Wormwise for goats: Trying to change the world one goat farm at a time

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Abstract
Wormwise for Goats is an initiative funded by leftover goat levy money after farmer levy-payers elected to drop the goat meat levy in 2009.

It aims to be a central resource for information on worm management for goat farmers and their advisors, and possibly a platform for further work on parasite management in goats.

In 2013 a nationwide survey of goat producers was undertaken to help better understand current on-farm practices and the information needs of goat farmers.

The results of this survey and a summary of key points from Wormwise for Goats is presented in this paper.

Introduction
In 2009, farmer levy payers to the former industry-good body Meat & Wool NZ elected for the existing wool and goat meat levies to be dropped. This resulted in Beef + Lamb New Zealand replacing Meat & Wool New Zealand.

The goat levy money in existence at the time was put up for tender for projects that would benefit goat industries.

“Wormwise for goats” was one of the projects funded by this money. The project aims to provide a one-stop shop for up-to-date worm management information for goat farmers and their advisors, as well as be a possible platform for further work and research.

The initial resource will be a printed booklet and downloadable PDF which broadly follows the original Wormwise manual ‘A handbook of sustainable worm management for sheep and beef farmers’; distilling its salient points and expanding the information as it applies to goats and goat farming.

As part of the project a survey of goat producers, and veterinarians providing services or advice to goat farmers was undertaken regarding their approach to worm management in this species. The results of these surveys are presented in this paper, as are the key points from Wormwise for goats.

Goat worm management today
Most goat farmers are acutely aware of the impact of worms on their stock – goats are more susceptible to parasitism than sheep or cattle when grazing pasture alone, and in general do not develop the same degree of innate immunity to worms once they reach adulthood.
From industry feedback, and the limited published information available, it would seem that drench resistance on goat farms is widespread and severe. The fact that many goat dairy operations run a ‘cut and carry’ system to feed their goats grass is testament to the difficulty of managing worms in a pasture-only goat grazing system.

The most recent comprehensive work on drench resistance on NZ goat farms was reported by Juriah Kamaludeen (Kamaludeen 2010) in 2010 as part of a Master’s thesis undertaken at Massey University. In a drench efficacy study of 17 goat farms nationwide, 11/17 farms had Trichostrongylus colubriformis that were resistant to all three of white, clear, and ivermectin drenches individually (until recently this represented the three main broad spectrum drench families). On 3/14 farms there was a similar pattern of resistance to all three drench families with Ostertagia circumcincta.

As part of this work it was also reported that a strain of T. colubriformis from goats had been identified that was resistant to the three main drench families when used in combination (i.e. a triple combination drench; Matrix Sheep drench)

Ian Scott and co-workers from Massey University have recently reported two cases of goat farms in the Manawatu (Scott et al. 2013) that have independently developed resistance to the new active Monepantel (Zolvix), within three years of starting to use it. At least one of these farms already had resistance to the triple combination.

So it would appear that some NZ goat farms are in dire straits when it comes to drench efficacy. However throughout the process of putting Wormwise for Goats together, I have come across goat farmers who are managing worms in their animals in a sensible and what would seem to be pretty sustainable, manner. It is important that other goat farmers, and their advisors, learn from the experiences of these farmers.

In a 2008 survey of goat meat levy payers, Batten¹ found that parasite problems were ranked only fourth in a list of issues that they found problematic in managing goats. Both challenges in improving kidding % and foot problems were ranked ahead of parasitism. The number one issue was low liveweight gain in kids however, which could also be a proxy for parasite problems.

Extensive and repeated feedback from the industry would suggest that problems with managing worms in goats are much more prevalent in the Angora and Boer breeds, but given that these may be more likely to be kept as the dominant stock class on small blocks where overstocking, inability to integrate with other stock and general lack of management skill are prevalent, it may be an unfair reflection on these breeds per se.

During the course of the 2013 survey I spoke with a number of commercial farmers running ‘large’ flocks (150-1550 head) of these breeds who appear to be coping well with managing worms, who were applying some if not all of the elements of known best practice and found goats a valuable addition to their farming system.

Goat farmer survey results 2013

As part of the Wormwise for Goats project, a nationwide survey of goat producers was undertaken, to attempt to better understand the current practices and approaches happening on goat farms.

A standard set of questions was e-mailed to goat farmers via a number of goat industry channels, covering meat, fibre and outdoor dairy goat producers.

In addition in-person and phone interviews were conducted with some key goat farmers and industry personnel.

