



Animal science: delivering for all our needs

Sustainable control of roundworms in livestock

Fiona Kenyon

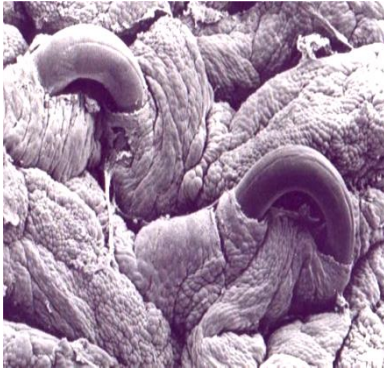
Principal Investigator | Moredun Research Institute

Top health and welfare issues in UK sheep industry



Rank	Meat sheep
	Mostly outdoor
1	GI parasites
2=	Lameness
2=	Nutritional issues
4	Mastitis
5	Ectoparasites
6	Poor maternal relationship
7	Morbidity and mortality rate

Roundworms are everywhere!



Infection affects productivity, carcass quality and ~10% lower value at sale

Infections with multiple worm species common

Subclinical disease common, so difficult to spot



Recent (2020) estimates suggest annual costs to UK meat sheep industry of:

£15 million (€ 16.9 million) in lost production

£27.3 million (€ 30.7 million) in treatment

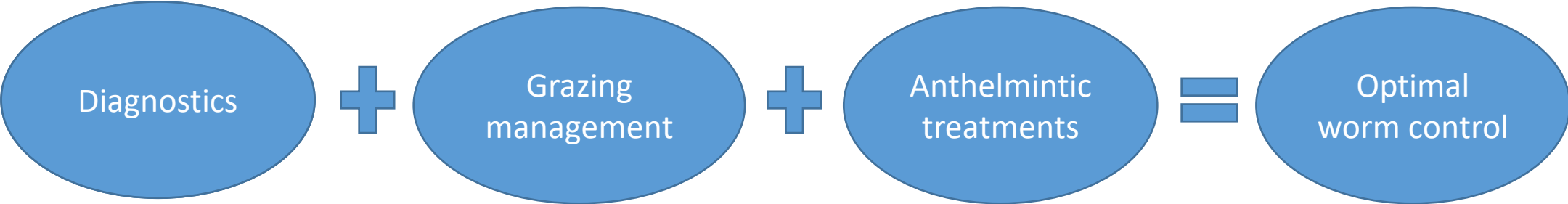
Total (£42.4 million/year)



Charlier et al, 2020. Preventative Veterinary Medicine, 182; 105103.

Control of roundworms

- What parasites are present
- Extent of challenge/risk of disease
- Efficacy of anthelmintics



Grazing history
Management history
Clinical signs
Forecasting
Faecal egg counts
Weight gain (EID)

Rotational grazing
Co-grazing
Clean grazing
Late turn out
Early housing

Product choice
Timing
Correct dose rate
Appropriate storage
Appropriate administration
Effective treatment

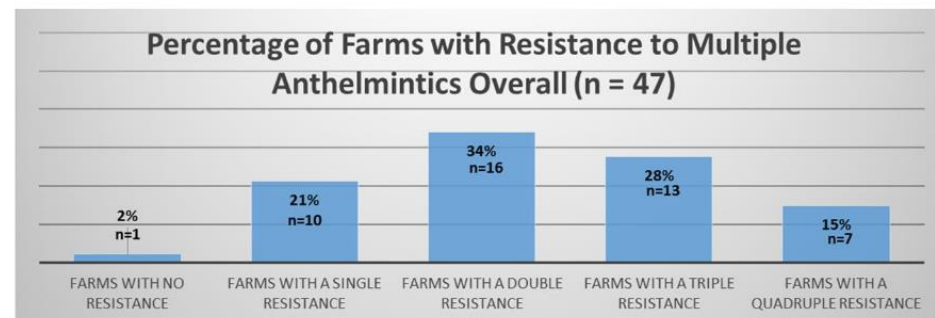
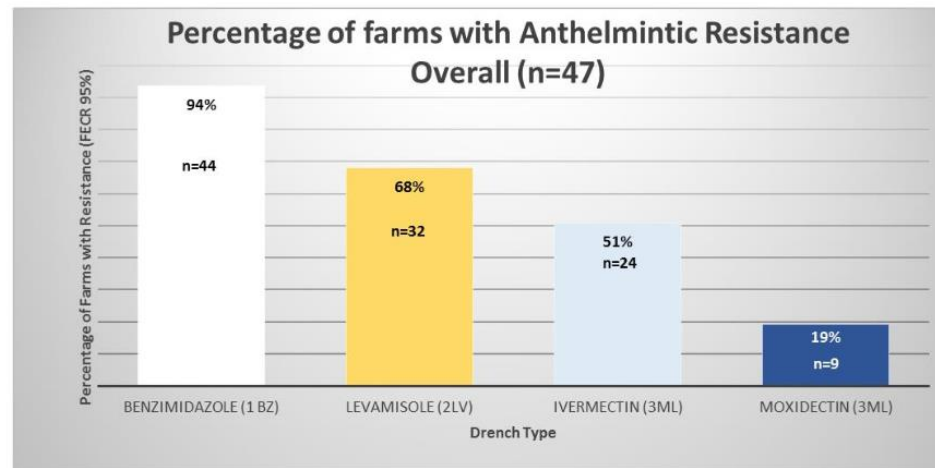
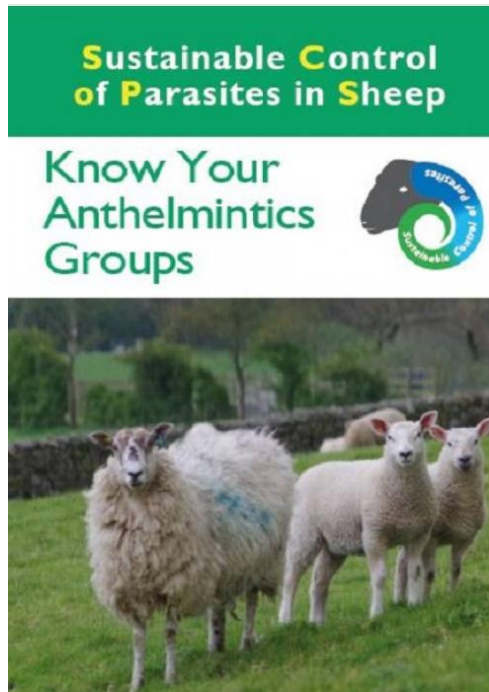
Current control

