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Focus Site Project Review

Roundworm contamination mapping

Tirlan, Brechfa

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1 Summary

Tirlan Farm, Brechfa, Sir Gar is a 77 hectare (ha) upland mixed livestock farm running approx. 450 Beulah Speckled, Poll Dorset and Texel ewes. Fields as grazed in rotation with the herd of 20 Limousin/Limousin cross suckler cows and calves. The farm is owner occupied, has a further 10 ha of woodland and has been in Glastir Advanced since 2016.

Business aspirations:

Gain a more healthy efficient flock by reducing the incidence of Gastrointestinal Nematodes (GIN) infection.

Reduce the resilience of wormers while maintaining good lamb performance.

Lessen financial and labour requirement.

Be proactive in gaining professional advice to obtain appropriate treatment, thus a successful business.

Catrin George has worked on the family farm for most of her life. The farm has been actively involved in the TAG group studying ewe nutrition, where the group were advised to participate in a Faecal Egg Count (FEC). Catrin knew that worm burden was an issue for the farm and did occasional counts with the local vet. Participation in the FEC project with Techion UK Ltd[1] and being a Farming Connect Focus Farm was therefore seen as great opportunities to tackle this issue.

Focus Farm Project key objectives:

To investigate if contamination mapping is an effective control method for reducing the occurrence of Gastrointestinal Nematodes (GIN) infection in sheep. The project included:

1. Utilising data from FEC sampling to introduce contamination mapping, to enable better management decisions

2. Adapting a prevention rather than a remedial approach to lower worm burdens

3. Adherence to the Sustainable Control of Parasites in Sheep (SCOPS) principles

4. To communicate and disseminate project findings to the wider sheep industry via open days, progression events and social media

The administration of broad spectrum anthelmintics has been essential in controlling the impact of GIN in sheep. The misuse of relatively cheap products has led to the development of resistance. Anthelmintic failure within the sheep industry is a huge concern; it is threatening sustainable production of lamb in Wales and further afield. GIN infection has several associated issues including reduction in feed intake, a decrease in digestive efficiency and protein loss from the gastrointestinal tract due to tissue damage.

Many farmers are unaware that their anthelmintic treatments are losing their effectiveness, and as a result are losing ewe and lamb performance. Contamination mapping is a new concept in the sheep

[1] https://techionstorage.blob.core.windows.net/techion-group-ltd/newsfeed-documents/Sainsbury%20Project%20Update%20Jan%202017.pdf (FECPAK info)

industry. There is little information in the public domain, therefore the project is particularly interesting. Contamination mapping is achieved through mapping worm burdens on a field by field basis, using the results of faecal egg counts (FEC).

What difference has the project made to production at Tirlan?

- The rearing percentage at Tirlan in 2015 was 143%. This has increased to 145% by 2017.
- Lamb weaning weights have increased from 23.2kg to 27.2kg in the two years.
- In 2015, avg lamb weight at 8 weeks was 16.4kg. This has risen to 19.8kg by 2017.
- Kgs of lamb liveweight produced per ewe in 2015 was 33.2kg. Lamb kg output per ewe has lifted to 39.4kg by 2017.
- In 2015 32% of lambs were under 15kg at 8 weeks. By 2017, just 16.6% of lambs were under 15kg; nearly a 50% improvement.
- Output from the hill flock has increased by £4,500. The more kg per ewe produced, at current lamb value equates to an extra £10 per ewe.

1.1 Project Conclusions

1. Contamination mapping allowed for informed decision making.

The data collected at Tirlan Farm proved that contamination mapping is a successful control method in reducing the prevalence of Gastrointestinal Nematodes (GIN) infection in sheep.

Catrin collected the faecal samples and noted which sheep group the faecal sample belonged to and recorded the movement of the sheep between fields. By doing this she built up a picture of which fields are at highest risk of worm infestation. This information allowed Catrin to make better management decisions in regards to what fields lambs graze and maybe the possibility of mix grazing some fields with cattle to reduce worm burden.

