Final report

Less weeds better pasture package

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Abstract

Weeds commonly occur in pastures and reduce pasture productivity. The different problems weeds cause and their varying contributions to herbage mass complicates decisions on controlling them. A package of weed assessment, decision support and management information were created in consultation with nine producer groups with the aim of identifying areas for improvement and to make sure the resources were of value. The resources created were designed to appeal to visual learning styles of producers and provide a logical progression through weed identification, assessment of dominant weeds, deciding whether to remove the weed and implementation of control tactics. Three separate agronomist groups were trained in using the resources and they showed potential for extending information to producers. Having a comprehensive suite of weed management resources that focuses on achieving long lasting control will help producers increase their knowledge to better control weeds. The weed management package can be utilised in many different educational forums and therefore reach a wide producer audience. Due to restrictions with Covid, the weed products were unable to be promoted at face to face producer events. This remains a gap that is recommended to be addressed.

Executive summary

Background

Weeds commonly occur in pastures and reduce pasture productivity. The different problems weeds cause and their varying contributions to herbage mass complicates decisions on controlling them. Especially, when their control with herbicide can not only remove the weed but cause a loss of available feed and reduce pasture growth or not have long lasting effects.

Objectives

Objectives were to create an assessment and decision support tool for common pasture weeds and a suite of regionally suitable intervention tactics to manage common weeds in Southern Australian pastures. Feedback was to obtained from producer groups or advisors on the value of the approach and identification of areas for improvement. Training workshops were to be delivered to retailers and advisors on the use of the newly created resources. This project was delivered through the Southern Feedbase Adoption Plan (FAP). Pasture weeds was one of the four themes addressed in the FAP plan that focused on addressing feed gaps, maintaining pasture production and stability to meet the requirements of red meat animal production.

Methodology

Weed resources were created and designed to appeal to visual learning styles of producers and provide a logical progression through weed identification, assessment, deciding on whether to intervene to remove the weed and implementation of control tactics. Road testing of products occurred with producer groups to identify potential improvements and develop high quality resources. Training of agronomists in the use of the products occurred in both face to face and online workshops.

Results/key findings

The weed resources developed in consultation with nine different groups of producers included:

- Assessment and scoring of the dominant weed within Pasture Paramedic tool
- Weed identification within PP technical manual
- Weed fast facts – a booklet guide to support weed management
- Six fact sheets on weed control tactics
- Three short videos on how to successfully implement spray-grazing, winter-cleaning and spray-topping.

Three separate agronomist/reseller groups were trained in the key components of using the resources and showed potential for extending the reach of the project to producers.

Benefits to industry

Having a comprehensive suite of weed management resources will help producers increase their knowledge to better control common weeds that reduce animal production and desirable species persistence. The package of weed resources developed can be utilised in many different educational forums and therefore reach a wide audience of producers.

Future research and recommendations

Due to restrictions with Covid, the weed products were unable to be promoted at face to face producer events. This remains a gap that is recommended to be addressed. Training of three agronomist groups was successful and training of further groups would be a way to further extend the impact of the weed management package created.

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1. Background

Weeds commonly occur in pastures and reduce pasture productivity. Weeds can also build to levels where they cause problems and even affect pasture persistence and become unwanted. However, not all weeds are equal, some can create more significant problems than others because of their growth, palatability, toxicity or seeding attributes. Also, they can cause issues in some farm enterprises but not others and so producers can perceive their "weediness" differently.

Many common pasture weeds can also have positive features, by contributing to the herbage mass, providing early autumn or out of season feed or providing a protein source over summer.

The different problems weeds cause and their different contributions to herbage mass complicates decisions on controlling them. Especially, when a herbicide is implemented as the recommended approach. Herbicides will remove the targeted weed, check desirable plants species and significantly reduce pasture growth during winter when feed shortages may already occur.

The project aim was to provide practical information and actions to producers and advisors in MLA's southern region on the growth and management of common weeds. This will help inform when to intervene with weed control and what tactics to keep weeds to a manageable level where they do not detract from more desirable species.

This project addresses the pasture weed theme of the Southern Australian Feedbase Adoption Plan (FAP). Pasture weeds are one of the four themes addressed which aims to develop products and training activities focused on addressing feed gaps, maintaining pasture production and stability to meet the requirements of animal production., The FAP was an initiative created to extend the information and research findings of MLA and its partners development of the Feedbase Investment Plan (FIP) and associated research. This provides a review of all aspects and relevant technologies of feedbase production and sustainability that can improve red meat production for the Southern Australian feedbase.

In many cases, there is adequate weed information available on invasive "noxious" species especially on government agency websites but there is a reduced number of independent resources available on controlling the "everyday" weeds that producers commonly need to deal with.

The information products developed will provide a package of weed resources that can be utilised in many different educational forums, such as:

- Producer and agronomist training events
- Profitable Grazing Systems (PGS) training packages, e.g., Manipulation, Resowing
- E learning modules
- Making More from Sheep modules
- MLA E news and Feedback magazine.
- MLA weed hub
- One to one advice

2. Objectives

This project helps deliver the Southern Australian component of the FAP plan. Pasture weeds was one of the four themes addressed in the FAP plan which involved product development and training activities focused on addressing feed gaps, maintaining pasture production and stability to meet the requirements of animal production. The FAP was to provide extension of the key research findings that MLA and its partners generated as part of the Feedbase Investment Plan (FIP). The FIP developed in 2010 and subsequent research investment was focused on feedbase production and sustainability that could improve red meat production for the Southern Australian feedbase.

The project objectives of the Less weeds better pasture package were:

1. Create an assessment and decision support tool for common pasture weeds.
2. Develop a suite of regionally suitable intervention tactics to manage common weeds in pasture, supported by technical information on weed lifecycle, seed longevity, impact of season etc.
3. Feedback from four select producer groups or advisors on the value of the approach products and areas for improvement.
4. Delivery of a minimum of 3 ‘workshops’ to retailers, advisors, group facilitators on the use of the assessment tool and exposure to supporting documentation.

The first objective was successfully achieved by development of

- An assessment within the Pasture Paramedic tool which involves a scoring method for the type of dominant weeds within the pasture and its contribution to the feedbase.
- Technical manual (hard copy and online) providing assessment support information and weed identification.

Together these resources provide the necessary tools for producers to assess and make decisions on whether the pasture requires resowing, manipulation or condition is suitable but consider improvements.

The second objective was met through meeting the writing of six fact sheets on making herbicide decisions and common weed control tactics and the production of three associated videos. In addition, Weed fast facts a booklet containing weed lifecycle, growth, feed quality characteristics and possible interventions provides further weed management decision support.

The third objective was met from seeking feedback from five groups of producers and agronomists who road tested products to ensure that the weed assessment process was sound and user friendly and identify potential improvements. Feedback was also sought throughout development of fact sheets and Weed fast facts through an additional four events to ensure resources would be well received by producers and advisors.

The final objective was met through running three training workshops, involving 30 agronomists to demonstrate and train them in using the products, so that they in turn could share and utilise products with producers.

3. Methodology

3.1 Assessment and decision support tool

The first part of the objective was to assess the current condition of pastures and that was achieved through the development of Pasture Paramedic (PP); a tool in project L.FAP.1903 (The persistence and productive pasture package). PP is a tool to rapidly assess pasture composition.

Pasture Paramedic contains one critical assessment option related to weeds in the winter/early spring assessment. There was no assessment in the late summer/early autumn period because winter active weeds are not growing and many summer growing weeds have unpredictable appearance and are difficult to achieve a meaningful reduction in their seed bank. These can include clammy goosefoot, fat hen, blackberry nightshade and wild radish.

In PP winter/early spring assessment, producers take three critical assessments; amount of desirable grasses, amount of improved clovers and the third critical assessment is related to dominant weed presence. Users score the weed condition based on identification of the weed and its dominance in the assessed area. Assessments include 10 random observations across a paddock using a $0.1m^2$ quadrat (table 1). The sum of scores from the three critical assessments helps inform the decision of paddock treatment; maintain, manipulate or resow.

Table 1: Dominant weeds scoring criteria

Critical Assessment Factor 3	Score	Condition
Dominant weeds	4	Few or no weeds present
	3	Category A weeds - high grazing value, palatable
	1	Category B weeds - some grazing value, less palatable
	0	Category C weeds - little or no grazing value, major animal health issues

In the first edition of PP (Southern high rainfall), the presence of dominant weeds are used and divided into three categories, A, B and C (see table 2). Categories of weeds are based on if their presence adds to the quantity/quality of feed available for grazing. The dominant weeds are assigned to one of three categories (table 2).

Producers are instructed to avoid being distracted by the variety of weeds, instead concentrate on identifying the most common species present. Commonly found weeds have been included as examples, however, producers in training events are instructed to use this approach to rate other less common weeds or noxious weeds that are not included in table 2.