Wormers (anthelmintics) are only curative treatments available

Five classes available:

BUT worms can develop resistance

- can lead to treatment failures
- clinical disease
- sub-clinical production loss more common



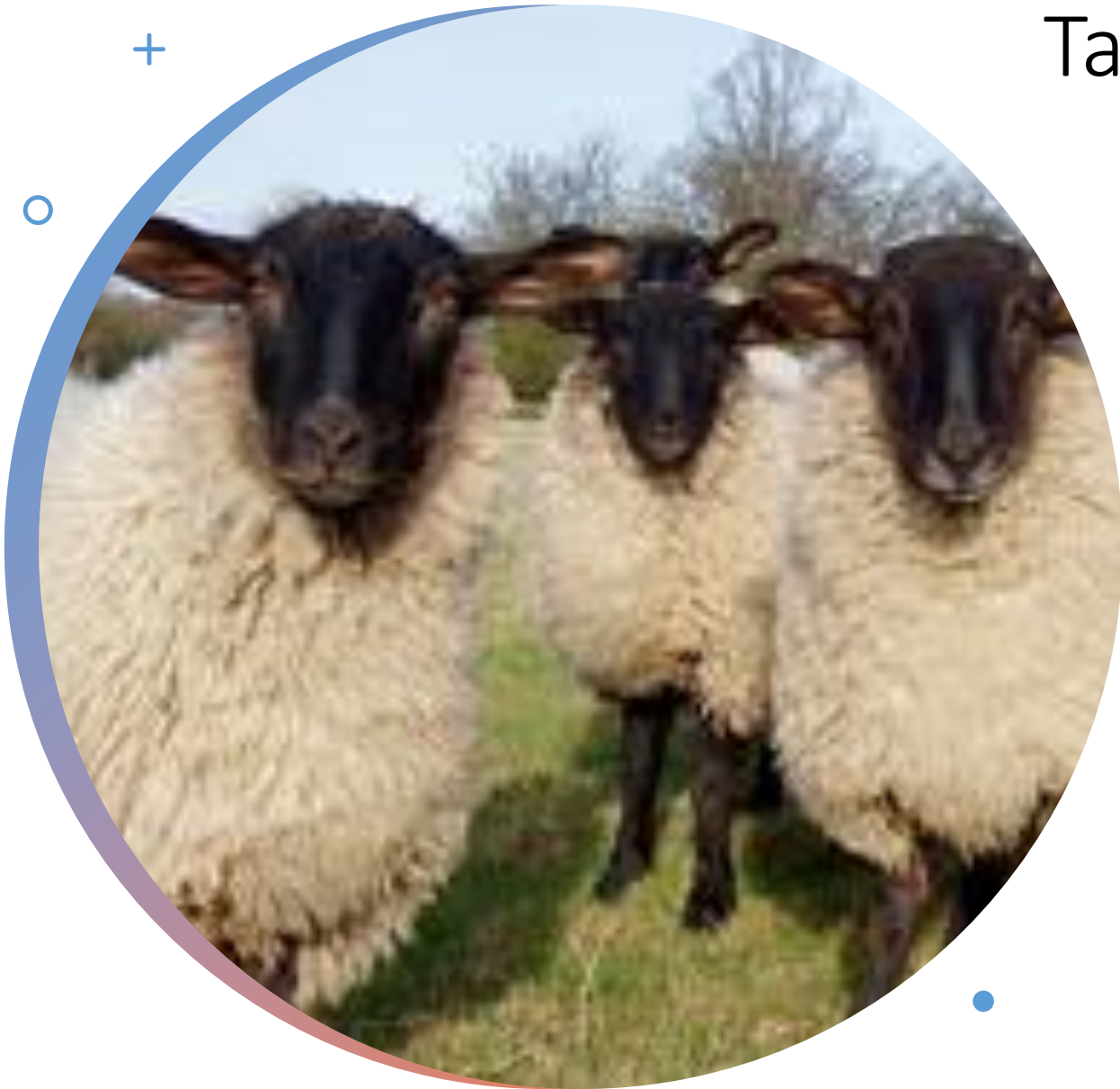


Need to use anthelmintics carefully

- Only 5 actives on market (for sheep)
- ‘Little as possible, as much as needed’!
- Target treatments – use FEC, monitor group performance
- Only administer wormers to certain animals



Imagine being able to weigh and select which lambs will benefit from wormer, as easily and calmly as this?



Targeted Selective Treatment (TST)

