



Manaaki Whenua
Landcare Research

Economics of horehound to New Zealand dryland farming

Prepared for: Horehound Biocontrol Group

April 2018



Economics of horehound to New Zealand dryland farming

Contract Report: LC3142

Ronny Groenteman

Manaaki Whenua – Landcare Research

Reviewed by:

Pike Brown
Senior economist
Manaaki Whenua – Landcare Research

Approved for release by:

Chris Jones
Portfolio Leader – Managing Invasives
Manaaki Whenua – Landcare Research

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Summary

Project and Client

- A survey was initiated by the Horehound Biocontrol Group to estimate the current cost of horehound to dryland sheep farming.

Objectives

The aim of this report is to quantify the current cost of horehound to sheep farming in dryland high- and hill-country, including the impact of horehound on lucerne crops.

Results

- Ninety-five land owners/managers, mainly from Canterbury and Otago, responded to the survey, covering land area estimated as 7% of the South Island high- and hill-country farms
- Horehound turned out to be a problem in both lucerne and other pasture types
- Horehound infestation covered a median 3.8% of the land (meaning that in half the properties horehound infestation was 3.8% or lower and in the other half of properties horehound infestation was 3.8% or higher).
- Costs of horehound to farming operations were associated with control (chemical and non-chemical), lost production, contamination of wool, pasture replacement, sub-optimal grazing regime (to avoid horehound at critical times), and other opportunity costs.

Conclusions

- A conservative estimate of the cost of horehound to dryland high- and hill-country farming reached \$6.85 million per annum
- This estimate is considered an underestimate because several identified cost factors were not possible to quantify from the survey.

1 Introduction & Background

A survey was initiated by the Horehound Biocontrol Group (hereafter: the Group) to estimate the current cost of horehound to dryland sheep farming. Costs were estimated using a questionnaire (Appendix 1).

The survey was distributed through the original group of farmers interested in biological control for horehound to their networks. It was also put up on websites of Beef + Lamb New Zealand, Manaaki Whenua – Landcare Research, and Dryland Research (Lincoln University). The survey was also distributed in Beef + Lamb field days for dryland farming. Farmers were encouraged to respond regardless of whether horehound was a big or small problem for their farming operation, and regardless of the size of their property. Survey respondents do not represent a balanced cross-section of the dryland farming sector and there may be bias towards farms where horehound is a problem.

2 Objectives

The aim of this report is to quantify the current cost of horehound to sheep farming in dryland high- and hill-country, including the impact of horehound on lucerne crops.

3 Results

The response to several questions was highly skewed towards values at the higher end of the range. Thus, to be conservative, medians (rather than means) were used to calculate total cost values throughout. Mean is the sum of observations divided by the number of observations. The mean can be strongly skewed by extreme observations (either very low or very high). Median is the value that represents the midpoint of observations. Therefore, in response to any question, half of the observations are equal to or lower than the median, and the other half of observations are equal to or higher than the median. The median is not sensitive to extreme observations, and was therefore chosen here as a more conservative representation in instances where the means were highly skewed upwards.

3.1 Farm Characteristics

Ninety-five farmers/lifestyle block owners responded to the survey either in hard copy or online. Most respondents came from Canterbury (45) and Otago (26), but there were also responses from Nelson (4), Tasman (3) Marlborough (3) and Southland (2). There were 10 responses from the North Island. Two respondents did not provide a geographic location.

Property size ranged from a 1.3-ha lifestyle block to a 38,800-ha sheep farm, with stocking unit capacity ranging from 0.5 to 14 per ha (Table 1). The combined area covered in the survey was 212,843.3 ha, of which 206,311.3 was in the South Island. This represents 7% of

the total estimated area in hill- (1.62 million ha) and high-country (1.33 million ha) South Island farming (Beef + Lamb NZ 2018a, 2018c).

Respondents described horehound infestations as either increasing (64.5%), stable (27.5%), or decreasing (6%). Two respondents (2%) did not provide a status.

Lucerne production is a fast-growing key element of dryland hill- and high-country farming in the South Island.

