GRASSLAND SOCIETY OF NSW INC.

Newsletter

Welcome to the first Grassland Society of NSW (GS NSW) newsletter for 2019.

Unfortunately drought conditions remain widespread across NSW, particularly in the western area of the state which is managing a prolonged drought event. The north and north west of the state (a summer rainfall zone) have also received very little rain over the 2018-19 season combined with higher than average maximum temperatures through to the end of February. For more information on the latest seasonal conditions check out the NSW State Seasonal Update for February compiled by NSW Department of Primary Industries (NSW DPI) on page 6.

For those dealing with the drought a range of information can be found on the NSW DPI Drought Hub page https://www.dpi.nsw.gov.au/climate-and-emergencies/droughthub. Information is available on the drought transport subsidy, available drought assistance you can apply for, the latest drought maps, managing during a drought, water resources available during drought, animal welfare during drought and what services are available to support the wellbeing of you and your family.

As always 2019 is shaping up to be a busy, but exciting year for GS NSW – the conference is back in 2019 at Gunnedah on July 03–04 (more details below). The committee is working hard to bring you a stimulating and relevant program. Our first Pasture Update was held in early March at Crookwell and planning is underway for a number of update events throughout the year. Keep an eye on our website (www.grasslandnsw.com.au), our Facebook page and future newsletters for further details.

In this issue of the newsletter we continue a series of articles modified from the Temperate perennial pasture establishment guide - steps to ensure success published by the NSW DPI (pages 2, 3 & 5). There is also an interesting case study based on the experiences of GS NSW committee member and Nuffield Scholar Stuart Tait (page 4). Stuart explains his approach to filling the feedgap on his family property. Rounding out the newsletter is an article on nitrate and nitrite poisoning in livestock (page 8).

As always we welcome contributions to the newsletter so please contact me at carol.harris@dpi.nsw.gov.au

Carol Harris, Editor

In this newsletter

The Grassland Society of NSW Conference is back in 2019 so make sure you save the date.

Where: Gunnedah Town Hall

When: July 03-04 2019

Theme: Renewed focus on livestock systems for resilience - the swing back to forages

For further information contact George Truman 0427 505 040

Sowing – timing, soil moisture, seeding rate and depth

Editors Note: This articles "Sowing - timing, soil moisture, seeding rate and depth" and " Seed quality, purity and germination are a continuation of a series of articles modified from the Temperate perennial pasture establishment guide - steps to ensure success published by the NSW Department of Primary Industries.

The Temperate perennial pasture establishment guide is available at www.dpi.nsw.gov.au/tppeg

The sowing operation and timing are critical for successful pasture establishment. Date of sowing, soil moisture, seeding rate and sowing depth are all important considerations.

Sowing time

While temperate perennial pastures have been successfully established in autumn, winter and spring, the climatic conditions, growth and development of the pasture species, and weed and insect life cycles vary between seasons. Therefore, there is no single recipe; each sowing period has its own set of management considerations.

Autumn: Autumn has traditionally been a reliable period for the establishment of temperate pastures – seedling growth should be vigorous while soil temperatures are adequate and air temperatures mild, provided there is adequate soil moisture. Rainfall of 50–100 mm prior to sowing and a moist profile to a depth of 20 cm is ideal. This will stimulate germination of the majority of annual weed seeds, allow for effective control and so minimise weed competition for the emerging seedling.

The 'autumn break' can be unreliable in many areas and it may be necessary to delay sowing until late autumn or early winter when soil moisture is adequate and annual weeds have germinated. Pre-sowing weed control will ensure the seedlings are sown into a weed-free seed bed.

Winter: The germination and early growth of pastures is slow in winter and any factors that reduce plant vigour will further affect establishment. Planning and management of constraints such as nutrient deficiencies, soil acidity, and weed and pest populations are particularly important for winter-sown pastures. Insecticide mixed with the pre-sowing knockdown herbicide application will address early weed competition and also provide insurance against earth mite damage.

"Frost lift" is an issue for winter-sown pastures in high altitude areas. The soil surface freezes and causes physical tearing of the plants when the frozen surface expands and separates from the soil below. This issue is more likely to occur when pasture is sown into cultivated, heavy clay soils. Sowing into these soil types should be avoided when the risk of severe frosts is high, e.g. mid-July on the Tablelands. Direct drilled pastures are rarely affected by frost lift.

Temperate pasture species can tolerate temperatures as low as −8 °C and pastures on the Southern Tablelands have successfully established despite exposure to long periods of consecutive, severe frosts. However, moisture-stressed seedlings are more vulnerable and may be damaged by frosts and temperatures of −3 °C to −4 °C.

Annual legumes such as sub clover must be sown by mid-July in order to set sufficient seed for regeneration the following autumn. Check the maturity ratings and 'days to flower' of your preferred sub clovers varieties. Ensure the proposed sowing date allows sufficient time for seed to mature before moisture stress and hot temperatures in late spring stop seed development.

Spring: Spring sowing can be very successful for perennial grasses and legumes such as lucerne, if it occurs by mid-September, and provided there is adequate soil moisture to support the young seedlings over summer.

Annual legumes (e.g. sub clover) should not be sown in spring. The plants will not have enough time to establish, flower and set seed before they are affected by moisture stress and high temperatures. Results from broadcasting annual legume species into spring-established perennial grass or lucerne pastures the following autumn are variable. Therefore, if annual legumes are an essential component of the perennial-based pasture, it is recommended that the pasture is not sown until the following autumn.

