



Department of  
Primary Industries

# Drought recovery guide

FOURTH EDITION



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Primary Industries

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Fourth edition

[www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

Job No. 16051 02/20

ISBN 0 7347 1678 8

Cover image: NSW DPI Image Library (Photo by Peter Simpson)

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# Foreword

This drought has been ongoing in some parts of the State for nearly three years now, making life incredibly difficult for those on the land.

It will certainly be a long path to recovery and many difficult decisions will have to be made, but rest assured the NSW Government will continue to support our farmers.

By compiling the best resources from the NSW Department of Primary Industries and Local Land Services, the Drought Recovery Guide will give primary producers the information they need to get back on their feet.

Whether it is information on pasture management, cropping recovery or animal health management, this guide will be able to help meet the challenges to getting operations back on track.

Our farmers are some of the most resilient in the world and this guide is a valuable tool to help them meet the challenges of resuming normal operations following a difficult time.

For more information on the NSW Government's broad range of support and assistance measures to support our farmers, their families and regional communities impacted by drought conditions, I encourage you to visit [www.droughthub.nsw.gov.au](http://www.droughthub.nsw.gov.au).

**Hon. Adam Marshall MP**

Minister for Agriculture

Minister for Western New South Wales

# Financial management during drought recovery

When drought breaks, most farmers need to help offset financial losses incurred during drought. This involves considering a range of options and making many decisions, all with impacts on the business. Reduced revenue and increased feed costs will have tightened working capital for many farmers, but cash is required to sow crops, buy replacement stock and meet financial obligations to keep the business running. This chapter outlines some practical suggestions for financial drought recovery.

Prior to that however, it may be useful for everyone in the business to evaluate their priorities and commitment to the business by asking themselves the following questions:

## **Take stock #1. To farm or not to farm?**

Invest time in a little soul searching, speaking to trusted friends and advisers. Is farming still what you really want to do with your life or is it time to consider other options? This is possibly the most important decision for you and your family so give it the energy it deserves. Many regions have continued to experience increasing land values despite the drought and so family farms still represent good capital value if you decide to sell.

## **Take stock #2. What is the financial position of the business?**

Cash-flow has likely been strained, and equity may have declined. To plan the best way forward, a true understanding of the business' financial position is required to continue farming and obtain finance. A Statement of Position including all assets and liabilities and equity, in dollars and percentage terms, must be calculated. Calculate fair market value for land, machinery, livestock, fodder and grain using the pro-forma at [www.raa.nsw.gov.au](http://www.raa.nsw.gov.au) (search the website for 'Statement of Position'). While all businesses differ, an equity level below 50% is typically considered at risk; greater than 75% quite secure.

## **Take stock #3. Review**

Once you understand your financial position, it's time to reconsider: How could life look if you were doing something else? Is farming still your passion?

## **Take stock #4. How are you?**

Farming is tough, both physically and psychologically, more so in drought. How are you really travelling healthwise?

## **The importance of cash flow**

If more finance is required, prepare an accurate month to month cash flow projection for the next 12 to 24 months (or longer if required). Some tips to reduce costs include:

- 1. Cost control** – identify and prioritise those expenditures which are critical for production (such as fertiliser, chemical, animal health costs) and those which are not such as overhead costs and capital expenditure. Be disciplined and spend cash only where required. Consider enterprises with lowest cost required to generate income.
- 2. Improve finance terms** – speak to your bank and creditors about refinancing/restructuring your debts, considering the following options:
  - a. Reduce repayments – refinance principal and interest (P&I) loans to interest only
  - b. Consider extending the loan term to reduce annual repayments
  - c. Restructure debts requiring monthly/quarterly payments to annual-in-arrears payments



- d. Restructure overdraft debt. Overdrafts often have higher interest rates than fully drawn loans, so if a portion of overdraft debt has become 'hard core' (unlikely to be repaid within a year), consider transferring that portion to an interest only, fully drawn loan, to reduce the interest cost on that debt portion
- e. Seek more favourable payment terms from non-bank creditors. Depending on the debt structure, it may be less expensive to have a creditor than a bank loan/overdraft.
- f. Ensure interest rates and bank fees are as low as possible by requesting a review, as banks regularly develop new products.
- g. Be prepared to compare interest rates and switch to other lenders, especially if your financial position is sound.
- h. Contact NSW Rural Assistance Authority (RAA) or the Rural Investment Corporation (RIC) to apply for government subsidised loans, rebates and subsidies for drought affected farm businesses.
- i. Farm debt mediation. Creditors must provide an opportunity for mediation before enforcing action against farmers: a structured process with an independent mediator to try to negotiate an agreement for debt repayment. NSW RAA provides farm debt mediation services.

**3. Prioritise income** – any income will be useful and sends a positive message to finance providers.

- a. Consider enterprises that will generate short-term cash flow
- b. Sell non-essential machinery, inventory and other assets (including land)
- c. Look to insure future earnings against drought where possible
- d. Seek off farm work/income if possible
- e. Cash in Farm Management Deposits



Consider selling capital items to pay down debt. For example, can contractors be substituted for owning machinery?  
Photo NSW DPI Image Library

## Case study 1: Generating Income

Consider a predominantly cropping farmer who is enduring a poor harvest. Income for 2018 is well below budget and credit lines are stressed. Realising there was little to be done for the crops, the farmer managed to gain off farm employment in September at a local processing business. Almost \$70k worth of machinery identified as surplus to needs was sold. A decision made earlier in the year to take out Multi-peril Crop Insurance means that, while total income will be well below budget, an additional income of around \$170k of income was realised, compared to taking no action. The farmer's bank has been very supportive as a result.

### 4. Enterprise choice – sheep vs cattle vs cropping...and how?

Low stock numbers at the end of a drought represents a chance to review enterprise mixes and breeding directions. While infrastructure, handling facilities and other factors may limit options, short-term cash flow needs may be better met by increased cropping, livestock trading, or a shift in the balance of livestock enterprises.

The most common question for livestock farmers aiming to lift numbers is whether to purchase replacements on an inflated re-stocker market, or breed up from any remaining animals. Purchasing livestock often requires more debt, but is also likely to realise income more quickly as land is fully stocked, with saleable animals produced each season. Conversely, breeding up numbers typically requires less initial debt, but also produces less cashflow until numbers return to the desired level. Careful breeder management is required to maximise the number of animals produced and the decision requires modelled results of the various scenarios over several years. To review typical gross margins for livestock and cropping options, visit [www.dpi.nsw.gov.au/agriculture/budgets](http://www.dpi.nsw.gov.au/agriculture/budgets)

Critical to each decision is the Statement of Position and access to cash (via overdraft) following bank discussions. The gross margin will give an indication of enterprise performance when fully stocked, however more important is ensuring access to sufficient funds to get from where you are now to where you would like to be and perhaps an alternative enterprise is prudent in the short term. The case study below illustrates this point.

## Case study 2: Enterprise choice

Directing limited cash to key production costs is the first step, considering the most efficient alternative is also critical. While restocking may be a priority, it can also be costly, particularly as the demand for stock increases coming out of drought. Consider the following case study comparing the costs to utilise 100ha of land which can carry 8DSE/ha. Option 1 assumes a purchase of 400 ewes for \$300/head compared with Option 2, which assumes full contract rates to sow a wheat crop.

Table 1. The up front costs of restocking with ewes or sowing a wheat crop after drought.

Purchase 400 Ewes			Sow 100ha Wheat		
	\$/head	Total Cost		\$/ha	Total Cost
Purchase ewes	300	120,000	Sowing	60	6,000
Shearing	8	3,200	Seed	40	4,000
Husbandry general	20	8,000	Harvest	60	6,000
Pasture (\$/ha)	50	5,000	Chemical	80	8,000
			Fertiliser	140	14,000
			Spraying	50	5,000
<b>Total Cost (100ha)</b>		<b>136,200</b>	<b>Total Cost (100ha)</b>		<b>43,000</b>

While the analysis presented above is deliberately simple, it illustrates a critical point:- the impact of enterprise choice on cash flow. Faced with this choice, the decision to restock requires \$93,200 more cash in the short term than planting wheat and may limit your ability to do other things, or may strain the banking relationship. It is also important to consider the length of time between expenditure and income from each enterprise when making this decision. Some objective analysis is required to plan the most efficient way forward.

**Critical questions to consider:** How much will this enterprise cost?  
 How much income can I make from it?  
 How soon will that income be received?  
 Is this the best use of available cash?



## The banking relationship

No matter how uncertain the future, avoiding the bank will not help. Being proactive is most likely to gain the bank's support and confidence. There are many farmers experiencing financial hardship and all creditors have a vested interest in helping them succeed.

The recent Banking Royal Commission has tightened lending practices among the banks and this will likely continue. Planning thoroughly and providing financiers with the information they need is critical to locking in a great deal. So, what do they want? It's all about 'The 5 Cs'

1. **Cash flow** – the business must be able to demonstrate capacity to generate adequate cash to meet all costs including interest payments. Revenue calculations need to be calculated using reasonable and achievable assumptions for yields, commodity prices and costs.
2. **Character** – management expertise, integrity and honesty. Previous and future conduct with the bank is important. A poor credit history represents a much higher risk. A proven ability to handle difficult times and capitalise on opportunities reduces perceived risk.
3. **Capital** – the financial position of the business - assets, liabilities, net worth, equity position and debt ratios. The higher your equity, the lower the risk.
4. **Collateral** – the saleability and adequacy of the assets you provide as security for the loans. Adequacy is simply the amount of security – banks express this as loan-to-value ratio (LVR). A loan of \$600k against a farm worth \$1m gives an LVR of 60% - the lower the LVR, the lower the risk. Assets such as livestock, grain and machinery tend to be less appealing forms of security, are more risky and therefore attract a higher interest rate when used as collateral.
5. **Conditions:** What is happening at a macro level to the industry in which you operate? Global markets for rural commodities are generally strong at present and demand for land is sound. How does the business manage external risk: interest rates, exchange rates, variation in climate and commodity prices? These factors cannot all be controlled, but good management can reduce the downside risk. Consider the change in perceived risk from a bank who had loaned funds to a live beef exporter when the federal government banned live exports to Indonesia.

The Farm Decision Making Checklist at the end of this document is a useful guide to some of these points. Another useful resource is the Grains Research and Development Corporation fact sheet 'Understanding a Bank's Approach to Farm Business', available at [www.grdc.com.au](http://www.grdc.com.au)

## Business plan

Banks are also asking business borrowers to provide them with a full business plan. However, there is more benefit in writing a business plan than just appeasing creditors. A good plan will determine what scenarios are possible and which are most likely to provide a good financial return. Despite fluctuating costs and income, a business plan for the next 5–10 years will help with decision making and preparation for the next drought.

A business plan does not lock in a set course of action, it identifies goals and plans to achieve them with the information available at the time. It should be considered a living document and reviewed at least annually. It will also help track progress over time, highlighting both challenges and achievements. Consider employing an accountant or consultant to help develop a business plan that includes the following details:

- » **A clear, concise title page.** Include your business name and contact details.
- » **An executive summary.** Outline the amount and type of loan applied for, giving the bank the opportunity to accept, modify, improve or reject the loan. Clearly state the purpose of the loan and how it will be repaid. Also, briefly describe the business structure (sole trader, partnership, trust or company) and relevant financial ratios – historically and projected if the loan proceeds and the business is successful.
- » **Clear goals and objectives.** Detail the direction of the farm business and the family owners, perhaps with a mission statement.
- » **Management profile.** One of the most important resources of a farm business is its staff — remember that banks lend to people. It is important to highlight the experience, qualifications and background of all members of the farm family as well as key advisers.
- » **Physical plan.** Banks place a major value on major assets eg land and so it should be presented positively and factually. Include maps, photos, special attributes, such as highway frontage, proximity to town, or soil fertility. Include a property management plan, where available.

- » **Production plan.** Discuss such things as additional costs over and above the usual as a result of the drought. Outline assumptions for all projected yields, prices and input costs. This enables the banker to understand the differences in the budget forecast compared with your actual performance in previous years.
- » **Development plan.** Highlight any strategic plans or significant changes from previous years, e.g. anticipated capital purchases in coming years, or changes to enterprise mix or management. Discuss areas where there is a slightly longer pay-off period, such as breeding programs and applying lime.
- » **Marketing plans.** Banks like to see attempts to manage income as well as costs. Examples may include forward contracts and strategies to aim for: improved pricing; negotiating reduced commissions; having a range of selling methods, such as selling direct to feedlots or abattoirs; or perhaps production changes in micron (fibre diameter) or breed to meet client requirements.
- » **Financial plan.** Banks will often ask for the last three years' tax records, which should be accompanied by the relevant management records to give a more complete picture of the farm's performance. A cash flow statement and statement of position will be required, while several years future projections for financials, including Profit and Loss and Balance Sheet, together with relevant financial ratios, will also be useful.
- » **Exit strategy.** Ideally debts will be repaid in accordance with the contracts, but if not, a clear strategy for other options reduces perception of risk. This may include:
  1. sale of non-farm assets
  2. sale of non-core farm assets (eg machinery, livestock, grain)
  3. sale of core farm assets
  4. sale of land.

