of 35-45 mg/kg (Figure 2).

The majority of soil samples in all Hundreds had potassium levels above 120 mg/kg (Figure 3).

Of the Hundreds with predominantly ironstone soils, the majority of samples had sulphur levels greater than 6-8 mg/kg (Figure 4). The majority of sandy soil samples, except the Hundred of Haines, were also above the critical value of 10 mg/kg.

Summary

The 2019-2021 soil tests carried out by Kangaroo Island farmers indicate that overall, soils in the area are on target or above for organic carbon, potassium and sulphur.

The average soil phosphorus levels were low in the predominantly ironstone soil Hundreds. Across the Island, soil pH (CaCl2) levels were below critical values. Areas where low pH is occurring will reduce the availability of essential nutrients such as phosphorus to the plant and will result in limiting overall farm productivity.

The most cost effective and practical way to address low pH is through the application of lime. Low nutrient levels can be addressed through the application of fertilisers. Always seek advice from your local agronomist or consultant to ensure you are applying the right fertiliser or lime at the correct rate.

Soil types vary within each Hundred, so care must be taken in the broader interpretation. In addition, the data only reflects the number of samples taken in each Hundred, which may represent only a few properties. The data and resultant graphs can only be interpreted to the point of identifying trends over time.

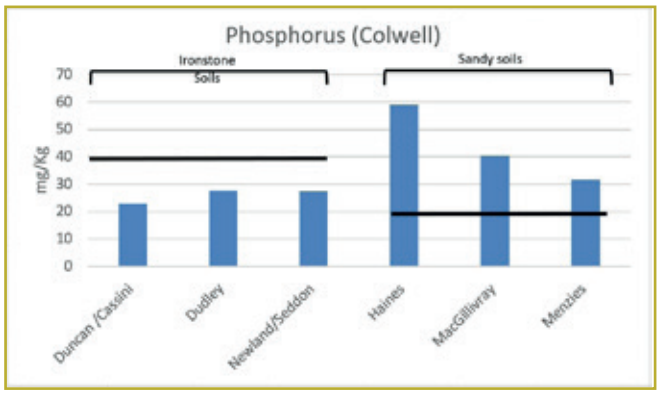


Figure 2: Average sil phosphorus levels for each Hundred during the 2019-21 season.

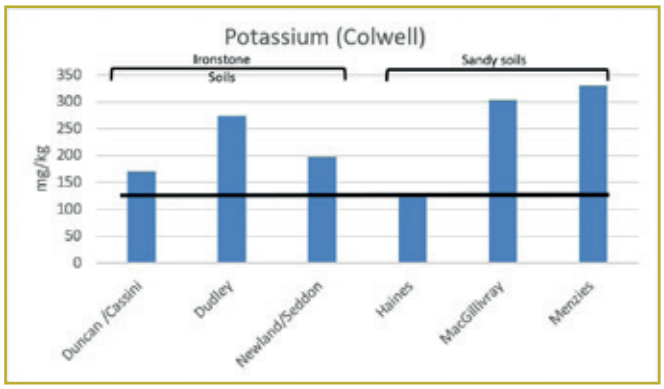


Figure 3: Average soil potassium levels for each Hundred during the 2019-21 season.

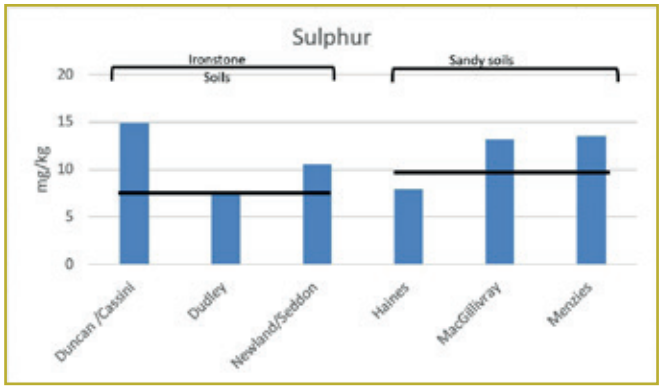


Figure 4: Average soil sulphur levels for each Hundred during the 2019-21 season.

	Organic Carbon %	Conduct-ivity dS/M	pH ($CaCl_2$)	Phosph-orous mg/kg	Potassium mg/kg	Sulphur mg/kg
Haines (22)	2.5	0.08	5.1	59	112	8
MacGillivray (24)	3.4	0.18	5.1	40	303	13
Menzies (39)	2.2	0.26	5.9	32	330	14

Table 3: Summary of results for sandy soils. Note mg/kg is the same as ppm. The number in the brackets refers to the number of soil samples taken per Hd.

	Organic Carbon %	Conduct-ivity dS/M	pH ($CaCl_2$)	Phosph-orous mg/kg	Potassium mg/kg	Sulphur mg/kg
Cassini/Duncan (16)	3.9	0.26	4.8	23	171	15
Dudley (46)	2.9	0.14	5.1	28	274	8
Newland/Seddon (26)	3.6	0.14	4.9	27	198	10

Table 3: Summary of results for ironstone soils.

Take home messages

- Soil testing is essential for monitoring soil fertility levels.
- Of all the soil samples taken the majority were below critical levels for pH.
- Phosphorus levels were low on some properties particularly with ironstone soils

Funding/Sponsors

This project is supported by AGKI through the Australian Government National Landcare Program Smart Farms Small Grants.

This project is also supported by Kangaroo Island Landscape Board, through funding from the Australian Government's National Landcare Program.

Further Information

Lyn Dohle, PIRSA Kingscote

M 0419 846 204
E lyn.dohle@sa.gov.au

Note: The information used was sourced from individual Kangaroo Island farmer soil tests and analysed using CSBP analytical Laboratory.

Soil pH Benchmarking 2020-21

Background

Soil pH is known to be quite variable down the soil profile. Many of our soils have clay at depth, and low pH can cause aluminium toxicity which literally burns the fine plant roots. This can severely impact crop and pasture growth as roots are unable to access soil moisture and nutrients.

Ten paired monitoring sites were selected across the Island with consideration of rainfall, soil type and land use (perennial pasture [Kikuyu] and continuous no-till stubble retention cropping) compared to annual pasture (clover and annual grasses). Soil pH was monitored down to 50 cm.

Method

As part of the Soil Carbon Benchmarking project, all soil samples were also measured for soil pH.

Sampling methodology was based on the existing SA long-term pH monitoring site protocols. Ten 'paired' paddocks were selected to compare the effect of rainfall, soil type and management practice on pH to 50 cm (Table 1). In some instances, the annual pasture site was on an adjoining neighbour's property.

At each site ten soil cores were collected for depths; 0-5, 5-10, 10-30, and 30-50 cm and bulked to have one sample for each depth and the soil was analysed for pH 1:5 $CaCl_2$.

Site		Soil Type	Rainfall	Site	Lime History
1A	1	Ironstone	6-700mm	Pasture - Kikuyu	2018 2.5t/ha
1B	2			Pasture - Annual	2018 2.5t/ha
2A	3	Sand over clay	< 500mm	Pasture - Kikuyu	-
2B	4			Pasture - Annual	-
3A	5	Ironstone	6-700mm	Pasture - Kikuyu	
3B	6			Pasture - Annual	-
4A	7	Sand over clay	< 500mm	Pasture - Kikuyu	2005 2.5t/ha
4B	8			Pasture - Annual	2005 2.5t/ha
5A	9	Ironstone	7-800mm	Pasture - Kikuyu	2010 & 2015t/ha
5B	10			Pasture - Annual	2010 & 2015t/ha
6A	11	Sandy loam over clay	6-700mm	Pasture - Kikuyu	-
6B	12			Pasture - Annual	-
7A	13	Sandy loam over clay	< 500mm	Crop - Continuous	2013 2.5t/ha
7B	14			Pasture - Annual	2016 2.5t/ha
8A	15	Sand over clay	5-600	Crop - Continuous	2000, 2008, 2015, & 2019 2.5t/ha
8B	16			Pasture - Annual	2002, 2008, 2015, & 2019 2.5t/ha
9A	17	Ironstone	< 500mm	Crop - Continuous	2020 5t/ha
9B	18			Pasture - Annual	-
10A	19	Samd over clay	5-600	Pasture - Multi Species	2017 2.5t/ha
10B	20			Pasture - Annual	-

Table 1: Site list showing soil type, rainfall, farming system comparison and years under management.

Results

Soil pH readings down to depth are presented in Table 2. pH($CaCl_2$) less than 5 will restrict root growth, thus limiting crop and pasture plants' access to water and nutrients.

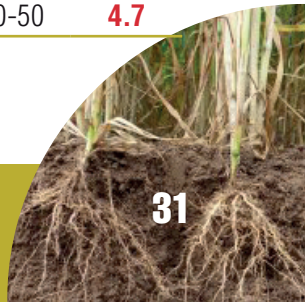
The results show that sites where lime has not been applied (especially sites 3B, 6A, 6B and 10B) had the lowest pH readings in both the topsoil and to depth. Site 4A & 4B had been limed but over 15 years ago and the results show that the site has re-acidified. Site 7B was limed 8 years ago and is also showing signs of re-acidifying. This re-enforces the need to re-apply lime.

A number of sites are showing an 'acid throttle' (such as sites 1A, 1B, 7A, 10A). An 'acid throttle' occurs when there is a layer of soil with a low pH which would be sufficient to restrict root growth, thus limiting the crop's access to water and nutrients. This can occur where lime has been broadcast and has increased the surface pH, but at depth the pH is still very acidic. Compare those sites to sites 8A & 8B where lime has been applied four times in the last 20 years. This constant re-application has driven the lime to depth.

Site 9A has had one application of 5t/ha with some incorporation as it's a cropping site and shows a good pH down to depth, compared to its adjacent site 9B which has had no lime applied and is highly acidic in the top 10 cm.

Interestingly there appears to be a trend of higher pH($CaCl_2$) in kikuyu pasture than annual pasture. This may be due to the roots of the kikuyu absorbing soil nitrates at depth.

Site ID	Soil	System		Sample Depth	pH $CaCl_2$
1A	Ironstone	Pasture	Kikuyu	0-5	**5.5**
1A	Ironstone	Pasture	Kikuyu	5-10	**4.7**
1A	Ironstone	Pasture	Kikuyu	10-30	**5.4**
1A	Ironstone	Pasture	Kikuyu	30-50	**4.3**
1B	Ironstone	Pasture	Annual	0-5	**5.3**
1B	Ironstone	Pasture	Annual	5-10	**4.6**
1B	Ironstone	Pasture	Annual	10-30	**4.6**
1B	Ironstone	Pasture	Annual	30-50	**4.5**
2A	Sand over clay	Pasture	Kikuyu	0-5	**6.1**
2A	Sand over clay	Pasture	Kikuyu	5-10	**5.5**
2A	Sand over clay	Pasture	Kikuyu	10-30	**5.6**
2A	Sand over clay	Pasture	Kikuyu	30-50	**7.3**
2B	Sand over clay	Pasture	Annual	0-5	**5.8**
2B	Sand over clay	Pasture	Annual	5-10	**4.7**
2B	Sand over clay	Pasture	Annual	10-30	**4.8**
2B	Sand over clay	Pasture	Annual	30-50	**7.4**
3A	Sand over clay	Pasture	Kikuyu	0-5	**5.3**
3A	Sand over clay	Pasture	Kikuyu	5-10	**5.0**
3A	Sand over clay	Pasture	Kikuyu	10-40	**5.2**
3A	Sand over clay	Pasture	Kikuyu	40-50	**5.4**
3B	Sand over clay	Pasture	Annual	0-5	**4.6**
3B	Sand over clay	Pasture	Annual	5-10	**4.7**
3B	Sand over clay	Pasture	Annual	10-40	**5.0**
3B	Sand over clay	Pasture	Annual	40-50	**4.5**
4A	Ironstone	Pasture	Kikuyu	0-5	**4.7**
4A	Ironstone	Pasture	Kikuyu	5-10	**4.4**
4A	Ironstone	Pasture	Kikuyu	10-40	**4.6**
4A	Ironstone	Pasture	Kikuyu	40-50	**5.2**
4B	Ironstone	Pasture	Annual	0-5	**4.4**
4B	Ironstone	Pasture	Annual	5-10	**4.4**
4B	Ironstone	Pasture	Annual	10-40	**4.7**
4B	Ironstone	Pasture	Annual	40-50	**5.2**
5A	Ironstone	Pasture	Kikuyu	0-5	**5.1**
5A	Ironstone	Pasture	Kikuyu	5-10	**5.1**
5A	Ironstone	Pasture	Kikuyu	10-20	**5.0**
5A	Ironstone	Pasture	Kikuyu	20-50	**4.9**
5B	Ironstone	Pasture	Annual	0-5	**5.3**
5B	Ironstone	Pasture	Annual	5-10	**5.1**
5B	Ironstone	Pasture	Annual	10-30	**4.9**
5B	Ironstone	Pasture	Annual	30-50	**4.7**



Site ID	Soil	System		Sample Depth	pH $CaCl_2$
6A	Loam over clay	Pasture	Kikuyu	0-5	**4.7**
6A	Loam over clay	Pasture	Kikuyu	5-10	**4.5**
6A	Loam over clay	Pasture	Kikuyu	10-20	**4.6**
6A	Loam over clay	Pasture	Kikuyu	20-50	**5.3**
6B	Loam over clay	Pasture	Annual	0-5	**4.2**
6B	Loam over clay	Pasture	Annual	5-10	**4.3**
6B	Loam over clay	Pasture	Annual	10-20	**4.4**
6B	Loam over clay	Pasture	Annual	20-40	**4.8**
7A	Sandy loam over clay	Crop	Continuous	0-5	**5.2**
7A	Sandy loam over clay	Crop	Continuous	5-10	**4.6**
7A	Sandy loam over clay	Crop	Continuous	10-30	**4.8**
7A	Sandy loam over clay	Crop	Continuous	30-50	**6.0**
7B	Sandy loam over clay	Pasture	Annual	0-5	**4.8**
7B	Sandy loam over clay	Pasture	Annual	5-10	**4.4**
7B	Sandy loam over clay	Pasture	Annual	10-20	**4.6**
7B	Sandy loam over clay	Pasture	Annual	20-50	**5.7**
8A	Sand over clay	Crop	Continuous	0-5	**5.3**
8A	Sand over clay	Crop	Continuous	5-10	**5.2**
8A	Sand over clay	Crop	Continuous	10-30	**5.6**
8A	Sand over clay	Crop	Continuous	30-50	**5.8**
8B	Sand over clay	Pasture	Annual	0-5	**5.5**
8B	Sand over clay	Pasture	Annual	5-10	**5.3**
8B	Sand over clay	Pasture	Annual	10-30	**5.6**
8B	Sand over clay	Pasture	Annual	30-50	**5.9**
9A	Ironstone	Crop	Continuous	0-5	**6.2**
9A	Ironstone	Crop	Continuous	5-10	**5.4**
9A	Ironstone	Crop	Continuous	10-40	**5.3**
9A	Ironstone	Crop	Continuous	40-50	**5.7**
9B	Ironstone	Pasture	Annual	0-5	**4.9**
9B	Ironstone	Pasture	Annual	5-10	**4.9**
9B	Ironstone	Pasture	Annual	10-35	**5.2**
9B	Ironstone	Pasture	Annual	35-50	**5.5**
10A	Sand over clay	Pasture	Multi sp	0-5	**5.1**
10A	Sand over clay	Pasture	Multi sp	5-10	**4.5**
10A	Sand over clay	Pasture	Multi sp	10-30	**4.7**
10A	Sand over clay	Pasture	Multi sp	30-50	**5.4**
10B	Sand over clay	Pasture	Annual	0-5	**4.8**
10B	Sand over clay	Pasture	Annual	5-10	**4.4**
10B	Sand over clay	Pasture	Annual	10-30	**4.4**

Figure 1 (right) illustrates the impact that the management system and lime application can have on soil pH. Site 5 was a kikuyu site and although it had not been limed showed a higher pH down the profile compared to the adjacent annual pasture. Sites 13 and 14 had both been limed but show indications of an acid throttle at 5-10 and 10-30 cm. Note: an acid throttle is a layer of soil with a low soil pH that is sufficient to restrict root growth.

Site 17 has had one application of 5 t/ha with some incorporation and shows a good soil pH to depth.