The main grazing blocks, Gilfach, Hafod and Tirlan were grazed with cattle or dry ewes post weaning early August through to Christmas. Contamination mapping (average egg contamination per ha per day per block) concluded that Hafod has 65% less contamination than Gilfach. As a result, decisions could to be made during the grazing year, for example, where to graze lambs post weaning and finishing. Results can be seen in section 2.2.1.

2. Doses were more effective during turn out of lambing ewes (when worm counts are at their highest) as opposed to 5-6 weeks post weaning.

Faecal egg count results showed that there was a rapid increase in eggs found on pastures 7 weeks prior to the beginning of the lamb period. During the lamb period, the ewes were under more stress resulting in a lower immunity, allowing worms to thrive. By dosing at turn out, this reduced the amount of eggs being deposited onto the fields for lambs to pick up later on in the year.

Dosing at this time has proven to be far more effective at Tirlan as opposed to dosing 5-6 weeks post weaning, which was the practice previously. The highest levels of lamb performance can only be achieved

if they are not exposed to high worm burdens during their first grazing season[2]. Results can be seen in section 2.2.2.

3. Increased lamb weights and ewe performance from 2015-17, over the project lifetime.

The cost of finishing infected lambs increases because the slower a lamb grows the less efficient it becomes. Even a modest decrease in price per lamb over an additional 9 weeks of 30p/kg would reduce the value of the lamb by £5.70 (for a 19kg carcase).

If you add the cost of additional feed e.g. supplement feed or competition for grass with ewes, this can reduce financial returns by £10/lamb or more[3].

Tirlan lamb weights at 8 weeks were up by nearly 3.5kg in 2017 and 4kg at weaning (since 2015). Rearing percentage was up by 2% with ewes also achieving nearly 6kg more at weaning, an equivalent to £10/ewe output. Results can be seen in section 2.2.3.

Although 2016 results were poorer as a whole, Catrin and the TAG group came to the conclusion this was due to a poor spring and early summer, which stunted lamb growth. This shows the importance of trialling new systems over several seasons before coming to firm conclusions, as other variables can affect project results.

4. Drenching when most effective results in savings to the business, and product effectiveness long-term.

The business has made cost savings as a result of:

- Reducing dosage frequency, dependant on animal requirement, and not routinely treating
- Lower labour requirements
- reduced risk of drench resistance, ensuring that simple to use treatments are effective for longer

Prior to the FEC system, Catrin was routinely dosing, drenching ewes at tupping, and taking a whole flock approach, rather looking at individual groups. Ewes are now only drenched post lambing, lambs mostly only 4 times a year, and only when the FEC results indicate it is required.

Catrin acknowledges that the volume of anthelmintics used in the business is probably similar to that pre project, but that adjusting her timings of treatment has made them more effective, with a tangible increase in kg/ewe produced.

With FEC, Catrin now effectively has an early warning system that can help her identify any emerging resistance issues on farm, and ensures she chooses the most effective worm treatment products. Reducing the risk of future drench resistance is being achieved through monitoring lamb/ewe performance and strategic drench use.

[2] http://beefandlamb.ahdb.org.uk/wp-content/uploads/2016/08/BRP-Worm-control-in-sheep-manual-8-170816.pdf

[3] http://beefandlamb.ahdb.org.uk/wp-content/uploads/2016/08/BRP-Worm-control-in-sheep-manual-8-170816.pdf

1.2 Take home points for the industry:

1. Do not rely on wormers as the sole means of control

There are a number of options that will improve the worm control on your farm (as outlined in the AHDB Beef and Lamb Better Returns Manual 'Worm control in sheep for Better Returns'). These are most effective if used as a package, rather than each in isolation.

