

  
**PGG Wrightson** *Seeds*

# Internal Parasite Management Guide

**FORAGE CROP STRATEGIES IN SHEEP LIVESTOCK SYSTEMS**



# Drench resistance challenges require new strategies to manage internal parasites

For more than 60 years, anthelmintics (drenches) have been the backbone of internal parasite (worm) control in sheep. However, resistance by worms to drenches is becoming increasingly prevalent across the country, so relying solely on drench use will not protect our stock or our farms for future generations.

Internal parasite resistance is an ongoing challenge, but it also creates an opportunity to rethink our farm systems and farm with greater confidence.

Through management strategies such as increasing the ratio of cattle to sheep, implementing targeted selective treatment of stock, and maintaining refugia\*, we can reduce reliance on routine drenching, reserving drenches for when they are truly needed.

Forage crops are an additional tool in the fight against resistance. These crops help break the worm life cycle, improve the nutrition and resilience of lambs, and reduce the need for frequent, repeated drenching.

\*Refugia is a population of internal parasites that aren't exposed to anthelmintics (drenches) e.g. leaving some lambs undrenched, and/or reducing or stopping drench or capsule use in ewes

“  
We can't drench our way out of internal parasite challenges anymore.”

ETHAN BUTCHER,  
FORAGE SYSTEM  
SPECIALIST, SOUTHLAND.



## Contents

### INTRODUCTION

- 3 Forage crops to reduce drench use in lambs
- 4 Forage crops and fewer internal parasite larvae
- 5 How can forage crops break the internal parasite life cycle?
- 6 Nutrition and parasite management in lamb production systems

### TRIAL RESULTS

- 7 New Zealand wide trial work
- 8 Canterbury trial results
- 10 Waikato trial results
- 11 Southland trial results

### ON FARM PRACTICES

- 12 Value of clean, weed free crops vs. internal parasites
- 13 Best practice agronomic management for forage crops
- 14 Checklist: Forage crops for internal parasite management
- 15 Forage crops and internal parasites: Effective drenches remain key

wormwise

Funded by Beef + Lamb New Zealand

Read more about everything to do with parasites at Wormwise



### FURTHER FORAGE CROP INFO

Refer to the Pasture & Brassica Guide on our website for more information, or email us with your details and we'll send you a copy.

info@pggwrightsonseeds.co.nz



# Forage crops to reduce drench use in lambs

Use of forage crops to finish lambs or grow replacement ewe lambs is well established in New Zealand sheep systems. Recent trial work by PGG Wrightson Seeds\*, in collaboration with PGG Wrightson adds an important extra benefit: lambs grazing forage crops may carry lower internal parasite burdens, reducing the need for frequent drenching.

While forage crops will not replace other essential strategies for managing drench resistance, they offer another valuable 'tool in the toolkit' for controlling internal parasites.

This brochure outlines how forage crops can help reduce drench frequency for forage crop-fed lambs compared with pasture-fed lambs.

The reasons why forage crops lower worm challenge are not fully understood. Forage crops may interrupt the parasite life cycle or simply improve lamb nutrition, increasing resilience to worm pressure.

Four grazing studies conducted between 2023 and 2025 show that, with good management, forage crops can reliably reduce drench frequency. Because no drench removes all worms, regular repeated drenching speeds up the development of drench resistance.

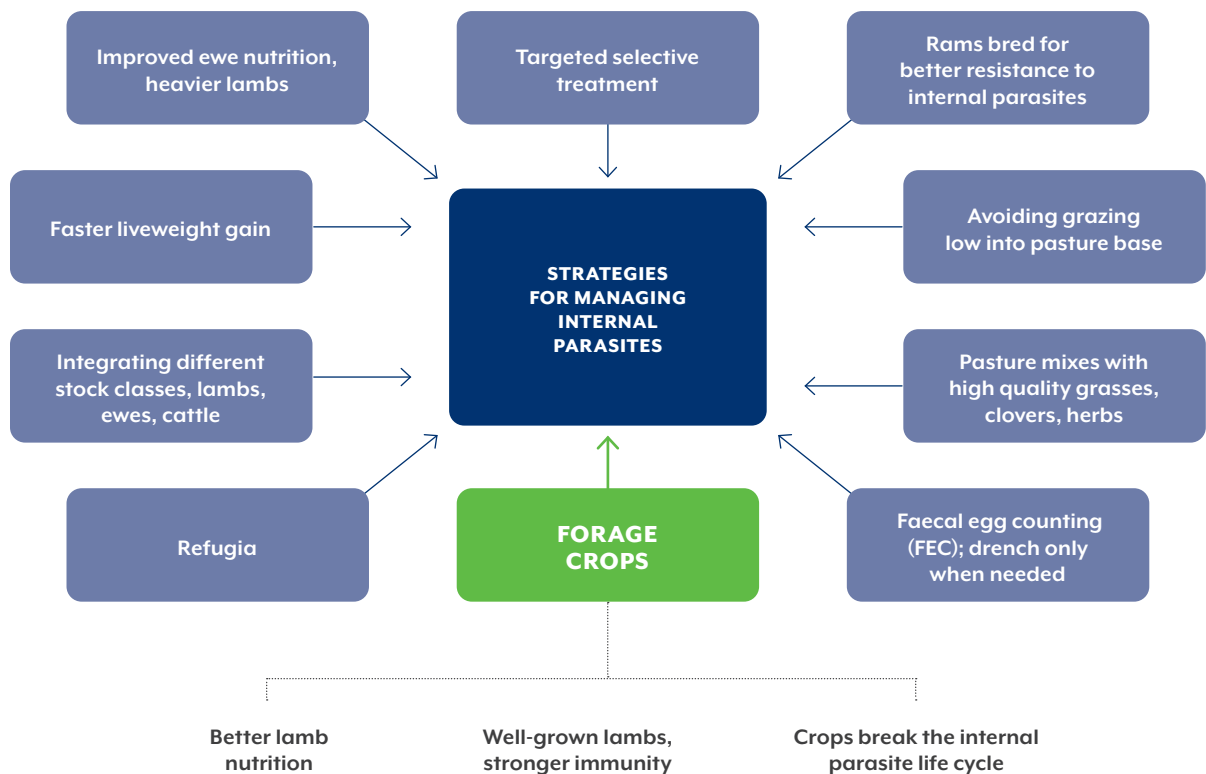
Fewer drenches help slow onset of drench resistance, cut costs, save labour, and reduce yarding-associated lamb health issues such as pneumonia.