Site 15 and 16 had been limed four times in the last 20 years (2.5 t/ha per year). The constant re-application has driven the lime to depth.

Fifteen of the twenty sites (75%) had pH ($CaCl_2$) values below 5.0 within the 0-30 cm depth and six of those fifteen sites had pH ($CaCl_2$) values below 4.5 within the 0-30 cm depth.

Liming has increased soil pH, but soils will re-acidify over time. Repeated lime applications can help drive the pH change down the profile. A single once off heavy application (with incorporation) can have the same impact – but care must be taken to ensure the soil is not over limed as this can induce trace element deficiencies such as Manganese and Zinc.

There was a trend of higher pH ($CaCl_2$) in kikuyu pasture than annual pasture.

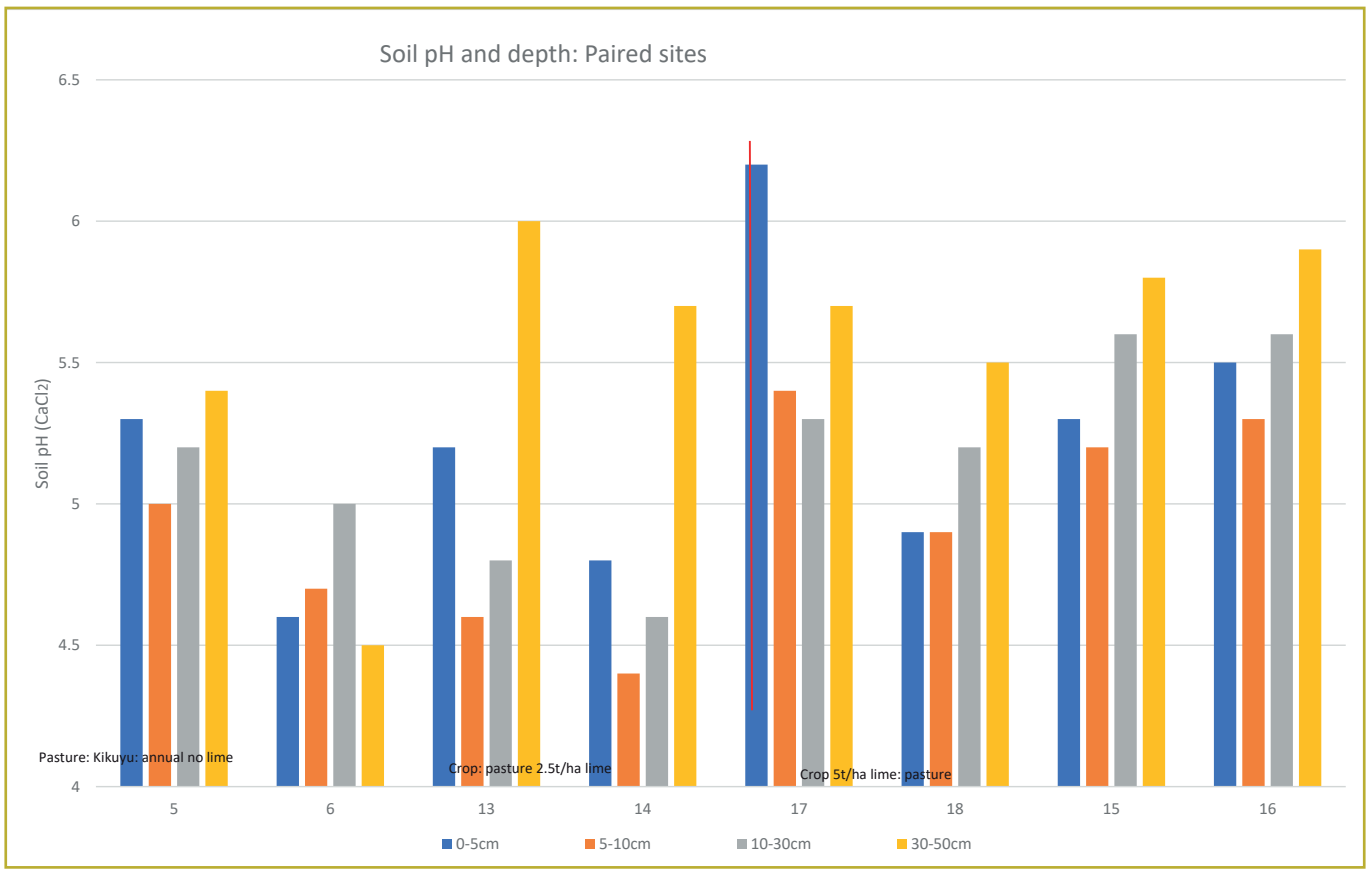


Figure 1: Soil pH changes to depth under different management systems.

Take home message

- The majority of sites had a soil pH less than pH 5.0 (CaCl2) which will reduce crop and pasture productivity and reduce profitability.
- Soils should be sampled at 0-5 and 5-10 cm rather than 0-10 cm. There is often an 'acid throttle' that is missed if sampling at 0-10 cm.
- Soils that have been limed will acidify over time. An application of lime every 5-6 years may be necessary to keep the soil pH above pH 5.0 (CaCl2).
- Deep rooted perennial grass dominant pastures can be less acidifying than annual pastures.

Funding/Sponsors

- **Department of Environment and Water**
- **Kangaroo Island farmers who provided sites for monitoring**

Further Information

Lyn Dohle, PIRSA Kingscote

M 0419 846 204
E lyn.dohle@sa.gov.au

Or contact the PIRSA Office in Kingscote for a copy of the complete document.

Soil Carbon Benchmarking 2020-21

Background

There is strong interest in assessing and understanding the soil carbon (C) levels in our agricultural soils. However, there are few sites that are suitable for monitoring soil C change to depth and over time. Selecting the most appropriate soil carbon test and understanding what it means can also be confusing.

Ten paired monitoring sites were selected to measure soil carbon to 50 cm at strategic locations across the Island with consideration of rainfall, soil type and land use (perennial pasture and continuous no-till stubble retention cropping) compared to annual pasture. Common soil carbon tests were analysed to establish guides for the soils in the region.

What was done

Sampling methodology was based on the national soil carbon research program and existing SA long-term soil C monitoring site protocols. Ten 'paired' paddocks (Figure 1) were selected to compare the impact of management practice on soil carbon (Table 1).

At each site bulk density was measured to depth and ten soil cores were collected along 2 transects within the grid for depths; 0-5, 5-10, 10-30, and 30-50 cm and bulked to have one sample for each depth. Soil was analysed for organic carbon (Walkley and Black method), total carbon (Dumas method).

Farmer	Site	Soil Type	Rainfall	Site	Yrs	Comparison Site
Heinrich	1, 2	Ironstone	6-700mm	Pasture - Kikuyu	10	Annual Pasture
Green	3, 4	Sand over clay	<500mm	Pasture - Kikuyu	11	Annual Pasture
Paxton	5, 6	Ironstone	6-700 mm	Pasture - Kikuyu	12	Annual Pasture
Wilson	7, 8	Sand over clay	<500mm	Pasture - Kikuyu	6	Annual Pasture
Short	9, 10	Ironstone	7-800mm	Pasture - Kikuyu	5	Annual Pasture
Clarke	11, 12	Sandy loam over clay	6-700mm	Pasture - Kikuyu	20	Annual Pasture
Berry	13, 14	Sandy loam over clay	<500mm	Crop - continuous	20	Annual Pasture
Mills	15, 16	Sand over clay	5-600mm	Crop - continuous	15	Annual Pasture
Pontifex	17, 18	Ironstone	<500mm	Crop - continuous	19	Annual Pasture
Stanton	19, 20	Sand over clay	5-600mm	Pasture - Multi species	5	Annual Pasture

Table 1: Site list showing soil type, rainfall, farming system comparison and years under management.

Figure 1: Map showing approximate location of ten sampling sites.

Carbon values are generally expressed as a concentration in the soil (Mg/g or percentage %). To consider the carbon on an area basis (stock as t C/ha) the bulk density (g/cm3), gravel content and soil thickness (depth cm) needs to be included.

Carbon stock (t/ha) is calculated by OC % x depth (cm) x bulk density (fine earth) g/cm3.

However, this conversion does not account for differences in soil mass between soils with a fixed depth. As soil mass is responsive to changes in land management, carbon stock was calculated using a standard or equivalent soil mass (ESM) of 3700 tC/ha in the 0-30 cm and 6500 tC/ha in the 0-50 cm depth (close to median (50th percentile) mass of the 20 sites). Stock data have been reported as tonnes of carbon per hectare of soil for the specified depth. To convert to tonnes of carbon dioxide equivalent multiply the t C /ha value by 3.67.

Results

Most agricultural soil analysis report carbon using the Walkley and Black method. However, carbon accounting requires that total carbon is reported. This analysis has not been used in the past and there is little understanding how the tests compare to each other. As a guide for the results on Kangaroo Island, a multiplication factor of 1.12 for OC WB to total C can be used, refer to Figure 2.

There was a strong positive relationship between carbon stock and rainfall and soil type where sand over clay soils had lower carbon and ironstone soils higher carbon. There appears to be a sharp increase in C stock at rainfall > 600 mm. Management practice had a more variable effect on C stock (Figure 1) and it is difficult to define a pattern.

There are contrasting results for management between OC and TC stock for sites 7 and 8 and 11 and 12. There is also a difference in magnitude of difference between OC and TC between paired sites for sites 1 and 2, 5 and 6, 9 and 10, 13 and 14 and 17 and 18.

These results require further investigation to determine what the different analytical tests are analysing in the soil. It could be possible that the total carbon analysis is including charcoal (past or recent) that the Walkley Black is known not to include.

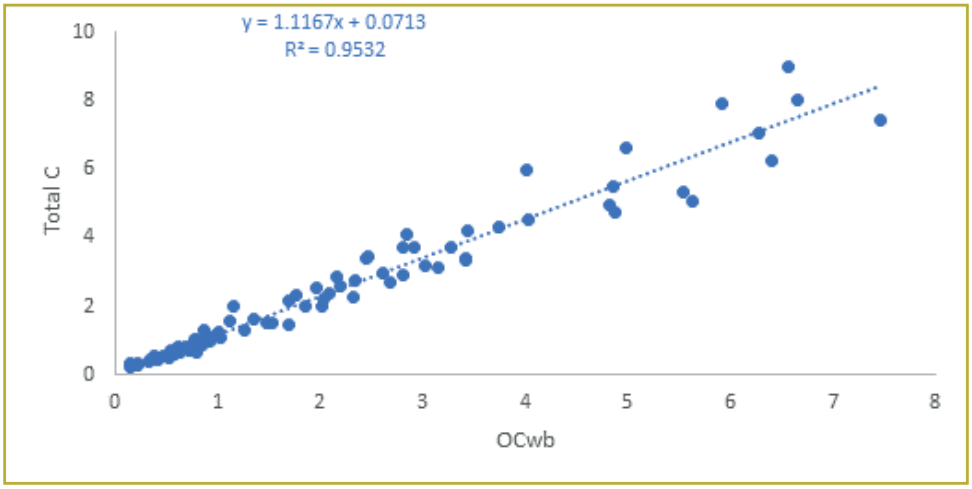
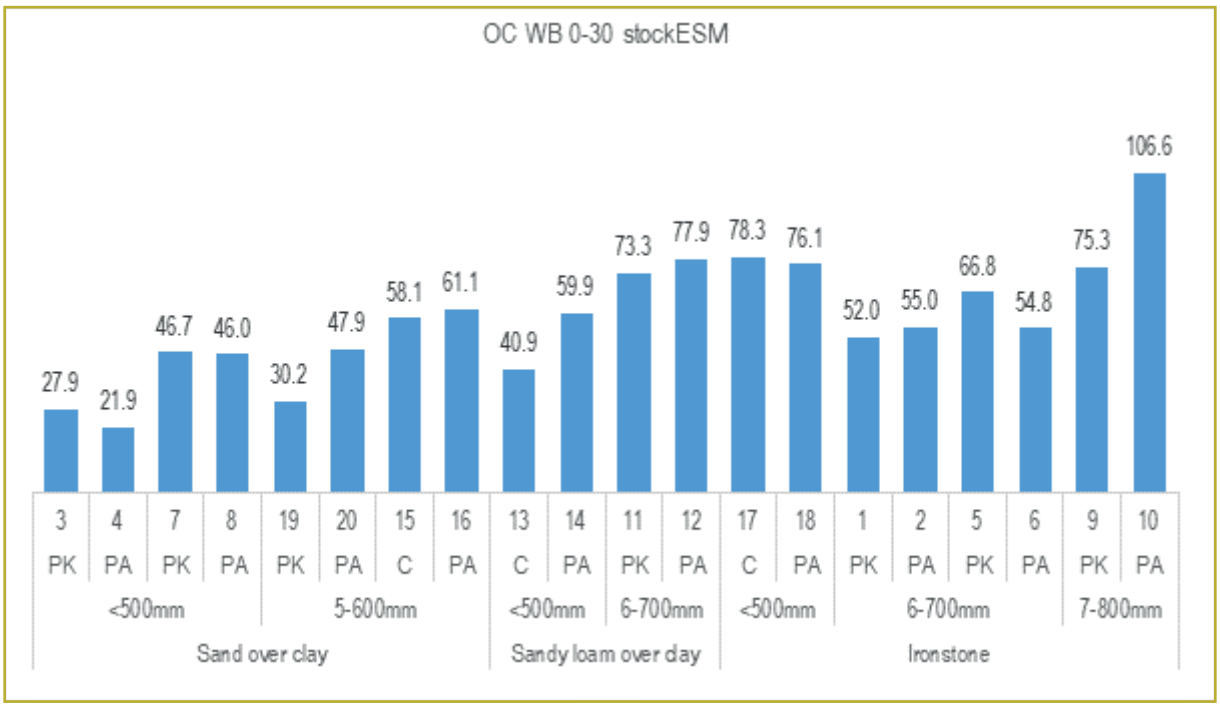


Figure 2: Correlation between Total C (Dumas) method and Organic C (Walkley and Black Method)



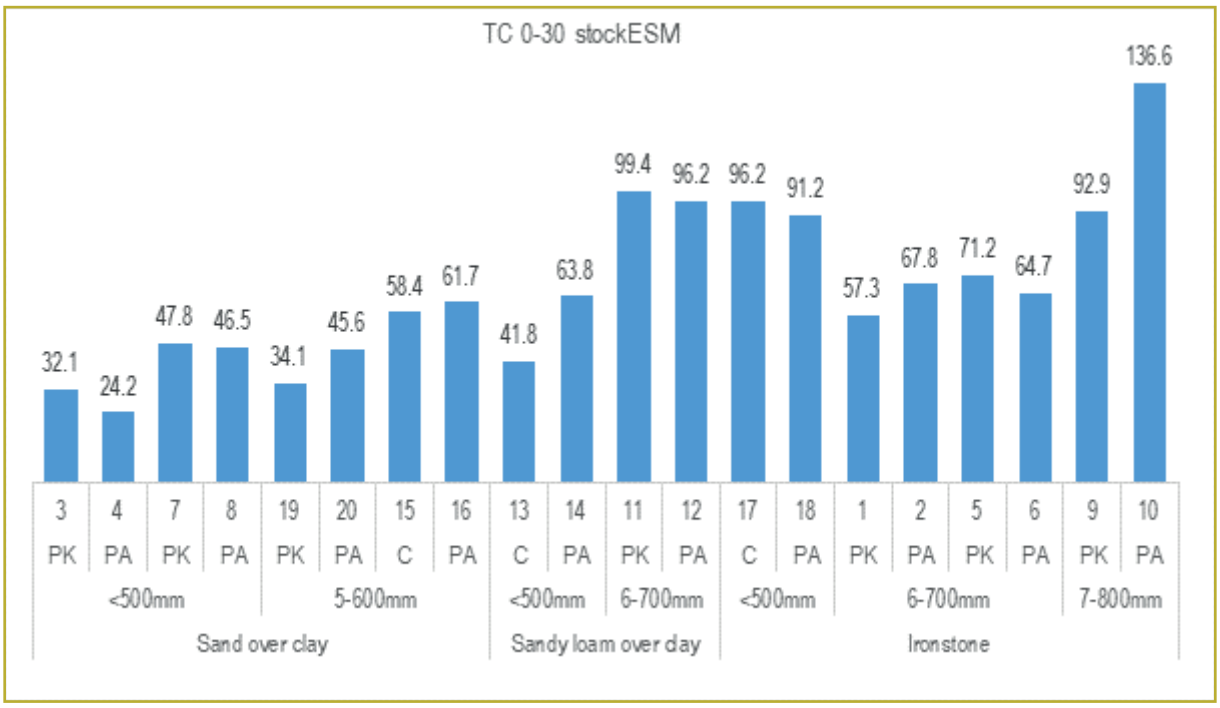


Figure 3: Carbon stock in the 0-30 cm for the equivalent soil mass (3700 t/ha) for organic carbon (Walkley and Black method) and Total C (Dumas method) ordered by soil type and rainfall. Abbreviations: P = Pasture, A = Annual, K = Kikuyu, C = Crop (no till, stubble retention).

