Final report

Management options and species evaluation to increase productivity in dieback-affected pastures

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Abstract

Pasture dieback has resulted in the death of large areas of previously productive grazing country in Queensland and, more recently, northern NSW. The cause of dieback, pasture mealybug (*Heliococchus summervillei*), causes reduced pasture health and death.

Legumes are not affected by pasture dieback, and some grass species appear to tolerate its effects. Four field trials established in 2021 demonstrate that combinations of stick raking or cultivating and re-sowing with a grass pasture or pasture/legume mix greatly improved productivity compared to untreated areas that were left to regenerate naturally, or those resown with the pre-existing grass species (i.e. buffel or bisset).

These trials show that stick raking is a viable option for preparing a seed bed in locations that are not particularly weedy, or do not have a large bulk of pre-existing grass. Grass mixes and grass and legume mixes appear to be providing good coverage in dieback sites; however, they will require longer term studies to assess the long-term impact of dieback on these treatments compared to control plots.

Variety trials have identified that both Mekong brizantha and Humidicola are tolerant to dieback, Strickland finger and premier digit have shown severe dieback symptoms, however, they remain persistent in the trials. Other species have had varying degrees of germination and impact by dieback. Further assessments are required to assess the impact of dieback on these varieties long term.

Executive summary

Background

Pasture dieback has been causing the death of pastures in Queensland and New South Wales since 1926. This issue has become a major problem for cattle producers, worsening in recent years. Pasture dieback affects a range of species, particularly the most productive introduced species such as buffel grass and bisset bluegrass, thereby reducing the available feed for livestock. Producers urgently need solutions to provide feed on dieback-affected land.

The project was initiated to find ways for graziers to produce feed from dieback-affected pastures by either increasing productivity or reducing dieback severity. The first two phases of the project established management and grass species evaluation trials in four strategic locations in Queensland: Theodore, Jambin, Gaeta, and Biggenden, covering both coastal and inland areas in central and southern Queensland. These sites were heavily affected by dieback, caused by pasture mealybug (*Heliococcus summervillei*).

The trials were designed to monitor the impact of various management strategies on dieback-affected pastures. The selected strategies were based on ease of implementation and cost-effectiveness. After consultations with graziers and a review of the latest research-based information, the following trials were established: fully replicated management trials on dieback-affected sites included re-sowing with grass mixes, legume mixes, grass and legume mixes, with and without a fertilizer program, based on soil testing and a low-cost single species grass re-sowing treatment. All treatments were established following stick raking (cultivation in one location), with appropriate controls in place. Grass species evaluation trials aimed at evaluating the tolerance of different grass species to dieback were established adjacent to the management trials.

Data collection involved measuring plant coverage, documenting species composition, conducting mealybug counts, and collecting dry matter biomass. These metrics were used to evaluate the effectiveness of each treatment across four replicates of each of the nine treatments.

To communicate the findings, a 'How to’ Guide' for selecting grasses tolerant to pasture dieback and an agronomist’s guide to pasture dieback were developed. Field days were organised to demonstrate trial results and share practical insights with producers. Currently, three years of data have been collected, showing impressive results. However, it is believed that five years of data are required to confidently predict the long-term success of these interventions.

Objectives

The broad aim of this project was to rigorously evaluate altered pasture management in dieback-affected areas and communicate the results to producers. Specifically, the project aimed to:

- Identify and evaluate economically viable pasture management options: Increase pasture productivity and produce feed for livestock in dieback-affected Queensland grazing regions.
- Identify and evaluate tolerant pasture species or varieties: Find pasture species or varieties that are tolerant to pasture dieback
- Communicate results and recommendations: Share findings and recommendations with producers through a producer's guide, field days, factsheets, and other communication methods.

Methodology

- Assessment of four management trial field trial sites, with percentage area of plant coverage, species composition, mealybug counts and dry matter biomass across four replicates of nine treatments.
- Assessment of four pasture variety field trial sites, with percentage area of plant coverage, species composition, mealybug counts across four replicates of 15 treatments.
- Development of a 'How to guide' for selecting grasses tolerant to pasture dieback
- Development of an agronomist's guide to pasture dieback
- Field days to demonstrate the results of trials.

Results/key findings

Assessment of the field trial sites demonstrated that treatments using stick raking or cultivation and resowing with a pasture grass and/or grass and legume mix generally gave the best results in useful plant coverage. Stick raking or cultivating and allowing for natural regeneration resulted in a higher weed incidence, and greater dieback expression. This was a consistent trend across all trial sites.

Pasture grass and grass and legume mixes gave the best results by minimising dieback expression and providing good, useful coverage. The weediness of an area may impact the effectiveness of these treatments and needs to be considered when sowing legumes due to constraints of managing forbs.

Application of fertiliser has not impacted dieback susceptibility, however, it supported an initial increase in biomass.

Variety trials have had varying degrees of seed germination and resulting success of pasture establishment. Low seedling numbers in some varieties are the result of poor-quality seed. Further assessments are required to better assess the impact of dieback on these varieties.

Benefits to industry

Trials established in 2021 are already yielding results that can guide producer decision making to improve pastures in dieback-affected areas. One of the most promising strategies identified is sowing pasture mixes with more tolerant grass species into dieback-affected areas and including legumes in the mix. Additionally, the trials have identified and tested commercially available grass species with strong tolerance to the pasture mealybug.

These findings offer producers practical, immediate solutions to mitigate the impact of dieback and enhance pasture resilience.

Future research and recommendations

Based on the project's results, it is recommended to extend the project to provide a robust basis for recommending replanting and renovation strategies.

The trial sites should be used as demonstration sites to showcase effective practices to the broader industry, leveraging networks like MLA, DAFQ and AgForce for dissemination.

Lastly, a comprehensive communication strategy should be implemented to share findings through field days, factsheets, and updates to the MLA Pasture Dieback Management Guide.

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1. Background

Pasture dieback is a condition that causes widespread and episodic death of pastures. It starts with reddening or yellowing of the leaves at the tips, progressing towards the ligule, and eventually turns the entire plant grey instead of the normal straw colour of senesced grass. This makes the grass unpalatable to cattle, which then avoid it (Makiela 2008). The condition is caused by the pasture mealybug (*Heliococcus summervillei*).

This issue poses a major problem for cattle producers in Queensland and northern New South Wales, resulting in the death of many pasture species, particularly productive introduced species like buffel grass. This reduces the available feed for livestock, creating a need for both long-term solutions and immediate strategies to provide alternative feed.

The project aimed to find and evaluate economically viable pasture management options to boost productivity and produce feed for livestock in dieback-affected regions of Queensland. It also focused on identifying pasture species or varieties that are tolerant to dieback and/or mealybugs, with the necessary agronomic traits for productivity and economic viability in these regions. By emphasising economically viable strategies and collaborating closely with agronomists and graziers during variety selection, the project aims to guide management actions for pasture dieback and further research and adoption efforts.

2. Objectives

The primary goal of this project was to thoroughly assess modified pasture management practices in areas affected by dieback and share the findings with producers. Specifically, the project aims to:

- Identify and evaluate economically viable pasture management options that can enhance pasture productivity and provide feed for livestock in dieback-affected Queensland grazing regions.
- Identify and evaluate pasture species or varieties that are tolerant to pasture dieback
- Communicate the results and recommendations to producers through field days, factsheets, an updated guide to dieback and other communication methods.

3. Methodology

3.1 Best Practice Agronomy Trials

The objective of these trials was to identify methods for graziers to enhance feed production in dieback-affected pastures by increasing productivity and reducing dieback expression.

Planning and establishment of trials

Field trials were conducted in dieback-affected grazing regions to evaluate pasture resistance or tolerance to dieback, agronomic performance, biomass yield, and mealybug populations. The trials were set up on four properties selected in Activity 3, located in the southern region (Biggenden/Gaeta) and the Biloela region (Jambin/Theodore). These trials were fenced, and grazing was controlled. Producers hosting the trials were fully engaged in the planning and consultation processes for the assessment of management treatments and pasture species/variety resistance. The project covered all costs associated with establishing and running the trials.

Site preparation

The minimum plot size was 9 x 9 meters, varying by site. Larger plots were necessary for implementing management treatments and increasing the likelihood of dieback presence in each plot. Specific plot sizes were as follows:

- Theodore: 11 x 12 meters
- Jambin: 8 x 15 meters
- Gaeta: 9 x 9 meters
- Biggenden: 10 x 10 meters

Site preparation varied by location. At Theodore, Jambin, and Biggenden, the process involved stick raking, applying fertiliser to relevant plots, and then stick raking again. This second stick raking dragged the bulk back over the plots, effectively working the fertiliser into the ground without transferring it to other plots. At Gaeta the plots were cultivated once and then scarified.

Treatments

The management interventions to be evaluated focused on cost effective and minimal input treatments that could be applied in a wide range of pastural environments.

Treatments varied slightly across sites, with specific fertiliser rates detailed in Table 3-2. The treatments at each site included:

Jambin and Theodore

1. Untreated control
2. Stick rake
3. Stick rake + buffel
4. Stick rake + grass mix
5. Stick rake + legume mix
6. Stick rake + grass and legume mix
7. Stick rake + grass mix + fertiliser
8. Stick rake + legume mix + fertiliser
9. Stick rake + grass and legume mix + fertiliser

For the Biggenden site:

1. Untreated control
2. Stick rake
3. Stick rake + bisset
4. Stick rake + grass mix
5. Stick rake + legume mix
6. Stick rake + grass and legume mix
7. Stick rake + grass mix + fertiliser
8. Stick rake + legume mix + fertiliser
9. Stick rake + grass and legume mix + fertiliser

For the Gaeta site:

1. Untreated control
2. Cultivate + scarify
3. Cultivate + scarify + grass mix
4. Cultivate + scarify + legume mix
5. Cultivate + scarify + grass and legume mix
6. Cultivate + scarify + grass mix + fertiliser
7. Cultivate + scarify + legume mix + fertiliser
8. Cultivate + scarify + grass and legume mix + fertiliser
9. Cultivate + scarify + bisset
10. Cultivate + scarify + bisset + fertiliser

Planting method: Seeds were mixed in a bucket to homogenise the mixes before sowing. Prior to this step, legumes were inoculated with peat-based inoculum and water. Sowing was conducted by hand using the “feed the chickens” broadcast method. Sowing rates for each treatment are outlined in Table 3-1.

Table 3-1: Grass and Legume mixes and their associated sowing rate used for management trials

Treatment	Common name	*Scientific name*	Sowing rate (kg/ha)
Buffel mix	Buffel mix (USA, Gayndah)	*Cenchrus ciliaris*	15
Bisset mix	Bisset	*Bothriochloa insculpta*	15
Grass mix	Reclaimer rhodes	*Chloris gayana*	3
	Callide rhodes	*Chloris gayana*	3
	Purple pigeon (bare) or Biloela buffel	*Setaria incrassate* or *Chloris gayana*	1.35 Or 4.5
	Gatton panic	*Panicum maximum*	13.5
Legume mix	Lab Lab	*Lablab purpureus*	1.5
	Butterfly pea	*Clitoria ternatea*	3.75
	Desmanthus (Coastal or Progardes)	*Desmanthus spp*	3
	Stylos (caatinga)	*Stylosanthes guianensis*	3.75
	Cowpea (buff)	*Vigna unguiculata*	5.25
Grass and legume mix	Reclaimer rhodes	*Chloris gayana*	3
	Callide rhodes	*Chloris gayana*	3
	Purple pigeon (bare) or Biloela buffel	*Setaria incrassate* or *Chloris gayana*	1.35 Or 4.5
	Gatton panic	*Panicum maximum*	13.5
	Lab Lab	*Lablab purpureus*	1.5
	Butterfly pea	*Clitoria ternatea*	3.75
	Desmanthus (Coastal)	*Desmanthus spp*	3
	Stylos (caatinga)	*Stylosanthes guianensis*	3.75
	Cowpea (buff)	*Vigna unguiculata*	5.25

Table 3-2 Rates of fertilisers used for variety trial and fertilised plots in the management trial

		Site			
		Theodore	**Jambin**	**Gaeta**	**Biggenden**
Fertiliser (kg/ha)	**DAP**	158	50	158	158
	Sulphate of ammonium	85	195	85	85
	$CuSO_4$	5	5	NA	NA
	$ZnSO_4$	41	15	NA	NA
	Borax	NA	10	NA	NA

Site maintenance: Field plots were maintained in good condition. Spraying along the fence line at Jambin was carried out a week after trial establishment. Mouse bait was distributed through the Jambin site due to large numbers of rodents. Slashing and spraying for parthenium management was conducted for the trial at Theodore. During site visits, fences were inspected to make sure they were intact, and any incidence of mealybug or dieback was recorded as outlined. Weed management was conducted at Gaeta as required, particularly in control and legume only plots.

Statistical design and analysis: The field experiments were set up as Randomised Complete Block Design (RCBD) with four replicates in each trial. Field trials included 9-10 treatments. Individual treatment plot size varied with each site ranging from 81 m^2 to 120 m^2. The individual trial plans were developed for each site in collaboration with the producer and checked by a biometrician.

Assessment of dieback: A 50 x 50 cm quadrat was randomly placed and photographed within a typical dieback area in two locations per experimental plot. The severity of dieback was assessed by two people walking the entire plot and rating species type and coverage, pasture dieback symptom and mealybug counts as outlined below. For percentages less than five, 1% increments were recorded, for percentages over five, 5% increments were used (Table 3-3).

Table 3-3: Dieback assessment protocol

50 x 50cm quadrat /100
% Bare
% Rock
% Debris (exc. thatch)
% Grass including thatch
% Forbs – legume Note species if known
% Forbs – non leguminous
Grasses / 100
Dominant sp.
% (dom. species)
Height (cm) (dom. species)
% Purpling
% Yellowing
% Dead (thatch)
% Dead (dry/ golden)
% Dead (grey)
Sec.Sp./new grass
% (sec. species)
Height (cm) (sec. species)
% Purpling
% Yellowing
% Dead (thatch)
% Dead (dry/ golden)
% Dead (grey)
% Other grass (note species)
MB count in 50 x 50cm

An overall score of useful coverage was then calculated by using the following formulas. Each grass species is coded as palatable (1) or weedy (0) (eg. Indian couch).

Percent dom species cover *= % dom species x grass cover/100;* ***Percent sec species cover*** *= % sec species x grass cover/100*

Percent useful coverage *= (% dom species cover – (% dead x % cover dom species/100) x grass code) + (% sec species – (% dead x % cover sec species/100) x grass code) + legume*

Data Analysis: A two-way ANOVA was performed for each assessment to determine significant differences between treatments. If differences were found, a Tukey's HSD test was performed to determine differences between each treatment ($P<0.05$).

Assessment of mealybugs: These assessments were based on the overall appearance of each plot and on a detailed examination of each treatment. Mealybug assessments were weather dependent, with more focus on counts given during times of mealybug activity. An overall site check (five random points) was conducted for mealybug at each visit using the QUT method, either by AHR staff or in collaboration with QUT.

Mealybug count method: If mealybugs are found, use one of the same 0.25 m^2 sampling quadrats in each plot from pasture dieback assessment. Assess the presence of mealybug by counting the number of mealybug found in the leaf and mulch layer in the bottom left quarter of the quadrat (25 cm x 25 cm). Record numbers counted in each plot.

Biomass sampling: Biomass sampling was conducted in March 2022 and March 2024. For each treatment, all plant material in two 50 cm quadrats was collected and weighed separately. Each quadrat's contents were then sorted into categories: grass, legumes, and weeds, with each category being weighed individually. The plant material was subsequently oven-dried at 40°C until it reached a constant weight.

Theodore Re-Sow Feb 2022

Due to poor growth and competition with parthenium weed, the management site at Theodore was resown in February 2022. The treatments followed the initial trial plan for the site, with the exception that legume mix was replaced with Desmanthus (*Desmanthus* spp). The legume-only treatments were replaced with pasture mixes of grasses and legumes. Treatments with fertiliser were based on previously fertilised plots. A full table of the treatments and pasture mixes is shown in Table 3-4.

