Strategic Management of Worms

Take advantage of worm weaknesses and livestock strengths.

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Doug Alcock

What are your enterprise goals

Healthy productive animals

- Good lamb growth

- Good Reproduction

Round worms are one of the major health issues for sheep and goats

- $260 Million (industry wide)
- More than $11 per breeding ewe in high summer rainfall zones.
- 80% of this is lost production.

A BIT ABOUT THE WORMS

The most important worms are..

- Barbers Pole
  - (*Haemonchus contortus*)

- Brown Stomach
  - (*Teladorsagia curcumcinta*)

- Black Scour
  - (*Tricholstrongylus spp.*)

Barbers Pole (*Haemonchus contortus*)

- 20 – 30mm
- 10,000 eggs per day
- 4th stomach (abomasum)
- Burrow into the wall and suck blood
- Animals anaemic and can exhibit bottle jaw.

Source: Wormboss

Brown Stomach (*Teladorsagia curcumcinta*)

- 10mm, 50-100 eggs per day.
- 4th stomach (abomasum)
- Damage to the gut causing inflammation and scouring
- Reduced appetite and protein loss
  - 35% less weight gain
  - 20% less wool growth
  - 20% less milk before there are clinical signs.

Black Scour (*Tricholstrongylus spp.*)

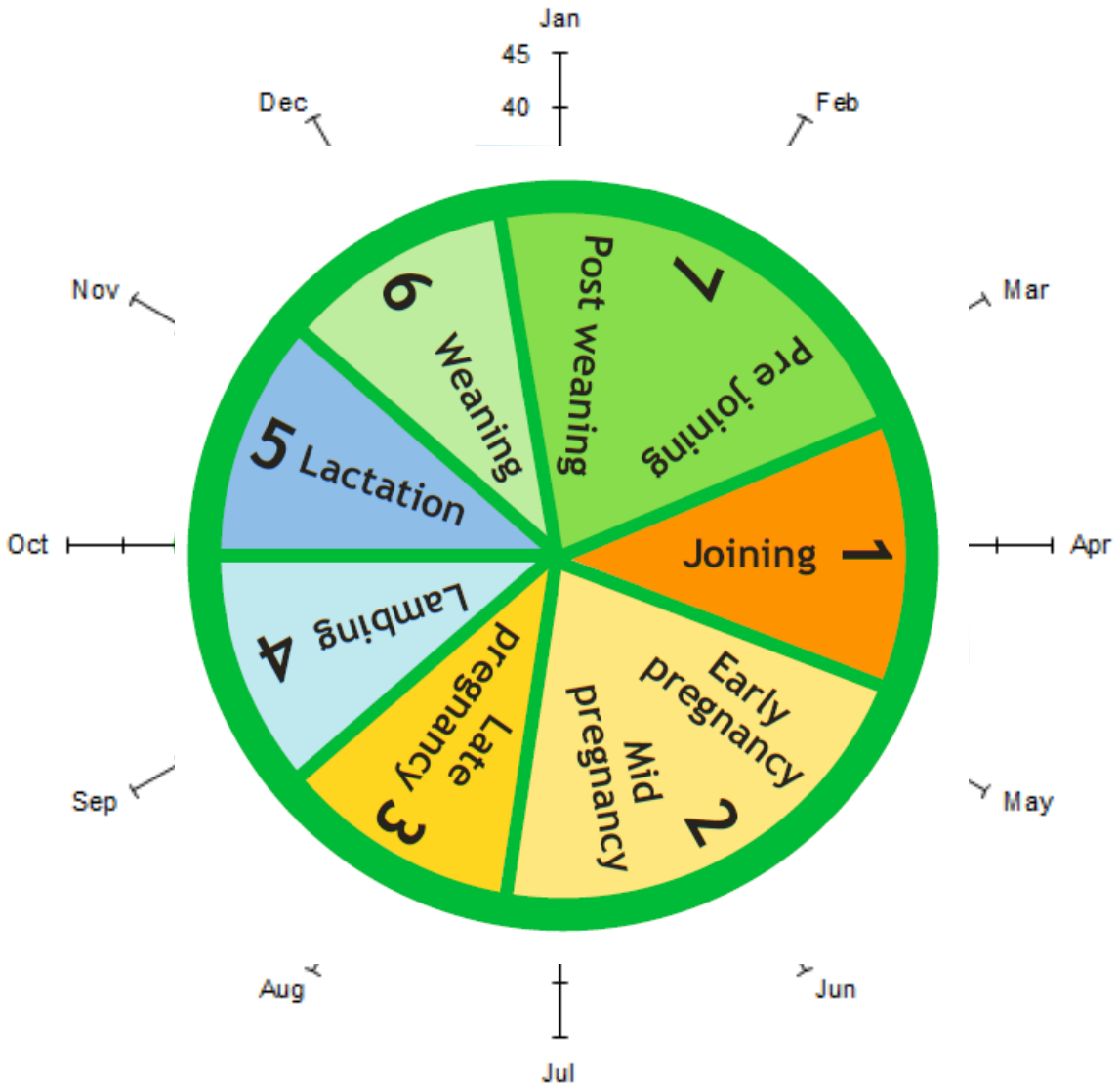
- <1mm 
- 100 – 200 eggs per day
- Small Intestine (first 3m)
- Lethargy, weight loss, scouring, death.
- Losses before signs are apparent.

General Effects of Worms

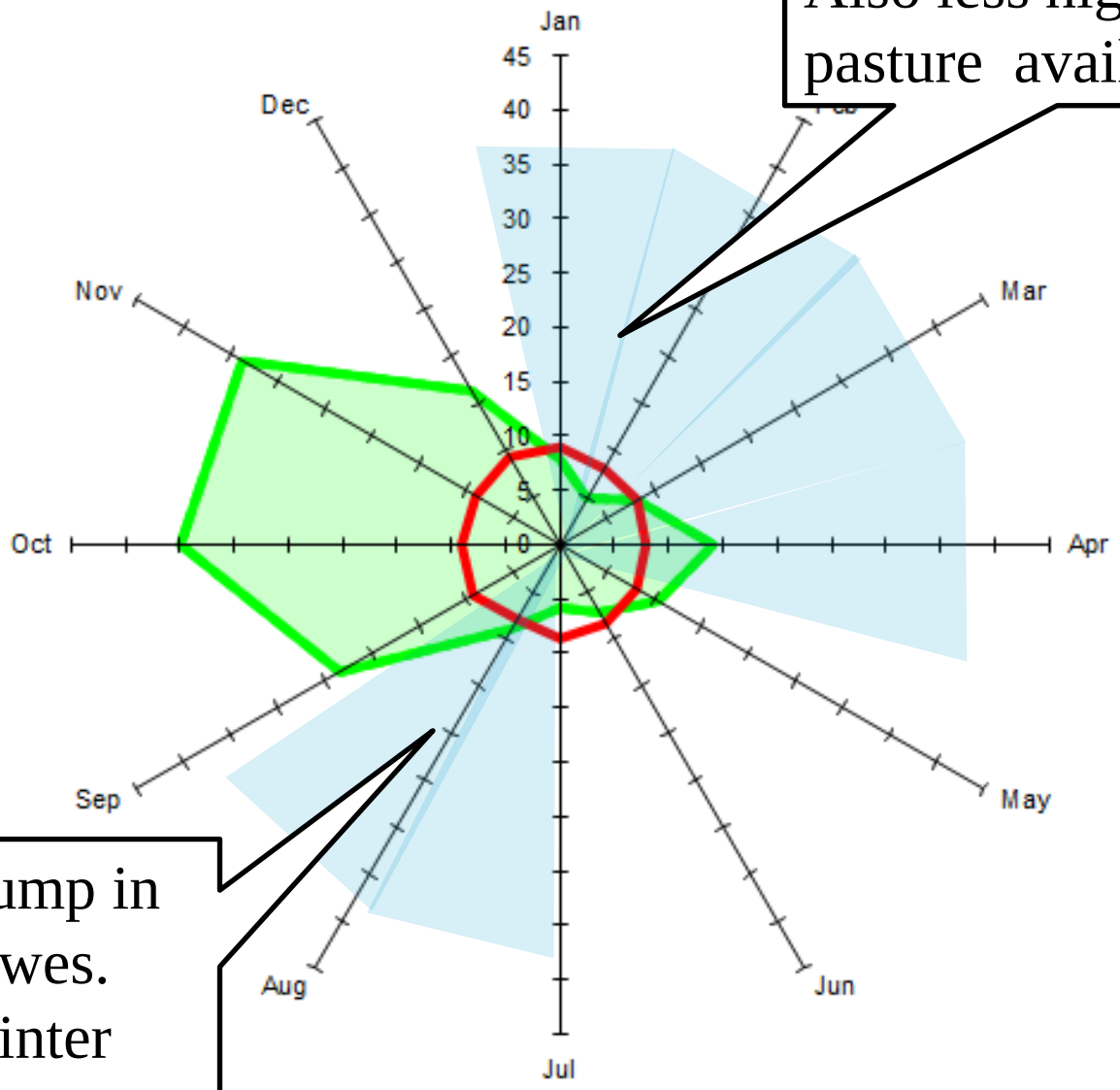
- Wormy sheep eat less
- Damage to intestine reduces nutrient absorption.
- Greater endogenous loss of protein.
- Diversion away from productive uses of nutrients toward immune responses.

When are sheep most susceptible to worms?

