

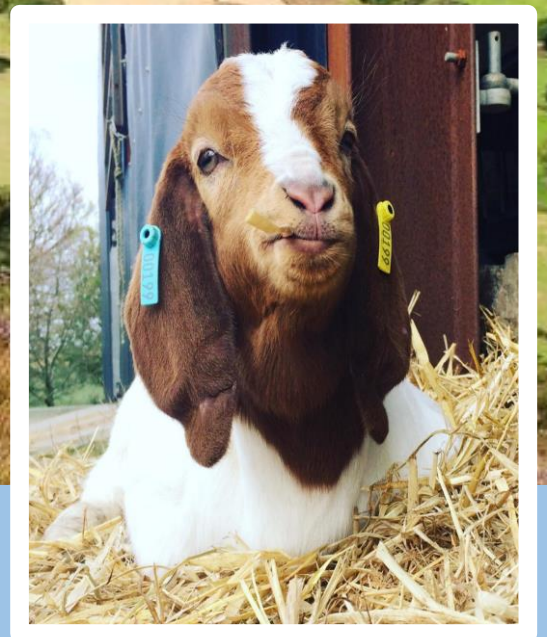


EIPWALES

Cydweithio er ffyniant gwledig
Collaborating for rural success



menter
a busnes



To improve the sustainability of goat meat production in Wales by investigating the efficacy of recommended wormer dose rates for meat goats.



Cronfa Amaethyddol Ewrop ar
gyfer Datblygu Gwledig
Ewrop yn Buddsoddi Mewn Ardaloedd Gwledig
European Agricultural Fund for
Rural Development
Europe Investing in Rural Areas



Llywodraeth Cymru
Welsh Government

June 2022

Contents

1.0 Introduction	1
2.0 Motivation for the project	2
3.0 Participant overview	2
4.0 Process	3
5.0 Goat Body Condition Scoring (BCS)	5
6.0 Develop grazing management awareness.	8
6.1 Sharing information	8
7.0 Results and Analysis of Data	9
8.0 Project findings	16
9.0 Areas for future study	17
10.0 Recommendations	17
11.0 References	19
Annex 1. Project participants	20
Annex 2. From interim report	Error! Bookmark not defined.
Annex 3. Farmers Weekly dissemination article	21
Annex 4. Improving Worm Control in Goats Pamphlet	23

1.0 Introduction

The project “To improve the sustainability of Goat Meat Production in Wales by investigating the efficacy of recommended wormer dose rates for meat goats” was launched in 2018 as part of the European Innovation Partnership Wales programme to sustainably improve productivity and viability within agriculture.

This report presents an overview of information compiled through the project with key practical recommendations for goat farmers and potential areas for further research.

The goat meat market has grown significantly, with global goat meat production increasing 23.12% between 2006 and 2016 (Mazhangara, Irene & Chivandi, Eliton & Mupangwa, John & Muchenje, Voster, 2019), with further increase expected. As consumers make nutritionally informed choices, goat meat is increasing in popularity as the meat contains significantly lower saturated fat than more popular meats, whilst providing comparable amounts of protein.

The growing market for goat meat has encouraged farmers across Wales to diversify to create an additional on farm income stream. Whilst knowledge of best practice for sheep and cattle production is readily available, guidance for new goat producers is less frequent and often relies on sheep industry information for guidance.

At present, the dose rate for many anthelmintic treatments of goats is not widely published and instead it is assumed to be 1.5 times that of the sheep dose. However, the ability of the goat species to metabolise toxins far more rapidly than sheep, and probably cattle, could potentially promote anthelmintic resistance within goat herds, leading to reduced efficacy of wormer drugs across the species.

This project aimed to establish a technical solution to the lack of clarity around the correct dose rate suitable for goats, therefore increasing the productivity and resource efficiency of goat farmers and minimising the application of ineffective or unnecessary treatments.

This project explored the integrity of the assumed 1.5 times the recommended sheep dose which is commonly used in goat management (e.g., if using Oramec where the dose rate for a sheep is 2.5ml per 10kg of bodyweight, for a goat it would be 3.75ml per 10kg of bodyweight).

Four goat farmers came together to explore the efficacy of the recommended wormer dose for meat goats using Faecal Egg Count (FEC) monitoring and Faecal Egg Count Reduction Tests (FECRT). The group sought to provide ‘Best Practice’ worming routines and rates to share with the meat goat sector with a view to reducing potential for anthelmintic resistance. FEC are used for the estimation of worm burden as “There is a good relationship between FEC and total GI (Gastro intestinal) strongyle worm burden in goats” (Rinaldi et al, 2009).

Proposed to begin in October 2018 and run for two years, the project gained approval to begin in January 2019 receiving an extension to run into Autumn 2021 following the impact of the Covid19 pandemic on accessibility over the summer of 2020.

2.0 Motivation for the project

Goats are thought not to develop age/exposure related resilience to GIN (gastrointestinal nematodes), as routine treatments are needed for goats of all ages. This potentially creates an environment that encourages swift development of resistant strains of GIN that may then impact upon both the goats and sheep grazing the same pasture. Coupled with a faster metabolism the advised dose for most treatments is 1.5 times that of the sheep dose, though this is not widely published.

The group of four farmers operate a range of different management systems with variation in access to pasture and sward length. Grazing management is acknowledged as an important part of endoparasite control, this project took different grazing regimes into account.

Finding the optimum dose rate with good efficacy specific to goats will help minimise the effects of internal parasites to the animals, leading to a better kill-out percentage of the animal while also prolonging the efficacy of the product as the optimum dose rate is brought into focus. As the production of goat meat provides a potential diversification to land use, the need to understand how to mitigate further development of anthelmintic resistance to GIN within the red meat sector is important for sustainability of both the existing anthelmintics and profitability of the sector as a whole.

3.0 Participant overview

The farmers involved within the project operate on different scales, utilising a range of management techniques. Over the course of the project due to a variety of factors, herd sizes have changed dramatically.

The project members include the McNamara's, Leyshon's, Church's and Menzies. All of which had a shared, invested interest in the projects aims and objectives.

This group includes farmers with only goats and also those who farm other species, including sheep and cattle.

Grazing sward lengths vary between farms, due to availability of pasture and management systems. A few of the herds involved utilise a longer pasture with goats browsing swards of 10-15cm high.

Over the course of the project all farmers adopted body condition scoring (BCS) and noted the benefits to their production, although this took time to integrate.

Farmers have indicated that they will continue to FEC test to aid diagnosis and selection of the appropriate treatment.



Figure 1 - Group members and Kate Hovers, project veterinarian

4.0 Process

The group met on a number of occasions both physically, and online.

The launch meeting was held at the APHA Laboratory in Carmarthen in January 2019, with the focus of the meeting being to establish effective processes for sample collection, familiarising the group with the parasites that challenge goats and to demonstrate the laboratory's role within the project. During the meeting the group's drench guns were calibrated to ensure that all equipment being used was accurate to 0.5ml to eliminate the opportunity for worm resistance to be hastened through inaccurate delivery.

There was also an emphasis on storing drenches and other treatments according to instructions, being aware of expiry dates and damage caused by extreme cold or heat and the potential to hasten resistant worm populations when using sub-prime products.

The group were advised to regularly check equipment to avoid future calibration errors. They were able to view some of the various parasites which provide a challenge to goats. Additionally, they were fortunate to observe the post-mortem of a goat with a high parasite burden during the meeting, highlighting the importance of early diagnosis and intervention.

The process of Faecal Egg Counting was demonstrated to the group, along with clear guidelines to ensure that all collected samples were usable, the information below was distributed to the group.