Success depends on best-practice agronomy. Clean, well-managed crops with minimal grass and weed

contamination help limit larval ingestion. Regular faecal egg counting and monitoring liveweight gain remain essential to ensure lambs remain healthy.

**Well-managed forage crop systems give farmers another non-drench approach to reducing internal parasite burdens in lambs.**

## Non-drench strategies for internal parasite (worm) management



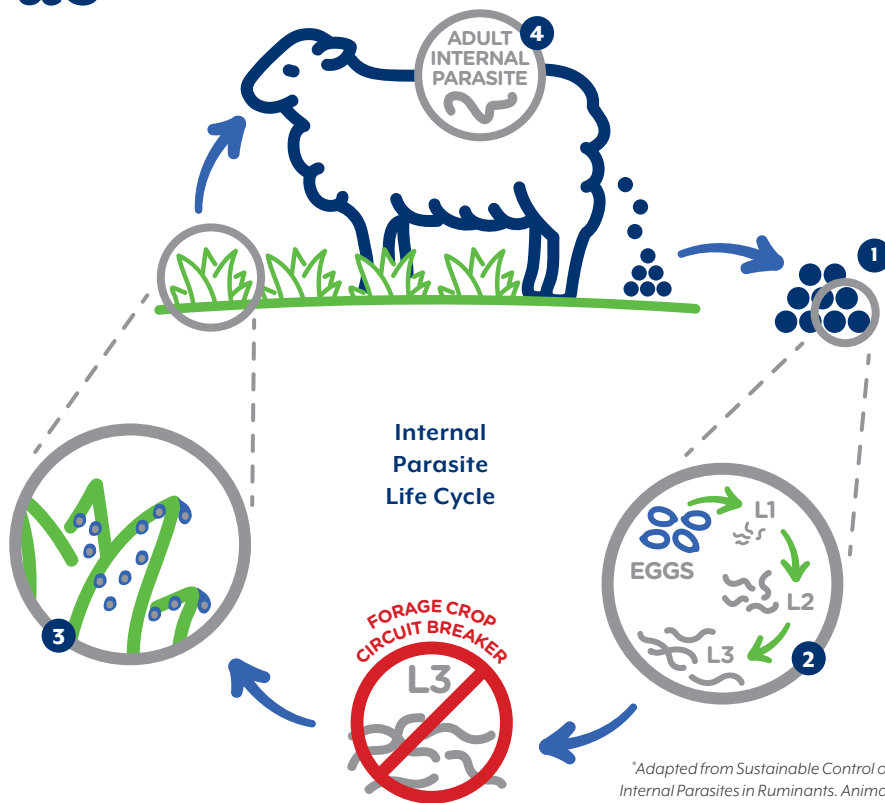
\* Westwood CT, Leslie JWR, Butcher EL, Hunter SL (2025) Liveweight gain and faecal nematode egg counts from Romney lambs grazing five contrasting forage treatments. *New Zealand Journal of Animal Science and Production*. 85, 61-66

# Forage crops and fewer internal parasite larvae

**MORE THAN 90% OF INTERNAL SHEEP PARASITES (WORMS) LIVE OUTSIDE OF THE ANIMAL**

Forage crops act as a circuit breaker, reducing the number of L3 larvae that sheep ingest, breaking the internal parasite life cycle.

Drenching attacks the adult internal parasites in the gut, while forage crops reduce numbers of larvae eaten by sheep – two different, yet complementary ways of tackling the parasite problem.



*\*Adapted from Sustainable Control of Internal Parasites in Ruminants. Animal Industries Workshop Lincoln University 1997.*

Circuit breaking forage crops work to break the life cycle of internal parasites outside of the animal.

**1**

Internal parasites live in the sheep's gut, laying eggs that pass out in the dung.

**2**

Eggs hatch into immature larvae (L1) in the dung, progressing through two growth stages to become infective L3 larvae.

**3**

As dung breaks up, L3 larvae move into pasture, climbing up grass blades, ready to be eaten.

**4**

Inside the animal's gut, larvae mature into adult internal parasites and the cycle starts again.

## Potential numbers of infective L3 larvae on different pastures and forage



# How can forage crops break the internal parasite life cycle?

Forage crops create an environment that is much less favourable for internal parasite (worm) eggs and larvae.

## FORAGES THAT SLOW VERTICAL INFECTIVE L3 LARVAE MOVEMENT

Disrupts L3 larval migration (vertical) up plant to grazing horizon.

Forage crops slow vertical L3 larvae movement; Fewer larvae are eaten by lambs.

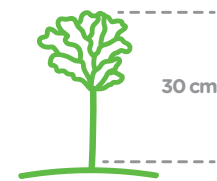
L3 larvae can't easily climb tall crops, so larvae often fail to reach the grazing zone of lambs. Fewer larvae eaten by lambs translates into fewer adult internal parasites establishing inside the lambs.