Farm area in lucerne ranged from 0 (on 18 properties) to 1,000 ha, or 0 to 48.7% of the farm (Table 1). The combined area in lucerne in the survey was 7,722.1 ha, representing 5% of the estimated 150,000 ha of hill country planted in lucerne (Monk et al. 2016).

Initial conversation with members of the Group indicated that horehound is mainly a problem in lucerne pastures, and the survey was designed accordingly, focusing on horehound as a weed in lucerne pastures. Indeed, several respondents commented that lucerne is becoming too expensive to farm due to horehound (Appendix 2). However, it also became clear from comments made by several respondents that horehound is also becoming an unmanageable weed in grass and mixed pastures. It is therefore likely that the cost of horehound to farming in New Zealand estimated from this survey is undervalued, due to the lack of quantitative information on the cost of horehound and associated lost production in pasture types other than lucerne.

The proportion of farm area infested with horehound (of any density) ranged from 0% to 100%, with a median of 3.8% (Table 1). Our questionnaire did not ask respondents to differentiate infestation on lucerne vs other pastures, thus, although infestation in lucerne is likely to cover a higher proportion of the total area in this crop, our conservative estimate treats infestation as the conservative median figure on 3.8% of the total farm area.

The total area of high- and hill-country farming in the South Island is estimated to be 2.95m ha (Beef + Lamb NZ 2018a, 2018c). Using the infestation rate of 3.8%, at least 112,100 ha are infested with horehound.

The area of hill country planted in lucerne is estimated to be around 150,000 ha (Monk et al. 2016). Using the infestation rate of 3.8%, at least 5,700 ha infested with horehound.

3.2 Control costs

Respondents were asked to estimate all costs associated with chemical control of horehound, including chemicals, labour, equipment, etc. Forty-eight respondents provided annual control costs as well as an estimate of area infested (Table 1). To estimate what proportion of infested land was under chemical control, it was also important to further investigate the use of chemical control by respondents who did not provide a cost. For 21 of the respondents who did not provide cost of chemical control, it was possible to conclude from their comments that their spending on chemical control was nil. For example, 15 commented that horehound was not a big enough problem for them to manage or that they manage to keep on top of it by grubbing (Appendix 2). They

represented a total farm area of 26,841 ha (12.6% of the total farm area in the survey), area infested of 610.6 ha (2.4% of the total area infested in the survey), and area in lucerne totalling 887 ha (11.5% of the area in lucerne in the survey). For another 20 respondents who did not provide cost for chemical control, it was possible to conclude from their comments that they currently apply chemical control (some on a small scale, but at least one using helicopter) or that they have done so previously but found it ineffective. This group represented a total farm area of 24,752.3 ha (11.6% of the total farm area in the survey), area infested of 922.5 ha (3.7% of the total area infested in the survey), and area in lucerne totalling 849.3 ha (11% of the area in lucerne in the survey). The infested area of these 20 respondents was included in the calculation of the proportion of area under chemical control below.

Annual costs were divided by area infested (including lucerne and other pastures, combined) to generate annual cost per ha ranging from \$1.5 to \$875. The figure at the lower end of this extreme range possibly represents instances where the cost provided only related to the chemical itself and excluded labour and machinery. The figure at the high extreme end may represent an outlier. Three respondents provided annual control costs but not area infested, so were excluded from the analysis of cost per ha.

Thus, at a total South Island high- and hill-country farming area infested of 112,110 ha, and with around 98,650 ha (88%) of the infested area under chemical control at a conservative median cost of \$25 per ha, annual cost of chemical control comes to \$2.5 million. Put another way, if the land covered by the South Island respondents in this survey represents 7% of the South Island high- and hill-country farm area, their combined expenditure of \$198,060 per annum would translate to \$2.8 million per annum for the South Island alone.

Respondents were not asked to provide a breakdown of control costs. These may be underestimated due to failure to separate labour costs, especially if the farmers themselves executed the control operation. For example, one land owner with 750 ha of infested land commented on spraying large areas of hillside by helicopter, yet only recorded \$1,500 as the annual cost for chemical control. The data resulted in an estimate of \$2 per ha for chemical control on this farm, which is clearly a gross underestimate. Another land owner with 20 ha of infestation quoted \$300 per annum but commented that the expenses are not so much for the chemical, but that control was intensively time consuming – a cost clearly not included in the per annum quantity. If survey respondents did not account for the opportunity cost of time, the estimates presented here will be a lower bound on the true costs.