Take home messages

- Twenty soils monitoring sites were established on a selection of rainfall, soil type and management systems on the agricultural soils of Kangaroo Island.
- Soil organic carbon (Walkley and Black method), total carbon (Dumas method) and pH (calcium chloride) were analysed for depths 0-5, 5-10, 10-30 and 30-50 cm.
- There was a good relationship between organic carbonWB and total carbonD for the results on Kangaroo Island. A multiplication factor of 1.12 can be used to estimate total carbonD from organic carbonWB.
- There was a strong positive relationship between carbon stock, rainfall and soil type.
    - There appears to be a sharp increase in carbon stock at rainfall > 600 mm.
    - Sand over clay soil type had lowest carbon stock and ironstone soil type the highest.
- Management system had a variable effect on carbon.
- There are inconsistencies in carbon stock for the sites depending on which analytical test was used organic carbonWB and total carbonD. This requires further investigation.

Funding/Sponsors

This project is supported by the Kangaroo Island Landscape Board, through funding from the Australian Government's National Landcare Program.

Also supported by the Kangaroo Island farmers who provided sites for monitoring.

Further Information

Amanda Schapel, PIRSA Nuriootpa

M 0411 137 258
E amanda.schapel@sa.gov.au

Or contact the PIRSA Office in Kingscote for a full copy of the report.

Photo Credit (this page): Fancois Maritz: Harvest, KI. Taken from Higgs, A. (Ed) *Kangaroo Island*, Wakefield Press, 2021.

Lime Trials

Background

Soil acidification affects 76% of topsoils and 73% of subsurface soils on Kangaroo Island, with an annual loss of production cost of $1.5 million (2018). Liming has the potential to save you yield penalties, but how do we do this most effectively and efficiently? A three-year research trial aims to investigate the impact of precision lime application rate, placement and product on cropping land and will evaluate cost effective ways to ameliorate subsoil acidity. There are two parts to the trial:

- Rate response trial – comparison of three rates of surface-applied lime sand with a control (no lime)
- Novel treatment (rate, incorporation) trial – comparison of two rates of lime sand, comparing surface-applications of the different rates, plus seeing what the effects of incorporation of a high rate of lime are, using offset discs (10-15cm) to manage sub soil acidity.

Agriculture Kangaroo Island (AgKI) are delivering this trial as part of a multi-state project. There are 10 sites in total – one on Kangaroo Island, two in the South East of South Australia, two in Tasmania, two in Gippsland and three in Southwest Victoria. The project will run over three seasons, finishing in June 2022.

Other partners involved in this project are Precision Agriculture, Federation University – the Centre for eResearch and Digital Innovation (CeRDI), Australian Fertiliser Services Association, Victorian Lime Producers Association, Victorian Department of Agriculture and Glenelg Hopkins Catchment Management Authority.

What was done

Rate Response Trial

The trial site was established in early 2019, on Simon & Marisa Veitch's property off Jenkins Rd, MacGillivray. The starting topsoil (0-10cm) pH^{CaCl2} was 4.8; for the rate response trial, the following treatments were randomly applied in four replicates, using local lime sand:

- Control: no lime was applied
- Treatment 1: low rate of 0.5t/ha to target a rise in pH^{CaCl2} from 4.8 to 5.0 (0.6t/ha lime sand)
- Treatment 2: moderate rate of 1.8t/ha to target a rise in pH^{CaCl2} from 4.8 to 5.5 (2.4t/ha lime sand)
- Treatment 3: high rate of 3.2t/ha to target a rise in pH^{CaCl2} from 4.8 to 6.0 (4.1t/ha lime sand)

Novel Treatment Trial

For the novel treatment trial, four treatments and a control were applied in four replicates at each site, to improve the starting pH^{CaCl2} from 4.4 (topsoil 0-10cm), 4.6 (subsoil 10-20cm) and 4.9 (20-30cm) to 5.8 (0-10cm), 5.3 (10-20cm) and 5.0 (20-30cm). A set of offset discs were used to incorporate the lime in applicable plots. The treatments are as follows:

- Control: no lime + no cultivation
- Treatment 21: farmer rate surface lime – applied at 1.85t/ha (2.5t/ha lime sand)
- Treatment 22: high rate surface lime – applied at 4.0t/ha (5.4t/ha lime sand)
- Treatment 23: high rate surface lime + incorporation – applied at 4.0t/ha (5.4t/ha lime sand)
- Treatment 24: incorporation only (no lime)

The site was sown with lupins in 2019 and wheat on 10th May 2020. The site was harvested on 19 December 2020.

Results

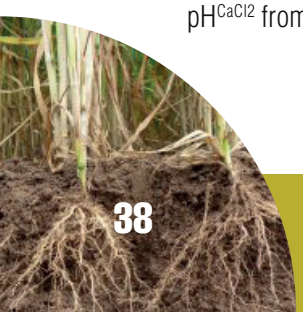
Novel trial - Soil pH changes to depth

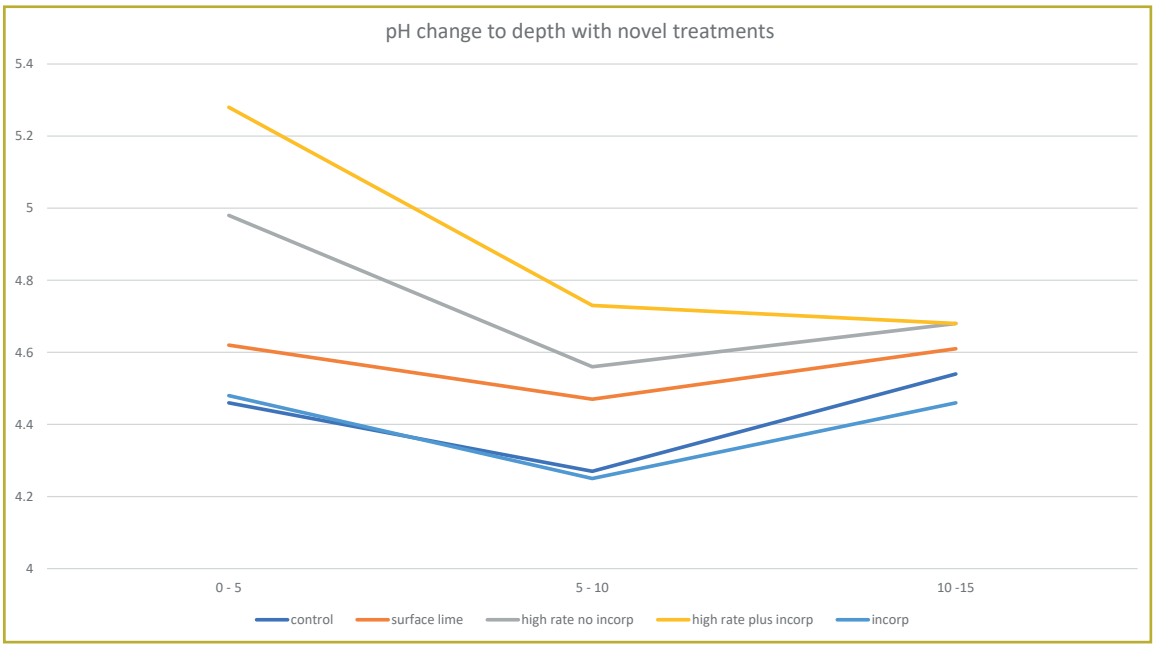
Soil pH changes down the profile were measured in the novel treatments trial. pH was measured in increments of 0-5, 5-10 and 10-15 cm down the profile and compared to the control (no lime applied) in March 2020, refer to Graph 1.

As expected, the high rate of lime (5.4t/ha lime sand) treatments had the greatest impact on soil pH, increasing the soil pH by almost 1 unit in the topsoil and 0.5 of a unit in the 5-10cm layers. Whilst incorporation of the lime provided the highest increase, surface application of the high rate still had an impact at depth.

Surface application at 2.5t/ha improved the topsoil pH by about 0.2 of a unit and had some impact at depth.

These initial results indicate that to change soil pH at depth ideally requires some form of incorporation and/or higher application rates.



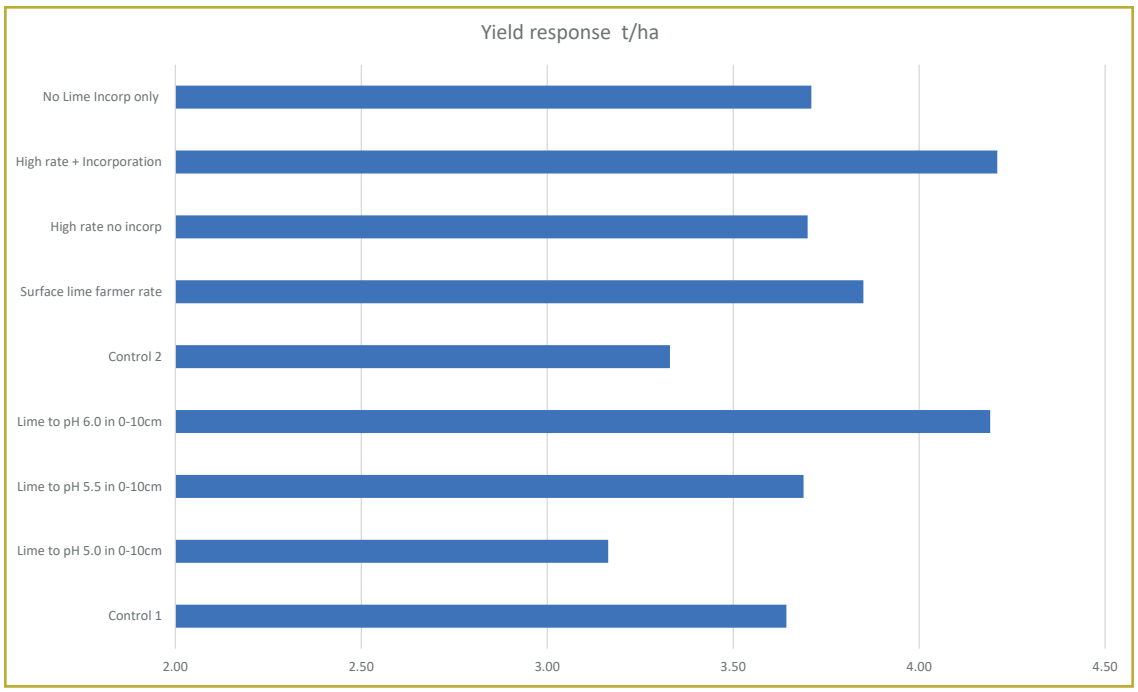


Graph 1: pH ^{CaCl} changes to depth with novel treatments.

TREATMENT	Yield (t/ha)	Moisture (%)	Protein (%)
Rate Response Trial			
Control	3.64 $^{a\,b}$ *	12.43	11.88
Lime to pH 6.0 in 0-10cm (4.1t/ha lime sand)	4.19 ^{c}	12.45	11.72
Lime to pH 5.5 in 0-10cm (2.4t/ha lime sand)	3.69 $^{b\,c}$	12.40	11.67
Lime to pH 5.0 in 0-10cm (0.6t/ha lime sand)	3.16 ^{a}	12.45	11.65
Novel Treatments Trial			
Control	3.33 ^{a}	12.55	10.8
High rate + Incorporation (5.4t/ha lime sand)	4.21 $^{a\,b}$	12.40	11.0
Incorporation only	3.71 $^{b\,c}$	12.53	11.2
high rate no incorp (5.4t/ha lime sand)	3.7 ^{c}	12.43	11.4
Surface lime farmer rate (2.5t/ha lime sand)	3.85 $^{a\,b}$	12.45	11.0

* Note: a, b or c indicate if there is a statistical difference between treatments. Treatments with superscript are NOT statistically different.

Table 1: Lime rate response and novel treatment summary statistics.



Graph 2: Yield response all treatments.

Take Home Messages

- These initial results indicate that to change soil pH at depth ideally requires some form of incorporation and/or higher application rates.
- In the second year of monitoring, there was a significant increase in yield with the high rates of lime application (either incorporated or surface application).

Funding/Sponsors/Acknowledgements

- AgKI in conjunction with Southern Farming Systems, through funding from the Australian Government's National Landcare Program.
- Simon and Marisa Veitch

Further Information

Lyn Dohle, PIRSA Kingscote

M 0419 846 204
E lyn.dohle@sa.gov.au

Soil pH Micro-Variation Mapping

Background

Farmers usually collect top-soil (0-10cm) samples when determining if they need to lime, but soil pH can be quite variable down the soil profile. Will a single sampling depth show up this inherent variability? To then further complicate the issue, most farmers usually broadcast lime as the paddock is either in permanent pasture or under minimum tillage in crop. However, we know that lime moves slowly through the soil profile and KI data indicates limited movement below 5-10cm.

This raises many questions:

- Are our soils acidifying at depth? If so, will this impact on crop and pasture growth?
- What happens when we just apply lime to the top soil?
- Do we need to be re-thinking our liming program?

The widespread adoption of minimum tillage will have impacts on how we manage soil acidity. The current standard industry practice of spreading lime, with no incorporation under minimum till systems, confines the lime benefits to the surface layers. There is a range of options to get lime to depth under minimum or no-till operations that farmers may need to now consider:

- Apply high rates of surface applied lime to drive the leaching of lime down the soil profile.
- Incorporate lime into sub-surface or sub-soil using specialised machinery.
- Use delving or spading to help move lime or help mix less acidic soil horizons.
- Use strategic tillage to more thoroughly incorporate the lime.

What was done

Two cropping sites were selected on T & F Fryars & Sons property on Hog Bay Rd, Hundred of Haines. Both sites were sampled on the 21st May 2020. At each site, four mini (soil) pits were dug approximately 50 cm apart. In each mini pit, five 4 cm wide cores were taken, two under each seeding row and three cores between the seeding rows. Each core was subsampled into 2.5 cm increments down to 15 cm, bulked and analysed for soil pH.

Site 1:

- Barley Stubble 9" spacings
- Limed in 2018 at 2.5t/ha limesand
- Continuously cropped by the current owner since 2013. Cropped by the previous owner for at least 5 years prior to that and possibly limed during that time
- Paddocks are direct sown using knife points since 2013 and minimum tillage used by previous owner
- Soil - sandy loam graduating to a yellow sandy gravel layer. Orange clay at 30cm.

Site 2:

- Barley Stubble 9" spacings
- Limed in 2018 at 2.5t/ha limesand
- Continuously cropped by the current owner since 2013. Cropped by the previous owner for at least 5 years prior to that and possibly limed during that time
- Paddocks are direct sown using knife points since 2013 and minimum tillage used by previous owner. Paddock was delved approximately 10 years ago
- Soil – loamy sand over bleached white sand, gravel layer at about 18cm, orange clay at 30cm.

Results

At **Site 1** the results show limited lime movement below 5 cm (refer to Table 1). This correlates with other monitoring work on Kangaroo Island and the mainland, which indicates that broadcast lime does not move much below about 5 cm at normal application rates of 2.5t/ha. Only the top 2.5 cm of top soil has pH readings considered adequate for crop growth, with some lime movement into the 2.5-5 cm layer but still below desirable levels.

Site 2 (Table 2) although limed at the same time as Site 1, is showing a distinct 'acid throttle' between 5-12.5 cm. An 'acid throttle' occurs when there is a layer of soil with low pH that would be sufficient to restrict root growth, thus limiting the crop's access to water and nutrients.