It may be possible to sell a small parcel or two of land and maintain a viable scale – great news to a bank. Also detail here all Life, Disability and Income Protection insurance policies held, as this is another important determinant in risk assessment.

This may sound like a lot of preparation but it can be very useful when negotiating financial recovery from drought. The depth, detail and understanding demonstrated in the loan proposal document reflect the character, attitudes and values of the farm business; the ability and commitment to servicing the loan, repaying the capital, and generating a return on the bank's investment. It also influences the bank's perception of your professionalism, and hence the interest rate.

### Upskill yourself

Until the drought breaks, undertake financial literacy training and business planning training. It will give you greater control and leave your business better prepared for the next drought. The NSW RAA has a number of approved workshops under the Farm Business Skills Professional Development Program, which are subsidised by 50% and could be the best use of your time until the rain starts to fall.



Reconsider the need for costly infrastructure that does not aid drought management. For example, renewing fences often improves the capital value of the farm (useful if it is to be sold) but to the detriment of short term cash flow. Photo Todd Andrews

**Table 2. Farm Decision Making Checklist, adapted from Commonwealth Bank booklet FARM (Finance Agriculture and Rural Management), 3rd Edition 1992.**

1. Are debt repayments a significant problem for me?	YES —Proceed to 2.	NO —Proceed to 3.
2. Can I reduce my debt repayments? Consider, for example: <ul style="list-style-type: none"> <li>» seeking lower interest rates;</li> <li>» extending the period of the loan;</li> <li>» seeking an interest-only loan;</li> <li>» selling some less-productive assets to repay some or all of the loan, e.g. the 'back' paddock;</li> <li>» repay the stock and station agent;</li> <li>» machinery that could be hired or contracted instead;</li> <li>» livestock that could be replaced by agisted stock.</li> </ul>	Yes —Proceed to 3.	
3. Can we increase our family income? Consider, for example: <ul style="list-style-type: none"> <li>» increasing crop yield;</li> <li>» increasing crop area;</li> <li>» increasing livestock numbers;</li> <li>» increasing marketing percentages;</li> <li>» increasing growth rates;</li> <li>» improving product quality;</li> <li>» improving marketing;</li> <li>» introducing new enterprises;</li> <li>» getting a job off-farm;</li> <li>» investing in an off-farm business;</li> <li>» contracting or share farming.</li> </ul>	YES —Proceed to 4.	NO —Proceed to 4.
4. Can I reduce my costs? Consider, for example: <ul style="list-style-type: none"> <li>» minimum tillage;</li> <li>» rationalising machinery;</li> <li>» reducing wastage at harvest and in storage;</li> <li>» sharing your machinery or specialised buildings with neighbours;</li> <li>» sell equipment under hire purchase or lease;</li> <li>» using sires longer;</li> <li>» reviewing feed purchases;</li> <li>» improving fuel efficiency;</li> <li>» reducing hired labour;</li> <li>» altering lifestyle;</li> <li>» reducing personal costs.</li> </ul>	YES —Prepare gross margins for the enterprises currently on the farm, and also look at other possible enterprises. Proceed to 5.	NO —Proceed to 5.
5. Can I now see any action that I can take to improve our situation?	YES —Prepare a cash flow budget for the coming 12 months. Proceed to 6.	NO —Proceed to 6.
6. Will I now have enough cash to pay my bills as far as I can see into the future?	YES —Proceed to 7.	NO —Proceed to 8.
7. Will this new situation offer me and my family a satisfactory life?	YES — STAY WITH IT !	
8. It seems clear that I cannot continue to farm my own land. Can I see any other ways of continuing to work on the land in a satisfying manner, apart from owning my own land? Consider, for example: <ul style="list-style-type: none"> <li>» selling, and working for another farmer;</li> <li>» selling, and leasing the farm land;</li> <li>» selling, and leasing a more productive farm;</li> <li>» selling livestock and machinery, leasing the farm to someone else, and working for another farmer.</li> <li>» You would be well advised to discuss your plan with your family, your banker, your accountant and your solicitor to see if there are any hidden traps. If there are not, proceed as quickly as you can without unduly jeopardising the price you will receive for your land, livestock and machinery.</li> </ul>		

## Resources for farm business finances

### Rural Financial Counselling Service (RFCS)

The RFCS provides free and impartial rural financial counselling to eligible primary producers, fishers and small rural businesses who are suffering financial hardship.

Contact: Northern region 02 6662 5055  
Southern region 02 6452 5850  
Central region 1800 940 404

Call 1800 768 593 or visit [www.raa.nsw.gov.au/about-us/contact-us/rfc](http://www.raa.nsw.gov.au/about-us/contact-us/rfc) to find your nearest rural financial counsellor.

### Farm Household Support

The Federal Government's Department of Human Services provides financial help for farmers and their families experiencing financial hardship. To be eligible:

- » you must be a farmer or the partner of a farmer. If you are the farmer, you must contribute a significant part of your labour and capital to the farm enterprise based on specific criteria
- » meet an income and assets test
- » be willing to undertake a Farm Financial Assessment
- » be willing to enter into a Financial Improvement Agreement to help you improve your financial circumstances

For more information phone the Farmer Assistance Line on 132 316 or visit [www.humanservices.gov.au/individuals/services/centrelink/farm-household-allowance](http://www.humanservices.gov.au/individuals/services/centrelink/farm-household-allowance)

### Office of the NSW Small Business Commissioner

Business Connect is an advisory program for small businesses in NSW, including agribusinesses.

Phone 1300 134 359 to make an appointment with your nearest advisor. Or visit <https://business-connect-register.industry.nsw.gov.au> to find an advisor.

### The Rural Assistance Authority (RAA)

The Rural Assistance Authority administers a range of assistance schemes.

As at 1 July 2019, the NSW Government's Emergency Drought Relief Package included:

- » the Farm Innovation Fund
- » transport subsidies (stock, fodder and water)
- » waivers to Local Land Services rates for 2020
- » waivers to fixed charges for NSW Water and bore licences
- » emergency water carting
- » waivers to interest charges for Farm Innovation Fund loans
- » mental health support, including rural counsellors
- » Farm Business Skills programs
- » donated fodder transport
- » rural preschool and long day care centre fee subsidies.

For more information phone 1800 678 593 or visit <https://www.raa.nsw.gov.au>

### Appeals process

The RAA has developed an independent system to review applications for assistance that have been refused. In the first instance the applicant should seek to discuss the refusal decision with the authority staff member responsible for the assessment. If the applicant is still not happy with the decision they can lodge an appeal within 20 days of receiving the RAA's written refusal.

## Regional Investment Corporation

### Commonwealth Farm Business Loans

The Australian Government has established the Regional Investment Corporation (RIC). From 1 July 2018, farmers have been able to apply to the RIC for the Commonwealth's farm business concessional loans. The RIC offers two loan products for farm businesses – farm investment loans and drought loans. For more information about the loans and eligibility requirements phone the RIC on 1800 875 675 or visit [www.ric.gov.au](http://www.ric.gov.au)

If you have an existing Commonwealth Concessional loan, the RAA will continue to administer this loan. Phone 1800 678 593 if you have any questions about your loan.

## Australian Taxation Office

Special rules apply to any income farmers may receive including:

- » Profit from forced disposal or death of livestock

You can elect to spread profit earned from the forced disposal or death of livestock over a period of five years. Alternatively, you can elect to defer the profit and use it to reduce the cost of replacement livestock in the disposal year or any of the next five income years. Any unused part of the profit is included in assessable income in the fifth income year.

If you are forced to shear your sheep a second time in the same financial year, there may be an opportunity to carry forward the income from the second shearing

You can elect to spread or defer profits if you dispose of stock or stock dies because:

- » land is compulsorily acquired or resumed under an Act
- » a state or territory leases land for a cattle tick eradication campaign
- » pasture or fodder is destroyed by fire, drought or flood and you will use the proceeds of the disposal or death mainly to buy replacement stock or maintain breeding stock for the purpose of replacing the livestock
- » they are compulsorily destroyed under an Australian law for the control of a disease (including bovine tuberculosis) or they die of such a disease
- » you receive official notification under an Australian law dealing with contamination of property.

For more information contact the ATO or your accountant.

### Financial difficulties and serious hardship tax provisions

The Australian Taxation Office has a range of options for farmers experiencing financial hardship such as deferred payment plans. For more information visit [www.ato.gov.au/General/Financial-difficulties-and-serious-hardship](http://www.ato.gov.au/General/Financial-difficulties-and-serious-hardship) or phone 1800 806 218 to discuss your situation.

## Office of the NSW Small Business Commissioner

Visit the Office of the NSW Small Business Commissioner website at [www.smallbusiness.nsw.gov.au](http://www.smallbusiness.nsw.gov.au)

Business Connect is a business advisory program for small businesses in NSW, including agribusinesses. Phone 1300 134 359 to make an appointment with your local business advisor or register online at

[www.industry.nsw.gov.au/business-and-industry-in-nsw/businessconnect](http://www.industry.nsw.gov.au/business-and-industry-in-nsw/businessconnect)

## NSW Farmers Association

NSW Farmers is a membership organisation representing farmers across NSW. NSW Farmers advocates on behalf of the NSW industry on key issues that affect farming businesses including biosecurity, farm trespass, animal welfare, imports and product labelling. The Association is made up of farmers from across the state, who work throughout the year to ensure the views of NSW farmers are being heard, both at the state and national level.

For more information phone 9478 1000 or visit [www.nswfarmers.org.au](http://www.nswfarmers.org.au)



### NSW Farmers' Drought Network

NSW Farmers' Drought Network has launched a page to provide service information, links to assistance and services to individuals and families conducting, directly or indirectly, primary production businesses, who are being impacted by drought conditions in NSW.

For more information visit [www.nswfarmers.org.au/NSWFA/Content/IndustryPolicy/Resource/Drought\\_Network.aspx](http://www.nswfarmers.org.au/NSWFA/Content/IndustryPolicy/Resource/Drought_Network.aspx)

# Personal recovery from drought

The much anticipated rain that 'breaks' a drought brings great relief but also starts the often long and difficult period of recovery. Prolonged and intense drought depletes farm businesses of natural, physical, financial and human resources. While these are not quickly or easily replenished, previous drought experiences show the importance of personal health and wellbeing in the ability of farm businesses to rebuild resilience and capacity.

While the tangible factors of finance, stock and physical resources can be seen and measured, what is often less visible – and easier to ignore – is a person's physical and mental health. The huge toll on health and wellbeing wrought by months and years of uncertainty, heavy workload, financial stress and depressing weather cannot be underestimated, as farmers face the challenge of bringing the farm back to normal production.

## Research findings from the 'Millennium Drought'

In 2004, the NSW Department of Agriculture commissioned research by Charles Sturt University into the social impacts and welfare implications of the 'Millennium Drought'. That project (available at [www.csu.edu.au/\\_\\_data/assets/pdf\\_file/0008/704483/Social-Impacts-of-Drought.pdf](http://www.csu.edu.au/__data/assets/pdf_file/0008/704483/Social-Impacts-of-Drought.pdf)) investigated a range of social and personal issues including debt, off-farm income, education access, employment, health, social isolation and family disruption. It concluded:

*"The widespread drought of the early twenty-first century had significant social impacts in all the communities studied. Increased poverty and loss of income are evident, as is the impact on education and service access, a loss of employment and an increase in social isolation.*

***Perhaps the most serious impact is on the health and well-being of community members. Consequently the welfare implications of drought are significant.***

*These include the need for health and welfare support, attention to services and access, and an identified need for support for the support workers. Most critical is the need for communities to recognise that drought has significant social consequences, so that the people most affected do not feel isolated or alienated during a time of great social upheaval."*

### On health, the study noted:

*"It is clear that both men and women are suffering health impacts but that men more often try to hide their emotional stress from the community, preferring to be stoic in the face of adversity. Women on the other hand try to hide their stress from their families and ignore their own health, attending to the health of those around them."*

### Some quotes from farmers interviewed for the research:

*"I was suicidal in January and February. Emotionally the worst period of my life. ... I feel very isolated. ... I'm running out of resilience to keep taking the blows and keep moving on. ... I carry the hurt inside." (Farmer)*

*"He's aged dramatically in the last 12 months. He's drinking more. He's quite depressed at times. I find that when I arrive home I have to see what sort of day he's had or how things are going before I react." (Farm woman)*

*"I'd like to bloody well just walk out of here, get in my car and just go North and leave the whole lot of it behind. It's all so hard but I can't do that. I'm very responsible. I'm responsible to my husband. I'm responsible to a farm. I'm responsible to myself and I'm responsible to my family. Personally I would have liked to just pack up this year and go work on a big cattle station and do something totally different. But now I'm locked into this." (Farm woman)*



Producer discussions on animal health, feeding options and pasture management are useful during and after drought both for learning from others' experiences and to reduce social isolation. Photo Todd Andrews

## Drought and stress

Below is an edited version of information from the HelpGuide. Visit [www.helpguide.org](http://www.helpguide.org) for more information.