Roundworm control method where wormer is given to only underperforming lambs

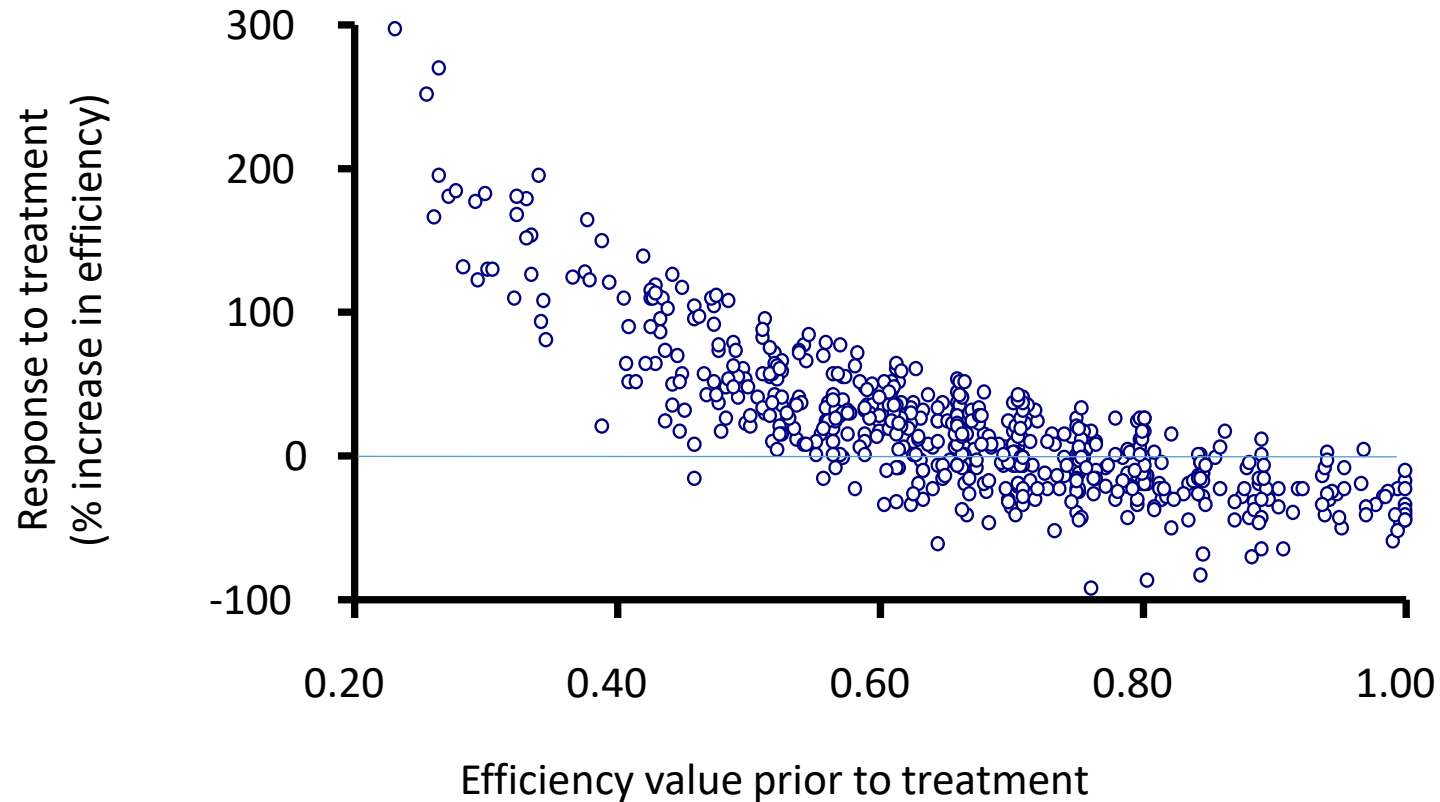
- optimise the amount of wormer used
- reduce the selection pressure on the worms
- rate of wormer resistance is slowed.

In prime/fat lamb production system,

short-term weight gain

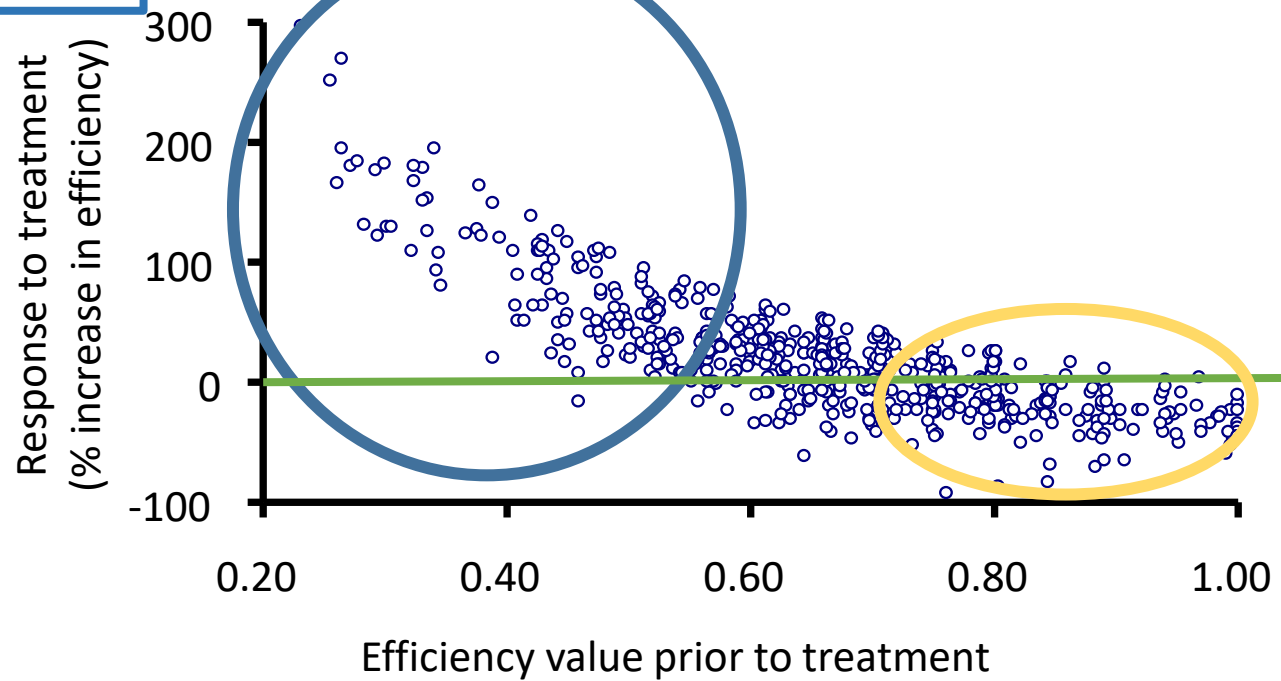
offers simple, quick and effective identification.