A variety of products are used for chemical control, with variable success at killing horehound ranging from 0 to 100% and off-target lucerne death ranging 0 to 100% (Table 1).

Cost of control by means other than chemical ranged from \$0.35 to \$937.5 per ha (Table 1). Where a method of non-chemical control was noted, it was most often grubbing.

Sixteen of the 64 respondents who did not provide a cost for non-chemical control methods reported using non-chemical methods to control horehound (grubbing, grazing regime). Together they represent 16,620.3 ha in total; and 16,247.3 ha in the South Island.

These respondents represent a horehound-infested area totalling 1,161 ha, 1,155 of which are in the South Island. For another 38 respondents who did not provide a cost for non-chemical control, it was possible to determine from their comments that their spending on such control methods was nil. They represent a total farm area of 116,379 ha in total and 115,937 ha in the South Island (55% of the total farm area in the survey), with a total area infested of 4,173.2 ha, all of which is in the South Island. The remaining 10 respondents did not provide a cost for non-chemical control and it was not possible to determine unequivocally whether they did or did not engage in such activities. They represented a total farm area of 11,121 ha, of which 10,489 ha are in the South Island, with a total area infested of 3,236.5 ha, all of which are in the South Island. The total area infested with horehound that can be confirmed as under non-chemical control therefore represents 70% of the total infested area in the survey (71% in the South Island).

Thus, at a total South Island high- and hill-country farming area infested of 112,100 ha and around 78,470 ha (70%) of the infested area being under non-chemical control at a conservative median cost of \$25 per ha, annual cost of non-chemical control comes to \$1.96 million. Put another way, if the land covered by South Island respondents in this survey represents 7% of the South Island high- and hill-country farm area, their combined expenditure of at least \$59,000 per annum would conservatively translate to at least \$0.85 million (noting that one third of respondents who clearly use non-chemical methods did not provide a cost).

3.3 Production losses

Respondents estimated that, left untreated, horehound infestations had doubled every 1 to 10 years (Table 1). The median and the mean were consistent, indicating a 3-year doubling period.

Lucerne yield loss due to horehound infestation was estimated by farmers to be between 0 and 70% but only a small number of respondents translated this yield loss to biomass terms, ranging from 0.5 to 6.7 tonnes per ha (Table 1). Lucerne paddocks are estimated to support around 12 stock units per ha, comprising one ewe plus twin lambs per unit (Moot 2012). Beef + Lamb (2018b) reported a 10-year average value for a lamb of \$94. Applying the median 20% loss in lucerne production from horehound infestation reported in this survey (Table 1), productivity loss translates to \$451 per ha on the lambs alone.

Several respondents commented about retiring land from lucerne and avoiding conversion of suitable land into lucerne due to horehound invasion (Appendix 2). These respondents identified an opportunity cost associated with these decisions, but did not provide monetary value of those losses.

If 3.8% (estimated from this survey), 10%, or 20% of lucerne in the South Island high- and hill-country were infested with horehound, this productivity loss would translate to \$2.6 million, \$6.75 million, or \$13.5 million annually in lucerne alone (not including loss in other pasture types).

In the absence of horehound, farmers replace lucerne every 7 to 40 years, but in the presence of horehound, the replacement interval drops to between 3 and 10 years (Table

1), roughly twice as frequently at the lower end of the estimates, and up to four times as frequently at the upper range. Estimates of lucerne replacement cost ranged from \$250 to \$2,100 per ha, with a mean of \$798 and a median of \$800 (Table 1). Divided by the median five year to replace lucerne in the presence of horehound, this figure comes to an annual cost of \$160 per ha per annum.

If 3.8% (estimated from this survey), 10%, or 20% of lucerne in the South Island high- and hill-country were infested with horehound, this replacement cost would translate to \$0.9m, \$2.4m, or \$4.8 m annually.