### What is stress?

While the physical, emotional and mental effects of prolonged drought are many and varied, the common link to most situations is chronic stress, a condition not widely understood or addressed. Stress is a body's way of responding to any kind of demand or threat. When sensing danger—whether it's real or imagined—the body's defence is an automatic process known as the 'fight-or-flight' reaction, or the stress response. Stress hormones, including adrenaline and cortisol, are released which prepare the body for emergency action, including increased heart rate, blood pressure and breathing, and sharper senses. These physical changes increase strength and stamina and reduce reaction time.

In emergency situations, this stress response can save lives by providing extra strength for defence for example or braking hard to avoid an accident. Stress can also help to meet other tasks and challenges. But beyond a certain point, stress stops being helpful and starts damaging your health, mood, productivity, relationships and quality of life.

Stress responses can also be triggered by emotional threats such as arguments and work and financial deadlines. The more times that a stress response is activated, it becomes easier to 'set off' and harder to 'shut off' so that people who are frequently stressed may be in a heightened state of stress most of the time. That can lead to serious health problems including: sleep disorders, depressed immune system, upset digestive and reproductive systems, increased risk of heart attack and stroke and premature aging. It can even 'rewire' the brain, leaving affected people more vulnerable to anxiety, depression, and other mental health problems.

### Signs and symptoms of stress

The symptoms and impact of stress can be cumulative and can start to feel familiar or even normal. It's important to be aware of the common warning signs and symptoms of stress overload.

Table 3. Physical, emotional, behavioural and cognitive symptoms of stress

Physical	Emotional	Behavioural	Cognitive
Aches and pains	Depressed / unhappy	Eating more or less	Memory loss
Diarrhoea / constipated	Anxious / agitated	Sleep disorders	Inability to concentrate
Nauseated / dizzy	Moody / irritable / angry	Unsociable	Poor judgement
Chest pain	Feeling overwhelmed	Procrastinating	Negativity
Libido loss	Lonely / isolated	alcohol/drug use	Anxiety/racing thoughts
Persistent cold / flu		Nervous habits eg pacing	Constant worrying

### Causes of stress

Anything that is physically or emotionally demanding can be stressful. We usually associate stress with negative events but stress can also result from positive events such as buying land, taking a well-earned holiday or a happy family event such as the birth of a child. Not all stress is caused by external factors or events. Stress can also be internal or self-generated such as worrying excessively about something that may or may not happen, or having irrational, pessimistic thoughts about life. Something that causes you stress may not be stressful for someone else. What causes stress is your perception of something. For example, driving or feeding stock may cause anxiety because of the time required but it can also be relaxing if used to take some time out or combined with listening to music or reading.

Table 4. Common causes of stress

External	Internal
Major life changes	Pessimism/negativity
Work or school	Inability to accept uncertainty / change
Relationship difficulties	Rigid thinking/inflexibility
Financial problems	Negative self-talk/perceptions
Overworked	Unrealistic expectations/perfectionism
Children and family	All-or-nothing attitude

### How much stress is too much?

Everyone handles stress differently. While some people ‘roll with life’s punches’, others thrive on the excitement of a high-stress lifestyle, and others can become very stressed in the face of small problems or obstacles. There are a number of factors that influence your tolerance to stress: Support networks - A strong network of supportive friends and family is an enormous buffer against stress. Having people to ‘count on’ reduces pressure compared with the prospect of dealing with problems alone, or feeling isolated.

Your sense of control – If you are confident in your ability to influence events and persevere through challenges, it’s easier to handle stress. On the other hand, if you believe you have little control and are at the mercy of your environment and circumstances, you are more likely to be affected by stress.

**Your attitude and outlook** – A positive and optimistic outlook generally makes people less vulnerable to stress. Stress-hardy people tend to embrace challenges, have a stronger sense of humour, believe in a higher purpose, and accept change as an inevitable part of life.

**Your ability to deal with emotions** – Having the ability to identify and deal appropriately with emotions can increase your tolerance to stress and your ability to cope with adversity. Conversely, an inability to control sad, angry, or other negative feelings can escalate stress levels.

**Your knowledge, preparation and experience** – Your ability to draw on previous experience can have a huge impact on managing stressful situations. Knowing what worked well in previous droughts or what are others doing successfully will make it easier to cope.





Family gatherings are important in keeping rural communities vibrant and for families to interact and socialise with others. Photo Maria Cameron

### **Learn to relieve stress**

Being able to manage and relieve stress is the key to staying balanced, focused, and in control, no matter what challenges arise. As well as helping to cope with day-to-day stressors, employing stress relief techniques help bring the nervous system into balance.

There are many techniques for dealing with stress including exercise, yoga and meditation. Sometimes it's not practical (or even possible) to go for a run or meditate such as when you're feeding or watering stock, working a second job or dealing with family commitments. For these situations, you need something more accessible and immediate to relieve stress.

### **Use your senses**

The best way to reduce stress quickly is to take a deep breath and use one or more of your senses—sight, hearing, smell, taste, and touch. Find something that works to relax and calm you. This could be looking at a treasured photo, smelling a favourite scent, listening to an emotive piece of music, tasting a piece of gum, or hugging a pet.

### **Talk to someone**

Talking face-to-face with a relaxed and caring listener can be calming and help to release tension. This is not always practical when working alone on the farm for long periods but it is also why maintaining a network of close relationships is vital for your mental health.

The key to quick stress relief is to experiment and discover what works for you. For more strategies, visit the HelpGuide at [www.helpguide.org/articles/stress/quick-stress-relief.htm](http://www.helpguide.org/articles/stress/quick-stress-relief.htm)

### **Planning for health and wellbeing**

A study of responses to the 2015 Regional Wellbeing Survey by the University of Canberra, for the NSW DPI Rural Resilience Program, highlighted the strong link between personal and business resilience in farming. It concluded:

"The wellbeing of farmers is interlinked with what is happening on the farm. This means that supporting personal resilience will also flow through to supporting business resilience. Conversely, building farm business resilience not only improves farm performance, but also farmer wellbeing."



Importantly, the study also identified key factors contributing to higher levels of farm business resilience. It concluded:

- » Farmers with high farm business resilience were more likely to engage in:
- » developing strategies to cope with drought (67% compared to 45%)
- » assessing farm risks and planning for managing them (56% compared to 40%)
- » discussing their farm plan with others who can help inform it (68% compared to 48%)
- » the Farm Management Deposits Scheme (30% compared to 14%),
- » planning for farm succession (46% compared to 27%), and
- » actively monitoring outcomes on the farm (56% compared to 40%) and updating their business plan (41% compared to 32%).

The full report can be found at [www.regionalwellbeing.org.au](http://www.regionalwellbeing.org.au)

## A guide to support services and assistance

If you are feeling run down and stressed or suffering from an injury or a mental or physical illness, there are many services that can help you return to good health and operate at your best. See your local GP as a first step.

The following organisations and services can also help.

### NSW DPI Rural Resilience Program 'Listen, learn and link to create opportunities for farming communities'

The Rural Resilience Program supports farmers and their families through tough times. The program works closely with other partners such as the NSW Rural Assistance Authority, Rural Financial Counsellors, the Rural Adversity Mental Health Program (RAMHP) and the Local Lands Services to offer educational, personal and business resilience building activities. Rural resilience workers contribute to Rural Service Support Networks across NSW and work to ensure there is an informed and cohesive approach to supporting farmers across various agencies. The negative impacts of drought also challenge the resilience of local communities and farm businesses.

Team members listen to farming communities, learn about their issues and needs and also about what other services and opportunities are available. Where appropriate we link farmers into existing services and initiatives. If those services do not exist then wherever possible, we work with our community partners to create new initiatives and opportunities.

Visit [www.dpi.nsw.gov.au/about-us/rural-support/rural-resilience-program](http://www.dpi.nsw.gov.au/about-us/rural-support/rural-resilience-program)

Table 5. Rural Resilience Officers and Rural Support Workers:

Region	Name	Phone	Email
Riverina	Danny Byrnes (Hay)	0400 374 258	danny.byrnes@dpi.nsw.gov.au
Southern Region	Ted O'Kane (Goulburn)	0427 781 514	ted.okane@dpi.nsw.gov.au
North West	Amanda Glasson (Coonamble)	0438 082 731	amanda.glasson@dpi.nsw.gov.au
North Coast	Jen Haberecht (Coffs Harbour)	0400 160 287	jen.haberecht@dpi.nsw.gov.au
Western	Ellen Day (Broken Hill)	0427 639 761	ellen.day@dpi.nsw.gov.au
Hunter	Karen Sowter (Scone)	0400 869 136	karen.sowter@dpi.nsw.gov.au
Manning & Lower Hunter	Peter Brown (Taree)	0437 671 459	peter.v.brown@dpi.nsw.gov.au
Central West	James Cleaver (Dubbo)	0408 687 165	james.cleaver@dpi.nsw.gov.au
Central West	Sue Freebairn (Coonabarabran)	0429 212 368	sue.freebairn@dpi.nsw.gov.au
Northern Tablelands	Brian Sherwood (Tamworth)	0437 606 860	brian.sherwood@dpi.nsw.gov.au
North West	Grace Murray (LLS Bourke)	(02) 6870 8600	grace.murray@dpi.nsw.gov.au

## Farm Family Gatherings

There may be opportunities to work with your local Rural Resilience Officer or Rural Support Worker (see above) to have a Farm Family Gathering in your area. These 'gatherings' are an opportunity for support services such as financial, production and emotional/physical health providers to share knowledge and experiences with farming communities. They are also a great opportunity for farmers to share their knowledge and experiences. These gatherings lift the spirits of people when they realise that "they are not in this alone!"

## Mental health and wellbeing

For access to local mental health services contact the organisations listed below.

**The Rural Adversity Mental Health Program (RAMHP)** provides a range of information services to individuals, communities and service providers to link rural and remote people to the help they need. This includes information on where to access services, common mental illnesses and how to keep mentally healthy, as well as the Glove Box Guide to Mental Health. To find the location of your nearest RAMHP Officer call 026363 8444.

**Kids Helpline** – phone 1800 551 800 telephone counselling service 24 hours, seven days a week

**Community Mental Health Line** – phone 1800 011 511

**Mensline Australia** – phone 1300 789, 24 hours a day, seven-day telephone counselling for men

**Beyondblue** – depression information line phone 1300 224 636

**Lifeline** – phone 131114

**Australian Red Cross** – the Red Cross provides personal support during a disaster and an outreach service to affected households. Phone 1800 660 066 or (02) 49413200 in the Hunter area.

**Black Dog Institute** – phone 9382 4530

**The Salvation Army** – for personal support contact the Salvation Army Rural Chaplains.

- » Central NSW: Captains Jon and Leah Belmonte 0401 690 877
- » Western NSW: Majors David and Robin Pullen 0419 013 320
- » North NSW: Majors Rusty and Di Lawson 0417 797 785
- » Southern NSW :Majors Max and Karen Smith 0428 650 915

**St Vincent de Paul Society** – Vinnies has been transforming the lives of people experiencing hardship for more than a century. Dedicated drought relief is provided through the Rural Task Force, by Vinnies members who live and work in the communities they serve. When Vinnies receives a request, it conducts an assessment of need. A member then calls the applicant back within 24 hours to listen to their circumstances, make an assessment, and determine how Vinnies can best assist.

Vinnies has provided support to people affected by drought including:

- » Direct payment of utility bills, phone bills, council rates, vehicle registration, medical accounts, and education fees
- » Distributing vouchers for local businesses so that people in need can purchase local goods and services while keeping money within local communities by supporting local business
- » Providing hampers of food, personal care items, small household items, furniture and clothing
- » Covering the cost of water cartage for household usage
- » Visiting people in their homes to listen to them, provide moral and emotional support, and reduce loneliness and isolation
- » Provide referrals to specialist service providers, such as rural financial counsellors and mental health counsellors.

Telephone: 13 18 12 or 02 6862 5758, visit [www.vinnies.org.au/drougthhelp](http://www.vinnies.org.au/drougthhelp) or speak to the team at any Vinnies shop.

For a list of financial support services, refer to page 8.

# Soil and pastures management following drought

## Soil management

Maintaining adequate ground cover is not only important for pasture persistence and longevity, it is also vital for soil health, water infiltration and nutrient retention. Research has shown that erosion during drought-breaking rain can make up 90 per cent of the total soil loss in a 20–30 year cycle.

### Topsoil

Pasture and crop stubbles help water infiltrate the soil. Without them not only is crucial water lost from the system, but topsoil is also removed. The loss of 1 mm of topsoil represents losses of 10t of soil, 100 kg of organic carbon and 10 kg nitrogen per hectare. While most nutrients can be replaced with purchased fertilisers, organic carbon and topsoil are much harder to rebuild. Cultivating bare soils roughens its surface, reducing wind erosion and improving infiltration. Cultivation needs to be timed so that the soil is moist but not too wet. Cultivate on the contour to catch maximum rainfall and reduce run-off.