Due to rain at establishment, stick raking could not be conducted. To include some soil disturbance before sowing, a power harrow was shallowly run over the plots. Only the control was not power harrowed.

Table 3-4: Treatment plan and varieties of resown management trial at Theodore, sowing rates were multiplied by the safety factor, Gatton panic and Bambatsi panic had higher values due to poor germination. Sowing rates were based on 10 kg/ha for coated seed and 3 kg/ha for bare seed.

Treatment	Pasture/mix	Variety	Sowing rate (kg/ha)	Safety factor
1	Control			
2	Pasture mix 3	Strickland finger	10	1.5
		Gatton panic	10	2.5
3	Buffel	USA/Gayndah	10	1.5
4	Pasture mix 1	Reclaimer rhodes	10	1.5
		Gatton panic	10	2.5
5	Pasture mix 2 + leg	Endura rhodes	10	1.5
		Premier digit	10	1.5
		Bambatsi panic	10	2.5
		Desmanthus	3	1.5
6	Pasture mix 1 plus leg	Reclaimer rhodes	10	1.5
		Gatton panic	10	2.5
		Desmanthus	3	1.5
7	Pasture mix 1 plus fert	Reclaimer rhodes	10	1.5
		Gatton panic	10	2.5
8	Pasture mix 2 plus fert plus leg	Endura rhodes	10	1.5
		Premier digit	10	1.5
		Bambatsi panic	10	2.5
		Desmanthus	3	1.5
9	Pasture mix 1 plus leg plus fert	Reclaimer rhodes	10	1.5
		Gatton panic	10	2.5
		Desmanthus	3	1.5

3.2 Identification of pasture species/varieties resistant to dieback

Establishment of field trials: Field trials to assess 15 different grass species/varieties tolerance to dieback were established in dieback-affected grazing regions. Fencing was erected around the trial areas to exclude stock after pastures had been sown. In Biggenden and Theodore, trial areas were sprayed out with glyphosate. All sites were cultivated to kill weeds and existing pasture. Follow-up cultivation took place immediately before sowing seed. The aim was to achieve sufficient soil moisture and a suitable seedbed for small-seeded grasses to establish reliably. A fertiliser application program providing N, P, S, Cu was developed based on the soil test results. This was used to fertilise the variety trial at the same rate used in fertiliser treatments in the management trial. Fertiliser was spread before the final cultivation of the trial plot.

Trials were established by hand sowing, using a 'feeding the chickens' broadcast method, using the species and sowing rates in Table 3-5. Those with high sowing rates were multiplied by a safety factor due to poor germination.

The field experiments were set up as Randomised Complete Block Design (RCBD) with four replicates in each trial. Field trials included 14-15 varieties depending on site Table 3-5. Individual variety plot size varied with each site from 8.4 to 10.8 m^2. The individual trial plans and selection of species were developed for each site in collaboration with the producers.

Table 3-5 List of species used in variety trials. Note buffel mix and Biloela buffel were not included at Biggenden or Gaeta trials. Bisset was not included in Theodore or Jambin trials.

Variety	Species	Sowing rate (kg/ha)
Buffel mix (USA and Gayndah)	*Cenchrus ciliaris*	15
Bisset	*Bothriochloa insculpta*	15
Biloela buffel	*Cenchrus ciliaris*	15
Qld bluegrass	*Dichanthium sericeum*	15
Mekong Brizantha)	*Brachiaria sp.*	15
Humidicola	*Brachiaria humidicola*	45
Purple pigeon (bare)	*Setaria incrassata*	4.5
Strickland finger	*Digiteria milanjiana*	30
Premier digit	*Digitaria eriantha*	15
Gatton panic	*Panicum maximum*	45
Swann forest blue grass	*Bothriochloa bladhii ssp. glabra*	15
Floren bluegrass	*Dichanthium aristatum*	45
Dave's choice (G2) panic (bare)	*Panicum maximum*	4.5
Endura rhodes	*Chloris gayana*	15
Forest bluegrass (bare)	*Bothriochloa bladhii*	13.5
Bambatsi panic	*Panicum coloratum*	30

Assessment of management and species evaluation trials protocols

Data collection

Data collection included ground cover of planted species, dieback incidence and discoloration and mealybug counts, and was assessed by converting collected data using the formulas below.

Percent planted species cover *= % planted species x grass cover/100*

Percent useful coverage *= (% planted species cover – (% dead x % cover planted species/100)*

Discolouration percentages and presence of mealybug can then be compared to the percentage of useful cover to assess for correlations.

Assessment of mealybugs

These assessments were based on the overall appearance of each plot and on a detailed examination of each treatment. Mealybug assessments were weather dependent, with more focus on counts given during times of mealybug activity.

3.3 Print-ready revisions to Pasture Dieback Management Guide

AHR has collated input to produce a draft of the revised producer and agronomists' guide on the management of pasture dieback. Researchers and organisations involved in pasture dieback were invited to contribute and comment. Feedback from these organisations has been integrated and sent back for comment. With input from most participants, the guide synthesizes all research into a useful tool for advisers and producers on managing pasture dieback.

In addition to the initial draft, AHR has provided photographs and results of field trials. QLD DAF and QUT have assisted with editing, manuscript comments and photographs. NSW DPI contributed to editing and provided comments. QUT has co-authored the sections focused on mealybug.

3.4 Review of all field days

In total four field days were held at both Jambin and Gaeta sites. These were held in collaboration with Queensland University of Technology (QUT), Department of Agriculture and Forestry Queensland (DAFQ) and AgForce.

3.4.1 Jambin field day

Held on March 20, 2024. Presenters included Naomi Diplock and Gordon Rogers (AHR), Caroline Hauxwell (QUT) and Geoff Maynard (Grazier). Cattle Australia were in attendance and conducted interviews with attendees.

Figure 3-1: Attendees during information session at Jambin field day, March 2024

Participants visited the trial sites, which included a walkthrough of the management trial, a variety trial, and a session on "how to look for mealybugs." These walkthroughs highlighted the most promising findings from the trials so far. Caroline Hauxwell provided training on mealybug identification and discussed its biology and management. Geoff Maynard shared his experiences with dieback. Feedback forms were distributed to all attendees.

3.4.2 Gaeta field days

Two Field Days were held; on March 21 2024, and March 31 2023. Pasture Dieback Program presenters included Naomi Diplock and Gordon Rogers (AHR), Caroline Hauxwell (QUT) and producer and AgForce representatives. AgForce interviewed attendees and presenters during the 2023 field day. Queensland Country life attended both events and interviewed presenters and attendees. ABC radio interviewed at both events, and ABC news followed up for an online story highlighting the results of the trials following the 2024 event. A video was made my AHR to showcase the results of these trials.

Figure 3-2: Attendees during information session at Gaeta field day, March 2024

Figure 3-3: Attendees at Gaeta field day, March 2023

The afternoon's focused on the management and variety trials, with participants walking through both trial plots. These walkthroughs highlighted the most promising findings from the trials so far. Caroline Hauxwell provided training on mealybug identification and discussed its biology and management. Feedback forms were distributed to all attendees.

3.4.3 Theodore field day

This event was held on 30 March 2023. Presenters included Naomi Diplock and Gordon Rogers (AHR), Stuart Buck (QDAF), Caroline Hauxwell (QUT), and the host grazier). AgForce were in attendance and conducted interviews with attendees.

Figure 3-4: Attendees during information session at Theodore field day, March 2023

Figure 3-5: Theodore field day attendees learning about mealybugs and how to use a hand lens

Three sites were visited over the course of the afternoon. This included a walk though of the management trial, a walkthrough of the variety trial and visiting a site that the grazier has replanted following on from the success of the field trials.

These walkthroughs focused on the 'best bets' that have been concluded so far from the outcomes of the trials. Stuart Buck also spoke at each site, complementing the findings with those from the QDAF trials.

Caroline Hauxwell delivered mealy bug identification training and spoke about its biology and management.

Feedback forms were distributed to all attendees.

3.4.4 Mort and Co dieback field day

Naomi Diplock and Gordon Rogers attended the Mort and Co dieback R &D Update and field day event, hosted by Barry Hoare on June 14, 2023 in Moura. They provided an update on the outcomes of the trial sites. During this presentation, the fact sheet titled "How do I select grass varieties tolerant to pasture dieback" was launched.

Figure 3-6: Mort and Co, Moura, June 2023 dieback field day. Claire and Barry Hoare (left), Mort and Co representative and Naomi Diplock (right). Photo credit AgForce CQ.

3.5 Other communication

3.5.1 'How do I… select grass varieties tolerant to pasture dieback'

The fact sheet, "How do I select grass varieties tolerant to pasture dieback," was produced through a collaborative effort by all researchers involved in the MLA pasture dieback research. This document represents the culmination of results from all field, glasshouse and lab trials conducted by the various organisations.

4. Results

4.1 Best Practice Agronomy Trials

This report highlights the latest evaluations from January 2024 and March 2024, detailing the results and effects of these treatments, three years after the trial's inception. The data analysis has focused on individual assessments due to seasonal variations and diverse factors like weed control. The most recent assessment is presented in this report for its long-term implications. For a comprehensive overview spanning from 2021 to 2024, detailed assessments can be found in Appendices 7.1 to 7.4

The treatments replanted with a pasture grass mix, and those replanted with a pasture grass and legume mix consistently gave better coverage and more biomass compared to the controls (natural regeneration) and all other treatments. This was a consistent trend across all four sites and seasonal assessments.

Initial analysis of pasture composition data and mealybug counts (conducted by QUT) indicates a notable reduction in mealybug populations with increasing proportions of legumes across all treatments and sampling dates at both the Biggenden and Gaeta sites. The presence of other forbs (weeds) shows inconsistent correlation with mealybug abundance. Furthermore, a higher proportion of thatch in plots correlates with increased mealybug abundance in 3 out of 4 site/date combinations (QUT P.PSH 1459).

4.1.1 Gaeta

The assessment completed in January 2024 and March 2024 showed clear delineation between the treatments. The best coverage with minimal dieback and bare ground was observed in pasture and legume mix (both with and without fertiliser), as well as pasture mixes (with and without fertiliser) with healthy and thick grass growth observed. These treatments are looking promising with minimal dieback symptoms observed and good coverage.

In comparison, bisset, control plots (control, stick rake and bisset) and legume only plots displayed large patches of purpling grass and poor growth, indicative of the first stages of dieback in January. There was a significant difference between useful pasture in treatments ($P = 0.001$).. By March, the control, stick rake and plots resown with bisset had almost completely died off (Figure 4-1, Figure 4-4, Figure 4-5). All plots reseeded with a grass mix (with and without legumes and/or fertiliser) were found to be significantly different to all other treatments in terms of useful pasture cover in the March assessment ($P = 0.000$), with almost no useful pasture remaining in any of the control or bisset plots or those resown with legumes only (Figure 4-4). The rhodes grass cover while beginning to hay off has persisted well during this period.

Dry weights of biomass collected in January 2024 show that all mixes that included a grass mix (with and without fertiliser, and or legumes) were significantly higher than those left to regenerate naturally (control) or those reseeded with bisset (Figure 4-6) ($P = 0.000$). Fertiliser initially increased biomass for the first year, however, there was no significant difference between biomass of those with or without fertiliser three years on.

Mealybugs were found in all plots. However, numbers were much lower in the grass mix and grass and legume mix plots (with and without fertiliser). This correlates to the change in grass cover from January to March, along with the significant difference in biomass between treatments.

Figure 4-1: Gaeta management trial, January 2024 (left) vs March 2024 (right). Note the clear line of dead bisset compared to the rhodes plots in the March assessment.

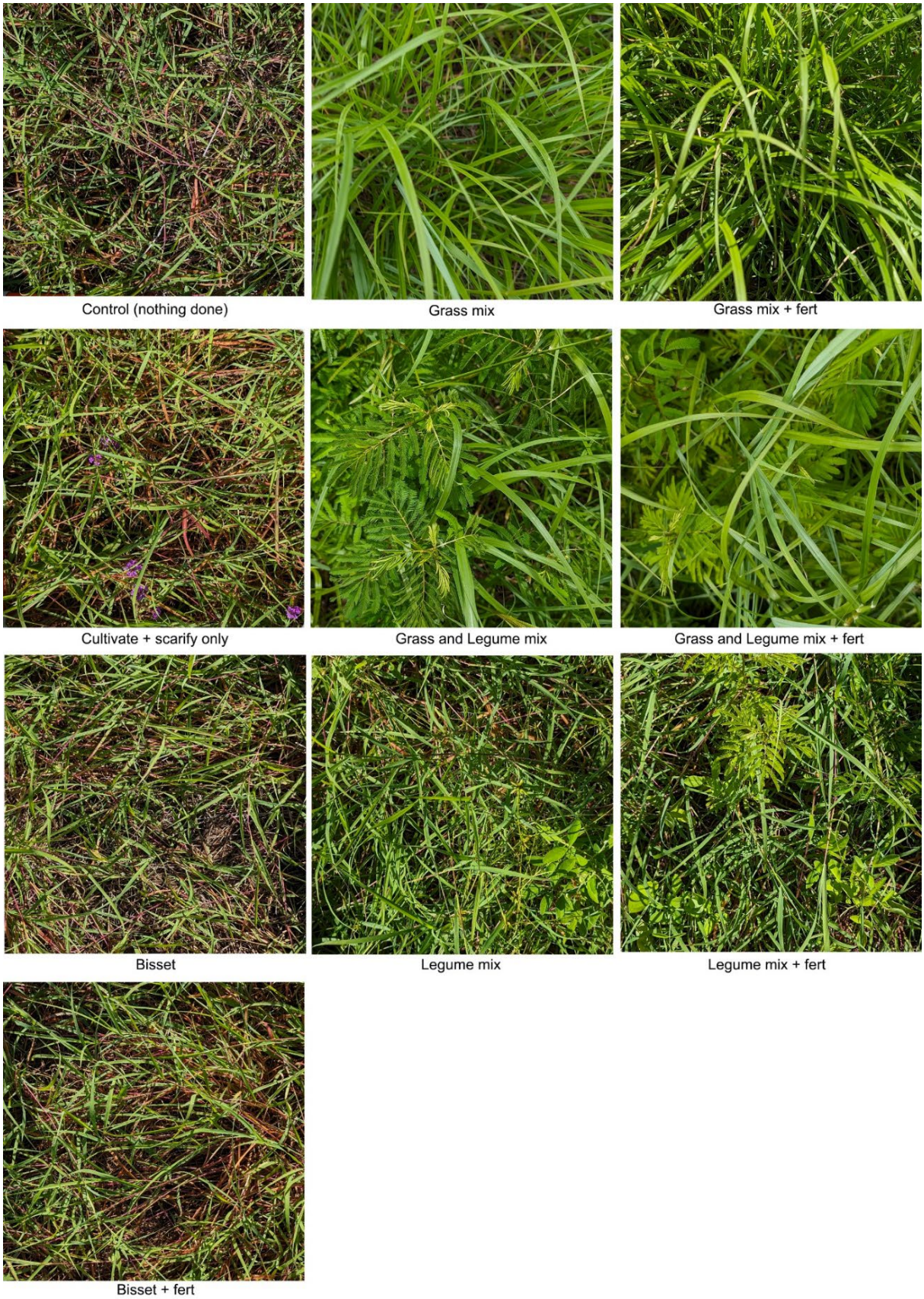

Figure 4-2: Gaeta management trial: appearance of different treatments in January 2024