Only the dominant weeds are considered in the assessment because while many other species may be present, their content being lesser is considered to not affect the overall performance of the pasture.

Categories of weeds were used because the benefits and downsides of having these species in a pasture differ, so the decision on what to do about them would also be different. In some regionally adapted versions of Pasture Paramedic, local advisors involved in its adaptation have preferred to use percentage number of weeds.

Table 2: Categories for dominant winter weeds

Category	Description	Example weeds
A	• High grazing value • Palatable; grazed readily by stock • Possible seed head issues • Short season growth • Grow rapidly	Annual ryegrass, barley grass, capeweed, soft brome grass.
B	• Some grazing value but with reduced winter feed on offer • Less palatable so less readily eaten by grazing animals	Bent grass, dandelion, dock, erodium, fog grass, mallow, mouse-ear chickweed, oxalis, silver grass, sorrel, sweet vernal, thistles, wild oats, wild radish, winter grass, wireweed.
C	• Little or no grazing value • Not palatable • Major animal health issues	Nightshade, onion grass, Paterson's curse, toad rush.

3.2 Develop a suite of regionally suitable intervention tactics

3.2.1 Weed Fast Facts

Weed fast facts was developed as a support tool to help producers make weed management decisions. Producers identify, assess and score their dominant weed. If the PP decision guide indicates manipulation or resowing, then the producer can use Weed fast feeds to find out more about their dominant weed in order to decide if control is warranted. It provides information on the problems it can cause and its contribution to feedbase in terms of quality, palatability and potential toxicity. It also provides an understanding of how the weed grows (lifecycle, reproductive and seeding habits) and the conditions which favour its growth, intervention options available to manage that weed and achieve longevity in its control. All these factors need to be considered in weighing up whether to control the weed.

The guide contains information on 15 common pasture weeds which are:

- 5 annual grasses: Barley grass, annual ryegrass, soft brome grass, silver grass, winter grass,
- 2 perennial grasses: bent grass and fog grass.
- 6 narrow/broadleaf weeds winter growing: onion grass, wire weed, capeweed, erodium, sow thistle, flatweed
- 2 broadleaf summer annual weeds: fat hen, clammy goosefoot

Each weed has detailed facts on growth, grazing value and possible interventions. Information is shown around a monthly calendar, designed to give a visual representation of the cyclical nature of

plant growth (see Figure 1). Facts were determined by a literature search. Grazing value was determined by feed testing and the feed quality allocated into different ranges based on its impact on animal production.

Figure 1. Front cover of Weed fast facts (left) and barley grass growth wheel (right)

Feed quality data was collected monthly by sampling weeds over their growing period near Shelford, Victoria. Weed collection locations were maintained for practicality and for consistency of sampling. Each sample taken is a pure representative sample of the selected weed with seed heads included in the sample during spring and summer. The samples represent what an animal would likely graze, that is samples were not cut back to ground level and contain only the weed sample to enable an indication of their quality. Samples were sent to an accredited laboratory (FeedTest) for testing. Tests included dry matter, crude protein, digestibility of dry matter and metabolisable energy (ME).

3.2.2 Fact sheets

All six fact sheets were written using MLA's fact sheet style design around the question of How do I do something. This was done to help engage producers and answer their commonly asked questions. The topics behind the six fact sheets were based on common tactics used in weed control. These fact sheets are downloadable from the MLA website and hardcopies were printed for use in workshops and field days. Each of the fact sheets included discussion on pre-treatment preparation, feed loss, pasture recovery and required timing. These factsheets filled an important knowledge gap that had been missing from previous developed material. A literature search was utilised to find weed control success rates for each tactic.

Throughout the design process producers, agronomists and researchers were involved in making sure the products were valuable and technically correct.

The methodology, key messages and the gaps in extension material of the five fact sheets is provided below.

i) How do I know if herbicide application would improve my pasture?

This fact sheet runs through the process of deciding what action to take and includes a simplified decision guide to assist producers to step through it in a logical manner. The following critical factors and information on how to assess them is discussed in the document:

- Problems the weeds are causing.
- The capacity for desirable plants to fill the gaps
- Benefits compared to costs of the treatment
- Actions to make the treatment long-lasting

In the herbicide use decision guide, condition criteria are assessed, scored and scores summed to inform a decision of whether to apply herbicide or not.

ii) How do I spray-graze to remove broadleaf weeds?

In preparation for writing this fact sheet a demonstration site was established at "Murnong," a mixed farming property near Inverleigh, Victoria in early winter 2019 to collect photos of the process and results. The trial was designed to demonstrate when the techniques were done correctly but to also show what happens when timing or insufficient grazing occurs. Details on the demonstration site can be found at Brogden, 2020.

iii) How do I winter clean pastures to remove annual grass weeds?

A winter cleaning demonstration was also established at "Murnong", using three herbicide application times: ideal, late, very late in winter 2020. This allowed collection of photos depicting what was happening to the herbage base over time. Some photos and data were collected prior to the demonstration site becoming waterlogged resulting in the vast majority of biomass dying.

iv) How do I spray-top to reduce annual weeds in pastures?

Two demonstrations were set up at "The Falls," near Inverleigh, one demonstrating early, ideal and late timing with paraquat and the other demonstrating early, ideal and late timing with glyphosate in spring 2020. The pasture was dominated by barley grass with a marginal presence of phalaris and a solid sub clover base. Some photos were collected before livestock broke through the fenced off area and grazed out the plots.

v) How do I use hay and silage production to remove annual grasses?

Another tactic for controlling annual grasses with short seed viability is cutting pastures for hay and silage. This fact sheet explains how to use the tactic effectively. Most information was sought using a review of literature and photos taken of local SFS producer members paddocks.

vi) How do I use selective herbicides to remove annual weeds in pastures?

Much of the key messages and information for this fact sheet was obtained from review of product labels and from herbicide development officers who spoke at "Selective Herbicides – what can we use in pastures," which was an MLA event run through the project Productive and persistent pasture package (L.FAP.1903) on February 18th, 2021.

The fact sheet used a traffic light system as a guide for the weed kill e.g., green for very good to complete control and also desirable pasture tolerance e.g., green for minimal to light damage to sown pasture – acceptable (see Figure 2). Two tables of either grass or broadleaf weeds were

developed to allow producers to select a herbicide that kills the targeted weed but causes minimal damage to the desirable species. Due to continual changes of commercial herbicide trade names, the tables lead with the herbicide active ingredient. Photos were sought through herbicide development officers.

	Weed kill	Desirable species tolerance
	Very good to complete control	Minimal to light damage to sown pasture – acceptable
	Suppression	Some or moderate damage to sown pasture species but regrowth and recovery expected
	Not on label, poor control	Severe damage – unacceptable
	Grey area – don't know, not on label or no published data available	Grey area – no published data available on species tolerance

Figure 2. Traffic light system interpretation for weed kill and desirable species tolerance used in fact sheet, How do I use selective herbicides to remove annual weeds in pastures?

3.2.2 Videos

Three short videos (less than 8 minutes) were developed to show how to implement common herbicide tactics were developed because of the recognition that this information transfer medium had high appeal to visual learning styles of producers. There is a tendency, particularly for younger producers to look up YouTube videos to find out how to do something.

Information within the spray-grazing, spray-topping and winter cleaning fact sheets was used to develop videos scripts to show producers the key components to make the techniques successful. The spray-grazing video was produced by Southern Farming Systems and both winter cleaning and spray-topping videos were produced by MRL media company.

The spray-grazing video covers the use of controlling broadleaf weeds with short seed life by using a combination of sub lethal herbicide application followed by hard grazing. Also presented are the keys to its success involving both the timing of herbicide application and the timing of grazing.

The winter cleaning video focused on the removal of silver grass and some other annual grasses with short seed life. It explains the process of what to do but then discusses three of the important considerations if the tactic is to be used. The first consideration was timing of the spray application to reduce the loss of winter pasture production, the second was if the reduction in winter pasture growth could be afforded and thirdly if there were sufficient desirable plants present to fill the gaps left behind from weed removal.

The spray-topping video covered how to use sub lethal doses of two knockdowns herbicides on annual grasses and capeweed to render seed sterile. It presents information on five critical factors for producers to get right such as target weeds with a short seed life, aim to get even seed head emergence, use of the correct herbicide, herbicide application at the ideal time and strategies to increase desirable pasture competition to make the treatment long lasting. Also presented was how to make use of the preserved feed value after treatment.

3.3 Testing of products

There were nine producer groups involved in providing feedback on products as shown in table 3. They have been involved in helping to shape weed assessment in Pasture Paramedic (PP), Weed fast facts and intervention fact sheets.