### Pasture – High Risk

Shorter plants (e.g. grasses) and dense pasture swards allow more vertical movement of L3 larvae.

✗ L3 larvae easily climb grass plants to reach the grazing horizon



### Crop – Low Risk

Taller forage crop plants slow vertical movement of L3 larvae.

✓ L3 larvae are less able to climb and survive on taller forage crops

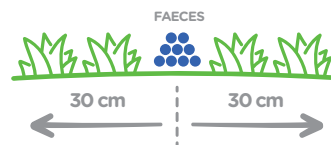
## FORAGES THAT SLOW HORIZONTAL L3 MOVEMENT

Disrupting infective L3 larvae migration (horizontal)

L3 larvae density is greatest within 30 cm of animal faeces; they thrive in warm wet conditions and move within the pasture sward, shifting outwards, away from the dung pile.

Internal parasite larvae are sensitive to sunlight (UV) and dry conditions, and so are more vulnerable to desiccation/death in the more open, exposed microclimate that many forage crops provide.

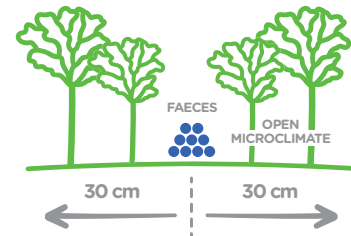
Larvae survivability in crops will be influenced by grass and weed concentrations, as higher grass and weed infestations will provide a potential environment for L3 larvae to survive in.



### Pasture – High Risk

Higher plant numbers create the ideal microclimate to support the survival of parasite eggs and larvae.

✗ L3 larvae can reach plants, survive



### Crop – Low Risk

Lower plant numbers and sward density create a hotter, drier environment, which is unfavourable for L3 larvae survival.

✓ L3 reach fewer plants

# Nutrition and parasite management in lamb production systems

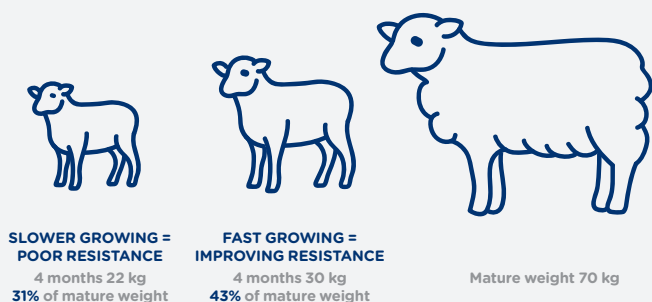
Leafy green forage crops provide lambs with energy-dense, high-protein feed that boosts growth and enhances their ability to cope with internal parasite challenges.

## Dietary protein and lamb immunity

- Lambs need more dietary protein when their immune systems are fighting internal parasites.
- Compared with poor-quality summer pastures, forage crops supply more high-quality dietary protein to support immune function and the continued growth of lean tissue and bone.

## Heavier lambs and resistance to internal parasites

- Fast growing, crop-fed lambs reach heavier liveweights sooner.
- Heavier lambs start to develop more effective immunity to internal parasites at a younger age than lighter lambs.



## Nutrient-dense crops when appetite is poor

- Internal parasite burdens can reduce lamb appetite and grazing time.
- Forage crops allow lambs to take in more energy, protein, vitamins and minerals with every mouthful, lessening the effects of poor appetite.

## Reduce risk of other health challenges

- Grazing lambs on forage crops can lessen exposure to pasture-related health issues that may slow lamb growth and weaken the immune response to internal parasites.
- Forage crops can help limit lamb exposure to facial eczema spores, ryegrass endophyte toxins, and pasture-associated mycotoxins.

Good nutrition builds strong, well grown lambs that are more resistant to internal parasite challenges.



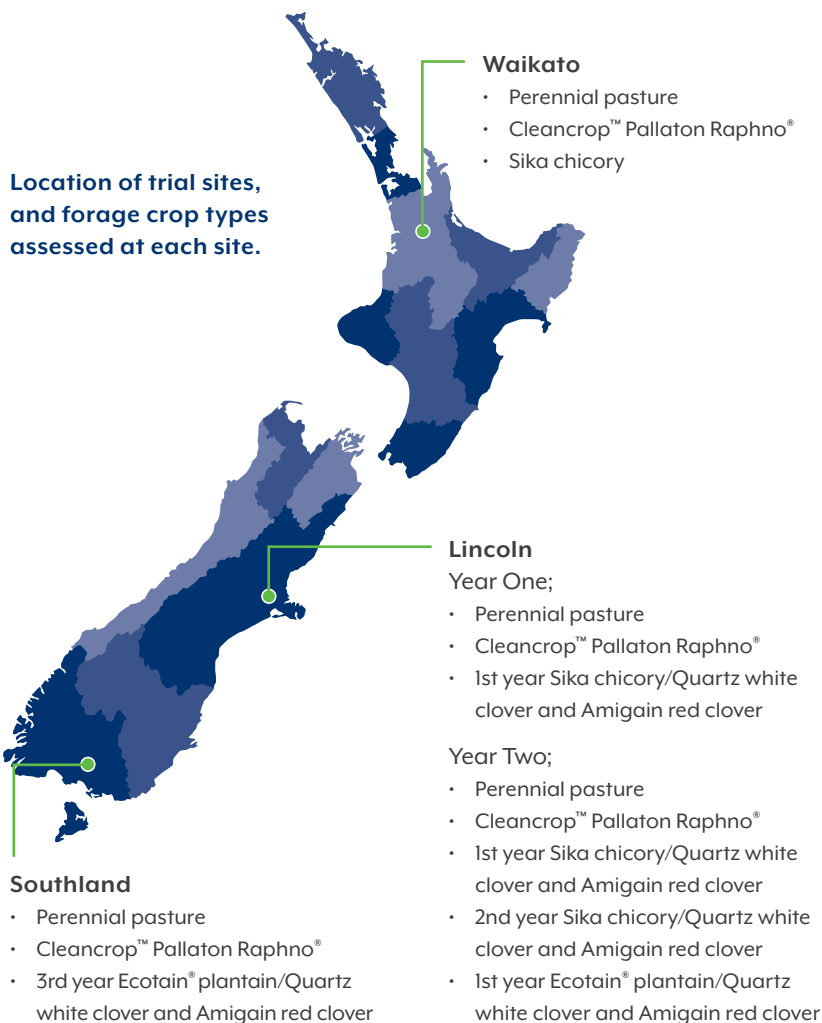
# Testing how forage crops influence lamb parasite management