Depth/Width (cm)	Seeding Row	6-12cm	12-18cm	18-23cm	Seedling Row	Mean Down
0-2.5	5.72	5.74	5.54	5.37	5.69	5.6
2.5-5	5.14	5.51	5.52	5.11	5.35	5.3
5-7.5	4.9	4.99	4.96	4.92	5.15	5.0
7.5-10	4.99	4.86	4.72	4.71	4.98	4.9
10-12.5	5.24	5.15	4.81	4.86	4.9	5.0
12.5-15	5.57	5.56	5.31	5.24	5.05	5.3
Mean across	5.3	5.3	5.1	5.0	5.2	

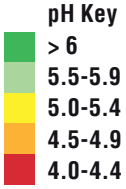
Table 1: Soil pH results from Site 1. Note column headings are the distance from the first seeding row.

Depth/Width (cm)	Seeding Row	6-12cm	12-18cm	18-23cm	Seedling Row	Mean Down
0-2.5	5.3	5.34	5.34	5.37	5.31	5.3
2.5-5	4.55	4.9	4.8	5.25	4.82	4.9
5-7.5	4.42	4.41	4.33	4.68	4.51	4.5
7.5-10	4.36	4.26	4.24	4.38	4.38	4.3
10-12.5	4.52	4.42	4.29	4.42	4.39	4.4
12.5-15	4.54	4.56	4.6	4.61	4.59	4.6
Mean across	4.6	4.6	4.6	4.8	4.7	

Table 2: Soil pH results from Site 2. Note column headings are the distance from the first seeding row.

These results indicate the need for regular liming to increase and then maintain soil pH. The results also highlighted the limited movement of lime down the profile. Traditional 0 -10 cm soil sampling post liming, may give a false result by indicating a pH increase through the top soil when in fact, it's only the top 2.5 cm that has increased in pH. Farmers need to be aware of this and sample pH at greater depths. A quick check may be to dig a quick a hole (just with a shovel will be fine) down to 20 cm and test the pH with a garden soil pH kit. This will quickly highlight the soil pH to depth and the potential for any acid throttles.

If an acid throttle is detected i.e. a zone of soil with a pH of less than 5 in the top 20 cm of soil, other liming strategies will need to be considered. This may involve an increase in rate and/or frequency of lime application, but be aware of the risk of over-liming and inducing nutrient deficiencies especially Manganese. Otherwise, you may need to consider a once off strategic tillage to fully incorporate the lime.



Take home messages

- Monitor pH to depth by using a shovel and cheap pH test kit.
- Don't assume just because you once limed that the problem is solved – monitor, monitor, monitor!
- Consider options to get lime to depth by increasing the rate and/or frequency of liming or using strategic tillage.

Funding/Sponsors/Acknowledgements

- Department of Environment & Water
- Fryar Family

Further Information

Lyn Dohle, PIRSA Kingscote

M 0419 846 204 E lyn.dohle@sa.gov.au

2020 Stokes Bay Small Plot Fertiliser Trial

Background

The BioAg fertiliser trial was established in 2019. The trial has 6 treatments with 4 replications and compares various BioAg products and rates against an annual application of single super. The biomass is measured by mowing with a push behind mower and weighing the catchings. The site was not grazed.

The site is located on W & J Stantons at Stokes Bay on a sandy soil. The pasture is a perennial veldt grass and serradella with a light smattering of capeweed and annual ryegrass. The site experienced a hot burn in January 2020 with the treatments closest to the scrub line suffering the most damage to the pasture base.

Treatment	23-Jul 20	15-Sep 20	Cumul-ative
Control	1670±130	2613±195	2355±176
275kg Superb - biennial	1518±130	2844±195	2693±176
200kg PhosS10 - biennial	1507±129	2964±194	2844±175
125kg Single - annual	1428±129	3033±194	2301±175
135kg Superb - annual	1539±130	2922±195	2595±176
275kg Superb + lime + Trace Elements - biennial	1730±109	2953±164	2651±148

Table 1: Means and standard errors of each treatment at both harvest times. Units are kg/ha.

Funding/Sponsors

- BioAg
- W & J Stanton

Further Information

Jenny Stanton

M 0484 602 946
E jennybehenna@hotmail.com

Phil Toy, BioAg

M 0458 440 225

Results

Due to the fire and the upright podding nature of serradella it was decided to allow the serradella to set seed in spring 2020. Resultantly, only 2 cuts were taken during the growing season. Veldt and serradella typically hit their straps in spring and there was estimated to have been an extra 4t DM/ha grown between September and November. The trial will run for another two years.

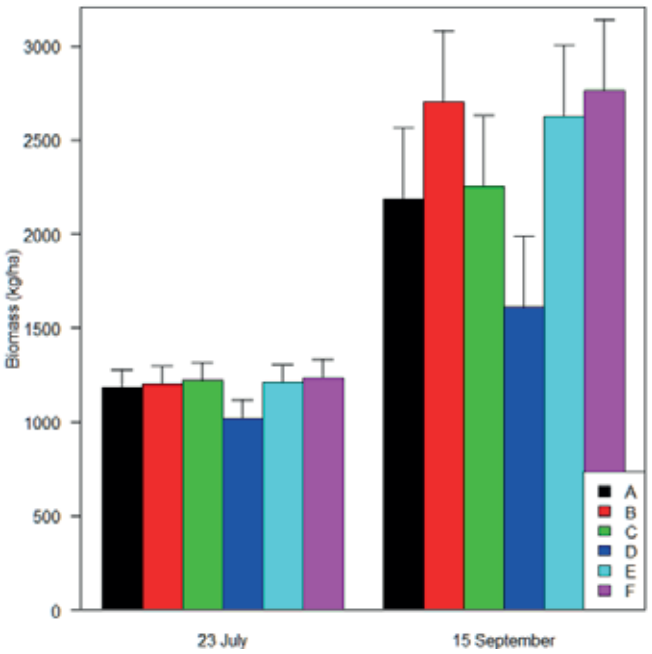


Figure 1: Biomass production for each treatment at each sampling date from Stokes Bay trial. Error bars are standard errors. Refer to codes in Table 1 to identify treatments.

Take home messages

- There was no significant difference on a dry matter basis between all fertilizer products. Nor was there an effect of the cumulative amount over the four harvest times.
- There was high variability across the site owing to the effect of the January bushfire.
- There was a hint in the data that plots receiving treatment D (single super) were the least productive at both the Parndana and the Stokes Bay trials.

2020 Parndana Small Plot Fertiliser Trial

Background

The BioAg fertiliser trial was established in 2019. The trial has 6 treatments with 4 replications and compares various BioAg products and rates against an annual application of single super.

What was done

The site is located on M & M Tremaine's at the big bend on the Playford Highway east of Parndana. The pasture is an annual regenerating pasture. In 2019, the composition was 70:30 clover:capeweed. The site was burnt in January 2020 and it is likely that this influenced capeweed to dominate the sward with the ratio tending 10:90 clover:capeweed in 2020.

The biomass was measured by mowing with a push behind mower and weighing the catchings. The site was not grazed.

Results

Below is a summary from the site in 2020 when 4 cuts were taken. The trial will run for another two years.

Treatment	6-Jun 20	7-Aug 20	4-Sep 20	3-Dec 20	Cumulative
Control	1670±130	2613±195	2355±176	3187±186	9824±341
275kg Superb - biennial	1518±130	2844±195	2693±176	2897±186	9952±341
200kg PhosS10 - biennial	1507±129	2964±194	2844±175	2903±184	10218±339
125kg Single - annual	1428±129	3033±194	2301±175	3013±184	9775±339
135kg Superb - annual	1539±130	2922±195	2595±176	3114±186	10171±341
275kg Superb + lime + Trace Elements -biennial	1730±109	2953±164	2651±148	2724±156	10058±270

Table 1: Means and standard errors of each treatment at both harvest times. Units are kg/ha.

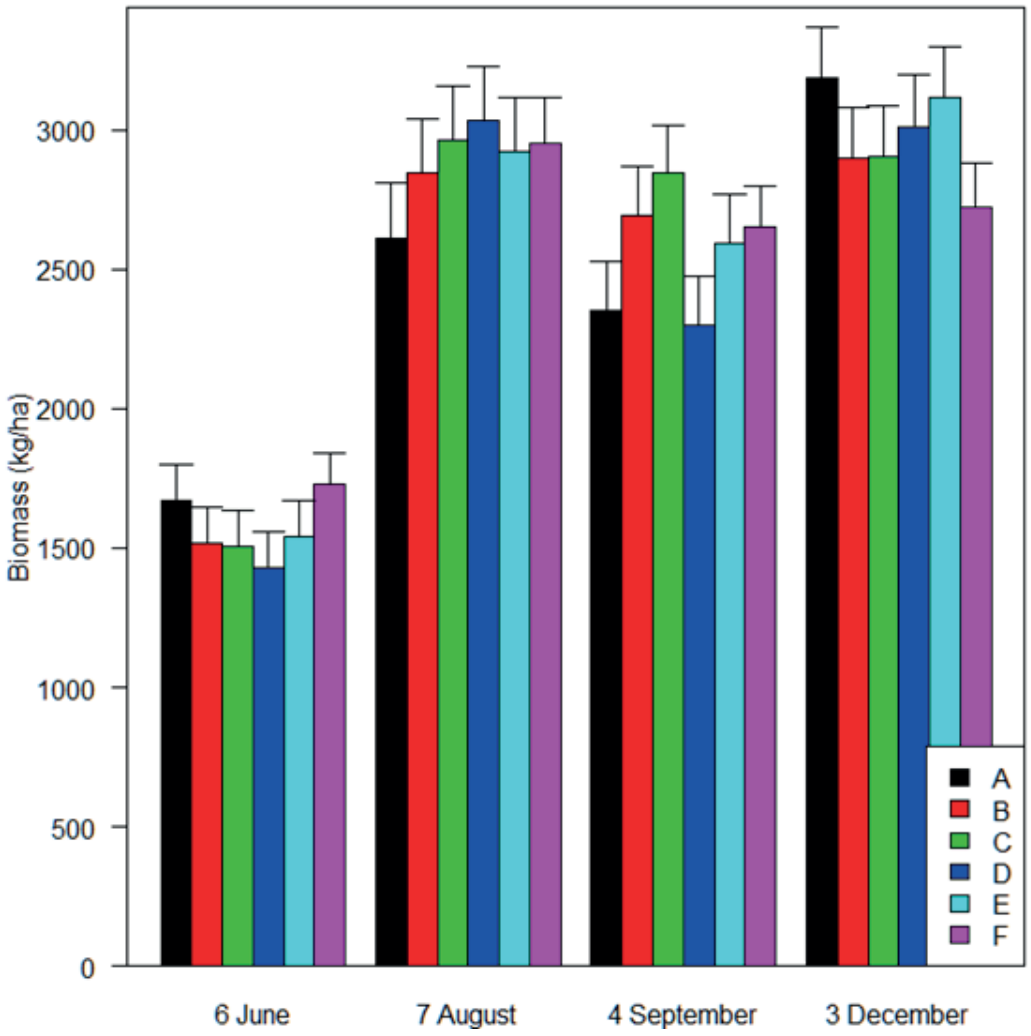


Figure 1: Bar plot of averages across treatments of cuts at each date for Parndana trial. Error bars are standard errors. Refer to codes in Table 2 to identify treatments.

Funding/Sponsors

- BioAg
- Tremaine family

Further Information

Jenny Stanton

M 0484 602 946
E jennybehenna@hotmail.com

Phil Toy, BioAg

M 0458 440 225

Photo Credit (previous page): Francois Meritz: Potato Harvest, KI. More images by this artist can be found in Higgs, A. (Ed) *Kangaroo Island*, Wakefield Press, 2021.

Take home messages

- There was no significant difference on a dry matter basis between all fertilizer products. Nor was there an effect of the cumulative amount over the four harvest times.
- There was a hint in the data that plots receiving treatment D (single super) were the least productive at both the Parndana and the Stokes Bay trials.

Building Resilient Agricultural Systems on KI

Background

In March 2020 Nicole Masters from Integrity Soils delivered a 3-day regenerative agriculture workshop on Kangaroo Island. Following this workshop, a 'community of practice' comprising over 20 farmers from Kangaroo Island who are interested in implementing regenerative agricultural practices was created.

Since the initial workshop this group has been supported by Kim Deans - a regenerative agriculture coach from Integrity Soils - through webinars, group coaching calls and question and answer sessions to provide the opportunity for group accountability, interaction and support as participants implement what they are learning. Having a local, supportive network of farmers to learn with and from is a key aspect of a successful transition to regenerative agriculture systems.

What was done

Four demonstration sites have been established on Wheaton (DW1, DW2, DW3), Jenny Stanton (JS1, JS2, JS3, JS4), Carly Bussenschutt (CB1) and Venetia Bolwell (VB1, VB2, VB3, VB4) properties. These sites will be used to explore how biological approaches to restoring soil health and holistic grazing practices lead to improved soil health, increased soil carbon, increased soil water holding capacity, improved plant health, improved production, increased on farm diversity and a reduced need for synthetic inputs.

Demonstration site participants have had access to individual coaching calls with Kim Deans. There is no one-size-fits-all approach to regenerative agriculture and the Integrity Soils coaching process supports participants to put together a strategy that is relevant for their unique situation. The coaching process empowers participants to deepen their observational skills and understanding of soil processes to find points of leverage that provide the greatest return on investment in quality, production, and performance.

Monitoring is the foundation of a successful transition to a regenerative system. Soil health monitoring has been undertaken on all demo sites with the assistance of Damon Cusack (Regional Agricultural Landcare Facilitator). Monitoring transects have been established at the demonstration sites to monitor physical, biological and mineral aspects of soil health over the course of the project.

Soil physical health assessments have been carried out in line with the Integrity Soils process, which measures several soil and plant health indicators along with keeping photographic records of the sites. Soil biological health has been monitored using laboratory testing from Microbe Labs. Soil mineral analysis has been undertaken on each site with samples analysed by Environmental Analysis Laboratory (EAL). This data completes the whole picture of soil health and is viewed alongside soil physical and biological health indicators.

Site	Water Infiltration (mm/min)			18-23cm
	1st 25mm	2nd 25mm	3rd 25mm	
CB1	2	1.3	-	17
DW1	-	-	-	14
DW2	1	-	-	18
DW3	12.5	2	1.6	14
JS1	2.7	2.2	1.9	17
JS2	30	1.2	-	17
JS3	<0.8	-	-	18
JS4	0.5	1.7	1.7	16
VB1	2.5	0.9	-	15
VB2	6.5	1.8	1	15
VB3	2.7	0.7	-	12
VB4	3.6	1.4	1.2	12

Assessing Water Infiltration Rate				
Results mm/min	0 – 0.5	0.5 - 2	2 - 4	>4
Guide	Poor	Mod-erate	Good	Very good

Visual soil assessment score	Assessment
<10	Poor
10-20	Moderate
>20	Good

Table 1: Key aspects of soil physical health assessment.

Table 2: Key aspects of soil biological laboratory testing.

Site	Total Micro-Organisms	Bacteria	Fungi	AMF	Protozoa	An-aerobes	Diver-sity
CB1	Good	Fair	Good	Good	Good	High	Low
DW1	Good	Fair	Good	Good	Good	High	Low
DW2	Good	Low	Good	Good	Good	High	Low
DW3	Fair	Low	Low	Good	Good	High	Low
JS1	Low	Low	Low	Low	Low	High	Low
JS2	Low	Low	Low	Low	Good	High	Low
JS3	Good	Fair	Good	Fair	Good	High	Low
JS4	Good	Low	Good	Good	Good	High	Low
VB1	Low	Low	Low	Low	Good	High	Low
VB2	Low	Low	Low	Low	Good	High	Low
VB3	Low	Low	Low	Low	Good	High	Low
VB4	Good	Low	Good	Low	Good	High	Low

Low	
Fair	
Good	
High	

Results

The monitoring data collected is also used to guide the development of the strategy employed at each demonstration site. Monitoring data provides a baseline and is used to indicate if the system is going forwards or backwards. This data will become more valuable over time as the project progresses and trends become obvious.