In road testing the weed assessment tool, five producer groups provided feedback. This included two producer groups from across the western district of Victoria that had experience in grazing and mixed farming systems as well as classes of third year agricultural students from Marcus Oldham College and two Women on farms groups (WOF). The assessment was conducted in three to four hour workshops, the theory behind the tool was presented, and using mock-up kits, shown how to use it and then observed in trialling its use. Following this, producers were questioned using objective, reflective, interpretative and decisional questioning (ORID method). Suggestions for improvements were recorded.

Table 3. Workshops that have involved road testing MLA weed products

Training event name & description	**Weed product focus**	**Location**	**Date**	**No of producers**	**No of Agronomists**	**Total No of Participants**
Product development with two red meat producer groups	Weed assessment in Pasture Paramedic	Shelford, Inverleigh	Mar-19	28	2	30
Road testing with 3rd year Marcus Oldham College students	Weed assessment in Pasture Paramedic	Geelong	Mar-19	30		30
Road testing with two WOF groups during Integrated Weed Management course. Sessions 2 & 3	Weed assessment in Pasture Paramedic Fact sheet tactics Weed id. Weed pros & cons. Weed lifecycle.	Hamilton & Lake Bolac	21 & 22 May 2019 and 10 & 11 Sep, 2019	19	5	24
Premium Pasture Group	Selective herbicide fact sheet	Virtual	18/2/2021	8	13	21
Weed session with Marcus Oldham College final year students	Testing the fact sheets	Geelong	24/3/2021	30		30

SFS members, Agrifocus – Weed products overview	How do I know if herbicide application would improve my pasture & Weed fast facts	Virtual	23/09/2021	9	29	38
Totals 9 groups				**124**	**49**	**173**

The WOF groups were undertaking integrated weed management training and therefore information sourced for this training was presented and evaluated for use in Weed fast facts and fact sheets. How this information was received was noted and their questions guided what was included in the tactic fact sheets.

The Premium pasture group and some herbicide company representatives from Nufarm, Adama, SipCam and Bayer were sent a draft copy of the selective herbicide fact sheet and asked to provide feedback. It was mainly herbicide representatives that provided feedback that led to improvements in the fact sheet. Feedback was also sought on the winter-cleaning, spray-grazing and spray-topping tactics from Nufarm's herbicide development group leader.

The use of the weed fact sheets was tested by Marcus Oldham students. Students were presented with the theory behind three main herbicide techniques from the fact sheets: spray-grazing, winter-cleaning and spray-topping. They then worked through the fact sheet, How do I know if herbicide application would improve my pasture. This approach was then tested on four paddocks with students applying the decision matrix and making recommendations. Students were required to apply this skill again three weeks later as part of an assessable assignment.

The weed resources created were presented to SFS members at Agrifocus in a half hour online presentation. The aim of this presentation was mainly to gauge interest in the products and seek feedback on Weed fast facts and the selective herbicide fact sheet which had not yet been finalised.

3.4 Training workshops for retailers and advisors

Three training workshops on weeds were held in February and early March 2022. This timing was based on completion of all the weed products and avoided the Christmas and holiday period. Details of the training events are given in table 4.

The workshops focused on showing agronomists how to use the weed resources and agronomists were expected to be familiar with herbicide tactics and therefore training concentrated on the lesser-known parts of the tactics that were important for their successful implementation, such as:

- paddock preparation,
- expected feed loss and how to minimise
- ways to quicken pasture recovery and
- visual cues for identifying correct timing of herbicide application.

This approach also allowed other information from other MLA feedbase projects to be used in the training. Such as using the information from the More Sub-clover package to describe how to fill the gaps left by weeds and hasten pasture recovery. Or the Healthy soils project, by getting agronomists

to use the weeds as an indicator of soil condition and address the potential cause to achieve longevity of weed control.

Two workshops were with agronomy companies and a third event was held as an open event for advisors and independent consultants. The opportunity was well received with 16 participants registered to attend from a diverse range of companies. This open workshop would also expand the knowledge of weed products to more companies and allow companies to send graduates for training opportunities. The Gorst Rural workshop was due to be held on the 16/2/2022 but was cancelled due to a covid outbreak in the team and rescheduled for early March.

Table 4. Details of three retailer/advisor training workshops

Company Name	**Date of delivery**	**Location**	**Workshop Format**
Gorst Rural	2/3/2022	Lake Bolac	Face to Face
Elders	18/2/2022	Southern Feedbase	Virtual and recorded
Open event for advisors	23/2/2022	Ballarat	Face to Face

The general design of the weeds workshop follows the below process:

Introduction
Discuss Pasture Paramedic to reach suggested decision, highlighting the weed identification part of the online manual using the QR code.

If manipulation is suggested, this may require action on:

- Desirable grasses
- Legumes
- Weeds

Or a combination, but let's focus on pasture weeds.

Considerations for weed control
Objective is to make sure it will work.

Use: How do I know if herbicide application would improve my pasture?

Take producers through the five considerations:

1. What problem is the weed causing? – more information in the *Weed fast facts* (step them through how it works).
2. Are there desirable species to fill the gaps? Assessment comes from *Pasture Paramedic*.
3. Most appropriate technique? – describe five tactical options (MLA fact sheets)
    - Spray-graze
    - Winter clean
    - Spray-top
    - Selectives
    - Hay / silage
4. Costs and benefits? – How the costs can vary from year to year – use winter clean example.

5. What other management may need to change? Requirements for lasting success – use low soil fertility as an example.

Decision Matrix
Step through the decision matrix (from fact sheet; Do I apply herbicide?) giving three different examples and show how they score.

Tactics
Discuss each tactic and the lesser known information within each fact sheet that is a key component for the tactic's success.

Selective herbicides
- How to minimise desirable species damage with emphasis on grazing before treatment application and application when the desirables are not actively growing, e.g., winter.
- Show how to use tables.

Winter-cleaning
- Quick overview of how winter-cleaning works.
- Emphasis on how to manage the loss of feed.

Spray-Grazing
- Quick overview of process.
- Strategies on how to get the grazing component right.

Spray-topping
- Quick overview of process.
- Concentrate on the grazing preparation needed for even seed head emergence.
- Visual cues for picking the best time to apply herbicide.

Hay/Silage
- Overview of the two approaches used, that is prevent viable seed formation and capture seed and remove through hay and their effectiveness and downsides.
- Consideration of matching timing to cutting.
- Using grazing to encourage even seed head emergence and delay maturity to avoid late development of reproductive tillers.

4.0 Results

4.1 Assessment and decision support tool

The assessment and decision support for weeds was contained in the Pasture Paramedic kit. This kit is made up of a quadrat, technical manual, recording booklet and pen. Printed hard copies of PP are available from SFS.

Information about the assessment tool and links to the online booklet to help support use and weed identification are available from the MLA website from either the feedbase hub or tools and calculators at:

https://www.mla.com.au/globalassets/mla-corporate/extensions-training-and-tools/documents/pasture-paramedic.pdf

A video to support use of pasture Paramedic and weed assessment is available at: https://www.youtube.com/watch?v=SxUdA8ojkJY&t=5s

The assessment and scoring of dominant weeds were found to be relatively easy for users to utilise. The hardest part for some producers was identification of the weeds, as described in section 4.3 on product testing.

It was observed that some regional specific Pasture Paramedic versions were required and were later developed. Their approach involved assessment of the amount of broadleaf and grass weed numbers. An observation of this technique was that it made scoring more difficult, as users had to sum up percentages rather than single digits. While both approaches have merit, the weed assessment in the high rainfall version of PP allowed users to identify the dominant weed and consider its contribution to the feedbase and is more easily scored. The percentage of weeds can also be easily derived in scoring, as in most cases it is what's left from subtracting the desirable grass and clover content.

Result to date of Pasture Paramedic kit hand out is to 843 people and 291 number trained in workshops.

4.2 Develop a suite of regionally suitable intervention tactics

Three different resources were developed to meet this objective. They include Weed fast facts, six weed management fact sheets and three videos on the most used tactics: spray-grazing, winter-cleaning and spray-topping.

Aspirational targets set in the monitoring and evaluation plan were a 10% improvement in access/download/use of MLA tool/website and 20% improvement in access/download/use of MLA publications.

It is difficult for SFS to quantify the impact of the resources created, but MLA reported for the feedbase hub on weed control, since its creation on 20 May 2021 the page was viewed 5,352 times by 4,562 people with an average time of 1 minute and 13 seconds.

4.2.1 Weed fast facts

Weed fast facts, a decision support guide to help producers make weed management decisions was made available from the SFS website in mid January 2022 at https://sfs.org.au/wp-content/uploads/files/0272_SFS_MLA-Weed-Fast-Facts_Jan-2022_Active-Links_LR.pdf. It has had 69 downloads from mid January to February 21, 2022. This is planned to be promoted and added to the MLA weed hub during autumn.

This product will be a valuable resource for MLA and producers. The performance indicator was to include 10 common weeds but 15 have been included. This allowed a variety of different common weed types to be included, such as annual germinating summer and winter species and perennial weeds.