Horehound also contributes to organic matter contamination in wool, known as 'vegetable matter'. In the absence of vegetable matter, New Zealand wool is ranked top grade and gets processed in New Zealand. If contaminated with organic matter, the wool is downgraded and can no longer be processed in the country. Sending the wool for processing in Australia doubles the cost of processing. In our survey, horehound made between 0 and 90% of vegetable matter (Table 1). We do not have enough data to translate this information to an annual cost to the industry, resulting in further under-estimation of the cost of horehound.

Table 1: Survey responses summary: Median (observations midpoint value), Mean (sum of observations divided by the number of observations), Standard Error (measure of variation)

	Median	Mean ± Standard Error	Number of respondents
Farm characteristics			
Property size (ha)	832.5	2264.3 ± 518.4	94
Stocking rate (Stock units/ha)	6.3	6.5 ± 0.4	85
Area in lucerne (ha)	40	85.8 ± 16.4	90
Area in lucerne (% of farm area)	2.7	7.1 ± 1.0	90
Area of farm infested (%)	3.8	12.5 ± 2.3	82
Doubling rate for horehound infestations (yrs)	3	3 ± 0.2	56
Control costs			
Chemical control (\$ / ha of infested area)	25	64.5 ± 20.2	45
Chemical control success (% of horehound killed)	70	60 ± 5	57
Non-chemical control (\$ / ha of infested area)	25	98.5 ± 35.2	28
Lost production			
Lucerne yield loss due to horehound infestation (%)	20	22.2 ± 3.3	24
Lucerne yield loss due to horehound infestation (t/ha)	2.5	3.2 ± 0.7	9
Off target lucerne death due to chemical control (%)	20	33 ± 7	29
Lucerne replacement cycle in the absence of horehound (yrs)	10.5	12.3 ± 0.9,	38
Lucerne replacement cycle in the presence of horehound (yrs)	5	6.2 ± 0.4	33
Lucerne Replacement cost (\$/ha)	800	798 ± 95	26
Vegetable matter (%)	10	31.2 ± 5.3	37

4 Conclusions

The calculations above suggest that the annual cost of controlling horehound in high- and hill-country farming conservatively come to a minimum of \$3.35 million (chemical: \$2.5 million; non-chemical: \$0.85 million).

Conservative addition of costs due to lost production cause at minimum another \$3.5 million (productivity loss in lucerne: \$2.6 million; lucerne replacement: \$0.9 million). While some of this loss may be regained by managing horehound either chemically or otherwise, chemical control results in lucerne yield losses that offset the gains (Table 1). These losses have not been incorporated into the calculations above and are separate to the calculated lost production.

These costs are considered an underestimate because the survey identified several other factors where there was no data / insufficient data to quantify the cost. These factors include:

- 1 Wool processing costs. Qualitatively, farmers identified that the cost of processing wool doubles if the wool is contaminated with organic matter (vegetable matter). It is not clear at what threshold of contamination this doubling takes effect, and whether vegetable matter from sources other than horehound are easier to remove in order to regain clean status
- 2 Opportunity cost due to avoidance / removal of lucerne from grazing regime. This opportunity cost has a space dimension and a time dimension:
 - a Space dimension: Land owners suggested they avoid putting into lucerne areas that would otherwise be highly suitable, or that they remove lucerne from areas currently in this crop because of horehound. It is not clear what other pastures these farmers use instead of lucerne, and what is the difference in land productivity between these other pastures and lucerne.
 - b Time dimension: land owners avoid grazing otherwise high-productivity paddocks (practice 'locking up') during critical times of the year for animal weight gain, because at these times horehound seed burrs develop and easily become caught in the fleece.
- 3 Cost of lost productivity due to horehound in other pastures. Land owners were only requested to identify lost productivity in lucerne, but not in other pastures. It was therefore not possible to estimate the monetary value of lost productivity on pasture types other than lucerne.

Together, these components are likely to add significantly to the cost of horehound to dryland high- and hill-country farming, potentially several times the minimum figure estimated above.