FEC Sampling guidelines:

- Before you start, consider the timing of the sample arriving. The shorter the time to lab the better, so posting over the weekend is to be avoided.
- For a monitor FEC sample, draft off 10 goats representing the average animal from a group of similarly aged animals that share a management group (cohort). Avoid the extremes within the cohort.
- Stand them on a clean surface of concrete, stone, or straw and after an appropriate amount of time, collect the faeces trying to separate the individual animals' deposits into their separate pots.
- As demonstrated in the visit to the lab, the minimum requirement of 3g is not going to fill the pot, however as the eggs are more stable in an anaerobic environment, do try and fill the pot, if possible, without mixing individual samples.
- Mark tested animals so that the same animals can be revisited for a post drench FEC should drenching be prescribed.
- Wrap the sealed pots in absorbent material, (blue paper towel, kitchen roll), return to the large plastic bag and post to the Carmarthen VI centre.
- The lab will remove equal amounts of sample from each pot to create a pooled sample which they will then count. This will happen usually on the day of receipt.

The group were reminded that if using home equipment to monitor egg counts, it is likely that results will differ to those received from the laboratory as no two samples, even from the same animals, are identical as they are dependent upon egg dispersal within the sample.

With a generous allowance for FEC within the project, the farmers were able to demonstrate to themselves the merits of FEC sampling both routinely and post treatment.

Guidance for post Drench FEC sampling is as follows on the next page.

Post drench FEC sampling:

- Post drench FEC time intervals are 7 days for group 2 LV (levamisole) (yellow) drenches. The rest are 10-14 days. Bear this in mind when choosing your date to worm so that you avoid posting over the weekend where possible.
- BZ (White drench) works best on an empty stomach. LV (Yellow) not necessary to be empty (goats are particularly sensitive to LV). ML (clear Avermectin) there is a suggestion that 1, 1.5 or 2 times the sheep dose can be used. Kate will confirm at the time she prescribes which group to use.
- Zolvix, use with caution to retain efficacy.
- Repeat as per primary FEC and where possible label each sample with the individual goat ID. AND remember to mark your submission form requesting “post treatment FEC” individual samples.

Kate Hovers, independent sheep veterinary consultant discussed the 5 groups of wormer, (Group 1- White, Group 2 – Yellow, Group 3 - Clear, Group 4 - Orange, Group 5 – Purple) commonly used for goats, noting that goats are particularly sensitive to Group 2 – Yellow drench and highlighted the emerging resistance to orange group, Monepantel (trade name – Zolvix) within the UK. While the orange or purple groups are advised to be used on all sheep farms as a mid or late season drench for lambs, their use in goats is more contentious due to the emergence of resistance. It should still be included in quarantine treatment for animals entering the farm (with a follow up FEC).

The second meeting was held on farm at Moat Goats (the project lead farm) and focussed on developing Body Condition Scoring competency within the group. Yoav Alony-Gilboa, a renowned goat and sheep vet joined the group to deliver hands on training to the group. Using the stock available, Yoav delivered an interactive training session to the group, guiding members through the techniques used to score stock and the key traits to look for, drawing particular attention to the brisket. Group members were encouraged to develop their knowledge and skills throughout the session.

5.0 Goat Body Condition Scoring (BCS)

Unlike the sheep equivalent, there is more focus on the brisket. Like many things that are a bit different, increased familiarity with the practice and recording develops the skill of recognising changes in individual goat’s BCS, improving stock management awareness and enabling timely intervention. The scoring matrix below was provided by Yoav to the group as a reference.

- Various methods exist including that found at <https://goats.extension.org/goat-body-condition-score-introduction/#Introduction>
- Goats can sometimes seem thin “on the outside” as much of the fat is stored intra abdominally
- A combination of sternal (brisket to the layman) fat pad assessment (see illustration below), ribs and lumbar spine cover will allow accurate assessment.
- Practice makes perfect, regardless of method used.
- Better if one person scores as less variability.



Figure 2 Group members taking part in Body Condition Scoring training

Score	Spinous process	Rib Cage	Loin eye
BCS 1 Very thin	Easy to see and feel, sharp	Easy to feel and can feel under	No fat covering
BCS 2 Thin	Easy to feel, but smooth	Smooth, slightly rounded, need to use slight pressure to feel	Smooth, even fat cover
BCS 3 Good Condition	Smooth and rounded	Smooth, even feel	Smooth, even fat cover
BCS 4 Fat	Can feel with firm pressure, no points can be felt	Individual ribs can not be felt, but can still feel indent between ribs	Thick fat
BCS 5 Obese	Smooth, no individual vertebra can be felt	Individual ribs can not be felt. No separation of ribs felt	Thick fat covering, may be lumpy and "jiggly"

Figure 3 Body Condition Scoring Guidance

Illustration of sternal fat pad distribution

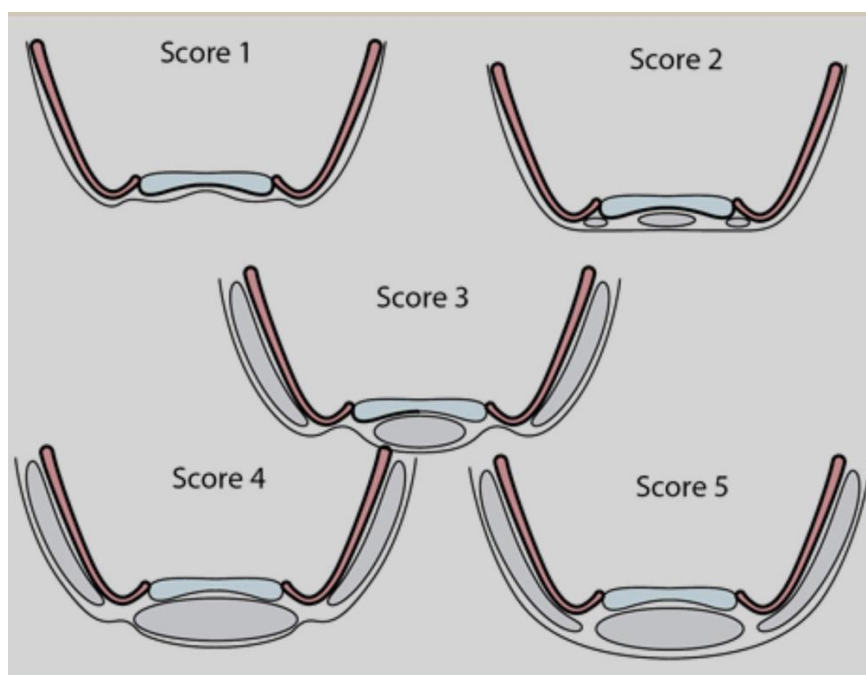


Figure 4 Diagram of sternal fat distribution for each BCS

The competencies developed during the meeting provided the group with additional skills to effectively monitor and better understand the health of their herds and individual goats. Having benefited from practical training from an expert, group members were able to identify trends and outliers within their own management group as the training delivered, boosted confidence in this practice.

When used consistently, BCS is proven to be a highly successful tool for identifying the early symptoms of challenge within groups or the herd.

Following the initial skills-based meetings, participants were encouraged to undertake regular testing and BCS assessment to monitor the worm burden within their herds. Results from FEC testing often prompted further investigations, including *Haemonchus* staining. Once embraced and utilised alongside FEC, BCS quickly became part of routine management and adopted as part of best practice. It really is a question of regular hands on to become comfortable with your own judgement.