By providing MLA with art design files, further weeds can be added over time. Weed fast facts will also provide a library of weed photos and can be easily adapted for eLearning. It is envisaged Weed

fast facts will be a popular resource and can be utilised in relevant PGS courses or weeds featured as timely reminders in Friday Feedback.

The value of Weed fast facts as a resource has already been demonstrated by the interest from Agriculture Victoria. Initially Cam Nicholson, from Nicon Rural, was invited to present its weed feed quality information at the BestWool Best Lamb conference in 2019. His presentation is available at: https://agriculture.vic.gov.au/support-and-resources/networks/bestwoolbestlamb/bestwoolbestlamb-conference-videos/2019-conference-presentations#h2-3

Further weed feed quality data was later requested and provided to Agriculture Victoria for an article they wrote on summer weeds in November 2021. Available at: https://agriculture.vic.gov.au/farm-management/land-and-pasture-management/grazing-value-of-summer-weeds

In January, 2022 Agriculture Victoria did a further press release to promote Weed fast facts (see appendices 1 and 2), available at https://agriculture.vic.gov.au/about/media-centre/media-releases/fast-facts-on-the-grazing-value-of-summer-weeds

This article was picked up by another nine media outlets including Sheep central, Ausfarm nutrition, Benalla ensign, Wangaratta chronicle, Cobram courier, Yarrawonga chronicle, Australian online news, National tribune and ABC radio.

SFS also wrote a promotional article, (see appendix 8.1.3 and 8.1.6) and it was road tested through SFS main field day (Agrifocus, see section 4.3) and presented at three agronomist workshops (see section 4.4).

4.2.2 Fact sheets

Six fact sheets outlining intervention tactics for weed management in pastures were developed. These fact sheets are available for download from the MLA weeds hub. The information in the fact sheets spray-grazing, winter cleaning and hay and silage has been further utilised and developed into E learning training packages. All the fact sheets show photographs to support the text and appeal to visual learning styles which was an objective because statistics showed agriculture contained high numbers with this learning preference. Total downloads have been 209 and approximately 100 hard copies handed out. Some of the tactics were promoted in SFS newsletter called eUpdate which is circulated to 581 recipients with an open rate between 35-40% (see appendix, 8.1.4 and 8.1.5). Through twitter @southernFS, Weed fast facts had 11 engagements and 6 clicks and Facebook 10 clicks to view the product.

Table 5. Number of fact sheet downloads up from May 20th until February 2022.

Fact sheet Name	**Download number from MLA website**
How do I know if herbicide application would improve my pasture?	7
How do I spray-graze to remove broadleaf weeds?	46
How do I winter clean pastures to remove annual grass weeds?	140
How do I spray-top to reduce annual weeds in pastures	11
How do I use hay and silage production to remove annual grasses?	5

Totals	**209**

Promotion of the fact sheets was due to occur at Sheep Connect, Hamilton, a producer focussed event expecting up to 2000 producers but was cancelled due to Covid on two occasions, once on July 2021 and then Feb 15, 2022.

Results of each fact sheet and how they have been received and used is discussed below.

i) How do I know if herbicide application would improve my pasture?

https://www.mla.com.au/globalassets/mla-corporate/extensions-training-and-tools/feedbase-hub/weed-control/how-do-i-know-if-herbicide-would-improve-pasture_8pp.pdf

This fact sheet is where producers/agronomist should start with their intervention decisions. Its original in its content, outlining the key considerations when making herbicide use decisions. This fact sheet has been a main feature of weed workshops and agronomists have expressed that they liked the consideration of having desirable plants to fill gaps left behind through weed removal, having knowledge of feed losses and the consideration of changing management to achieve lasting success.

Total downloads from MLA and SFS websites has been low, only 7 since appearing on the weed hub in late May 2021. These figures are low considering the importance of this fact sheet to guide herbicide decision making and therefore needs to be a focus of a promotional campaign.

ii) How do I spray-graze to remove broadleaf weeds?

how-do-i-spray-graze-to-remove-broadleaf-weeds_8pp.pdf (mla.com.au)

This fact sheet outlines what the producers need to do to make spray-grazing successful and achieve longevity in their weed control. This fact sheet emphasises the importance of the grazing component to remove the weed and how to do this before the herbicide effect wears off and the broadleaf weed can recover.

It has had reasonable downloads from MLA websites. Material from it was also used by MLA to create an e-Learning module.

iii) How do I winter clean pastures to remove annual grass weeds?

how-do-i-winter-clean-pastures-to-remove-annual-grass-weeds_6pp.pdf (mla.com.au)

The tactic of removing silver grass through winter cleaning is explained. This tactic can be damaging to the feedbase and therefore an original component of this fact sheet is to describe the expected damage and how to encourage pasture recovery.

This fact sheet has had the highest downloads from MLA and SFS websites has been 140. Possible reasons for the appeal of this fact sheet could be related to the number of producers who are wanting to control silver grass which is the main annual grass weed targeted by winter cleaning. Information within the fact sheet was used by MLA to create an e-Learning module.

iv) How do I spray-top to reduce annual weeds in pastures?

how-do-i-spray-top-to-reduce-annual-weeds-in-pastures_9pp.pdf (mla.com.au)

Spray-topping can be an effective tactic, provided the correct timing of herbicide application occurs. This fact sheet is unique in terms of focussing on paddock preparation and showing how to pick the optimal flowering time to maximise success.

Total downloads from MLA websites has been low, only 11.

v) How do I use hay and silage production to remove annual grasses?

MLA629_How-do-I-...-use-hay-and-silage-production-to-remove-annual-grasses_-5pp.pdf (sfs.org.au)

Cutting hay and silage is an important non-chemical tactic to reduce seed set in annual grasses. This tactic is rarely explained and so this fact sheet fills that information gap and explains keys to maximising success.

Total downloads from MLA and SFS websites has been 5. This is the lowest amount of weed fact sheet downloads and may also need to be promoted. Hay and silage are useful tactics producers can use especially in combination with other weed control options to allow two to three years of weed control to clean up a pasture. This factsheet has also been used by MLA to create an e-Learning module.

vi) How do I use selective herbicides to safely remove common weeds from sown mixed pastures?

How-do-I-use-selective-herbicides_-28.2.22.pdf (sfs.org.au)

This fact sheet was the most difficult of the tactics to write because of the number of commercial herbicides available, many with the same active ingredient or with slight variations in concentrations. It was recognised that for that reason, this fact sheet was important to try and simplify the process of choosing a selective herbicide that would not only kill the weed but minimise pasture damage.

This fact sheet was only finalised in February 2022 and so downloads are not included in table 5.

4.3.2 Videos

SFS developed three videos on the three most common tactics: spray-grazing, winter cleaning and spray-topping. Initially two videos were planned, however it was deemed that these tactics were all equally important. They are accessible from the MLA weed hub and are available to watch on YouTube.

The process of writing a fact sheet and using this to base a video script was a useful method. It allowed some resource saving as photographs, key messages and literature collection could be re-used.

The spray-grazing video was released earlier than the others and has therefore had the most views (total 1692). The views of the videos far outstripped the downloads of the herbicide fact sheet. This highlights the importance of video as an educational means.

Views of these videos are expected to become higher once timing of winter techniques become relevant.

Table 5. Number of video views up until February 2022.

Fact sheet Name and link to YouTube	No of views from MLA website	No of views from SFS website
Spray-grazing- Turning weeds into feed https://www.youtube.com/watch?v=T5Ti0reGclc	Uploaded mid-February 2021 1619 view	Uploaded mid September 2020 73 views
How do I winter clean pastures to remove annual grass weeds? https://www.youtube.com/watch?v=hpKRHZ3zHFA	Not yet uploaded	Uploaded mid-January 2022 41 views
How do I spray-top to reduce annual weeds in pastures https://www.youtube.com/watch?v=QXQ4pd9NA5o	Not yet uploaded	Uploaded January 2022 45 views
Totals	**1619**	**159**

4.3 Testing of products

A target of four producer groups was to provide feedback on the assessment tool, involving 60 participants. This target was achieved with five groups being involved in testing the assessment tool with 77 diverse producers. Another four groups tested other components of the weed package such as Weed fast facts and fact sheets. Table 7 shows details of the events and participant numbers. The road testing was a useful process to collect feedback and changes to products were made as a result. The feedback and changes are outlined under each product section below.