Production efficiency in sheep varies within a group; anthelmintic treatment can improve efficiency



We can make wormers work harder for us by focusing treatment on those lambs that will respond to worming with increased efficiency of production

Underperforming lambs that show increase in performance post-worming



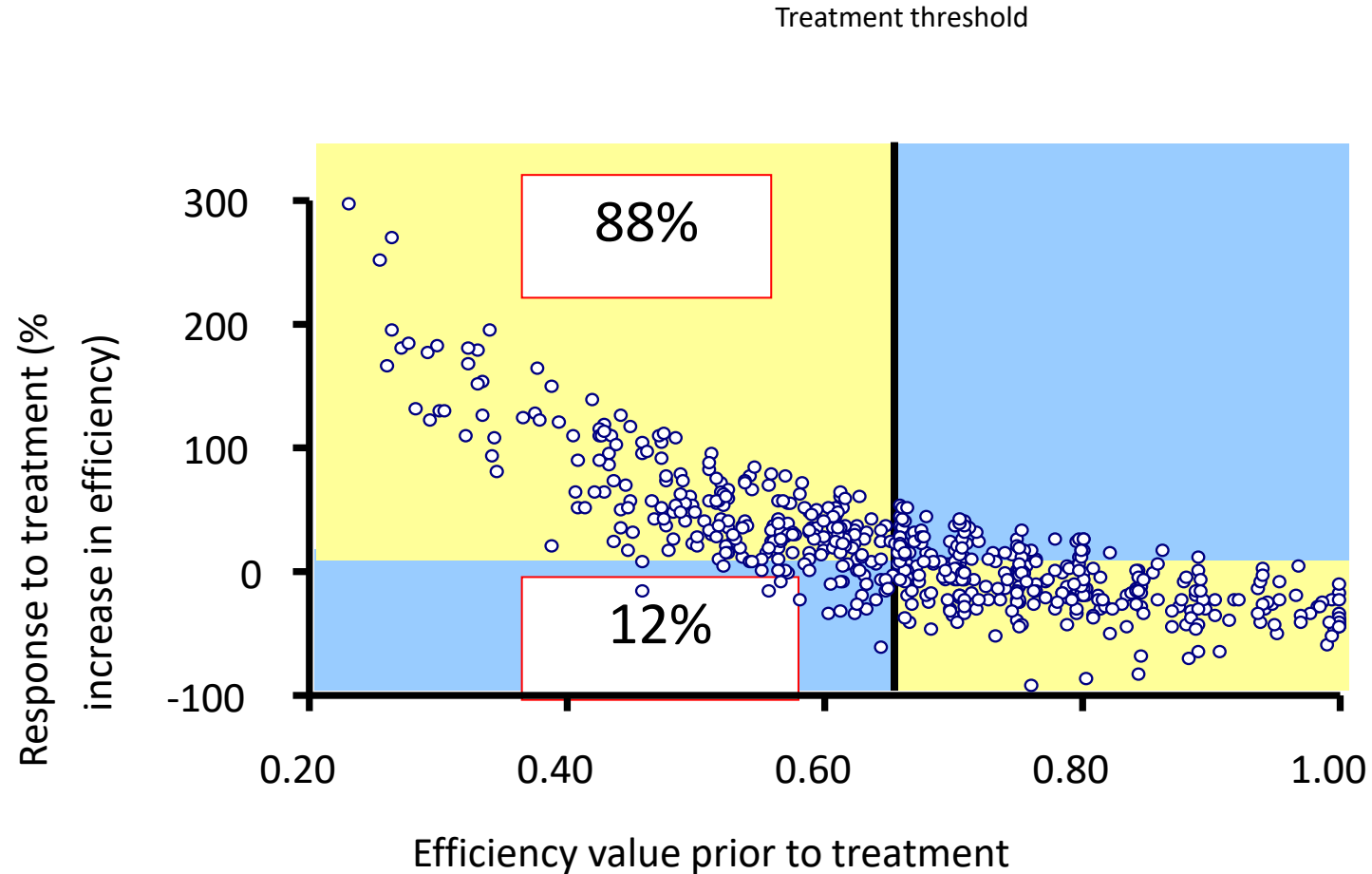
Well-performing lambs that show no increase in performance post-worming



Happy Factor TST short-term weight gain

- Target underperforming animals
- Reduce wormer use by 40-50% compared to other strategies
- Maintain lamb performance
- Slows development of resistance
- Reduce costs and labour
- Successful in a range of farming systems and breeds

The happy factor identifies lambs requiring treatment with 74% sensitivity, 88% specificity



TST reduces wormer use, maintains weight gain, slows wormer resistance and lower GHG

Group	Mean No. Treatments	Mean final bodyweight (kg)	Mean IVM efficacy 2010 (95% confidence limits)	Mean GHG emission (kgCO ₂ e/kg LW)
Monthly	4.0	36.84	62% (55, 68)	2.17
TST	1.8	36.02	86% (81, 92)	2.22
Strategic	2.0	35.86	86% (83, 90)	2.27
Clinical	1.4	33.65*	83% (78, 88)	2.48*

Clinical – production cost and extra 10% emission of CO₂e per kg of weight gain
Kenyon et al, 2013, IJP:DDR, 3:77-84; Kenyon et al, 2013, Agriculture, 3:271-284

Software development

- Farmers, farm advisors and vets included in design process
- Wanted way to determine minimum weight target automatically
- Dashboard to visualise information created

The TST APP Dashboard

The dashboard features a dark header with the AgriIgnite logo, user name 'Fiona Kenyon', and 'MoreDun Research Institute'. A red sidebar on the left contains navigation options: Main Navigation (Dashboard, Fields, Map, Calendar), Admin (Farm Details, Business Details, Users), and a 'Users' link. The main content area is titled 'View Sheep Group [edit]' and is divided into three sections:

- Group Details:** Shows 'Group Name: Firth TST 2021'. A table lists field IDs and their on/off dates. A 'Download Treatment History' button is present.
- Shearing:** Includes input fields for 'Date' (05/10/2021), 'Wool Weight' (2 kg), and an 'Add' button.
- Map:** An aerial satellite view with a red polygon highlighting a field area.