Haemonchus contortus is an abomasal worm which feeds on the host animal's blood. *Haemonchus* can be particularly dangerous to small ruminant animals such as goats due to the adult worm's ability to remove high volumes of blood, (0.05ml/day). The risk of death is high to the host animal if untreated due to the high daily egg output of female worms, (5,000- 15,000 eggs/day). The 20-day life cycle means that in ideal conditions levels of infection can build on pasture extremely quickly.

High FEC counts in animals can be an indicator of a potential *Haemonchus* issue. PNA staining of eggs allows for early detection of *Haemonchus* and treatment to be administered as *Haemonchus* eggs appear the same under the microscope as other commonly present Trichostrongyle type worm eggs. Whilst adult worms can be seen with the naked eye within the abomasum, this will not be possible until post-mortem.

Farms were advised to carefully monitor instances of *Haemonchus*. SCOPS best practice for *Haemonchus* management includes mapping the areas where infection levels are high, to allow for avoidance techniques (Reference 2).

Participants were able to access veterinary advice from Kate throughout the project.

6.0 Develop grazing management awareness.

Grazing management was discussed both at a group meeting and individually with farmers.

It quickly became evident on one farm that the grazing was insufficient to support the size of the herd and it was becoming highly contaminated with worm eggs. This led to a new grazing plan where some groups were not grazed and a small number of poorer stock were grazed on a separate small area.

One herd moved to a new farm where they were housed for a longer time until the new grazing was available and then a grazing management plan with regular FEC testing was implemented suggested by the farmers with advice and input from Kate.

All participants adjusted their grazing management to varying degrees over the course of the project with input from Kate and sharing best practice and experience of the other project members.

6.1 Sharing information

Information has been disseminated regularly throughout the project:

- Notably the project featured in Farmers weekly in April 2021.
- Kate has given a number of webinars through Farming Connect.
- A 'Common Misconceptions' pamphlet was produced in order to share information with other goat keepers or potential goat keepers within Wales and more widely.
- In addition, the farmer group members feel suitably confident to share their experiences online through meat goat specific social media chats and group sites.
- Kate will be presenting the project to the Goat Veterinary Society summer meeting in June 2022.
- The project attracted interest at the Sheep Veterinary Society Conference in September 2021.
- In December 2021 the project technical expert Kate Hovers BVSC CertSHP MRCVS co-authored a report with Dr David Cutress Knowledge Exchange Fellow IBERS



Figure 5 Group members learning how to Body Condition Score from specialist, Yoav

7.0 Results and Analysis of Data

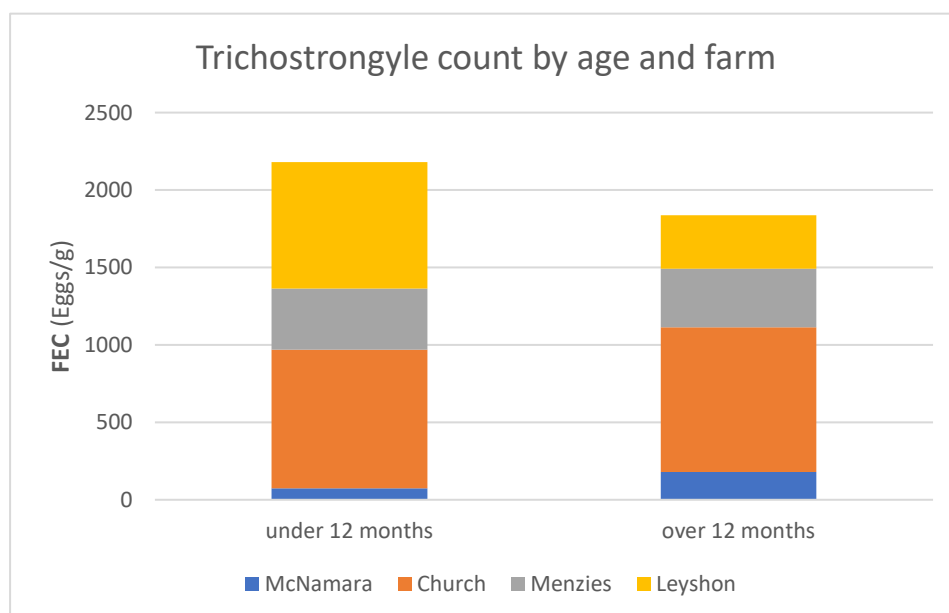
When FEC results suggested that treatment was needed, the previous date and product used was discussed with Kate who provided a recommendation for product and dose rate.

1.5 times the sheep dose was used for BZ (white), Lev (yellow) and ML (clear) drenches. The purple drench was unavailable and Zolvix (orange) was used sparingly when 2 times the sheep dose was used, as per off label advice from the pharmaceutical company.

There were no instances of adverse reactions in goats given these suggested doses of wormer. However, there was one occasion in one herd where 1.5 times the sheep dose of BZ did not have an appreciable effect on FEC, so 2 times the sheep dose was then used. The follow up FEC to this increased dose also showed a total lack of efficacy and goats were losing condition. Therefore Zolvix (Monepantel) was used at twice the sheep dose. Further follow up FEC showed this was fully effective. Subsequently, where a lack of efficacy was found at post treatment FEC, a different treatment group was used (at 1.5 times the sheep dose) with follow up FEC.

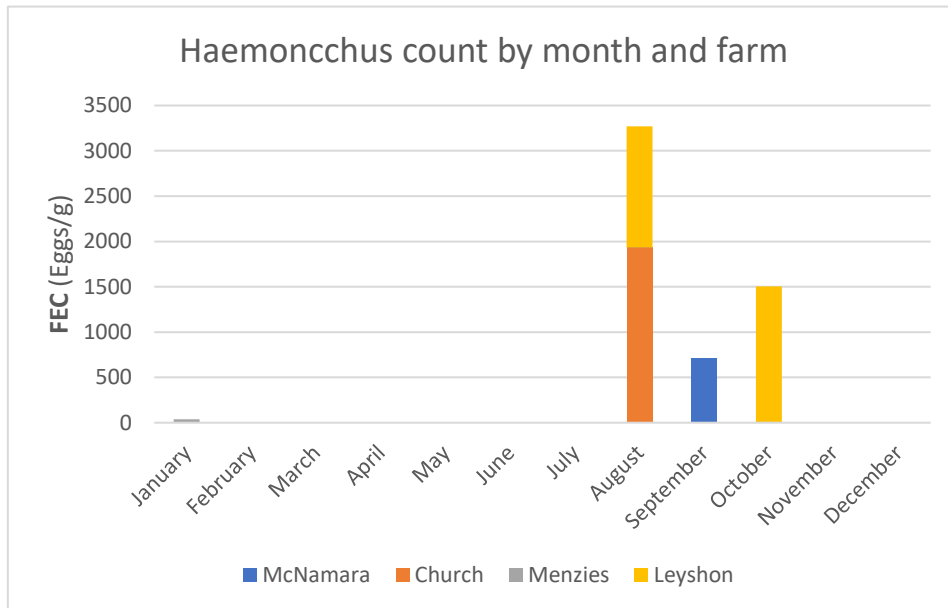
There was no trend across the farms for a reduction in significant FEC with age. The counts for Leyshon were on average, lower for adult goats, but were all at a level where treatment would be recommended. The counts for McNamara increased with age but were generally low so the difference may not be significant, and most were at a level where treatment was not recommended. This concurs with the recommendations that goats, unlike sheep, do not develop age related immunity and so should be monitored and treated when appropriate at all ages. (Please see Graph 1).