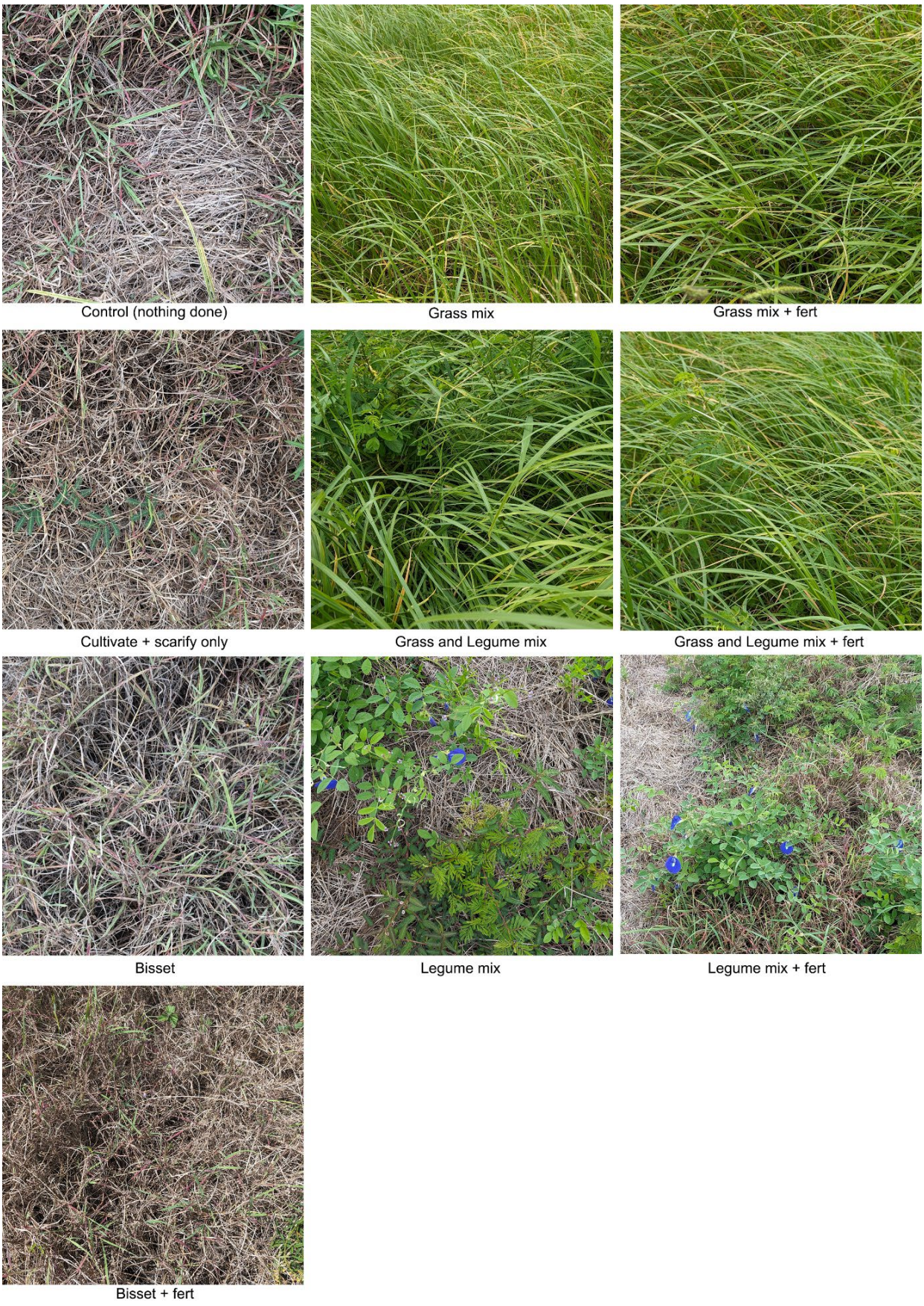

Figure 4-3: Gaeta management trial: appearance of different treatments in March 2024

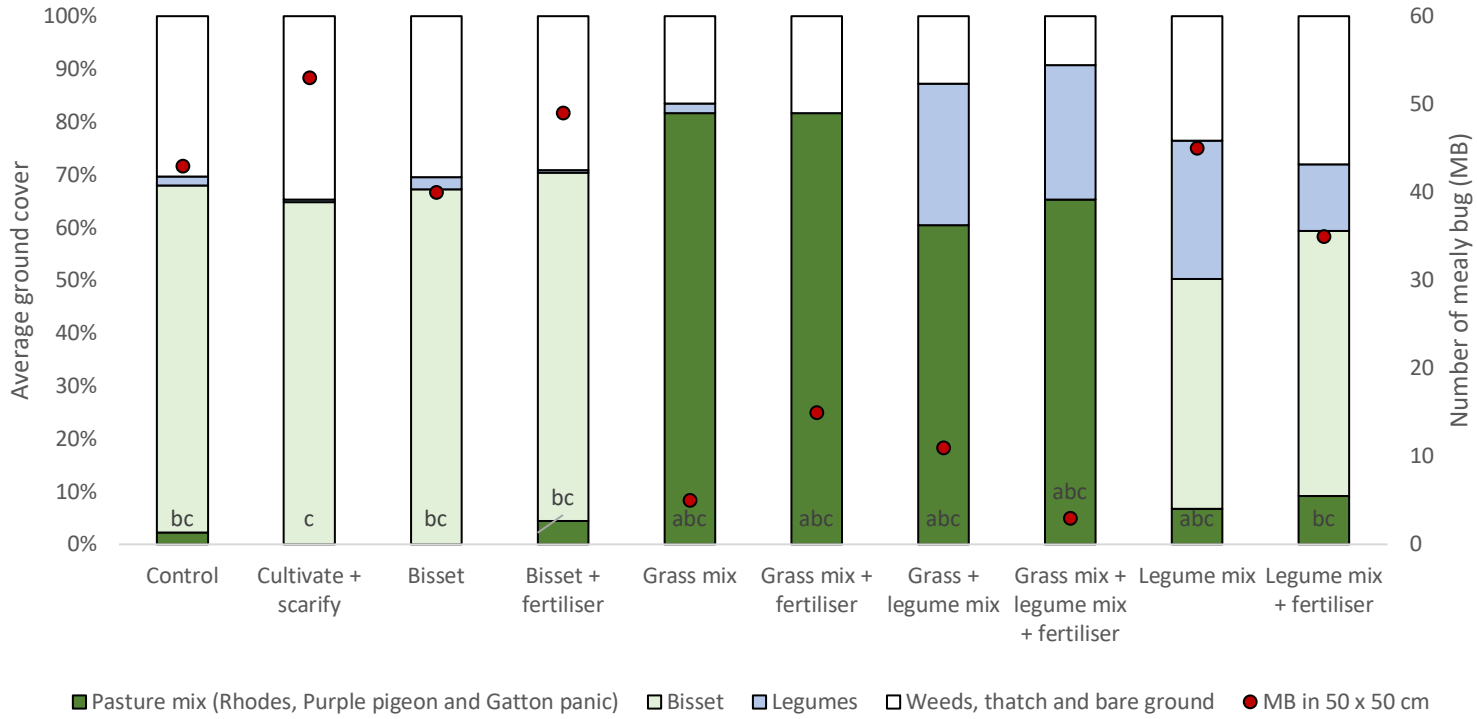

Figure 4-4: Gaeta management trial: Full plot assessment of composition of ground cover, management trial Jan 2024. Different letters indicate a significant difference in useful pasture cover (grass + legume).

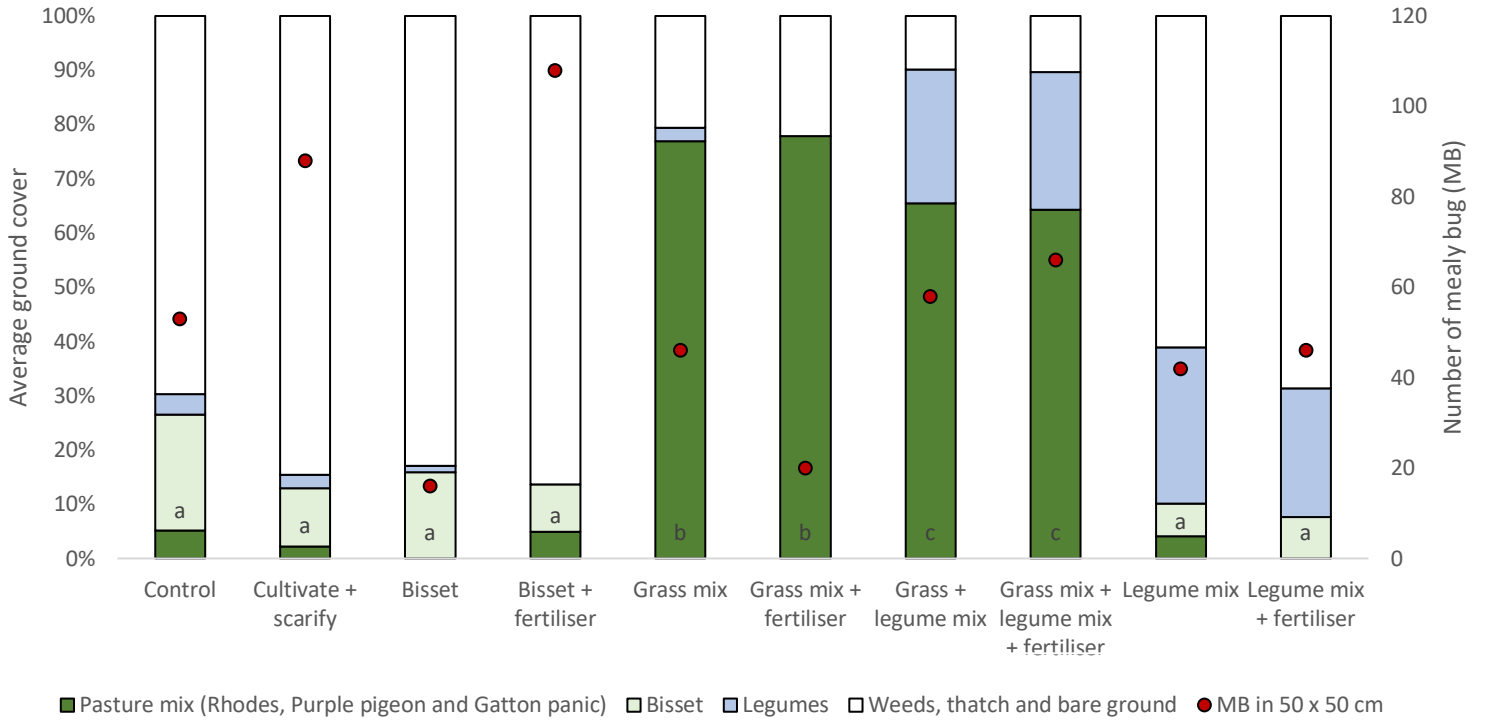

Figure 4-5: Gaeta management trial: Full plot assessment of composition of ground cover, management trial March 2024. Different letters indicate a significant difference in useful pasture cover (grass + legume).

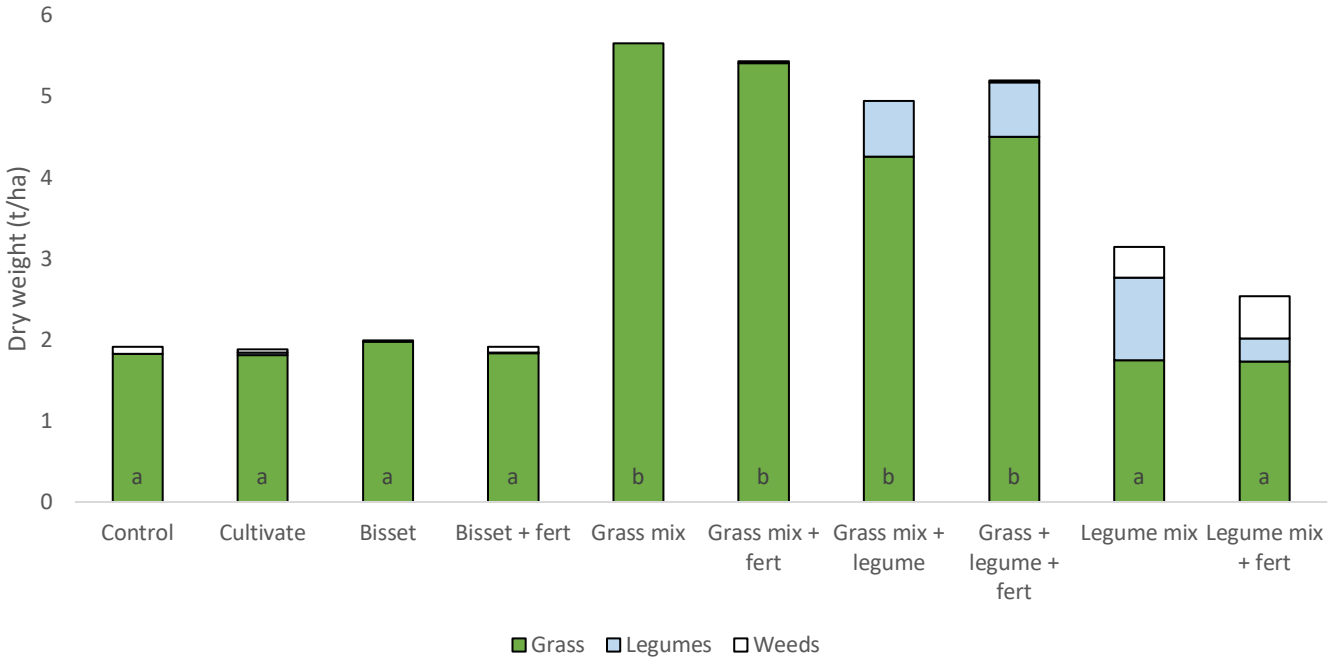

Figure 4-6: Gaeta management trial: Biomass (Dry weight) January 2024 n=8. Different letters indicate a significant difference in biomass of useful pasture cover (grass + legumes).

A video summary showcasing the results observed in March 2024 at the Gaeta site is available for viewing here.

4.1.2 Jambin

The site at Jambin was selected on November 19, 2020 and marked out on January 15, 2021. This site was chosen due to widespread active dieback in buffel grass. The site is a brown sandy loam, with a pH of 6.0.

An assessment of the trial was conducted in February 2024 (Figure 4-7). Active dieback was minimal this season, however, the lasting impacts from previous more severe seasons were observed.

Figure 4-7: Jambin trial site February 2024

The impact of dieback has resulted in a decrease of desirable species in dieback-affected plots, as well as a significant decrease in dry weight biomass, particularly in control and buffel plots.

Clear delineation in species composition was observed between treatments. The best coverage with minimal dieback and bare ground was observed in pasture and a legume mix (both with and without fertiliser), as well as pasture mixes (with and without fertiliser) with healthy growth observed. These treatments are looking promising with minimal dieback symptoms observed and good coverage.

In comparison, buffel, control plots (control, stick rake and buffel) and legume-only plots displayed patches of purpling grass and poor growth, as well as large areas covered by weeds or less desirable species such as Biloela buffel (Figure 4-8, Figure 4-9). A significant difference ($P = 0.006$) was found between treatments in terms of useful pasture cover.

Dry weights of biomass show that all mixes that included a grass mix (with and without fertiliser, and/or legumes) were significantly higher ($P = 0.000$) than those left to regenerate naturally or those reseeded with buffel (Figure 4-10).

It is notable that the Sabi grass USA and Gayndah buffel that dominated the site in 2021 have almost completely died off. All plots that were planted with buffel, or legumes only, have suffered from weed infestations in the dieback affected areas, minimising the useful ground coverage in these plots. Biloela buffel is beginning to take over these plots now, but it has questionable palatability.