	Worm control options	Tirlan experience
1	Group lambs by age.	The flock is split into 4 groups and lambs are managed in age based groups.
2	Weaning – provide pasture of lowest risk to weaned lambs.	If the FEC indicates a high worm burden, weaned lambs are not put onto this field, as it would severely impact on growth rates and lamb health.
3	Mixed grazing (cattle/sheep), or rotating grazing between species.	Catrin uses the cattle to 'mop up' after the sheep, and this rotation grazing helps reduce flock exposure to the worm challenge.
4	Good quality grazing: essential for lamb growth and increasing lamb resilience to worms	Fields are reseeded every 10 years, with a grass/clover ley lasting 5 years or more. This results in a high quality grazing platform, and good quality silage, both helping reduce concentrate costs.
5	Grazing by mature ewes reduces infective larvae volumes, lowering the challenge	This protocol is part of the rotational grazing regime.
6	Using alternative and bioactive crops, such as chicory or birdsfoot trefoil.	Not currently used at Tirlan, but may be of increasing relevance if anthelmintic treatment options narrow.
7	Breeding for resistance to worms	As above, although Tirlan has a strict culling policy, which helps remove ewes with persistent health/productivity issues.

2. Being in control can deliver numerous benefits to your enterprise

Worm control is part of a wider flock management strategy; including grazing management, tackling other health issues, nutrition and ewe body condition scoring.

Take action NOW and ask yourself[4]:

- Are you in control of the worms on your farm? Do you know where and when they are most abundant?
- Could you use FECs and contamination mapping to monitor worm burdens and contamination levels?

[4] http://beefandlamb.ahdb.org.uk/wp-content/uploads/2016/08/BRP-Worm-control-in-sheep-manual-8-170816.pdf

- Do you have a quarantine strategy in place?
- Do the wormers you use work effectively? (Your anthelmintic resistance status)
- Do you ALWAYS treat correctly at the right dose?
- Could you reduce anthelmintic use in adult sheep?
- Could you use reduce your reliance on anthelmintics?
- Could you apply other control methods to control worms?

Taking a strategic approach to tackling worm burdens in your flock results in:

1) Increased financial returns - Achieved through increasing animal performance, decreasing workloads and efficacy of drench used.

2) Reduced drench resistance - Reduce the risk of drench resistance through monitoring performance and minimising drench use by only treating animals which require it.

3) Meeting consumer needs - Meet customer demands in the meat industry by reducing chemical usage.

4) Being in control - Through gaining valuable information enabling to implement a best practice approach to control parasites.

You can now facilitate your own flock faecal egg counts more easily, frequently and at fewer costs due to the FEKPAK^{G2} system. FEKPAK^{G2} allows for simple FEC on-farm, traceable, long-term FEC data, results sent straight to you, online access to your data, technical support and test reminders/animal health alerts tailored for your needs. https://www.techiongroup.com/Products/FECPAKG2

3. Timing doses is key for effective control

Farmers participating in FEC projects have adjusted their timings regarding dosing, in order to ensure maximum efficacy of treatments given[5].

Results from the Sainsbury FECPAK^{G2} Project –farmer experiences.

'Biggest change has been to dosing ewes with a reduction of 1 dose per ewe and a big change to timing of the spring / lambing dose. Testing showed that old dosing regime was wrong and significant pasture contamination would have been missed. FEC is now used to refine exactly when and which ewes need dosing.'

'Only slight reduction in lamb dosing but a change to dose timing. Lamb deadweight's have steadily improved over the 2 year period with average weights last year 1.9kg better than before project started. This is approximately £2,400 more return for the farm (based on 350 fat lambs @ £3.60/kg), although a few changes in management will have influenced this, so can't pin it all down to better worm control.'

[5] https://techionstorage.blob.core.windows.net/techion-group-ltd/newsfeed-documents/Sainsbury%20Project%20Update%20Jan%202017.pdf

4. Be pro-active in gaining professional advice

Gaining professional advice ensures you receive the treatment which is most effective and appropriate for your flock based on your anthelmintic status.

5. Apply the Sustainable Control of Parasites in Sheep (SCOPS)[6] to your farm

The SCOPS principles are key to being able to control worms in years to come. These recommendations have been successfully used, and incorporate the practicalities of sheep farming and health planning:

- Always make sure that any treatment you give is fully effective
- Try to reduce your reliance on anthelmintics using management options and monitoring where possible
- Avoid bringing in resistant worms and/or other parasites by following a robust quarantine routine
- Minimise the selection for worms that are resilient to anthelmintics when you treat sheep.