- Immature
  - Undeveloped immune system
  - Nutritional set backs.
- Lambing (loss of acquired immunity)


Jan
45
40
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1 Joining
2 Early pregnancy
Mid pregnancy
3 Late pregnancy
4 Lambing
5 Lactation
6 Weaning
7 Post weaning
Pre joining

Weaners are
More susceptible.
Also less high quality pasture available



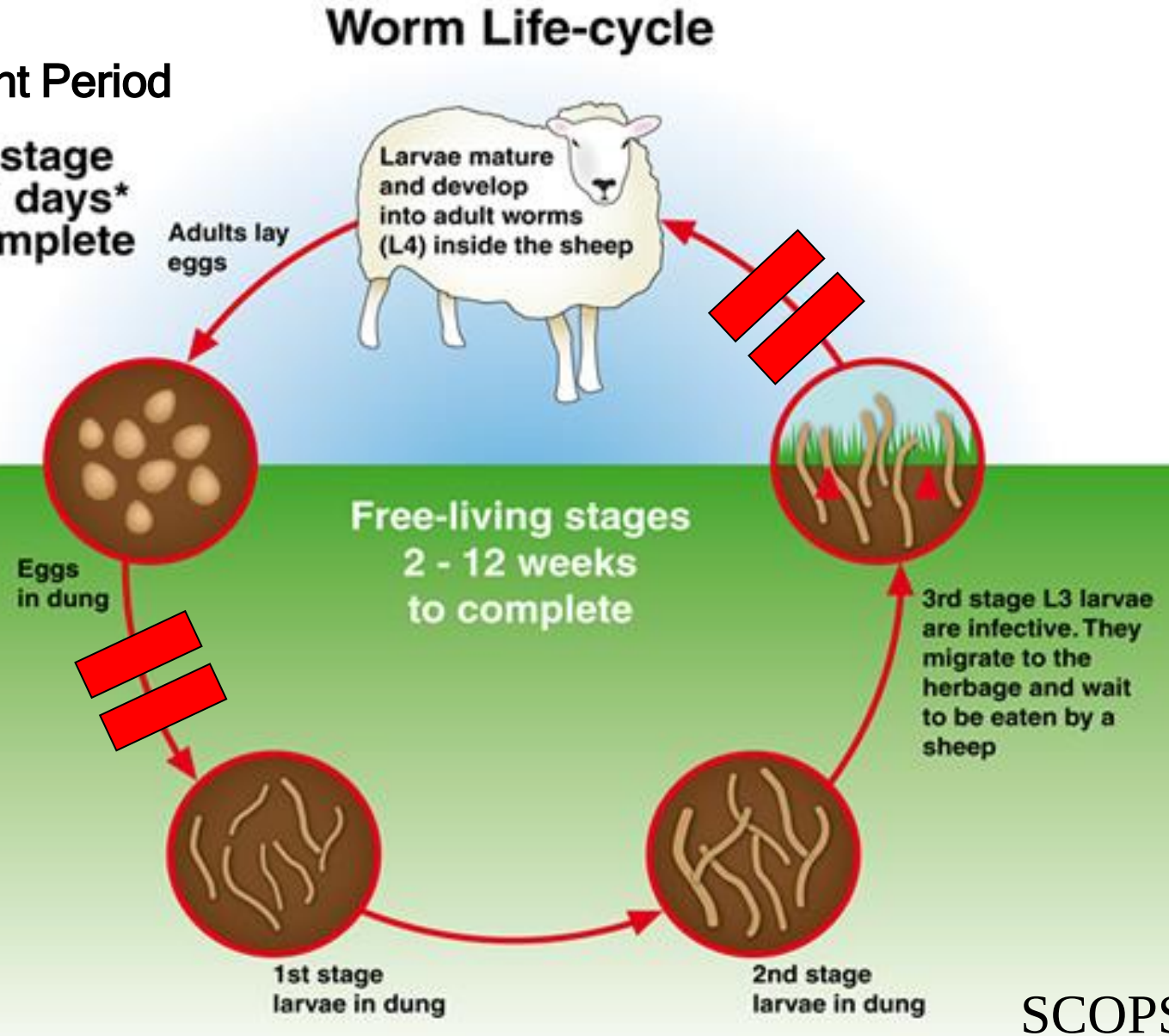
Pre-partum slump in immunity in ewes.
In adequate winter pasture

Options to manage worms

- Use management to break the worm lifecycle.
- Increase host (sheep) resistance/resilience.
- Treat the infection with anthelmintics

Grazing Management to break the worm lifecycle.

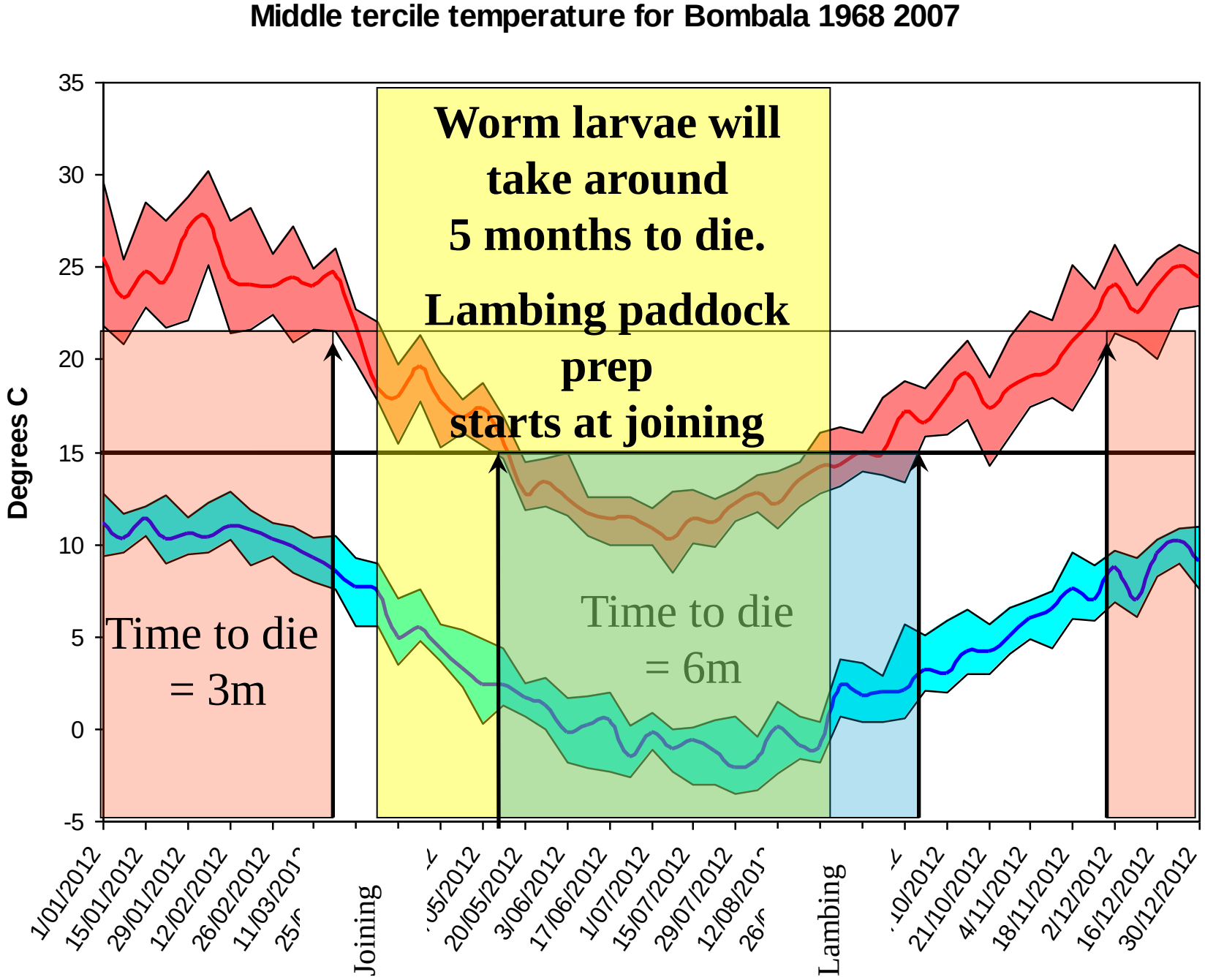
Pre-patent Period



SCOPS 2012

Time to die?

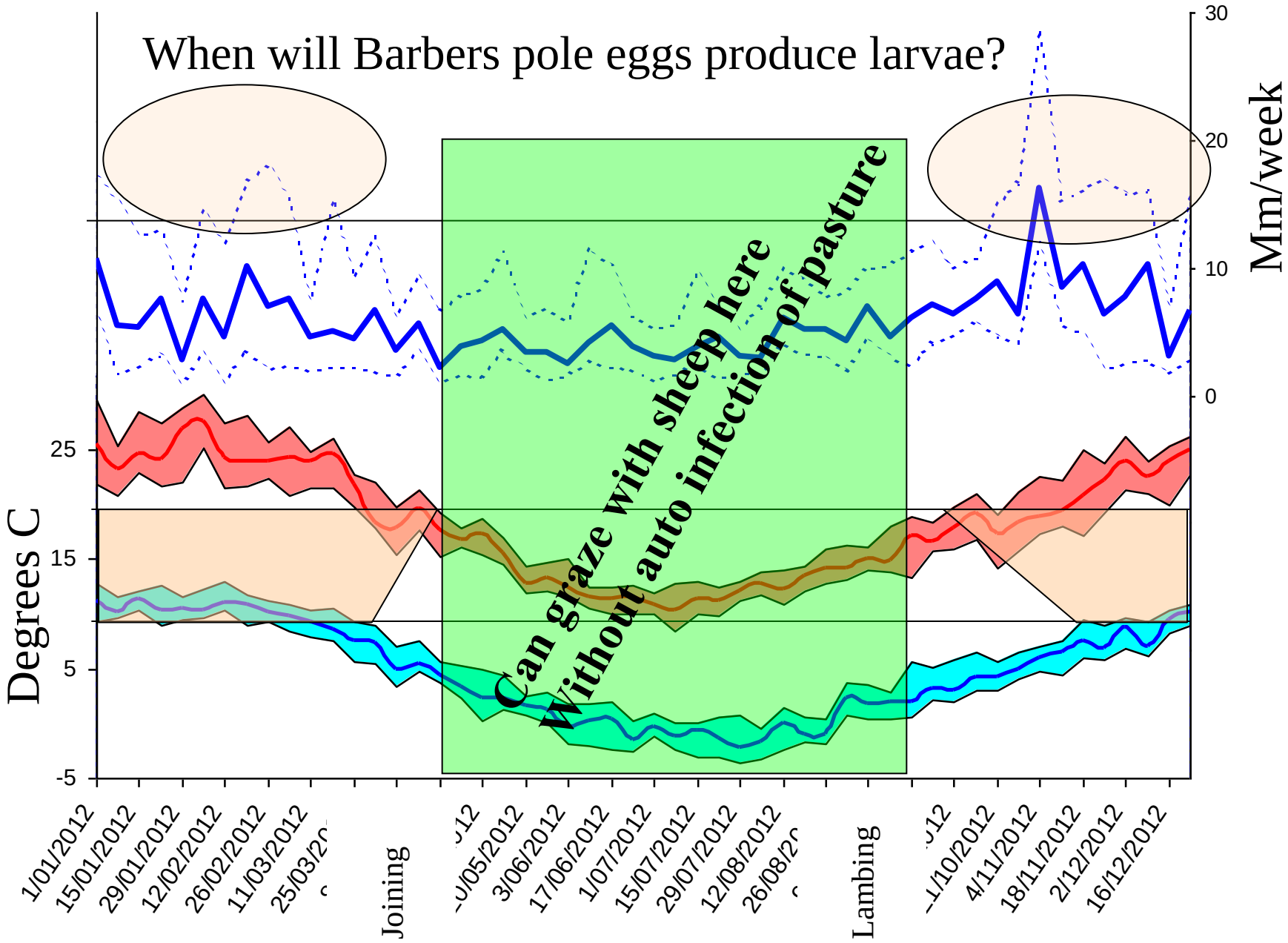
	Adults In the sheep	Eggs on pasture	L3 larvae on pasture
Barbers Pole	Months once established (depends on host immunity) Or when you drench	5 days but… 10^4 eggs/day	3 months if daily max >22°C 6 Months if daily max <15°C Vitrinus need cool/moist Can survive frost B.Scour inside pellet
Black Scour *T.colubriformis*		16 days	
Black Scour *T.vitrinus*		16 days	
Small Brown Stomach		Can overwinter	
Liver Fluke	Years!	Complex dual host life cycle	