Cracking clays retain their structure but are still highly erodible without sufficient groundcover. On the other hand, the structure of non-cracking soils generally deteriorates during drought. Topsoils can become very dry and powdery and are highly vulnerable to erosion.

To reclaim eroded areas and prevent further erosion, consider planting cover crops in the short term to increase groundcover and constructing contours or soil conservation earthworks for long term solutions. These reduce and slow run-off, limit the movement of soil and organic matter, and reduce sedimentation and nutrient contamination of dams and waterways. Uncontrolled machinery traffic and stock trampling are major causes of soil compaction and erosion.

### Soil nutrients

Since mineralisation can continue in soils after plant growth has ceased due to lack of moisture, soil nitrate nitrogen (N) may increase during drought. Some portion of the fertiliser N applied to previous failed crops should also be available in the current year. However, prolonged heavy rains will move this soil N down the soil profile where it may not be readily available to young winter crops. Weeds can also use available soil N, reducing the amount available for subsequent crops. Consider deep (rooting-depth) soil tests to assess available N.

Phosphorus and sulfur may increase slightly during droughts due to low use, unused fertiliser from previous applications and mineralisation. Soil testing is useful in this situation. Where potassium levels are marginal, deficiencies are much more likely to be seen during dry years.

### Acid soils

Soil manganese is likely to increase following droughts, so avoid sowing susceptible crops such as canola on problem acid soil paddocks without first applying lime and allowing it to disperse and react. Drought has no impact on soil pH.

For more information on the management of soils during and after drought, view a webinar at: <https://youtu.be/oEn-OwuF8s4>

## Pasture management

Retaining adequate pasture stubble helps ensure perennial grass crowns and stems survive drought and maximises recovery rates when it rains and drought recovery begins. Retention of adequate plant cover (stem and crowns) is important for the survival of most perennial grasses and legumes. Research on the Northern Tablelands showed that the survival of perennial grasses was significantly better where more than 1000 kg/ha of pasture stubble was retained.

Note that losses following prolonged dry conditions (where some green feed may be available) can be greater than the losses from severe droughts. Plants are more likely to cease growth altogether in severe drought, whereas in a 'dry spell', plants continue to grow and are grazed, depleting plant energy reserves and resulting in the death of weak plants.

### Species adaptation to drought

Different species have different abilities for drought survival, and this can vary between areas. Even within a species, for example temperate perennials, some varieties are better able to survive drought than others. While grazing management is different for different species, a common need is to match stock numbers with pasture carrying capacity. Research suggests that overall stocking rates and fertility have more effect on pasture and soil health and long-term carrying capacity than any grazing management system.

### Introduced temperate perennial grasses

Temperate perennials, like phalaris, fescue, cocksfoot and perennial rye, generally require very high standard grazing management for drought survival, even in more favoured environments such as tableland and higher rainfall slopes areas. Heavy continuous grazing tends to weaken root reserves and lead to plant loss, especially when droughts begin with dry springs and lead into dry summers and autumns.

Different species have different grazing management needs (see NSW DPI pasture species growing guides). For example phalaris must be allowed to flower each spring to build root reserves for dry summer survival, a difficult management target in a dry spring. Phalaris is the most persistent of the temperate perennial grasses, followed by cocksfoot, fescue and then ryegrass.

#### Phalaris

Provided fertility is good, phalaris persists well, particularly on the heavier soil types even under heavy, prolonged grazing pressure. The more erect and winter active varieties such as Holdfast, Siroso and Sirolan are more sensitive to overgrazing than the prostrate Australian varieties. For more information refer to the [phalaris Primefact](#).

#### Tall fescue

The combined effect of dry, hot summers and heavy stocking, particularly with sheep, can cause high plant mortality, particularly in areas receiving less than 650 mm rainfall (Northern Tablelands) and 750 mm (Southern–Central Tablelands). This highlights the need for rotational grazing to reduce stress on fescue-based pastures, especially when grazed by sheep during summer.

Tall fescue varieties have either temperate/continental (eg Hummer, Quantum II) or Mediterranean (eg Flecha) origins. While the winter active/summer dormant Mediterranean varieties have much better drought tolerance and persistence in dry or marginal environments, their overall productivity is much lower than the summer active varieties.





Overgrazed native grass pasture is susceptible to wind erosion, has low water infiltration rate and is very slow to recover. Photo Bob Freebairn October 2018



Native grass pasture that has been rotationally grazed with reasonable ground cover retained can respond to rain. Photo Bob Freebairn October 2018



Improved tropical grass pasture that is rotationally grazed to retain ground cover can respond dramatically to rainfall in most months of the year in many areas. Photo Bob Freebairn October 2018



### Cocksfoot and ryegrass

These species are less persistent than Phalaris or Fescue, although cocksfoot's survival is better on heavier and more acidic soils and where pastures are stocked with cattle rather than sheep. Mediterranean cocksfoots (eg Currie) are more resilient than European types (eg Savvy, Porto, Megatas) although both are more drought resistant than perennial ryegrass.

In some situations, regeneration of ryegrass and cocksfoot from soil seed reserves was surprisingly good in the higher-rainfall areas (> 800 mm) following the drought of the early 1980s.

### Introduced temperate perennial legumes

#### Lucerne

While generally regarded as a relatively short to medium term species (four to eight years), well managed lucerne can be very resilient. Grazing management to ensure root reserves are replenished (rotational grazing) is especially important for persistence and plants should be allowed to reach full flowering after drought. Energy reserves in lucerne roots are at their lowest level two weeks after regrowth commences (see 'Figure 1') and grazing the green pick shortly after rain can significantly weaken a plant. 'Winter dormancy' rating and disease and pest resistance characteristics of individual varieties can also have an important impact on their persistence.

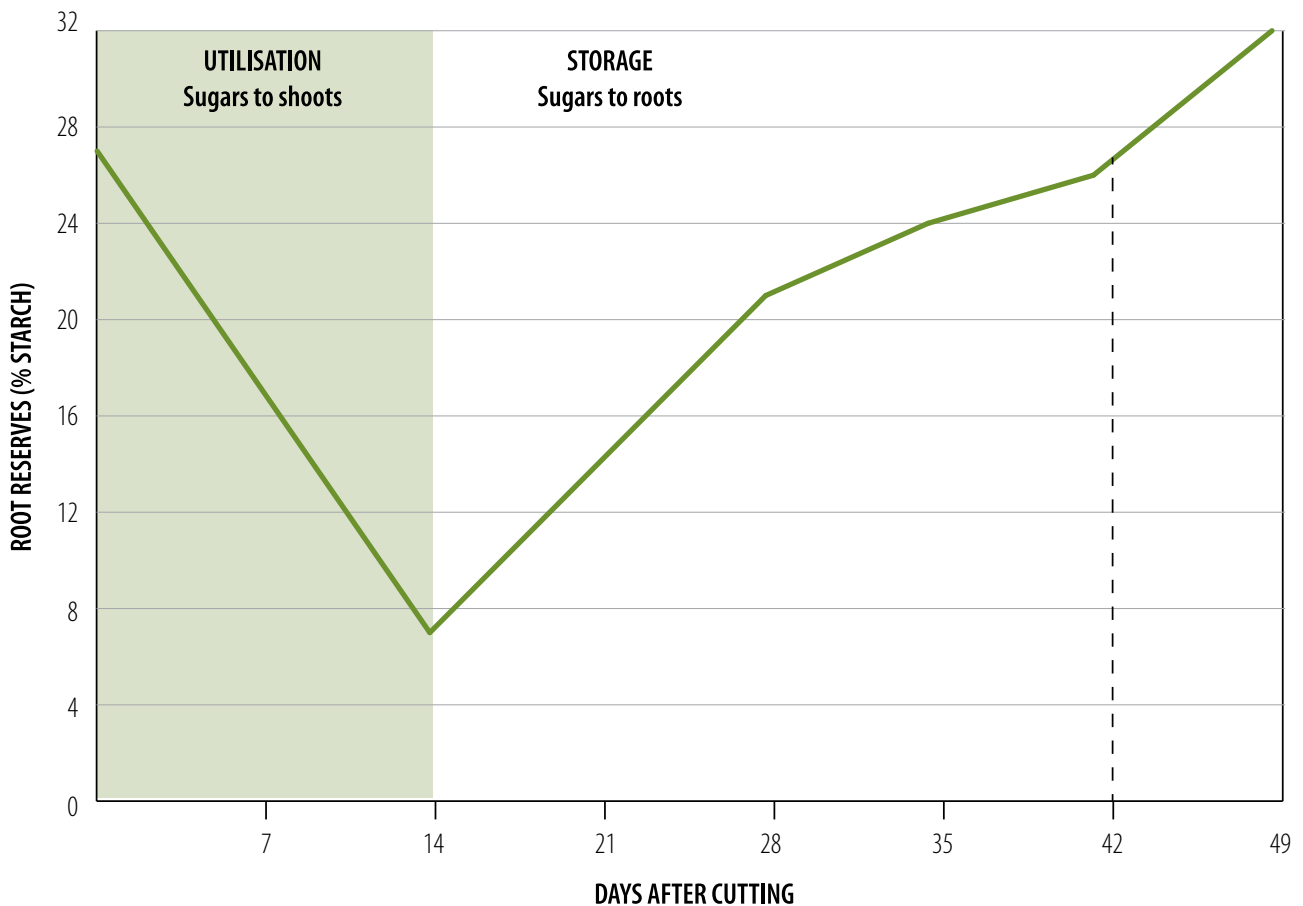


Figure 1. Root energy reserves in lucerne in relation to cutting time (Boschma and Williams, NSW Agriculture, Tamworth)

#### White clover

Shallow-rooted perennial legumes such as white clover generally do not survive as perennial plants, although varieties such as Haifa have good potential to recover from soil seed reserves. This is assuming that the pasture is well-established and has had a good opportunity to set seed.

## Tropical grasses

In many areas of central and northern NSW, temperate perennial grasses are being replaced by tropical perennials as they are proving to be far more persistent. Like most pasture types, tropical perennial grasses vary in their region and environment of suitability, but there are suitably persistent and drought tolerant species for most areas with at least 375 mm average annual rainfall.

For example, some varieties of Buffel grass are well known for their persistence in drier north western environments, especially on light to medium textured soils. Premier digit grass is a hardy species for light to medium textured soils in central and northern environments with low to medium rainfall. It has generally persisted better than various Rhodes grass and panic varieties, except for Bambatsi panic on heavy soils, where the two are often complementary. Megamax™ 049 is a newly released green panic showing promise in many central northern areas on a range of soil types.

Consol lovegrass is an especially persistent and productive species on lighter, acidic soils. Its aggressive growth into autumn, early winter and spring makes it hard to reliably grow in combination with winter legumes. Also, because its seed is difficult to distinguish from the weedy African lovegrass, it is not recommended for growing on the Tablelands.

Good grazing management is required in most environments for long-term persistence and for rebuilding depleted populations. Bambatsi panic, Premier digit grass, Consol lovegrass, Forest bluegrass and Buffel grass have survived recent droughts better than Purple pigeon or Rhodes grass.

## Native perennial grasses

Native perennial grasses generally survive drought well, although excessive grazing pressure will inevitably result in losses, particularly of the more palatable species. Survival and the potential for regeneration from seed depends on the species, management, and on the recruitment opportunities (rainfall). In a typical native grass pasture there are often 30–50 different species/varieties and good grazing management post drought commonly results in native perennial grass regeneration. There may already be a good level of seed of many useful native perennial grasses at the end of a drought, depending on pre-drought grazing management and seasonal conditions.

## Annual pastures

### Winter annual legumes

Sub clover, medics, serradella, biserrula, woolly pod vetch, gland clover and other introduced annual legumes are vital parts of most pastures and mostly survive droughts at reasonable population levels if they are well established and have good seed reserves. There is a wide range in maturity and 'hard seed' content of varieties, with high levels of 'hard' seed and early maturity important for long-term persistence. 'Hard' seed is dormant and does not germinate out of season, for example during summer or early autumn rains, while early maturing varieties can set seed on less rainfall.

Naturalised clovers such as burr medic (*Medicago polymorpha*) are common in many native and introduced grass pastures and have good to excellent levels of hard seed that allow them to survive droughts well if preceding seasons allowed reasonable seed set. Note that seed reserves may be depleted in heavily-grazed sheep pastures.

### Speciality pastures such as chicory and plantain

Species such as chicory and plantain require good grazing management, often facilitated by growing in smaller paddocks that can be carefully grazed. As short to medium-term pastures, their drought persistence is closely linked to grazing management.

## Grazing management following drought

Although livestock are often the focus of attention after drought, grazing management decisions should also consider pasture requirements, as a productive pasture base is necessary for a profitable business. Although destocking decisions during a drought often facilitate pasture rehabilitation, high feed prices and other pressures can mean that pastures are stocked too early after rains.