2 Business Review

2.1 KPIs and project impact on the business

The Key Performance Indicators (KPIs) for this project, and results are outlined below:

	KPI/performance attribute	What was the project result?
1	Rearing percentage (%)	The rearing percentage at Tirlan in 2015 was 143%. This has increased to 145% by 2017.
2	Increased lamb weaning weights	Lamb weaning weights have increased from 23.2kg to 27.2kg in two years.
3	Increased lamb weights at 8 weeks	In 2015, avg lamb weight at 8 weeks was 16.4kg. This has risen to 19.8kg by 2017.
4	Kilograms of lamb liveweight per ewe at weaning	Kgs of lamb liveweight produced per ewe in 2015 was 33.2kg. Lamb output per ewe has lifted to 39.4kg by 2017.
5	Increased lamb carcase weights	In 2015 32% of lambs were under 15kg at 8 weeks. By 2017, just 16.6% of lambs were under 15kg; nearly a 50% improvement.
6	Increased income	Output from the hill flock has increased by £4,500. The more kg per ewe produced, at current lamb value equates to an extra £10 per ewe.

[6] SCOPS - Sustainable Control of Parasites in Sheep

2.2 Test results

2.2.1 Average egg contamination per hectare per day

Table 1. Results of the average egg contamination per hectare per day of three individual blocks of land

Block	Average FEC	Average Egg Contamination/ Lamb/Day	Total Ha	Total Ewes	Total Lambs	Lambs /ha	Average egg contamination per ha per day
GILFACH	525	210,000	13.33	140	170	12.8	2,678,170
TIRLAN	508	203,000	8.6	80	110	12.8	2,596,512
HAFOD	193	77,000	7.8	90	120	15.4	1,184,615

Contamination mapping has identified the average egg contamination per ha per day per block enabling Catrin to study the findings and to make informed decision making, with the aim of reducing and preventing flock GIN infection.

For example, the table above shows that Hafod has 65% less contamination than Gilfach, therefore Catrin will reserve Hafod for lamb-only grazing prior to slaughter and consider using other control methods to reduce worm burdens in Gilfach.

2.2.2 Faecal Egg Count (FEC) Results

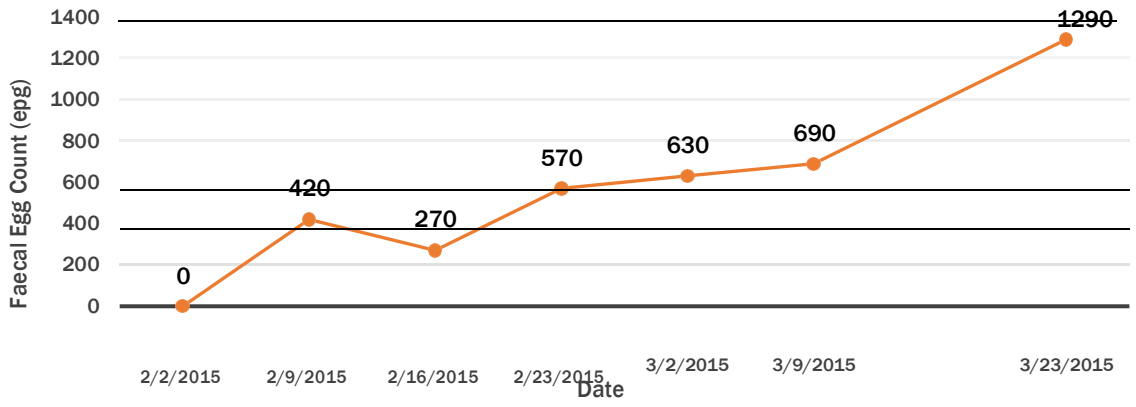


Figure 1. Increasing FEC in ewes 7 weeks prior to lambing

Figure 1 shows the rapid increase in eggs found on pastures 7 weeks prior to the beginning of the lambing period. This highlights the importance of dosing during the turning out of lambing ewes post lambing when worm counts are at their highest.