Graph 1 Faecal Egg Count by Age and Farm

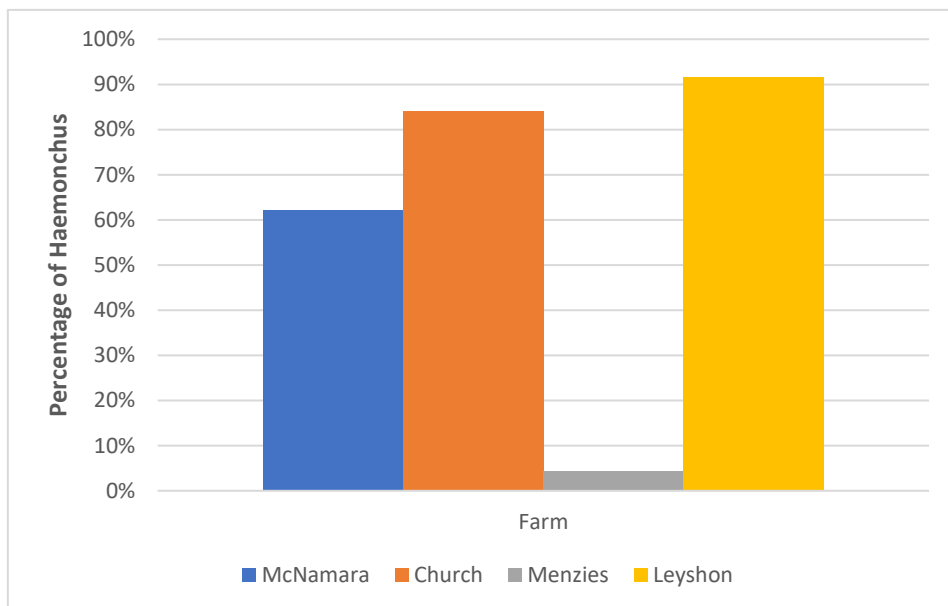


Haemonchus spp were associated with high FEC's. During the project, these occurred in late summer and were a high proportion of the total FEC when found on two of the farms (Leyshon and Church). See graph 2 and 3. These instances were also associated with loss of condition and, for Leyshon, a lack of efficacy of wormer. *Haemonchus* was present in the only high count of 2021 for McNamara. Menzies consistently had only a small number of *Haemonchus* eggs. The goats for Menzies and McNamara maintained body condition.

Graph 2 - Haemonchus count by month and by farm



Graph 3 Percentage of Haemonchus in samples where Haemonchus is present

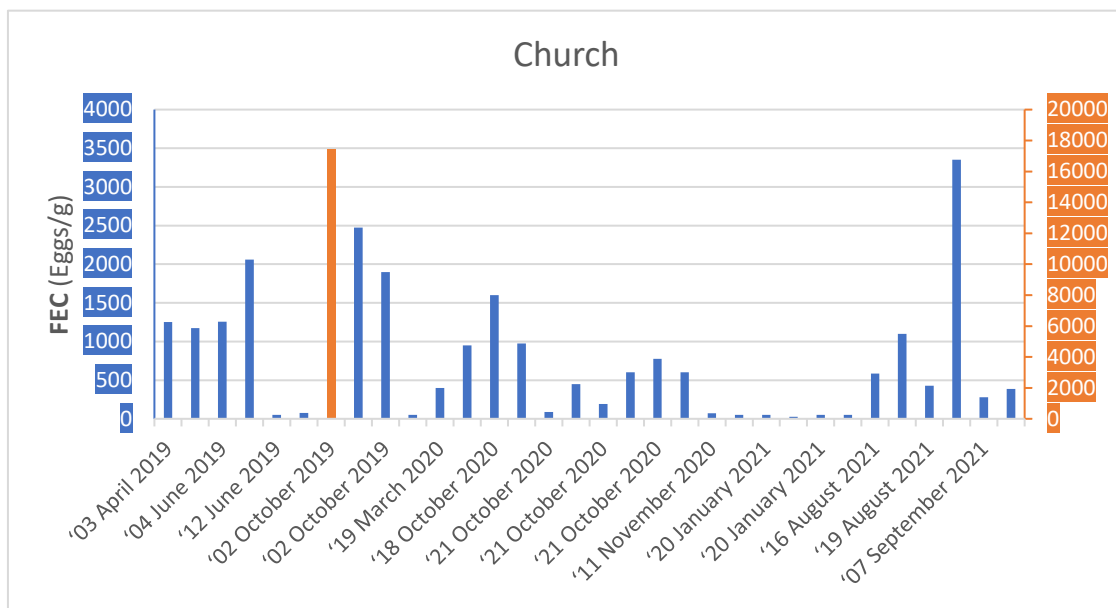


The following graphs (4-7) show the average or composite count. The average is where the given number of samples have been tested individually and the results averaged to gain the result. Composite is where a similar amount has been taken from each of x samples and one test performed. This is for each participating farm.

For Church, following a difficult year in 2019, a new grazing regime was implemented along with regular FEC and BCS, resulting in lower FEC. This was except when Haemonchus became an issue in October 2020 and September 2021. See Graph 4.

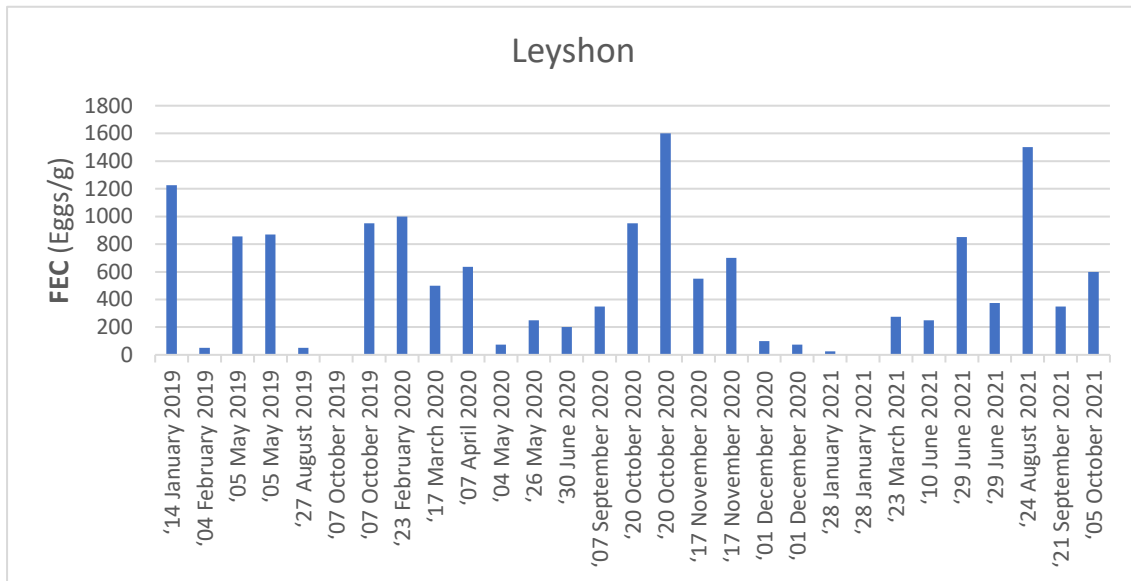
Graph 4 Average or composite count for Church

(The extremely high count in October 2019 is represented by the orange scale. All other counts refer to the blue scale)