Mealybug counts were the highest in plots replanted with buffel grass. No mealybugs were found in control plots. This is likely due to the death of susceptible species (i.e. Sabi grass and USA and Gayndah buffel) and the colonisation by weeds which are not affected by pasture mealybugs (Figure 4-9)

Figure 4-8: Jambin management trial: Appearance of different treatments in February 2024

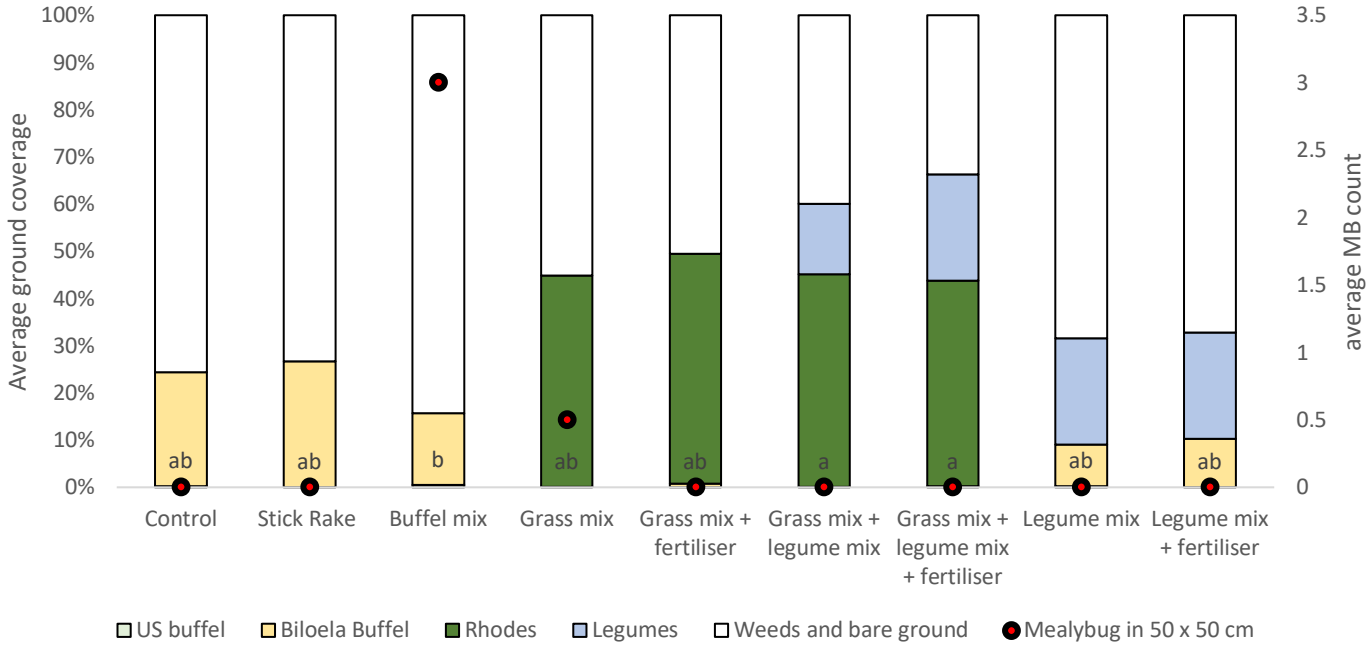

Figure 4-9: Jambin management trial: Full plot assessment of composition of ground cover, management trial February 2024. Different letters indicate a significant difference in useful pasture between treatments.

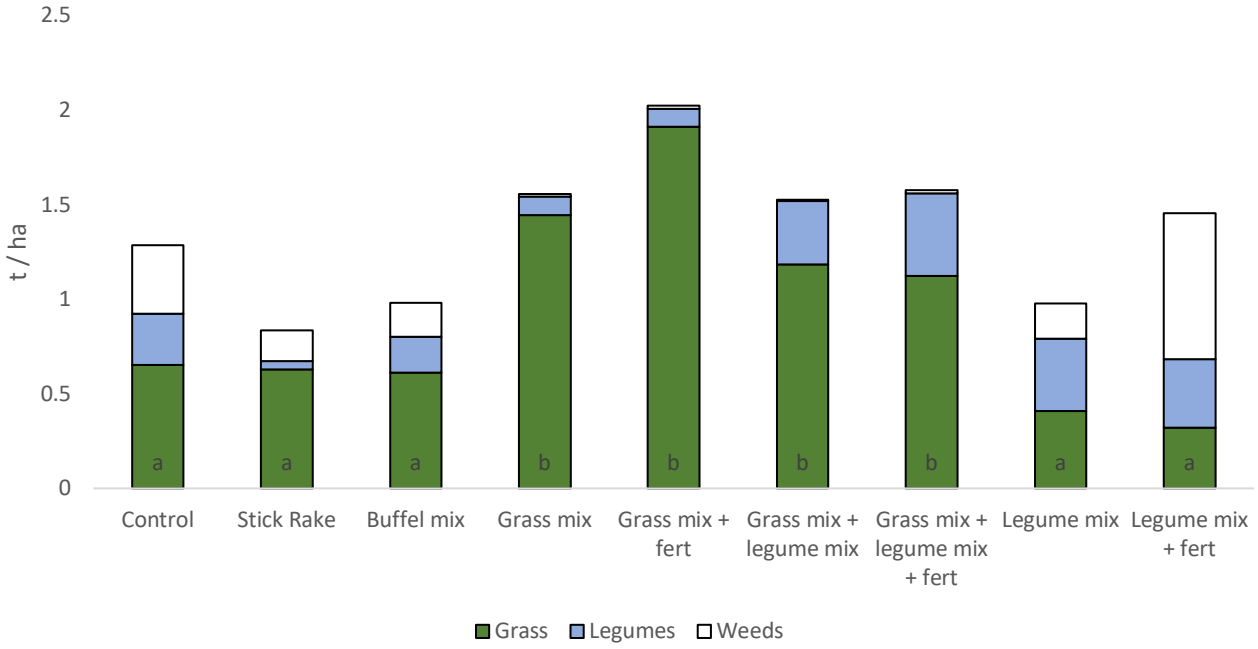

Figure 4-10: Jambin management trial: Biomass (Dry weight) March 2024 n=8. Different letters indicate a significant difference in biomass of useful pasture between treatments.

4.1.3 Biggenden

The site at Biggenden was selected and marked out on February 20, 2021. This site was chosen due to widespread active dieback in bisset bluegrass (*Bothriochloa insculpta)*. Severe dieback and large numbers of pasture mealybug (*Heliococcus summervillei*) were observed at the site, with a thick white powder coating shoes and clothes on the initial visit.

An assessment of the trials was conducted on January 11 and on March 5, 2024. Dieback was beginning at the top of the hill and moving down, with healthier grass at the bottom of the hill.

Figure 4-11: Biggenden trail site. January 2024 (left) and March (right)

(Figure 4-11).

Clear delineation in species composition was observed between treatments in both assessments (Figure 4-12, Figure 4-13). There was a significant difference (P= 0.008) between useful pasture (grass + legume) cover in the January assessment (Figure 4-14) with dieback symptoms beginning to develop. By the March assessment, there was an evident decrease is bisset cover and health (Figure 4-15).

In the March assessment, a significant difference in useful ground cover (grass + legume) between treatments sown with a grass mix (with or without fertiliser and legumes) and all other treatments (P = 0.000) was found. Mealybug numbers increased dramatically from January to March from a maximum average of 6.5 to 1177 in the control plots.

The impact of dieback on bisset was clearly observed in biomass collections with significant differences in dry weight of grass between treatments (P= 0.000). Control plots averaged a total of 1.6 t/ha dry weight of grass compared to 3 t/ha of grass in grass mix plots, and 4.2 t/ha in grass mix plots with fertiliser (Figure 4-16).

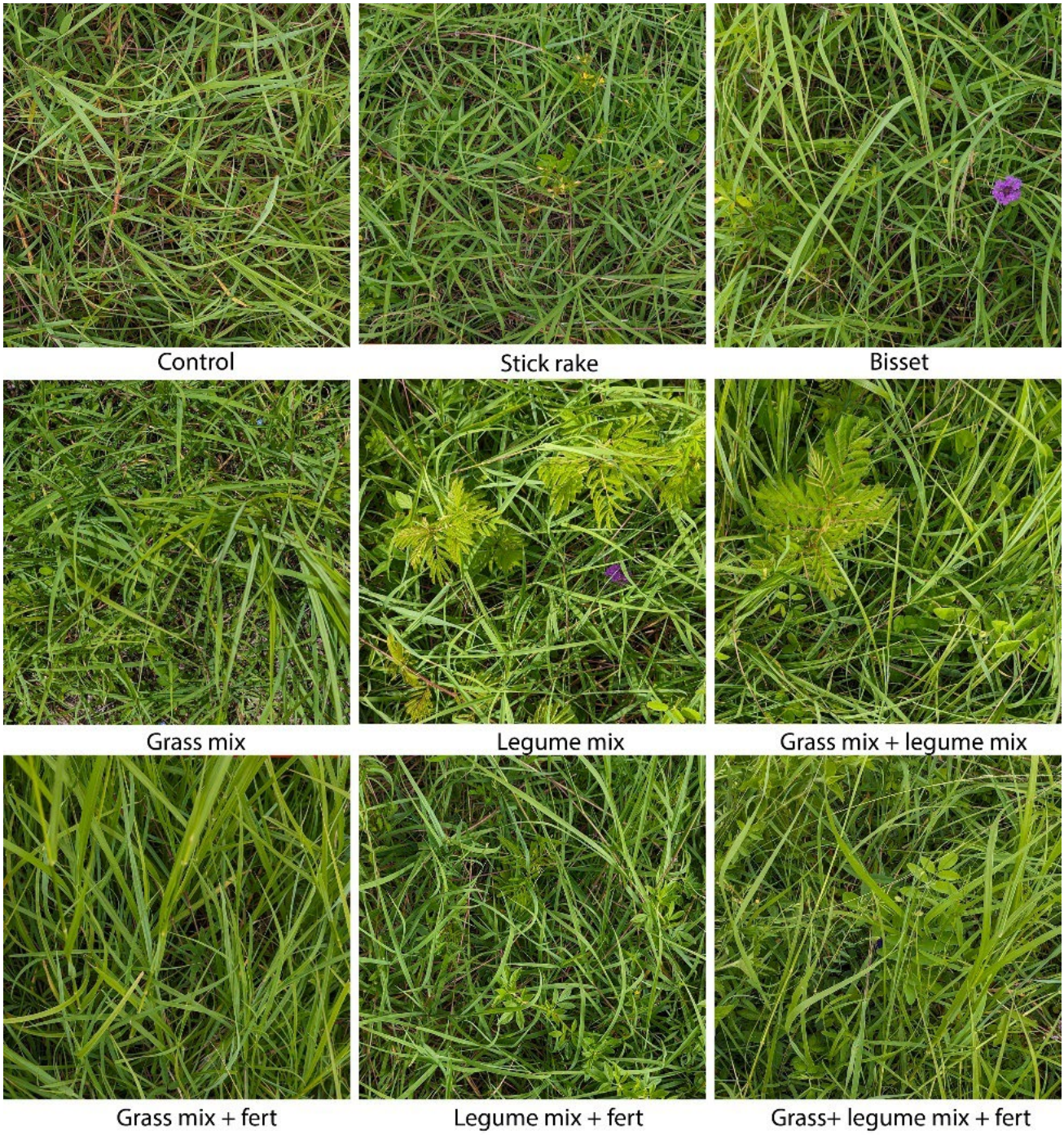

Figure 4-12: Biggenden management trial: Appearance of management trial treatments, January 2024

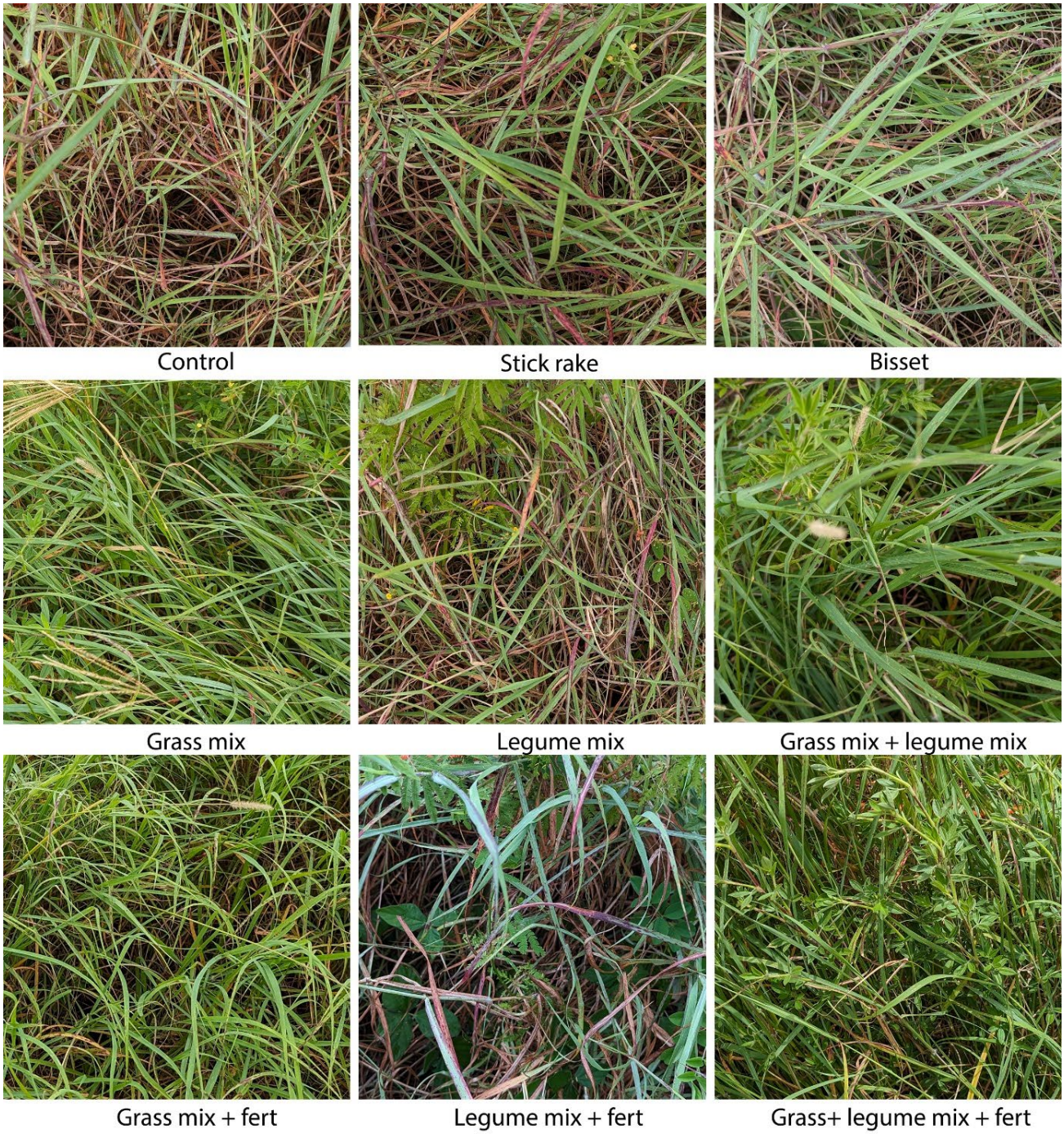

Figure 4-13: Biggenden management trial: Appearance of management trial treatments, March 2024

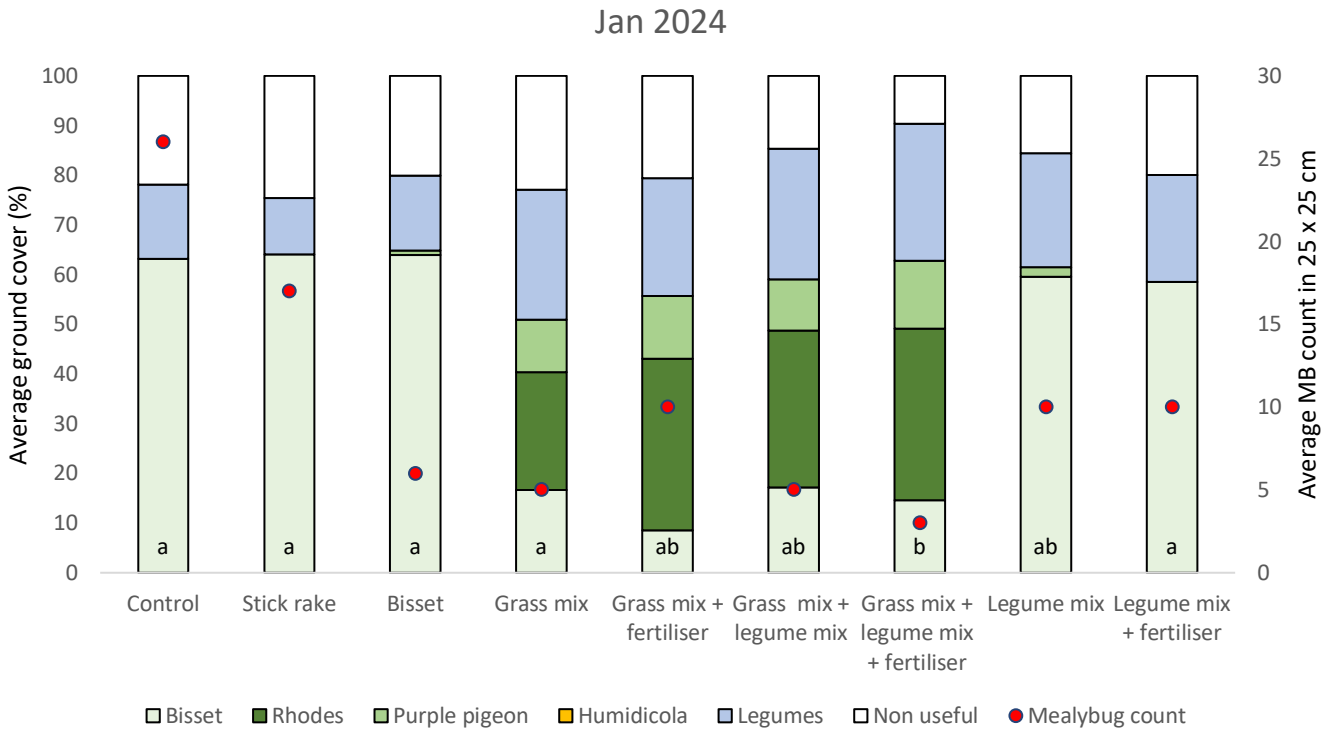

Figure 4-14: Biggenden management trial: Full plot assessment of composition of ground cover January 2024; average number of mealybug counts found in 50 x 50 cm quadrat in each plot. n=4. Different letters indicate a significant difference between treatments.