Dosing at this time has proven to be far more effective at Tirlan as opposed to dosing 5-6 weeks post weaning, which was practiced previously. The reason for this is due to the stress of lambing reducing the immunity of the ewes, allowing worms to thrive. By dosing at turn out, this reduces the amount of eggs being deposited onto the fields for lambs to pick up later on in the year.

2.2.3 Performance at Tirlan

Table 2. Increasing lamb and ewe performance at Tirlan from 2015-17

	2015	2016	2017
8 Week weight	16.4	14.3	19.8
Weaning weight	23.2	21.5	27.2
% below target (15kgs 8 WW)	32	40.4	16.6
Rearing %	143%	140%	145%
Kgs/ewe at weaning	33.2	28.8	39.4 (+£10/ewe output)

There has been a significant increase in both lamb weights and ewe condition at 8 weeks and weaning between 2015 and 2017 as shown in the table above. Acting on the contamination mapping information, and adjusting the timings of dosing has directly helped contribute to these increases.

2016 was a poor spring and early summer which held growth rates back at Tirlan, but this was seen across the whole TAG group. Thegroup came to the conclusion that good ewe body condition put them in good stead in comparison to others.

3 Project Review

Some basics:

What is a Faecal Egg Count (FEC)? https://www.techiongroup.com/Products/FECPAKG2

A faecal egg count gives the indication of the number of adult worms in the gut of a sheep. It is measured as eggs per gram (epg) of faeces.

FECs can be used to:

- Help determine the need to treat
- Provide information about the level of contamination on pasture
- Test the efficacy of a worming treatment (drench test)

What is anthelmintic resistance? **AHDB Better Returns Manual 8**

Worms are resistant when they survive exposure to a dose of anthelmintic that would normally kill it. Survival is genetic meaning it is inherited by the next generation. This means that when worms are left alive in the sheep, the eggs that are shed in the dung have resistant genes.

Over time the proportion of the worm population carrying these genes then increase, and the process becomes non-reversible when they represent more than 50% of the population. This is because there are not enough susceptible genes to dilute the resistant ones when the worms mate.

How worm burdens affect lambs **AHDB Better Returns Manual 8:**

- Depressed appetite reducing feed intake and growth rates

- Permanent damage to the gut which reduces nutrient adsorption and causes diarrhoea
- Reduced protein metabolism reducing overall muscle growth and carcase quality
- Impaired mineral retention causing small skeleton and exacerbating any trace of element deficiencies

What is Contamination Mapping?

Contamination mapping uses faecal sample data collected to help identify which fields have the worst worm burdens. This in turn helps manage what stock class is grazed where, and identify fields where we target alternative management to reduce burdens.

At Tirlan, when Catrin collected the faecal sample she noted which sheep group the faecal sample belonged to and recorded the movement of the sheep between fields. By doing this she built up a picture of which fields are at highest risk of worm infestation. This information allowed Catrin to make better management decisions in regards to what fields lambs graze and maybe the possibility of mix grazing some fields with cattle to reduce worm burden.

3.1 Aim of the project

To investigate if contamination mapping is an effective control method for reducing the occurrence of Gastrointestinal Nematodes (GIN) infection in sheep.

1. Utilising data from FEC sampling to introduce contamination mapping, to enable better management decisions

2. Adapting a prevention rather than a remedial approach to lower worm burdens

3. Adherence to the Sustainable Control of Parasites in Sheep (SCOPS) principles

4. To communicate and disseminate project findings to the wider sheep industry via open days, progression events and social media

3.2 Project analysis

3.2.1 SWOT analysis

STRENGTHS	• Contamination mapping helps identify where worm burdens are worst (low and high risk fields) enabling informed management decisions based on evidence • Worm prevention results in overall increased carcase weights and reduced ill-thrift/mortality (assuming the flock is healthy otherwise) • Timely doses reduces cost and labour requirement • Use of time for other farming practices • Strategic rather than routine practice allows YOU to be in control of your flock • Heavier lambs entering the market = potential increased returns • Mature ewes grazing post-weaning can reduce the level of contamination on high risk pastures that have carried ewes and lambs since spring – by ingesting large quantities of infective larvae, killing them off • Clear linkage between improving worm management and increasing KPIs, such as 8 week weights, rearing % and output/ewe. • Mixed grazing allows a range of worm burden control methods.