Table 6. Workshops that have involved road testing MLA weed products

Training event name & description	Weed product focus	Location	Date	No of producers	No of Agronomists	Total No of Participants
Product development with two red meat producer (BWBL) groups	Weed assessment in Pasture Paramedic	Shelford, Inverleigh	Mar-19	28	2	30
Road testing with 3rd year Marcus Oldham College students	Weed assessment in Pasture Paramedic	Geelong	Mar-19	30		30
Road testing with two women on farms (WOF) groups during Integrated Weed Management course. Sessions 2 & 3	Weed assessment in Pasture Paramedic Fact sheet tactics. Weed id. Weed pros & cons. Weed lifecycle.	Hamilton & Lake Bolac	May 2019 and Sep, 2019	19	5	24

BestWool/Best Lamb conference, The value of grazing weeds	Concept of grazing value of weeds in Weed fast facts	Bendigo	19/6/2019	55	5	60
Premium Pasture Group	Selective herbicide fact sheet	Virtual	18/2/2021	8	13	21
Weed session with Marcus Oldham College final year students	Testing the fact sheets	Geelong	24/3/2021	30		30
SFS members, Agrifocus – Weed products overview	How do I know if herbicide application would improve my pasture & Weed fast facts	Virtual	23/09/2021	9	29	38
Totals 9 groups				179	54	233

4.3.1 Weed assessment

Feedback from the working with two BWBL producer groups was that producers valued weeds differently from each other. For example, barley grass was seen as a valued early feed source by some producers and in some farm operations, had no issues with seed heads. Other producers saw it as their main problem weed. The result of this observation changed the weed assessment component of PP. Originally it was to be an assessment of percentage weeds within the pasture. However, because of producer's different perceptions, it was changed to an assessment of the type of dominant weed and the farmers could rate its category (A, B or C) according to its value for the feed base.

Road testing the dominant weeds approach with Marcus Oldham students in 2019, showed that this concept worked well and that they understood the differences between the categories of weeds and could easily assign the relevant group. This approach also showed that they were now weighing up the pros and cons of the weed and considering some of the potential value of the weed for feed contribution. For example, they were now asking questions such as, "Is this weed any good," or "Can I graze this this weed, or does it cause poisoning?"

In testing the PP weed component with two WOF groups, it was apparent they were struggling with weed identification, particularly distinguishing between different grasses or when weeds were small. Therefore, it was decided that weed identification information within a technical manual was necessary and that an online booklet they could access via their phones in the paddock would be of value. Also based on this observation, more emphasis was put into identification of the different stages of the plant and inclusion of distinguishing factors from similar looking plants. This group also suggested a change to the condition descriptions and that a consideration should be few or no weeds and this should be given the highest score. Another suggestion was to include a section in the

recording book, to note the dominant weed present, so that paddock changes could be seen over time.

Agronomists involved in the testing groups liked the weed assessment concept. They found it simple and easy to use and liked that it had clear decision points. They also welcomed the development of such a tool as they believed that producers currently did very little assessment of pasture condition, but they needed to. They also believed that producers didn't really know if their pasture was any good or not and therefore did not make good decisions in relation to management. They were happy that the tool encompassed the major assessments needed.

Identification of desirable plants and weed identification was identified as a skill gap which lends itself to be considered for development or inclusion in future training opportunities.

4.3.2 Weed fast facts

Information about individual weeds was presented in short facts to WOF groups. The facts presented were those related to the type of weed (annual, perennial), conditions which favour its growth, time of growth and reproductive or seeding characteristics that were important for its control. Producers were found to be able to easily recall the short key facts and interesting facts had high appeal. Therefore, information about weeds was developed, containing the key facts important for control or management rather than detailed descriptions. This was partly to keep the producers engaged while providing the critical information needed for management. The group also liked the approach of using calendars to control weeds, probably because of its visual nature and being able to use it for planning. They thought it encouraged to "think ahead, preparing for a weed, not just waiting."

The presentation to BWBL conference re-enforced that there was interest in grazing value of weeds and that some summer weeds should be included in Weed fast facts.

A major change to Weed fast facts was the presentation of feed value. To start with actual recorded feed test values were included in the grazing value wheel, but due to the nature of sampling and variation in values was leading to producers being distracted by possible causes rather than looking at the trend in feed quality. Therefore, to avoid producers becoming distracted with data variability, ranges in feed quality data were used instead.

Explanations of feed quality data were needed as some producers were unfamiliar with what these values meant in terms of production. Particularly protein, with some producers believing that the highest values were desirable and not realising that animals could not utilise all the protein or knowing that green material generally supplied enough protein to meet feed demands.

Links were added into the document, to help producers quickly access information they wanted as it was otherwise cumbersome to scroll through different pages to get to their weed of interest.

SFS members were shown Weed fast facts and thought it would be helpful. The main change made based on their feedback regarding the colours used, that they were too bright and so were toned down.

4.3.3 Tactic fact sheets

Marcus Oldham students showed they were able to use the decision guide from *How do I know if herbicide application would improve my pasture* and were able to prioritise the paddocks correctly and identify the appropriate weed control technique to use. When student's skills were later tested

all but one group (26 students out of 30) thought to use the decision guide, and all were correct in its application. This testing shows that the concepts work and have helped the students make sensible decisions.

Premium Pasture Group focus was on using selective herbicides and involved eight producers. What was apparent from this workshop, was that there many selective herbicides on the market, and choosing an appropriate herbicide was difficult because of the amount of information that needed to be considered. Producers needed to more easily identify a herbicide that would kill a specific weed but not the desirable pasture. Also, that some level of pasture damage was to be expected and if possible, specify this damage so that the producers could use it to make an informed decision. This shaped the development of this fact sheet.

This fact sheet was sent to herbicide company representatives for checking and the feedback from them was positive. Examples of this feedback is shown below:

- "The document reads well. Structure is good."
- "The fact sheet has a lot of great information in it – huge congrats to you for pulling all of this together!"
- "Very good information on the tech guide for MLA, it is always a hard one as many herbicides don't necessarily fit into one mode of action or another in grass selective situations but how much do you drill down into them?"

Through consultation with herbicide development officers, it was apparent that there had been a lack of attention in pasture herbicide development and that there were opportunities for further developmental work. This fact sheet also tried to quantify the level of damage to non-target species and if this had been established. There were some grey areas identified, where there was a lack of accessible research findings. Information collected by herbicide companies that was not published in tech notes may also have become lost as companies changed.

An opportunity to collect this data could be that at the completion of Pasture Trial Network sites, additional herbicide tolerance of new species could be collected by overlaying different herbicide applications and creating herbicide matrices. Photos showing pictures of damage at six weeks post application would be quite educational for producers.

One herbicide company had good research data and literature on a herbicide that controlled barley grass and in perennial grass pastures with damage minimal to perennial ryegrass and phalaris but for commercial reasons, had not registered the product for use and was not prepared to back its use. Increasing the demand of pasture herbicide products may encourage further commercial investment into their development.

4.4 Training workshops for retailers and advisors

The project objective was to run at least three training workshops for retailers/agronomists with a target of 30 trained in the use of the diagnostic tool and management options. In this project three training workshops with a focus on weeds were ran involving 45 agronomists.

The intended practice change targets for these workshops were:

- 65% of participants access and use specific MLA products and resources because of workshops and training events.
- 30% of participants participate in other MLA activities/programs.
- 75% of participants will demonstrate improved knowledge, skills or understanding.

The actual achieved practice change targets for these workshops are reported in table 8 and were:

- Greater than 92% of participants accessed and used specific MLA products and resources because of workshops and training events.
- About 70% of participants have intent to participate in other MLA training activities/programs that were part of the FAP four training packages.
- 100% of participants demonstrated improved knowledge, skills or understanding.

More information on feedback for each workshop is reported below.

Table 8. Summary of merchandise reseller workshop evaluation data.

Name of Agricultural reseller	Number of participants	Satisfaction rating	Knowledge or Competency Increase	Intent to use products	Intent to participate in other MLA activities	Evidence of potential further reach
Elders	27	5	100%	Unknown, however requests for download links and hard copies were provided.	Expected to be at least 90% given past repeat attendance.	Unknown, information not collected
Mixed agronomists/ advisors	13	4.4	100%	92%	33% had intent to attend training opportunities at the Rokewood site	83% mentioned using tools/information with clients
Gorst Rural	5	5	100%	100%	Expected to be greater than 90% given their feedback.	100%
	45	4.8	100%			

4.2.2 Elders

The Elders online event was attended by 27 agronomists from the southern feedbase region. At least three were trainees. The event was recorded to share with other staff members who were unable to attend. The chat box was used to collect evaluation information.

Nine provided evaluation information in the chat box when requested but all rated the value from the workshop a five which was the highest possible score. General comments reflected the value participants found in the training which could be used for future advertising. The value was as a refresher for experienced agronomists and for new graduates, it was access to the new and practical information. Comments included:

- “Herbicides to use was a good refresher”

- "Great session. As a trainee agro this session has been very insightful."
- "Highlighted decision support tools and literature that are available"
- "Very useful refresher about pasture management techniques, especially on timing and cost benefit analysis."
- "Refresher of herbicide use"
- "Herbicides to use refresher"

Assessment of participants insights reflected that their knowledge increased, and these are the things they reported they had learnt:

- "Pasture evaluation prior to treatment."
- "Grazing techniques in herbicide use."
- "Fertility and how it can affect weeds."
- "Tools available from MLA & SFS."
- "Biggest insight for me would have been the detailed description of spray-graze technique & also the ideal heights to maintain for desirables to ensure minimal damage."
- "Different timings /methods."
- "Biggest insight was how heavily you need to stock for successful spray grazing."
- "Whole farm feed budgeting & sub-clover response to lime / silver grass reduction."
- "Weed management tactics and in particular the height to graze down to."

