Department of Primary Industries
primefact

Managing worms in sheep in NSW

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Summary

Internal parasites or worms are one of the most important health challenges for the Australian sheep industry.

From the 1980s, the NSW sheep industry has been well-served by various region-specific sheep worm control programs: WormKill, DrenchPlan, and later, WestWorm and FarWestWorm.

WormBoss, is a national sheep worm control initiative, supported by Australian Wool Innovation, Meat and Livestock Australia, the Sheep CRC and various other parties. NSW DPI has been a major contributor since work began on the project around 2003.

The NSW-specific programs, WormKill, DrenchPlan, WestWorm and FarWestworm, have been subsumed into and form part of the foundations of the corresponding programs in WormBoss.

The NSW DPI Primefacts relating to these programs (WormKill etc.) will now (December 2017) be archived.

NSW-based sheep producers are encouraged to make good use of the material in WormBoss (www.wormboss.com.au), which currently is Australia's premier resource on sheep parasite control, and will continue to be given ongoing industry support.

Background

WormKill, which was launched in July 1984, was arguably the first of the 'modern' strategic, 'epidemiologically-based' worm control programs for sheep in Australia. It was developed for the north-eastern quarter of NSW, an area in which barber's pole worm (*Haemonchus contortus*) and disease caused by this parasite (*haemonchosis*) is endemic in sheep, goats and alpacas. *Haemonchus* occurs to some extent in most sheep raising areas of Australia, but its impact is greatest in the summer rainfall areas of north-eastern NSW, including the New England region, and south-eastern Queensland.

WormKill was developed as a result of a serendipitous confluence of various factors, including:

- anthelmintic surveys in the New England (1977 and 1984) which highlighted the emerging problem of drench resistance,
- work by CSIRO scientists, notably Dr KM Dash, building on earlier work by Dr Hugh McL Gordon,
- the increasing need for New England producers to treat frequently for worms in warmer months of the year, sometimes monthly, to prevent production losses and even deaths in their sheep,
- the Australian launch in 1982 of closantel, a narrow-spectrum anthelmintic with sustained activity against *Haemonchus*, as well activity against liver fluke (*Fasciola hepatica*), and
- the presence of the Department of Agriculture's Regional Veterinary Laboratory in the region (Armidale), which was able to provide critical laboratory support for WormKill (worm egg counting and other parasitology testing) and

Another important factor was that, much like WormBoss two decades later, WormKill was very much a cooperative effort. This was led in particular by Dr Keith Dash of CSIRO, with support from NSW

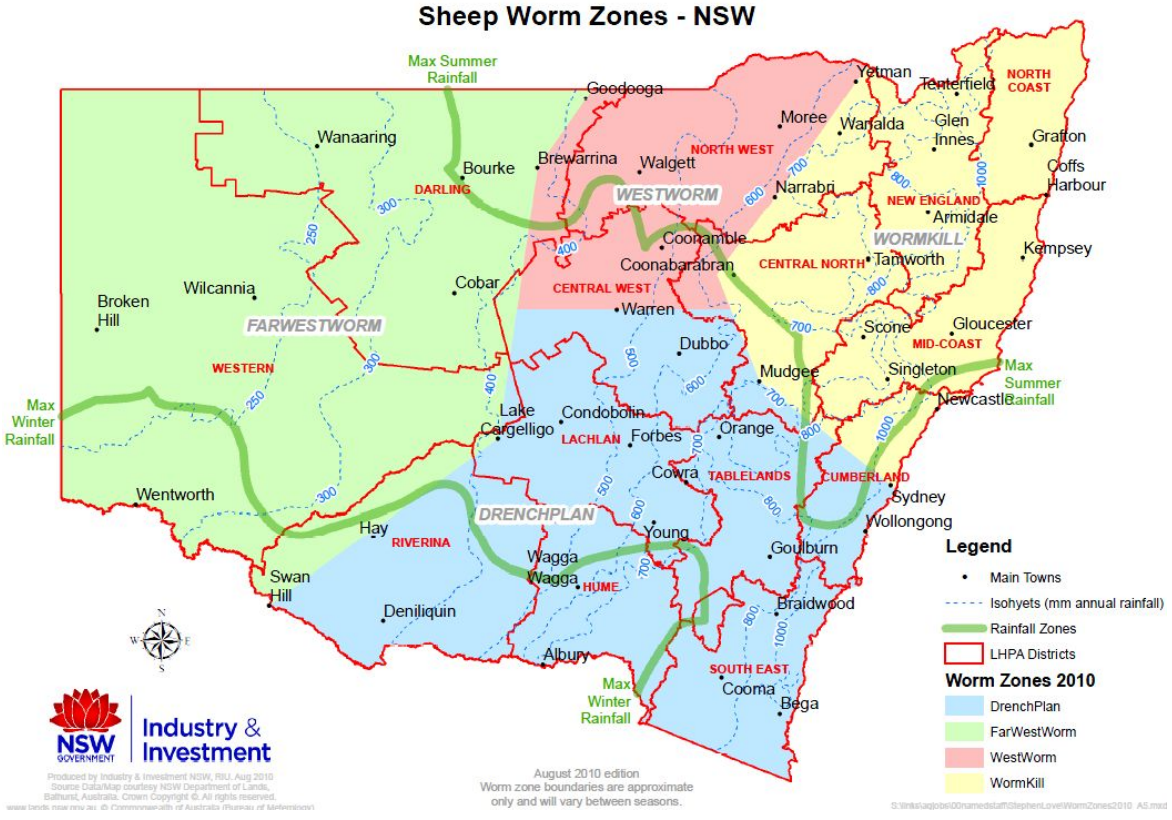
Department of Agriculture veterinarians and livestock officers, veterinarians from Pastures Protections Boards (one of the antecedents of the current Local Land Services system in NSW) and various industry stakeholders.

