

Breeding For Worm Resistance





What are we?

- Performance led sheep breeding company
- Allowing sheep to express their genetic potential
- EID based recording for 11 years (many more on paper)
- 28k EID breeding records and growing
- 3.2k individual FEC records
- Genetics not cosmetics
- Emphasis on 'ignored' traits - - FEC/footrot/mastitis

Internal parasites---what's the problem?

- 3rd largest economic driver in commercial lamb production
- Largest economic health problem in worldwide sheep production systems
- Running out of chemical options----resistance is ALWAYS increasing



Resistance vs. Resilience

We describe resistance as ---

The ability of the sheep to resist the challenge of the worms – To inhibit their development and reduce the number of eggs laid

Resilience is -----

The ability of the sheep to continue to be productive whilst hosting a large worm burden which continues to lay eggs

Genetic approach to internal parasite control

- It's a measurable trait
- It has significant variation
- It has good heritability 0.19 (S)
0.13 (N) [scan wt 0.18]
- It is economically important
- Measure under pressure
- So we can select
- So we can breed for this trait
- So it is worth doing

Method----

- Measure and record
- Analyse
- Select
- CULL
- And repeat every year ---
- Finger technology & FEC
- BLUP
- Data is king

2014 Trials ----Theory

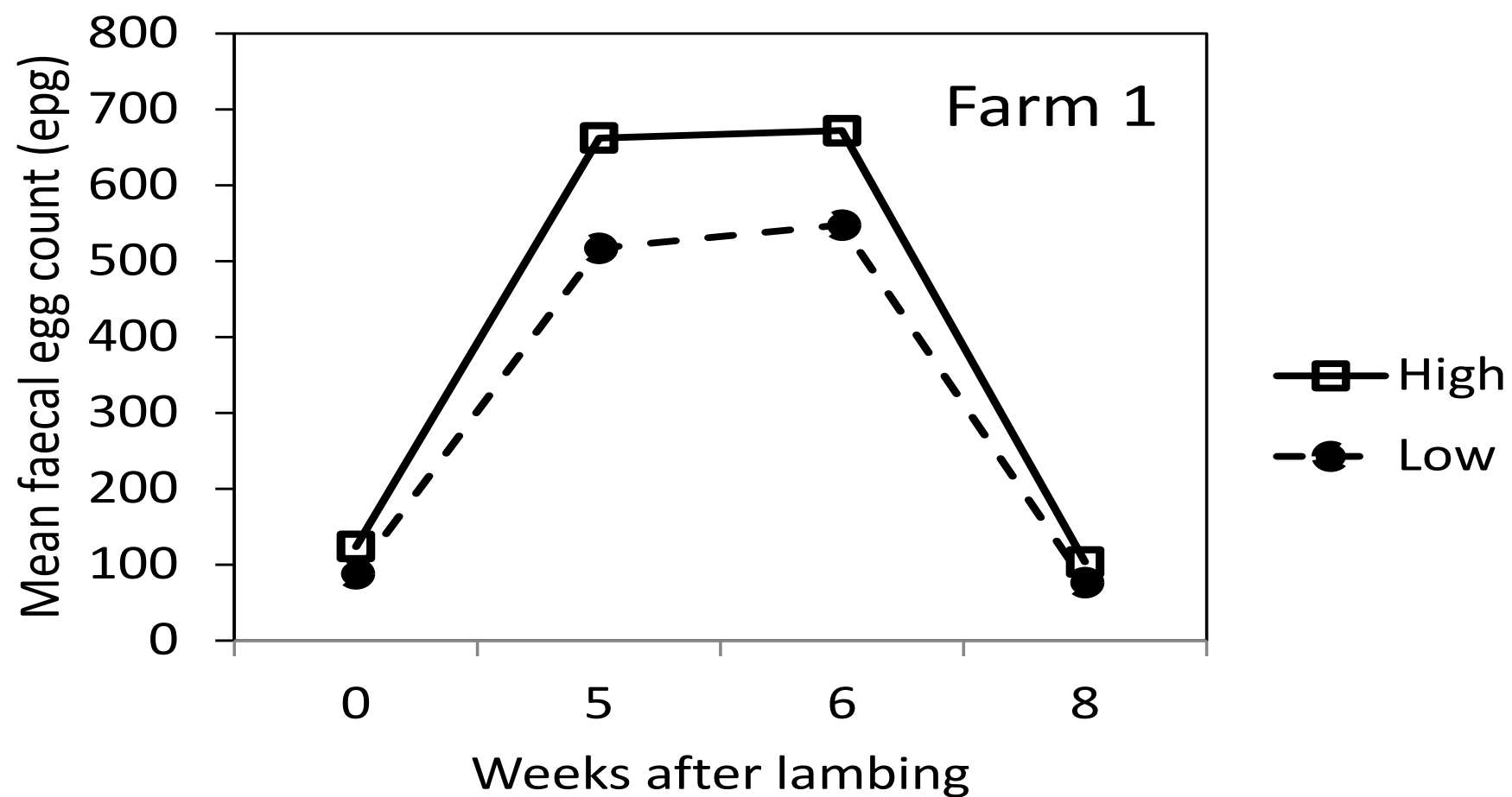
- From ongoing work we see that FEC EBVs are accurate and have decent heritability in lambs
- But does this translate to egg output in lactating adult ewes?
- If so = reduced worm burden for new lambs