Feeding forage crops are a suggested option for reducing the need for repeated drenching of lambs – but how effective are crops under farm conditions?

Between 2023 and 2025, four lamb grazing trials were conducted by PGG Wrightson Seeds in collaboration with PGG Wrightson. The work aimed to investigate if forage crops could limit the re-establishment of internal parasites (worms) in the gut of lambs. Trial work was approved by the Lincoln University Animal Ethics Committee.

At each site, 5-month-old lambs received a Zolvix™ Plus drench before being assigned to forage crops or perennial pasture for periods of up to 70 days post-drench.

Across all sites, forage crops, but not pasture, proved effective in limiting internal parasite re-establishment in the gut of lambs, ranging from partial to almost complete control\*.



\*Westwood CT, Leslie JWR, Butcher EL, Hunter SL (2025) Liveweight gain and faecal nematode egg counts from Romney lambs grazing five contrasting forage treatments. *New Zealand Journal of Animal Science and Production*. 85, 61-66

## GRAZING AND SAMPLING METHODS

Forage crops were grown under best management practice including weed control. First year forage crops were not previously grazed by stock before the trial began. Perennial pasture, 2nd year chicory/clover (Lincoln) and 3rd year Ecotain®/clover (Hedgehope) had previously been grazed by other sheep classes.

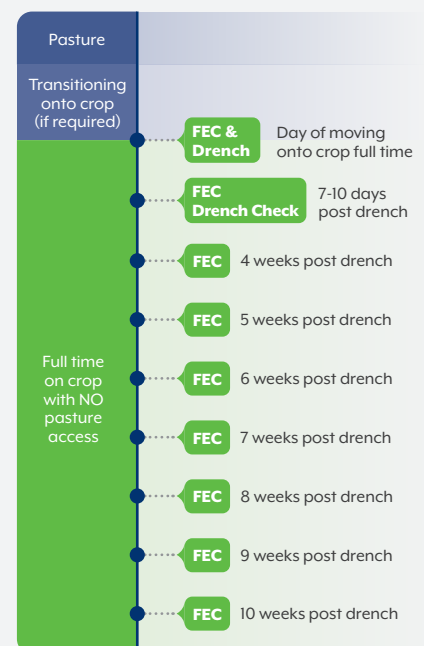
Lambs were allocated to treatment groups that grazed either forage crops or pasture. Following a Zolvix™ Plus drench, samples were collected for faecal egg counts (FEC). Drench check samples were taken 7–10 days after drenching, and weekly FEC collections began from day 28 post-drench.

Lambs were rotationally grazed through breaks of their allocated forage type.

Crop-fed lambs remained exclusively on forage crops, without pasture access, for up to 70 days post-drench. When group average FEC exceeded 500 epg, lambs were removed from the study and re-drenched. Where FEC remained below 500 epg and liveweight gains were satisfactory, lambs remained on forage crops until day 70.

## Lamb Forage Crop and Parasite Study – Project Timeline\*

Monitoring with regular FEC x 10 samples every week

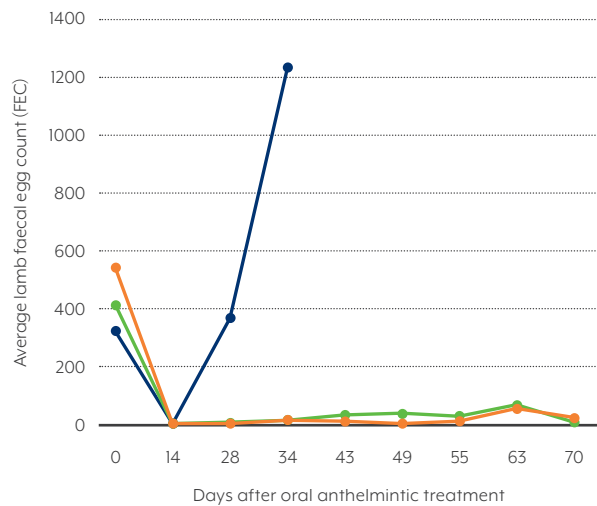


\*The same timeline was used at all study sites, with the exception of minor between-site variation in the timing of FEC Drench Checks

# Lincoln, Canterbury 2023/2024 (Year one) (Irrigated)

## Lamb Faecal Egg Counts (FEC)

- 1st year Sika chicory/Quartz white clover/Amigain red clover
- Perennial pasture
- Cleancrop™ Pallaton Raphno®