Below these sections are:

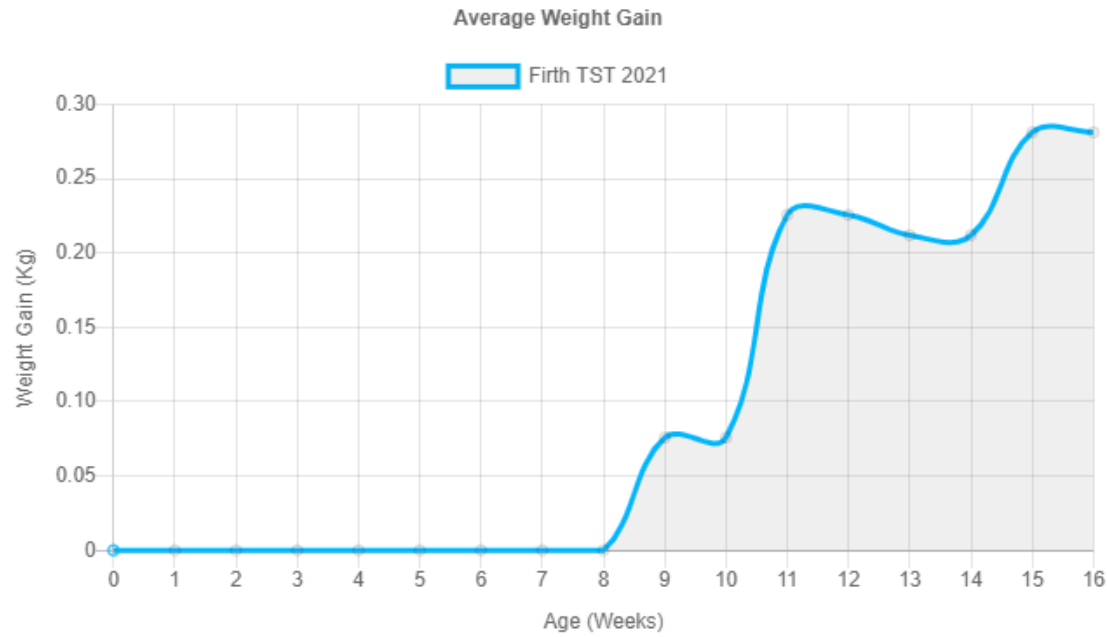
- Grass Quantity Readings:** A table with columns 'Date' and 'Quantity DM Kg/Ha' containing four rows of data.
- Chart:** A line graph showing 'Grass Quantity Readings' over time, with data points at approximately 2678, 1785, 2678, and 2500 kg/ha.
- Add New Grass Quantity Reading:** A form with 'Date' and 'Quantity DM Kg/Ha' input fields and a 'Save' button.

Desktop and phone

The mobile interface shows a 'Register grass growth' screen. At the top, it displays the time '17:19' and battery level '76%'. The screen is divided into three main sections:

- Your field location:** A map showing a red polygon on a field, with 'Firth Rd' labeled. A 'Google' logo is at the bottom left.
- Reading:** A numeric input field showing '0000' with 'Kg DM/ha' units. It includes '+' and '-' buttons for adjustment, and 'CLOSE' and 'SUBMIT' buttons.
- Bottom:** A standard Android navigation bar with back, home, and recent apps icons.

Lamb Performance



Weather Details



Current:

Weather: heavy intensity rain

Wind: WNW, 3 mph

Temperature: 8°C

Sunrise: 7:23 Sunset: 18:38



Tomorrow:

Weather: moderate rain

Wind: NW, 13 mph

Temperature: 11°C

Sunrise: 7:25 Sunset: 18:35



Thursday:

Weather: light rain

Wind: SSW, 11 mph

Temperature: 16°C

Sunrise: 7:27 Sunset: 18:33

Groups

Group	Head Count	Weight	Growth Rate		
Firth TST 2021	96	48.17 Kg	0.28 Kg/day	view	Edit

[Create](#)

Upload To Ignite

[Choose file](#) No file chosen

-- Select Default Group For New Sheep --

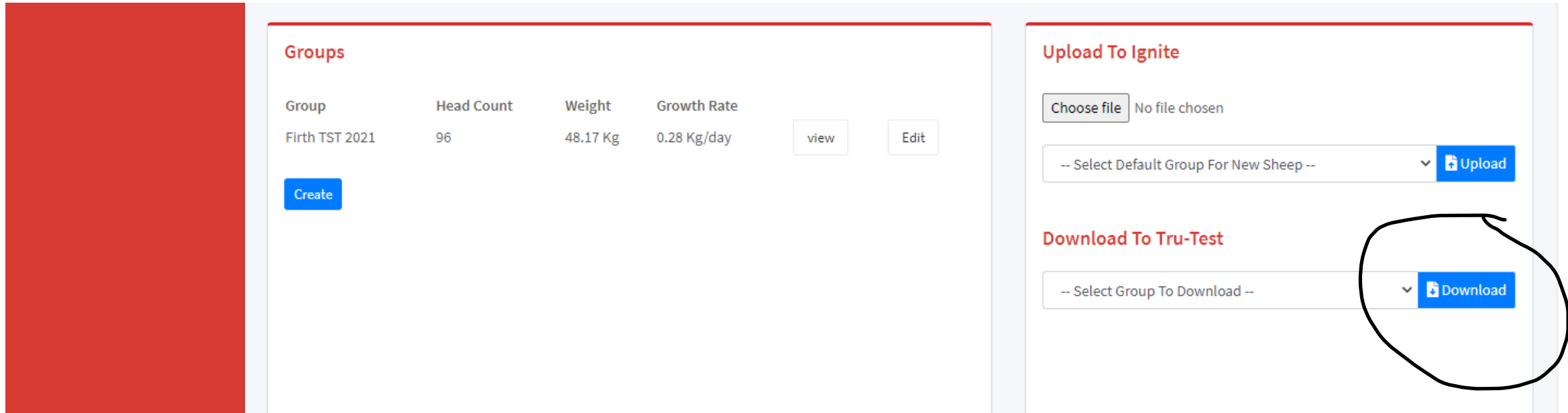
[Upload](#)

Download To Tru-Test

-- Select Group To Download --

[Download](#)

To get minimum target weights...