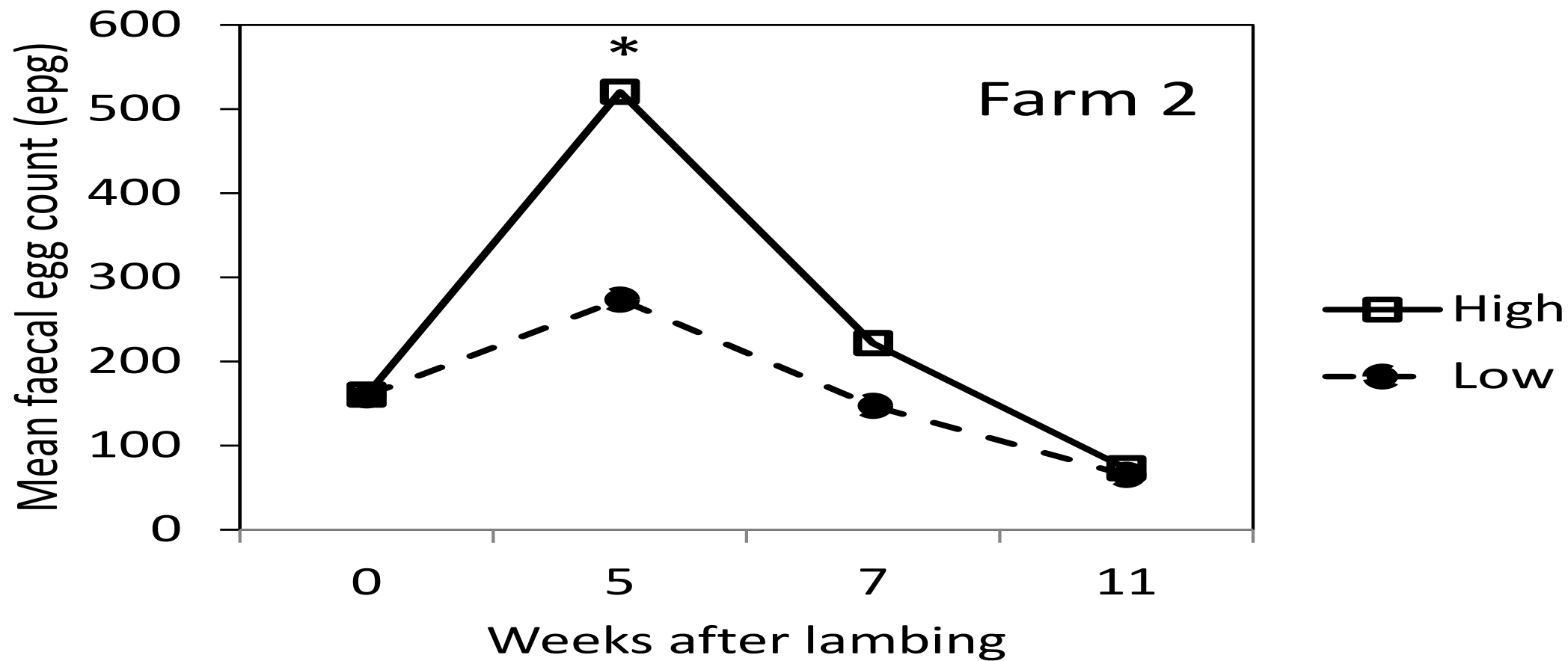


2014 trials---Practice

- Identify group of 80 ewes with variety of good and bad FEC EBVs
- Reduce variation within group---all rear twins, similar age ewes, all treated identically
- Measure individual FEC 10 days before lambing and every 2 weeks thereafter
- Duplicate trial on another farm

38% difference in egg output between top and bottom quartile FEC EBV ewes





50% difference in egg output between top and bottom quartile FEC EBV ewes

So????

- Juvenile FEC correlates with adult FEC
- Reduced adult FEC especially during periparturient rise is very important in reducing worm challenge to young lambs
- This is very important for a maternal ewe and her lambs performance

Exlana SNP association study results with The Roslin Institute

- 200 DNA samples from ewe lambs with recorded FEC and weight at 20 weeks old
- 15 SNPs (mutations) in 3 genes were sequenced in the lambs
- The 3 genes had previously been found to be involved in the development of worm resistance
- A significant association was found between FEC and a SNP in the Exlana lambs
- Lambs with the A allele on both chromosomes tended to have higher FEC than lambs with the G allele

Model prediction of FEC based on SNP7 in Exlana's

Gene	Allele	No. lambs	Average FEC (epg \pm error)
<i>IL23R</i> (SNP7)	AA	179	832 (\pm 993)
	AG	17	700 (\pm 964)
	GG	0	

Translating this into practicalities

- On farm uses of superior genetics is not instant
- Improvements in commercial flocks are hard to measure, too many variables & farmers are poor data collectors
- Anthelmintics are!
- You can't just use a ram with good FEC EBVs and expect to instantly reduce your worming schedule

So, how do lamb producers breed for worm resistance ?

- If you are breeding your own replacements

Buy a tup with a good FEC EBV from your ram breeder (it's his /her job to provide these animals for you)

- If you buy in replacements

- Buy ewes from a breeder who has a good breeding program and breeds for worm resistance

So this is where we are now----

EXLANA ewe lambs---16 months old and all raised a lamb, never wormed



The future -----???



Where next?

Further measurement & selection for genetic resistance

Should we be selecting for resilience as well as resistance?

Can we select for animals that exhibit resistance earlier in life?