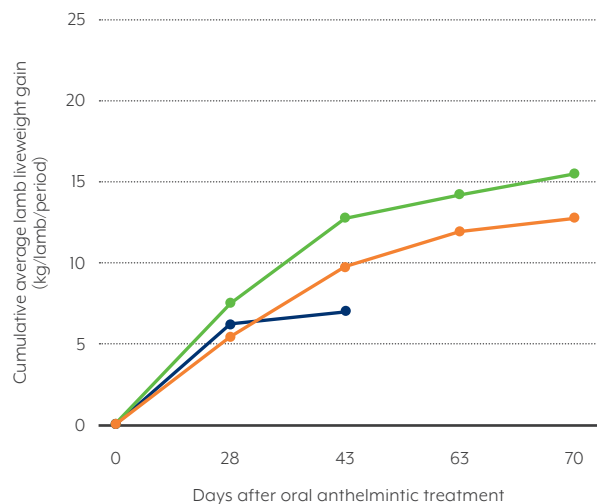
## Faecal egg counts (FEC)

- After initial drenching with Zolvix™ Plus, FEC on pasture fed lambs increased rapidly, lambs exceeded the drenching threshold after only 34 days and were removed from the trial.
- Cleancrop™ Pallaton Raphno® and Sika chicory/Quartz white clover and Amigain red clover-fed lambs had low FEC throughout the entire 70 day trial period and neither treatment reached the threshold for drenching.



## Liveweight Gain in Individual Lambs

- 1st year Sika chicory/Quartz white clover/Amigain red clover
- Perennial pasture
- Cleancrop™ Pallaton Raphno®



## Lamb liveweight gain

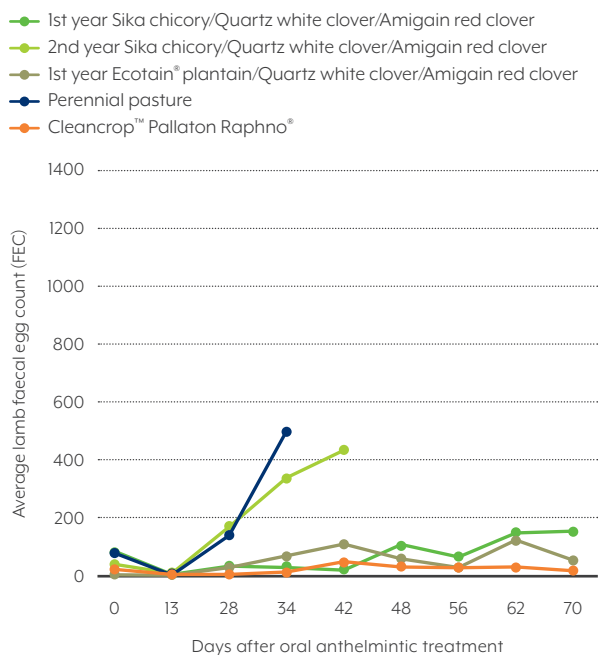
Lamb liveweights were monitored throughout the trial period. Poor liveweight gain can be an indicator of likely internal parasite burden.

- Lambs grazing Sika chicory, Quartz white clover and Amigain red clover, gained the most weight, averaging 226 g/head/day.
- Lambs grazing Cleancrop™ Pallaton Raphno® also performed well, on average gaining 189 g/head/day.
- Pasture-fed lambs performed well initially, but growth slowed significantly from 28 days post-drench, likely associated with the re-establishment of an internal parasite burden.



# Lincoln, Canterbury 2024/2025 (Year two) (Irrigated)

## Lamb Faecal Egg Counts (FEC)



## Faecal egg counts (FEC)

- By day 34 post-drench with Zolvix™ Plus, pasture-fed lambs reached an average FEC of 500 eggs per gram (epg), were drenched and removed from the trial.
- By day 42 post-drench, lambs grazing second-year Sika chicory/clover had average FEC increase to 435 epg, with some animals scouring. All second-year Sika chicory/clover lambs were drenched and removed from the trial.
- Lambs grazing first-year Sika chicory/clover, Ecotain® plantain/clover, or Cleancrop™ Pallaton Raphno® maintained low FEC through to day 70 and did not require drenching.
- The higher parasite challenge on second-year Sika chicory/clover was likely due to infective L3 larvae contamination from previous ewe and lamb grazing.

## Liveweight Gain in Individual Lambs



## Lamb liveweight gain

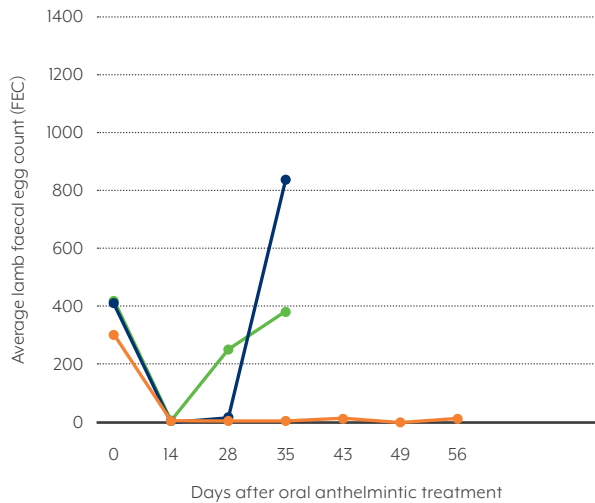
- All lambs on the first-year forage crops grew well. Lambs on the first-year Sika/clover and Ecotain® plantain/clover averaged liveweight gains of 300 g/head/day and 320 g/head/day, respectively.
- Cleancrop™ Pallaton Raphno® lambs also performed well, gaining on average 270 g/head/day over the 70 day period.
- Pasture lambs for a second year in a row grew well for the first two weeks post-drenching; liveweight gains slowed by day 28 post-drench.
- Lambs on the second-year Sika chicory/clover crop performed relatively poorly, most likely because of internal parasite reinfection.