Middle tercile temperature for Bombala 1968 2007
Worm larvae will take around 5 months to die.
Lambing paddock prep starts at joining
Time to die = 3m
Time to die = 6m
Degrees C
35
30
25
20
15
10
5
0
-5
1/01/2012
15/01/2012
29/01/2012
12/02/2012
26/02/2012
Joining
20/05/2012
3/06/2012
17/06/2012
1/07/2012
15/07/2012
29/07/2012
12/08/2012
Lambing
21/10/2012
4/11/2012
18/11/2012
2/12/2012
16/12/2012
30/12/2012

Conditions for eggs to hatch

	Life span	Daily Min & Max Temp°C	Ideal Temps	Moisture mm/week
Barbers Pole	5 days	>10 min >18 max	25-30	10-15+
Black Scour *T.colubriformis*	16 days	>5 min >15 max	25-28	10+
Black Scour *T.vitrinus*	16 ?	> 2 min	8-18	10+ Loves wet winters
Small Brown Stomach	Can over winter	>4 min	13-21	Not much

Middle tercile rainfall and temperature for Bombala 1968 2007



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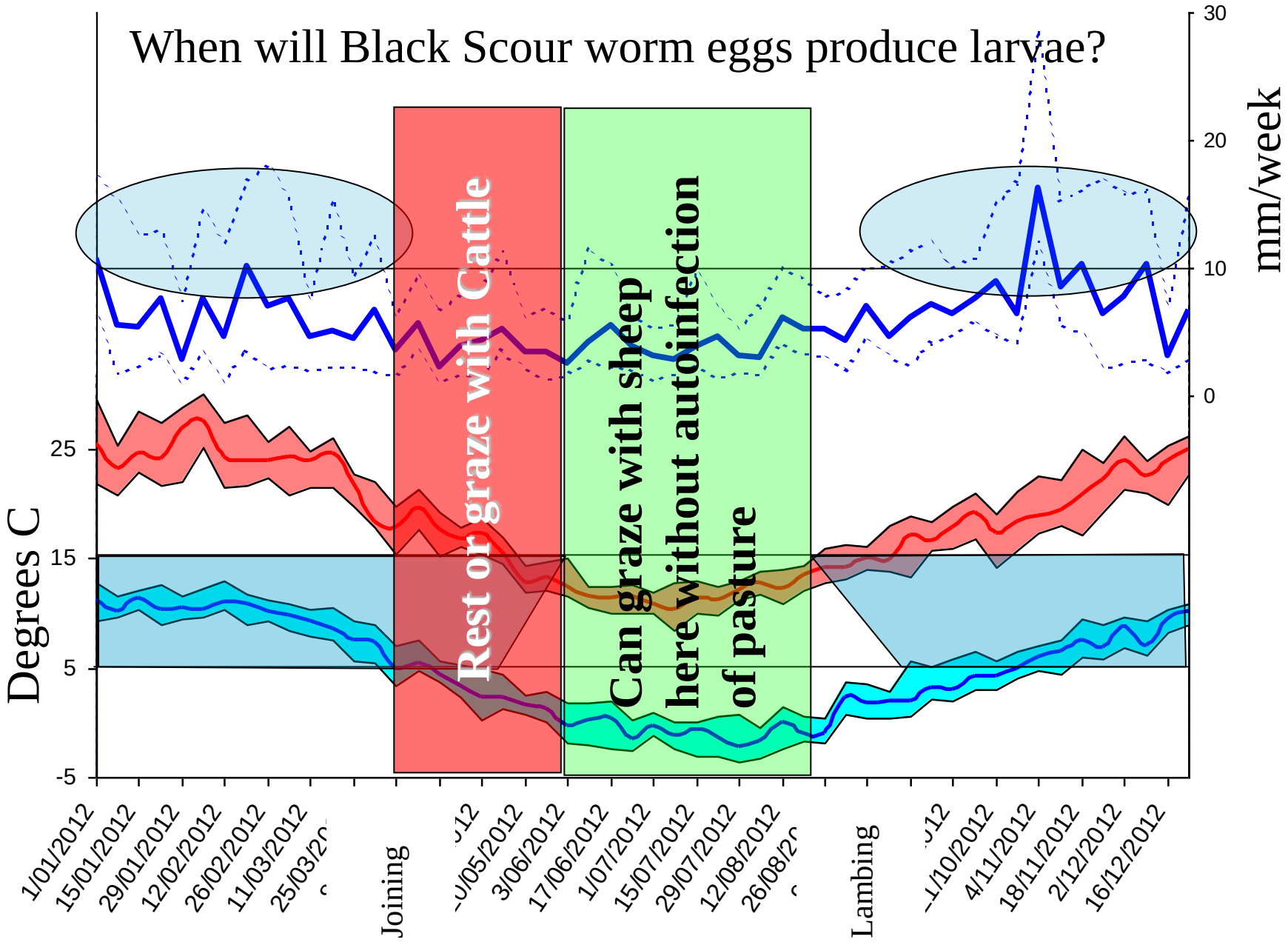


Cross Species Grazing

- Sheep and Goats share their problems.
- Cattle have different worms
- Grazing with cattle gives **rest** from reinfection with sheep/goat worms.
- Not really much active cleaning.
- Most effective with scour worms.

“Grazing Systems”

- “Techno grazing”
- “Cell Grazing”
- “HRM”

All are based on intensive rotations

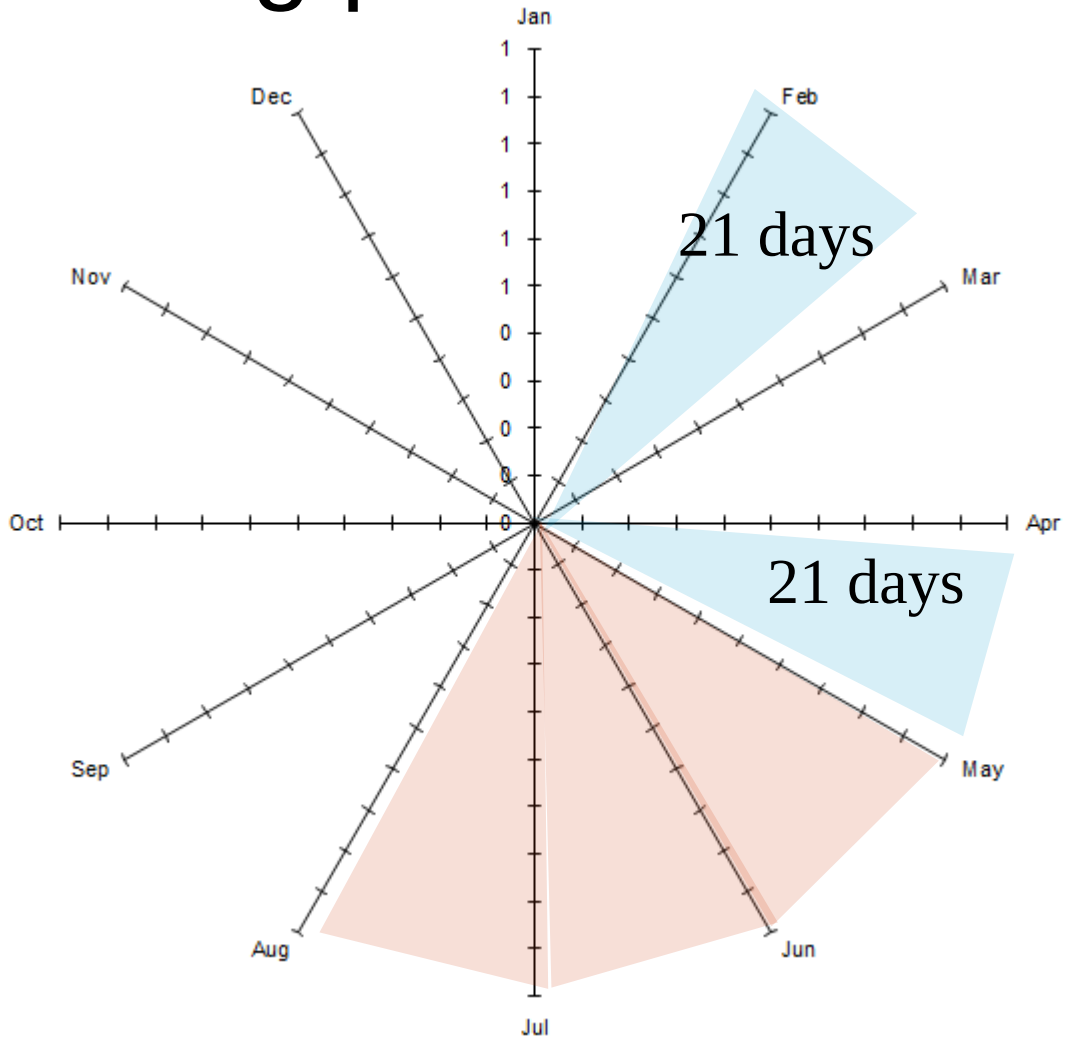
Short graze (< 10 days) & long rest (> 40-80 days)

- Avoids autoinfection.
- Particularly good for Barbers Pole.