WEAKNESSES	• Farmers not wanting to pay for the annual subscription for the use of FEC equipment (although the benefits far outweigh) • Sheep only farmers feel restricted in terms of not being able to use other livestock grazing techniques or not practicing crop offtake • Resistance to doses resulting in further challenges and more reliance on other management techniques • Variation in summer and winter rainfall areas means every farm is unique and may not be as reactive to control methods in comparison to other farms • Variable weather makes it difficult to predict the prevalence of parasitic disease
OPPORTUNITIES	• Provide pasture of lowest risk for weaned lambs to avoid high larval levels • Opportunity to use more than one control method e.g. newly sown pasture, or alternative crops. • Rotating grazing between cattle and sheep during the season dilutes the worm burden. • Grazing on bioactive forages, such as chicory and birdsfoot trefoil, can reduce the negative effects of worms in sheep. • Breeding for resistance to worms e.g. pedigree producers breeding for FEC Estimated Breeding Vales (EBVs) – this means the progeny of their rams has the enhanced ability to resist worm challenges once their immune system begins to work.
THREATS	• Buying in infected animals and not using quarantine methods. • Lack of rain resulting in a poor growing season, meaning sheep have to be located to wherever there is grass available. • Poor grass growing season resulting in poor lamb growth rates. • Poor grass growing season resulting in lambs grazing very low sward heights, making the more exposed to infective larvae. • Poor weather conditions causing sheep to become stressed and more susceptible to infection. • Drench cannot be supplied when the buyer needs it, disrupting routine treatment therefore increasing risk of infection. • Increased further resistance to other anthelmintic drenches if strategic approach is not adhered to.

3.2.2 Farmer perspective of the project

Catrin has enjoyed participating in the project and has every intention to continue with the system, especially after seeing the benefits it delivers to the sheep enterprise at Tirlan.

Catrin says: 'The FECPAK system is very easy to use and means you can test as and when you want. When we get the results I then take professional advice as to the most appropriate treatment'.

The project has resulted in Catrin drenching much more strategically, with associated financial and labour-savings, and improved lamb performance. Catrin now has on-going evidence of treatments being effective and the strategic approach should help avoid/delay anthelmintic resistance on the farm.

Catrin emphasises that "this concept is new and unique to every farm, and every year is different, therefore close monitoring of FEC will be an ongoing management tool at Tirlan".

She says that the improvements in flock performance over the past 2 years have given her the confidence that the business is on the right track. Who knows whether we will continue to receive payments post Brexit, which is out of our control, but we CAN be in charge of how our flocks perform for us'.

3.2.3 Alignment to sector's strategic goals

This work contributes to the Welsh Red Meat Sector's strategic objectives[7], specifically in relation to:

- Improving on-farm output from the red meat sector by at least 7% by 2020, by increasing helping to contribute to increasing the national average flock performance.
- Develop and encourage flock health planning, disease prevention and effective quarantine practices to improve biosecurity and reduce the impact of disease.
- Enhance industry understanding of economic benefits of optimising animal health and improving efficiency through effective husbandry.
- Increasing the average weight of lambs produced per ewe in Wales, by at least 10 (to 56kg).
- Develop new business focussed programmes to improve the management, efficiency and profitability of Welsh red meat businesses.

4 Impact on the industry

4.1 Impact on individual business

These are covered in the project Summary section of this report.

4.2 Impact on wider industry

Refer to the Take Home Points for the Industry section in the Summary of this report.