A total of 30 responses were received. These represented a cross section of the meat and fibre industries, but no outdoor dairy goat producers responded.

The questions aimed to gather information about the type and size of goat operation run, the approach to worm management and what producers perceived were the main issues that needed addressing regarding worm management in goats. The questions on the latter two aspects were deliberately open-ended to allow respondents

¹ Batten G - Personal Communication
to describe their own practices and ideas. The responses were then grouped/categorised to allow some evaluation.

*Figure 1. Number of goats run by survey.*

The mean number of goats run was 246 head, the highest was 3000 head and the lowest was 20 head. 14 farms ran more than 100 goats.

16 respondents ran fibre goats. 14 ran meat goats.

*Figure 2. Other species run with goat enterprise.*

A number of survey respondents commented that they believed it was not possible to farm goats successfully without cattle. Figure 2 illustrates the reliance of 2/3s of producers on a cattle component.
There was no relationship between number of goats farmed, and goats as a proportion of stock run.

Farmers were asked to describe the way in which they managed their goats, and based on their responses were assigned a category as described below:

- **Extensive** – Goats on high country run block or extensively managed hill country (e.g. North Island Class 5), generally at low stocking rate with infrequent grazing shifts
- **Extensive/scrub** – Where producers specifically described that goats were mostly confined to scrub blocks on hill/high country
- **Intensive** – Goats in small paddocks with frequent grazing shifts
- **Moderate** – Goats grazing medium sized hill country paddocks (e.g. North Island Class 4 hill country) with variable grazing shifts
- Two producers nominated that goats grazed extensive run blocks for a large part of the year and were brought onto an intensive block for kidding
Approach to worm management

Drench use
The goat farmers surveyed appear to have followed the national trend moving to the use of combination drenches, especially triple combinations, as shown in Figure 4.

It would be interesting to know how many of these have changed to triples because other drenches were failing badly, but this question was not specifically asked.

Of the producers who nominated that they were using Zolvix™ or Startect™, three appeared to be using them in a ‘knockout’ drench role (though more than once a year in at least one case). One producer appeared to be using Zolvix™ regularly.

Four producers used single active Macrocyclic lactones (MLs), namely ivermectin and moxidectin; two of these via injection.

One used single active Benzimidazoles (BZ) as the routine drench with Zolvix as a knockout.

Of the four producers who nominated double combinations (BZ/Levamisole combinations); half were using them as early drenches in kids before moving to a triple combination in adults. This may indicate a lack of understanding around the risks of toxicity posed by the individual component drugs.

Drench rotation
Four producers nominated that they rotated drenches (it appeared for all of these that this is within-season) in the belief that this would prevent resistance.

Dose
Four producers used 1.5 times the sheep dose, two used twice the sheep dose.

One used 1.25 times the sheep dose.

It was encouraging that three producers were aware of and using repeat dosing to attempt to improve anthelmintic efficacy.
**Drench frequency**

Six producers were categorised as being high users of drench in adults (three or more drenches to the adult goat flock per year). One of these stated that they drench all goats five weekly during the Barbers Pole worm season, and another stated that they drenched all goats monthly in the wet months.

Twelve producers were classified as being lower users of drench in adult goats (two or less treatments a year). Three of these only drenched individual adults on a visual basis, two drenched individual adults with high faecal egg counts.

Two producers drenched all adults once a year.

Interestingly, only two producers appeared to run a classic ‘preventive drench’ programme of monthly drenches in kids, but note that many goat farms kid quite late (October) and wean closer to mating than in a ewe flock, so this may explain the responses; many gave kids a drench at marking or weaning, followed by another sometime in autumn.

Six respondents appeared to be making some effort to integrate goats and cattle (in particular), with goats mostly grazing ahead of cattle.

Fodder trees and scrub were mentioned as being important by five producers, and three mentioned leaving high grazing residuals as being important in managing worms.

**Drench efficacy testing**

27% of respondents indicated that they had done either drench checks or a faecal egg count reduction test.