Moisture: Never dry sow temperate perennial pastures as there is a very high chance of establishment failure. Speed of germination and seedling growth is determined by soil temperature but the correct time to sow is when there is adequate soil moisture.

'Adequate moisture' means sufficient moisture at the surface for immediate germination, and moisture down to 20 cm for seedling survival until there is follow-up rain. There is risk involved with dry sowing as sufficient rain may fall to germinate the seed, but lack of subsoil moisture means that seedling survival is dependent on substantial follow-up rain.

Note: It has been demonstrated that adequate soil moisture in the soil profile is more important to a successful pasture establishment than sowing date.

Seed rate and seed size

The sowing rate will be largely influenced by sowing method (direct drilled, cultivated or broadcast), planned use of the pasture (irrigated, dryland, for weed or erosion control) and soil fertility. Establishment can vary from as low as 10% for broadcast seed and as high as 80% in well prepared cultivated or direct drilled situations.

Shotgun mixes: 'Shotgun mixes' that include small quantities of a number of perennial grass species are often sown to deal with paddock variability. However, such mixes jeopardise the long-term persistence of the pasture.

pasture that includes just one, or at the most, two well adapted grass species is much easier to establish and manage. Species composition of most pastures will change over time and only a couple of perennial species will persist. It is important to promote and minimise competition against the productive, persistent species. Do not include species that will compete but are unlikely to persist.

The impact of competition on uncompetitive but well adapted species is demonstrated by the results of a survey of established, commercial pastures by NSW Department of Primary Industries at Wagga Wagga. The survey assessed the persistence of phalaris when sown either as the only grass in a clover/ phalaris mix or when the mix also included perennial ryegrass. The survey showed that the percentage area of the pasture occupied by phalaris plants (% basal cover per square metre) in 2 and 3 year-old pastures ranged from 3 2–72% where phalaris was the only grass species sown, but dropped to 0–21% when ryegrass was included in the pasture mix. Phalaris establishment was clearly affected by the more vigorous ryegrass seedlings, but the results also show that the ryegrass did not persist. By years 2 and 3 the surveyed phalaris/ ryegrass pastures had a basal cover of perennial grass of less than 10%, which was predominantly phalaris.

Variable paddocks may require grass species with very different management requirements, for example, one to cope with waterlogging and another for long-term persistence on drier ridges. When sowing paddocks with such distinct zones, two separate grass-legume mixes may be needed, e.g. one for the areas prone to waterlogging and another for the ridges. Consider sub-dividing such paddocks, for ease of management and to control grazing.

Sowing depth

Deep burial of pasture seed is a major reason for poor establishment. Pasture seeds are small and the seedlings will not emerge if sown too deeply. To optimize germination and emergence, aim to sow into moist soil, ensure good seed-to-soil contact and a coverage of no more than 1–2 cm of loose soil.

Attention to the set-up of the seed drill is essential to manage seed placement.

Note: The optimum sowing depth for some very small seeded species is less than 1 cm, e.g. balansa clover and biserrula.

Seed quality, purity and germination

Seed quality: is one of the most important aspects of sowing a new pasture. Whenever possible, purchase Certified Seed or Quality Assured Seed to ensure that it is true to type for the nominated variety and has high germination capacity and physical purity. Ask for a current certificate of seed analysis when purchasing seed. These certificates are available for any seed from reputable merchants and provide details of the germination, physical purity, and lists weed seeds found in a representative sample. Insist on seed that has a high germination percentage and high level of physical purity.

Varietal purity: The only way to ensure that the seed purchased is the correct variety is by purchasing seed that is supplied under a Certified Seed or Quality Assured Seed Scheme where varietal purity is carefully managed. This will provide confidence that the seed is the correct variety and that it has been properly sampled and tested for physical purity and germination. Check that the seed lot or line number listed on the certificate matches the lot number on the bag purchased.

Physical purity: is presented on the certificate of seed analysis as the percentage weight of 'Pure seeds' and contaminants – i.e. 'Inert matter' and 'Other seeds':

Pure seeds – provides an indication of whether the lot is 'true to type', e.g. 99.1% sub clover (species but not variety).

Inert matter – includes broken seed and non-seed material such as dirt, plant residue and fungal material.

Other seeds – includes seed of all other plants found in the sample, including weeds. Check the list of 'other seeds' on the certificate and reject seed lots that contain the seeds of weeds you do not want introduced to your farm.

Germination percentage: The germination percentage on a certificate is broken down into several categories:

Normal seedlings – is the percentage of germinating seeds that will progress to develop 'normal seedlings'. It is an indication of the percentage of seeds that will germinate in the year of establishment. Ideally this should be more than 80%.

Hard seed – is the proportion of seed in the sample that is dormant. The hard seed levels of legumes can vary considerably between species and varieties.

Fresh ungerminated seed – are found commonly in tropical grass species and are either immature or dormant seeds.

Abnormal seedlings – are those produced by seed that germinates but is damaged in some way. These seeds are unlikely to produce healthy plants.

The germination test results are valid for up to 12 months provided that the seed is stored under suitable conditions – i.e. cool, dry and free of insect infestations

Sowing seed harvested on farm: Seed viability and germination percentage is affected by moisture levels at harvest and subsequent storage conditions. A seed test analysis from a reputable seed testing laboratory will provide an accurate estimate of germination percentage and assist in calculating seeding rates. For more information about seed quality and quality assurance programs are available at the Australian Seed Federation website: http://www.asf.asn.au/

Filling the feed gap - A Nuffield Scholar Case Study

Designing a profitable, resilient and year-round forage based grazing system suitable for beef cattle production was the focus of MLA's 2017 Nuffield Scholar, Stuart Tait.