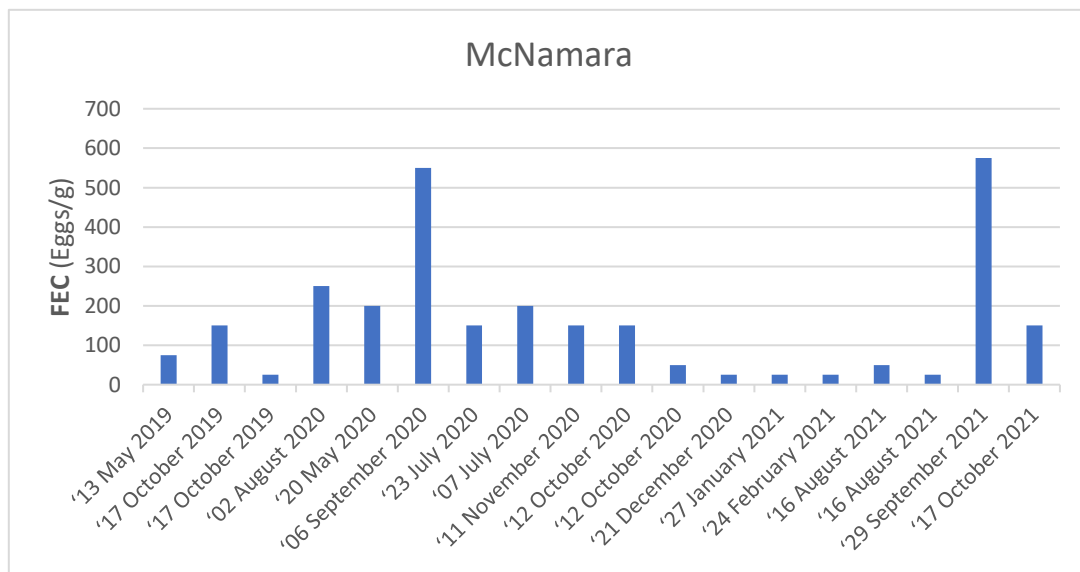
Leyshon had a similar picture to Church with Haemonchus in October 2020 and August 2021, both showing resistance and therefore needing a change of anthelmintic to gain control. See Graph 5.

Graph 5 Average or composite count for Leyshon



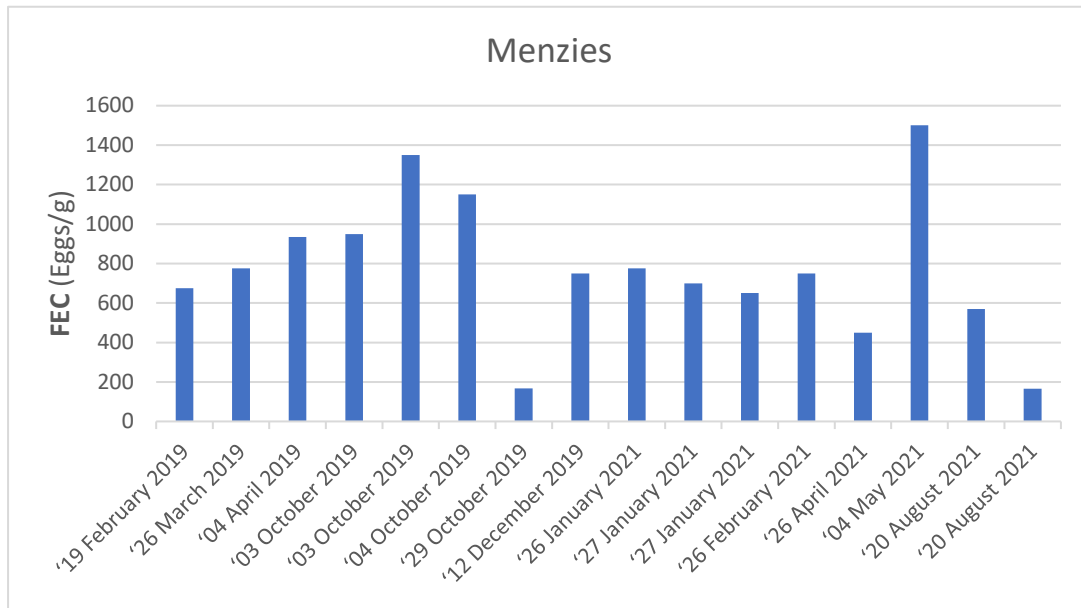
McNamara moved premises and the goats were housed for Winter 2020 until early Summer 2021. The counts on the new, “clean” grazing remained low until Haemonchus was present in September 2021.

Graph 6 Average or composite count for McNamara



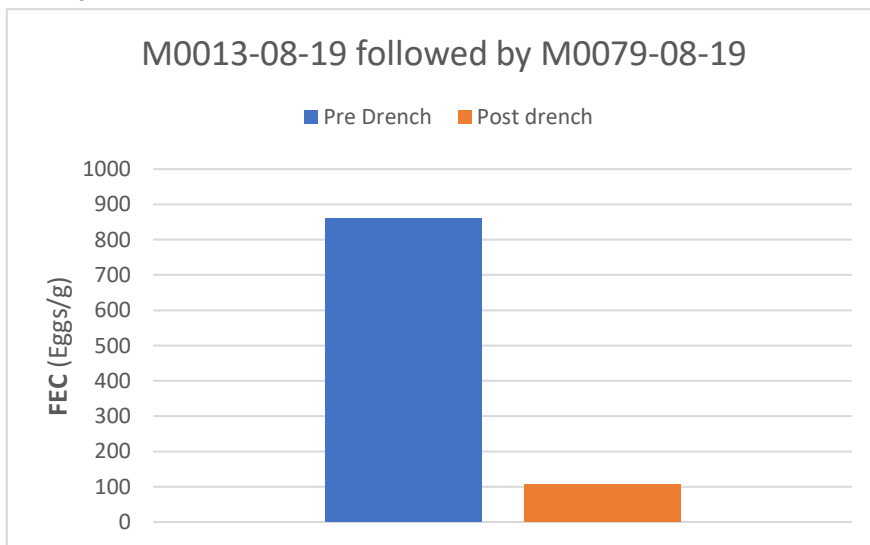
Unfortunately, Menzies were unable to sample in 2020, during COVID. Results were similar across different groups. The rather high result in May 2021 is an average of 4 individual counts where 2 were very high and 2 were much lower. See Graph 7. Usually, an average would only be taken when 8 – 12 individuals are sampled.

Graph 7 Average or composite count for Menzies



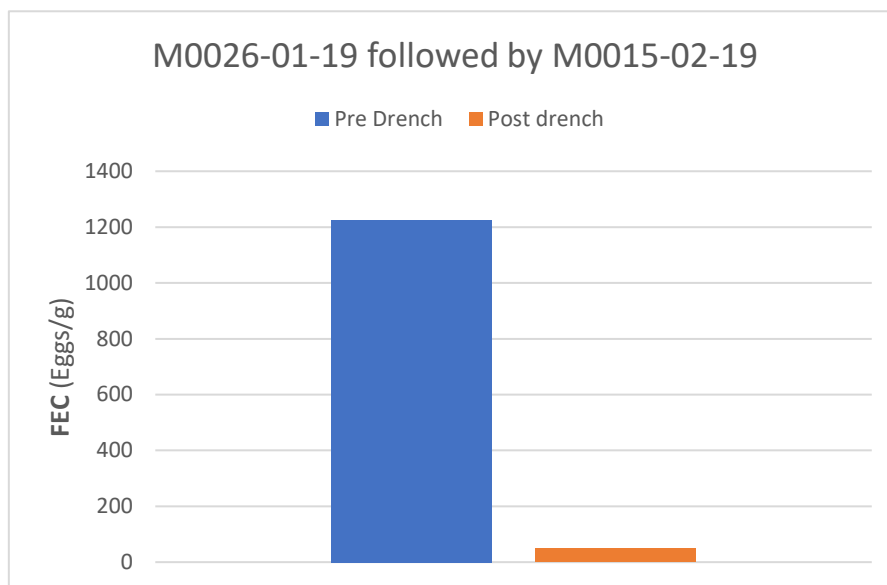
Graph 8 shows pre and post treatment FEC for Levamisole (group 2) at 1.5 times sheep dose. A FEC of 860 was reduced to 100. The post drench average is comprised of 9 counts at <50 and 1 higher. It is assumed that there was some irregularity in treatment for the animal with higher result. This could include incorrect (under) dose for weight, spitting drench out unnoticed or some issue affecting absorption, within the goat’s stomach. This demonstrates why it is good practice to calculate 10 individual counts in a post treatment sample.