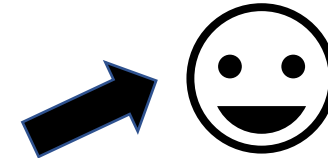


The screenshot displays a web application interface with a red sidebar on the left. The main content area is divided into two panels. The left panel, titled 'Groups', contains a table with the following data:

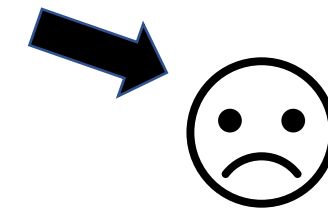
Group	Head Count	Weight	Growth Rate	view	Edit
Firth TST 2021	96	48.17 Kg	0.28 Kg/day	view	Edit

Below the table is a blue 'Create' button. The right panel is titled 'Upload To Ignite' and features a 'Choose file' button with the text 'No file chosen'. Below this is a dropdown menu with the text '-- Select Default Group For New Sheep --' and a blue 'Upload' button. The 'Download To Tru-Test' section below it has a dropdown menu with the text '-- Select Group To Download --' and a blue 'Download' button, which is circled in black.

Weigh lambs and draft against target weight





Have reached weight target,
No treatment



Did not reach weight target,
TREAT

Visual check for any other issues recommended for 'sad' lambs

Includes a medicine record

🔔 Fiona Kenyon
Moredun Research Institute 

Main Navigation

- Dashboard
- Fields
- Map
- Calendar

[Moredun Research Institute](#) / [Firth Mains Farm](#) / [Sheep Dashboard](#) / Unhappy Sheep

Sheep Needing Attention

The following sheep have been identified as being at risk by the happy factor, and should be treated immediately.

Sheep							
826 056154013832	Firth TST 2021	F41 (NT/26005/60003)	52.50 Kg	0.0 Kgs / day	0.43	Yes	<input type="checkbox"/>
826 056154013836	Firth TST 2021	F41 (NT/26005/60003)	45.50 Kg	0.0 Kgs / day	0.40	Yes	<input type="checkbox"/>
826 056154013840	Firth TST 2021	F41 (NT/26005/60003)	44.00 Kg	0.1 Kgs / day	0.58	Yes	<input type="checkbox"/>
826 056154013842	Firth TST 2021	F41 (NT/26005/60003)	45.00 Kg	0.0 Kgs / day	0.49	Yes	<input type="checkbox"/>
826 056154013846	Firth TST 2021	F41 (NT/26005/60003)	55.00 Kg	-0.1 Kgs / day	0.30	Yes	<input type="checkbox"/>

Showing 1 to 55 of 55 entries

Apply Treatment

The following treatment will be applied to all selected animals

Medicine*


Amount Administered*

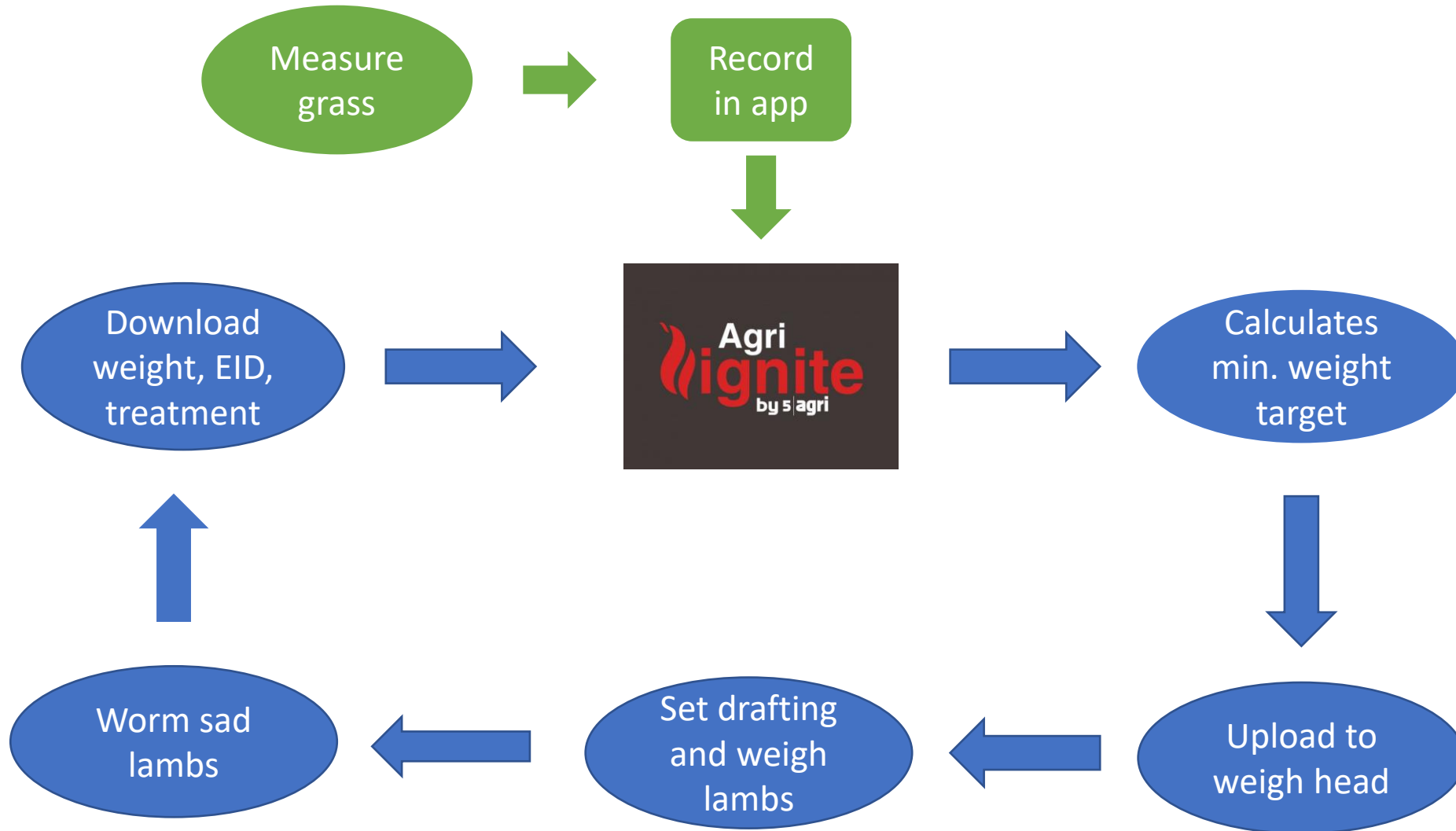
Batch No.*

Expires*

Administered By*

Date*





On farm validations

System simple to use and gives farmers better understanding of growth rates on farm