# Pencarrow, Waikato 2024/2025 (Dryland)

## Lamb Faecal Egg Counts (FEC)

- 1st year Sika chicory
- Perennial pasture
- Cleancrop™ Pallaton Raphno®



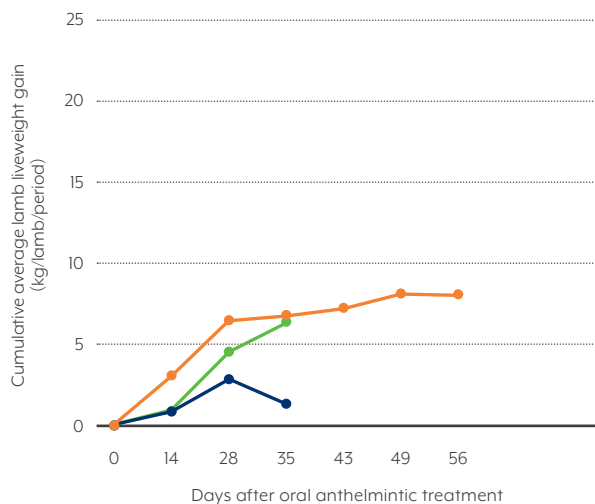
In this true dryland site, the agronomic performance of each forage was put under pressure by the harsh 2024/2025 Waikato drought. The study duration was shortened to just 56 days post-drenching with Zolvix™Plus due to absence of crop regrowth.

## Faecal egg counts (FEC)

- Pasture treated lambs exceeded the faecal egg count (FEC) threshold for drenching at day 37. Lambs were drenched and removed.
- Post-drench FEC continued to climb in lambs grazing Sika chicory. Chicory crop regrowth was poor with lambs grazing below target post-grazing residuals. Lambs were drenched on day 37 and removed from the trial.
- Average FEC for lambs grazing Cleancrop™ Pallaton Raphno® remained low until lambs were removed from crop 56 days post-drench.

## Liveweight Gain in Individual Lambs

- 1st year Sika chicory
- Perennial pasture
- Cleancrop™ Pallaton Raphno®



## Lamb liveweight gain

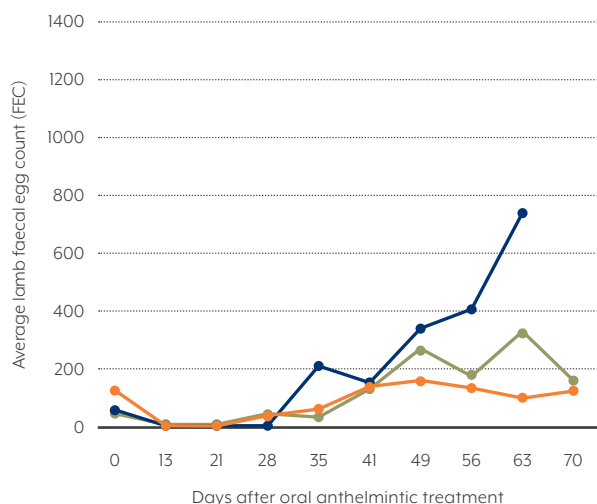
- Pasture-fed lambs averaged just 100 g/head/day up to day 28 post-drench, before failing to gain liveweight between days 28 and 35. These lambs were drenched and removed from the trial.
- Lambs grazing Sika chicory averaged 177 g/head/day over their 37 days on trial.
- Lambs grazing Cleancrop™ Pallaton Raphno® gained an average of 180 g/head/day over the first 35 days, with growth slowing between days 35 and 56, likely due to declining feed quality of drought-stressed brassica plants.



# Hedgehope, Southland 2024/2025 (Dryland)

## Lamb Faecal Egg Counts (FEC)

- 3rd year Ecotain® plantain/Quartz white clover/Amigain red clover
- Perennial pasture
- Cleancrop™ Pallaton Raphno®



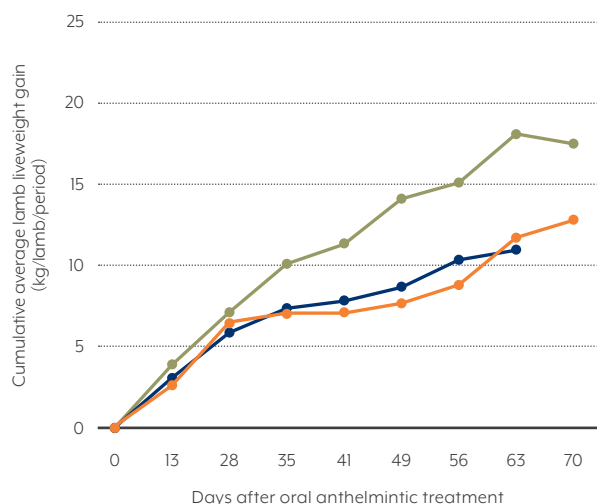
## Faecal egg counts (FEC)

- In the pasture-fed lambs, FEC remained below the 500 epg drench threshold until day 63 post-drench. The delayed rise in FEC aligns with the farmer’s long-term focus on breeding for improved resistance to internal parasites.
- FEC in lambs grazing Cleancrop™ Pallaton Raphno® and third-year Ecotain® plantain with Quartz white clover and Amigain red clover stayed low throughout the trial. Lambs grazing these crops did not require drenching.