Based at Mandurama on the NSW Central Tablelands, Mr Tait and his parents run 600 Angus breeders and depending on seasonal conditions, trade between 200-800 head of cattle annually, as well as cropping around 450 hectares of winter crop.

After experiencing drought and the challenge and costs associated with supplementary feeding cattle, Mr Tait wanted to examine farming systems using dual-purpose crops to fill feed gaps.

His Nuffield Scholarship saw Mr Tait travel through the Mid-West of the United States including Oklahoma and Kansas. He then travelled to the United Kingdom, Ireland, Canada, South America and New Zealand to examine which particular crops producers had chosen as the centrepiece of their grazing systems.

"Taking a step back, we were running a business that was not very flexible and we were generally unable to adapt to seasonal conditions. We weren't necessarily capitalising on good seasons and we found dry seasons particularly challenging," Mr Tait said.

"This led to the development of my Nuffield topic which revolved in one sense around the cost of supplementary feed and how we ensure we have in-situ feed 12 months of the year.

"I was never expecting to find a silver bullet on my Nuffield travels, but everywhere that I went I found pieces of the puzzle that I could bring together to create the overall system.

"The solution is an old saying – don't take the mountain to the man, take the man to the mountain. Animals have legs for a reason - the cheapest feed is that which is in-situ."

While in Alberta, Canada, Mr Tait found producers using Sainfoin – known as the 'forgotten forage' -a legume which is identical to Lucerne and very palatable to beef cattle, but with the key difference that it is non-bloating.

Mr Tait is now working towards importing some Sainfoin seed into Australia from Canada, and has also found a small quantity of Sainfoin seed at the Australian Gene Bank in South Australia, which he is going to trial on the family farm.

"We also have a trial of perennial wheat, which is not genetically modified, on our farm," Mr Tait said.

"One of the key take home messages from my Nuffield Scholarship is that we need to treat pastures more like crops.

"Most cropping farmers have a solid understanding of their individual costs and returns per hectare, and how both interact to impact profitability. This isn't typically the case in the beef sector, where cost and return per head is the focus over cost and return per hectare.
"You can't manage what you don't measure, and we'll be better placed to fine tune our pasture input costs if they're analysed on a per hectare basis.

"Subdivision and rotation are both critical from a cropping point of view in terms of rotating those cropping cycles and pasture cycles, but also in terms of animals. Rotational grazing and breaking down paddocks into smaller areas is critical.

"And finally, find that centrepiece plant species and keep it simple."

Mr Tait said his Nuffield Scholarship also showed how virtual fencing and new technology, such as the development of sensors to measure both mass and pasture quality, which is underway at Noble Research Institute, Oklahoma, could be harnessed to improve productivity.

This article was published with permission by Nuffield Australia Farming Scholars and Meat and Livestock Australia. Stuart's full report is available at https://nuffield.com.au/scholar-profile-stuart-tait/

Nuffield Australia Farming Scholarships awards primary producers with a life-changing scholarship to travel overseas and study an agricultural topic of choice. More information is available at https://nuffield.com.au/scholarships/

Applications for 2020 open April 1 2019.

Weed and pest control at sowing

Editors Note: This article "Weed and pest control at sowing" is a continuation of a series of articles modified from the Temperate perennial pasture establishment guide - steps to ensure success published by the NSW Department of Primary Industries.

The Temperate perennial pasture establishment guide is available at www.dpi.nsw.gov.au/tppeg

Seedlings of most perennial grasses and legumes are not vigorous, so it is essential to effectively manage competition from weeds and damage from pests to maximise the potential for successful pasture establishment.

Weeds

Forward planning is the key to minimising the impact of weeds on establishing pasture. An effective weed control program in the two years prior to sowing will control perennial weeds and reduce the seed bank of annual weeds. By following this approach the only weeds that may pose a threat to establishing seedlings are young annual weeds that can be easily controlled by a knockdown herbicide applied just before sowing. This is the only possible way to achieve absolute weed control, and so eliminate one of the major threats to pasture establishment – weed competition.

The traditional approach that relied on a single application of a broad-spectrum knockdown herbicide the week before sowing is not recommended. This practice depends on a significant 'autumn break' and carries a high risk of failure, particularly when paddocks have infestations of perennial weeds and carry a large burden of annual weed seeds.

Do not sow on the opening autumn rain.

An 'autumn break' of more than 15 mm of rainfall and cooling temperatures should stimulate the germination of annual grass weeds and some broadleaf weeds. Inspect the paddock two weeks after "the break" for other weeds, including hard-to-kill perennials, such as established sorrel.

The three methods used to control weeds immediately prior to sowing are listed below. The first two methods rely on the use of non-selective knockdown herbicides and provide the best control:

1. Glyphosate application – with no cultivation at sowing (minimum disturbance);

2. Paraquat and diquat (Sprayseed®) application – with either minimum disturbance or full cultivation at sowing;

3. Sowing with a full cultivation.

A selective hormone herbicide may be mixed with glyphosate to target broadleaf weeds. This will delay sowing by 1 to 3 weeks because a plant back interval (the time between spraying and sowing a sensitive species) is required to allow for the residual effects of the hormone herbicides to break down. It may be worthwhile including an insecticide in the herbicide mix to control earth mite.

Note: Check herbicide labels for chemical compatibility and plant back periods.