- No impact of leaving some lamb untreated,
- Gained confidence in using technology

Commercial Farms:

- AGR
- EG
- LS
- MC1

Institute Farms:

- MRI
- SRUC





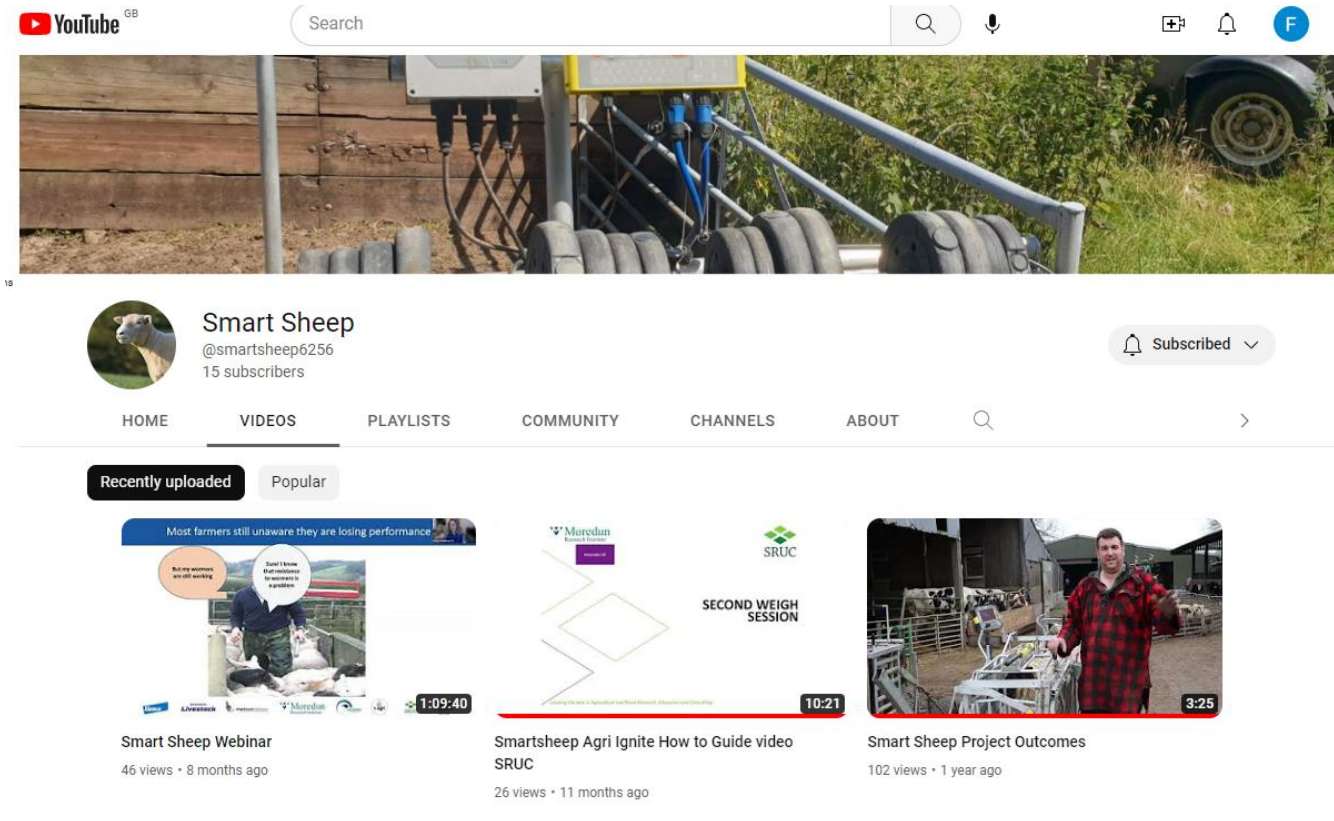
On farm validations complete

- Plenty of teething problems
- Main issues
 - Connectivity between equipment
 - Data format
 - Lack of familiarity with equipment, both farmers and advisors
- All but one farmers had success in using Agrilgnite

SmartSheep: Precision Parasite Control & Integrating Technology

Youtube Channel Development

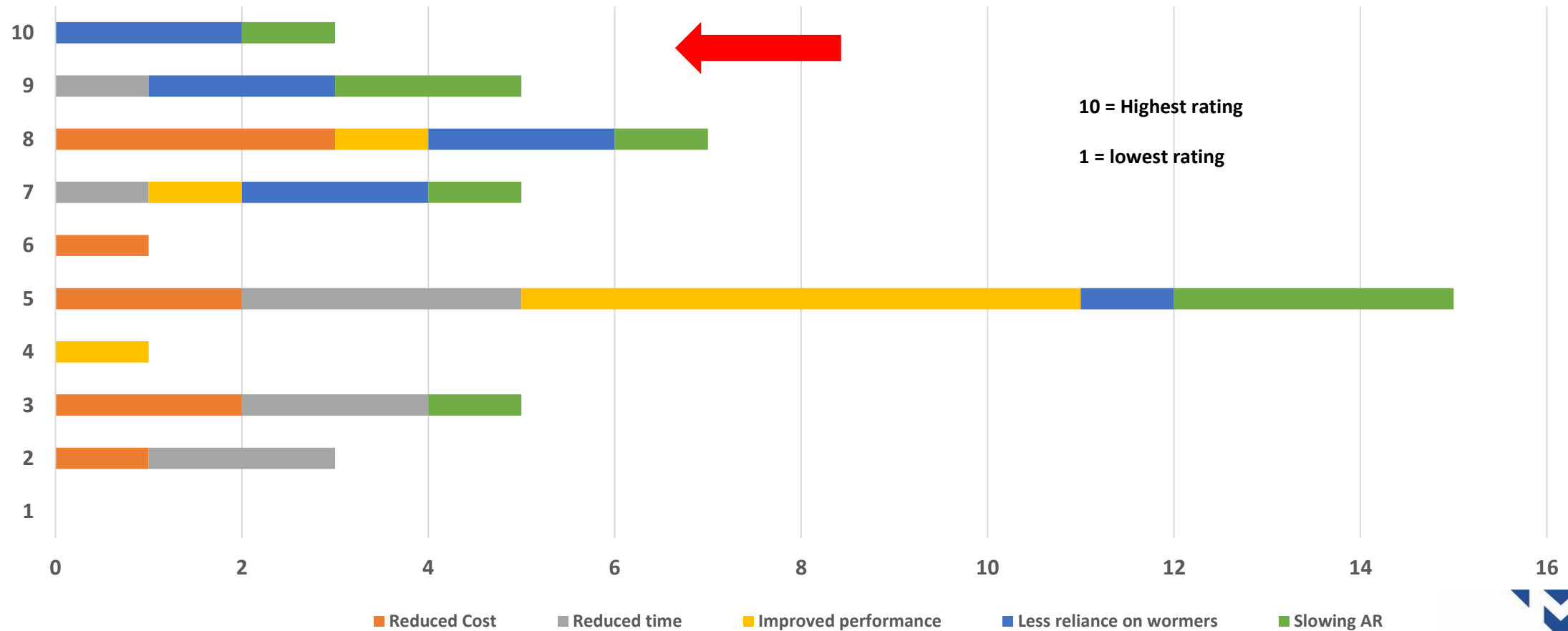
- Series of videos developed
- Storyboard but also to stand alone
- Multiple advisors and farms involved
- Freely available to the public