A grazing plan based on pasture type, pasture condition and stock requirements can be developed as part of property management plans. Livestock components of the plan may include:

- » assessing the condition of all stock classes
- » setting short-term and medium-term objectives for these classes, with particular emphasis on breeder fertility and target markets for finishing stock
- » accepting or seeking agistment stock depending on pasture growth, cash flow etc
- » concentrating stock on fewer paddocks to ensure pastures remain vegetative as long as possible, where pasture growth grossly exceeds stock intake. In turn, rest paddocks that are prone to weed invasion or have been heavily grazed during drought.
- » conserving pastures that are likely to become rank, replenishing conserved fodder reserves. Hay/silage options may also be important strategies for weed control.

## Assessing pasture survival and density

Before developing a grazing strategy, consider the pasture and how the drought has affected it. The survival of both perennial grasses and legumes can vary and is influenced by: total rainfall and distribution; pasture composition; soil type, slope and aspect; type of stock and stocking rate; grazing management; pasture pests, such as wingless grasshoppers, pasture scarabs, lucerne aphids and earth mites; and pasture health prior to drought.

Once pastures have started growing, it is important to evaluate what is left and determine whether the stand is satisfactory or needs resowing. It may be necessary to wait until spring to evaluate warm-season annuals and autumn for cool-season annuals. Seek agronomic help with pasture plant identification, as the density of perennial species is more important than that of annual species.

Minimum perennial plant densities vary between districts. For example, at Wagga Wagga or Tamworth a lucerne density of 15 plants/m<sup>2</sup> is thick and 9 plants/m<sup>2</sup> is acceptable while at Trangie, 8 plants/m<sup>2</sup> is thick and 5–6 plants/m<sup>2</sup> is acceptable.

Remaining perennial plants have the ability to take advantage of the additional space, nutrients and moisture, and may still produce reasonable yields. For example, one tropical grass plant/m<sup>2</sup> can produce around 85 per cent as much feed as 9 plants/m<sup>2</sup>. Native perennial grasses and temperate perennials require slightly higher populations than introduced tropical species.

## Value and management of surviving pasture

Pastures are under pressure after a drought breaks. Feed is expensive, cash reserves are often low, and it is tempting to continue grazing paddocks in the hope that growth will improve and meet stock needs. Consider the composition of surviving pasture in relation to its value to the enterprise following the drought. For example, both improved and native perennial pastures are difficult and expensive to re-sow and should be given priority for rest and recovery.

Pastures can be ranked according to their potential value and subsequent management requirements after drought, as follows:

- » Paddocks with moderate to high densities of desirable species, under severe stress due to drought and grazing pressure, must be managed carefully. These high-potential paddocks should be given priority for rest and recovery.
- » Paddocks with moderate-to-high densities of desirable species that have not been under severe stress from drought and heavy grazing may offer some grazing as conditions improve but will need management to allow full recovery. These paddocks should be rested as soon as practical.

- » Paddocks where the pasture density is too low to be rehabilitated can be considered for immediate grazing ('sacrifice paddocks'), cropping possibilities, resowing or pasture renovation.

Lucerne is a difficult pasture to restore once plant numbers have declined to suboptimal levels (for many areas around 7 plants/m<sup>2</sup>) as it is very difficult for new seedlings to establish between existing lucerne plants and other herbage. Often the best approach is re-establishment after a crop phase. Temperate perennials can also be difficult (but not impossible, especially in favourable environments) to rebuild via in-pasture recruitment. Management that allows for seeding but also some bare areas can increase plant counts in favourable conditions.

Native perennial grasses can rebuild populations to adequate levels, given appropriate management, when good seasonal conditions return. Post drought grazing management that encourages periodic seed set of existing plants provides opportunities for seedling recruitment and establishment. A degree of flexible rotational grazing is important for recovery.

Tropical perennial grasses can also be managed, much like native grasses, for recovery of plant population and productivity after drought. Annual legumes like sub clover and serradella can also be restored post drought, if correct varieties exist (or are added) and there is a reasonable remnant soil seed population. It is important to allow maximum seed set (lenient or little grazing once flowering commences until after seed set) to allow for rebuilding soil seed reserves.

### When to graze

High value and priority pastures should not be grazed when they are in Phase 1 (early vegetative growth, see 'Figure 2'). At this stage, they are weak and have insufficient leaf area to produce feed quickly. If pastures are grazed at this stage, paddocks should be rotated quickly and rested where possible, with a plan to allow perennial grasses to set seed as soon as conditions permit.

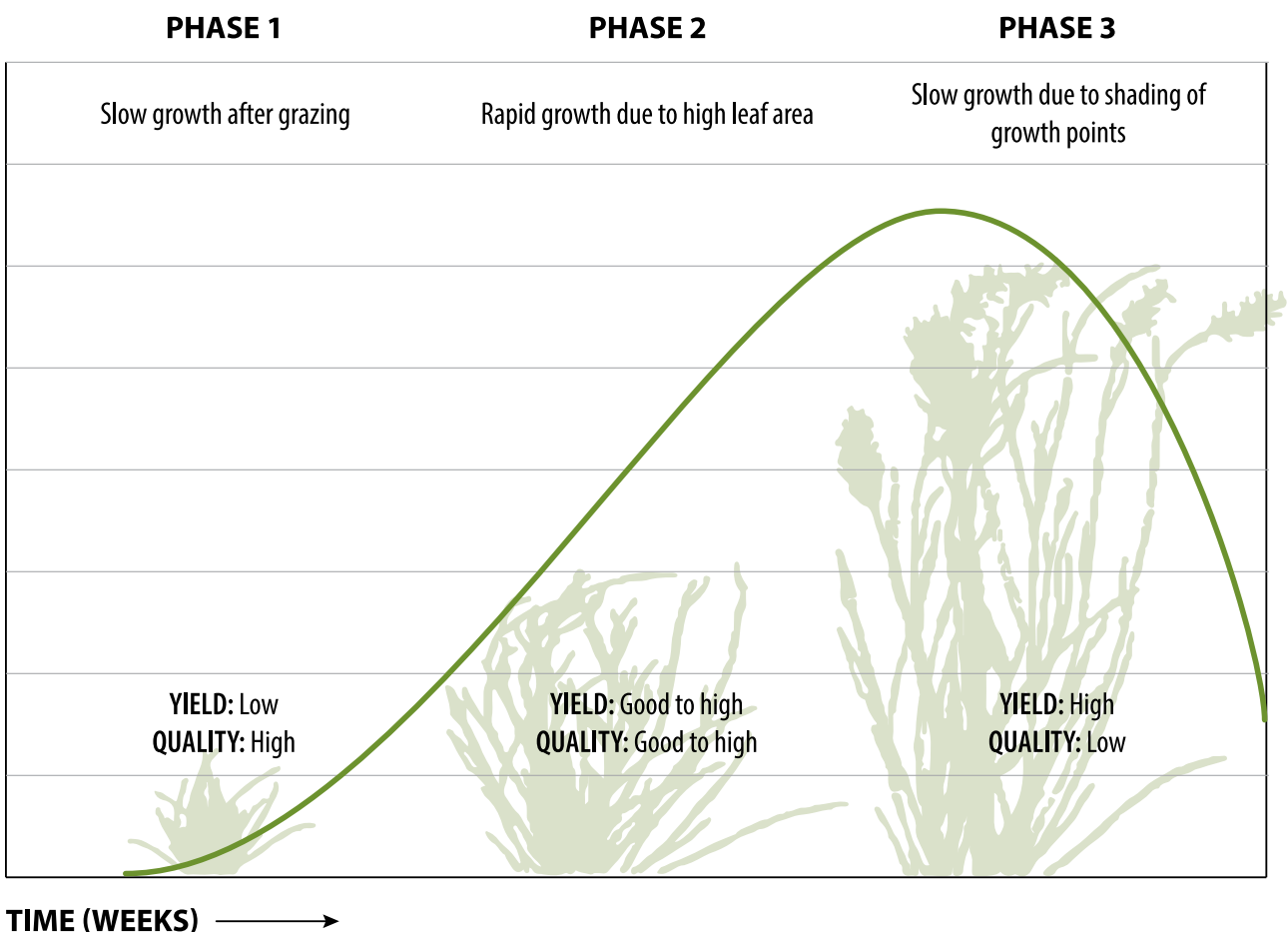


Figure 2. Simplified pasture growth curve. Source: The PROGRAZE Manual



Delaying grazing until pastures are in Phase 2 (late vegetative) allows plants to grow quickly with sufficient leaf area to produce feed efficiently. Pasture height at different growth stages varies depending on species, density, and growing conditions but as a guide, a healthy, dense perennial grass/legume pasture in Phase 2 would be between 3–11 cm in height (1000–2500 kg dry matter/ha) around 4–6 weeks after rain. Ideally, pastures should be allowed to reach Phase 3 (flowering) after a long stress period.

### Resowing/cropping/ renovation options

Paddocks with low recovery potential can be resown, cropped or renovated. Options include full seed-bed preparation or spraying and direct drilling for forage, cash crop, or permanent pasture (Table 1). Note that some annuals, such as sub clover, can be surface-applied in high rainfall areas.

### Forage crop selection

Fast-growing forage crops are suitable for a pasture regeneration program after drought. Once established, they can relieve grazing pressure on pastures. They are also useful for suppressing weeds prior to resowing pasture and for replenishing hay and fodder reserves.

The most suitable forage crop will depend on:

- » when the feed is required
- » what quality of feed is needed
- » sowing conditions, including soil moisture and temperatures
- » soil type.

Japanese millet or early-maturing cereals provide quick feed after drought. Where crops are required to provide feed over a longer period, forage sorghums or hybrid millets are ideal for the Slopes and Plains as are brassica forages on the Tablelands.

**Table 6. Options for pasture renovation**

Paddock situation	Options
Totally degraded. Substantial loss of introduced perennial grasses. Heavy weed invasion.	Annual forage crop (eg Japanese millet, cereals). Short-term pasture (Italian ryegrass/red clover). Cash crop (cereals, oilseeds, ryegrass, coarse grains to allow selective weed control). Select the most arable and fertile paddocks first. High priority.
Partial loss of introduced perennials. Some weed invasion. Reasonable legume recovery likely.	Weed control and direct drill to re-establish perennial pastures. Seasonal weed control (winter clean spray-graze). Moderate priority.
Survival of perennials more than 70 per cent. Poor legume survival. Some weed invasion.	Reintroduce legume by sod-seeding or broadcasting. Resume fertiliser applications to lift P and S or when cash flow allows. Selective broadleaf weed or annual grass removal, or use of 'weed wiper' equipment. Moderate priority.
Fair to good survival of native perennial grasses. Poor legume survival. Some weed invasion.	Low priority for early action. Add legume seed and P and S fertiliser when cash flow improves.

# Preparing for cropping after drought

Following drought or poor crop years there are a range of agronomic factors that can impact on cropping decisions. They include a higher risk of herbicide residues and soil borne diseases but also potential benefits such as carryover soil nutrients and lower risk of foliar diseases.

Given the importance of prudent cash spending after drought, sowing decisions should be based on good information about stored soil water, fertility and likely disease pressure. There are many sources of information including farm consultants and agronomists with access to soil and disease testing tools and decision support programs.

Three broad farming system categories account for much of the cropping in NSW:

- » cropping-only farms with a mix of cereals, pulses and oilseeds
- » mixed-farms with cropping and livestock grazing pastures, cereals and winter canola.
- » predominantly grazing enterprises that include grazing crops that fill autumn-winter feed gaps and reduce grazing pressure on pastures.

The following considerations are important for all three farming systems.

## Compare crop growing costs, gross margins and risk

Gross margin budgets help to evaluate the potential returns of different crop options. A gross margin is the projected gross income from an enterprise less the variable costs (seed, fertiliser, pesticides, fuel, harvesting costs, freight, insurance). Fixed or overhead costs (depreciation, interest payments, rates, permanent labour) are not included. Crops that can generate a positive gross margin under a range of conditions should be favoured over new, high risk/high reward crops. Gross margins can be used to show potential returns over a range of possible prices and yields.

## Seed supplies and seed quality

Seed is the most important single input into a farming system and supplies for winter crops are often low after persistent, widespread drought. If using seed retained from previous seasons, it is important to test the seed for germination and vigour through an accredited laboratory. Good quality seed of any grain crop should have a germination percentage greater than 90%, although high germination rates do not necessarily result in good seedling vigour. Small and shrivelled seed is most likely to exhibit poor germination and vigour, while seed stored incorrectly (high moisture and high temperature) or for long periods can also suffer from reduced germination rates.

Grading to remove smaller seed significantly improves overall germination and vigour. Retained canola seed should be graded to 2 mm diameter for sowing. Be aware that some seed dressings can reduce vigour by reducing coleoptile length, which might lead to poor establishment rates. Refer to the [NSW DPI Winter crop variety sowing guide](#) for more information.

Ensure that purchased seed is true to the variety claimed by the vendor so that it can be sown at the recommended time. Select varieties best suited to your area and include seed costs when calculating gross margins. For example, pulse seed costs can be up to \$100/ha after drought, while canola seed may cost as little as \$5/ha for retained supplies.