WormKill was remarkably successfully in controlling *Haemonchus* (at least until resistance to closantel appeared from the late 1980s and onwards). Other worms, notably black scour worm (*Trichostrongylus* spp), were well-managed, as long as effective broad-spectrum drenches were used as specified by the program. The use of closantel had a double benefit, due to its effect on liver fluke.

Research by University of New England agricultural economists (Rosemary Newman et al) also showed WormKill in a short time had an outstanding adoption rate (70-80%) among producers, far above that achieved by most agricultural extension programs. Part of the attraction for sheep producers, at least in the first several years, was that it was highly effective, prescriptive and simple, and cut the number of drenches needed each year by roughly half.

With the benefit of hindsight, part of the downside of WormKill being highly effective, robust and prescriptive, may have been that it selected more strongly for drench resistance. The current approach to the 'drenching part' of worm control is a mix of 'strategic' or routine drenches, with tactical drenches added when required as determined by regular worm egg count monitoring (WormTests). All this is spelled out in 'Your Program' at WormBoss (wormboss.com.au).

Figure 1. 2010 version of NSW Sheep Worm Zones map



The original version of WormKill initially covered a much larger geographic area, basically 'WormKill' plus much of 'WestWorm', as portrayed in Figure 1.

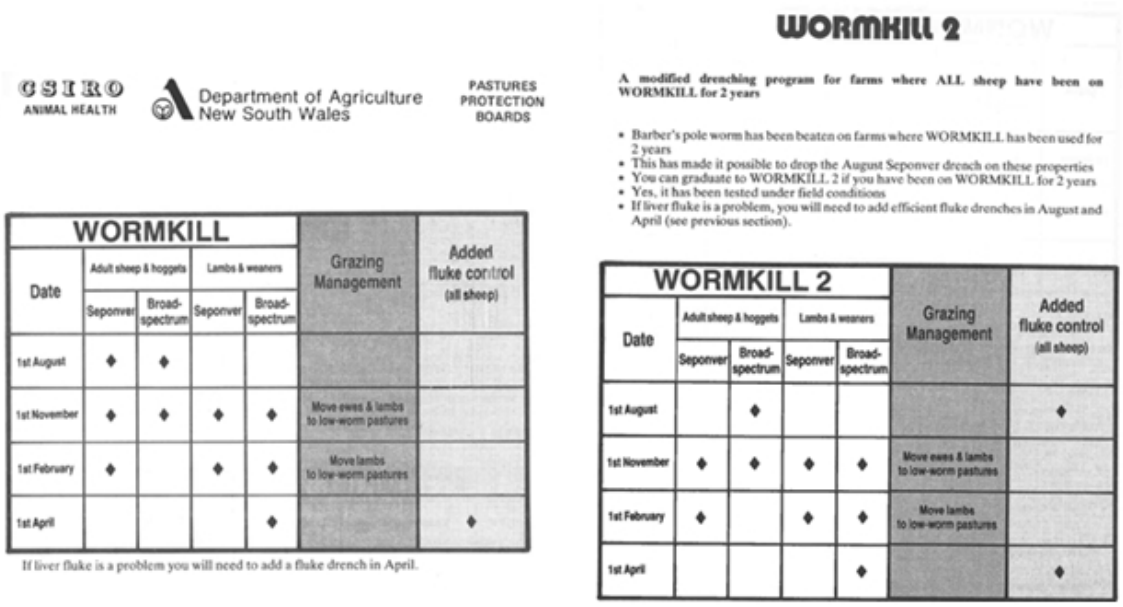
DrenchPlan, the sheep worm control program for most of the non-seasonal to winter rainfall areas of central and southern NSW, was launched a year or so after WormKill. Again this was a cooperative venture, involving CSIRO (including scientists such as Peter Waller, Ian Barger and Norman Anderson), PP Boards and the NSW Department of Agriculture. The routine or 'strategic' drenches in DrenchPlan (late 1980s) were two summer drenches, both broad-spectrum drenches, the first when pastures were haying off (often around October, depending on season and locality), and the second in February. There was also a drench for weaners at weaning, which could coincide with the first summer drench. The plan was later modified (late 1990s) with the second summer drench only being