5 Acknowledgements

I am grateful to the land owners/managers who responded to the survey and provided invaluable information. My thanks also to Dr Brown for comments and discussion on the methodology and the calculations. This work was funded by a Sustainable Farming Fund grant (405246) to the Horehound Biocontrol Group.

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Appendix 1 – Horehound economics survey questionnaire

How important is horehound?

Name & region: _____

Farm information. Will help us put properties of different size and capacity on a comparable scale.

Farm area (ha)	Farm capacity (Stocking Units per ha)	Area in lucerne (ha)

Information about the progression of horehound problem, control costs, control effectiveness. We assume control is mainly in lucerne, not so much in pasture. Please tell us if are wrong!

Size of infestation	
Year horehound was first detected on your property	Year:
Size of horehound infestation in that first year	Ha infested: % cover:
What year did you first notice horehound on your property?	Year:
What size was the horehound infestation then?	ha infested: % cover:
Size of horehound infestation now	Ha infested: % cover:
Control measures	
At what threshold % cover by horehound do you apply control?	
How much do you spend on chemical control of horehound? Include product cost, labour, machinery, helicopter time etc.	Per ha: Per annum:
Effectiveness: Chemical control successfully removes X% of my horehound problem	___%
Which chemicals do you use?	
How much do you spend on other control methods? E.g., grubbing, burning, ploughing, other?	Per ha: Per annum:

Effectiveness: Other control successfully removes X% of my horehound problem	___%
If an infested area is left untreated, how long does it take for horehound cover to double itself?	___ years
Effect on lucerne	
Chemical control kills X% of my lucerne in a treated area	___%
If it wasn't for horehound, I would be replacing lucerne every X years	Every ___ years
But, in horehound-infested areas I have to replace lucerne every X years	Every ___ years
How much does it cost to replace Lucerne?	\$___ per ha
Lucerne annual yield in horehound-infested areas is reduced by	___% Tonne per ha___
Horehound makes X% of Vegetable Matter in my wool	___%
Overall, Vegetable Matter accounts for annual loss of	\$___ per annum
Final remarks	
Horehound problem on my farm is	Decreasing / stable / increasing
Other comments	

Appendix 2 – Comments made by survey respondents (un-edited)

- Don't use any chemical controls any more as I found them decreasing Lucerne yield and Lucerne lifetime. Chemical Controls only seem to control about 60% of horehound. Grub Lucerne paddocks annual. But in the last two years I have gone from using a grubber to using a garden fork with extremely high success rate.
- We have large areas on hill we spray by Heli, this really only contains at best, it is encroaching large areas. We have a challenge on new pasture that does not include lucerne (in Fescue clover paddocks). Any chemical control has a detrimental effect to existing sward and really only contains it for a couple of years.
- Horehound is a problem in sheep camps and on broken ground. I spray the sheep camps with met every 3 or 4 years. Horehound is only a problem in camps and Lucerne I have moved away from lucern to winter active pastures and feed more in the summer. Its hard/impossible to give accurate answer to a lot of the questions but if it wasn't for horehound id probably have 150ha of lucerne instead of 50 and that area is decreasing. I've trialed 4l of pasture clean extra this year to take horehound out of Lucerne. have used viper in the past to control seedling horehound plants. it is the biggest pain in the arse weed we have. also I graze Lucerne hard with cows to eat the sticky seed heads off the horehound before the seed is viable in summer so the sheep don't get in a mess.
- Where native ground has been stripped bare by high rabbit numbers at some time in its history horehound has become readily established. No control method has worked due to whatever you do, it is horehound that is first to establish again. In my situation it's the combination of being highly rabbit prone with low rainfall and the primary sites for its establishment being non arable creating the seed bank to gradually contaminate the rest of the property. There are high costs in lost income due to wool contamination that leads to discounting. Chemical control is applied when doing pasture renewal. I direct drill and use Metsulphuron for 2 years when growing triticale. No cost supplied. Chemical control usually controls 100 percent of above ground horehound but more germination from seed bank. We do not go into mechanical control because most of the infected area is on stepper areas with rocky outcrops so no current control methods works.
- In the last 4-5 years horehound has become our most problematic weed. We would spend more on control if we found current options to be effective. We are finding we are having to renew pastures a lot sooner, often at the expense of renewing less productive pasture that aren't infested with horehound. Re chemical control: provides 90 % control initially but doesn't provide a solution that lasts. Chemical effect on lucerne is not only killing, but also slows production. The rate at which it is coming into our young paddocks is major concern.
- The seeds lasts in the ground for a very long time, you think you have beaten it but then more seeds strike. You have to hand grub deeply or it will not kill it. Spraying Metsulferon is very hard on the lucerne. I've been fighting this weed for 36 years.*
- It is only scattered on sunny country, sometimes i pull it or grub use prills mainly carry while mustering. Have used chopper or knapsack. Cattle will chew it off as well but not kill it.