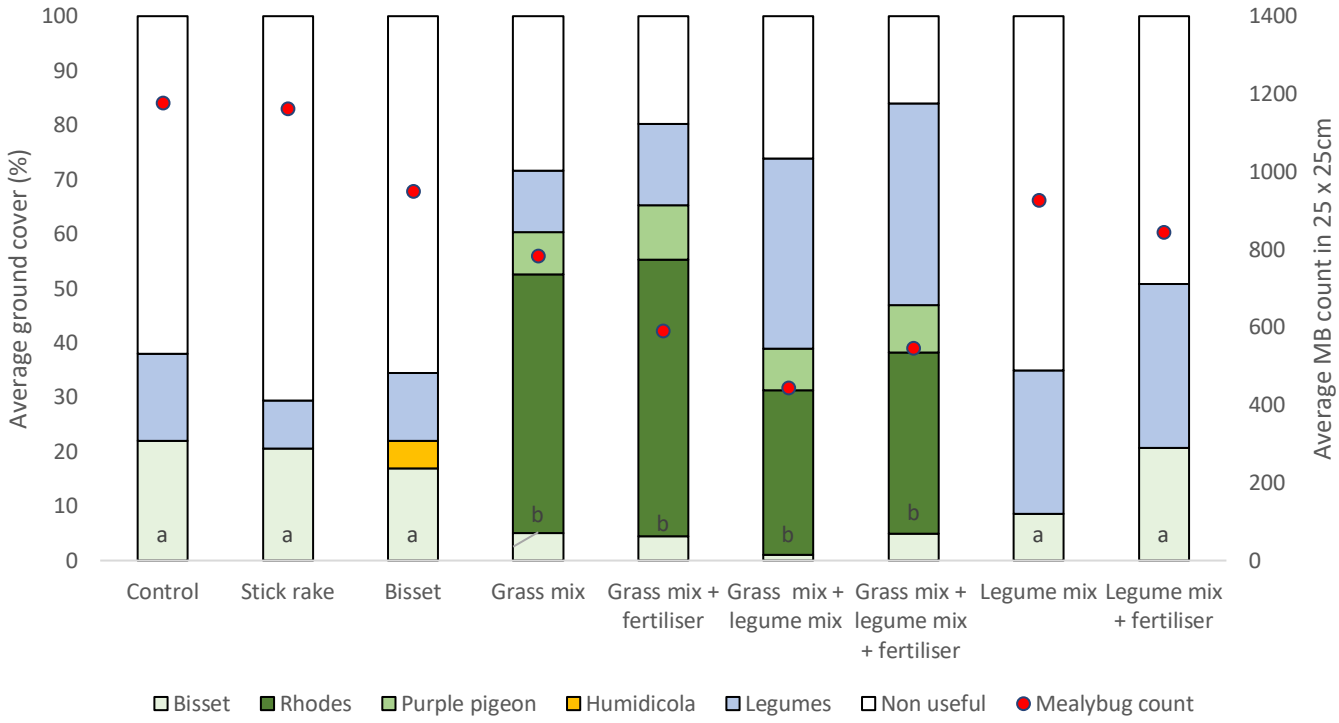

Figure 4-15: Biggenden management trial: Full plot assessment of composition of ground cover March 2024; average number of mealybug counts found in 25 x 25 cm quadrat in each plot (March 2024). n=4. Different letters indicate a significant difference between treatments.

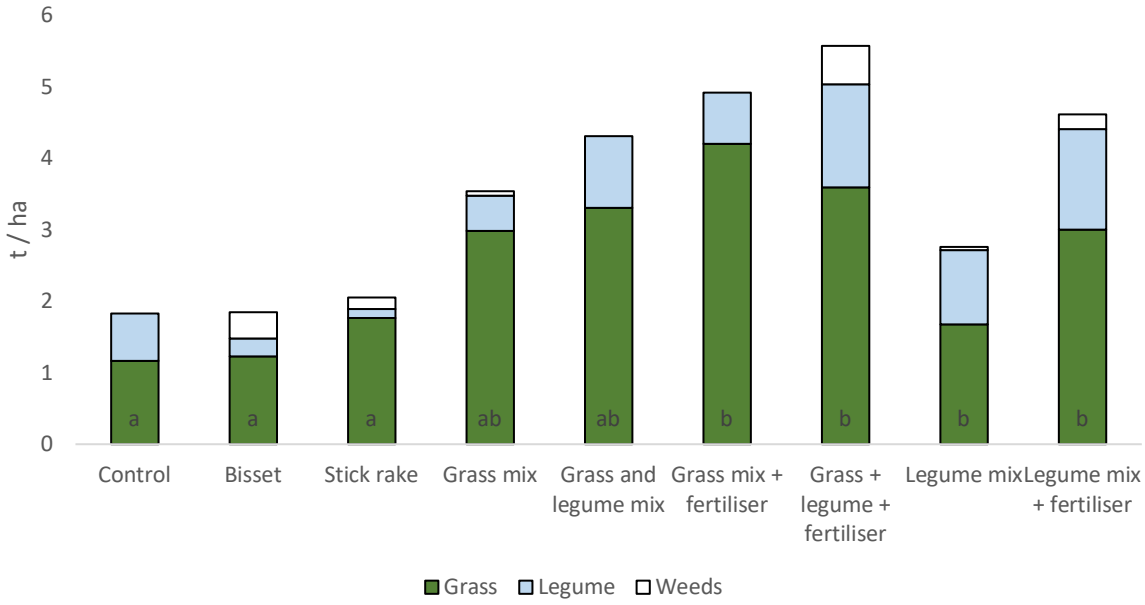

Figure 4-16: Biggenden management trial 2024: Dry weight of biomass samples collected from a 50 x 50cm quadrat. n=8. Different letters indicate a significant difference between treatments.

To compare the impact of slashing versus no slashing during mealybug season, a strip along the right-hand side of each plot was slashed eight weeks prior to assessment, with a significant difference between treatments found (P = 0.0001). This treatment affected coverage, with minimal regrowth of grass in plots previously dominated by bisset grass. While rhodes grass showed a higher rate of return, it was still impacted by the slashing treatment, and both bisset and rhodes exhibited dieback symptoms in the slashed areas. It was expected that these plots should have had much better growth given the good rainfall of (184 mm) in the eight weeks after slashing before assessment.

The slashed areas all had a thick thatch layer, conducive to mealybug breeding. Mealybug numbers were high in all treatments; however, they were lower in the slashed areas compared to the non-slashed areas, likely due to the minimal grass coverage in the slashed regions.

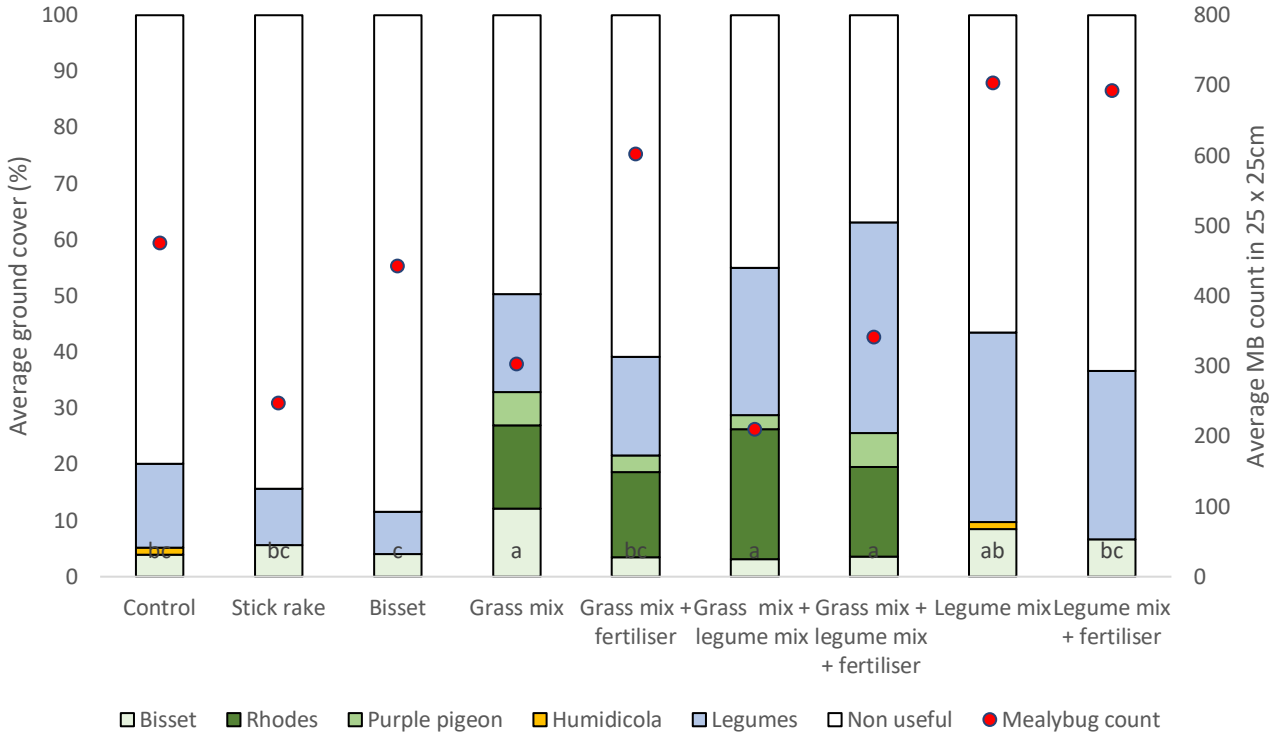

Figure 4-17: Biggenden management trial: Full plot assessment of composition of ground cover in slashed areas in March 2024; average number of mealybug counts found in 25 x 25 cm quadrat in each plot (March 2024). n=4. Different letters indicate a significant difference between treatments.

Figure 4-18: Biggenden management trial: Appearance of management trial treatments, slashed areas, eight weeks after slashing March 2024

4.1.4 Theodore

Dieback symptoms were first noticed on the property in 2016, with symptoms at the trial site initially found in 2019. The site at Theodore was selected and marked out on December 11, 2021. It features grey cracking clay soil with a pH of 7.5 – 8 and was chosen due to the widespread presence of dieback. Severe dieback and the presence of pasture mealybug (*Heliococcus summervillei*) were observed. Pasture mealybugs were found during site selection, trial establishment and subsequent assessments.

A comprehensive plot assessment was conducted on February 13, 2024. While there was no significant difference found between treatments (P = 0.1559) The best ground coverage was observed in plots replanted with reclaimer rhodes grass (Figure 9.2). These plots showed superior coverage compared to those replanted with endura rhodes, likely because the reclaimer rhodes plots were resown into areas that had previously also contained reclaimer rhodes. In contrast, the endura rhodes plots were resown into legume plots and are effectively a year younger than the reclaimer rhodes plots. Fertilised plots did not show a noticeable difference in ground cover but appeared greener and healthier overall (Figure 4-19).

In the control plots, Biloela buffel has largely taken over, with very few individual plants of Bambatsi panic, strickland finger, and Gatton panic found. This is likely due to poor-quality seed and insufficient rainfall after planting (Figure 4-21).

Mealybug numbers were low across all plots, with the highest numbers observed in plots replanted with buffel. Breeding females were found in the thatch layer (Figure 4-20), suggesting that mealybug populations may soon increase.

Figure 4-19: Theodore management trial: Appearance of management trial in February 2024

Figure 4-20: Breeding female mealybug with cluster of nymphs attached. Theodore management trial February 2024

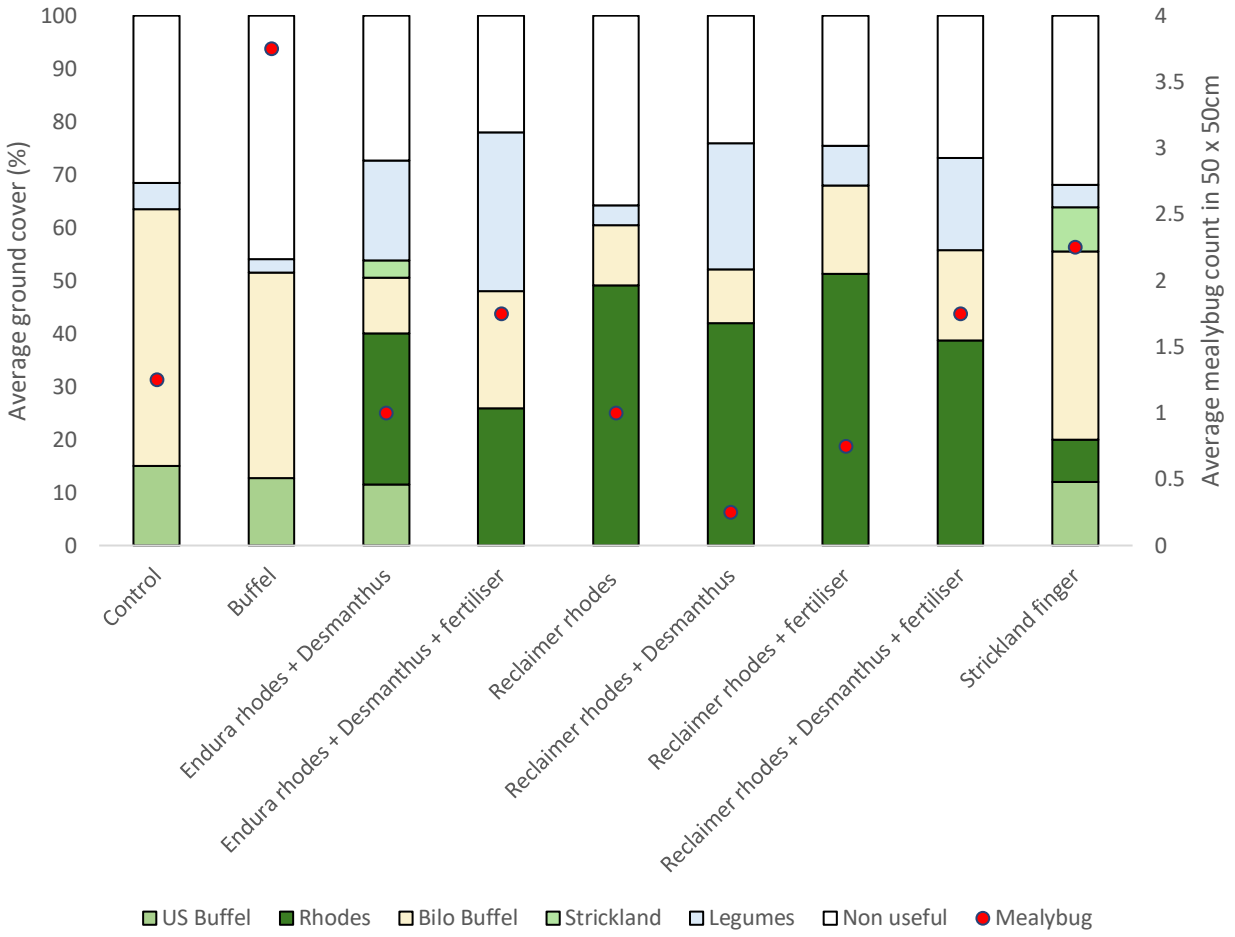

Figure 4-21: Theodore management trial: Management trial ground cover assessments and mealybug counts, February 2024.