Smart Grazing

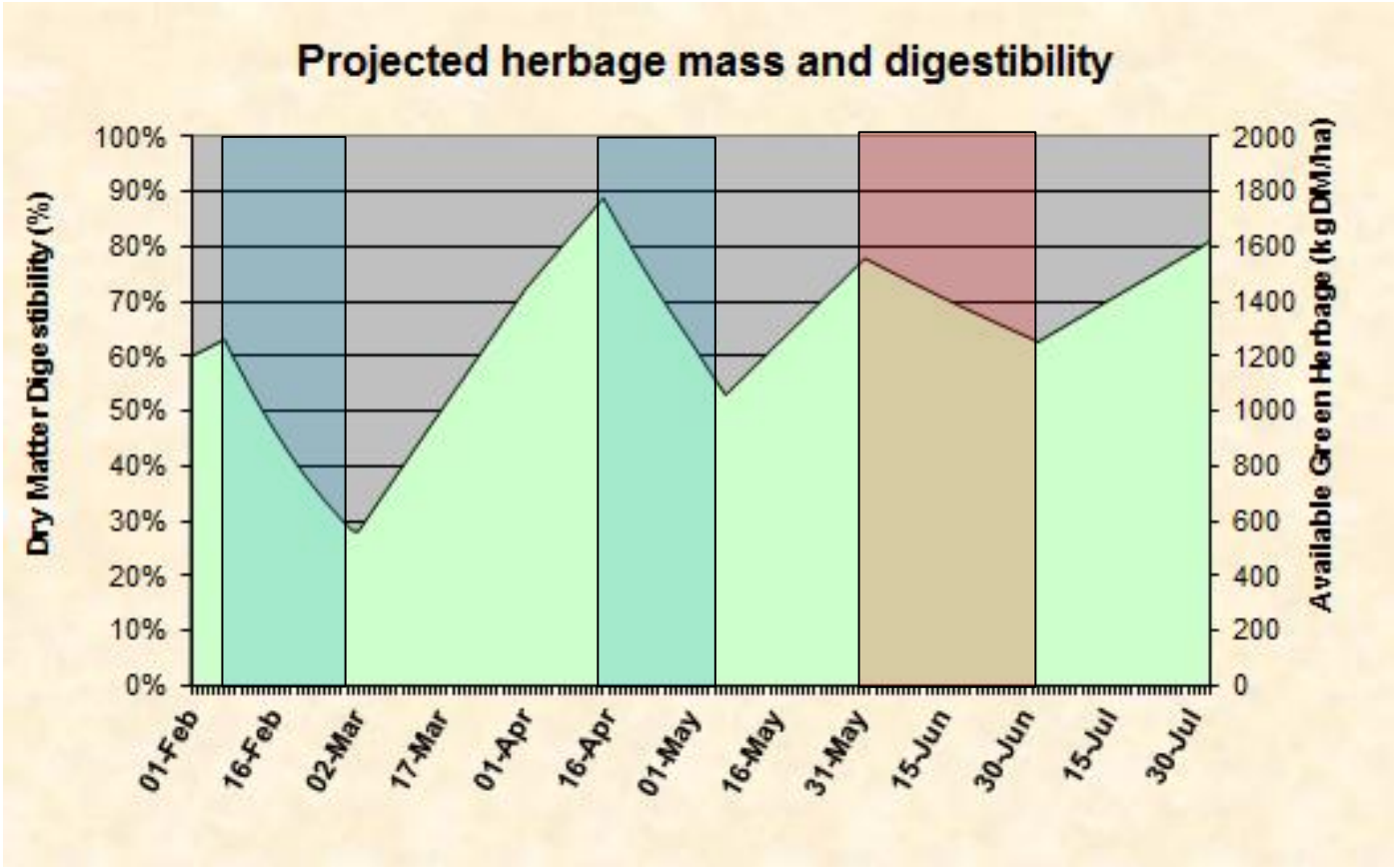
- Originally for winter rainfall areas (Vic)
- Adapted for summer rainfall areas.
- Uses the pre-patent period to advantage
- Sheep grazing events that manage pasture mass but don’t re-contaminate.

Smart Grazing steps to prepare lambing paddocks



- Recently drenched sheep
- Any Sheep

Smart Grazing Barbers Pole Example

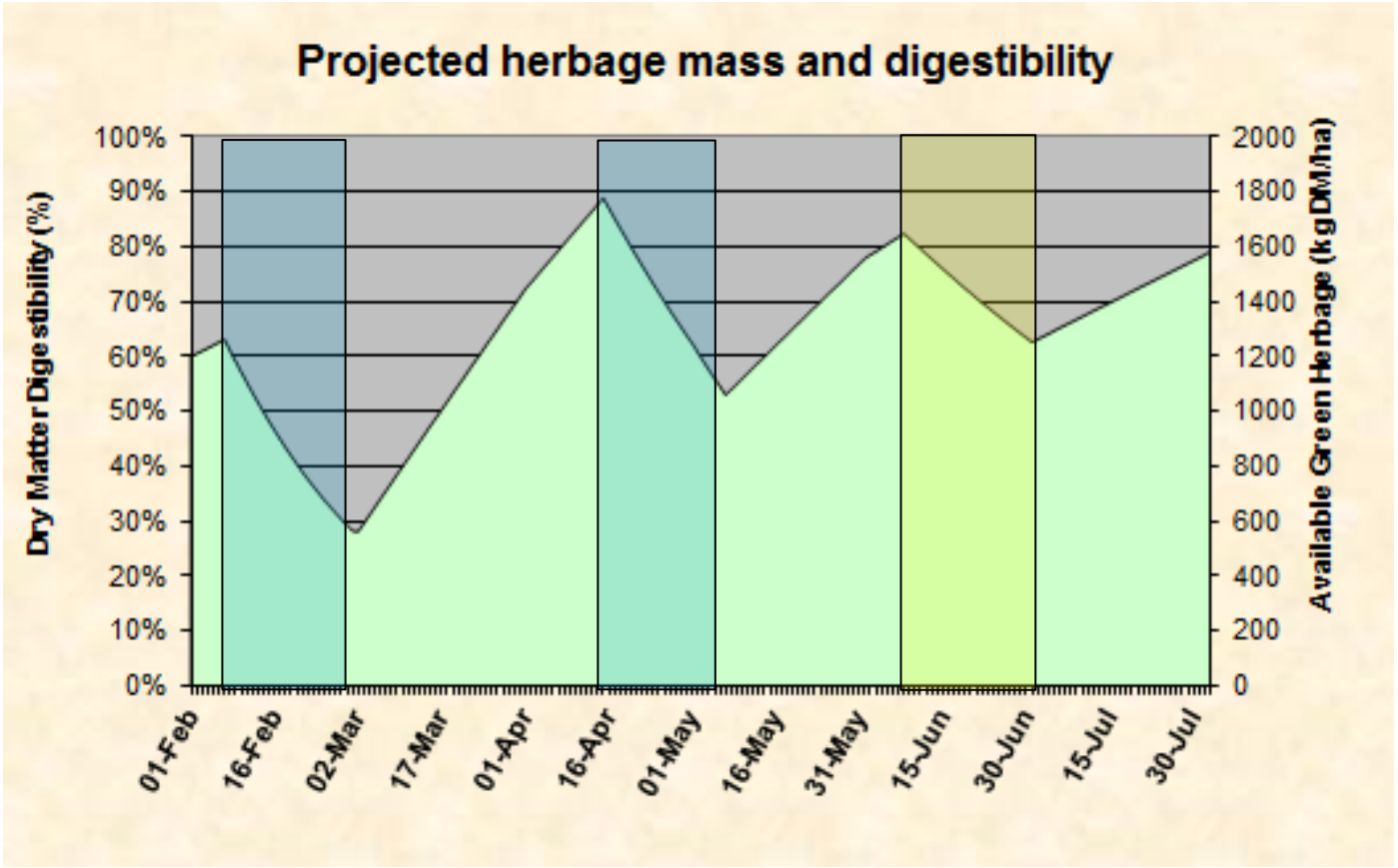


Ewes @ 40/ha

Hoggets @ 15/ha

GRAZ PROPHET CONSULTING

Smart Grazing Scour Worm Example



Ewes @ 40/ha

Weaner Heifers @ 4/ha

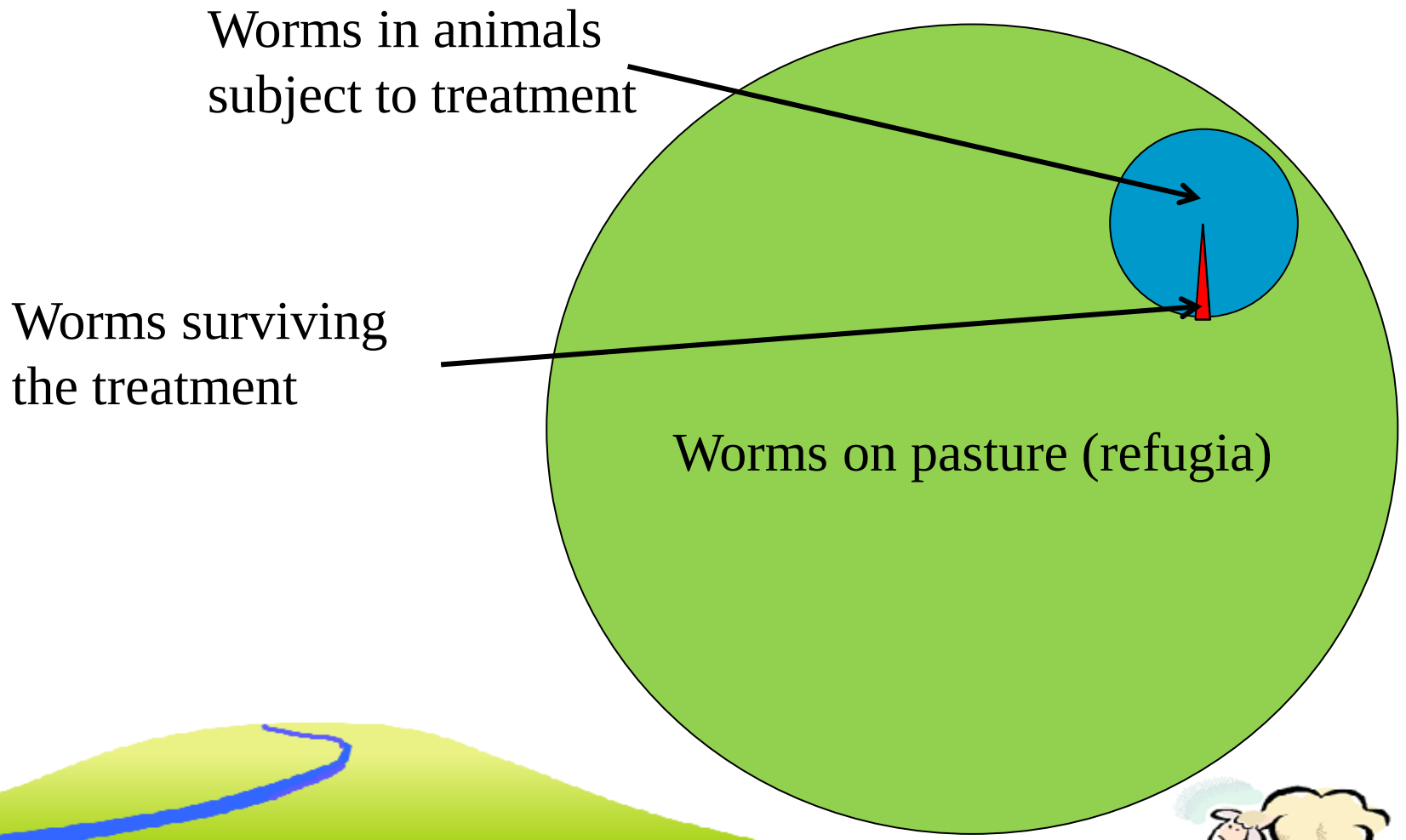
Words of warning.

