# FEC Check

# Contents

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# Understanding roundworm egg count results at a glance

A free online tool was developed to assist farmers, vets and livestock health advisors in the interpretation of the clinical implication of faecal egg count (FEC) results from sheep.

Roundworms are an ongoing challenge for sheep farmers in Scotland, threatening the health and welfare of animals and costing the industry an estimated £42.4 million per year in treatment and production losses.

Whilst acute infection can be fatal, most roundworm infections result in poor growth rates and reduced production efficiency. To meet upcoming environmental targets, roundworm infections must be controlled effectively and sustainably.

### Sustainable control

Roundworms are typically controlled using anthelmintics, however, resistance to one or more of the 5 available drug classes is common on UK farms. Targeting our use of anthelmintics, by treating animals only when they require it, could slow the development of resistance and reduce chemical usage on farm.

Faecal egg counts allow farmers to monitor whether animals require treatment, when to administer it and to check whether the treatment was effective. Fresh faeces can be collected from the ground for testing, this can be done individually, or samples from 10-15 animals can be combined and a 'pooled' test conducted.

### Challenges

Although the test itself is simple, knowing what results mean can be difficult.

Testing is available through diagnostic labs, independent veterinary surgeries and is increasingly performed by farmers at home. We know from previous farmer-facing projects that engagement in livestock health amongst vets is variable. This means that farmers sometimes receive results without context or interpretation because test providers don't have a framework to present the results to their clients. Guides for the practical meaning of results are available (www.scops.org.uk/) but extracting the information applicable to individual situations can be challenging.

The FEC Check app provides a visual representation of the clinical implication of test results, to simplify decision-making and combat variation amongst providers.

https://app.moredun.org.uk/fec

# Development of the app

With support from the SEFARI Gateway Innovative Knowledge Exchange (IKE) fund, we designed a prototype tool based on farmer reports developed within previous projects.

The initial prototype tool was developed in 'R shiny', an open source software for building interactive web applications.

Users input roundworm FEC results to produce a graph showing the clinical impact of the counts.

- **Monitoring** mode provides a traffic light visual of the results indicating whether treatment should be considered, aiding decision making.
- **Efficacy testing** mode visualises the reduction in roundworm eggs, comparing pre- and post-treatment results to provide the percentage reduction and information on what this means. Treatment failure can be due to administration/testing issues rather than anthelmintic resistance so a **reliability checklist** has been incorporated into the app – when all conditions have been met, the reduction calculated should be applicable.

- **Post-treatment drench check** mode can be used where a post-treatment test has been conducted but no pre-treatment test. This will allow you to visualise the results and what they mean clinically but will not describe how well the treatment worked. This can be a useful indication though of whether parasite eggs are remaining after treatment in large numbers.

Information pages and links to trusted sources have been included on the following topics:
- Collecting good samples for FEC
- Pooled testing
- Different uses of FEC
- Effective use of anthelmintics
- Anthelmintic resistance
- Types of roundworms

The app also includes a **decision support tool** for farms experiencing **multiple anthelmintic resistance** which was developed by the industry group Sustainable Control Of Parasites in Sheep (SCOPS)

Simplification of results: prototype visualisation graph for FEC Check – graphical representation of the FEC results table.