## Liveweight Gain in Individual Lambs

- 3rd year Ecotain® plantain/Quartz white clover/Amigain red clover
- Permanent pasture
- Cleancrop™ Pallaton Raphno®



## Lamb liveweight gain

In contrast to the Waikato, Southland experienced adequate rainfall over summer leading to strong forage supply across the trial.

- Lambs grazing the Ecotain® plantain/clover mix achieved the highest liveweight gain, averaging 250 g/head/day.
- Cleancrop™ Pallaton Raphno® fed lambs averaged 183 g/head/day.
- Pasture-fed lambs gained an average of 173 g/head/day up to day 63 post-drench, at which point they were drenched and removed from the trial due to high FEC.

## SUMMARY

Forage crops offer a practical way to reduce drench use in lambs.

Grazing first-year forage crops reduced the need for drench treatments.

Lambs grew faster on forage crops than on pasture.

Forage crops work best when combined with other internal parasite-control strategies.

Read more detail about this study



Westwood CT, Leslie JWR, Butcher EL, Hunter SR (2025) Liveweight gain and faecal nematode egg counts from Romney lambs grazing five contrasting forages. *New Zealand Journal of Animal Science and Production*.85, 61-66f

# Weeds don't do any favours for our forage crops

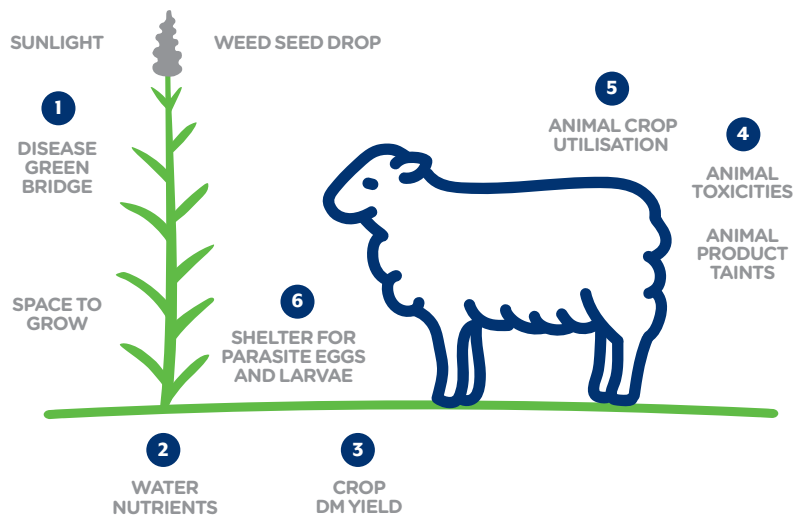
Keeping weeds and grasses out of forage crops is always worthwhile for a range of agronomic reasons.

Weeds provide internal parasite (worm) eggs and larvae with shade and shelter, helping them survive and increasing the risk of lambs consuming more infective L3 larvae. Aim to keep forage crops weed and grass free. This includes accessible areas for lambs that don't have any crop such as fencelines.

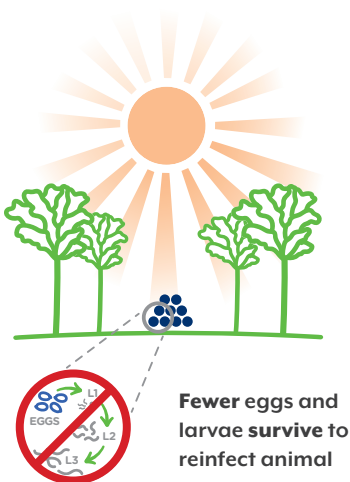
## THE POTENTIAL IMPACT OF WEEDS ON CROPS AND LIVESTOCK

Grasses and weeds can:

- 1 Act as a "green bridge" for plant diseases.
- 2 Compete with crops for water, nutrients, sunlight, and growing space.
- 3 Lower crop dry matter yield.
- 4 Pose toxicity risks to livestock and cause meat taints.
- 5 Decrease crop utilisation.
- 6 Provide shelter for parasite eggs and larvae.

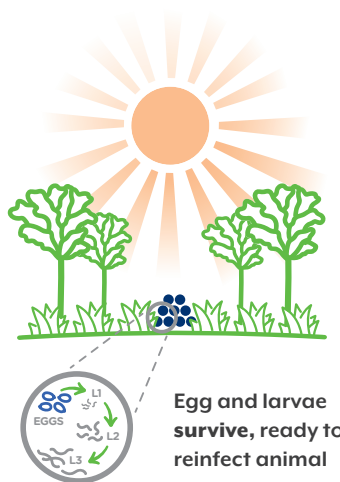


### Low weed burden forage crops



Sunlight, heat = drying out / killing of eggs and free living internal parasite larvae.

### High weed burden forage crops



Weeds provide shelter and a microclimate that favours survival of eggs and free living parasite larvae.

### High grass weed burden forage crops



Upright grasses, e.g. twitch (couch), Poa, and poorly sprayed out permanent pasture, all provide opportunities for infective L3 larvae to migrate up into the grazing horizon.

# Best practice agronomic management for summer forage crops

Maximising the value of forage crops for lambs and reduced frequency of drench use begins with best-practice crop establishment and management, guided by an experienced agronomist.

Success relies on careful paddock selection, soil testing, and ensuring soil temperature matches the requirements of the crop species. The use of pre-emergence and, where necessary, post-emergence herbicides helps achieve weed and grass-free crops.

Applying an appropriate starter fertiliser, along with good seedbed preparation (if cultivating) and correct seed-soil placement, ensures successful crop establishment.

A well-grown, weed-free, high dry matter yielding crop not only drives lamb productivity but also lowers the risk of lambs ingesting L3 infective parasite larvae.