Actions being undertaken on demo sites have been prioritised in line with the Integrity Soils soil health triage process outlined below:

1. **Solar energy**: Maximizing the use of the free solar energy, that drives the production system and sequesters carbon in the soil, is the first foundational step in a regenerative program. Practices that build this foundation include: keeping living ground cover and living plant roots in the soil, fine-tuning grazing management to allow for adequate rest and recovery of plants between grazing, and increasing the diversity of plant species through seeding and grazing management.
2. **Air:** High anaerobes in microbe labs tests at all sites are an indicator of poor soil function, poor aggregation and low gas exchange. Improving stable soil carbon levels will improve soil structure and porosity, providing aeration required by soil microbes to cycle nutrients in the soil. Improving gas exchange reduces GHG losses and the proliferation of anaerobic bacteria. This porosity also reduces evaporation.
3. **Water:** Improving stable soil carbon reserves will also improve water infiltration and storage in the soil. Maximising rainfall use efficiency is a requirement for maximising profitability in a farming system.
4. **Decomposition:** Boosting aeration and the water cycle in the soil will facilitate decomposition processes necessary for mineral cycling.
5. **Biology:** In addition to doing less harm to soil biology, actively feeding and stimulating soil microbial populations will restore biological health in the soil. Practices being undertaken on demo sites to restore soil biological function include applying biological stimulants in spring and autumn when there is good soil moisture and applying a seed coating of worm or compost extracts.

- **Minerals:** Mineral analysis indicates that foliar applications of nutrients, in particular nitrogen, phosphorus and trace elements (noting that exact requirements vary from site to site), could be beneficial across the demo sites and participants will be encouraged to take leaf tests during the growing season to monitor plant nutrient needs. The carbon:nitrogen ratio is high across all demo sites which indicates that decomposition processes are not functioning, due to low aeration, low bacteria levels and low nitrogen.

Funding

- Australian Government National Landcare Program

Further Information

Kim Deans, Integrity Soils

M 0455 596 464 E kimd@integritysoils.com

Biosecurity - Protecting KI Agricultural Industries

Background

The Kangaroo Island Rebuild and Recovery Project: Biosecurity Initiative, incorporates several activities to support the protection of Kangaroo Island's primary production and environment.

This includes

- increased random biosecurity checks at Cape Jervis ferry terminal
- an expansion of the current public education program
- awareness campaign about biosecurity risk for machinery hygiene

What was done

Four casual biosecurity officers were engaged in March 2021 and underwent training to become authorised under the Livestock, Plant Health and Landscape SA Acts. Since commencing they have checked 133 ferry services carrying 4235 vehicles and 11946 passengers.

They have intercepted 115 lots of honey, (2.7 per 100 vehicles) which is a significant increase from the 1.4 which has been the trend in previous years. The increase is due to the awareness level of the new cohort of first-time travellers to Kangaroo Island following the promotion of travel within Australia.

They have inspected 75 machines, including agricultural, earthmoving and construction equipment. Whilst most have been found relatively free of soil and plant material, there has been has been some earthmoving equipment found to be a high biosecurity risk due to the amount of soil and plant material present. In these cases, arrangements have been made to minimise the risk by cleaning the machines in Penneshaw prior to movement further onto the Island.

Biosecurity awareness has been increased with the requirements on the PIRSA Biosecurity SA website, development of advice sheets for earthmoving, construction, agricultural and vegetation clearing industries and review of signage at Cape Jervis. There were 82 individual engagements with machinery industry representatives encouraging machinery hygiene for equipment being brought to Kangaroo Island.

Case Study

Forestry companies minimising biosecurity risks to KI

A combined effort from KI Plantation Timber, PF Olsen and timber harvest contactor Harvestco ensured timber handing machinery arrived on KI clean and free of any biosecurity risks.

Two large machines had both been working in forestry operations in the South East of SA and were contracted to KI to assist with the removal and harvest of scorched plantation timbers adjacent to SA Power assets.

When KIPT announced that harvesting operations were being planned, they were requested to consider managing the biosecurity risk. They took on this responsibility alongside of with PF Olsen, who were managing the activity.

Advice was provided by Biosecurity SA to assist with the understanding of how to reduce risk. Soil, plant material with seeds, and any insects such as bees and ants needed to be removed from all machinery before transport. The contractor, Harvestco, undertook an extensive cleaning and inspection process which resulted in the machines passing their biosecurity inspection with flying colours.

Biosecurity Officer inspecting a machine at Cape Jervis.

Take home messages

- PIRSA / Biosecurity SA encourages the agricultural sector to incorporate biosecurity activities into their operations.
- See it. Report it. Early detection is the key to stopping the introduction and spread of unwanted pests and diseases.
- Report any unusual pests, weeds or signs of disease.
- Try and secure a sample, take a photo or video where possible and record the exact location where the incident occurred.
- All these factors will assist greatly in investigation and the taking of appropriate action where needed.

Forestry equipment with Harvestco Managing Director Rick Murphy, Operations Manager Craig Thompson and Biosecurity Officer Andrew Triggs.

Funding/Sponsors

- **Commonwealth and Government of South Australia under the Disaster Recovery Funding Arrangements.**

Further Information

Andrew Triggs

M 0427 981 410
E andrewtriggs2@sa.gov.au

Weed Biosecurity After Fires

Weed Biosecurity after fires

Weed biosecurity is always important, but particularly after a large disturbance such as a fire. Increased vehicle activity through firefighting and rebuilding, the movement of fodder and stock, and increased water movement down previously vegetated creek lines can all introduce and spread weeds to your property. In addition, the altered nutrient levels, exposed ground, lack of competition from other plants and reduced grazing can provide the perfect conditions for weeds to establish and proliferate.

However, fire can also provide an advantage to managing weeds. Large woody weeds may have been destroyed or reduced in size making it easier to control those remaining. For other species the seed may be triggered to germinate by a fire, meaning much of the soil stored seed bank has been exhausted, and so control of germinating seedlings can really help tackle the infestation. Areas of native scrub and creek lines which were previously densely vegetated will now be easier to access to find and control weeds.

Checklist for minimising weed risk after fire

- Ensure all vehicles and equipment (including contractors) are clean and weed free before entering the property, or keep visitors to tracks and non-production areas
- Clean vehicles and equipment in a designated area to contain outbreaks
- Ensure imported fodder, grain, mulch, rock and soil are weed-free (fodder and grain should be certified as such)
- Where possible, source feed grown on the island to reduce the risk of introducing new weeds from the mainland
- When moving fodder ensure bins, containers and bags of plant and seed material are covered during transport
- Inspect fodder and grain on arrival for any unusual weeds, pests or contaminants
- Unload and store grain or hay on compacted surfaces away from production areas
- Feed out fodder in a confined area (stock containment area), away from drainage lines, to reduce the likelihood of weed spread
- Quarantine new stock in a single location for 14 days to enable viable seed to pass through the animal
- Check stock for weed seeds (fleece, tail) and shear before introducing to the property
- Keep good records of grain and hay purchased and where it was fed out, and records of stock purchase and movement
- Avoid moving stock, vehicles and equipment between weed-infested and weed-free parts of the property
- Monitor wash-down sites, fodder storage and stock containment areas regularly for weeds
- Be vigilant for new weed outbreaks and seek information on unfamiliar plants as soon as possible (from PIRSA or the KI Landscape Board).

Fire Respondent Weeds

Albizia, Gorse, Montpellier broome and Tree lucerne were planted widely around Soldier Settler houses and have proliferated after the fire. Adult plants were destroyed, but seedlings have germinated in large numbers and so we have a good opportunity to control them before plants mature and produce more seed.

Gorse

Ibezia or Cape Leeuwin Wattle

Tree Lucerne

Montpellier or Cape Broome

Weeds Not Well Established on KI

Kangaroo Island is free of many of the weeds found on mainland Australia. However, there is the potential they may have been brought across to the island since the fires, in fodder or on livestock or vehicles.

Burrs

Bathurst Burr, Noogoora Burr, Innocent Weed and Caltrop all have spiny seeds that can easily attach to livestock, tyres or shoes.

Grasses

Look out for grasses such as African Lovegrass, Serrated Tussock or Needlegrasses. They can be difficult to identify, so please report any grasses you have not seen before or think look suspicious.

Noogoora Burr

Bathurst Burr

Caltrop

Innocent Weed

Herbs

Deep-rooted herbs such as Blue mustard, Parthenium weed, Ragwort, Silverleaf nightshade, Skeleton weed and Saffron thistle are not well established on Kangaroo Island but could be easily introduced in fodder from other regions.

Ragwort

Silverleaf Nightshade

Blue Mustard

Parthenium Weed

Saffron Thistle

Skeleton Weed

Funding/Sponsors

- **This information is supported by the Kangaroo Island Biosecurity Rebuild Project. The project is jointly funded by the Commonwealth and Government of South Australia under the Disaster Recovery Funding Arrangements.**

Further Information/Assistance

For advice on weed identification or control, contact PIRSA on 8553 4949 or KI Landscape Board on 8553 4444.

FACT SHEET:

Cape tulip How and when to control

One-leaf Cape tulip (*Moraea flaccida*) is a significant agricultural and environmental weed. All parts of the plant are poisonous to grazing animals.

One-leaf Cape tulip (*Moraea flaccida*, formerly known as *Homeria flaccida*) is a significant agricultural and environmental weed. All parts of the plant are poisonous to grazing animals.

One-leaf Cape tulip has long, strappy leaves and salmon pink-orange (occasionally yellow) flowers. The leaves die back completely over summer.

This plant is difficult to manage as it reproduces through both corms (a type of bulb) and seed. It may remain dormant for 5-10 years until favorable conditions stimulate germination. Up to 60% of the corms may remain dormant each season. Therefore control needs to be repeated for several seasons to ensure all corms have been treated.

The effectiveness of control is dependent on the situation and time of the year. However good results can be achieved from the right method at the right time. See the Cape Tulip Control Options section for the best control methods for your particular situation.

Photos courtesy of Kangaroo Island Landscape Board

CAPE TULIP CALENDAR

Summer			Autumn			Winter			Spring			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
			Leaves emerge (after Autumn rains)			Flowering stems emerge		Flowering				
				CONTROL – hand remove								
				CONTROL – metsulfuron-methyl								
						CONTROL – Glyphosate + metsulfuron-methyl						
						CONTROL – Glufosinate-ammonium						
Plant dormant										Seed set		

LANDSCAPE SOUTH AUSTRALIA KANGAROO ISLAND

Government of South Australia
Department of Primary Industries and Regions

CAPE TULIP CONTROL OPTIONS

INDIVIDUAL PLANTS

Hand Remove

Dig plants out, but ensure you get the entire corm (bulb). A screw driver can be handy.

Hand Wipe

Using a brush, sponge or 'tongs of death'* wipe **Glyphosate** (450 g/L) mixed 1:1 with water onto leaves

ISOLATED PATCHES

Spot Spray

Use early in the season (when flowering stems emerge)
selective, but residual

10g of **Metsulfuron-methyl** (600g/kg) per 100L of water + 100mL Pulse penetrant per 100L of spray solution

Use later in the season (Jul-Sep)
non-selective

800mL of **Glyphosate** (450 g/L) + 5 g **Metsulfuron-methyl** (600g/kg) per 100L water + 100mL Pulse Penetrant per 100L of spray solution

Use early in the season (when flowering stems emerge)
also to limit risk of developing resistance to glyphosate and metsulfuron

300mL of **Glufosinate-ammonium** (200g/L) per 100L of water + 100mL Pulse Penetrant per 100L of spray solution
***note there is an 8 week withholding period for grazing stock*

LARGE INFESTATIONS
(less impact on pasture
i.e. use when just running stock)

Weed Wiper
(8 kph application speed, two passes for dense infestations)

Use early in the season (when flowering stems emerge)
selective, but residual

50L of **Glyphosate** (450g/L) per 100L of water + 200mL Pulse penetrant per 100L of spray solution

Use later in the season (Jul-Sep)
non-selective

800mL of **Glyphosate** (450g/L) + 1g **Metsulfuron-methyl** (600g/kg) per 100L of water + 200mL Pulse penetrant per 100L of spray solution

LARGE INFESTATIONS
(more effective but will impact pasture
i.e. use in conjunction with crop rotation or reseeding)

Boom Spray
(8 kph application speed, two passes for dense infestations)

Use early in the season (when flowering stems emerge)
selective, but residual

5g of **Metsulfuron-methyl** (600g/kg) per ha + 200mL Pulse penetrant per 100L of spray solution

Use in cropping situations only
(see herbicide label)

20g of **Chlorsulfuron** (750g/kg) per ha + 200mL Pulse penetrant per 100L of spray solution

Use later in the season (Jul-Sep)
non-selective

800mL of **Glyphosate** (450g/L) + 5g **Metsulfuron-methyl** (600g/kg) per ha + 200mL Pulse penetrant per 100L of spray solution

Use early in the season (when flowering stems emerge)
Also to limit risk of developing resistance to glyphosate and metsulfuron

2.0-3.0L of **Glufosinate-ammonium** (200g/L) per ha + 200mL Pulse Penetrant per 100L of spray solution **note there is an 8 week withholding period for grazing stock

FOR FURTHER INFORMATION

https://www.naturalresources.sa.gov.au/files/sharedassets/adelaide_and_mt_lofty_ranges/plants_and_animals/pests/cape-tulip-weed-managment-guide-nov15-fact.pdf

https://www.pir.sa.gov.au/__data/assets/pdf_file/0020/232382/WEB_8867_PIRSA_Weed_Control_Handbook_2018.pdf

* Tongs of Death can be made by securing sponges to household tongs with zip ties or super glue. See http://adriennescatholiccorner.blogspot.com/2015/05/a-simple-kitchen-gadget-becomes-tongs.html

Burning on Private Land Program

Increasing efforts for a safer and more resilient community and environment

National Parks and Wildlife Service (NPWS) Burning on Private Land Program (BoPL) is expanding on Kangaroo Island with a newly appointed Fire Management Officer based in Kingscote, to help increase fire management work across public and private land.

The BoPL Program, created in partnership with the South Australian Country Fire Service (CFS), was designed to complement NPWS's Fire Management Program by working to reduce fuel in high-risk areas across private land, where it is strategically linked to the public land burning program.

This means reducing fuel becomes more effective as it can be done across the whole landscape, including on private property adjacent parks and reserves and near townships in strategically chosen locations. The first private land burn on Kangaroo Island was undertaken in 2019 near Vivonne Bay and the expanded program intends to increase the number of burns to approximately four per annum by 2023/24.

More NPWS staff are also being recruited in regional and state-wide planning and operational roles and as seasonal firefighters to enable an increase in prescribed burning on the island. There will also be an increase in fire appliances, personal protective equipment and essential safety equipment to match the new staffing levels.

These new positions and equipment are part of the State Government's response to the Independent Review into the SA 2019-20 Bushfires.

Choosing locations for burns on private land

High bushfire-risk locations are identified in the Kangaroo Island Bushfire Management Area Plan (BMAP), which is produced by the Kangaroo Island Bushfire Management Committee. The Committee is made up of representatives from CFS, NPWS, Kangaroo Island Council, Conservation Council SA, SA Police, CFS Volunteers' Association, Kangaroo Island Landscape Board, Agriculture Kangaroo Island and SA Water.

BMAPs draw on local knowledge to assess risks to life, property and the environment across the landscape and propose practical treatments to reduce bushfire risk. That's why the Kangaroo Island BMAP is the key document that guides hazard reduction on the island with the Committee overseeing its implementation.

Locations are currently being investigated to prioritise which private properties to work on next. These locations complement risk reduction activities undertaken by NPWS on parks and reserves and by Kangaroo Island Council and other landholders on the island. The Committee may add, remove or amend areas, following more detailed risk assessments and community consultation.

If your property is identified as a high priority by the BoPL program, you can expect to be contacted by NPWS. Your involvement is voluntary and NPWS will only undertake works with the full support of the landholder.

To find out more about these targeted locations visit cfs.sa.gov.au and search for bushfire management area plans. Scroll down to KANGAROO ISLAND and click on 'Kangaroo Island BMAP Online Map'. (Alternately, scan the QR code at the end of this article.) From there you can download the pdf (see top left-hand corner icons) and search for 'Landscape Treatment Investigation Areas'. Refer to Appendix 1 to view the local maps which display the proposed sites.