4.2 Identification of pasture species/varieties resistant to dieback

The most promising varieties observed across all four sites include Mekong Brizantha and Humidicola (Tully grass). These have shown to consistently *not* host pasture mealybug and they *do not* display symptoms of dieback even at high dieback pressure. Gatton panic and Dave's choice (G2) panic have also shown good results, however, germination of these were poor and resulted in low coverage scores. Premier digit and strickland finger have shown severe dieback symptoms across all sites, with purpling and plant death. These, however, have persisted in the pasture and may have a degree of tolerance compared to other more susceptible species. Further studies on these varieties are required.

Observations of the structure and form of various grasses suggest that those without a thatch layer and possessing thick, tough leaves generally tend to exhibit greater resistance to dieback. While these observations have not yet been formally investigated, they provide valuable considerations for selecting further species for evaluation.

The suitability of these pastures to each individual situation may differ, with these assessments concentrating on dieback tolerance rather than agronomic qualities.

4.2.1 Gaeta

Varieties were assessed for coverage and the number of mealybug January 11, 2024 (Figure 4-22).

Figure 4-22: Gaeta variety trial. January 2024

Clear differences were observed between varieties during the January 2024 assessment (Figure 4-24). Mekong brizantha stood out from all other varieties, with good coverage, no dieback symptoms and very few mealybugs present. Dave's choice panic, endura rhodes and purple pigeon all show good coverage with very few mealybug present. Humidicola, while providing less coverage has consistently shown to not host mealybugs. Gatton panic is also looking promising at this site, however, it suffered from very poor germination rates which has impacted the overall coverage. All displayed over 45% coverage and had a zero count of mealybug in earlier assessments.

Strickland finger and premier digit have both been unsuccessful in this location. Both of these varieties had good germination rates, however, died off soon after a herbicide for broadleaf weeds was applied.

Bisset coverage has increased and has taken over many of the other less successful plots. However, plants did not appear healthy and were hosting larger numbers of mealybug than all other varieties.

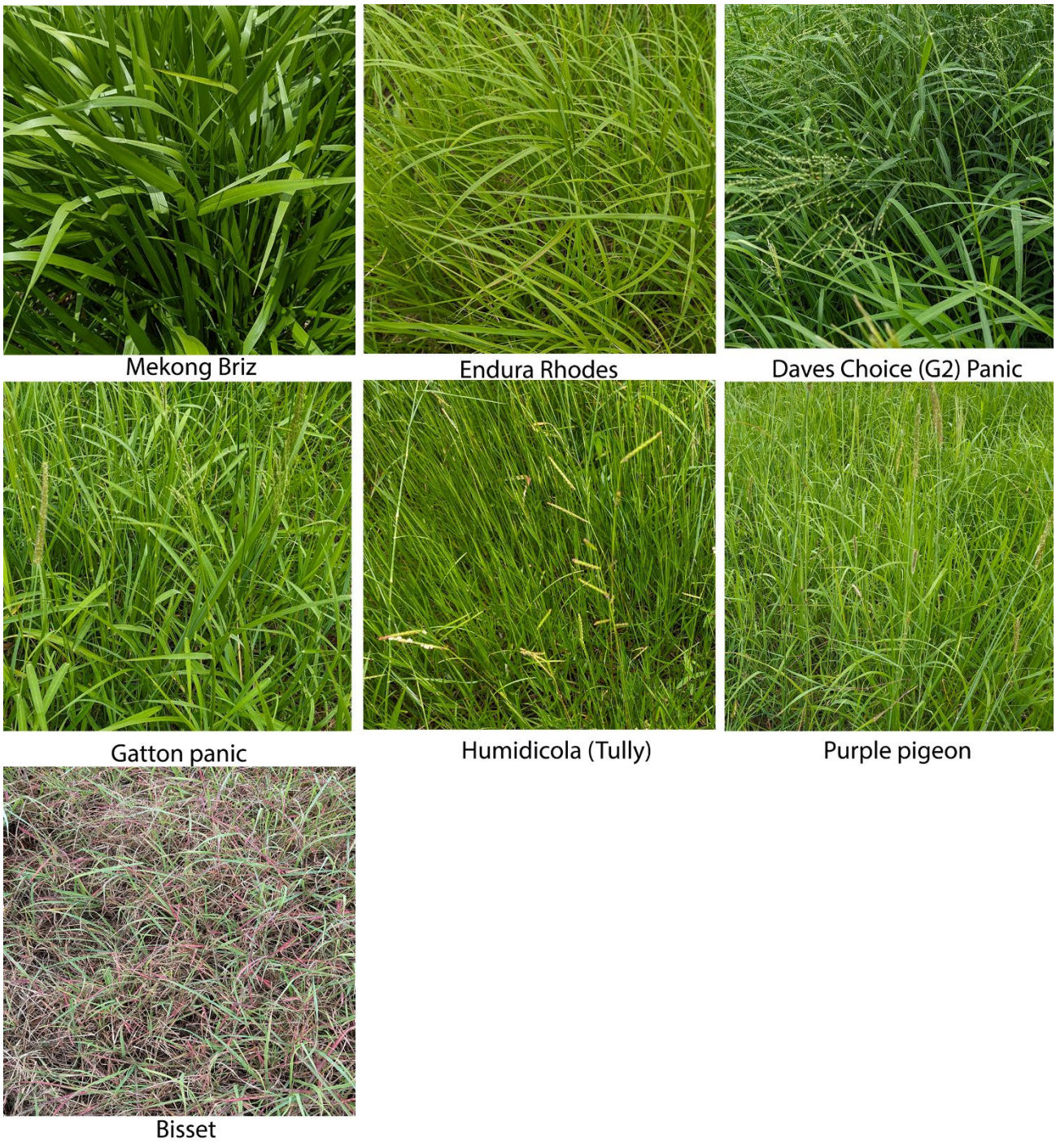

Figure 4-23: Gaeta variety trial: Variety trial ground coverage and mealybug count. January 2024

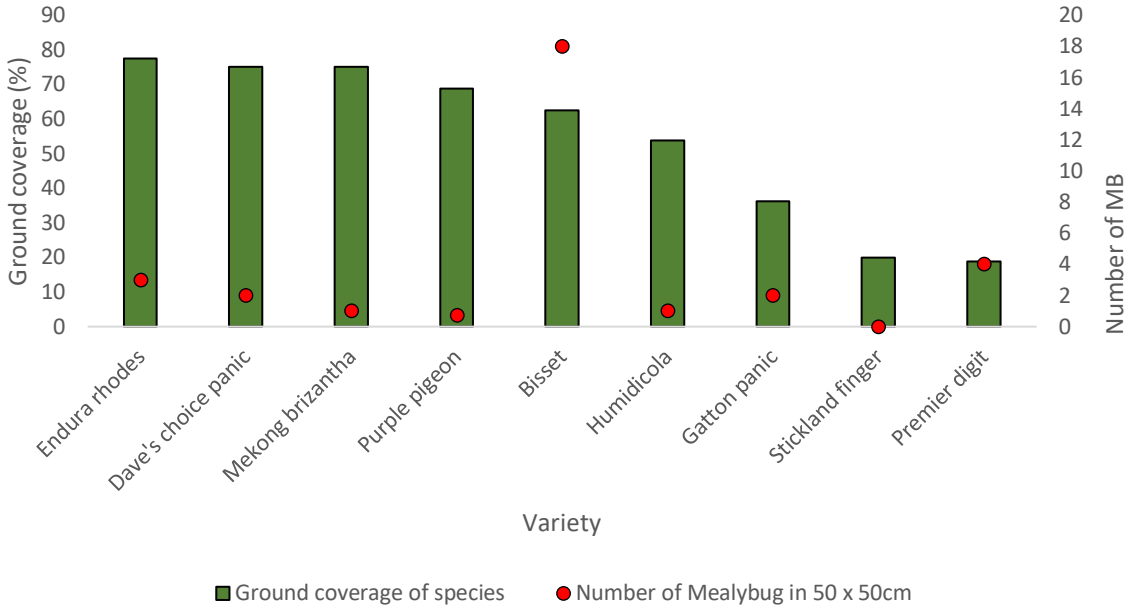

Figure 4-24: Gaeta variety trial: Variety ground coverage (January 2024) and mealybug count (January 2023)

4.2.2 Jambin

The Jambin variety trial was assessed on January 9, 2024 (Figure 4-25). Whole plot assessments were completed for each of the four replicates. Grass was rated for coverage, dieback symptoms and number of mealybugs. Due to the low numbers counted this assessment (due to seasonal impacts, mealybug counts from 2023 have been displayed in the graph).

Figure 4-25: Jambin variety trial January 2024

Clear differences were observed between varieties during the February 2024 assessment (Figure 4-26). Humidicola and Mekong brizantha stood out from all other varieties with good coverage, no dieback symptoms and no mealybugs present. Endura rhodes, Gatton panic, strickland finger and premier digit have all been successful in this location, however, require further monitoring for impacts of dieback.

While Biloela buffel had good coverage, it was host to a higher number of mealybugs in this assessment.

Figure 4-26: Jambin variety trial February 2024

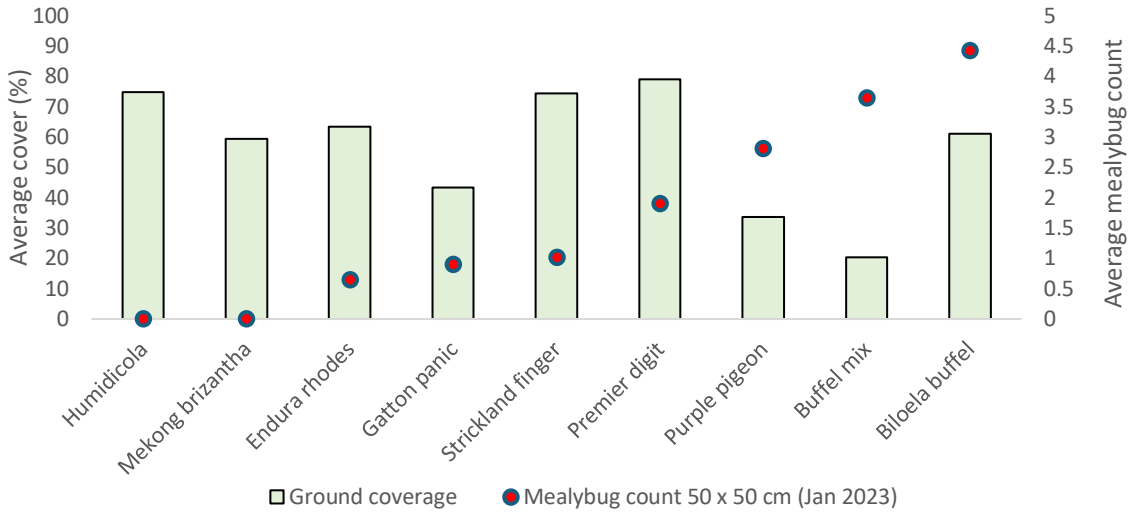

Figure 4-27: Jambin variety trial February 2024

4.2.3 Biggenden

Whole plot assessments were completed on January 12, 2024. No mealybugs were found in the variety trial, most likely as the dieback was moving down the hill and had not yet reached the variety trial. Variety coverage was this year plotted against mealybug numbers counted in January 2023.

Clear differences were observed between varieties during the January 2024 assessment (Figure 4-28). Mekong brizantha and Humidicola and purple pigeon all stood out from all other varieties, with over 80% coverage and no mealybugs. This has been a consistent trend across all sites.

Strickland finger, forest bluegrass and premier digit all displayed good coverage, however, during the January 2023 assessment were hosting low numbers of mealybugs. These three varieties have shown varying tolerance across all sites and require further assessment before recommendations are made regarding these.

Bisset coverage was more than 80%, however, this is likely to decrease dramatically once mealybug numbers increase in the variety trial following movement down the hill.