- Any strategy that effectively cleans pasture exacerbates selection for drench resistance.

  because

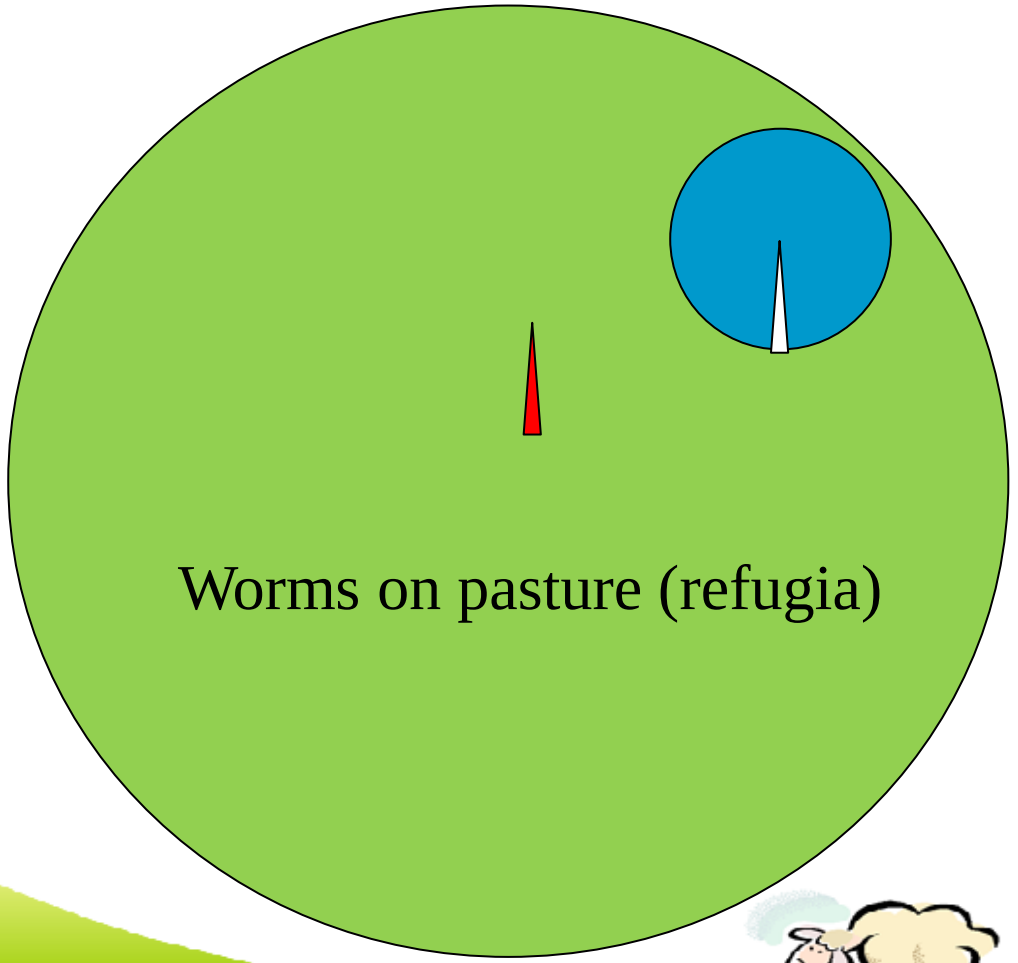
- Drenches are applied to the majority of the worm population.