## Stored soil water

Stored soil water is critical to profitable winter cropping, reducing the reliance on in-crop rainfall, and has traditionally been more important in northern NSW where summer rainfall predominates. Increasingly variable rainfall patterns mean that stored soil water at sowing is now important anywhere crops are grown, and is particularly important for early sown and dual-purpose grazing crops that are subject to warmer temperatures and higher evaporation rates. A short season, low risk crop such as barley is ideal for paddocks with low soil water reserves. Barley also provides rapid ground cover to protect against wind erosion.

Paddocks with insufficient stored soil water at sowing can be fallowed through to a summer crop in northern NSW, or long fallowed to the following year's winter crop in western areas of central and southern NSW, provided there is sufficient ground cover. A steel push probe inserted accurately is an easy and quick way to assess the depth of water in the top metre of soil. A push probe cannot measure plant available water however, as this varies with factors such as soil texture. More than 1,100 soils across Australia have been characterised and plant available water holding capacity (PAWC) estimated. These are available on the [APsoil database](#).

Deep soil testing down to 1.8–2.0 m can be used on the vertosol soils of northern NSW to estimate PAWC and also soil nitrogen (N). This helps match N fertiliser requirements to soil water. Measuring PAWC for a specific paddock and its characteristics is described in the [GRDC Manual: Field measurement of PAWC](#).



A dual-purpose cereal sown in late February 2018 on good sub soil moisture. Despite the drought this paddock supplied grazing for 120 days at a reduced average level of 1.5 steers/ha and recovered for harvesting. Photo Bob Freebairn

## Soil fertility

Mineralisation often continues during drought, although the amount depends on soil carbon levels and total rainfall. When combined with the potential carryover of nutrients from previous failed crops, the only reliable method for determining N status is to test deep soil N on each cropping paddock. Nitrogen rates need to be matched with the amount of stored soil water and the paddock yield target. Where winter rainfall is more reliable, splitting N between sowing and topdressing in-crop is a sound risk management strategy.

Crop phosphorus requirements are also best determined by soil testing. Soil phosphorus (P) can be stratified (layered) in no-till farming systems, where P is applied relatively shallow and near the seed. If the topsoil is dry, any phosphorus will not be available to the crop. Using soil tests and previous experience with P applications following a drought is the best guide. Anecdotal evidence following previous droughts suggests that P rates can be reduced by about 30% on normal rates. Note that P applied at sowing is most effective.

## Sowing time

Sowing dates should not alter significantly after a drought, except where the main aim of the crop is to generate feed and ground cover. Capitalise on accumulated soil water and nitrogen by sowing as early as possible within the recommended sowing period for each variety. To sow all crops within the sowing window, some crop types may need to be sown slightly earlier than recommended, taking into account location and frost risk.

## Herbicide residues

The rate at which herbicide residues are broken down is affected by soil moisture and temperature, and pH in some cases. As a result, droughts increase the risk of crop injury, particularly from residues of group B herbicides (including sulfonylureas, imidazolinones, Broadstrike®, Spinnaker®) and group C herbicides (triazines). Note also that the plant-back period for Group I products such as Phenoxy and Pyridines applied for summer weed control does not start until a specific amount of rainfall is received. Other herbicides that can persist in soils depending on seasonal conditions are listed under 'Guidelines for crop rotations' in the NSW DPI guide *Weed control in winter crops*. Further information on herbicide residues in dry conditions can be found at [www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0014/100238/herbicide-residues-after-drought.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0014/100238/herbicide-residues-after-drought.pdf) and, [www.agric.wa.gov.au/grains-research-development/residual-herbicides-carryover-and-behaviour-dry-conditions?nopaging=1](http://www.agric.wa.gov.au/grains-research-development/residual-herbicides-carryover-and-behaviour-dry-conditions?nopaging=1)

Accurate record keeping is critical to keeping track of herbicide use in paddocks to ensure that residues do not impact subsequent crops. There are a number of farm software products available with simple record keeping functions.

## Summer fallow weed control

Stubble retention and strict summer fallow weed control programs maximise stored soil water for winter crops. Weed control has the biggest benefit, with research in NSW, Victoria and South Australia showing a return of \$3–8/ha (averaging \$5/ha) for every dollar spent on fallow weed control. Uncontrolled weeds can remove up to 40–50 mm of stored soil water but also remove about 50 kg N/ha. These results are also relevant in mixed farming businesses where weed control decisions are often compromised by livestock feed needs: it is rare that the feed value of summer weeds is greater than the value of the water to the winter crop.

## Rotations and diseases

Following drought the aim should be to get paddocks back into sound agronomic rotations/crop sequence as quickly as possible. Where failed crops were grazed or made into hay, avoid sowing the same crop the following year, where possible. On these paddocks with low ground cover it is best to target a cereal crop that will generate some stubble and cover for the next summer, rather than planting a low biomass crop (e.g. lentils). Pulses should be sown onto paddocks with relatively high stubble loads. Similarly, paddocks with high ground cover will be more likely to retain moisture close to the surface for germination of crops such as canola.

Good weed control options are an important consideration in paddocks where weed control has been compromised during drought. For example, break crops or fallows are generally not as effective during drought as in other years. Consider the use of pre-emergent herbicides to reduce early weed pressure on the crop.

The risk of soil-borne disease is often higher after drought, as the rate of decomposition of crop residues that harbour disease inoculum is slowed by the low moisture. The main diseases to consider are crown rot in cereals, *Ascochyta* blight in chickpeas and blackleg in canola. Canola blackleg inoculum is carried over on stubble, including crops cut for hay, although crops grazed or sprayed out in mid-winter will have much less inoculum carry-over. There is also a lower risk of foliar diseases in a dry season, which may reduce the risk of infection in subsequent years. Seek advice on the lowest risk options that best fit the farming system.



The PREDICTA® B test is a reliable technique for assessing the risk of crown rot and a range of other soil- or stubble-borne pathogens prior to sowing. Consult your local agronomist if you are in an area with a history of crown rot. See the following websites

[http://pir.sa.gov.au/research/services/molecular\\_diagnostics/predicta\\_b](http://pir.sa.gov.au/research/services/molecular_diagnostics/predicta_b)

[https://grdc.com.au/\\_\\_data/assets/pdf\\_file/0025/159352/grdctipstacticscrownrotnorthern201602web.pdf.pdf](https://grdc.com.au/__data/assets/pdf_file/0025/159352/grdctipstacticscrownrotnorthern201602web.pdf.pdf)

## Cereals for grazing

Forage and dual-purpose cereals are often grown to help overcome autumn and winter feed shortages, as oats and other grazing cereals have higher winter growth rates than most pastures. Crop and variety selection and sowing time will influence the total amount of feed available, while dual purpose varieties can be harvested for grain after grazing. For hay production, avoid cereals with large awns such as barley, some triticales, cereal rye and some wheats. The same applies to grazing awned varieties when head emergence cannot be avoided.

Ideally, there should only be one type of cereal sown in a paddock as stock will preferentially graze one cereal over another. Oats will generally produce more overall forage than wheat, barley, cereal rye or triticale. Grain recovery, however, is not so clear cut, with winter wheats and triticale often having similar or better yields than oats and a higher dollar value. Further information on growth habit, maturity, sowing time, grazing management, stocking rates, and livestock health is discussed in the section 'Managing grazing cereals' in the NSW DPI *Winter crop variety sowing guide*.

## Dual-purpose canola

Grazing canola has increased in popularity on mixed farms of the upper slopes and tablelands due to its ability to provide early, good quality forage and then to recover for grain harvest, thereby improving total farm profitability. Winter-types are preferred and are commonly sown in February– March subject to soil moisture and sowing opportunity. Longer season spring types can be sown from late March–early April and grazed as well.



Dual purpose canola can supply more feed, faster for drought affected livestock. The winter wheat crop (left) was sown four days later than the canola (right). Dual purpose canola has a vernalisation (cold) requirement to set seed after grazing and so cannot be grown in all cropping areas of northern NSW. Photo James Brady

## Further information

- » Winter crop variety sowing guide  
<https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/winter-crop-variety-sowing-guide>
- » Weed control in winter crops  
<https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/weed-control-winter-crops>
- » Dual purpose grazing cereal evaluation in NSW - Trial report 2016  
[https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0019/800470/NSW-Cereal-Grazing-Trial-Full-Report-2016-FINAL-accessible-v2.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/800470/NSW-Cereal-Grazing-Trial-Full-Report-2016-FINAL-accessible-v2.pdf)
- » Herbicide residues after drought  
[https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0014/100238/herbicide-residues-after-drought.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0014/100238/herbicide-residues-after-drought.pdf)
- » Retaining seed: Fact Sheet GRDC 2011  
[https://grdc.com.au/\\_\\_data/assets/pdf\\_file/0019/204175/grdcfsretainingseed.pdf.pdf](https://grdc.com.au/__data/assets/pdf_file/0019/204175/grdcfsretainingseed.pdf.pdf)
- » Summer crop production guide 2014  
<https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/summer-crop-production-guide>
- » Insect and mite control in field crops 2013  
<https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/insect-mite-crops>

## Other useful websites:

- » GRDC  
<https://grdc.com.au/>  
<https://grdc.com.au/resources-and-publications/grdc-update-papers>
- » CliMate App  
<https://climateapp.net.au/>

# Weed management after drought

Droughts can often set back long-term weed control strategies for both pasture and cropping weeds. An accurate risk assessment and well-planned, long-term management strategies are essential parts of an effective weed control program.

## Weeds in pastures

At the end of a drought, ground cover has declined and pastures are less able to compete with weeds for light, nutrients, moisture and space. As a result, pre-existing weeds can rapidly increase their distribution and abundance, especially those with large and persistent seed banks.

While populations of annual weeds such as saffron thistle and fireweed may increase in the short term, well managed perennial pastures can gradually overcome these weeds or at least keep them to acceptable levels. Potentially more problematic are perennial weeds that are more difficult to manage, including African lovegrass, serrated tussock, Chilean needle grass and giant *sporobolus* species; blue heliotrope (*Heliotropium amplexicaule*), nodding thistle (*Carduus nutans*); Scotch thistle (*Onopordum* spp.), St Barnaby's thistle (*Centaurea solstitialis*) and St John's wort (*Hypericum perforatum*). Note that the weeds that appear after drought will be influenced by the soil temperatures (season) and other factors.

Following summer rains, there can be an increase in livestock weed poisoning as weeds produce palatable new shoots. Stock losses can result from both direct plant poisoning such as from green cestrum and rockfern or indirect such as photosensitisation from *Panic* spp. grasses, kidney failure from *Amaranthus* spp. and nitrate poisoning from thistles, marshmallow or Johnson grass.

Stock movements to agistment properties during drought, and back home again after rain, represent another means by which weeds can be moved. Gathering information about the presence and potential spread of weeds, and implementing management strategies such as stock quarantine, are important in managing this risk.



Producers need to be vigilant for high risk weeds that can be introduced with drought fodder. For example, giant *Sporobolus* grasses (pictured) are serious weeds of coastal New South Wales and Queensland, where hay has been produced and sent to other areas. Photo Todd Andrews



## Weeds in crops

In cropping areas, the potential for weed infestations may be similar to most other years. The immediate problem is fallow weeds, which deplete the soil of both nutrients and moisture. The problematic species may not change and may include common heliotrope (*Heliotropium europaeum*), summer burrs – Bathurst and noogoora burrs (*Xanthium* spp.), caltrops (*Tribulus terrestris*), *Amaranthus* spp., panic grasses (*Panicum* spp.), mintweed (*Salvia reflexa*), Johnson grass (*Sorghum halepense*), wireweed (*Polygonum aviculare*) and various thistle species.

## Weeds from introduced fodder and grain

Weed seeds can be introduced in both hay and grain. When these feeds are introduced from any off-farm sources, the risk of introducing weeds increases. As a result, paddocks should be checked regularly for new or unusual plants, especially where fodder has been fed out.

In a widespread drought, hay and grain may need to be sourced from interstate. This may lead to the risk of introducing weeds that are not yet established in NSW. Major weeds of concern that are present in other states include:

- » Parthenium weed (*Parthenium hysterophorus*) from Queensland
- » black knapweed (*Centaurea nigra*) from Victoria
- » Multiple herbicide resistant annual ryegrass from Western Australia
- » bifora (*Bifora testiculata*) and bedstraw/cleavers (*Galium tricornutum*) from South Australia. Note that bifora and bedstraw are widespread in the South Australian wheat belt. If fodder has originated from these areas, it is important to check for any weed seedlings in areas where stock have been fed. For a more comprehensive list of high risk weeds and photos, refer to [www.dpi.nsw.gov.au/biosecurity/feed-and-fodder/managing-biosecurity/high-risk-weeds](http://www.dpi.nsw.gov.au/biosecurity/feed-and-fodder/managing-biosecurity/high-risk-weeds)

The potential to introduce herbicide resistant weed seeds such as annual ryegrass can have major implications for crop production. Herbicide resistance is widespread in the grain belts of South Australia and Western Australia. As large quantities of grain and hay have been brought from these areas, this highlights the importance of biosecurity when drought feeding.