Invertebrate pests

The main invertebrate pests of pastures and their control have been discussed in Chapter 8. Implementing an integrated pest management (IPM) program prior to sowing will reduce the risk of damage from pests to establishing pastures.

Pest infestations are not predictable as populations are transient and life cycles are determined by environmental conditions. Therefore, to ensure successful establishment it is essential to monitor paddocks regularly. This includes checks every two to three days for the first three to four weeks after sowing, when the pasture is most susceptible, and ongoing monitoring until the pasture is established.

A proactive management approach such as Timerite® will assist in the management of redlegged earth mite.

For other pests monitoring paddocks and maintaining good records in the season prior to sowing will provide an indication of potential pests.

The decision to use a pesticide should only follow identification of the pest and consideration of the impact of the recommended pesticide on beneficial insects, which have an important role in controlling pest species. Seek advice to determine which strategy best suits your farming system, pest populations and risk profile.

There are two methods of chemical control used:

. Knockdown
. Bare earth

Knockdown pesticides tend to be a 'softer' option as they only kill pests present at the time of spraying. This option allows insects, both beneficial and pests, to re-enter the area, causing re-infestation to occur quickly. Identification, assessment of damage and monitoring of insect activity, in and around the target area, before and after the pesticide application, is essential for effective control when using knockdown insecticides.

Bare earth treatments generally use broad spectrum insecticides that kill both pests and beneficial insects. They have a residual effect ranging from days to weeks. Bare earth treatments can offer a sense of security because pests are controlled over an extended period. However, continued monitoring is essential as pest populations may still rebuild quickly, before the pasture is established. There is usually a lag period for the recovery of the beneficial insect populations during which time the pest populations will not be checked by natural predators

NSW State Seasonal Update February 2019

Drought conditions remain widespread across New South Wales (NSW), particularly in the entire western area of the state which is managing a prolonged drought event. The north and north west of the state are managing heightened levels of risk at this time because of the greater reliance of agriculture in this region on summer rainfall which has been extremely low for the 2018-19 season through the end of February.

A dry and warm February means that there has been little change in the overall situation in NSW since the release of the January 2019 State Seasonal Update (SSU). Localised storm rainfall has been recorded in some areas, however this has had no agronomic benefit in most regions. There are parts of the central tablelands and coastal NSW that are in drought recovery, but the rate of recovery has slowed over February and further rain is now needed to continue a positive trend.

The NSW DPI Combined Drought Indicator (CDI) provides a general regional assessment of the highly variable field conditions observable on farm. It indicates that there have been some minor shifts in the nature of the current drought, but NSW remains challenged by the agronomic and hydrological impacts of the event. Overall the CDI is unchanged since the January SSU with 99.9% of NSW experiencing drought conditions. The proportion of the state classified as being in Intense Drought (33.5%) remains similar in February, however the distribution of these areas has shifted, with some regions receiving localised intense rainfall events, and corresponding lift in the Rainfall Index. While rainfall was recorded at some meteorological stations there has been no change in agronomic and hydrological conditions (Plant Growth and Soil Water indices) and these drought indicators remain at critically low levels.

This highlights that, for most regions across the state, any rainfall received in January-February was largely ineffective due to high temperatures and evaporation. Despite the apparent easing of meteorological conditions in some regions, evident in rainfall records from the state's monitoring network, in-field conditions observable by landholders and agronomists remain largely unchanged. These areas, largely in the Western LLS region, remain in the Drought category. Due to the long-term soil moisture deficit being experienced throughout this current event, DPI advises that these areas continue to experience equivalent levels of agronomic and hydrological impacts as those classified as being in the Intense Drought category.

Rainfall throughout February was generally inadequate for prompting any practical wide scale agronomic response across most of the state. February rainfall anomalies indicate only very isolated areas of median to above median (up to 50 mm) rainfall. Temperatures remained warm to hot throughout February with the majority of the state experiencing average to 2°C above average for daytime and overnight temperatures. Without adequate rainfall during the month and on the back of the record heat experienced throughout January, temperatures are still having a negative impact on field conditions across the majority of the state. The dry conditions in February have continued the pressure on surface water supplies across the state. Farmers and communities, particularly in the western areas, continue to manage surface water shortages in addition to low primary productivity. In general, the lack of rainfall and high evaporation rates this month has not improved the NSW farm dam status.

Official climate forecasts released on 28 February from the Bureau of Meteorology indicate a low probability of achieving median rainfall across NSW for the March to May period. This probability of achieving median rainfall has declined significantly since the January SSU. The temperature outlook indicates a high chance of warmer than average daytime and overnight temperatures across all of NSW for the March to May period. The major climate drivers remain in a near neutral state, however El Niño predictions made in early autumn generally have lower accuracy than predictions made at alternative times of the year. Ultimately, the drought conditions are expected to continue across NSW into the near future when the combination of the less than favourable forecast and recent continuation of February drought conditions are considered.

Prepared by NSW DPI Climate Unit

Research Update

Keeping you up-to-date with pasture and grassland research in Australia. Abstracts of recently published research papers will be reprinted as well as the citation and author details in you wish to follow up the full paper.

Weaner survival is heritable in Australian Merinos and current breeding objectives are potentially leading to a decline in survival

S. F. Walkom [A D], A. N. Thompson [B], E. Bowen [C] and D. J. Brown [A]

[A] Animal Genetics and Breeding Unit, University of New England, Armidale, NSW 2351, Australia. (AGBU is a joint venture of NSW Department of Primary Industries and the University of New England).

[B] School of Veterinary and Life Sciences, Murdoch University, 90 South Street, Murdoch, WA 6150, Australia.