- We would like to get horehound under control. We have been in a serious drought for the last 2 years, and the horehound has flourished with the dry. We would be very keen on biological control. Year of first detection was given as pre 2012.
- Intensive cattle grazing controls. most of the hore hound on this property
- I think the seed comes with the lucerne seed. It has shown up in a new pasture area as well so I do wonder in climate may have a bearing on it. Horehound appeared on the farm when lucerne was first planted 6 years ago. Controls by pulling out plants when passing because infestation is still in the form of scattered plants as in the beginning except that there are more scattered plants now than there used to be.
- Our horehound problem is not a large area however we are finding it very difficult to control and stop spreading over our property. Also have mixed results from spraying
- We also have it in pasture and spot spray with tordon or grub it. Tree lanes are bad for reinfestation and under fences. Stock camps were the original areas of the weed. We have been spraying paddocks out with met roundup mix and having great success but 2 years later the seedlings pop up again. We sprayed a paddock with met 10 months before we sowed it with Lucerne after they said it needed 8 months and the met should be out of the ground. We had a 100 percent failure of the Lucerne so met needs a long time to get out of the soil. Grub, spot spray, boom spray treat it like a nodding thistle now and if we see it we deal to it but are not winning the battle. Spray effectiveness is 100 percent kill of above ground but comes back in two years. Same for other control methods: they are effective but the weed is quick to come back.
- we have tried cutting it down digging it out but just keeps returning probably because it seeded before we identified what it was and before it became an obvious infestation. the seed heads get matted in alpaca and sheep fleece and have seen the odd plant further away on property which we try and remove before seeding orflowering. would be happy for you to try any experimental measures on our property.
- We had been using Lucerne on hill blocks after burning but due to horehound this has stopped.
- I keep on top of my horhound in lucerne with a knapsack after it is grazed- not much chemical but very time intensive.
- grubbing is highly effective
- 3 small patches on high dry hillcountry have it under control. eradication is proving difficult. I feel if we don't keep on to it it will spread quickly
- Just started to grub lucerne about one third. Spraying with a hand gun on infected areas of pasture when we have some body spraying gorse. Most areas steep sunny knobs. Have seen plants in fodderbeet paddocks and some young grass paddocks on easy clay downs. Is it a couple of below average rainfall years.
- Horehound is mostly in pasture on dry bumps or around trees. My lucerne paddocks are clean. Despite a total eradication policy horehound is still present as isolated plants at about the same level as 20 years ago. It must spread very easily on sheep. The chemicals I use to kill it kill lucerne and clovers, and you cant establish lucerne again in sprayed areas for years.
- a large number of small plants have appeared in a fodder beet paddock planted in dec 2015. they seem to be spread over 30 percent of the paddock