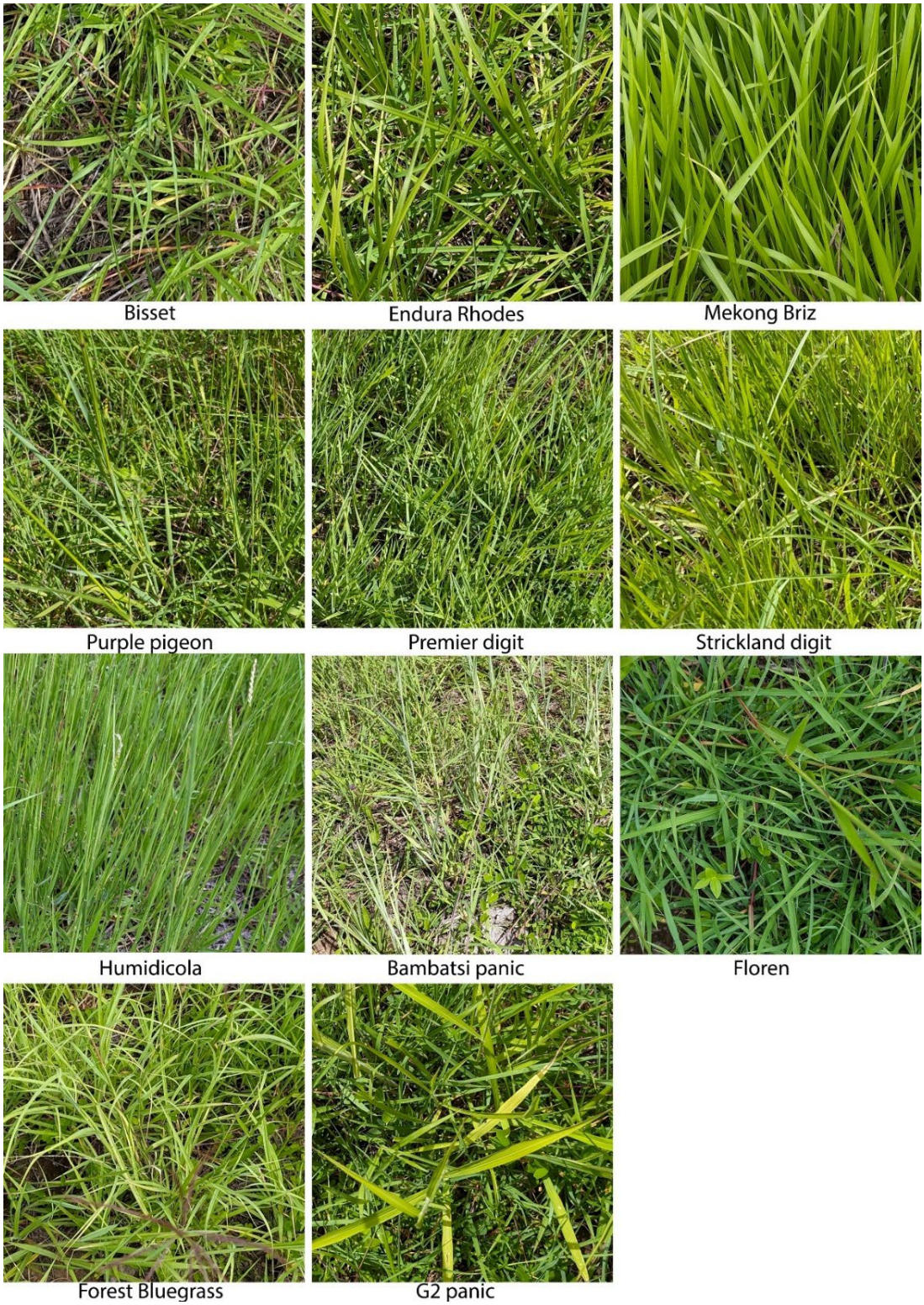

Figure 4-28: Biggenden Variety trial January 2024

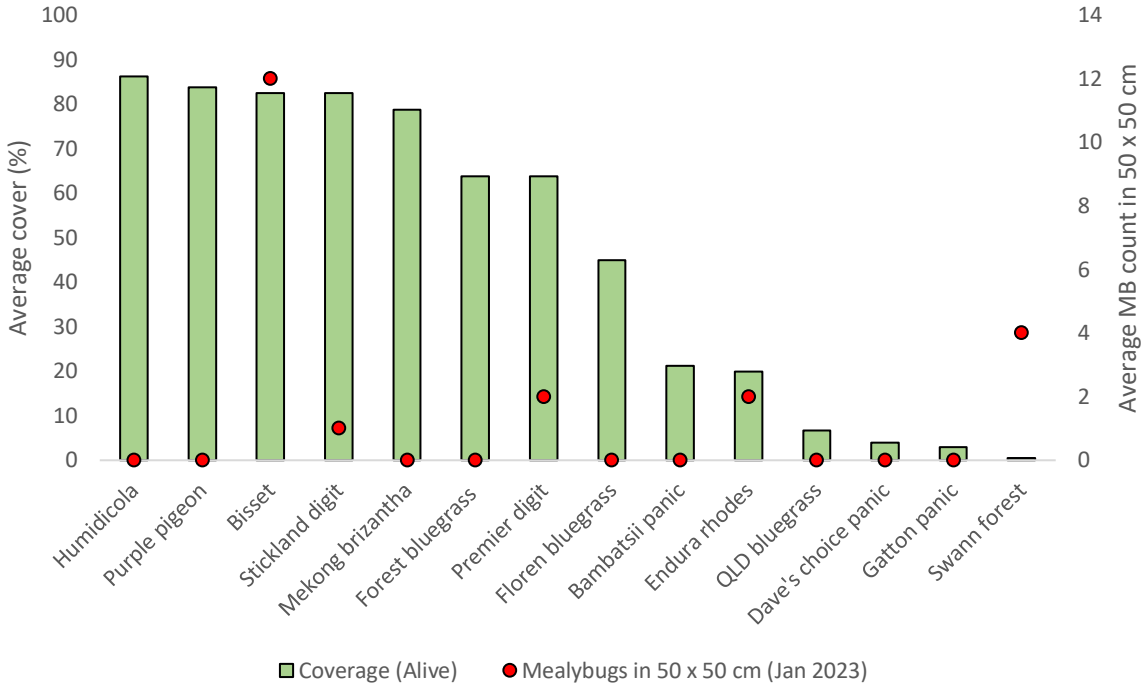

Figure 4-29: Biggenden: Variety coverage and mealybug count, January 2024

4.2.4 Theodore

An assessment of the pivot trial was conducted on February 14, 2024. Clear delineation in species composition was observed between treatments (Figure 4-30, Figure 4-33).

Figure 4-30: Theodore Pivot trial, February 2024

Mekong Brizantha, strickland finger, premier digit, reclaimer rhodes and endura rhodes continue to provide good coverage. Legume coverage has slowed grass growth in some varieties, with Mekong Brizantha displaying a healthy mix. Notably, plots thick with legumes exhibit a distinct color difference, showing a deep green compared to those without. Dieback symptoms of purpling were evident in strickland finger, premier digit and buffel grass.

Figure 4-31: Theodore Pivot trial appearance February 2024. Grass plots without legumes

Figure 4-32: Theodore Pivot trial appearance February 2024. Grass plots with legumes

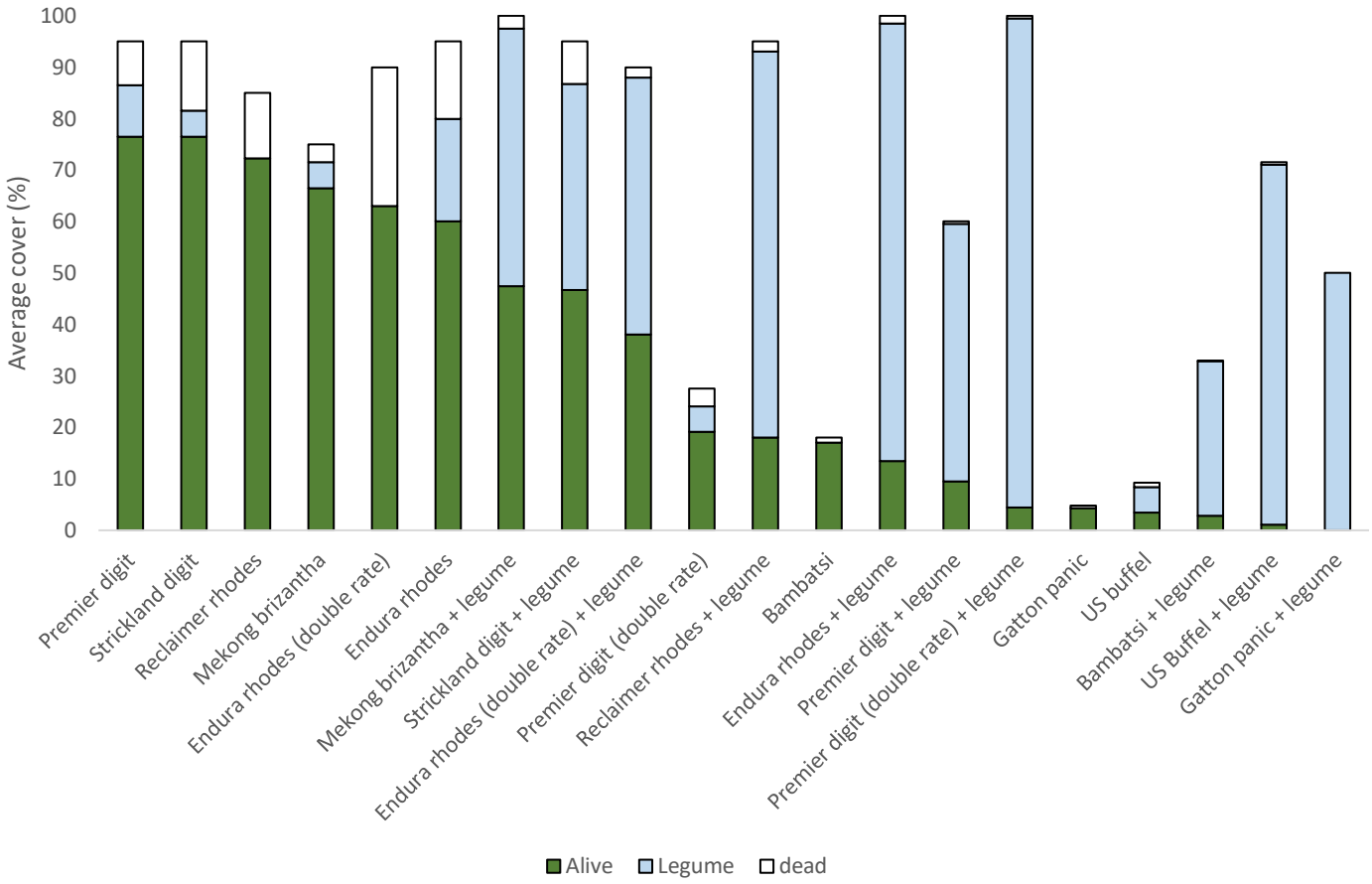

Figure 4-33: Theodore Pivot trial ground cover assessments. February 2024

4.3 Print ready revisions to Pasture Dieback Management Guide

The updates to the dieback guide are in progress with a draft incorporating all input and feedback distributed to other involved parties (Appendix 7.5). This will form a comprehensive resource once complete.

Once completed the guide can be found here, along with other pasture dieback resources.

https://ahr.com.au/blog/pasture-dieback-guide-2024

4.4 Review of all field days

4.4.1 Jambin

The field day at Jambin was a success with 30 attendees. The majority of attendees were graziers, with some representatives from seed companies and Cattle Australia present.

Feedback was positive with an average of 9/10 from 16 respondents. All attendees indicated they felt more informed about dieback and would attend a future event.

Comments regarding what was liked about the field day included:

- *Trial data*
- *Pasture results*
- *Walking through the trials*
- *Well presented. Speakers obviously involved and keen to impart information*
- *The information on the mealybugs themselves. I'm glad we had experts from all fields to share their knowledge.*
- *Seeing the trial plots*
- *The detail in explanation and openness to any questions asked*
- *Pasture walk*
- *The certainty of it being mealybugs*
- *The tolerance levels in grasses"*
- *The varieties that are not susceptible to mealybugs*
- *Causes well explained*
- *A positive explanation with mealybugs as the reason for die back + resistant grasses info - very helpful*
- *Field walk*
- *Hands on - identifying mealybugs. Well presented by staff"*

Comments for improvements for next time included:

- *None - well run*
- *None - well done*
- *It would have been good to see the trial photos when they were actively growing and not grazed. I think the trial would benefit from annual fertiliser on those plots.*

Other comments included:

- *I will be taking a closer look at our future management and improvements.*
- *All great*
- *Well done*
- *Very informative*

An email was also received after the Jambin field day with positive feedback and evidence of practice change.

'Just wanted to thank you guys again for the field day on Wednesday (20/03/24)

We also wanted to let you know we were in Rockhampton today and were able to track down some Mekong Brizantha seed at Elders. We got 2 x 25kg bags and are keen to get some in the ground before next rain (hopefully before winter). We will try it in a couple of locations (soil types) and let you know how it goes. We are definitely looking for an alternative to buffel grass after what we learnt at the field day, however at $34/kg it will take small steps, but we have to start somewhere.'

Data on property and herd size were collected. However, a significant number of respondents did not provide this information.

Acres	Herd
1200	100 breeders
2000	120
960	120
5685	
2965	500
37065	3500
42007	2000
1000	
2000	
	400/100 breeders

4.4.2 Gaeta

The field day at Gaeta was a success with 28 attendees at the 2024 event and 25 attendees at the 2023 event. The majority of attendees were graziers, with some representatives from seed companies, Elders and QLD Country Life present.

Feedback was positive with an average of 9/10 from 17 respondents (2024) and 9.3/10 from 15 respondents (2023). All attendees indicated they felt more informed about dieback and would attend a future event.

Comments regarding what was liked about the field day included:

2024

- *Demonstration*
- *Good clear knowledge of the day*
- *Great examples of how to manage dieback*
- *Mixed pasture soil health*
- *Well presented and great information*
- *All of it*
- *Effect of seeing trial*
- *Being able to see the growth of pasture*
- *Information on pasture species*
- *Pasture mixture*
- *The comparisons*
- *It was great - results speak for themselves*
- *Gave us a pathway to manage our grass*

- *Addresses some of the conflicting stories*
- *Hands on*
- *Explanation of the mealybug cycle*

2023

- *Visual examples, open conversation*
- *Seeing the results of what best grasses to grow resistant to the mealybugs, Great speakers and the extended research results*
- *Alternatives to present management*
- *Information - seeing different grasses*
- *Everything - I learnt a lot*
- *All of the true stories about our problem*
- *The walk around the trial plots and the information given by the speakers*
- *Seeing the different grasses and how they were coping with the dieback Hearing the options to help control the dieback when it starts*
- *Seeing the results*
- *Out in field Variety of grass-mixed trials*
- *Information Combating the problem Grass combinations - seeing them*
- *Good talk on dieback information*
- *See what pasture species are most resistant to pasture dieback symptoms - including legumes and fertiliser regimes*
- *Information of actual grasses*

Comments for improvements for next time included:

2024

- *All good*
- *Any further trials*
- *Natural treatment for mealybugs*
- *More of the same*
- *All good*
- *Seems to be well organised and informative … if only a tad wet*
- *Same as*

2023

- *Early start, if possible*
- *To compare others' sites*
- *Nothing really - all good*
- *Thank you was a good day*
- *Nothing - excellent field day*

Other comments included:

- *Excellent*
- *Very good*
- *Continue your good work*
- *Informative day - thank you*
- *Well done!*
- *Thank you for doing these trials*
- *Good job More funding*
- *Great work, AHR Good to have replicated, measured trial*

An email was also received after the 2023 field day with positive feedback:

'Thanks Naomi, Appreciate the extra info. We got plenty of ideas to help work with the dieback - multi species without the ones which become dominant like blue grass. I am now more confident that mealy bugs trigger the die process after seeing your trials with larger numbers in the bluegrass.

A recent phone call from a grazier revealed a change in their agricultural practices following attendance at the 2023 field day. They reported cultivating and planting a diverse mix of pasture grass and legumes, including Mekong brizantha, rhodes, and Desmanthus. The grazier expressed satisfaction with this approach, noting a significant reduction in dieback compared to paddocks that did not receive such intervention.

Data on property and herd size were collected. However, a significant number of respondents did not provide this information.

Acres	Herd size
10000	
9000	
16000	
84	
495	100
495	100
5930	
2000	
2000	
120	
2500	
1500	
5000	
	160
	1000

2024

QLD Country Life published an article leading up to the event and another following the field day, communicating the approach of these trials 'replanting with pasture mixes with and without legumes, taking a minimalist approach to restore these areas back to productivity at a reasonable cost to producers' as well as some steps can be taken to manage dieback including 'Keeping the thatch layer minimal, opening the pasture and using resistant or more tolerant species'.

queenslandcountrylife.com.au Thursday March 14, 2024 QUEENSLAND COUNTRY LIFE 5

NEWS

Dieback still a major concern

BY JUDITH MAIZEY

WITH nearly a fifth of their Malarga property at Brooweena in the Wide Bay Burnett affected by pasture dieback this year, the Hughes family is calling for more research to be done into finding a solution.

Ben Hughes said they first noticed pasture dieback about five years ago.

"For some years it hasn't been very bad at all, but it's generally the wet, humid years that are the worst. We did try controlling it with organic sprays originally, but they weren't effective," he said.

Like a lot of other cattle producers, the only option the Hughes family has is to burn. Mr Hughes said there was about 1214 hectares affected this year, with a lot of dieback in their breeder paddocks.

"A lot of areas where we have our bullocks and fattening country aren't too bad because they're on the flats and we can keep them slashed," he said. "If it hadn't been for the El Nino predictin last year, we would have burnt more country last spring which may have alleviated our current problem of dieback."

Mr Hughes said the majority of producers around Biggenden would be affected to a degree and some had burnt their affected grass.

He said they had not had dieback on Malarga as bad as they had it this year, even though it had been coming back every year since 2019.

"It's certainly getting worse and, I think, a lot more money should be going into research and trials - so many different grass species are affected by it, there's a few natives that aren't, but practically all introduced grass species are - and legumes aren't," he said.

Malarga is a 6474 hectare breeding and fattening operation that runs about 3500 head of Brahman cross cattle. Mr Hughes said the expense and logistics of re-pasturing their paddocks was not an option, nor was locking up affected paddocks an option.