[C] Sheep Data Management, 14 Goonawarra Street, Wagga Wagga, NSW 2650, Australia.

[D] Corresponding author. Email: swalkom@une.edu.au

ABSTRACT: There is little evidence to show that mortality rates during the period after weaning are improving over time in Australian sheep. The average mortality rate of Merino lambs during the post-weaning period has been estimated to be 5.2%. The present study explored the potential for producers to breed for improved survival rates during the post-weaning period and the potential impact this would have on key production traits. A total of 122 526 weaner survival (mortality) records were obtained from 18 Merino flocks, between 1989 and 2014, encompassing a wide variety of Australian Merino sheep types and production systems. The heritability of weaner survival from a sire model was estimated to be 0.07 ± 0.01 and was significantly greater than zero. The survival of lambs post-weaning was significantly influenced by weaning weight, with higher survival rates observed in the heavier lambs. The phenotypic relationship with weight indicates that selection for heavier weaning and post-weaning weights, and in turn larger growth rates, will improve survival rates. There is genetic variation in weaner survival not explained by the relationship with weaning weight. Weight-corrected weaner survival was antagonistically genetically correlated with fleece weight. Due to these antagonistic genetic relationships selection based on popular MERINOSELECT indexes is leading to a very small reduction in the survival rate of lambs after weaning through to the post-weaning stage. To prevent a decline in weaner survival, producers are advised to record weaner survival and include it in their breeding objective.

Animal Production Science 59(1) 35-47 https://doi.org/10.1071/AN17151

Australian Society of Agronomy

2019 Australian Agronomy Conference

25–29 August 2019

Wagga Wagga

For more information

www.agronomyaustralia.org/2019-conference-wagga-wagga-nsw

Grassland Society of NSW - **TRAVEL GRANTS**

The Grassland Society of NSW is able to assist members through its Travel Grants program.

Travel grants are open to financial members of the Society with at least two years of continuous membership prior to the date of application. Funding is available to attend conferences, symposiums or other activities and events associated with grassland science.

More details can be found on the membership tab of the Grassland Society of NSW website www.grasslandnsw.com.au - or by contacting the Secretary (secretary@ grasslandnsw.com.au)

mla

MEAT & LIVESTOCK AUSTRALIA

Nitrate and nitrite poisoning in livestock

EDITOR'S NOTE: This article is taken from the NSW Department of Primary Industries Primefact 415 2nd Edition May 2018 https://www.dpi.nsw.gov.au/animals-and-livestock/sheep/health/other/nitrate-nitrite-poisoning

The information contained in this publication is based on knowledge and understanding at the time of writing (May 2018). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries.

What is nitrate/nitrite poisoning?

During periods of drought, the amount of nitrate in the soil can increase greatly because of:

- a lack of leaching;
- reduced nitrate uptake by plants;
- decomposition of organic matter.

When a drought breaks, nitrate uptake by plants may be high, especially in the first week after rain. If hungry animals are allowed free access to such plants, stock losses from nitrate/nitrite poisoning may be disastrous. Nitrates and nitrites are closely linked as causes of poisoning. Nitrate is not always toxic to animals. When feed containing nitrate is eaten by ruminant animals, nitrate is converted to nitrite, and then to ammonia, by rumen microbes. Nonruminant animals are unable to do this. Nitrates have a direct, caustic effect on the lining of the gut if consumed in large quantities. Signs of poisoning include diarrhoea, salivation and abdominal pain. Nitrites are much more toxic. These are formed from nitrates during ruminant digestion and may also occur if stored plant materials heat up or are attacked by bacteria or fungi. When high levels of nitrites accumulate in the gastrointestinal tract, they are absorbed into the bloodstream. Nitrite in the bloodstream changes haemoglobin (the oxygen carrying part of blood) to methaemoglobin (which cannot carry oxygen). If enough methaemoglobin is produced, the animal will die. Some animals can tolerate up to 50% conversion of their haemoglobin without ill-effects; however, when more than 80% haemoglobin is converted, death occurs.

Sources of poisons

Plants - Nitrogen is considered the plant nutrient most widely deficient in the world's soils. Various agricultural practices have therefore been developed to increase its concentration in the soil. These practices include incorporating legume varieties in pasture and applying various nitrogen-rich fertilisers (urea, sulphate of ammonia, blood and bone) to crops. Such practices sometimes cause plants grown in these soils to have nitrate levels above safe limits, resulting in livestock poisonings. Certain weeds, various root crops, cereal hays, and even immature cereal crops can also cause these poisonings. More than 80 specific plants are known to cause nitrate/nitrite poisoning including; oats, sorghum, maize, canola, lucerne, kikuyu, turnip tops, sugar beet tops, rye, Sudan grass, soybean, wheat, barley, capeweed, varigated thistle, mintweed, crown beard, pigweed, redroot, caltrop, marshmallow, blackberry and fat hen.

Plant factors - Under certain soil and environment conditions, plants can contain high levels of nitrates Factors that facilitate uptake of nitrate by plants include:

- use of nitrogen-containing fertilisers;
- low soil sulphur and molybdenum;
- areas where stock have congregated and urinated/defaecated (e.g. yards).

Factors which cause nitrate to accumulate in the plant include:

- drought;
- cloudy or cold weather;
- herbicide application – especially phenoxy herbicides such as 2,4-D;
- wilting.

The amount of nitrate in plant tissues also depends on:

- plant species;
- stage of maturity;
- part of the plant.