**Perceived worm management issues**

A summary of issues mentioned and the frequency mentioned are detailed in the tables below:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drench resistance</td>
<td>27%</td>
</tr>
<tr>
<td>Knowing which product to use</td>
<td>20%</td>
</tr>
<tr>
<td>Knowing when to drench</td>
<td>17%</td>
</tr>
<tr>
<td>Need to learn other management options</td>
<td>17%</td>
</tr>
<tr>
<td>Lack of appropriate dose rates for goats</td>
<td>13%</td>
</tr>
<tr>
<td>Inconsistency of advice</td>
<td>13%</td>
</tr>
<tr>
<td>Lack of innate resistance in goats</td>
<td>10%</td>
</tr>
<tr>
<td>Better use of FECs</td>
<td>10%</td>
</tr>
<tr>
<td>A need for pour-ons in goats</td>
<td>7%</td>
</tr>
<tr>
<td>Drenches hard on goats</td>
<td>7%</td>
</tr>
<tr>
<td>Drench overuse</td>
<td>7%</td>
</tr>
</tbody>
</table>

A focus on drench as the main management tool for worms is evident in these answers, which suggests the need for a change in mindset. At least ‘other management options’ makes it into the top four!

**Changing the world via wormwise for goats**

There is very little current science around managing worms, and especially drench resistance, in goats, but much can be extrapolated and adapted from recent work with sheep and cattle.
Since the early 2000s, New Zealand scientists have lead the world in improving our understanding of the on-farm risk factors for drench resistance, and importantly, management practices to minimise its development and progression.

Dr Dave Leathwick and his team at AgResearch have clearly defined a number of elements, which if integrated into a well-managed system, can significantly slow the onset and severity of drench resistance on sheep and cattle farms. Much of this advice can and should be adapted for goat farms.

New Zealand sheep and cattle farmers, and their advisors, are fortunate to have access to a comprehensive resource in the Wormwise initiative to help them understand and manage internal parasites (worms) in a sustainable manner.

Much of the material presented in the Wormwise manual; ‘A handbook of sustainable worm management for sheep and beef farmers’ and the previously published Wormwise seasonal newsletters is of use and relevance to those farming goats.

That said, it is recognised that many people using Wormwise for Goats may not use the existing Wormwise resources. Thus Wormwise for Goats has been designed to capture the salient points from the Wormwise literature, and then build on them for goats.

**Wormwise for goats – a potted summary**

**Production loss from worms**
- Larval challenge is the big driver of production loss in grazing livestock.
- Most larvae are found in the bottom 2cm of the pasture sward and 1cm of soil.
- Goats are natural browsers and prefer to graze about 10cm up the sward, actively selecting seedhead, flowers, weeds and scrub as part of their diet.
- In systems where goats are required to eat most of their diet as permanent pasture, where they are the dominant stock class, and especially where they are forced to graze close to the ground, they will tend to require a lot of drenching. Managing goats in this way is not sustainable in the long term.

**Immunity to worms**
- Adult goats do develop some degree of innate immunity to worms, though on average this immunity is weaker and more susceptible to break down when animals are under stress.
- Some individuals develop an immunity as strong as an adult sheep (and almost never require drenching) whereas others only maintain a weak level of immunity and require regular drenching. This variation means there is great potential to breed goats for improved tolerance to worms.
- On average the level of worm immunity of adult goats is similar to that of a two tooth ewe: if they are well fed and under minimal stress they are able to resist or tolerate parasite challenge without the need for frequent drenching.

**Worm life cycle and management**
- Levels of worm larvae on goat-grazed pasture follow a similar pattern to sheep systems, but does may lose immunity to a greater degree over kidding, increasing pasture contamination at this time.
- That said the biggest contributor to larval challenge to kids has mostly overwintered from the previous season.
- The experience of dairy goat producers that it can take it can take several years for a grazing property to become essentially ‘worm free’ once converted to a cut and carry system illustrates that some worm larvae probably survive even longer than the quoted eight months on pasture.
- Grazing swaps with cattle can be effective but need to run over months not weeks.
- However leader/follower grazing systems where cattle follow goats can still dilute overall worm challenge.
- Goats do best if not forced to graze below about 2500kg DM/ha (about 11cm long winter-grown pasture and
7cm long summer-grown pasture). At this level of grazing they will gain optimum nutrition from the grass they eat, will selectively eat weed species that take their fancy (this can vary through the year) and they will be consuming very few worm larvae.

- From a management perspective, grazing with another species, or some other form of pasture control will be required to maintain an acceptable sward. Allowing pastures to remain at 2500kgDM/ha or above will result in a low quality pasture with excessive dead matter in the base, dominated by thatch forming species such as Yorkshire Fog and Browntop.
- Cattle grazing from 2500kgDM/ha down to residuals of 1500kg DM/ha will fit this requirement. This is also the optimum grazing range for high cattle performance.