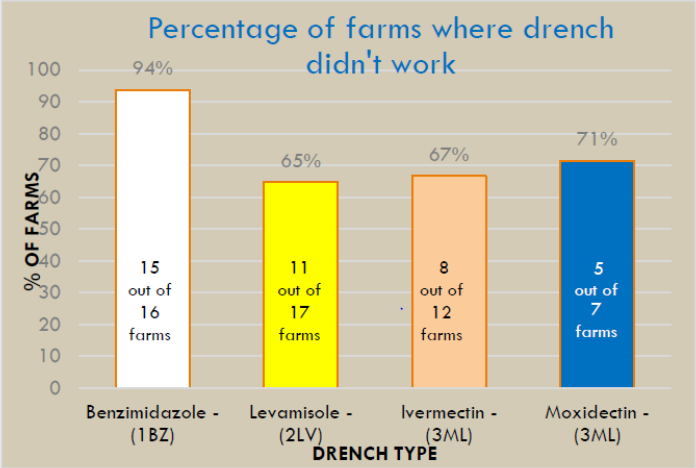
There is scope for the project concept to be replicated over sheep farms throughout Wales. Tirlan is a great example of how sheep farmers can manage their doses dependant on faecal egg counts, reducing their doses, and/or timing their doses to ensure maximum efficacy, thus making cost and time savings.

Longer term, taking an industry wide responsible approach to ensure anthelmintic efficacy is essential, in order to ensure these treatments are effective for as long as possible. Wormer resistance has been detected on more than 80% of the farms that have been tested in Wales and across the UK[8]. Resistance to the benzimidazole (BZ) group is widespread and the incidence of levamisole (LV) resistance is increasing. Reports now indicate that resistance to the macrocyclic lactone (ML) group is also now occurring.

Data from the more recent Sainsbury FECPAK[G2] Project provides a snapshot of resistance issues in Wales and the UK. A total of 52 tests on different drench types were successfully completed on 32 farms which is summarised in the graph below.

[7] Hybu Cig Cymru – The Strategic Action Plan for the Welsh Red Meat Industry

[8] HCC Are you winning the War on Worms booklet.



- The results show that most drenches from the older wormer families aren't working on most farms with 3 out of every 4 tests overall showing a failure.
- The level of efficacy varied from being 0% effective in reducing egg counts to 94% reduction which is the cut off point for determining effectiveness.

These recent snapshot figures indicate that farmers industry wide need to routinely FEC sample in conjunction with applying the SCOPS principles, in order to ensure treatments are effective for as long as possible in the Welsh flock.

4.3 Impact on Welsh Government's cross cutting and priority themes

4.3.1 Climate Change

Changes to the climate have also brought warmer, wetter weather patterns and increased the grazing season. This has also changed the pattern of worm populations. For example, Nematodirus is now not only seen in the spring but can also be seen in the autumn. Haemonchus, the Barber's Pole Worm, a tropical blood sucking parasite is now found throughout the UK despite not normally surviving well in colder northern climates. All of these affect the way that we treat worm infections.[9]

Climate change presents us with production challenges – the need to maintain production from as low a carbon emissions base as possible. Effective worm control plays an important part in optimising the outputs from our sheep, by reducing the impact of worms on growth rates, feed requirements and time to finishing as well as by reducing our use of chemical treatments.

4.3.2 Animal Health and Welfare (AHW)

Poor worm control in sheep flocks can result in major adverse effects on sheep flocks for example, permanent damage to the gut and depressed appetite and food intake.

Exercising good worm control and management promotes good animal health and welfare, resulting in reduced ill thrift and mortalities, thereby achieving a higher % of healthy flocks and successful sheep enterprises.

[9] HCC Are you winning the War on Worms booklet.

4.3.3 Future Generations

Addressing the ongoing challenge of worm burdens and dose resistance in flocks will allow young farmers to see that major challenges can be overcome in the industry, hopefully inspiring them to pursue or continue a career in agriculture.

It will also encourage future generations to make the changes they need to make to achieve a well-managed and more productive business, leading to a more secure future and sustainable lamb production in Wales.

4.3.4 Tackling Poverty

Focusing on key elements such as reduced worms as part of flock management will reduce overall losses, resulting in higher productivity, therefore tackling poverty. More cost efficient business practices result in the potential for increased returns, whether that be from on or off farm income.