Nitrate concentrations are usually higher in young plants and decrease as plants mature. Most of the plant nitrate is also located in the bottom third of the stalk, hence the leaves contain less nitrate and the flowers or grain contain little to no nitrate.

Hay and silage - Hays made from cereal crops, especially those grown under drought conditions and cut while 'sappy', can develop toxic nitrite levels when they heat up. Oaten hay is particularly risky and becomes poisonous if previously dry hay is dampened by rain or snow some time before feeding out. Hays made from nitrate-rich materials contain almost as much nitrate as when first made, unless some is converted to nitrite by heating or mould. Silage contains less nitrate than its parent crop due to the fermentation process that it undergoes. Forages high in nitrate can lose 40%–60% of their nitrate content during fermentation.

Water - Water can contain toxic levels of nitrates. High-risk sources include:

- water from deep wells fed by soil water from highly fertile soils;
- condensed water from ventilating shafts in piggeries where there are high ammonia levels in the air;
- fluids draining from silos containing materials rich in nitrates.

Water contaminated by fertiliser, animal wastes or decaying organic matter may also be a source of toxic levels of nitrate. Marginally toxic levels of nitrate in water, combined with marginally toxic levels of nitrate in feed, can also lead to poisoning.

Animal susceptibility

Species - There is considerable variation between species in their susceptibility to nitrite poisoning. Pigs are the most susceptible, then, in order, cattle, sheep, and horses. Non-ruminants, such as horses and pigs, have no mechanism for converting nitrate to nitrite in their digestive tracts, so they are not susceptible to nitrite poisoning from excessive intake of nitrates. However, they are

highly susceptible to poisoning from nitrite intake (for instance in mouldy hay) because they cannot convert the nitrite to ammonia.

Sheep are more efficient at converting nitrite to ammonia, so this may be the reason why they are less susceptible to nitrite poisoning than cattle.

Hungry stock - Hungry stock are at far greater risk than animals receiving regular and good fodder. This is because hungry stock consume more toxic feed, and, in the case of ruminants, their rumen microbes will not have had time to adapt to converting the nitrite to ammonia. For example, it takes about twice as much nitrate to kill a ruminant when the nitrate comes from forages that are eaten over a long period of time, compared to that which is consumed very quickly.

Ruminant animals receiving carbohydrate rich fodders tolerate high nitrate and nitrite levels better than those that are not. This is because energy from carbohydrates (grain) helps rumen microbes convert nitrite to ammonia. Animals that are stressed or in poor health or condition will also be more susceptible to nitrate/nitrite poisoning.

Adaptation or acquaintance - Frequent intake of small amounts of high nitrate feed increases the total amount of nitrate that can be consumed by ruminant animals without adverse effects. This is because rumen microbes are adapted to deal with the increased nitrate content of the feed.

Signs of poisoning

Signs of nitrate poisoning are:

• diarrhoea and vomiting;
• salivation;
• abdominal pain.

Signs of nitrite poisoning usually appear 6–24 hours after the toxic material is consumed. These include:

• rapid, noisy and difficult breathing;
• blue/chocolate-coloured mucous membranes;
• rapid pulse;
• salivation, bloat, tremors, staggering;
• dark, chocolate-coloured blood;
• abortions – pregnant females that survive nitrate/nitrite poisoning may abort due to a lack of oxygen to the foetus; abortions usually occur 10–14 days after exposure to nitrates;
• weakness, coma, terminal convulsions, death.

Diagnosis

Diagnosis is based on observed clinical signs, possible exposure to toxic plants, feed or water, post-mortem findings and laboratory tests.

Treatment

Urgent veterinary attention is required to confirm the tentative diagnosis and to treat affected animals. Stock should immediately be removed from suspect material, and be handled as little and as quietly as possible. Hay or some other low-nitrate herbage should be fed to dilute the nitrate and/or nitrite in the stomach. Affected animals can be treated by intravenous injections of methylene blue, a powdered dye material. Methylene blue converts the methaemoglobin back to oxygen-carrying haemoglobin.

Note: Methylene blue is no longer approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for use in food-producing animals.

Contact your veterinarian for advice. If producers have an old supply of methylene blue on hand, they should consult their veterinarian before attempting to use it. A veterinarian may use or recommend methylene blue to treat a single animal. Written advice about the treatment, including an appropriate withholding period to manage residue risks, must be provided to the person in charge of the animal.

Prevention

The risk of poisoning can be reduced by:

• having feeds and forages analysed for nitrate when in doubt, such as drought-stressed, small-grain forages;

• not grazing stock on forages that are potentially dangerous;

• observing stock frequently when put on potentially risky feed;

• feeding hungry stock on dry hay or mature grass before allowing free access to immature cereal crops or root-crop tops;

• feeding only well-dried cereal hays;

• preventing hungry stock from gorging recently sprayed weeds;

• preventing hungry stock from gorging highly fertilised crops;

• not overstocking risky pastures / grazing crops – overstocking can result in more stalk material being consumed (the stalk contains the most nitrate in the plant). Avoid strip grazing for the same reason;

• not grazing high-nitrate pastures or crops for 7 days after periods of rainfall, cloudy days, frosts, or high temperatures that cause wilting;

• grazing stock on high-nitrate pastures or crops during sunny afternoons (when the temperature is above 15°C) and removing them at night. This reduces the amount of high-nitrate forage consumed and helps rumen microbes to adapt;

• preventing access to high-risk weeds around yards/sheds;

• feeding risky material in small amounts diluted with safe feed, preferably high carbohydrate feed such as grain (if accustomed to grain feeding), and gradually increasing the amount fed – this applies only to ruminants;

• ensuring that water does not contain high levels of nitrates;

• not feeding green chop that has heated after cutting;

• never feeding mouldy hay.