**Systems management**

- ‘Let goats be goats’ – they cannot be managed like little sheep.
- Let goats graze in the pasture mass range suggested above.
- Give goats access to browse, weeds and shrubs where possible.
- Better attention to body condition of adult goats is required by many producers.
- Owners of lifestyle blocks should be prepared to feed their goats supplement extensively. On some blocks this period may cover as much as nine months of the year. There is a good case on smaller lifestyle blocks for goats to be held off pasture and fed in yards or barns for periods of the year to allow grass to regrow to an acceptable pre-grazing length and reduce worm larval challenge. Careful management of drench inputs in such a system would be required to maintain adequate refugia.
- The lower the proportion of goats to other stock on the farm, the easier worms will be to manage in the goats.

**Drench use**

**Kids**

- Whether a ‘standard’ preventive drench programme is required in kids depends entirely on the farm system.
- Drenches should not be given at intervals closer than 28 days.
- A combination drench of as many highly effective actives as possible is generally the best choice. It may be valid to avoid levamisole use in young kids because of the toxicity risk, although many producers appear to use combination drenches containing levamisole on their kids with no ill effects.

**Adults**

- There is wide variation between individual adult animals in their ability to handle worm challenge.
- Worm management in adult goats must attempt to exploit this phenomenon, to avoid regular whole-flock drenching of adults and maintain a population of worms in refugia.
- In general adult goats tend to need higher drench inputs than adult sheep, but more attempt should be made to only drench those adults who need it (e.g. drenching the tail end, drenching the worst half of the flock, leaving the fattest adults undrenched, only drenching the young adults).

**Quarantine drenching**

- Is usually very poorly done (if at all); poor product choice and inadequate attention to the management of imported animals after treatment often combine, with the result that resistant worms still survive the process and contaminate the farm.
- Emphasis is placed on acquiring existing information from the property of origin, keeping treated animals yarded to allow for faecal clearance time (given that not all products are ovicidal, and those that are may be ineffective anyway), and grazing treated stock initially on contaminated pasture.
- The need to use a combination of highly effective unrelated actives is emphasised. In the goat industry this may be a combination of Zolvix™ and Startect™.

**Worm monitoring**

The tools we are all familiar with such as faecal egg counting and drench efficacy testing are outlined. Although many goat farmers may lack the number of animals to complete a faecal egg count reduction test in one hit,
drenches can be tested sequentially.

**Drenches and drench resistance**

**Drench resistance is a particular problem in goats. Drivers of this include:**

- Their apparent need for greater drench inputs when farmed in a manner that doesn’t suit them; thus drench overuse
- Many drugs reach a lower peak level in the blood in goats than in sheep when given at the same dose rate; it is noted that goats metabolise drugs faster than sheep; thus under-dosing.
- A high percentage of adult goats retain the oesophageal groove reflex, meaning drench goes straight into the abomasum and is absorbed faster than from the rumen, reducing peak blood level and in-contact time with parasites; thus under-dosing.

It would appear that multi-drug drench resistance on NZ goat farms is widespread and severe. It is imperative that goat producers who rely heavily on drench reassess their farming systems and look for ways to farm their goats with lower worm challenge, better nutrition and reduced dependence on drench chemicals.

**Product choice**

- Decisions on product choice are much better informed where individual efficacies of the various drench families are known – do a FECRT
- The products that are registered for goats are old single active products and are likely to be a poor choice
- Producers and advisors need to accept this and come up with practical ways of managing the default withholding on unregistered products
- In general the best drench choice is a combination of unrelated highly effective actives, but this may be difficult to achieve on some NZ goat farms now; and the answer will undoubtedly include one or more of the new actives used off-label
- Given the speed with which resistance has developed to Zolvix as a single active it should not be used on its own. The required dose of Zolvix to kill susceptible parasites in goats has been established, at 1.5x the sheep dose. 2x the sheep dose is safe.
- Startect has anecdotally been safely used in goats at 2x the registered sheep dose rate, but there is no published information on it’s efficacy in goats

**Protecting the drenches**

- Look for ways to introduce refugia into the system
- Manage and feed goats better so they need less drenching
- Goats are quite good at spitting drench out and it may be better to drench them in a sitting position (i.e. dragged over the boards) than standing in a race
- Use techniques and drench volumes that minimise oesophageal groove closure
- Check the drench gun. Show your farmers how to do this!
- Repeat dosing at 12-24 hours after the first treatment (preferably yarded with water available to slow down gut transit time) has been shown to improve the blood profile of most anthelmintics in goats

**References**

Kamaludeen J. *Studies on the occurrence of anthelmintic resistance in goat parasites in New Zealand*. Thesis towards master of veterinary studies in parasitology, Massey University, 2010