Intention to use products was not a question asked. However, the product list was requested from Elders and agronomists had intention to download factsheets.

This group had previously participated in an MLA sub-clover workshop from the More sub-clover package (L.FAP 1904) with 28 attending (one was a work experience student). At this event there were 27 and the majority were repeat attenders. Elders expressed interest in receiving training in the pasture module. One graduate expressed interest in the opportunity to sign up for the PayDirt training package.

The group requested whether more information on achieving weed control in species other than common desirable grasses and sub-clover. This implies they like the current products and want more. An opportunity might be developing information packages for the next most common pasture species where knowledge gaps exist. For example, annual ryegrasses for fodder or arrowleaf clover.

4.2.2 Mixed agronomists/advisors

Of the 17 that registered, 13 agronomists attended and eight reported that their client numbers which totalled. Three participants were seed sellers, with one mentioning they dealt with 28 merchandise stores. This highlights the opportunity to extend the reach of the information package to producers provided agronomists use the information. The remaining two participants were trainee agronomists and had no individual clients at present. One participant had previously attended the Nutrien More sub-clover training day and had brought with them a trainee.

The value agronomists expressed the got from the workshop was an average of 4.4 out of 5 (6 scores each of 4 and 5 and one score of 3).

Assessment of participants insights reflected that their knowledge increased, and what they learnt varied. However, commonalties were knowledge that the tools existed and it showed that participants picked up on the key messages Such as that weeds had some feed value and that there can be production loss from removing these weeds. The groups responses to what were there biggest insights are listed below:

- “The value of weed species for feed. Selective herbicide use in pastures."
- “The breadth of work done and information available to advisors and producers.”
- "Insight into weed feed value"
- "Spray top timing"
- “New resources available"
- “Table of herbicide efficacy etc.”
- “How taking out weed species can leave a gap in the season.”
- “How much production we can lose from applying herbicides to our pastures with weed issues.”
- "The use of tools and decision making.”
- “Production use of weeds.”
- “Weed control matrix of when to apply or not. Matrix of herbicide effects on weed and desirable species."
- “Insight into the decision making process around applications.”
- “Insight into available tools.”

The workshop participants expressed their intention to use the products and how they would use it. What was notable, was that three agronomists indicated they would use Pasture Paramedic and weed assessment with producers and the other comments related to using the other information resources when giving advice.

Participants responses to “How do you intend to use the information or products?”

- “Assisting farmers with grazing and spraying recommendations.”
- “At home and on the farm. Advising clients. Different ideas.”
- “Save Pasture Paramedic to phone-show and utilise with clients.”
- "Better advice to producers; spreading the word re information and tools available."
- "Every time I'm on farm to refer back to."
- “Will use square with growers who aren't really switched on with pasture composition to get them doing it themselves."
- "Spreading info to clients to help support decision making."
- “Use this with my clients in the crop. Share with colleagues."
- "Application on farm."
- "Backing up current knowledge and passing onto clients when suitable."
- "Better understanding of spray application regarding effective timing and need/long lasting effects."
- “Direct clients to this information, use information for consultancy."

Responses to what further information/workshops/client days/ other would you like are listed below. There were four responses in relation to intending to visit the Rokewood trial site, which is being set up as a demonstration and training site for information used in the FAP four training packages (soils, weeds, sub-clover and pastures), to further cement training.

- "Further weed control."
- "Species selection."
- "Continued development/replication of what was done on sub-clovers with other varieties."
- “You need palatability in tables and a thought as to rotations if cropping and weed seedbank of long dormancy weeds."
- “Weed fast facts sheet book."

- “Herbicide options in pastures. I enjoyed the herbicide options exploration in this presentation, so a bit more on that."
- “Pasture cropping."
- “Pasture disease."
- “Trial site field day."
- "Interested in the new pasture trial site at Rokewood."
- "Visit Rokewood site. Become familiar with Pasture Paramedic and use tools."
- “On farm demonstrations for farmers."

Other suggestions for future consideration may be the development of Weed fast facts into a hard copy booklet and development of further training packages with other pasture species. Possibly a fact sheet on cropping as a weed control tactic.

4.2.3 Gorst Rural

Five agronomists attended on the day and two were trainees. This number was lower than initially planned because the original workshop was cancelled due to half the team having Covid and the other half isolating at home. This meant that agronomists had only recently returned to field work and so some were unable to attend due to other work priorities.

All the group members rated the workshop as valuable with 100% rating it five out of five. There additional comments provided insights into what they found valuable.

- "Very informative and great research."
- “Fantastic pasture tool to make life easier and more productive for growers and consultants.”
- “This truly is fantastic, and the research being done is usable and topical."

The groups biggest learning insights were:

- "How to test for seed maturity. Going through the steps to have a grower gain confidence."
- “Step by step assessment of pastures to determine proper manipulation, with cost effective measures too."
- "Realising all the cool tools that are out there."
- “Shown how much resources are available.”
- “There are fantastic resources available for tackling pasture, weed and soil management."

The group’s intention to use the information or products was for use with clients. Responses are below.

- “For my own development. Clients"
- “Help work through the steps of pasture repair with growers"
- “When training my colleagues and sharing with growers"
- “With clients helping them understand better about the common weeds and how to control them"
- “Use with growers to assist with making decisions for paddock management"

The group expressed interest in having all the available training packages on offer and offering training of these tools with clients. Their responses to what further information/workshops/client days/ other would you like were:

- “All of them!"

- “We would like to have all workshops please, both just in house and to growers"
- “’Soils. Sub clovers."
- "Try and do all the workshop packages, have you come and do grower days"

5.0 Conclusion

5.1 Key findings

- Identifying the dominant weed present and considering how it contributes to the feed base is an effective component of a pasture assessment tool.
- Producers can have poor plant and weed identification skills especially when plants are small and vegetative and so identification support material was deemed important and therefore provided in the PP support technical manual.
- Road testing resources with producers and some agronomists resulted in identification of product improvements, especially when tested in a group setting where improvements could be discussed, and ideas built upon. Sending out resources and asking producers for comments rarely resulted in constructive feedback.
- The decision guides used in PP and in the fact sheet, *Do I apply herbicide to improve my pasture* are very effective educational tools at causing producers to consider the critical factors they need to get right.
- The development of fact sheets is a great starting point and efficient way to develop other resources, such as a video scripts, e-learning modules or promotional material.
- Training agronomists/advisors in use of the resources has helped increase the access of resources to producers and helped promote MLA as a useful source of weed information.
- Part of the success of creating informative resources has been to create or seek out good photographic evidence to support written material and appeal to visual learners. Also, the refereed data on weed composition changes and losses in production has appealed to agronomists/producers and will enable them to make better decisions around weed control options and management.

5.2 Benefits to industry

A complete set of weed management resources on common weeds is now available for red meat producers and their advisors to use. Resources provide support to producers all the way along the decision making cycle of weed control, starting with weed assessment (PP kit), deciding on whether to intervene (Weed fast facts and Do I apply herbicide guide) and implementation (tactic factsheets and videos).

These resources will help producers increase their knowledge to better control weeds that reduce animal production and desirable species persistence. The resources have undergone road testing with producers and are supported by agronomists and are ready for widespread release. Future training of agronomists/advisors in use of the resources will increase the reach of the resources to producers.

This project links well to the more sub-clover (L.FAP 1904) and pasture productivity and persistence package (L.FAP 1903), which helps to achieve long lasting weed control by maximising desirable

species competition against weeds and fills gaps left behind by weeds. It also links to Healthy soils (L.FAP 1902), where some weeds are useful indicators of unfavourable soil conditions and therefore require treatment to create soil conditions favourable to desirable grasses and clovers.

6 Future research and recommendations

A key challenge was sourcing information on desirable species or cultivar tolerance to selective herbicides. Gaps in knowledge of selective herbicides efficacy or species tolerance was depicted in cells shaded grey in tables 4 and 5 of the fact sheet, *How do I use selective herbicides to safely remove common weeds from sown mixed pastures?* An opportunity to collect this data or partner with herbicide companies could be at the completion of Pasture Trial Network sites. Additional herbicide tolerance of new species could be collected by overlaying different herbicide applications and creating herbicide matrices. Photos showing pictures of damage at six weeks post application would be quite educational for producers. This would allow a library of new cultivars to be tested. Currently many cultivars that have been tested for herbicide tolerance are no longer commercially available or have been replaced by improved cultivars.