Other potential weed contaminants of both grain and fodder are Paterson's curse (*Echium plantaginium*), silverleaf nightshade and other deep rooted perennials such as ground cherries (*Physalis* sp.), wild radish (*Raphanus raphanistrum*) and spiny emex (*Emex australis*). These last two species are major weeds in NSW but could spread further as a consequence of drought feeding. Weeds from coastal NSW that have the potential to become established inland, especially in the summer rainfall zone and in irrigation areas, include Tropical soda apple (*Solanium viarum*), fireweed (*Senecio madagascariensis*) and Giant Parramatta grass (*Sporobolus fertilis*).

## Control strategies

### Plant identification

Early identification and control are the most important steps in weed control and eradication. Consult an agronomist or council weeds officer to help identify all new or unusual plants and implement effective control methods. **WeedWise** is a NSW DPI program that provides descriptions, photos, distribution maps and control information for more than 300 weeds. It can be downloaded as an app or is available as a desktop version at [www.dpi.nsw.gov.au/biosecurity/weeds](http://www.dpi.nsw.gov.au/biosecurity/weeds)



## Importing stock feed onto a property

- » Obtain as much detail as possible about the source of the fodder or grain and local weeds.
- » Consider carefully where the grain and fodder are to be fed. Where possible, avoid cropping paddocks due to the potential to spread herbicide resistant weed seeds.
- » Restrict the feeding area as much as possible. A drought lot or stock containment area may be the best option, located where regular checks can be made after rain. Flat, arable areas allow easy access and the opportunity for a range of weed control options (mechanical, chemical, biological, or grazing management).
- » Quarantine or restrict stock movements. Annual ryegrass seed is normally digested by sheep, and very little viable seed passes through the digestive tract.

## Weeds and earthmoving machinery

During a drought, many livestock producers engage a contractor using a tracked excavator to remove silt from farm dams while water levels are low. The tracks on these machines can spread many weeds, including lippia (*Phyla canesens*) and spiny burr grass (*Cenchrus* sp.). Wherever possible, ensure the tracks and track frames on these machines have been cleaned by the operator before work starts.

# Controlling vertebrate pests during and after drought

Reducing the potential rate of population increase should be the focus of vertebrate pest management strategies. Producers can take advantage of the natural vertebrate pest population decline caused by prolonged drought and greatly reduce the potential rate of increase.

## Mice

Populations of small vertebrate pests such as mice usually decline during drought as the high nutrition requirements for breeding are unavailable. Rodent problems are mostly found around farm buildings and feed stores during drought. Controlling rodents around these areas reduces feed loss, and the risk of livestock diseases associated with feed contaminated by faeces and urine.

Mice populations can increase dramatically if drought breaking rain provides them with an abundance of food and shelter. Mice that survive natural phenomena such as drought are the strongest and fittest of the population and a single pair of mice can result in many hundreds more over a six-month breeding period. Drought can also reduce the numbers of predators that would otherwise control them.

## Rabbits

Rabbits living in areas that have a lot of seed in the soil, particularly clover or medics, are able to survive and breed well into a drought. When this feed source is exhausted, the population can suddenly crash. In most areas, rabbit populations decline or contract to core warrens during drought, as the absence of green pick inhibits breeding. Remaining rabbits are likely to be hungry and because they seek food with high moisture content, baits can be particularly effective.

If rabbits have contracted to core warrens, these can be ripped and sown with pasture seeds ready for rain. There is the risk of increased erosion around ripped warrens however, and this should be weighed against the long-term benefits of ripping. Trapping is seldom used for broad-scale rabbit control, but can be useful around buildings or when bait uptake is difficult because of alternative feed. Only soft-jawed traps or cage traps are permitted: steel-jawed traps are illegal in NSW.

While producers are often busy feeding stock or shoring up water supplies during drought, any expenditure on rabbit control can be beneficial by reducing the breeding population when the drought breaks. A single pair of rabbits may produce up to 40 rabbits over a six-month period in good conditions, through their own mating and the mating of their offspring.

Areas that receive sufficient rain and have moderate to high rabbit densities may experience a virulent myxomatosis or calicivirus outbreak. This should not be relied on however, as it is impossible to predict the timing or effectiveness of any outbreak.



Targeting feral animals during drought when they congregate around dwindling water supplies, keeps their numbers lower for longer during recovery. Photo NSW DPI

### Feral pigs

Feral pigs can benefit from increased feed availability from carrion during the early stages of drought. As drought progresses however, they stop breeding and many piglets die as they are highly dependent on water for thermo-regulation and quality forage for reproduction and lactation.

As populations retract to areas with permanent water, they can foul those water supplies, reducing clean water availability for livestock. Their concentrated distribution and the lack of cover during drought makes pigs susceptible to trapping and aerial shooting programs. Coordinated and effective control programs during these times can have significant impacts on long-term pig populations.



Figure 3. The change in numbers of feral pigs in good and bad seasons after 50% and 90% control kills (Source: Hone et al. 1980, Decisions in the control of feral pig damage, Ag Bulletin 5, NSW Agriculture)

## Wild dogs

Wild dog populations can also benefit during the early stages of drought due to increased food availability including weakened or mismothered lambs, native animals, or carrion. Wild dog populations may decline during extended droughts, especially if there are major declines in native prey such as kangaroos and wallabies, lower feral goat and sheep populations, fewer calves, and as water bodies dry up.

Predation can be more obvious however as stock become weaker and gather around water or feed sources. Ground baiting and trapping can be targeted at these areas. As a result, broad scale co-operative control programs like coordinated aerial and ground baiting are likely to be more effective in reducing wild dog numbers during drought.

Note that competition for baits by foxes, pigs and birds may increase during drought. Leg-hold trapping is effective for removing troublesome dogs that refuse baits and is best conducted by experienced trappers using soft-jawed traps that conform to legal requirements.

If wild dog populations decline during drought, there may be less predation afterwards. Some dogs will disperse to new areas, regardless of food availability. This may be more obvious as they scavenge on dead livestock in previously unaffected areas. Landholders should remain vigilant, particularly in autumn and winter when dogs usually disperse.

Monitoring wild dog activity during drought and after fires allows control measures to be implemented before predation of livestock becomes a major problem. There are strict regulations governing the poisoning of wild dogs. Poisoned baits can only be prepared by authorised Local Lands Services (LLS) officers. Advice on baiting programs and group coordination is available from your local LLS office or at [www.lls.nsw.gov.au](http://www.lls.nsw.gov.au).

## Foxes

Fox populations generally remain relatively static, even during extended droughts if there is a supply of carrion such as lambs, kangaroos and wallabies. In many instances foxes will prey on insects, such as locusts, to sustain themselves. However, this alternative food supply does not necessarily reduce lamb predation as foxes will increase their territories in search of alternate prey.

Landholders should always remain vigilant, particularly in autumn and winter when young foxes are often dispersing and older females are breeding. Young, inexperienced foxes will often leave their parents' home range, regardless of feed availability. If juveniles do not disperse, then there is a potential for much more localised predation of lambs and poultry.

A baiting program is usually inexpensive and can be carried out in early autumn (to reduce breeding animals), with a follow up in late winter to reduce pregnant females. LLS vertebrate pest teams can help with a baiting program.

## Summary

All invasive animals gain body weight and start breeding when a drought breaks. If the pest population is already low and can be made lower by tactical control, this will generally be a good investment because the recovery rate of the population is much slower. A coordinated approach by adjoining landholders and land managers will maximise and prolong the benefits. Otherwise pests will simply breed-up and migrate from adjacent areas.

Drought can also severely reduce the number of predators in a system with predator populations usually taking longer to recover than their prey. This means that many pest species can breed with few constraints once good seasons return, so populations can increase extremely quickly.

## Further information and assistance

- » PestSmart Connect:  
[www.pestsmart.org.au](http://www.pestsmart.org.au)
- » Local Lands Services:  
[www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)



## Managing total grazing pressure

Managing total grazing pressure (i.e. the ratio of the demand for forage relative to the availability of forage at a point in time) is essential in achieving grazing strategies during drought recovery. It plays an important role in restoring ground cover, regenerating and resting pastures, and maximising the opportunity for pasture growth following rain.

Forage demand considers the intake requirements of all grazing animals. It includes the demand by domestic livestock and non-domestic animals that consume forage. At times, the demand for forage by non-domestic animals including unmanaged goats, kangaroos, rabbits and pigs can be substantial. Studies in western NSW have found that kangaroos and unmanaged goats can contribute more than half the total grazing pressure.

The unmanaged grazing pressure exerted by non-domestic animals can make achieving resource condition and grazing targets challenging, particularly during drought recovery when pastures have low biomass. Although the stocking rate of domestic livestock can be readily adjusted relative to available forage, free-roaming animals can graze de-stocked paddocks, limiting attempts to rest and regenerate pastures. The uncertainty about likely forage consumption by unmanaged grazers is problematic when developing fodder budgets.



Harvesting goats during drought generates cash flow, reduces pressure on pasture and water supplies, and improves pasture management options during recovery. Photo NSW DPI

Having a defined grazing strategy and prioritised paddocks for rest and recovery can help guide management responses and the control efforts required to manage non-domesticated animals. These plans should also consider the unique impacts on pastures that different species can have because of variation in the nature of their grazing behaviour and diet selection. For example, studies have shown that kangaroos prefer to graze in paddocks with no sheep.

Non-domesticated animals need to be managed with effective, humane and cost-effective control practices. The use of a particular practice will depend on the species and any legislation relating to their control. Control measures may include commercial harvesting, culling, water management or fencing. Producers will often use a combination of control practices to successfully manage the grazing pressure from non-domestic animals.

Unmanaged goats can be sold into well-established export and domestic goatmeat markets, generating cash flow. Producers can also retain harvested goats in a managed production system as a restocking option.

In NSW, native animals are protected by the *Biodiversity Conservation (BC) Act 2016* (the Act). Producers undertaking non-commercial kangaroo culling should be aware of their requirements including obtaining a licence from the Office of Environment and Heritage. Under the Act, it is an offence to harm (including kill, injure or capture) a kangaroo or attempt to harm a kangaroo without a licence.

The NSW Government has recently approved changes to non-commercial licences to help landholders to manage the impact of kangaroos during the drought while maintaining animal welfare standards and ecologically sustainable kangaroo populations.

Producers and other shooters culling kangaroos must comply with the [National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes](#). The NSW DPI Game Licensing Unit has also developed a comprehensive [Non-Commercial Kangaroo Shooters Best Practice Guide](#).

## Further information

- » Office of Environment and Heritage - Kangaroo management  
[www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/kangaroo-management](http://www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/kangaroo-management)
- » Office of Environment and Heritage - Non-commercial culling of kangaroos  
[www.environment.nsw.gov.au/wildlifelicences/licence-harm-kangaroos.htm](http://www.environment.nsw.gov.au/wildlifelicences/licence-harm-kangaroos.htm)
- » National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes  
[www.environment.gov.au/biodiversity/wildlife-trade/publications/national-code-practice-humane-shooting-kangaroos-and-wallabies-non-commercial](http://www.environment.gov.au/biodiversity/wildlife-trade/publications/national-code-practice-humane-shooting-kangaroos-and-wallabies-non-commercial)
- » Non-Commercial Kangaroo Shooters Best Practice Guide  
[www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0005/826988/kangaroo-best-practice-guide.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/826988/kangaroo-best-practice-guide.pdf)

# Animal Health

## Rain – the immediate effect

The volume of rain required to end a drought can impact on drought-affected stock with below-average fat scores, especially when combined with extreme weather events such as cold snaps or storms. Weather should be monitored and stock moved to sheltered paddocks, although drought lots or other paddocks being used for feeding should have shelter. Off shears sheep are particularly susceptible and they can be confined to small paddocks or sheds to provide adequate shelter and supplementary feed during extreme weather events.

Prolonged wet conditions can cause stock to reduce feed intake or 'go off their feed'. If stock are being fed on the ground, much of this feed (especially grain) can be trampled and wasted in wet conditions. Energy requirements increase by approximately 20% in cold, wet conditions and feeding rates should be increased, preferably with hay, to prevent stock losses.

The short pasture growth following rain, or 'green pick', has high water (80-85%) and low dry matter content. It is the dry matter, however that contains the nutrients required by livestock. Animals will often stop eating supplied feed in preference to the green pick. Although highly palatable, the low availability and dry matter content of fresh growth means stock can die from starvation.

Drought-breaking rain changes stock feed and water supply rapidly, bringing new challenges to disease management. As well as changes to the quantity and quality of paddock feed supply, stock may be in poor condition, have developed vitamin and/or mineral deficiencies as a result of unbalanced drought rations, or have other drought related health issues.