Another option for reducing the risk of nitrate/nitrite poisoning is to harvest and feed high-nitrate forages as silage. This is because nitrate levels are reduced by the fermentation process when feed is ensiled. Harvest these feed crops at least 7 days after rain or cloudy weather, preferably later in the day.

Harvesting close to maturity is also advised to reduce the risk of nitrate toxicity (although this means reduced digestibility of the feed). Raising the cutter head to selectively avoid stalk bases is another method of reducing the risk of poisoning.

Cultivating a shared vision for Agricultural Innovation

Agricultural Innovation—A national approach to grow Australia's future

Following a collaborative stakeholder engagement process, Ernst and Young have developed the shared vision for agricultural innovation. Realising the vision for Australia's agricultural innovation system will allow us to harness the power of knowledge to make our food and fibre systems more competitive, prosperous and sustainable.

The vision report is titled Agricultural Innovation—a national approach to grow Australia's future and was launched 5 March 2019. The report makes recommendations aimed at benefiting all participants in Australia's agricultural innovation system, including researchers, research and development corporations (RDCs), industry representatives, producers, processors, investors, government agencies and companies across the start-up, accelerator and incubator communities.

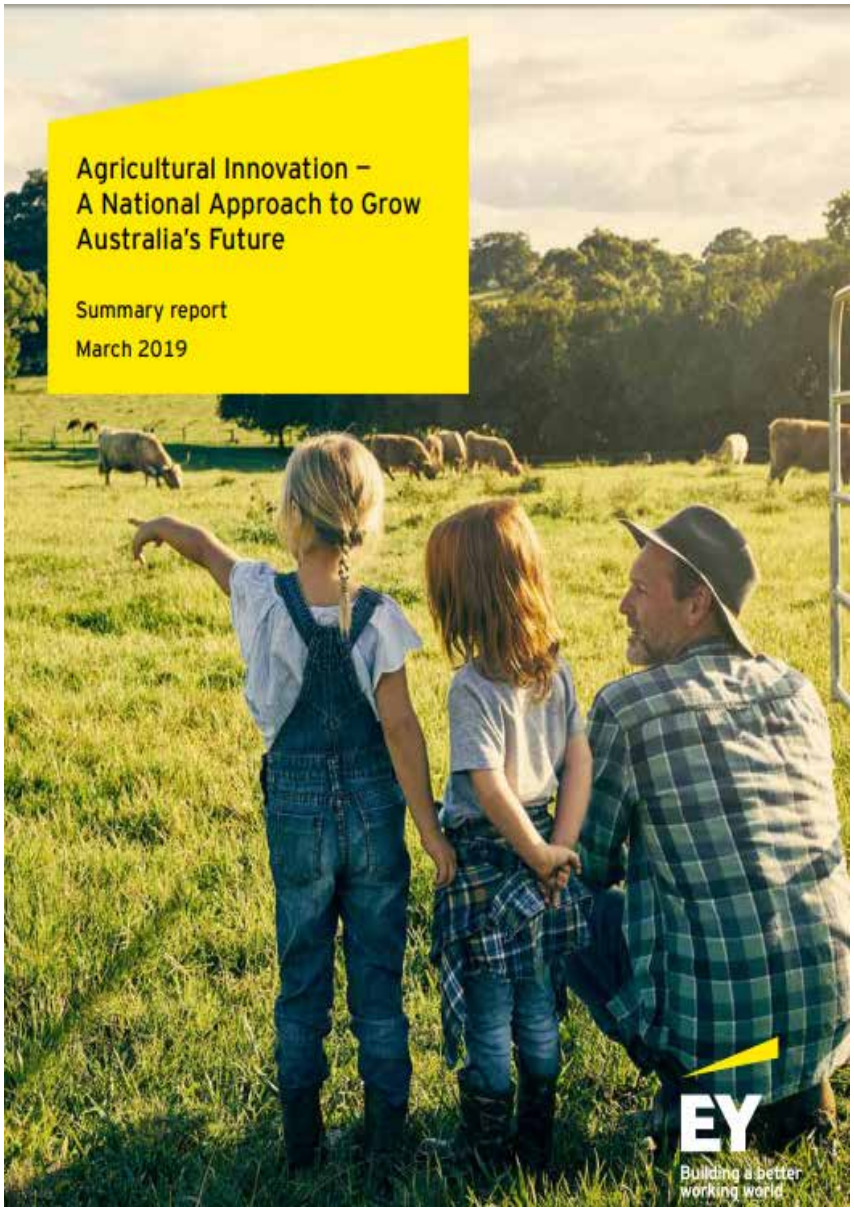
There are five recommendations in the report:

• strengthening leadership for strategic direction, but also for improving connections, collaboration, and culture,

• balancing funding and investment to solve short-term challenges as well as targeting transformational and cross-commodity outcomes,

• establishing world-class innovation practices including disruptive thinking, ambition and entrepreneurship to maximise opportunities from our investments,

• strengthening the regions to maximise innovation uptake and provide regions with a greater role in national priority-setting, and



• establishing the next generation innovation platform for our data, physical infrastructure, and regulatory environment.

A world class agricultural innovation system will help Australia to reach the National Farmers Federation's target for a $100 billion sector by 2030.