Due to restrictions with Covid, the products were unable to be promoted at large producer events. This remains a gap. Promotion of how the weed products fit together and can be used, needs to also occur plus instructions to utilise sub-clover and desirable grass MLA resources for improving pasture recovery and competition following treatment. Promotion of the weed resources to relevant PGS coaches could also mean these resources are utilised in training.

Agronomists were very receptive to training and provision of resources that will help in their weed control recommendations. Training of more agronomists is therefore recommended to occur. Training of new graduates, using the new resources created is also likely to have high appeal due to the practicality of information and their appetite for it.

Agronomists provided feedback that they had concerns with how to approach pastures with multi species of weeds and what could be done about them. A fact sheet could be developed with dealing with the challenges and decisions involving multi weed species.

Identification of desirable plants and weed identification was identified as a skill gap which lends itself to be considered for development or inclusion in future training opportunities or events.

High numbers of views of weed control videos, indicates the appeal of this medium. Videos of other weed management tactics should be considered.

7 References

Brogden J, (2020) Spray grazing – Turning weeds into feed**.** In ‘Trial Results Victoria Edition 2019’. pp 134-139 (Southern Farming Systems)

Appendix

8.1 Media

8.1.1 Agriculture Victoria tweet promotion of Weed fast facts.

8.1.2 Agriculture Victoria - promotion of Weed fast facts.

Fast facts on the grazing value of summer weeds

An informative article 'Grazing value of summer weeds' has been published in Spring Sheep Notes 2021 looking into the nutritional value of sheep eating weeds during the summer season.

Agriculture Victoria Livestock Extension Officer Raquel Waller said some summer weeds can cause animal health issues, while others have nutritional value for sheep which may be worth considering before deciding to spray and remove them.

Ms Waller said green pick over summer can provide protein, which is a necessary component of the sheep's diet and is important for the digestion of the low-quality dry feed that may be on offer.

"In the absence of a summer pasture species like lucerne, summer weeds can be of value.

"However, it is important to know your weeds, since toxic weeds can affect the health of the flock," she said.

The article outlines the nutritional value of some weeds that are potentially useful over summer.

It is a preview of the work conducted by Jess Brogden and Lisa Miller at Southern Farming Systems (SFS), and will be published in 2022 as a Weed Fast Facts booklet on Meat & Livestock Australia's (MLA) web hub www.mla.com.au/weeds and LESS WEEDS, BETTER PASTURE – Southern Farming Systems (sfs.org.au)

Ms Waller said the pros and cons of grazing, rather than spraying out summer weeds in a pasture needs to be considered in terms of how it affects the preferred grasses and clover during the growing season.

"There can be competition for resources of light or shade, water and nutrients, problematic seeds for livestock, issues of toxicity and chances of success. For example, buried wireweed/ hogweed seed can last for up to 60 years.'

"Generally, a good quality sown perennial pasture will contain 30 – 50 per cent sown grass and 20 – 40 per cent subterranean clover, with annual volunteer weeds making up the rest of the pasture.

"Pastures that dry off over summer, decline in energy and protein as the plants go to seed and die off. "High-quality pastures may still retain sufficient quality to support non-lactating animals for the duration of summer–autumn, but poorer quality pastures will not benefit animals.

Find the article and more science-based information from Agriculture Victoria, including a range of tools, tables and calculators, online via the Feeding Livestock website.

8.1.3 SFS eUpdate Weed fast facts.24/1/2022

Weed Fast Facts

By Lisa Miller Manager, Soils, Pasture & Livestock

Weed fast facts is now available from our SFS website from the project page Less Weeds More Feed.

Its an information guide SFS developed with MLA funding on 15 commonly found pasture weeds to support management decisions.

There are many things to like about this product. Its both visually appealing and informative.

Weed fast facts helps you understand the how weeds grow and the weeds' benefits or costs in terms of their contribution to feed available for grazing. It also provides facts on interventions and when tactics should be implemented.

We are not the only ones that like it. Agriculture Victoria featured our summer feed test data in their Spring Sheep Notes and recently gave it a plug on ABC radio.

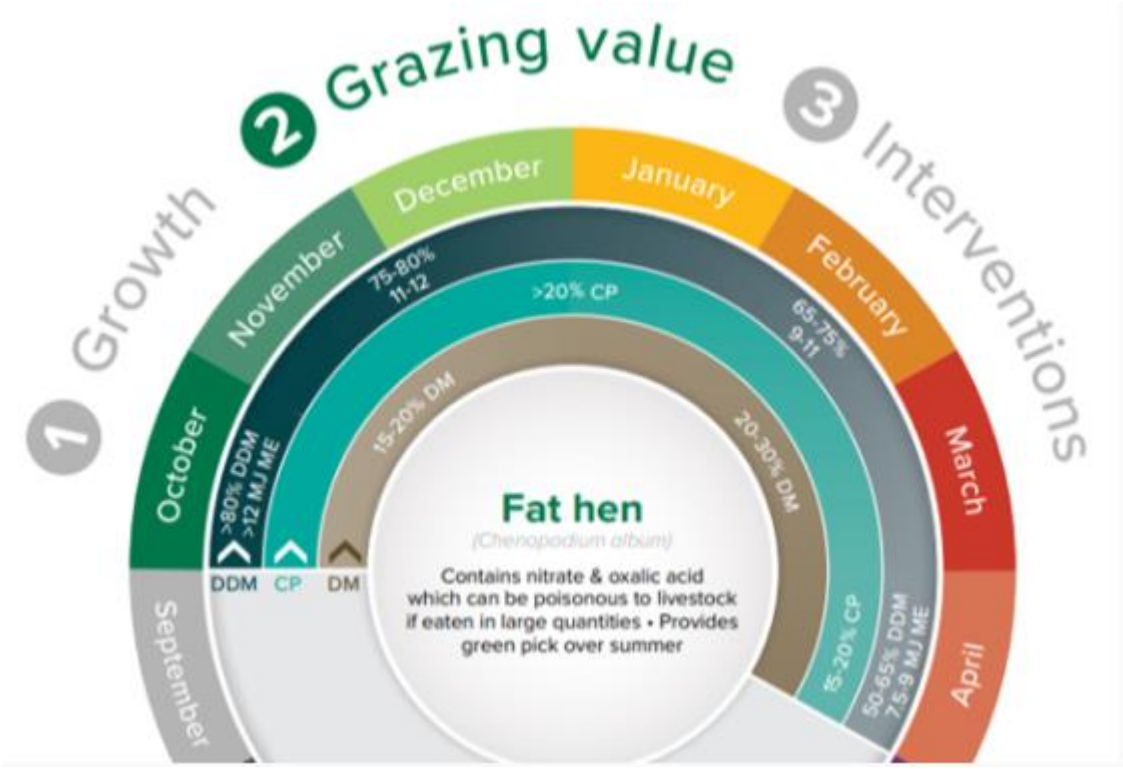
Information on each weed is presented in three wheels: growth, grazing value, and interventions. The wheels are based around a monthly calendar, which represents the cyclical nature of plant growth.

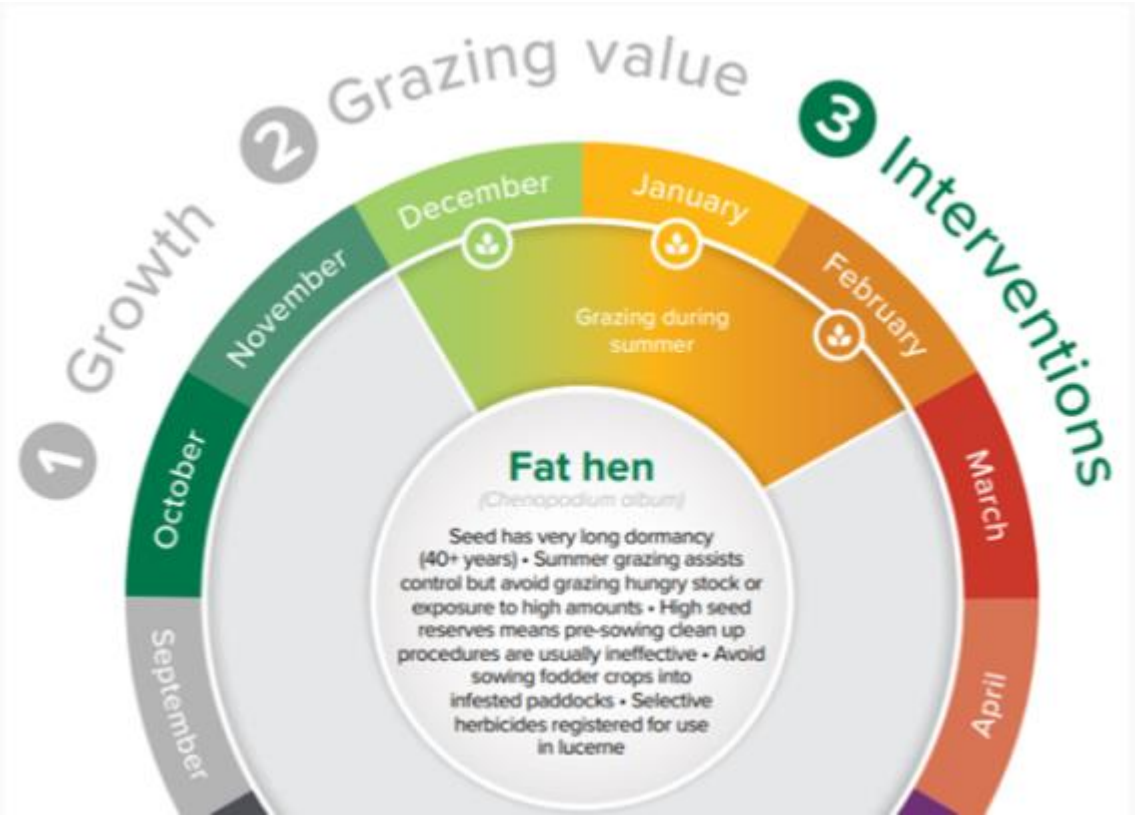
Together, this information can help you decide what action to take. Weed control decisions require appreciating and comparing the benefits and costs, and pros and cons of both the weed and its interventions.