Best practice agronomy maximises the value of forage crops for lambs.

## Crop Establishment Timeline

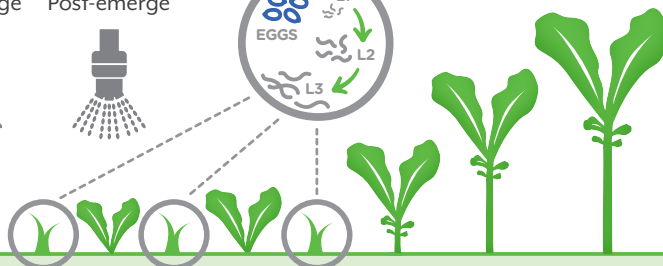
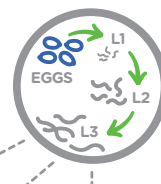
Spray out



Pre-emerge



Post-emerge



Glyphosate & companion herbicide

Cultivate\* or direct drill

Seed sowing

Remove unwanted grasses and weeds  
Eliminate worm eggs and infective larvae surviving in grass and weeds beneath crops

Monitor for ongoing emergence of unwanted grasses & weeds AND crop disease and pests

\*Cultivation removes more worm infective parasite larvae than direct drilling.



# Checklist: Forage crops for internal parasite management

Forward planning is essential when using forage crops as part of a wider internal parasite management strategy. The following steps outline a practical, step-by-step approach to using forage crops to help manage internal parasites.

Further guidance is available in the Wormwise handbook and on the Beef + Lamb website: [beeflambnz.com](http://beeflambnz.com)

## 1 CHOOSE PARASITE MANAGEMENT STRATEGIES THAT BEST SUIT YOUR SYSTEM

- There are many options available to reduce the risk of drench resistance or help manage or reverse existing resistance challenges.
- Forage crops are one tool in internal parasite management and should be used alongside other strategies.



## 2 KNOW YOUR DRENCH STATUS

- Carry out a drench check by collecting faecal egg counts (FEC) 7–10 days after drenching lambs.
- Consider faecal egg count reduction testing (FECRT) to confirm which drench actives are still effective, in consultation with your vet.



## 3 WORK WITH AN EXPERIENCED AGRONOMIST TO DEVELOP CROP PLANS

- Not all paddocks or blocks are suitable for all types of crops.
- Plan well in advance.
- Keep crops clean and weed and grass free.
- Integrate use of crops into an overall regrassing plan.



## 4 PLAN A TIMELINE FOR GETTING LAMBS ONTO CROP

- For brassica crops, plan for gradual adaptation of lambs from pasture to crop e.g. on-off grazing between pasture and crop.
- When lambs are ready to graze full time on crop, drench lambs onto crop with a product known to work against parasites.
- Prevent lambs from accessing pasture while grazing crop.
- Drench check (10 samples for FEC from crop-fed lambs) 7-10 days after drenching.
- Repeat collection of FEC every two weeks, and/or if lamb liveweight gains are poor and/or clinical signs of parasitism e.g. scouring are seen.



## 5 AS HEAVY LAMBS ARE DRAFTED OFF CROP

- Replace with lighter lambs that are drenched at the time of moving onto crop with a product that's highly likely / known to be effective against worms.
- Collect FEC from new lambs 7-10 days after drenching.



# Forage crops and internal parasites: Effective drenches remain key

Wormwise principles highlight the importance of grazing forage crops only after lambs have been drenched with an effective product (that removes a very high proportion of parasites).

Effective quarantine drenching of introduced stock and knowing which drenches still work on your farm are essential. Where possible, source lambs from vendors who know their drench status.

## QUARANTINE DRENCHING

- Effective quarantine drenching minimises the risk of introducing resistant parasites with purchased lambs.
- Although effective drenches remove adult parasites and larvae, eggs are not affected, so lambs must be confined in yards or a suitable containment area for 24–48 hours to allow eggs to pass before moving lambs onto pasture.
- Due to widespread resistance to triple drenches and recent reports of reduced effectiveness of 'novel' drenches, Wormwise recommends the use of four-way active drenches as best practice for lamb quarantine drenching. Discuss with your vet potential meat withholding implications when four-way active drenching is used.
- A follow-up FEC 7–10 days after quarantine treatment (Drench Check) is recommended to confirm quarantine drench effectiveness. FEC should be zero or very close to zero if the drench has been effective. Note that no drench active will be 100% effective at removing parasites.

## KNOW YOUR DRENCH STATUS

- When you drench lambs with an ineffective drench, resistant parasites survive in the gut, reproduce, and produce eggs, accelerating the build-up of larger populations of resistant parasites on farm.
- Always Drench Check 7-10 days following each drenching event.

Read more about quarantine drenching



Read more about your drench status



## KEY TAKE HOME MESSAGES

- Forage crops offer a valuable tool to manage internal parasite risk in lambs.
- First year forage crops have the greatest effect on reducing parasite risk.
- Good agronomy and weed control will maximise benefits of forage crops.
- Good animal health practices are still important.
- Know your drench status – continued monitoring is essential.

## ADDITIONAL INTERNAL PARASITE RESOURCES (WRITTEN, VIDEOS, PODCASTS):

Wormwise



Beef and Lamb  
New Zealand Ask Bella



The Rumen Room Podcasts:  
with Dr Charlotte Westwood



Read more detail  
about this study



Westwood CT, Leslie JWR, Butcher EL, Hunter SR (2025) Liveweight gain and faecal nematode egg counts from Romney lambs grazing five contrasting forages. *New Zealand Journal of Animal Science and Production*. 85, 61-66

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