| Sample | Pre-treatment | Post-treatment |
|--------|---------------|----------------|
| 1 | 261 | 0 |
| 2 | 207 | 0 |
| 3 | 162 | 9 |
| 4 | 207 | 3 |
| 5 | 72 | 0 |
| 6 | 369 | 46 |
| 7 | 189 | 0 |
| 8 | 99 | 42 |
| 9 | 909 | 0 |
| 10 | 405 | 5 |
| 11 | 117 | 9 |
| 12 | 105 | 0 |
| 13 | 720 | 8 |
| 14 | 54 | 1 |
| 15 | 48 | 7 |
| Average | 262 | 9 |
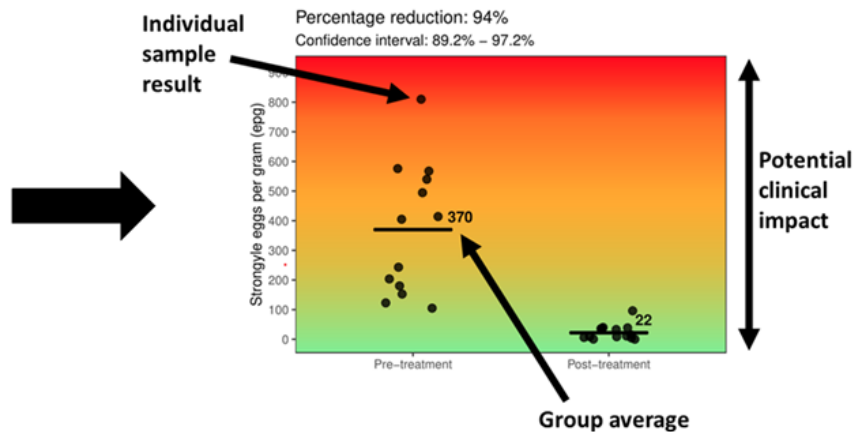
# Stakeholder workshops

Stakeholders were recruited to test the app and provide feedback. Four workshops were held in person; two at Moredun (19/20th January) and two in Crieff (22nd February). A total of 33 stakeholders attended the events; 17 sheep farmers, 2 vets and 14 livestock health advisors.
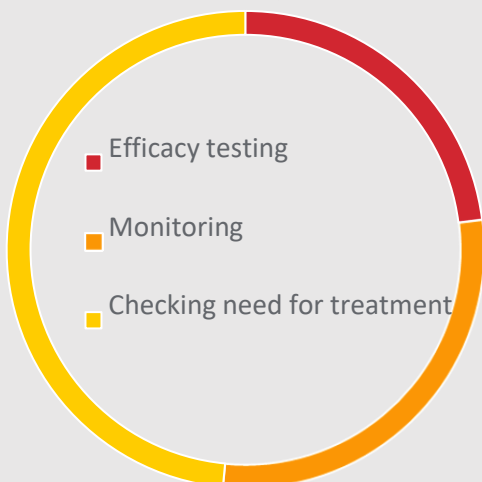
## Current FEC experiences

Sheep farmers attending the workshops were asked a series of multiple choice questions about their experience of faecal egg counts using interactive keypads. The keypads provide instant results graphs displayed on a large screen, which was useful in stimulating round-table discussion. Examples included the variety of uses for egg counting and the extent of information being lost within the current system.
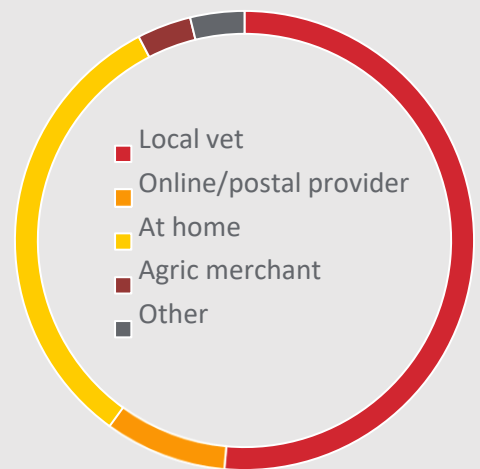
The sheep farmers who attended the workshops were largely already engaged with faecal egg counting; 85% used the test on-farm for a variety of reasons and via multiple providers (see pie charts).

Attendees discussed the range of formats they have received FEC results, with some accounts describing good engagement with vets, and others receiving a text message with numbers only. This variability highlights the need for a tool such as FEC Check to support those receiving little or no interpretation to make informed decisions .

### Where are FEC tests normally performed?



- Local vet
- Online/postal provider
- At home
- Agric merchant
- Other

### What do you currently use FEC for?



- Efficacy testing
- Monitoring
- Checking need for treatment

## Stakeholder groups

Engaging with vets proved difficult, due to time constraints and reasons beyond our control. The workshops were advertised through the sheep vet society mailing list and we also reached out to large animal vet practices local to each of the venues. The lack of engagement with this group was disappointing however, feedback from the two vets who attended was similar to that of the livestock health advisors so we believe that the views captured in workshop events were representative of this stakeholder group. Attempts will be made to disseminate the app to sheep vets through the sheep vet society and update our outputs where necessary based on feedback.