"At the moment, we're just living with it," he said. "If we get good rain in September, 75-100ml, we'll try to burn all this (dieback) grass to get it back to a clean slate and, hopefully, this area this time next year won't be affected because it's had a fire through it."

Naomi Diplock, lead researcher for Applied Horticultural Research's pasture dieback trials, agreed dieback had been terrible, especially in the last month.

"It's the worst I have seen it over the three years of our trials, especially in the Biggenden/Gin Gin area," she said.

AHR managing director and agronomist Gordon Rogers said they had been funded by MLA for four years to do research on pasture dieback and were optimistic of finding a solution.

"But, we'd like another couple of years of funding, that would be good. We've had trials in the ground now for three years, but just to be confident of the results in the long term if we had them in the ground for five years that would be a pretty good test," he said.

"We're looking at replanting with pasture mixes, with and without legumes...and then with and without supplementary fertiliser. We've got trials across four different areas in Queensland and the approach we're taking is a minimalist approach...to restore these areas back to productivity at a reasonable cost to producers."

Both Mr Rogers and DAF agronomist Stuart Buck agree dieback is caused by mealybug and not a fungus introduced to control giant rat's tail grass around Sarina.

MLA said it had invested more than $3 million in dieback research. Dieback trial field days are scheduled for Jambin next Wednesday and Gaeta next Thursday.

Ben Hughes of Malarga with acres of pasture dieback (the brown patches) in the background. Picture: Judith Maizey

Dieback still an issue after three decades

BY JUDITH MAIZEY

AS MORE producers struggle to deal with pasture dieback, it was clear at a field day last week that there is still no silver bullet to eliminate it after more than three decades since its first appearance.

Last Thursday, about 28 people attended a pasture dieback field day at Gaeta where Applied Horticultural Research has been carrying out trials to find ways to produce feed from dieback-affected pastures. About 30 people attended a similar day at Jambin the day before.

Michael St Henry, Glen Eva, Gin Gin, who runs Brahman breeders, said dieback first appeared on his place in 2017 and had taken over 80 per cent of his bluegrass paddocks this year.

He said they had tried Mekong Brizantha and different crosses of the improved grasses, as well as fertilising, slashing, burning and "flogging" the paddocks. "We've tried everything and it doesn't seem to do anything," he said.

Mr St Henry agreed with Ben Hughes of Malarga, Brooweena, who recently called for more money for research to find a better solution.

Chris Roffey, Gaeta, who runs Brangus/Droughtmaster cross breeders and hosts the trial, said dieback had reduced his carrying capacity by about one third and, at its worst, affected 80 per cent of his 800-acre property.

Mr Roffey said more money into research would always help, but he did not think it was an easy problem to solve.

"When it first started here, no-one knew what it was... they didn't really decide on mealybug up until about three years ago...and fourarm (the fungus) on it, it's the two combined," he said.

Mr Roffey said pasture dieback was by far the most challenging management issue he had faced, even worse than giant rat's tail grass.

AHR research scientist Dr Naomi Diplock said there was absolutely no question that dieback was caused by pasture mealybug and how producers dealt with it depended on their "unique situation", soil types and production systems.

"Just being aware of and knowing what the mealybug looks like, looking for mealybug in the summer...that's when you will first start to see it up on the leaf, determining that it is pasture dieback which is caused by mealybug and taking those steps to managing it - keeping your thatch layer minimal, opening your pasture and using resistant or more tolerant species," she said.

Michael St Henry, Glen Eva, Gin Gin attended an Applied Horticultural Research pasture dieback field day at Gaeta last week. Picture: Judith Maizey

ABC News Radio aired an interview with Naomi Diplock discussing the promising trial results on March 27, 2024. This led to an online news article on April 7 which discussed findings from multiple research organisations, highlighting the collaborative and collective efforts in tackling this issue.

'Pasture dieback research offers hope as mealybugs spread and devastate grazing land'

ABC Rural / By Jennifer Nichols, Abbey Halter, and Megan Hughes

Posted Mon 8 Apr 2024 at 11:39am

https://www.abc.net.au/news/rural/2024-04-08/pasture-dieback-research-hope-beef-graziers/103654066

2023

ABC Radio and QLD Country life gave positive coverage of the afternoon through online news articles and radio interviews. AgForce CQ also posted videos of interviews on their social media page.

Ian Winter has since taken another group of graziers to view the trial site, with further one on one visits planned.

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NEWS

How to fight pasture dieback

BY **BRAD MARSELLOS**

GRAZIERS and scientists have united to discuss managing pasture dieback at a Gaeta research trial site.

The Applied Horticultural Research site, located in the Bundaberg region, is one of four established to find ways graziers can produce feed in paddocks that have been severely affected by pasture dieback.

With pasture dieback mealybugs now understood to be the main cause of the issue, QUT associate professor Caroline Hauxwell said the focus of farmers and researchers could move to managing the devastating and costly issue.

"If you know what is causing this you can manage it," she said.

"We know it is a mealybug that is causing this problem, it isn't going away and it hasn't gone away in 10 years, it is settled in, establishing and heading south into New South Wales and it can travel long distances on wind."

Ms Hauxwell said the mealybug was likely a new incursion variant, carried by wind from overseas or accidentally transported into the country.

And while the dieback was only first recorded on scale in 2011, she believes the pest would have been in Australia "longer than that".

Spotting dieback early was one of the vital tools in management Ms Hauxwell said, with the juvenile insects causing the damage feeding through spring and summer before the adult females disperse and hide, with some travelling deep underground until the fresh grass returns and they lay their eggs.

"We know the mealybugs by feeding on the plant are causing the immune system to shut down," she said.

"It takes very few mealy bugs to do that and they do it very quickly, so if you can get that population down, the grass can recover.

"The first thing is if you see them in that spring early summer period, graze the grass, bale it if possible or as a last resort slash it - but crash grazing works really well, it stops them from breeding."

Combating the pasture dieback mealybug long term was also important for graziers, Ms Hauxwell said, and that came down to sowing crops not susceptible to the insect.

Dr Noami Diplock is a plant pathologist passionate about helping to solve the issue of pasture dieback and in the research trial has concentrated the cultivation of 14 varieties of grasses as well as legumes in the impacted Gaeta paddock to discover fodder that may be dieback resistant.

"Biodiversity of grasses plus a legume mix seems to be the key," she said.

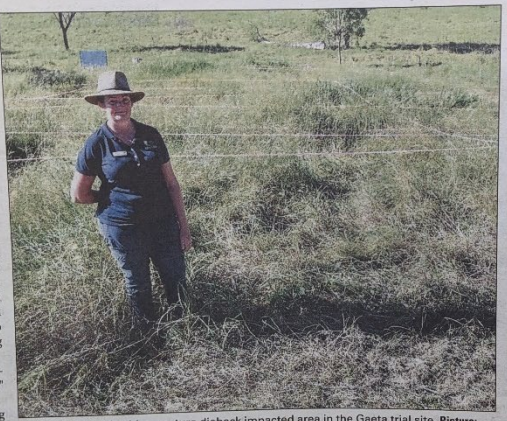
"If you have been impacted, resow with pasture that suits your conditions as well as a good mix of legumes amongst there and that will reduce dieback.

"Use tolerant grass species, and in these trials Mekong Briz antha is a standout, Tully grass is also doing well, some of the Rhodes grasses are holding up well across all sites and Gatton panic is fantastic, especially when mixed with legumes."

Dr Diplock, who has won awards for her work dealing with dieback, agreed controlling the mealybug could not be achieved but planning pasture could help manage the impacts.

"We need to be able to manage our pastures and produce feed with mealybug there," she said.

"It depends on each persons situation, if you have high weed pressure it might not be possible to increase legumes in your paddock because if you need to spray you will lose them, but by increasing your grass mix you are still going to face less dieback. But if you can introduce legumes, which aren't impacted, you are also going to get less dieback."



Dr Naomi Diplock with a pasture dieback impacted area in the Gaeta trial site. **Picture: Brad Marsellos**

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TOWN & COUNTRY

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Associate professor Caroline Hauxwell, Gordon Rogers and Dr Naomi Diplock from Applied Horticulture Research.

PASSION FOR PASTURE

Pasture dieback researchers and local graziers gathered in the Gaeta region of Bundaberg to witness the results of a two year trial led by Dr Naomi Diplock from Applied Horticulture Research.

Graham Pott, Cotswald, Eidsvold and Michael St

Ivan Naggs, Spring Ridge, Neusa Vale and Sara Cue from Agforce.

QUT researcher Darcy Patrick and Zac Geldof from Agrimix.

Gordon and Merril Brauer, Moolboolaman.

Russ McDonald, Aghrem, Rosedale and Russel Augustine, Sandila, Mt Perry.

4.4.3 Theodore:

The field day at Theodore was a success with 30 attendees. The majority of attendees were graziers, with some representation from seed companies and Elders present.

Feedback was very positive:

- a score of 8.5/10 as an overall assessment of the afternoon.
- 100% of participants felt more informed about pasture dieback following the field day
- 100% of participants would attend similar events in the future
- Comments regarding what was liked about the field day included:
  - *Interaction*
  - *Information from experts in each field*
  - *Pasture species susceptibility*
  - *What grasses are better to plant for mealybug-free pastures*
  - *Knowledge on dieback*
  - *Some actual answers from trials*
  - *See what other people do with their properties*
  - *The opportunity to see what's working in our local area and interact with other graziers*
  - *Speakers on task*
  - *The actual site inspection*
  - *Potential cure via legume/gatton panic*
  - *Management of problem*
  - *Trial plots*
  - *The way the trials are showing promise*

Comments for improvements for next time included:

- *All good*
- *More time to ask questions of the experts*
- *More speakers*
- *Why mealybugs attack different grasses*
- *Need to know which grasses and legumes are best for the area*

Other comments included:

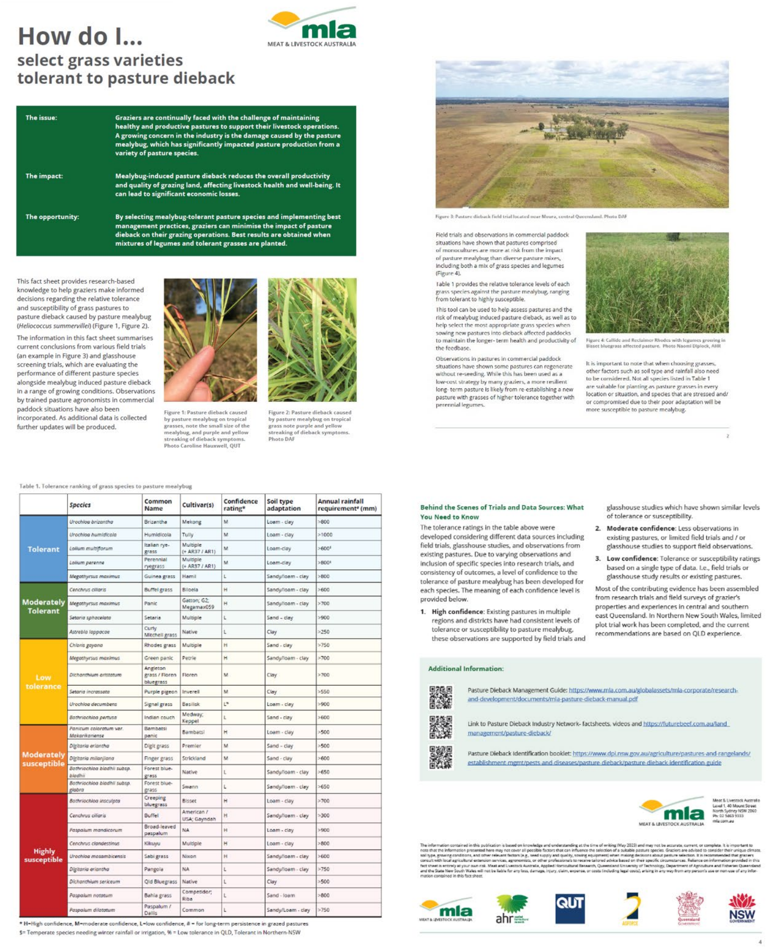
- *Great day!!*
- *Worth attending*
- *Great afternoon*

4.5 Other communication

4.5.1 'How do I… select grass varieties tolerant to pasture dieback'

Following collaborative efforts, the 'How do I… select grass varieties tolerant to pasture dieback' fact sheet was launched at the Mort and Co. field day in Moura on June 23' 2023. This is a useful guide for producers, offering guidance when looking to regenerate pastures in dieback affected areas and can be found here

https://ahr.com.au/blog/how-do-i-select-grass-varieties-tolerant-to-pasture-dieback



5. Conclusion

The results of the management trials indicate the method of stick raking and replanting with more tolerant species (with or without legumes) is an effective and economically feasible solution for rehabilitating dieback affected pastures. This trend was observed across all four trial locations over the three years of assessments, with better coverage and higher biomasses achieved compared to plots left to naturally regenerate or those sown with legumes only. A cumulative assessment of results over the trial duration was not possible due to varying times of assessment (weather dependant), however the most recent assessment provided in this report demonstrates the results of the trials at their most recent assessment, showing results three years after establishment.

A comparative analysis of biomass data demonstrates a superior performance in the plots resown with a grass or grass and legume mix. There was less dieback and fewer mealybugs in these plots compared to those left to regenerate naturally, or those resown with the preexisting pasture, this trend was observed across the three sites where biomass data was collected, across multiple seasons.

Initially in 2022 the addition of fertiliser improved yield, however, the impact of the fertiliser diminished by 2024. This suggests that the beneficial effects of a single fertiliser application were not long-lasting.

5.1 Key findings

Pasture dieback, caused by the pasture mealybug (*Heliococcus summervillei*), has led to significant losses in productive grazing areas in Queensland and northern NSW, particularly affecting introduced grass species like buffel grass and bisset bluegrass.

5.1.1 Field Trials and Results:

- Four field trials established in 2021 demonstrated that stick raking or cultivating followed by re-sowing with legume or grass/legume mixes greatly improved pasture productivity compared to untreated areas or areas resown with pre existing grass species.
- Grass and legume mixes provided the best results in minimising dieback expression and offering good plant coverage. However, allowing natural regeneration in dieback affected areas resulted in colonisation by less desirable species and higher weed incidence.
- Application of fertiliser initially increased biomass but did not impact dieback susceptibility.
- Stick raking was effective in preparing seed beds, especially in areas with low weed incidence and minimal grass bulk.
- The trials highlighted the importance of using good-quality seed to ensure successful germination and establishment of new pastures.
- Long-term studies are necessary to fully assess the impact of these treatments compared to control plots.

5.1.2 Variety Trials:

- Trials identified Mekong brizantha and Humidicola as highly tolerant to dieback, showing good coverage and minimal dieback symptoms.
- Strickland finger and premier digit displayed severe dieback symptoms but persisted in the trials, indicating some level of tolerance.

5.2 Benefits to industry

The findings offer practical and immediate solutions for producers to improve pastures in dieback-affected areas, enhancing pasture resilience.

The identification of commercially available grass species with strong tolerance to the pasture mealybug provides a valuable resource for producers.

6. Future research and recommendations

A comprehensive communication strategy has been implemented to share findings with producers, including field days, factsheets, and an updated Pasture Dieback Management Guide. These efforts are crucial for disseminating practical insights and recommendations.

Based on the project's results, further research is recommended to extend the trials and provide robust replanting and renovation strategies.

Demonstration sites should be used to showcase effective practices to the broader industry, leveraging networks like MLA and AgForce for dissemination.

Overall, the report highlights significant progress in understanding and managing pasture dieback, offering valuable insights and practical recommendations for improving pasture health and productivity in affected regions.

7. Appendices

7.1 Gaeta full report (confidential)

7.2 Jambin full report (confidential)

7.3 Biggenden full report (confidential)

7.4 Theodore full report (confidential)

7.5 Updated Pasture Dieback Guide (DRAFT)