Weed fast facts is easy to use. The document contains hyperlinks that allow you to move to each weed or wheel you are interested in viewing.
Check it out!

The images below are the Facts on Fat Hen, one of the summer weeds you will currently find.


1 Growth
2 Grazing value
3 Interventions
December
January
February
March
April
May
June
July
August
September
October
November
Fat hen
(Chenopodium album)
Annual broadleaf weed • Favoured by fertile, heavy textured soils & summer rainfall • Tolerates wide range of soil and climatic conditions • Frequently found on fallows • Germinates by seed in spring to summer & dies out during winter


1 Growth
2 Grazing value
3 Interventions
December
January
February
March
April
September
October
November
75-80%
11-12
>20% CP
65-75%
9-11
15-20% DM
20-30% DM
15-20% CP
50-65% DDM
7.5-9 MJ ME
>80% DDM
>12 MJ ME
DDM
CP
DM
Fat hen
(Chenopodium album)
Contains nitrate & oxalic acid which can be poisonous to livestock if eaten in large quantities • Provides green pick over summer


1 Growth
2 Grazing value
3 Interventions
December
January
February
March
April
September
October
November
Grazing during summer
Fat hen
(Chenopodium album)
Seed has very long dormancy (40+ years) • Summer grazing assists control but avoid grazing hungry stock or exposure to high amounts • High seed reserves means pre-sowing clean up procedures are usually ineffective • Avoid sowing fodder crops into infested paddocks • Selective herbicides registered for use in lucerne

8.1.4 SFS eUpdate – Winter cleaning

Less Weeds More Feed, Winter Cleaning Pastures

By Jessica Brogden, SFS Research & Extension Officer, Soils, Pasture & Livestock

It is not often that we have a pasture free from weeds and it is understandable that farmers would be hesitant about winter cleaning as the competitive growth of silver grass provides reasonable feed for high animal demand.

Removing silver grass from the feedbase may reduce the food on offer in the short term but the long term effect of winter cleaning relies on the ability of perennial grasses and clovers to fill the gaps left by the removal of silver grass (Nicholson, 2006).

Silver grass has a very short seed viability and very little seed dormancy (DPIRD, 2020) disrupting the seed set even for one year can dramatically reduce the seed carry over the following year (Nicholson, 2006).

Keeping silver grass in the feed base can mean that sub clover production takes a back seat in 2021. The degraded residue from a dense stand of silver grass may affect the germination and production of sub clover. Silver grass has low biomass during autumn and winter and low palatability and nutritive value in late spring and summer where livestock avoid grazing silver grass after seed head emergence (DPIRD, 2020).

Southern Farming Systems project Less Weeds More Feed, funded by MLA is looking at the impact of different spraying times on silver grass, the desirable grasses and clovers in the feedbase. The first application was applied in June 2020 with Simazine and Paraquat and the impact on winter feed production, effectiveness of removing silver grass from the feedbase and the impacts on sub clover and perennial grass persistence will be closely monitored. Further applications will be applied over winter and spring to look at the effect of timing on reducing the plant's ability to set seed and what impact that has on the feedbase.

Less Weeds More Feed Trial Site, Quadrant showing pasture composition and estimated Feed On Offer. Credit:Jessica Brogden, SFS

Less Weeds More Feed Trial Site, Showing the pasture composition in the paddock. Credit: Jessica Brogden, SFS

8.1.5 SFS eUpdate – Spray-topping

Spraytopping– You haven't missed the boat

By Jessica Brogden, SFS Research & Extension Officer, Soils, Pasture & Livestock.

The time of spraytopping is fast approaching and is determined by seed maturity.
At or just before milky dough stage is ideal for glyphosate application, which often coincides with about 70 to 80% seed emergence. Beyond the milky dough stage seed will be soft but no milk will be released. The seed heads will appear lighter green to light brown and start to 'hay off'. Paraquat is then the preferred herbicide.

The other key to success of this technique lies in achieving even seed head emergence which helps get the right time to spray. Heavy grazing in winter and early spring followed by a two to three week rest prior to spraying allows the seed heads to emerge at the same time.

Spraytopping uses a sub lethal dose of herbicide to sterilise seed that is being formed. Breaking the ability of the plant to set viable seed dramatically reduces the seed carry over. As a result there is less seed available to germinate at the break and therefore less weeds the next year. This technique can improve our perennial grass and clover content, extending the productive life of a sown pasture and reduce seed injuries to stock.

Growth from annual grasses can be considerable, especially during autumn and winter. They rapidly establish by germinating early and provide high quality feed during winter and early spring. For these reasons we often accept and value their presence. However, it is at the expense of our perennial pasture systems. Annual grasses have the potential to destabilise pastures by out competing sub-clover which in turn reduces feed quality, animal intake and nitrogen needed for grasses.

Southern Farming Systems through the "Less weeds more feed" project funded by MLA are developing information and diagnostic products that help you reveal the potential of your pasture.

Please get in touch to find out more!
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Photo: Pasture ready for Spraytopping. **Credit:** Jessica Brogden, SFS

8.1.6 SFS eUpdate – SFS E-news December 28th, 2021

Weeds, where's the value?

By Jessica Brogden, SFS Research & Extension, Soils, Pasture & Livestock.

Weeds can reduce the productivity of a pasture but spraying to remove them needs to be carefully considered to maximise the benefits. All pastures will contain species that may not have been sown but generally only contribute a small proportion to the overall pasture mix and are of similar quality to the desirable species when vegetative.

The weeds in our feed base can be undervalued in terms of their quality and often provide valuable feed in tight seasons and over the summer. Grazing also allows us to capitalise on the feed value of these weeds whilst removing them from the feed base or until they reach a productivity threshold that requires another intervention such as herbicide manipulation. In most cases these plants remain in small quantities from year to year and commonly do not significantly affect pasture quantity or quality. We just live with them.

However, problems arise when plants:

- Significantly displace or compromise growth of desirable species through competition for light, water and nutrients. e.g. silver grass and sub-clover, capeweed and perennial grasses etc
- Cause animal health issues, carcass damage or fodder contamination e.g. barley grass, erodium, nightshade, Paterson's curse etc
- Shorten seasonal production by flowering earlier e.g. Winter grass (*Poa annua)*
- Create areas of exposed soil over summer that could erode. e.g. Capeweed on bare hills

Weed control can be a low-cost/high benefit tactic to improve the productivity and life of a pasture. The lowest cost tactic is often grazing, provided the weeds are not toxic. Grazing is a simple tactic that can be used alone or with other methods. Annual grasses with short seed viability such as barley grass rely on successful seed set to persist from one year to the next. Interrupting this process for just two or three years significantly reduces the soil seed bank. This can be achieved through strategic grazing, cutting silage, herbicide manipulation (e.g. spray grazing/selective herbicides).

Removing weeds provides an opportunity for other plants to occupy the bare spaces created. For this to be effective, herbicide treatments also rely on having sufficient desirable species to fill the new spaces otherwise one weed may just be replaced by another. This may be through encouraging existing species to tiller/seed or by introducing new species through oversowing.

For further information, Southern Farming Systems have recently written a MLA factsheet titled "How do I know if herbicide application would improve my pasture. This will become available in January 2021.
SFS on behalf of MLA are developing numerous products and workshops on improving perennial pasture systems in the high rainfall zone of southern Australia. To register your interest, please get in touch with jbrogden@sfs.org.au