The Kangaroo Island BMAP is complemented by fire management plans produced by NPWS for the land it manages in the Cape Forbin, Cape Gantheaume, Dudley Peninsula and Flinders Chase areas. These plans undergo extensive community consultation during drafting and guide a three-year rolling program of activities including prescribed burning. To find out more about NPWS fire management plans visit environment.sa.gov.au and search for fire management plans.

If your property overlaps with a priority public land site, you may be contacted by NPWS.

Reducing fuel loads with fire

'Prescribed burning' is the planned application of fire under prescribed environmental conditions and within defined boundaries to reduce fuel hazard immediately adjacent to assets and to strategically reduce fuel loads across the landscape. Reducing fuel hazards is important - it reduces the intensity of bushfires making them easier to control and helps prevent them spreading to residential areas ultimately saving lives and property.

NPWS generally conducts its prescribed burns in spring and autumn, when there is enough moisture in the landscape to make fire easier to control. Weather conditions must be warm and dry enough for the fire to start and spread, but not so hot or windy that a fire could get out of control.

The Bureau of Meteorology is consulted, and a burn is only scheduled if conditions are appropriate. There is generally a fairly short window of time when the fuel moisture and the weather is conducive to burning safely while still achieving fuel reduction objectives. Because these burns are part of a rolling three-year program of bushfire mitigation, there is flexibility to move burns to another season or year according to prevailing and localised conditions.

The prescribed burning program is prepared in consultation with stakeholders and local neighbours to manage impacts. Careful planning, preparation and management are key. Many months of research, planning and approvals occur before staff will attempt to ignite a burn. This includes working with the CFS to minimise risks by making sure back-up resources are organised and fall-back positions identified.

Before an area is considered for a burn, planning and assessment also includes looking at the big picture and asking: what plants and animals live there? How will they respond to fire at different times of their lifecycles? Are there big trees that provide shelter to birds and mammals that need to be protected?

This landscape-scale approach to managing bushfire risk can also be used to improve the condition of some of our natural environments. Called 'ecological burns', they can help plants establish and improve habitat for animals.

Fire management is more than burning

Prescribed burning is the most effective and environmentally sensitive way to reduce fuel loads across large or complex landscapes in order to help minimise the impact of bushfires. However, it is just one part of a broader strategy needed to combat the more extreme fires Australia now faces.

Other strategies used to mitigate fire risks include modifying vegetation through mechanical treatment such as weed control, lopping or slashing vegetation and improving access and safety for firefighters. In these ways, the likelihood of major fires is reduced, and their likely impact on communities is lessened.

The CFS is South Australia's bushfire hazard leader and has primary responsibility for helping landowners to understand and address bushfire risk to their property. To find out more about managing fuel on your land and preparing a bushfire survival plan please visit the CFS website.

Careful planning, preparation and management are key, with months of research, planning and approvals before will NPWS ignite a burn.

Mopping up after a prescribed burn at Western River.

Take home messages

- The BoPL program is expanding on KI.
- High bushfire-risk locations are targeted.
- The KI Bushfire Management Area Plan guides the BoPL program's choice of locations.
- Locations under investigation for treatment are shown in the plan.

Further Information

Paul Cory, Fire Management Officer (BoPL)

E paul.cory@sa.gov.au

Find out more about the Burning on Private Land Program, including frequently asked questions, at environment.sa.gov.au

QR: CFS Bushfire Management Area Plan Online Map

KI Feral Pig Eradication - An Update

Feral Pigs on KI

Feral pigs on KI cause severe impacts to primary producers through damage to pastures, fences, grain, and potato crops, as well as killing and eating lambs. In the period between 2015-17, feral pigs cost KI farmers an estimated $1.16 million.

Feral pigs also kill and eat native wildlife and plants, damage natural habitats, spread weeds and muddy streams. They are vectors of diseases that impact livestock and native wildlife, and spread the root-rot fungus Phytophthora.

The 2019-20 bushfires burned most of the best feral pig habitat. The feral pig population pre-bushfire was estimated to be around 5,000 and was dramatically reduced by the fire.

The KI Feral Pig Eradication project was funded to take advantage of this one silver lining of the fires. The program is a collaboration between PIRSA, Kangaroo Island Landscape Board and KI National Parks and Wildlife Service working together with the KI community, including AgKI, Livestock SA, KI Plantation Timbers and KI Council.

The KI Feral Pig Eradication

Starting in September of 2020, the KI Feral Pig Eradication Program is now well into its first year. So far, the program has culled over 350 pigs, building on earlier post-fire pig control carried out by the KI Landscape Board.

Control Tools

A range of modern technology is being used to eradicate feral pigs. All baiting to date has used the HOGGONE® Sodium Nitrite bait; no 1080 has been used as a part of the feral pig eradication. This recently developed bait is more humane, killing pigs quickly and efficiently. The bait is delivered in a bait box which excludes non-target animals, reducing risk to stock and wildlife, and is a Schedule 6 poison, making it easier and safer to use. To date the KI feral pig eradication has not had a single off-target death.

The program is also utilising state-of-the-art satellite camera operated pig traps, allowing trap operators to see every animal that enters the trap, and remotely trigger the trap mechanism when feral pigs enter the trap. This technology eliminates the risk of traps being triggered by stock or wildlife.

Feral pigs access bait in the Bait Boxes by lifting the heavy lids with their snouts (top), while a curious possum is excluded from accessing the bait by the design of the bait box (bottom).

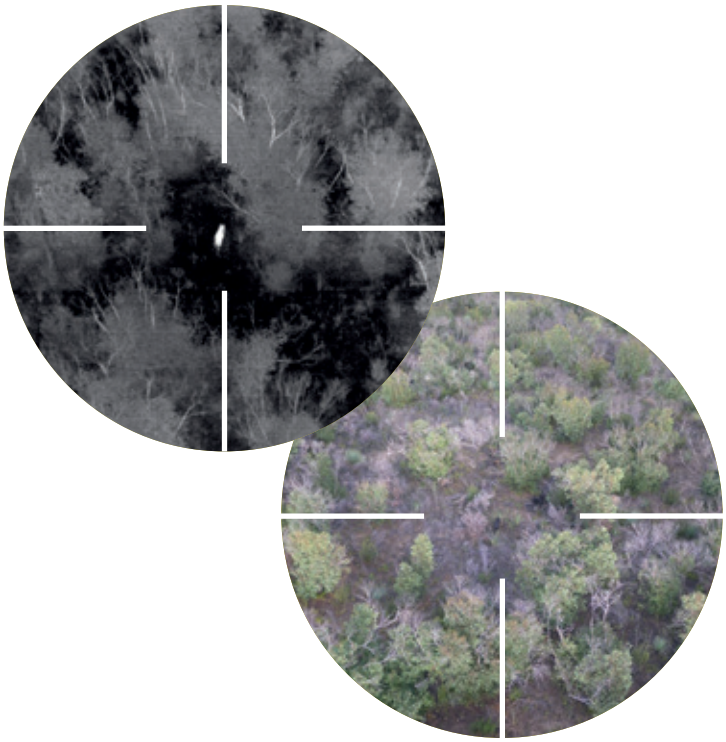
Satellite remote control camera traps send text message photos to ground staff, who can text the trap to shut immediately if the camera has detected a mob of pigs (top), or to keep the trap open if it is set off by stock or wildlife (bottom).

Thermal Assisted Aerial Culling – March Trial

In March of 2021, the first ever Thermal Assisted Aerial Cull (TAAC) in Australia was conducted on Kangaroo Island, as part of the feral pig eradication project. The tender for the operation was secured by specialist thermal surveying company HeliSurveys.

TAAC uses military grade thermal cameras to scan the landscape for feral pigs, so that pigs can easily be seen at long distances, and through dense vegetation.

The flight team flew 36 hours over most of Flinders Chase and the Ravine des Casoars Wilderness Area, with KI Landscape Board marksman Brenton Florance. 126 pigs were destroyed, with only a few escapes. Over 99% of the feral pigs seen in the dense recovering scrub were spotted using the thermal camera, compared with just 1% spotted with the naked eye.



Spot the pig! Thermal technology means feral pigs stand out, increasing the number of pigs seen and controlled on a flight. Same image with thermal (left) and standard camera (right), with a pig in the centre of the image.

The HeliSurveys Thermal Assisted Aerial Cull (TAAC) team, with pilot, thermal camera operator and marksman Brenton Florance (above). Over 36 hours of flight time they covered most of the parks of the west end (red lines on map, below).

Funding

The KI Feral Pig Eradication is funded by the South Australian and Australian Government Disaster Rebuilding and Resilience Program.

Further Information

Visit PIRSA website - scan the QR code or search for "PIRSA Feral Pig Eradication Program Kangaroo Island".

If you would like to use the control tools mentioned here or report feral pig sightings, contact Matt Korcz.

M 0438 117 513 E Matt.Korcz@sa.gov.au

Bat Survey in Progress on KI

Background

This research was introduced in last year's trial booklet. In view of the significant beneficial role of insectivorous bats in agriculture, the University of South Australia and partners have included several agricultural properties in their survey of the bats of Kangaroo Island. An objective for the future is to determine the role of bats in agricultural landscapes.

Work completed so far

Between December 2019 and February 2021, 94 sites were sampled acoustically. Bat detectors were generally left for three nights at each site. Bat detectors record the high-frequency sounds made by bats as they hunt insects using echolocation. The files are split into two-second sections, which are then slowed down and graphed by software.

The three major difficulties we have encountered are:

1. semi-automation is not producing satisfactory results and every single file of the millions collected so far has to be identified manually by brave, heroic souls;
2. many insect species also produce high-frequency sounds and need to be screened, but the information is interesting;
3. bat calls are variable within species and the overlap among certain species can make teasing them apart difficult (Fig. 1).

MB Stonor has been analysing files starting with the western end of the island, for which we have some pre-bushfire data, and a couple of other sites on unburnt ground.

We have also conducted training sessions for landholders who are interested in finding out about the species that are on their properties.

So far, we have found that all seven bat species known to occur on the island from Museum records still do (Petit et al. 2021 – please follow the link in the references for more information on the bats of Kangaroo Island).

Most importantly, we believe that other species, never-before recorded but rarer than the others, also occur on the island. This finding is important not only because the biodiversity hotspot status of Kangaroo Island may be enhanced by bats, but also because bat diversity is related to breadth of predation on insects. For example, a recent publication by Kolkert et al. (2021) indicates that different bat species consume different insect pest species of the Australian cotton industry, amounting to between $99 and $361/ha or $63.6 million saved in insect control annually.

We are also discovering extraordinary variability in activity and species richness over three nights at one site, suggesting that bats diversify their hunting grounds each night.

Finally, we placed 750 nest boxes for bats and pygmy-possums on 13 private properties in 2020-2021. The first bat, a forest bat, was found in March this year!

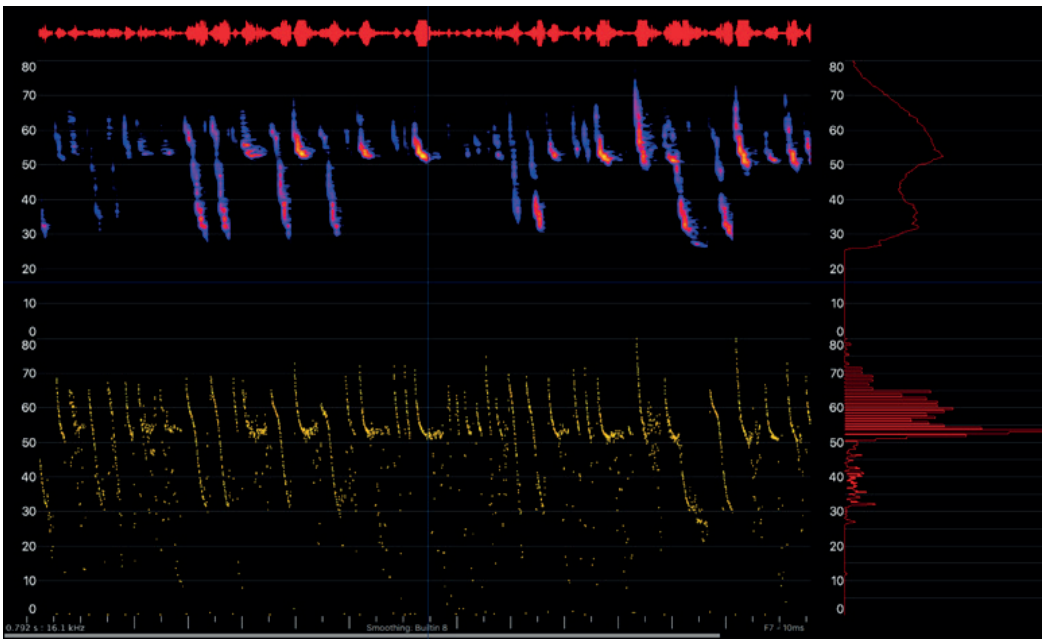


Figure 1: Example of a sound file with two species difficult to identify.

What is happening in 2021

As we continue the data analysis and re-survey some sites, we will also conduct trapping sessions at different sites this spring/summer, in an attempt to confirm the presence of new bat species and to obtain call vouchers for each species. Trapping is very difficult because it takes place at night and only a tiny proportion of bats may be trapped. Monitoring of the nest boxes will continue.

How you can help

- Identify location of roosts (sheds, trees, etc.).
- Let us know if you are interested in being involved in any aspect of the research or participating in a training workshop (bat call analysis, monitoring boxes etc).

Please do not touch bats! Like all of us, bats can carry viruses (such as Lyssavirus) and will bite if they feel threatened. We can also transfer diseases to bats and other wildlife.

References

Kolkert H, Smith R, Rader R, Reid N (2021) *Insectivorous bats provide significant economic value to the Australian cotton industry.* Ecosystem Services 49, 101280.

Petit S, Stonor MB, Lapeyre F, Reardon T (2021) *Bats of Kangaroo Island.* Kangaroo Island Research Station. https://www.kiresearchstation.org/bats

Funding

- **Lirabenda Endowment Fund Grant**
- **University of South Australia's Vice Chancellor's Fund for KI**
- **Foundation for National Parks & Wildlife**
- **WIRES-Landcare grant to KI Wildlife Network**
- **Nature Foundation Wildlife Recovery Fund**

Further Information

Dr Topa Petit

M 0432 400 424

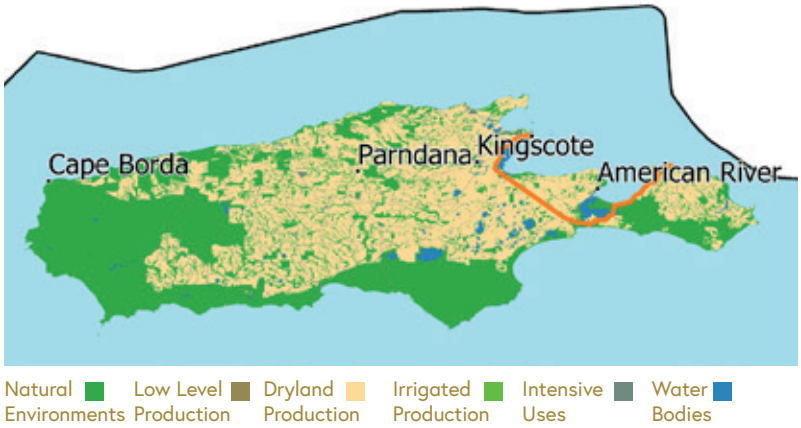
E sophie.petit@unisa.edu

Photo Credit: Terry Reardon

Regional Weather and Climate Guide

In the last 30 years on Kangaroo Island

- Annual rainfall has been relatively stable
- Dry years have occurred 11 times and wet years seven times
- Rainfall has decreased in the autumn and spring months
- Winter rainfall is reliable; summer is unreliable
- The autumn break occurred end May or early June in the east around Cape Willoughby and through the west of the island, mid-June through the centre and not until late June around Kingscote
- Evaporation has increased in the spring months, but overall water balance remains unchanged
- There have been more hot days, with more consecutive days above 40 °C



Kangaroo Island at a glance

Kangaroo Island covers around 1.1 million hectares, of which 49% is under agricultural production. The region supports a diverse mix of agricultural enterprises, including sheep (wool and meat), cattle, broadacre cropping of cereals, pulses and oilseeds, viticulture, fruit and vegetables. The region contributed around $88 million to the Australian economy in 2017–18.