For a copy of the report or more information go to http://www.agriculture.gov.au/SiteCollectionDocuments/agriculture-food/innovation/summary-report-agricultural-innovation.PDF

Vale Rev. Stephen Millar

Former President of the Grassland Society of NSW Rev. Stephen Millar sadly passed away on January 08 2019 at Tamworth Hospital after a short illness.

Stephen was a long term member, supporter and contributor to the Grassland Society of NSW, serving on the state committee including 2 years as President from 1994 to 1996.

On behalf of all members of the Grassland Society of NSW we offer our condolences to Stephen's wife Wendy and family.

From the President

Welcome to 2019. I was very pleased to get rid of 2018, even without knowing what 2019 has in store. We can only hope it is better, and only time will determine if that is the case. For many, very little has changed unfortunately as we start 2019, and some would say it has deteriorated even more. I am sure we are all 'over' the extended number of hot days! The New England and North West is very dry in what is considered their 'growth period', while feed stocks in the south have all but disappeared, and dry pasture residue has been consumed. Patches of the Central tablelands and slopes have been fortunate with scattered storms, however they have been very scattered. Sadly, in the odd place, the intensity has been so great they have been damaging. Ground cover and fences have been washed away in some freak 100 mm plus storms. It's a tough gig farming, and the challenges ahead are huge.

Many are looking to plant early grazing crops as I write, some have already sown. The challenge for many is finding seed. Adding to the cereal seed supply issue is a very short supply of pasture seed, and in particular the grasses. Many Phalaris, Cocksfoot and Fescue varieties are very short on supply, and the seed industry in general are still trying to determine what quantities they will have available come April. The quick tip, get organised and hope your supplier can get the varieties you would like.

Our 2019 Grassland Society of NSW Inc Biennial Conference is coming together nicely. Gunnedah 3rd and 4th July are the dates for the diary. "Renewed focus on livestock systems for resilience – the swing back to forages" is the title, and the organising committee has a great program in the making. I look forward to seeing those who can make it to Gunnedah in July.

The last of the '2018 Pasture Updates' will be held at Crookwell on March 5th. This will conclude the current contract with MLA, and we thank them greatly for their continued support of the Pasture Update program. The society will continue to run regional activities throughout 2019, and hopefully you will get the chance to attend such an activity in your region.

Given the challenges I mentioned above that confront us in farming, and the tough times many are enduring at present, please make the effort to call, visit or offer to help in any way, your own family, friends, work colleagues or even strangers. Keeping us all 'fit and well' provides the resilience we need for these extended periods of duress. Don't underestimate the value of that contact, and "how are you".

All the best, here's hoping rain is on its way, and 'Season 2019' starts soon!
Regards,
David Harbison,
President.

The Grassland Society of NSW Inc is a unique blend of people with a common interest in developing our most important resource - our Grasslands

The Grassland Society of NSW was formed in March 1985. The Society now has approximately 500 members and associates, 75% of whom are farmers and graziers. The balance of membership is made up of agricultural scientists, farm advisers, consultants, and or executives or representatives of organisations concerned with fertilisers, seeds, chemicals and machinery.

The aims of the Society are to advance the investigation of problems affecting grassland husbandry and to encourage the adoption into practice of results of research and practical experience. The Society holds an annual conference, publishes a quarterly newsletter, holds field days and is establishing regional branches throughout the state.

Membership is open to any person or company interested in grassland management and the aims of the Society. For membership details go to www.grasslandnsw.com.au
or contact the Secretary at secretary@grasslandnsw.com.au or at PO Box 471 Orange 2800

Office Bearers of the Grassland Society of NSW – 2018-19

State Executive

David Harbison (President)
Peter Wilson (Vice President)
Janelle Witschi (Secretary)
Frank McRae (Treasurer)
Mick Duncan (Immediate Past President)
Carol Harris (Editor)

Committee: Amanda Britton, Helen Burns, Nathan Ferguson, Keith Garlick, John Ive, Jeff McCormick, Lester McCormick and Stuart Tait.

Branch Representatives

Lester McCormick (North West Slopes)
Frank McRae (Central)
John Ive (Southern Tablelands)
Mick Duncan (Northern Tablelands)
David Harbison (Central West Slopes and Plains)
Nathan Ferguson & Helen Burns (South Western Slopes & Riverina)

If you are interested in reactivating an old branch or forming a new branch please contact the Secretary at secretary@grasslandnsw.com.au or by mail at PO Box 471 Orange NSW 2800

Grassland Society of NSW Snippets

Next Newsletter: The next edition of the newsletter will be circulated in June 2019. If you wish to submit an article, short item, a letter to the Editor or a photo please send your contribution to the Editor - Carol Harris at carol.harris@dpi.nsw.gov.au or DPI NSW 444 Strathbogie Road Glen Innes 2370. The deadline for submissions for the next newsletter is May 03 2019.

Electronic newsletter: Don't forget you can receive the Grassland Society of NSW newsletter electronically. Just email your details to Janelle (secretary@grasslandnsw.com.au) and you will be added to the list. Next newsletter you will receive an email notification with a link to the newsletter on the website.

Fan of Facebook - make sure you check out the Grassland Society of NSW Facebook page. You can either search for GrasslandNSW or access the Facebook page through our web site. Pasture Update details will be posted on the Facebook page as well as the website. Please feel free to Like Us, as well as post photos of pasture and/or related topics in your area.

Grassland Society of NSW – PO BOX 471 Orange NSW 2800, www.grasslandnsw.com.au

This publication is prepared by the Grassland Society of NSW Inc and printed by GK Craig Printers, Orange on recycled paper