done if a WormTest indicated it was necessary. This change was an effort to reduce potential selection for drench resistance.

Soon after WormKill (July 1984) and DrenchPlan (late 1985) were launched, other states introduced their own versions of these programs, for example, WormBuster in Queensland, WormPlan in Victoria, and 'CRACK' in Western Australia.

WestWorm was then introduced for the north-west slopes of NSW. This was basically a cut-down version of WormKill (which was probably overkill for that area), the original idea coming from Narrabri-based PP Board veterinarian, Dr Shaun Slattery, who named the local program 'Narrabri Worm'. FarWestWorm, for the pastoral zone or rangelands of western NSW, was launched at the same time.

Figure 2. WormKill - early versions. July 1986 ('Seponver' is a brand of closantel)



CSIRO ANIMAL HEALTH — Department of Agriculture New South Wales — PASTURES PROTECTION BOARDS

WORMKILL

Date	Adult sheep & hoggets		Lambs & weaners		Grazing Management	Added fluke control (all sheep)
	Seponver	Broad-spectrum	Seponver	Broad-spectrum		
1st August	♦	♦				
1st November	♦	♦	♦	♦	Move ewes & lambs to low-worm pastures	
1st February	♦		♦	♦	Move lambs to low-worm pastures	
1st April				♦		♦

If liver fluke is a problem you will need to add a fluke drench in April.

WORMKILL 2

A modified drenching program for farms where ALL sheep have been on WORMKILL for 2 years

- Barber's pole worm has been beaten on farms where WORMKILL has been used for 2 years
- This has made it possible to drop the August Seponver drench on these properties
- You can graduate to WORMKILL 2 if you have been on WORMKILL for 2 years
- Yes, it has been tested under field conditions
- If liver fluke is a problem, you will need to add efficient fluke drenches in August and April (see previous section).

WORMKILL 2

Date	Adult sheep & hoggets		Lambs & weaners		Grazing Management	Added fluke control (all sheep)
	Seponver	Broad-spectrum	Seponver	Broad-spectrum		
1st August		♦				♦
1st November	♦	♦	♦	♦	Move ewes & lambs to low-worm pastures	
1st February	♦		♦	♦	Move lambs to low-worm pastures	
1st April				♦		♦

After the honeymoon

The 'honeymoon period' for WormKill lasted from 1984 until the early to mid-1990s. After this time, resistance of *Haemonchus* to closantel became more common.

The first of the macrocyclic lactones (MLs), ivermectin, was released in Australia in 1988. Moxidectin, which had persistent activity against *Haemonchus*, was released in 1996, and rapidly took the place, to some extent, of that occupied by closantel in the 10-15 years from 1982. First cases of resistance to ivermectin were reported in Australia in the early 1990s (*Ostertagia*-WA, *Haemonchus*-NSW), and to moxidectin, in the early 2000s (*Haemonchus* - northern NSW).

In the New England region of NSW, resistance of *Haemonchus* to the MLs and to closantel currently (2017) occurs on more than 80% of sheep farms. Resistance of worms to these and other anthelmintics is less prevalent in other areas of NSW, but still quite common.