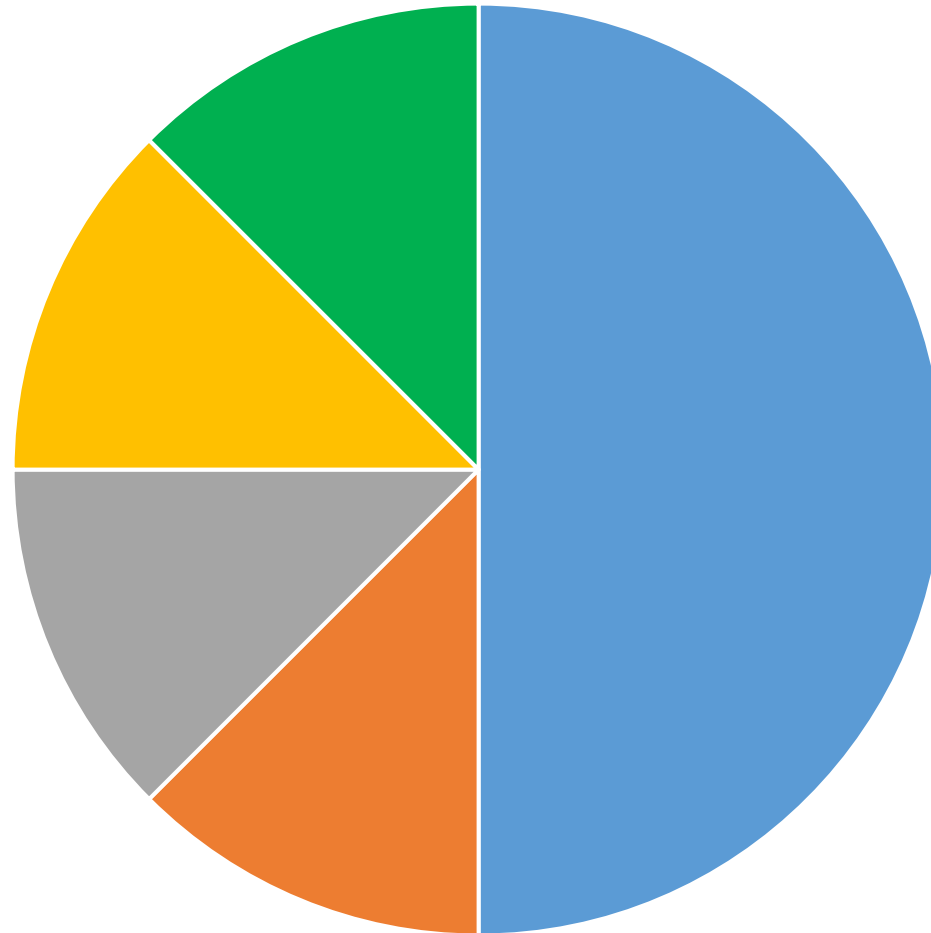
<https://www.youtube.com/channel/UCyis8euy-AQw159rWAZgrYQ>



Scoring the benefits of Smart Sheep



How helpful was the project in your general use of PLF?



■ Extremely ■ Very ■ Helpful ■ A little helpful ■ Not helpful



Measure the weight gain of some animals



MEASURE to MANAGE
Use EID to **record** individual weights



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LOOK at the data



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Ask Questions- Are the animals growing as you would expect? If not, why not?



Check your pasture



Use a **software package** to collate all this data to allow you to make **informed decisions** on any **interventions**



How can we further improve reduction in anthelmintic use?

- Breeding for resistance/tolerance of worm infections
- Improved sward mix
 - including various pasture species with properties such as increased nutrition, anthelmintic effects
- Grazing management



Integrated worm control trial

Traditional
Set-stocked

Traditional
Rotational

Improved sward
Set-stocked

Improved sward
Rotational

In a sheep only system

What are the production benefits of the various systems?
> Expect that Improved sward, rotational will be best

What is the impact of each system on roundworm prevalence and species composition?

How much wormer is required to maintain acceptable lamb growth? (Use TST to determine wormer need)

What is the longevity of the improved pasture species?

Thanks to.....

FOCUS FARMERS



Colin MacPhail
Linda Owen
David Owen



Gavin Coates



Emily Gascoigne
Georgina Cox



LSSC Ltd

Lesley Stubbings
Matt Blyth



Matt Colston



Alison Fergus



Heather McDougall
Gillian Mitchell
Leigh Andrews
Jade Duncan
Adam Hayward
Bioservices



Claire Morgan-Davies
Ann McLaren
Ailsa Thomson
Cathy Dwyer
Michelle Reeves
Aimee Walker



Strategic Research
Programme 2006-2011,
2011-2016, 2016-2022



Transforming Food
Production Challenge Fund
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UK's innovation agency



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