Graph 8 Pre & Post treatment FEC for Levamisole (Grp 2) at 1.5x sheep dose rate



Graph 9 shows the pre and post treatment with Avermectin at 1.5 times sheep dose. This shows a reduction in the FEC from 1250 to <50 demonstrating it was an effective treatment method.

Graph 9 Pre & Post treatment FEC for Avermectin at 1.5x sheep dose rate

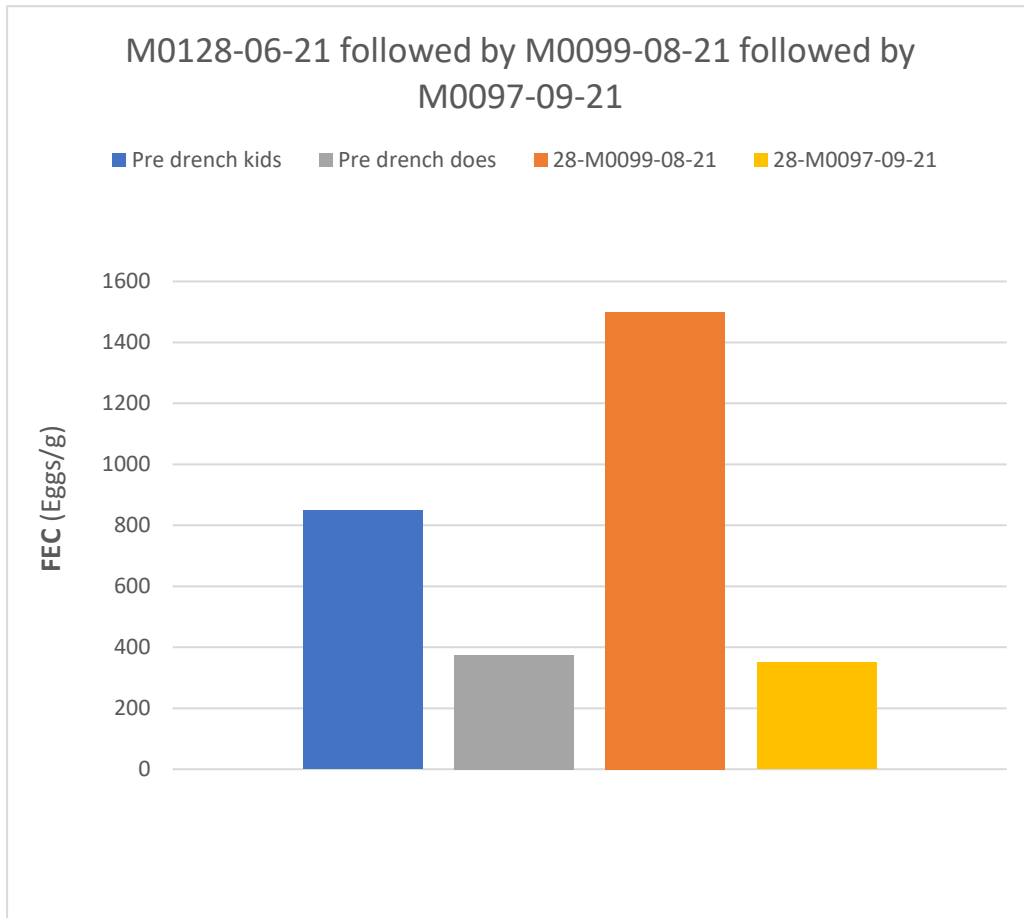


Graph 10 shows pre and post treatment FEC with Levamisole at 1.5 times sheep dose, this had no effect and actually resulted in an increase at the post drench FEC. Haemonchus was also confirmed. Levamisole had been effective against the Trichostrongyle type with no Haemonchus present 2 years previously.

Kids and does were sampled separately pre drench but it was only possible to get samples that could have been from either post drench. While this is not ideal, it shows some of the constraints of sampling in the real herd situation.

The herd were then treated with Avermectin at 1.5 times the sheep dose and the post drench FEC is shown. This caused a 76% reduction and therefore indicates resistance. At this level, the wormer may seem effective and indeed the goats had improved in condition after a dramatic loss between initial drench and first post drench FEC. Avermectin had only been 80% effective previously (in the absence of Haemonchus). It was used because the farmer had a quantity they wanted to use up and were not prepared to buy more drench at that time. This raised concerns whether the drench was still suitable despite assurances about storage temperatures. Further FEC was recommended after the project end.

Graph 10 Pre and Post treatment FEC with Levamisole at 1.5x sheep dose followed by Avermectin at 1.5x the sheep dose rate



8.0 Project findings

Whilst the project acknowledged that all farms are different, common findings can be drawn from the study.

The group primarily focused on goat nutrition to ensure that the animals were more robust to cope with the parasite challenge they face. From this, grazing plans were established and thereafter FEC testing. FEC testing is critical to reducing the reliance on anthelmintic treatments. Also, when such treatments are used, basing management decisions on research means that the treatments can be far more targeted.

Body condition scoring (BCS) has been identified as a highly effective tool by all farms who adopted the practice. BCS is particularly effective as an early warning system to instigate FEC testing. It is an indicator of which animals may be suffering from higher worm burdens when all other factors e.g. age, gestation stage, feed etc. remain equal.

Grazing management has been proven to be incredibly important. The combination of overgrazing and unmonitored worm burdens on pasture can lead to serious problems and reduced productivity.

Varying sward lengths were seen to dramatically impact the worm burden seen within the group/herd. The study found that goats benefiting from longer pastures saw lower worm burden. The majority of worm larvae are in the first 5cms of growth, the instance of larvae then reduces dramatically between heights of 5-10cm. Almost no larvae are found above 15cm as such goats browsing pastures in excess of 10cm have less exposure to larvae, than those grazing shorter pastures (Reference 5).

Whilst *Haemonchus contortus* is an issue for both sheep and goats, it occurs more frequently in goats. This is not new information but a timely reminder as it can reach damaging levels within the herd, very quickly. The *Haemonchus contortus* parasite is significant within UK goats with the capacity to have a severely detrimental effect on herd health and thus sustainability.

We saw significant levels of *Haemonchus* on two farms in 2020 and on one in 2021, this necessitated treating all goats on the premises with a follow up FEC. Resistance was identified in one farm and Zolvix (orange) drench was the only effective treatment. This is significant as there have been suggestions not to use Zolvix in goats due to concerns that this could accelerate resistance. We have not used Zolvix more than once per year on any of the farms and follow up FEC's have shown full effectiveness so far.