Drenching animals on wormy pastures

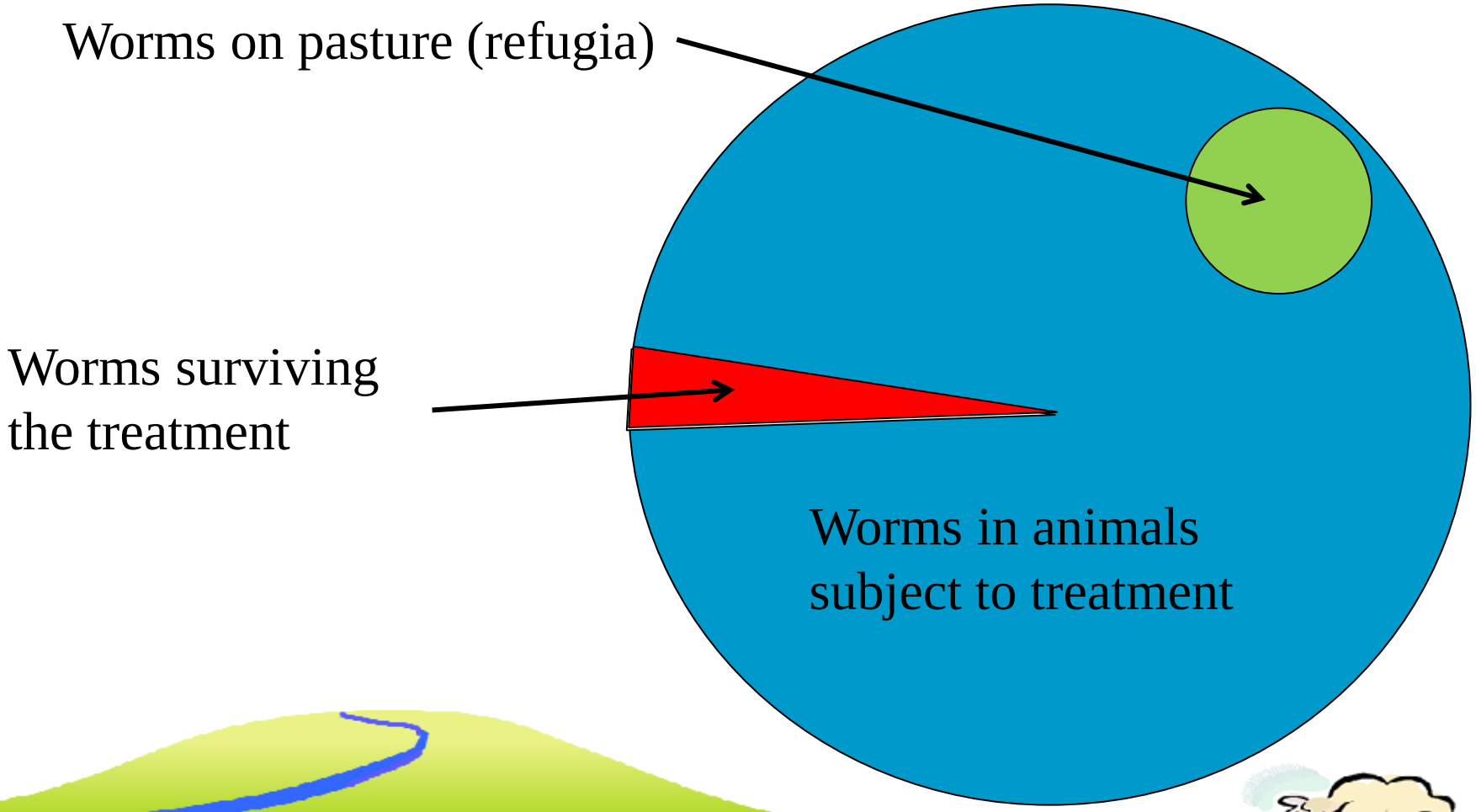


Drenching animals on wormy pastures

Resistant worms are massively diluted with unselected worms

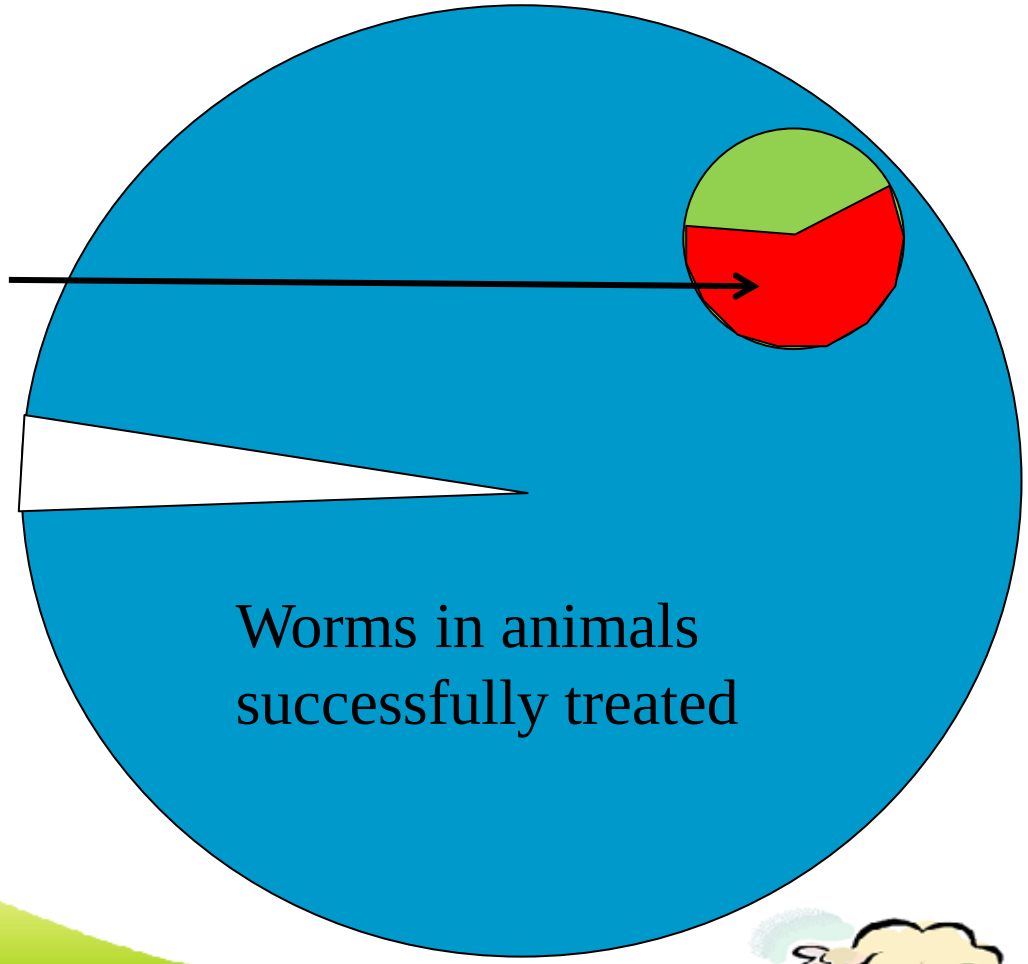


Drenching animals on wormy pastures



Drenching animals on wormy pastures

Resistant worms make up a large proportion of a small total worm population



If using Long Acting product in lambing ewes

- Use a priming dose with unrelated drench
- Make sure this drench is EFFECTIVE
- Use long acting drench at lambing
  - Selects for resistance
- Use an exit drench
  - Different family and EFFECTIVE
- Next graze with wormy sheep
- Follow with cattle

Special Comment on Goats

- Happy to graze the top of tall pasture.
- This is helpful as most worm are lower than 100mm in the pasture sward.

But

- Metabolise drenches quicker.
- Many drench options are off label.
- Frequently win the drench resistance race.

Increasing the resilience / resistance of sheep to worms

Nutrition Impacts

- Host ***Resistance***
- Host ***Resilience***

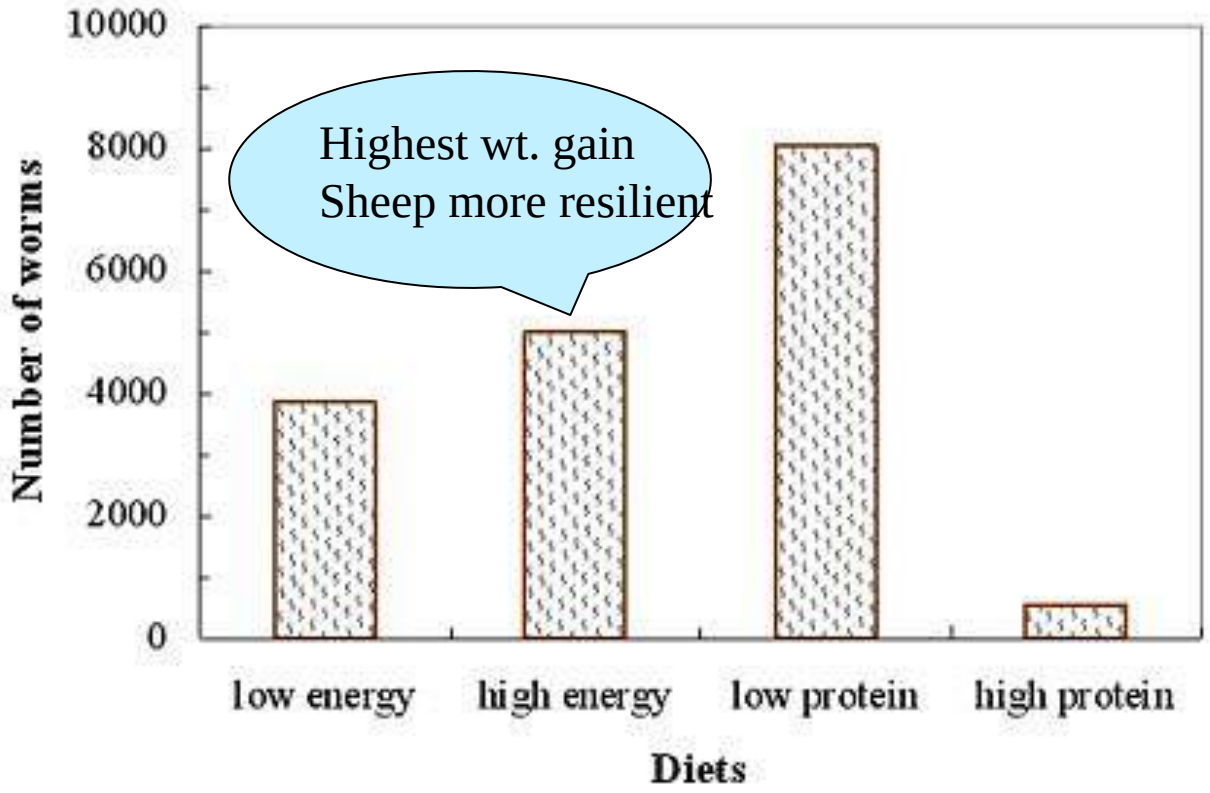
Minerals and trace elements

- Phosphorous (<0.2% DM)
  - Reduced immunity to scour worms
- Cobalt (< 0.1mg/kg)
  - Impaired immune function
- Copper supplements
  - Reduce establishment of BP and BS
- Molybdenum
  - Pen trials increased rejection of BP & BS

BUT….

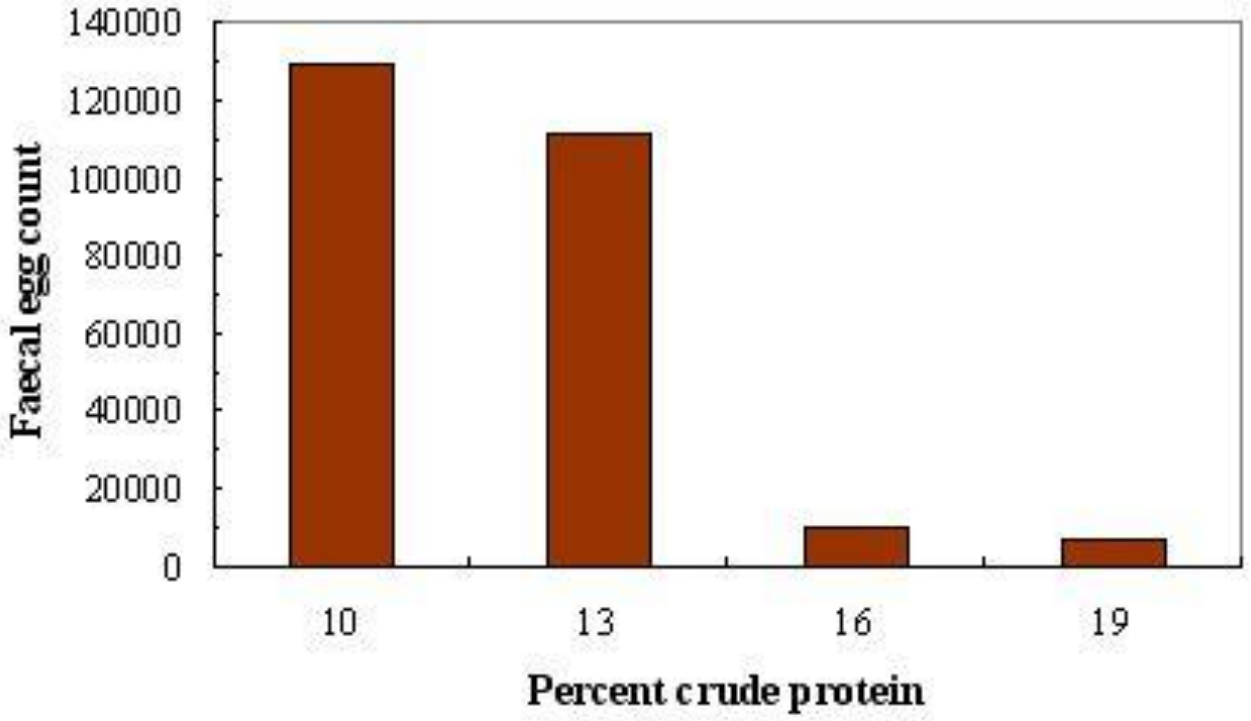
Dietary ***protein*** and ***energy*** are still the most important
Mineral supplements will not compensate inadequate energy and/or protein.