A guide to weather and climate on Kangaroo Island

Primary producers make decisions using their knowledge and expectations of regional weather patterns. The purpose of this guide is to provide an insight into the region's climate and an understanding of changes that have occurred through recent periods. This information can potentially assist primary producers and rural communities make better informed decisions for their business and livelihoods. This guide is part of a series of guides produced for every Natural Resource Management area around Australia.

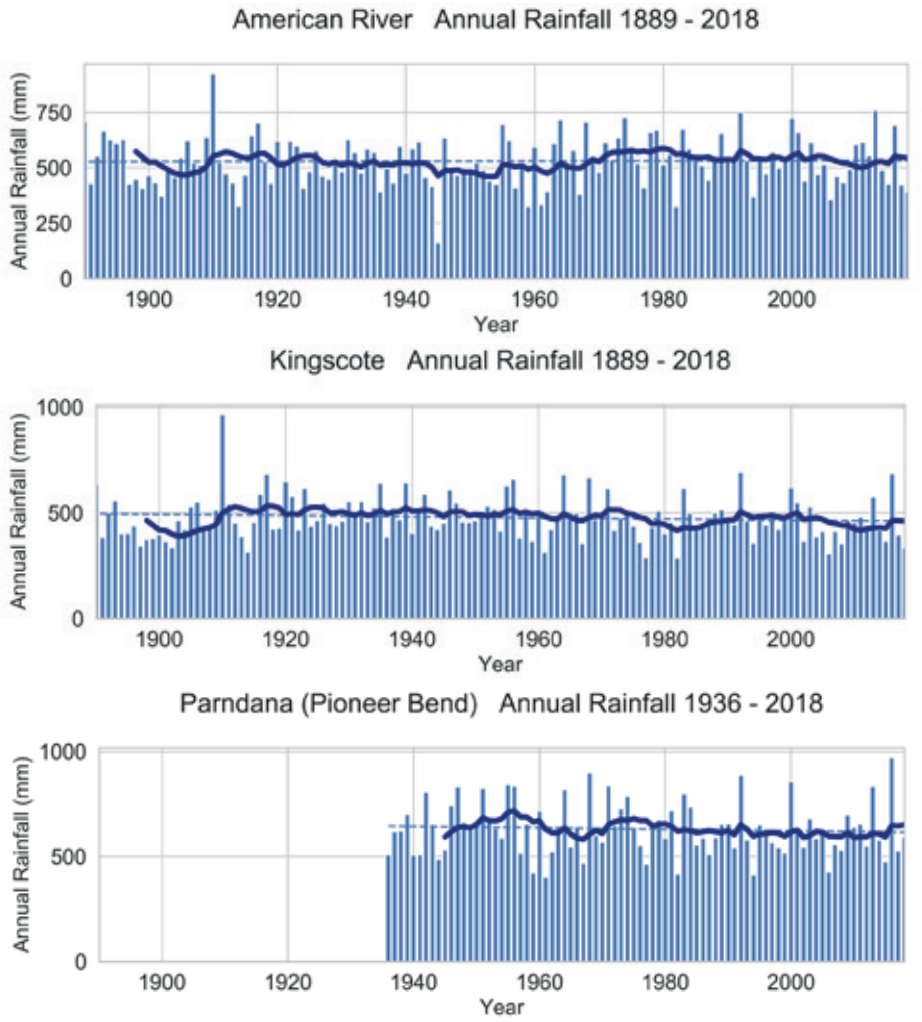
A climate guide for agriculture
Kangaroo Island, South Australia

Annual Rainfall

Annual rainfall on Kangaroo Island has been relatively stable

Annual rainfall on Kangaroo Island has been relatively stable, decreasing by around 10 mm (-1%) from about 620 mm to about 610 mm over the past 30 years (1989–2018) when compared to the previous 30 years (1959–1988). The charts show annual rainfall (blue bars), with a 10-year running average (solid blue line) for American River and Kingscote. Although the average annual rainfall has been relatively stable, it still fluctuates from year to year with natural variability.

In the past 30 years (1989–2018), dry years (lowest 30%) have occurred 11 times and wet years (highest 30%) have occurred seven times, while the remaining years were in the average range. Note the Millennium drought accounted for five of these dry years in the recent period. During the previous 30-year period (1959–1988), dry years occurred eight times and wet years occurred 11 times.

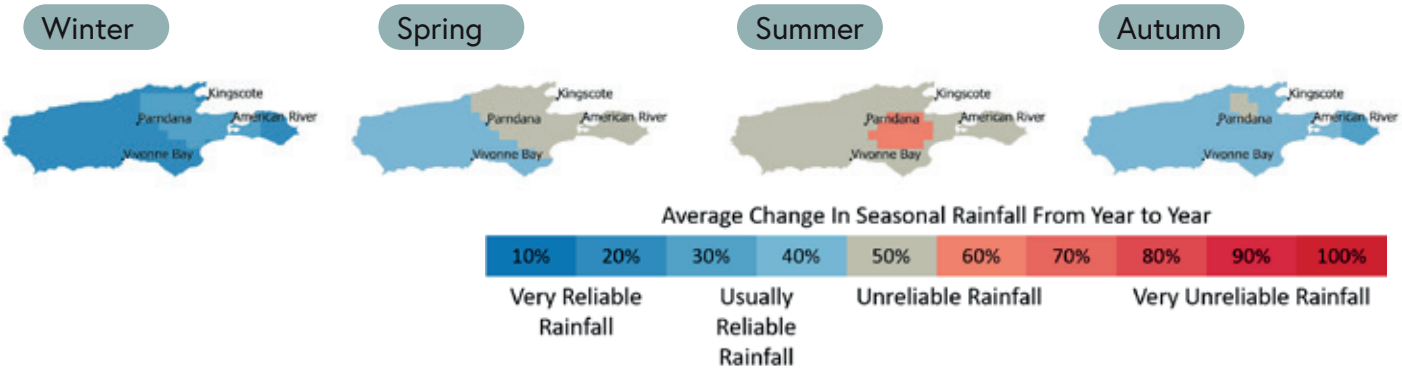


For more information on future projections, visit the Climate Change in Australia website
> www.climatechangeinaustralia.gov.au

Want to know more about the guides? Try Frequently Asked Questions at
> www.bom.gov.au/climate/climate-guides/#faqs

Kangaroo Island winter rainfall is reliable; summer is unreliable

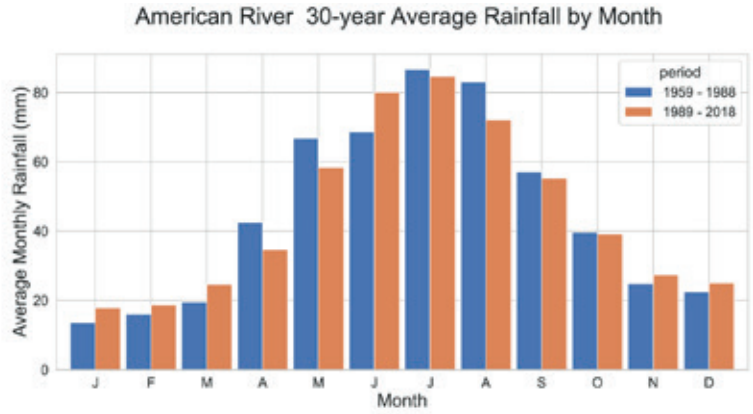
Rainfall reliability maps for the past 30 years (1989–2018) show winter rainfall has been reliable across the region (blue areas) with less variability in the west than the east. Winter seasonal rainfall usually has about 70 mm difference from one year to the next. Autumn rainfall is also moderately reliable from year to year across most of the region. This is in contrast to spring rainfall, which has been less reliable on the east of the island around Kingscote and Cape Willoughby (beige areas). Although there have been some wet summers in the past 30 years, summer rainfall has been unreliable (beige and red areas) and can change by around 60% (40 mm) from year to year.

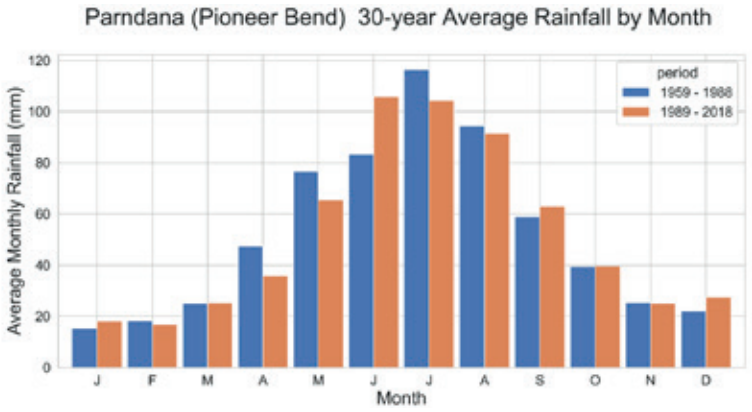


Rainfall Timing

Rainfall has decreased in autumn; increased in spring

Rainfall decreased in the autumn months at American River and Parndana between 1989–2018 (orange bars) compared with 1959–1988 (blue bars), but recorded increases in June and across late spring/early summer.
Over the past 30 years, growing season rainfall (May to November inclusive) for American River was 417 mm, decreasing by 10 mm from the 427 mm average for the previous 30-year period (1959–1988).
For Parndana, winter rainfall was relatively stable, from 494 mm in 1959–1988 to 495 mm in the period 1989–2018.
Over the same 30-year periods, summer rainfall (December to April inclusive) remained relatively stable, at 121 mm for American River (an increase of 7 mm) and 123 mm at Parndana (a reduction of 5 mm).





For more information on the latest observations and science behind these changes, refer to the State of the Climate Report
> www.bom.gov.au/state-of-the-climate/

Timing of the autumn break on Kangaroo Island

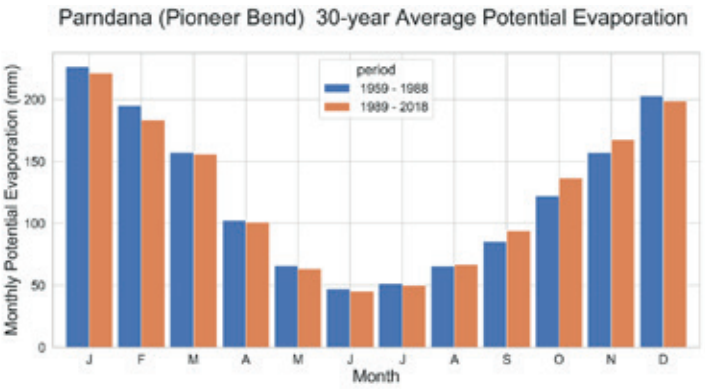
Weeks after 1 April	4	5	6
Autumn Break Usually Occurred After...	5 May	12 May	19 May

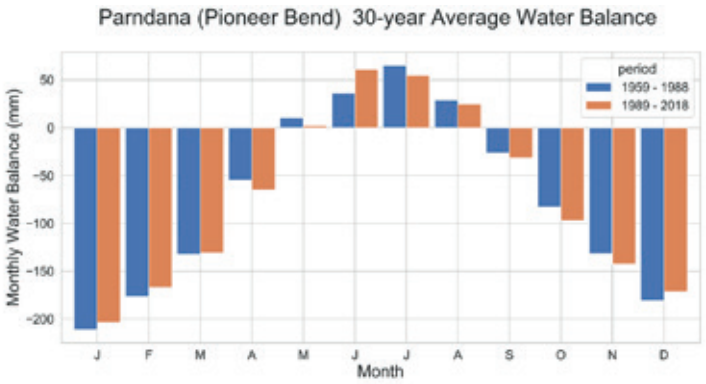
On Kangaroo Island, the autumn break can be defined as at least 15 mm of rainfall over three days, prior to the commencement of sowing. The map shows that over the past 30 years (1989–2018), the break typically occurred in early May. The autumn break usually arrived at the west of the island about two weeks earlier than the area around Kingscote.

Evaporation

Evaporation rates remained stable

The graphs show the mean monthly evaporation and water balance (rainfall minus evaporation) between 1989-2018 (orange bars) compared with 1959-1988 (blue bars) for Parndana. There has been no significant change in the annual water balance.





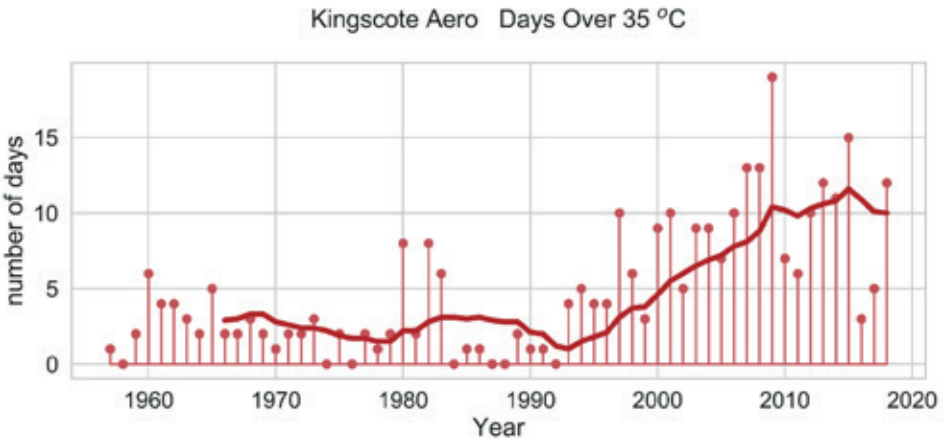
Temperature

Kangaroo Island has experienced more hot days in the past 30 years

The chart shows the annual number of days above 35 °C (red bars), with a 10-year running average (solid red line) for Kingscote.

Kingscote experienced an average of eight days per year above 35 °C between 1989–2018, compared to an average of three days per year above 35 °C between 1959–1988. Since 2004, temperatures of 42 °C have been recorded for Kingscote 13 times, including twice in 2019.

Prior to 2004, the recorded temperature exceeded 42 °C at Kingscote only once, in 1982. Instances of consecutive days above 30 °C have also been more frequent.



In 2008, 2009 and 2013, Kingscote experienced periods of nine or more days in a row above 30 °C. A run of nine or more days above 30 °C at Kingscote had not been recorded before 2008.

Regional Weather and Climate Guides are produced as a partnership between Bureau of Meteorology, CSIRO and FarmLink

Community Legal Centres SA Inc.
Bushfire Community Legal Project

Clearance of Native Vegetation (NV) Under *Native Vegetation Regulations 2017 ('NVR')*

INTRODUCTION

How to Use This Document

This document provides a **general overview** of how you can legally manually clear NV on KI under the *NVR* for fences. This document ***does not apply*** to NV on council Land (e.g. road side), other areas of South Australia, or clearance done burning NV.

Page 2 contains a series of questions for you to work through, to see if your proposed clearance of NV is allowed under this portion of the NVR.

Additional matters and laws you may need to think about are noted on this page. We strongly recommend ***contacting us*** for free legal advice on your specific circumstances before you start clearing!

What if This Doc Doesn't Apply?

If your answer to a question on Page 2 results in *"This Document Does Not Apply"*, it means your **proposed clearance of NV cannot be done under this portion** of the *NVR*. Contact us to see what your other options might be.

NVR REQUIREMENTS

Mitigation Hierarchy ('MH')

Regulation 7 of *NVR* requires all applicants to **have regard and give effect to the MH**. The MH is at Regulation 5 of *NVR*: **Avoidance, Minimisation, Rehabilitation/ Restoration & Offset.**

Notifying NVC

NVC Guidelines require an email to be sent to nvc@sa.gov.au before the clearance of NV happens. The email must include:

- Landowner Information;
- Written consent of Landowner if the Applicant wants to act on their behalf;
- Applicant Information;
- Property Details;
- Reason for Clearance;
- Other alternatives considered;
- Map of clearance area & photos;
- A description of the vegetation.

Heritage/Management Agreement

This type of clearance CAN take place on land that is subject to Heritage and/or Management Agreement. If the Agreement says it can't, get advice first!

Clearance of native vegetation **NOT on a road reserve** to maintain or establish a fence on Kangaroo Island ('KI').