- Small infestation in some lucerne paddocks. cost of control really unknown there has been some grubbing and some spraying but it has persisted. Wet areas particularly bad and areas where there has been soil damage such as gateways and along fence lines.
- 95 percent of horehound is confined to a limestone ridge area, sheep are only grazed there after shearing or in spring when in green vegetative state. A bit of spread to other paddocks where they are normally grubbed.
- As an organic farm I haven't let any other weed go unchecked but this weed has started to show up more on our dry north facing ridges. Biological control is the best way please
- We haven't spent time working out what it is costing us specifically but it is definitely an increasing problem that we can't really ignore anymore. Only bought farm 4 years ago and HH was already here. we are going to take 10ha of lucerne out of lucerne so we can try and control the Horehound. We haven't had much success in lucerne paddocks controlling the horehound hence we are taking them out
- We just have patches of horehound on our hill faces
- We don't have a problem with horehound in lucerne it's in a lot of lea paddocks.
- WORSE AFTER DRY YEARS. Cost of lucerne replacement: 3 years of winter crops.
- The last two years of dry-drought has seen the horehound on our property grow exponentially. After multiple attempts at control we have lost the war in the most productive areas of our farm. We have tried all methods commercially available, from ground to air application, sought professional advise (on and off label recommendations) and used contractors where required. The results have been very disappointing. We look forward to the findings of your study and survey.
- easily controlled by grubbing if you never let it get away
- no infestation in Lucerne
- Not a problem in Lucerne. Grub 10 - 20 plants per yr. Problem on west facing ridges on steeper hill country.
- You are very wrong stating that the problem is mainly in lucerne. Large area of otherwise productive hill country are being lost to horehound. And there is no real control mechanism available. Thus encroachment on the hill country is a much bigger problem because we can't do anything about it.
- Hore hound is present at low levels on stock camps in drier parts of the hill country, it is not a weed of significance for us and has been present as long as I can remember.
- Has been isolated populations for decades. Sheep seem to find it attractive in the autumn but rarely eat it. Prefers dry, free draining sites.
- Better ground coverage of pasture prevents horehound from getting mature and seeding
- Would be great please get this insect
- last 2 yrs have been very dry. Have attacked weed with ewes at various times. results variable. no weed in cut pdks
- Our main concern is in dry steep hill country where control is difficult. It also encroaching on areas of chicory-clover pastures where control is as difficult as in Lucerne. Aerial or boom spraying has had initially ok results but reinvasion occurs rapidly. Problem is not in lucerne.

- Disturbance of the ground seems to germinate more horehound seedlings. Huge increase after the January rain - ideal conditions for establishment
- I noted the rapid establishment occurred in a Lucerne stand after 1 year when scattered plants were allowed to seed due to not identifying the plant at the time resulting in the plant become numerous to an estimated 1 plant per 25 square meters. Control started with grubbing in the second year when it was apparent that the standard chemicals for lucerne maintenance Gramoxone and Atrazine were not controlling the plant. On investigation other chemical control appear to be marginal in Lucerne and effective chemicals may or do have serious impact on the Lucerne stand. Many hours spend on hand control by grubbing. A nearby new grass paddock has seedlings appearing now with the beginning of the spring growth probably spread by stock movement. Current infestations in the Lucerne paddock have declined but seedlings are still appearing around the site of the original mature plants. I consider this a serious weed infestation due to its rapid spread, if allowed to seed and the apparent lack of chemical control options available.
- Dry ridges and fence lines on our steeper tussock country. Nothing on flats. Spot spraying and grubbing in larger infected areas.
- In the local area of lifestyle blocks, horehound is becoming increasingly well-established. Grubbing is only partially effective and either hand-pulling after rain or deep slicing of roots below ground level is preferred. Applicable to small holdings only. Use of chemicals has allowed the establishment of barley grass into otherwise good English grasses.
- We have hore hound in lucerne and grubb this. We also have significant areas of hore hound on sheep camps and dry exposed hillsides. A bio control would make a huge difference to our operation. Horehound is an increasing problem and will keep costing dryland farmers more in coming years
- figures are hard to quantify however it depends on climate i.e timing of rains in spring to germinate it. Problem for use is we will go through a 3 year rotation and then sow paddock out to either Lucerne or permanent pasture then it turns up again as the seed is in the soil.
- Hadn't heard about this survey until I read about it in the local newspaper. We have had hoarhound on the property for more than 50 years, it appears mainly on sheep camps and has only ever been a concern to us with a light invasion in our lucerne. We summer shear and have had little or no wool contamination. To my eye there has been little or no change in the population of hoarhound.
- we have the ability to mob stock and use that to control horehound. becoming more of a problem on dry extensive ridges very keen on bio control
- Been here since 2000. always been odd plants in a few lucerne paddocks but it has increased in the last 5 years to warrant spraying different paddocks every year. I have not noticed lucerne population dropping because of having to spray with Met.
- Because horehound is so hard to kill and over the last 5 years is taking over our lucerne it is making farming lucerne too expensive for us to farm.
- Not a massive problem but struggling to keep out of new pastures, e.g. grass lucerne. Even when cropped for over 5 years. Have tried spot spraying weed wiper boom spraying helicopter. But seems to keep coming back as strong.