Protein nutrition affects ewes worm resistance



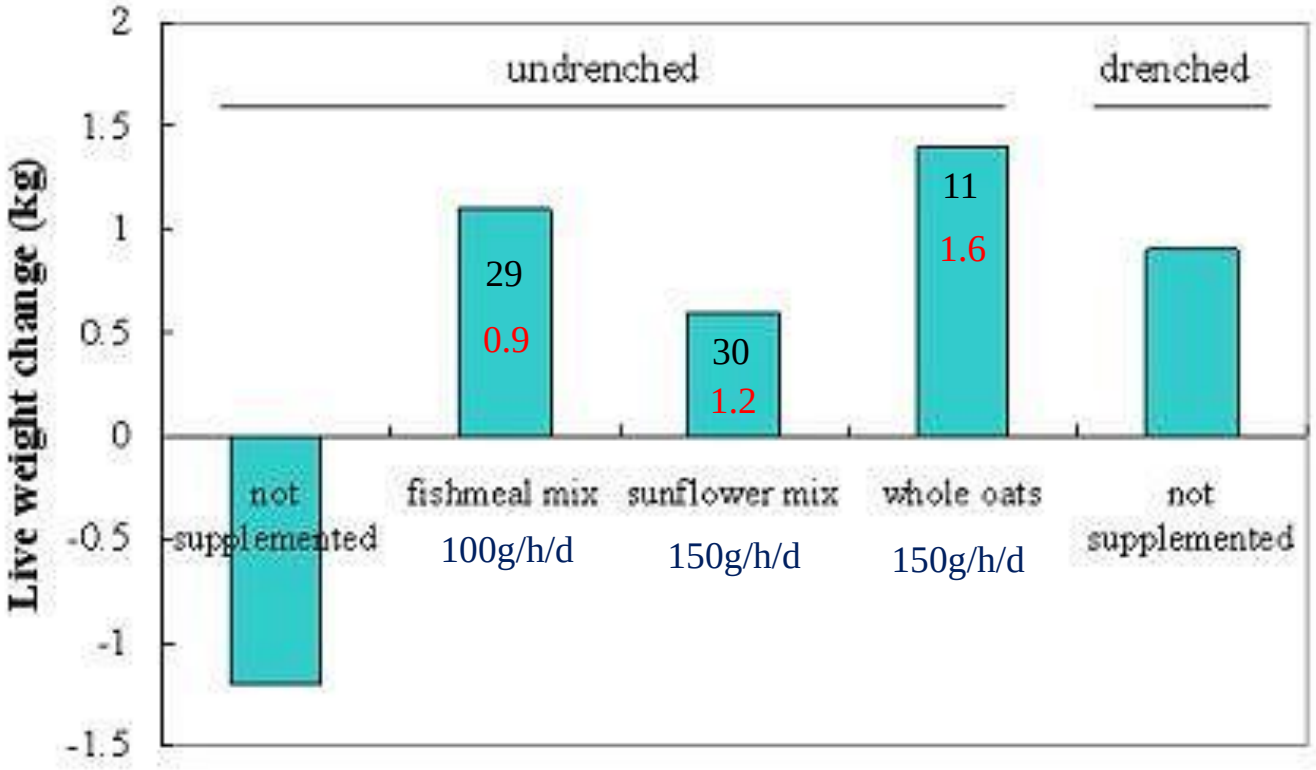
Source: Donaldson et al 1997

And also improves lambs resistance to infection…



Source: Datta *et al* 1998

Nutrition also affects resilience in lambs

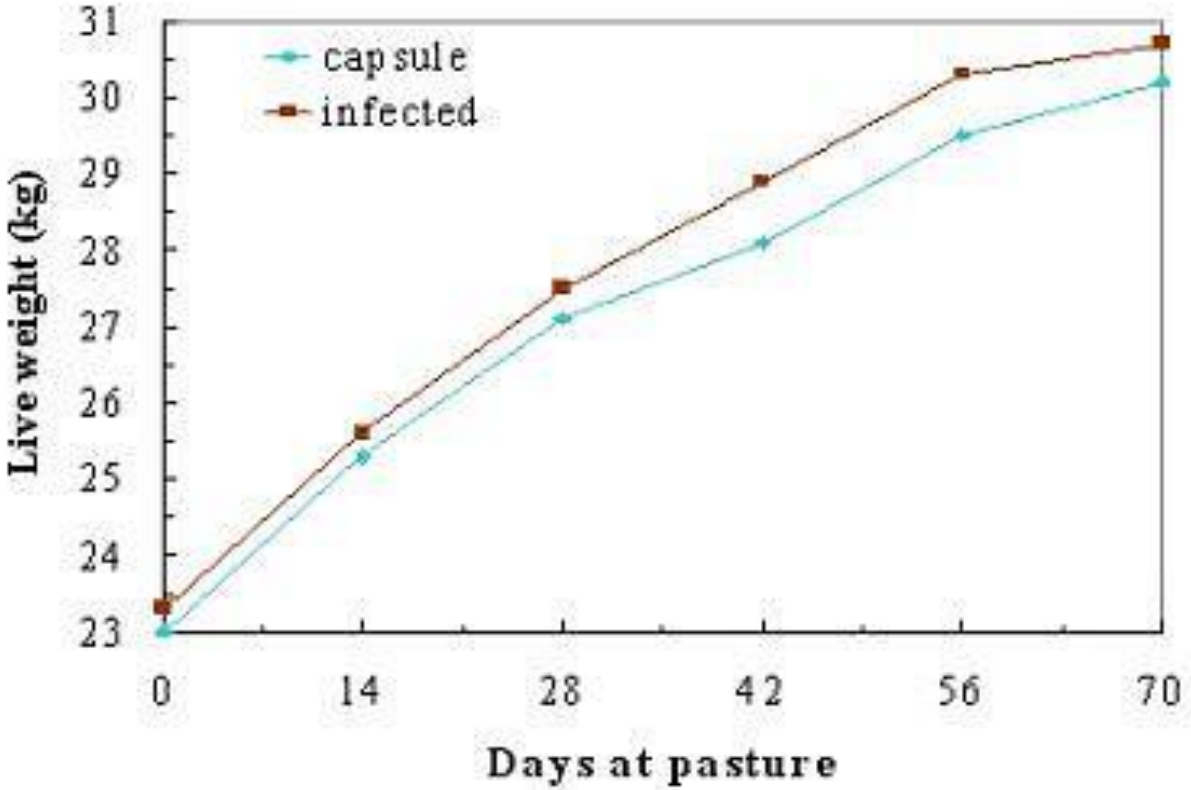


XX = Grams of protein consumed

X.X = extra energy intake

Source: van Houtert et al. (1996)

Good pasture also gives resilience in lambs.



Pasture

- 70%DMD
- 40% Clover
- WEC
  - Zero
  - 800 epg

Kahn et al. (2001)

Grazing Management Compromise?

- Management to influence pasture quality
- Management to reduce infective larvae

Can do both but usually in sequence.

Breeding sheep to resist worms

- WEC traits are heritable (0.2 – 0.3)
- Correlated traits
  - Staple strength (-0.16)
  - EMD (-0.17)
  - Fat (-0.26)

  These correlations are desirable

Rate of gain in WEC

- Around 2% per year without losing production.
- Trials in WA
  - Resistant vs Unselected lines
    - 10 fold difference in WEC
    - Ewes up to18% heavier at time of peak challenge
    - Lambs weaned up to 22% heavier.
- Resistance is across worm species.

Do low WEC high production sheep exist?

Top 10 sires on the FP+ Merinoselect index

Rank	YWT	YEMD	YCFW	YFD	YSS	YWEC
1	-0.2	-1.4	26.7	-2.8	3.2	-44
	75%	53%	76%	83%	69%	64%
2	1.9	0.2	19.8	-2.6	8.6	-
	92%	60%	85%	95%	91%	
3	1.4	-1.8	34.1	-2.2	0.8	-37
	98%	83%	98%	98%	96%	95%
4	4.4	-1.5	30.3	-2	1.1	-16
	97%	84%	96%	98%	96%	79%
5	0.8	1.1	13.2	-2.9	2.2	-72
	98%	88%	98%	98%	97%	94%
6	-1.2	-0.2	24	-1.9	4.4	-39
	93%	69%	93%	97%	81%	77%
7	11.7	-0.5	25.8	-2.8	4.3	21
	84%	71%	75%	82%	69%	57%
8	-1.3	0	-4	-4.6	0.1	-56
	96%	60%	95%	97%	92%	87%
9	1.9	0	19.8	-1.9	7.8	27
	85%	48%	85%	91%	76%	69%
10	2.9	-0.6	23.8	-1.8	5.7	-
	91%	57%	84%	93%	88%	

Drenching / Drenches

Drenches

- BZ (Benzimidazole)
- LEV (Levamisole)
- ML (‘mectins, abamectin, moxidectin)
- AAD (Monepantel)
- Sal-P (Closantel)
- OP (Napthalaphos)

} Medium /narrow spectrum

Drench Resistance

2013 Survey results

Survey results found:

Prevalence

Drench Active(s)	% Properties with resistance			
	Brown stomach	Black scour	Barbers pole	Any Parasite*
BZ	88	87	75	96
LEV	82	86	30	96
NAP	72	79	15	86
ABA	49	25	83	77
MOX	38	14	52	54
MPL	0	0	0	0
BZ/LEV	79	48	19	81
BZ/LEV/ABA	22	6	14	28

*Any parasite refers to *Teladorsagia*, *Trichostrongylus* or *Haemonchus* spp.

Severity: The severity of resistance was found by calculating the average efficacy (%) of each active against black scour worm, brown stomach worm and barber's pole worm across all of the farms on which it was used. Results revealed average efficacies of *levamisole* 61%; *naphthalophos* 72%; *abamectin* 73% and *moxidectin* 86%.

Source: Wormboss

Do you know your drench resistance status?

- Do a Drench Test every 2-3 years

- Do DrenchCheck-Day10 in between times.

Don’t import resistance!