Contact CLCSA:

(08) 8121 4473 | 0428 066 958 | bushfirelegal@clcsa.org.au | www.clcsa.org.au

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ADDITIONAL REQUIREMENTS

For Access to the Land

If the proposed clearance of NV relates to land which you do not own, you should **always try to obtain the landowner's written consent** for the clearance to occur (and for you, or your contractors, to access their land to clear the NV).

In most cases it is **illegal to proceed** with the NV clearance **without the landowner's consent** to enter their land, especially where the land belongs to or is managed by Council, State, or Commonwealth Government (e.g. Road Reserves, Parks.)

Fencing Laws

The *Fences Act 1975* sets out a **procedure you should follow** if you want to legally erect, replace or repair a fence to divide land and seek a financial contribution from your neighbour for the fencing work.

If the adjoining or abutting land is owned or managed by Council or Government, this Act may not apply. Depending on the type of fence, you may need Development Approval.

Contact us for specific advice beforehand!

IMPORTANCE OF THE NV

Threatened/Protected Species

Both Commonwealth and State laws are in place to protect extinct, threatened, endangered, vulnerable and rare plant and animal species. Under this legislation, it is an offence to impact (e.g. remove, damage) these species. **Large fines and imprisonment *can* occur if breached.**

If you're unsure about the species of NV you want to clear, contact the KI Landscape Board or KI Council.

Significant Trees

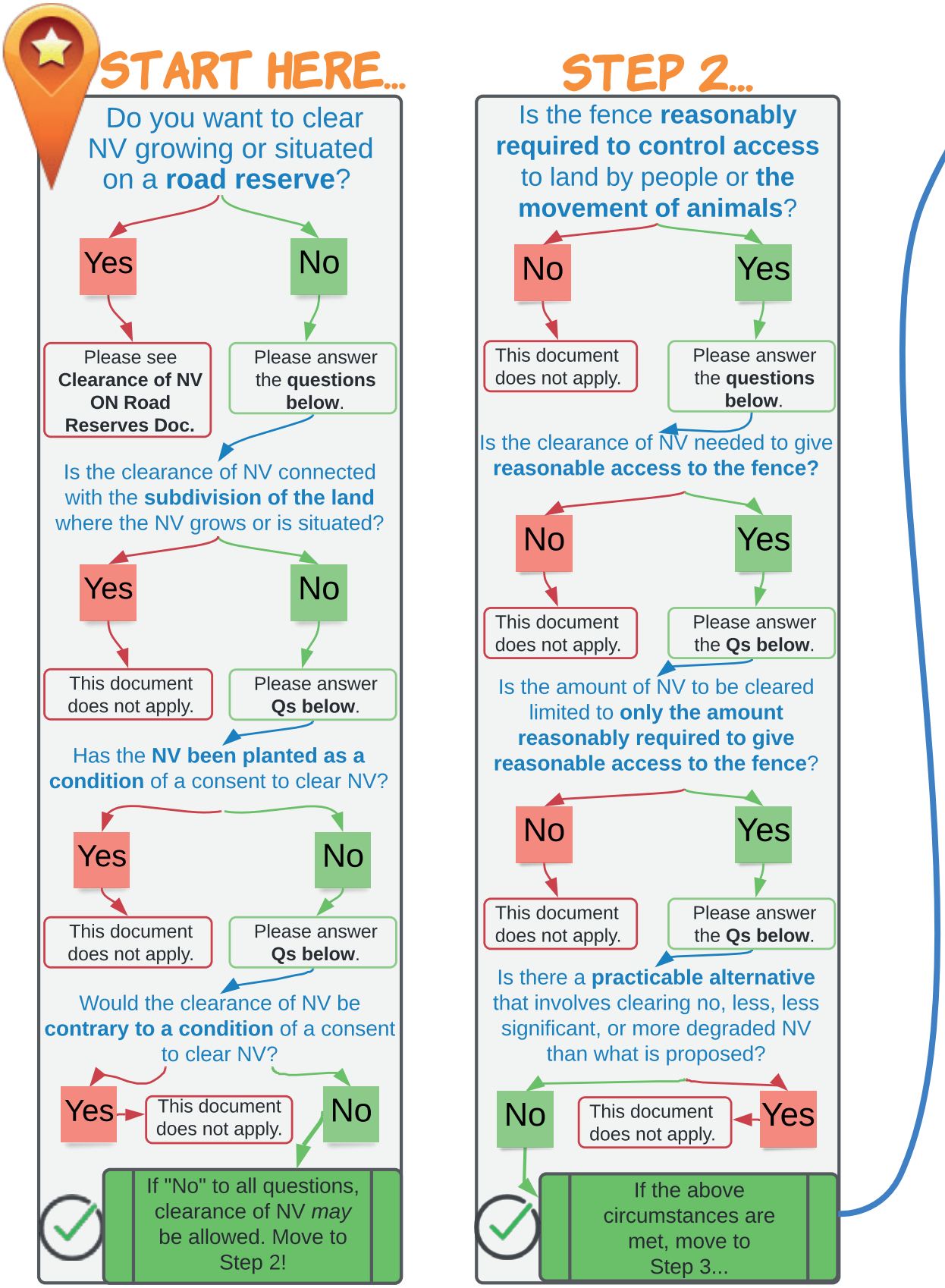
Development Approval may be required to interfere with these types of trees. As at production of this document, there are **no Regulated or Significant trees on Kangaroo Island** under the Panning, Development and Infrastructure Act 2016.

Community Legal Centres South Australia

Flinders UNIVERSITY

*Produced in Collaboration with the **Flinders Legal Centre***

Clearance of Native Vegetation ('NV') Under *Native Vegetation Regulations 2017* ('*NVR*'): Clearing of vegetation NOT on a road reserve to maintain or establish a fence on Kangaroo Island ('KI').



...NOT on a road reserve

STEP 3...

Do you want to clear NV to provide access to **Establish a New Fence** *or* to **Maintain an Existing Fence?**

Establish A New Fence

If you want to clear NV in the course of constructing a new fence, you need to **notify the Native Vegetation Council ("NVC")** first.

How Do I Notify NVC?
See Page 1!

Landowner Written Consent obtained (if required) and NVC has been notified.

Maintain Existing Fence

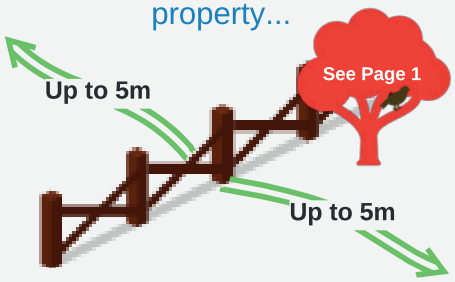
You **do not** need to notify NVC before you clear NV.

Move to Step 4, to see how much NV you can clear...

STEP 4...

OR

If the fence/proposed fence is **on** the **boundary** of the property...

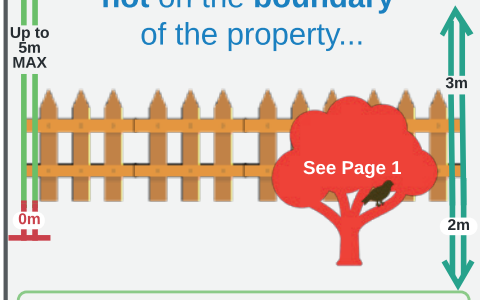


The **total width** of the strip of cleared NV **on either side** of the boundary fence can be **no more than 5 metres** (i.e. 5m your side of the fence and **5m on your neighbour's side**).

Do you want to clear NV on your neighbour's property?

Contact Your Neighbour First
See Page 1!

If the fence/proposed fence is **not** on the **boundary** of the property...



If the **fence divides a single property or is internal**, the **total width** of the strip of cleared NV can **be no more than 5 metres total.** For example, you could clear 2m one side of the fence and 3m from the other).

I only want to clear on my side, or my neighbour has agreed, or the fence is internal and I don't want to clear more than the permitted metres of NV...

FINISH!...

If you have made it this far, you *can* clear a strip of NV to provide access to maintain or establish a fence under the *NVR.*

If possible, clear less than the permitted amount of NV if that will provide reasonable access to the fence!

FYI...

This type of Clearance along fencelines is also considered a "Firebreak". Where the land is used for Primary Production, more NV *may* be able to be cleared.
Contact us for advice.

HOWEVER, you *may* need to consider other laws too. See Page 1 for more info!

Community Legal Centres South Australia

Scan/Photograph QR Code for More Info!

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CLCSA's Bushfire Community Legal Project is funded by the Commonwealth Attorney-General's Department and Administered by the South Australian Attorney-General's Department

Community Legal Centres SA Inc.
Bushfire Community Legal Project

Clearance of Native Vegetation (NV) Under *Native Vegetation Regulations 2017 ('NVR')*

INTRODUCTION

How to Use This Document

This document provides a **general overview** of some of the ways NV can legally be **manually cleared from road reserves** on KI under the *NVR*. This document **does not apply to clearance by burning of NV.**

Page 2 contains a series of questions for you to work through, to see if your proposed clearance of NV is allowed under this portion of the NVR.

Additional matters and laws you may need to think about are noted on this page. We strongly recommend ***contacting us*** for free legal advice on your specific circumstances before you start clearing!

What if This Doc Doesn't Apply?

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NVR REQUIREMENTS

Mitigation Hierarchy ('MH')

Regulation 7 of *NVR* requires all applicants to **have regard and give effect to the MH**. The MH is at Regulation 5 of *NVR*: **Avoidance, Minimisation, Rehabilitation/ Restoration & Offset.**

NVC's 'Guideline for Managing Roadside NV'

'NVC's Guide' sets out **how Local Councils and State Government can clear NV** on roadsides and rail crossings. Under the *NVR* **clearance of NV in these areas must be per NVC's Guide** and (where applicable) Local Council RVMPs. Currently, KI Council does not have a RVMP, so all clearance of NV on RR is done via the *NVR* and NVC Guide.

NVC's Guide sets out additional **requirements Local Council/DIT need to ensure are met** for NV to be cleared.

Road Reserve = land set aside for a public road, extending from one property boundary to another on the other side.

Clearance of native vegetation **ON a road reserve** to maintain or establish a fence on Kangaroo Island ('KI').

Contact CLCSA:

(08) 8121 4473 | 0428 066 958 | bushfirelegal@clcsa.org.au | www.clcsa.org.au

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ADDITIONAL REQUIREMENTS

For Access to the Land

Under the *Local Government Act 1999*, *NVR* & NVC's Guide, it is an offence to clear any vegetation (or erect structures) on road reserves without the consent of your Local Council.

Applying to KI Council

Send a written request to KI Council, asking their consent to clear NV on a Road Reserve (in accordance with the activities on Page 2.) Include the following info:

- Applicant name and contact;
- Address of proposed clearance;
- If NV needs to be removed;
- A sketch of the entire property, showing the location of the fence;
- If you intend on moving the fence inside your property (i.e. away from the boundary) and how far inside?

kicouncil@kicouncil.sa.gov.au
PO Box 121, Kingscote SA 5223

IMPORTANCE OF THE NV

Threatened/Protected Species

Both Commonwealth and State laws are in place to protect extinct, threatened, endangered, vulnerable and rare plant and animal species. Under this legislation, it is an offence to impact (e.g. remove, damage) these species. **Large fines and imprisonment *can* occur if breached.**

If you're unsure about the species of NV you want to clear, contact the KI Landscape Board or KI Council.

Significant Trees

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Community Legal Centres South Australia

Flinders UNIVERSITY

*Produced in Collaboration with the **Flinders Legal Centre***

Clearance of Native Vegetation ('NV') Under *Native Vegetation Regulations 2017* ('*NVR*'): Clearing of vegetation ON a road reserve to maintain or establish a fence on Kangaroo Island ('KI').

START HERE...

Do you want to clear NV growing or situated on a **public road reserve**?

- **No** → Please see **Clearance of NV NOT on Road Reserves.**
- **Yes** → Please answer the **questions below**.

Is the land subject to a **Heritage or Management Agreement**?

- **Yes** → This document does not apply.
- **No** → Please answer the **questions below**.

Does the clearance of NV **ensure the safety of persons** entering or passing the land, **or the safety of property** on the land?

- **No** → **OR** Is the clearance of NV to **control pests** on the land?
  - **No** → This document does not apply.
  - **Yes** →
- **Yes** →

If the above circumstances are met, clearance of NV *may* be able to occur under the *NVR*, subject to the next columns..

THE NEXT COLUMN DEALS WITH CLEARANCE ALONG FENCELINES FOR SAFETY. CONTACT US FOR INFO ON CLEARANCE FOR PEST CONTROL.

FENCES ON RR...

Do you want to clear NV to **construct or maintain a fence you share with a RR?**

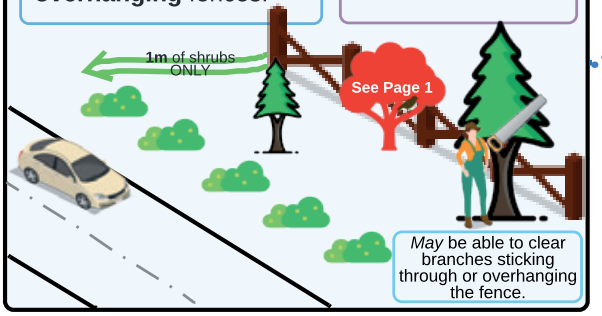
- **Yes** →
- **No** → This document may not apply. See column to the right or Page 1.

Which side of the fence do you want to clear NV from?

- **Mine** → Please see our **Clearance of NV NOT on RR flow chart.**
- **RR** →
- **Both** → See below and our **Clearance of NV NOT on RR flow chart.**

What **type of NV** is in the RR?

- **Trees** → KI Council **can only allow you to**:
  - remove only the **trees growing on the actual fence line**; &
  - clear **branches sticking through or overhanging** fences.
- **Shrubs** → Where shrubs & bushes grow through a fence line, KI Council **can only allow you to** remove those (not trees) **growing within 1m** of the fence line.



...ON a road reserve

ACCESS POINT...

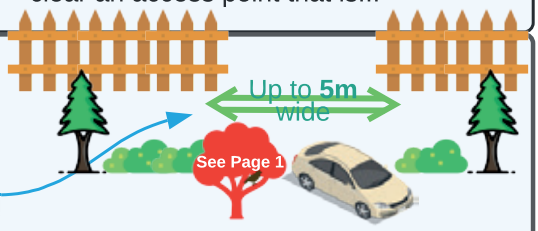
You *may* be able to ask KI Council if you can clear NV from a RR to **access your adjoining land** if...

- The **access point** is NOT for a **new development**;
- You currently **do not have an access point**; and
- You **cannot avoid clearing RR NV** to create the access point.

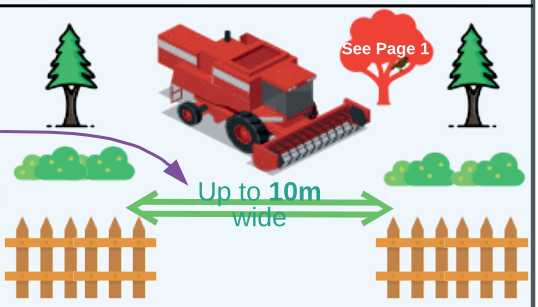
What **type of car** do you require access for?

KI Council can only allow you to clear an access point that is...

Normal Vehicle



Wide Farm Vehicle



KI Council *may* also consent to you clearing a minimum amount of RR NV with slender stems (i.e. those that break/uproot on impact) to create sight distance.

KI COUNCIL CONSENT

You **can't do these activities without** KI Council's **consent**. See Page 1 to learn how!

Ask KI Council for Consent.

If you want more NV to be cleared from RR than what KI Council can allow, KI Council will need to apply to the NVC for NVC's consent.

They *might* suggest you bring the boundary fence 3 to 5m into your property, or install a strut for the fence to deviate around a tree. If so, see **Clearance of NV NOT on Road Reserves.**

This type of Clearance along fencelines is also considered a "Firebreak". If you think a larger firebreak is needed on the RR, contact KI Council. If they agree, they will need to apply to CFS for approval.

FYI...

FINISH!

If you have made it this far (and KI Council (or NVC) has consented), then you can clear NV on a RR ONLY in accordance with the terms of the consent received.

There are other circumstances where NV on a RR *might* be able to be removed. **Contact us** for more info!

HOWEVER, you *may* need to consider other laws too. See Page 1 for more info!

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