From the data submitted indicating ages of goats both in composite groups and individuals, it is apparent that whilst the intention is there, the accuracy of data is dubious. Within the project we had a few goat individuals progressively recorded as considerably younger over the course of a year. This was unintentional though evidences the benefits of utilising a record system that is both accessible and accurate.

Learning points for farmers

A high composite test count doesn't mean all your goats are suffering. Combined with body condition scoring and weighing, it enables a fuller picture to be created and individuals can then be identified for treatment.

The exception to this is *Haemonchus contortus*, when levels indicate treatment, it is important to treat them all as this parasite quickly reproduces to levels debilitating to the goats, wasting inputs and delaying outputs as well as excreting very high numbers of eggs onto pasture for grazing goats.

As consumers are now assessing their meal choices based not only upon their nutritional credentials but also their environmental impact, it is important to understand what this could mean for goat meat farmers.

Goat farmers must take consumer perceptions and motivations into account when establishing their farming system, in addition to effective management. AHDB research shows, that when making purchasing decisions, 59% of consumers value free range certification, compared to 45% identifying products being grass-fed as important or very important (Reference 6). As such, it is important that worms are managed effectively so that goats can continue to graze without adverse effects.

9.0 Areas for future study

A small number of samples suggest possible familial traits affecting worm burdens. Without further investigation it is not known if this is predominately nature or nurture, the participating farmers highlighted a strong tendency for females from a family to socialise both housed and at grazing, which may impact levels through shared exposure.

10.0 Recommendations

- Take regular samples for FEC (Faecal egg count) and record which group they are from and where they are grazing.
As the project progressed the members' enthusiasm for sampling increased as they gained more knowledge and information. Single FEC's whilst useful in that instance, do not give a wider picture of the herd and the farm.
- If FEC's are high, consider looking for Haemonchus, send to a lab that can do a PNA stain for Haemonchus eggs. If Haemonchus is present, then consult with your vet about a suitable treatment programme and test again post treatment to ensure that it has been effective.
- At least once a year, check the effectiveness of treatment with a post treatment FEC (7 days for Levamisole, 12-14 days for other wormers).
- Have a strict biosecurity protocol that everyone knows. This should be for all bought in and returning stock (not just goats!). Isolate, FEC and treat if needed. Wait for follow up FEC before turning to pasture. Discuss other testing with your vet (e.g., Caprine Arthritis Encephalitis (CAE), Johnes).
- Make a grazing plan, preferably on a map of the farm. Decide which groups go where, approximately when and at what stocking density. Record which fields have had groups with high worm counts on. Decide when to rest pasture and what other livestock may be grazing. Remember sheep and goats share worm species, cattle and goats less so and therefore should be taken into account.
- Good medicine storage. Always use products before the expiry date, plus there is often a recommended 'suitable for use' period after a pack has been opened which should be adhered to.
All medicines should be stored securely and at the correct temperature (which varies between different medicine products). Outside sheds are rarely appropriate as temperatures may

reach freezing in winter which can destroy the active ingredients. Many products come in large quantities which can make proper use tricky for smaller herds. Vets are allowed to dispense from a pack so may often supply smaller amounts. While this may appear to be more costly per dose, it avoids the temptation to hold on to a bottle of drench that has been open for months or to use it when it may have lost its effectiveness. Using a less than effective treatment is a costly mistake.

- Calibrate your drench gun, every time you use it! Squirt an amount of the drench you are using into a syringe (take the barrel out and put finger over the nozzle). If the amount in syringe differs from the amount on your drench gun, then adjust the gun and repeat until it is correct.

Participating Farmers comments

On completion of the project, thoughts were gathered from the majority of the participating farmers on how they felt their involvement in the EIP project went. These concluding comments are below:

The project proved to be invaluable - the specific species testing and professional veterinary advice enabled us to fully understand the issues our herd was facing. We are confident that without the project resources we would not have discovered the particular parasite issue nor understood how to manage it. As result of the project, we have made changes to our land management and grazing numbers, our herd are certainly a lot healthier as a result. The project also busted some myths or common misconceptions which we had about the different types of wormer and use of them, something I'm sure would benefit many goat and sheep owners.

Church

This project has allowed us to maintain a high-standard of welfare among our herd of meat goats. It has enabled us to undertake regular worm egg counting in our herd, both for regular monitoring & when there has been a symptomatic goat needing diagnosis. We've benefited from the access to specialist veterinary advice before & after the worm egg counting & analysis of results which has resulted in a more efficient use of wormer for our herd, both in terms of welfare and saving us money by using the correct wormer.

MacNamara

Being part of the group has taught me that as a group we can find out more by communicating results.

I did learn a lot and reduced our usage of Anthelmintics. I would take part in an EIP project again

Menzies

11.0 References

- 1- Mazhangara, Irene & Chivandi, Eliton & Mupangwa, John & Muchenje, Voster. (2019). The Potential of Goat Meat in the Red Meat Industry. Sustainability. 11. 3671. 10.3390/su11133671.
- 2- https://www.scops.org.uk/workspace/pdfs/haemonchus_1.pdf
- 3- <https://cookslarder.co.uk/blog/benefits-of-goat-meat/>
- 4- Rinaldi, L., Veneziano, V., Morgoglione, M. E., Pennacchio, S., Santaniello, M., Schioppi, M., ... & Cringoli, G. (2009). Is gastrointestinal strongyle faecal egg count influenced by hour of sample collection and worm burden in goats?. *Veterinary Parasitology*, 163(1-2), 81-86.
- 5- <https://beeflambnz.com/knowledge-hub/PDF/wormwise-resource-book>
- 6- <https://ahdb.org.uk/news/consumer-insight-consumer-attitudes-to-pasture-reared-livestock>

Annex 1. Project participants

Lead Farmer: MacNamara's.

Farmer Participants:

Church, Fronrhydd.

Leyshon, Glanyrafon.

Menzies, Ty Mawr Uchaf.

Technical Experts:

Lead:

Kate Hovers BVSC Cert SHP MRCVS

Additional:

Sian Mitchell BVMS, PhD, Dip EVPC, Dip ECSRHM, MRCVS

Yoav Alony-Gilboa DVM CertSHP MRCVS.

Facilitator:

Alice Lampard

Innovation Broker:

Jeremy Bowen Rees, Landsker Business Solutions Ltd, Landsker Business Centre, Llwynybrain, Whitland, Carmarthenshire, SA34 0NG

Annex 2. Farmers Weekly dissemination article

LIVESTOCK HEALTH AND WELFARE

Study reveals how to treat goats more effectively for worms

Carrying out tests to identify worm species is helping goat producers in Wales to better treat animals. **Debbie James** reports

Taking part in a study into drench resistance has given goat farmers Damian and Meg McNamara the confidence to graze their goats by picking up parasite burdens early before they spiral out of control.

The McNamaras are among four goat farmers in Wales taking part in a European Innovation Programme (EIP) study to assess effective parasite dosing.

Like the other farmers in the trial, the McNamaras carry out regular faecal egg counts (FECs). However, these do not differentiate between the gastrointestinal parasites teladorsagia, trichostrongylus and haemonchus (Barber pole), and the less harmful bunostomum and oesophagostomum.

Without identifying which species of worm is present in the sample, it is not possible to show which species, if any, show resistance.

The study used treatments to target all gut worms and tested the efficacy by carrying out post-treatment FECs.

Historically, the McNamaras have had a low parasite burden in their Boer-cross herd at Moat Village Farm, New Moat, Pembrokeshire. No anthelmintic resistance has been detected, allowing treatment with BZ (benzimidazoles – white) wormers to continue.