# Feedback

During the workshops, attendees were supplied with different pieces of tech (tablet, laptop or smart phone) and asked to test the app and featured information links.

Overall, feedback was overwhelmingly positive with stakeholders describing the app as "visually great" and "perfect for farmers and shepherds". One participant also commented that this tool could "encourage people to think about what they are doing", which supports our aim of promoting evidence-based treatment decisions .

## Additional functionality

Feedback highlighted several technical and design issues such as sizing, guide information and what should be included with the download graph. Attendees also highlighted the wish to include an option for "drench checking" (a single sampling point post-treatment to check that an anthelmintic treatment was effective) and the ability to analyse *Nematodirus* counts within the app. These additional functionalities were added and alterations were made to the existing material as suggested. The revised app was then re-tested with three of the participant sheep farmers to ensure the amendments were suitable.

## Valuable to a range of stakeholders

Vets and livestock health advisors were included in the workshops to assess whether their needs and comments differed from those of sheep farmers (the primary stakeholder group for this tool). Comments, opinions and future aspirations regarding the tool were similar between the groups. Vets and advisors remarked that the tool could be useful for them when returning information to clients, highlighting potential uses beyond the primary target stakeholders without the need for further modifications.

## Future aspirations

Stakeholders were also asked about additional app functions that they would find useful.

Two key features were highlighted by attendees:

- The ability to look at longitudinal data, draw out trends in roundworm infection over time and between years (this was raised by attendees in all four workshops)
- The ability to alert local farmers if multiple users within the same region logged high FEC results, warning them to be vigilant and test their flock

These functions were out-with the scope of the current project but with further funding and development this app could be built upon in the future to meet these industry wishes.



Stakeholders taking part in FEC Check workshops.

# Raising awareness

A logo and leaflet were designed to publicize the online tool (page 8), these will be printed and disseminated at agricultural events attended by Moredun throughout the summer together with live demonstrations (NSA Welsh Sheep, North Sheep and The Royal Highland Show). The tool will also be highlighted through the institute's social media platforms. We plan to create a "how to" video which will be embedded within the homepage of the app.

The findings and outputs of the IKE project have been presented through the following knowledge exchange modules and events:

## Stakeholder engagement

- SEFARI blog
- presented to RESAS policymakers during a lab-visit at Moredun
- Discussed at on-farm events
- Presented to farmers, vets and researchers at international stakeholder meetings in Canada about the future of small ruminant roundworm control
- Article in Sheep Farmer magazine
- Article in the Moredun members magazine

## Scientific audiences

- Kenyon F, Geddes E, Duncan J, Morgan E, Stubbings L, Melville L (2023). Making roundworm data ewe-niversal for all. British Society of Parasitology. April 2023; Edinburgh, Scotland.
- Geddes E, Duncan A, Lamont K, Duncan J, Kenyon F, Melville L (2023). "FEC Check": Development of an online tool to aid farmer understanding of roundworm faecal egg counts.
- University of Edinburgh PhD day. April 2023; Edinburgh, Scotland
- British Association for Veterinary Parasitology. May 2023; virtual meeting
- European Federation of Animal Science. August 2023; Lyon, France

## Additional funding

We successfully co-designed and developed a functional app with seed-funding from the SEFARI Gateway Innovative Knowledge Exchange Fund. This allowed us then to leverage additional funding from the Veterinary Medicines Directorate to translate the app from R shiny to JavaScript, allowing it to be hosted on websites and adapt to use on mobile devices. At this point we also incorporated additional existing resources including a decision support tree to assist farmers facing multiple anthelmintic resistance and resources developed by Moredun for the Animal Health and Welfare Pathway on collection of samples, pooled FEC protocol and types of roundworms.

Leaflet developed to promote the FEC Check app at agricultural shows and events throughout the summer.

## Acknowledgements

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