- Pockets of horehound but has never increased. Merino sheep camps. Never applied chemicals to it.
- horehound is in pasture and lucerne.
- Not only lucerne but grasses are affected. Biggest cost is the limiting of crops and things that can be grown. Having to prep paddocks with Metsulferon and stand down period have great cost and seed bank in soil is heavy.
- At this stage have undertaken no controls. We are looking at beginning this season. We have noticed horehound really getting going over last 2 years perhaps because of the dry.
- We also have it in pasture paddocks but doesn't increase in population numbers as fast. As soon as the paddock is either cultivated or DDrilled the plant numbers explode. Chemical control removes 100 percent for 2 years then back to where we started.
- Increasing if not sprayed. Although small area, since on sheep camps many sheep can be affected in their wool and therefore potential to spread it.
- Cost to replace lucerne is just to spray and put seed. Bigger cost is lost production because lucerne isn't there and soils/environment suit it.
- Mainly a problem on stock camps on hill blocks. Spray is temporary 1-4 years. then seed load brings it back. Get those controls here! Northburn Stn.
- Te Oma has had horehound for years and now it is out of control. Impossible to control. Nearly impossible to replace lucerne.
- Chemical doesn't kill lucerne but knocks it for a long time. Not sure how much horehound costs in yield and how often I have to replace lucerne paddocks. Spraying with 30-40 gram escort cleans out paddock but can knock it back for 3 months or longer.
- A big problem and increasing in sheep camps and lucerne paddocks.
- Chemical treatment of major infestations such as on rocky knobs works well but the horehound is back the following year just as thick. A biological control that kept the new shoots from seeding would be a huge benefit to our farm.
- Hoarhound has not yet got away in our lucerne paddocks, we are spot spraying areas where it is getting out of control and using metsulphuron and ryecorn greenfeed as a break crop..
- Always present on hill by first in lucerne 2016
- Total cost to replace lucerne over the 2year process \$2500.
- I am shocked at how it is appearing in other areas of my farm so quickly. Currently found around river banks but spreading quickly into pasture.
- Lucerne is slow to recover after spraying so there is a loss of grazing and this is my greatest loss and can make me short of feed. I have to be careful not to spray to much at once. In thin stands horehound does grow again from new plants. While the horehound is not getting worse on my farm, there are new sites appearing which i spot spray. Horehound arrived here on finewool sheep from up country.
- Problem increasing exponentially over the last 3 years
- We have a small lifestyle block (1.75 acres) and this damn weed is taking over the whole place. We have sprayed with Roundup, pulled it out, mowed it to no avail. I have been given a natural remedy spray but I don't think it will work. We were told what spray to use by an agriculture agent but it means that anything within 2 m will die as well.

- Is not a major problem. Will infest the odd fleece
- Our main problem is on dry ridges and stock camps where often in dry summers chemical control is marginal because the plants shut down with moisture stress. Contamination of wool is a major issue especially in the autumn.
- Only in patches and sheep camps on limestone hill country. Xbd sheep are better at grazing.
- We find every time we break the ground, the horehound is the fastest thing to grow back, beating all other seeds. We have tried to put in lawns and a track, and now these are covered in horehound, we have only been at our current site 1 year.
- Would like to grow Lucerne in the future.
- It would be good to have Biocontrol over the horehound.
- Been Horehound here as long as I can remember, I am 65. Mainly confined to fringes of shelter belts, stock camps. Not a problem for us in Lucerne. Incidentally can be fermented and brewed, Horehound beer, not a bad drop!!!
- Also gets into red clover paddocks. Has got a lot worse in the last 3 years
- Problem would increase majorly without control.