Green pick, the fresh pasture growth after rain, is high in moisture and low in energy and cannot sustain drought affected stock, particularly pregnant and lactating cows. Photo Todd Andrews



The key strategies to reduce livestock health risks include:

**1. Vaccinate for clostridial diseases e.g. pulpy kidney and black leg**

- » A change of feed, particularly onto lush, green pastures or onto cereal crops is a common factor in animals developing enterotoxaemia (also known as pulpy kidney). This disease affects cattle, sheep, goats and other ruminants. Stock affected by pulpy kidney are often found dead with no previous signs of ill health. Stock should be brought up to date with their clostridial vaccinations e.g. 3-in-1, 5-in-1, 6-in-1 and 7-in-1, prior to being introduced into paddocks with fresh green pick.

**2. Continue feeding to transition stock from grain based to pasture diets. Avoid putting hungry stock into a fresh paddock.**

- » Sudden changes in the amount or type of feed can have disastrous consequences including digestive upsets and plant poisonings. The risk can be reduced by gradually transitioning between feed types. Continue to feed drought rations, but gradually reduce the amount offered, and replace it by providing limited access to pasture (an hour or two each day), then gradually increasing the amount of time until they can be left on the pasture. Note that stock can be transitioned to a mature pasture much more quickly.

**3. Monitor factors that can affect stock herd/flock health including pastures and unusual plants.**

- » Bloat can be caused by rapidly-growing legumes such as lucerne, clovers and medics, especially in young cattle. If pastures contain a significant legume component, bloat protection should be implemented including bloat blocks/licks and bloat oils mixed with supplementary feed or trough water although grazing management for prevention is more reliable.
- » If heavy weed infestations are present seek advice on their toxicity risk as severe mortalities can occur when hungry stock access paddocks with toxic plants.

**4. Be aware of potential nutrient toxicities and deficiencies including:**

- » Grass tetany or hypomagnesaemia (low blood magnesium) most frequently affects breeding cows grazing short, green, grass-dominant pastures (green pick) in winter. Coming out of a drought, both breeding cows and ewes are more prone to magnesium deficiencies. It is usually associated with cold, wet weather and mainly affects females in late pregnancy and early lactation. Unfortunately, the first sign is often sudden death, sometimes affecting many animals and so prevention with magnesium supplements is essential.
- » Nitrate/nitrite poisoning of livestock is most common during drought or subsequent rain, as soil nitrate can increase greatly as a result of reduced leaching and lower plant uptake, in combination with increasing availability due to organic matter decomposition. Nitrate uptake by plants may be high, especially in the first week after rain, and may cause losses in hungry stock with free access to the wide range of crops and pastures and edible weeds that can be affected. Symptoms usually appear within a day of stock grazing affected plants, though sudden death is also possible and so a gradual transition to these feeds is required to manage this disease risk. The conditions and plant species that commonly accumulate nitrates are discussed in the [http://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/111003/nitrate-and-nitrite-poisoning-in-livestock.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/111003/nitrate-and-nitrite-poisoning-in-livestock.pdf).
- » Prussic acid is not normally present in plants but under stressful conditions (e.g. drought, frosted, herbicide treated), some species can accumulate large quantities of cyanogenic glycosides, which can convert to prussic acid — a potent, fast acting poison. The risk of prussic acid poisoning increases during drought and even more so after some rain, when stressed/stunted plants start growing. Symptoms appear within minutes of ingestion, leading to death soon after. Where possible, avoid grazing or making hay from immature plants under risky conditions. While various sorghum varieties are most commonly affected, for a full list of species refer to the [https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0013/111190/prussic-acid-poisoning-in-livestock.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0013/111190/prussic-acid-poisoning-in-livestock.pdf).





Sorghum re-growth after rain can be high in nitrates and/or prussic acid, and should be tested prior to grazing. Transitioning stock from drought rations to pasture requires care and planning. Photo Todd Andrews

#### **5. Control sheep parasites including:**

- » Sheep worm eggs often accumulate during drought because there is insufficient moisture for hatching. This, coupled with high stocking densities where sheep have been hand fed, can result in a large reservoir of worm eggs in paddocks. There can be a mass hatching of eggs after rain and stock can develop high worm burdens. Also, at the end of a drought, there is often reduced paddock availability for rotation or worm avoidance. If the normal drenching program has not been followed during the drought, it is wise to catch up as soon as possible. For further information on worm control in sheep contact a veterinarian or refer to [www.wormboss.com.au](http://www.wormboss.com.au)
- » Sheep flystrike. Because of the prolonged dry weather, most sheep will not have been given a preventative fly treatment. For further information on flystrike management contact a veterinarian or refer to [www.flyboss.com.au](http://www.flyboss.com.au)

If you have any concerns about stock health, contact a veterinarian. For any queries regarding notifiable diseases contact your Local Land Services on 1300 795 299 or the Emergency Animal Disease Hotline on 1800 675 888. For any NLIS queries contact your Local Land Services as above or ring the NLIS Support desk on 1800 654 743

### **Managing risks associated with restocking**

Although restocking after drought is no riskier than at other times, all introduced stock can potentially introduce pests and diseases such as weeds, worms, bacterial or viral infections and external parasites. These risks can be managed by knowing the history of the purchased stock, isolating the new stock on arrival and following legal requirements regarding movements. For more information on biosecurity considerations when buying sheep, refer to the <https://www.dpi.nsw.gov.au/animals-and-livestock/sheep/health/other/buying-sheep-the-general-biosecurity-duty,-and-how-to-avoid-health-hazards>.

Enquire about the history of the stock being introduced, either from the agent or the manager listed on the national vendor declaration (NVD). Useful information might include vaccination history and other health information, which would also be contained in animal health declarations. Biosecurity plans, such as the length of isolation from existing stock, can include that information.

All sheep and goats entering NSW from another state or territory must be accompanied by a completed, signed national sheep health declaration on their journey. This declaration must be provided to the person taking delivery of the sheep and a copy must be provided to the Local Land Services office in the delivery region within two (2) business days of the importation of the sheep into NSW. Note that a national sheep health declaration is not mandatory for sheep moving within NSW, but is strongly recommended.

All transported stock must be identified with NLIS tags prior to the movement and be accompanied by a completed NVD or Transported Stock Statement (provided by Local Land Services). The movement must be recorded on the National Livestock Identification System database within two (2) days of arrival. There are also other considerations and obligations when transporting livestock.

Cattle and other ruminants coming from a cattle tick infestation zone must meet legal movement requirements prior to entering NSW. For more information contact the NSW DPI Cattle Tick program on (02) 6626 1201 during business hours or by email [cattletick@dpi.nsw.gov.au](mailto:cattletick@dpi.nsw.gov.au)

### **On-farm biosecurity**

Biosecurity planning aims to prevent or minimise the impact of pests and diseases on stock and weed spread by recognising risks and listing actions to manage them. All Livestock Production Assurance (LPA) accredited producers should have an on-farm biosecurity plan. The five key pillars to an effective biosecurity plan are:

- 1. segregate incoming livestock**
- 2. a well- considered animal health program**
- 3. access procedures for visiting people and vehicles**
- 4. regular monitoring for pests, diseases, or anything unusual**
- 5. sound record keeping**

For more information refer to

[www.farmbiosecurity.com.au/five-key-ways-you-can-beef-up-your-livestock-biosecurity](http://www.farmbiosecurity.com.au/five-key-ways-you-can-beef-up-your-livestock-biosecurity)

# Tree management after drought

Droughts affect some tree and shrub species more than others. Landholders can observe which trees perform best during drought and continue to use these species to improve agricultural production, protect soils, water and wildlife, and improve the capital value of rural properties. Incorporating good tree management practices into property and drought management plans also improves the health and longevity of native trees.

## Recovery of mature paddock trees

Many mature paddock trees will suffer in drought due to lack of water, increased pest attack and poor seed set. To promote recovery of these trees:

- » Avoid cultivation and fertiliser application close to the root zone (stay well outside the canopy).
- » Observe trees for pest damage and control the pests where possible. Mature trees can be adversely-affected by repeated pest damage, particularly where leaf area is reduced by more than one third. Insecticide injection may be necessary if leaf pest attack is severe. Drought affected trees are also at increased risk of borer attack, which is difficult to treat in mature trees. Easing the conditions that contribute to tree stress (high nutrient levels, root damage, soil compaction, and over-clearing) is the most effective way to minimise the impact of drought.
- » Be patient. Some trees require months or even years to recover from severe drought depending on their age and health prior to the drought.
- » Restrict or eliminate grazing around lopped or damaged trees for at least 12 months to support their recovery.
- » Where trees and shrubs have been lopped for fodder, it is vital to allow their full recovery before subsequent lopping. For some trees, such as kurrajongs, this may take 4–5 years. Continued lopping can reduce the lifespan of a tree. When planning for future farm tree plantings, aim to replace or increase the number of fodder trees.

## Managing existing native vegetation areas

### Establishing native tree seedlings by natural regeneration

Many native plants respond to drought by flowering and setting seed. A break in the drought will often favour re-establishment of trees and shrubs by natural regeneration. This is a low cost method of increasing and maintaining native vegetation areas. For best results:

- » Exclude grazing from native vegetation areas, especially while young plants are getting established and continue to protect seedlings until they are above browsing height and the stems are sufficiently thick to withstand rubbing by livestock.
- » Fence areas around clumps or individual trees. Seed will fall up to 50 m from the trunk of large trees, falling mostly in the direction opposite prevailing winds. Orientate the fenced area to coincide with this pattern.
- » Identify and actively encourage natural regeneration areas where they will provide the best shade and shelter advantages.
- » Control feral and pest animals, such as rabbits, which typically graze on young seedlings.
- » Monitor native vegetation areas for weed growth. Exotic pasture and weeds can out-compete native plants, especially at the seedling stage. Reduce the weed seed bank in the soil – for example by using herbicides, but avoid those with persistent residues.



## Maintenance of young trees and existing plantings

If young trees and existing plantings have suffered during the drought:

- » Replace losses while the surrounding trees are still small – establishing seedlings among semi-mature trees is difficult due to competition for moisture and nutrients.
- » Ensure good weed control.
- » Monitor pest damage and control as required.
- » Eliminate stock access until trees are sturdy and above browsing height. If a windbreak is the goal, permanent exclusion is recommended to allow lower foliage to be retained.



These yellow box (*Eucalyptus melliodora*) trees have been fenced to protect them from stock and wildlife browsing, allowing them to reach beneficial heights more quickly. Photo Todd Andrews

## Planning for new plantings

Identify the trees and shrubs that occur naturally on your property. Take note of trees that have coped with drought conditions by observing if they have maintained a full canopy, resisted pest attack and provided native animals with habitat. Also note blocks or belts of trees that have provided wind protection and the trees that have provided fodder reserves.

Consider how new plantings or regeneration can link with existing plantings or bushland areas to provide wildlife corridors, windbreaks for stock and protect erodible gullies.

When redesigning or maintaining farm infrastructure (farm access tracks and fences), include opportunities for planting native farm trees.

When planting a windbreak or shelterbelt, include a diverse range of species (understorey and overstorey) that are adapted to the local area and soil types. Source seedlings grown from locally collected seed, but also from different plants to ensure genetic diversity. Native vegetation suited to local soils and climate has the best chance of surviving drought.

Early ground preparation is the key to successfully establishing native trees. Ripping along seeding lines, fencing and 'fallowing' the area will build soil moisture and allow stronger growth.

Consider planting smaller areas to help manage weeds and water seedlings if necessary. For grazing enterprises, consider increasing perennial native fodder sources such as saltbush and fodder trees. Prepare for future droughts by maintaining and increasing windbreaks orientated against the worst prevailing winds.

## Further information

- » Local Lands Services: 1300 795 299  
[www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)
- » Landcare NSW:  
[www.landcarensw.org.au](http://www.landcarensw.org.au)



## Publications

- » **The Dead tree detective.** Visit <https://biocollect.ala.org.au/acsa/project/index/77285a13-e231-49e8-b212-660c66c74bac> to record instances of dead or dying trees to help find patterns and causes of tree decline.
- » **Fodder trees for beef cattle** <https://www.daf.qld.gov.au/business-priorities/agriculture/disaster-recovery/drought/managing/feeding-beef-cattle>
- » **Nature Conservation on Farms.** Nature conservation is about keeping, or bringing back, a wide range of plants, animals and other organisms on your farm that will contribute to its health, productivity and appeal. It's about working in harmony with the environment to sustain the land and its productivity. Available at [www.tocal.nsw.edu.au/publications](http://www.tocal.nsw.edu.au/publications)
- » **Plan for trees – a guide to farm revegetation.** Shows how to re-establish trees and shrubs on farms. Includes how to plan a revegetation program and assess existing remnant vegetation. Covers natural regeneration, collecting native seed, weed control and protecting revegetation areas from livestock, insects and other threats. Available at [www.tocal.nsw.edu.au/publications](http://www.tocal.nsw.edu.au/publications)
- » **Using mulga as a forage supplement for livestock in droughts** NSW DPI Primefact 1487, August 2016



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