WormBoss gives good advice on managing resistance, as well as other aspects of worm control.

SCIPS then WormBoss, FlyBoss, LiceBoss, and ParaBoss

Before WormBoss, there was SCIPS (**S**ustainable **C**ontrol of **I**nternal **P**arasites of Sheep). Like WormBoss, it was also a national project, *"an initiative of The Woolmark Company, in conjunction with CSIRO, State Departments of Agriculture, Universities, private companies and Industry, to address the most important constraint and potentially serious threat to profitable wool production in Australia".* An overview of the SCIPS project can still be found on archived pages hosted by the University of Sydney: http://sydney.edu.au/vetscience/sheepwormcontrol/overview.html#project

About the same time or soon after (2003), the UK had its own version of SCIPs, which is named SCOPS: Sustainable Control of Parasites of Sheep.

WormBoss 'Mk I' was launched in March 2005. It served as a model for the two other 'Bosses', FlyBoss and LiceBoss, which were developed a little later.

WormBoss was developed further, with 'Mk II' being launched in 2012 (21.11.12).

ParaBoss (www.paraboss.com.au) is the umbrella under which WormBoss, Flyboss and LiceBoss reside.

Recently WormBoss was expanded to include goat as well as sheep worms.

Plans are afoot to include cattle endo- and ectoparasites under the ParaBoss umbrella.

NSW DPI currently has a Primefact on cattle worm control (see references).

Rightly can it be said that ParaBoss is currently the premier resource in Australia for the management of parasites of grazing livestock, certainly small ruminants.

For information on the contributors to WormBoss, see here: http://www.wormboss.com.au/about.php

Goat worms in NSW?

As mentioned, WormBoss now includes material on goat worms.

NSW DPI has a current Primefact on managing goats in worms in NSW (see references) which producers will also find useful depending on their preferences. However, use of WormBoss is also strongly encouraged, especially the "Your Program" section which includes region-specific programs for sheep and goat worm control.

Much of the material in the NSW DPI Primefact on goat worms **also applies to managing sheep worms** in NSW. The same principles apply to both species. The differences in worm control relate to characteristics of the host species. For example, goats are generally more susceptible to worms than sheep, and also they tend to metabolise (process and eliminate) drenches faster than sheep. An advantage goats have, however, is that they are more inclined to browse above ground, which means a lower intake of infective larvae.

NSW DPI sheep worm programs/regions and their WormBoss counterparts

Table 1. NSW DPI and corresponding WormBoss worm control regions

NSW DPI regions	WormBoss regions
WormKill	Qld/NSW Summer rainfall / tablelands and slopes
WestWorm	Qld/NSW Summer rainfall / slopes and plains
FarWestworm	Pastoral
DrenchPlan	NSW non-seasonal rainfall

For more on Your Program (Wormboss): http://www.wormboss.com.au/programs.php

Next page: map showing WormBoss worm regions/programs

Figure 3. WormBoss sheep worm control regions/programs

Image credit / source: http://www.wormboss.com.au/programs/sheep.php

References and more information

Love S and Greentree K, 2017. Managing worms in goats in NSW. Primefact 1564, 1st edition, September 2017. Accessed December 2017 at: https://www.dpi.nsw.gov.au/animals-and-livestock/sheep/health/internal-parasites/managing-worms-in-goats-in-nsw

Love S, 2017. Cattle worm control in NSW (Cattle worm control-the basics). Primefact 419, 2nd edition, November 2017. Accessed December 2017 at: https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/cattle-worm-control

ParaBoss: www.paraboss.com.au Incorporates WormBoss, FlyBoss and LiceBoss.

SCIPs (Sustainable Control of Internal Parasites in Sheep) http://sydney.edu.au/vetscience/sheepwormcontrol (Archived material; accessed December 2017). SCIPS was succeeded by WormBoss.

SCOPS (Sustainable Control of Parasites in Sheep). http://www.scops.org.uk/

SCOPS Technical Manual: http://www.scops.org.uk/content/SCOPS-Technical-Manual-4th-Edition-updated-September-2013.pdf (Accessed December 2017).

WormBoss: wormboss.com.au This highly regarded national resource currently includes information on sheep and goat worm control. Material relating to the management of internal and external parasites of cattle is planned for 2019.

For updates go to www.dpi.nsw.gov.au/factsheets

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