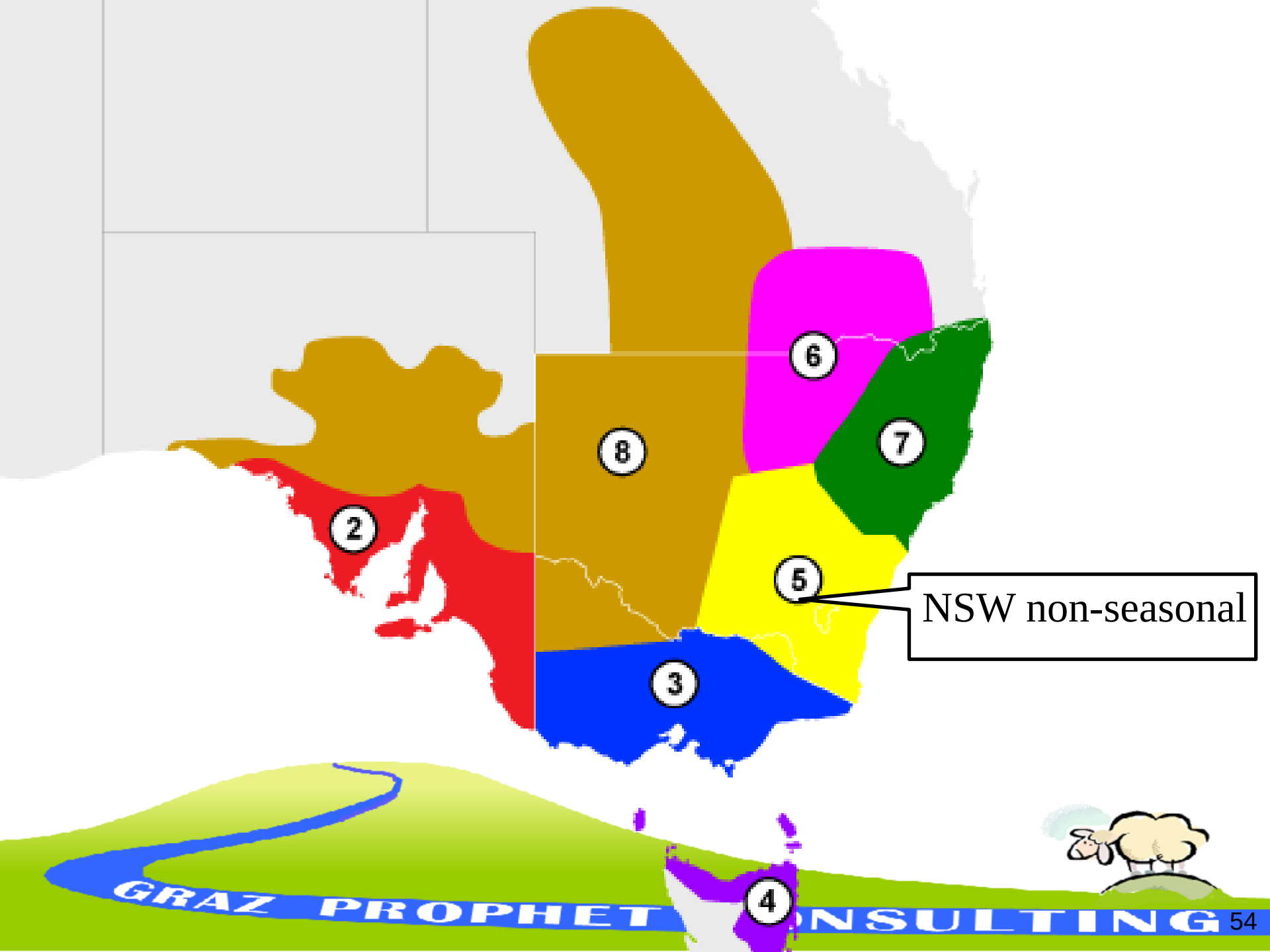
(quarantine drench with 4 actives including Monepantel.)

Slowing down resistance

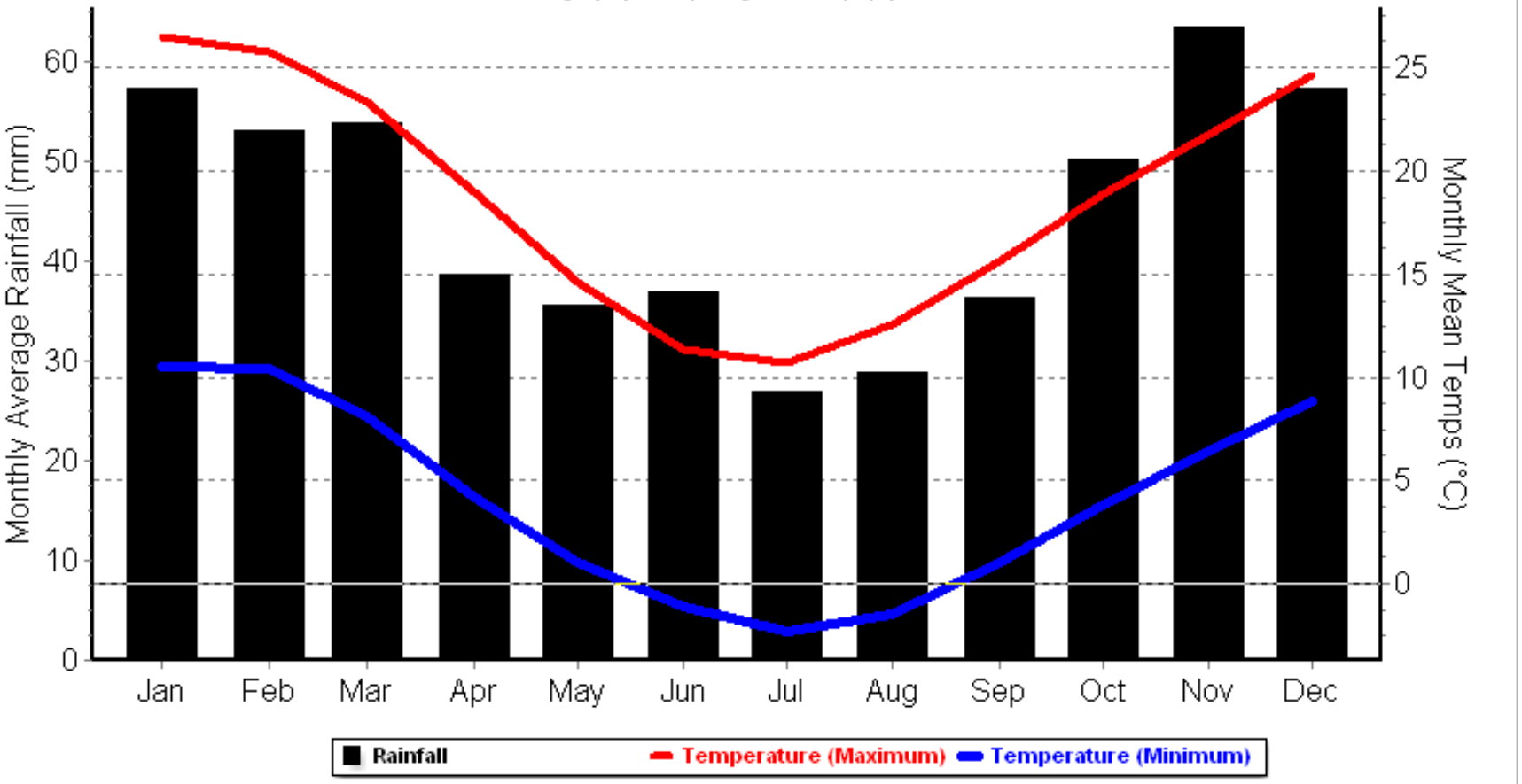
- Use effective drenches.
- Use combinations
- Rotate at each treatment.
- Use short acting treatments.

Strategic Drenching

- Under the NSW non-seasonal umbrella BUT
- Monaro is a bit unusual
  - Warm season dominant rainfall
  - Rainfall varies across the district (450 – 800mm)


6
7
8
2
5
NSW non-seasonal
3
4
GRAZ PROPHET
NSULTING

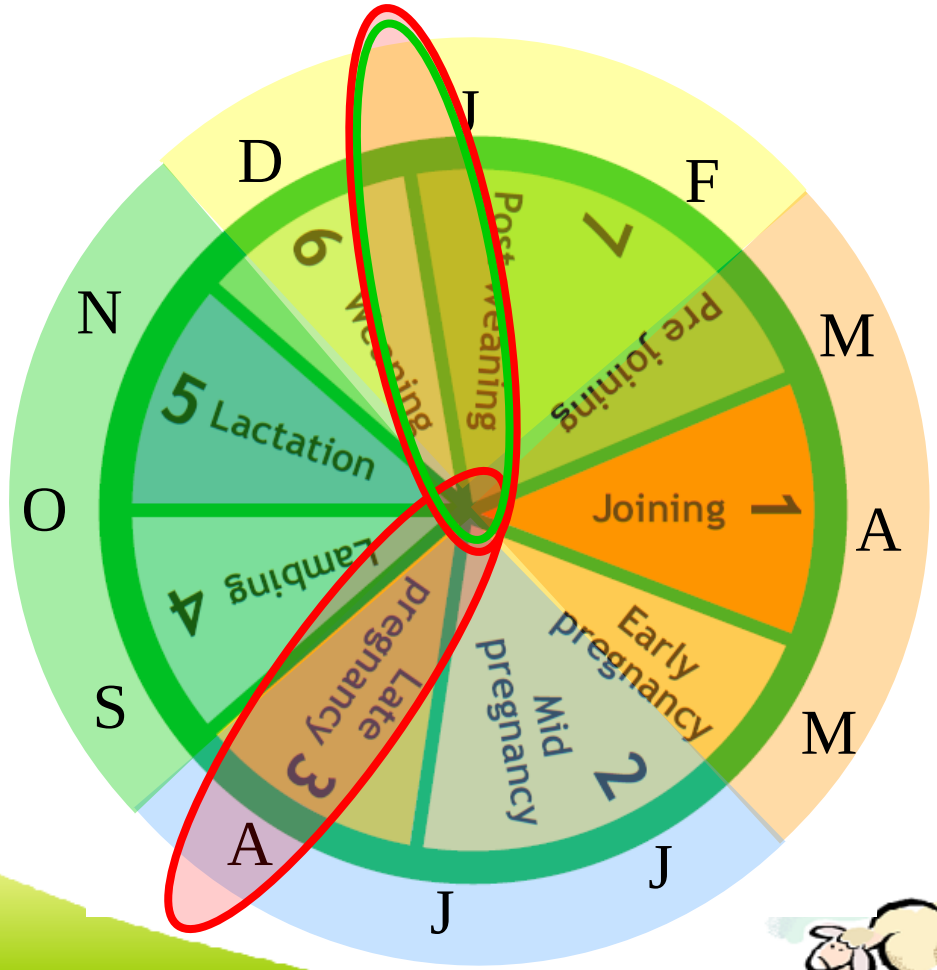
Cooma Climate



Monaro rainfall actually Summer dominant

Strategic Drenching Program

- Mix of WEC monitoring and drenching
- Mix of Non Seasonal and Summer rainfall tablelands



Worm Monitoring

New Directions for Treatments

- Prevention rather than cure.
- Development of vaccines for parasites.
  - Stimulate the animals immune system to do the job for us.

Vaccines

- Barbervax
  - Joint venture
    - Moredun Inst. and DAFWA
  - Currently going through registration with APVMA.
  - 70 - 80% efficacy
  - Requires repeated doses for ongoing protection
    - around 4 times over the season.

New Anthelmintics

- Startect
  - Combination of **derquantel** + abamectin
  - Registration in Aust.still under negotiation.
    - More data needed.
- Others always in the pipeline but..
  - Very few make it past the toxicoligy screening.
  - Anything currently showing promise is still 7 – 10 years away.

New Anthelmintics

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  - Combination of **derquan** ectin
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Protect the drench families you have.

wormboss.com.au

Go to Wormboss for more information