However, post-treatment FECs administered during the project helped to detect an issue with haemonchus. A higher incidence of

THE NUMBERS

3
Number of farms in the trial that showed high levels of haemonchus

2
Number of herds with a high level of haemonchus where Levamisole was effective

£43.10
The current cost of haemonchus stain test at Apha in addition to FEC cost

3
Number of days to get haemonchus test result

haemonchus was reported nationally last year and there were also sudden heavy worm infestations in the herds participating in the project.

Pre- and post-treatment samples are analysed at the Animal and Plant Health Agency (Apha) Veterinary Investigation Centre, Carmarthen. Although a stain test for haemonchus is an additional cost – currently an extra £43.10/sample – the payback from preventing anthelmintic resistance is significant, says vet Kate Hovers, who oversaw the study.

Worm counts were low – rarely higher than 50 eggs/g – but they slowly started to creep up, with speciation tests revealing haemonchus to be the cause.

This finding allowed the goats to be treated individually with Levamisole. This was chosen because it hadn't been used much in any of the participating herds and there had been some resistance to clear and white wormers detected the previous year.

At present, there is no published licensed dose rate for this anthelmintic treatment of goats.

Goats were dosed at 1.5 times the recommended dose rate for sheep, explains Ms Hovers.

Grazing
When the project first started, the McNamaras had one of the biggest goatmeat herds in

FARM FACTS

- 35 goats
- 34ha (85 acres)
- Goats slaughtered at a local butcher
- Sold directly through the farm's Moat Goats business

GET MORE LIVESTOCK ADVICE FROM OUR ONLINE KNOW HOW CENTRE

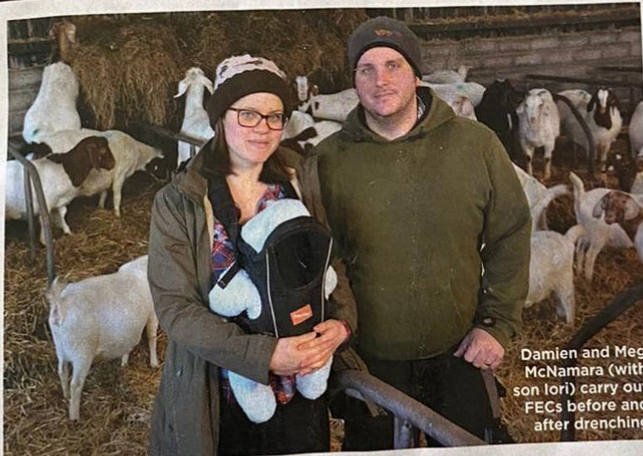
fwi.co.uk/know-how/other-livestock
Subscribers get unlimited access to our Know How centre, including these articles. For help logging in, call 0330 333 9694.

How a goat farmer has lifted AI conception rates

Zero grazing helps dairy goat farmer to reduce concentrates



The Boer-cross herd at Moat Village Farm has a low parasite burden



Damien and Meg McNamara (with son Iori) carry out FECs before and after drenching

OTHER FINDINGS FROM THE STUDY

Enhanced herd resilience was recorded in the herds grazing longer sward length, and kept in different age groups.

Where there was a combination of at least two of the following – low stocking, intermittent grazing or long sward length – herds recorded a significantly reduced worm challenge to the goats.

Evidence of worm resistance to both ML (macrocyclic lactones – clear) and white wormers was found in FEC sampling during initial groundwork in the first year of the project. The stain test found that worm treatments not fully effective against teladorsagia were successful in treating haemonchus. Vet Kate Hovers says this is significant and shows resistance to one drench group is not the same for different worm species.

Further larval studies where worm eggs were hatched in controlled conditions and examined for various trichostrongylus-type worms – teladorsagia, trichostrongylus, oesophagostomum and bunostomum – helped point to which wormer was more effective.

Furthermore, teladorsagia and trichostrongylus are more pathogenic and damaging and therefore a high level of other worms is less of a worry.

EIP WALES PROJECTS

European Innovation Partnership (EIP) Wales aims to take outcomes from research, whether it's a new technique or technologies, and test them at a farm scale.

There are currently 46 projects across Wales that bring like-minded people from different backgrounds together to try to solve common agricultural problems.

For more information on EIP Wales, please visit Farming Connect at gov.wales/farmingconnect or email eipwales@menterabusnes.co.uk

EIP Wales, which is delivered by Menter a Busnes and Farming Connect, has received funding through the Welsh government Rural Communities – Rural Development Programme 2014-2020, which is funded by the European Agricultural Fund for Rural Development and the Welsh government.

Wales, but they have now downsized from 500 to 35 goats to balance the demands of the farm with supporting their young son, Iori, who has cerebral palsy.

The scaling down of their Moat Goats herd has allowed a shift from a housed system to one giving goats access to pasture through rotational grazing. "We feel confident to do this because of the support and advice we are getting from the project," says Mrs McNamara.

They hope effective dosing will improve daily liveweight gains and reduce days to slaughter.

What's next?

As part of the next phase of the project, researchers hope to establish a solution to the lack of clarity around suitable dose rates for goats.

Goats metabolise toxins quicker than sheep and this could potentially promote anthelmintic resistance within herds, leading to reduced effectiveness of wormers across the species. "It should also be noted that goats can experience toxicity where sheep might not, so seek professional advice on dose rates for goats," says Ms Hovers. ■

Annex 3. Improving Worm Control in Goats Pamphlet



Improving worm control in goats

Kate Hovers, MRCVS an independent veterinary surgeon, responds to some common myths and misconceptions surrounding worm control in goats.



Giving mineral supplements is better for the goats in the long term than always assuming it's a worm problem.

It's only a solution if you have a deficiency. There is no evidence that providing supplements will cure an existing worm challenge. In the long term it's usually cheaper to pay for advice than guess and pay for treatments that are not needed.



You start with the clear drenches and work your way through the colours when you see signs that they are not working.

The change of colour from clear to vibrant orange is not an indicator of strength or order in which to use them. Using different drenches at different times (taking veterinary advice) but not sticking to the same type can extend the useful life of all of them.

I have the dates when I need to drench written up on my calendar from last year. Nothing has changed so I'll do the same again.

All sorts of factors influence the exposure of your goats and the herd as a whole to a worm burden including soil and air temperature, length of sward, gestation and stress levels (transport, handling etc.). Plus any new arrivals to the herd can bring in new worm populations.

Adult goats are more resilient to worms than youngstock.

Unlike sheep, goats rarely develop resilience as they get older.

My goats are treated like pets, they don't meet any other animals to catch worms from.

Unless they are permanently housed, they will have the opportunity to 'pick up' worms from pasture.



Goats are like sheep, they have the same gut parasites so we should use the same drenches to treat them.

Very few products are licensed for use in goats. Some drenches that are effective and safe for sheep are toxic to goats. It is essential to plan parasite control with the help of your vet. They will be able to provide bespoke information for your goat herd.

The dose rate (ml/kg) is the same as sheep because they are similar.

Goats have a higher metabolic rate which means they can eat all sorts of stuff safely (not everything though and with strange exceptions such as some sheep drench). A knowledgeable vet will advise the appropriate treatment and dose rate.

If I dose them when they don't need it, does it really matter? It's only a few pounds wasted.

If they don't need it don't treat them. Every exposure of gut parasites to treatment creates the potential for some to survive - speeding up the establishment of a resistant worm population which costs a lot more in the longer term.

All the drenches treat all the worms so I don't need to waste money asking my vet or even testing what worms they have.

The aim is to remove the worm burden without compromising the future efficacy of the drenches available to you and other goat and sheep keepers.

