Control of sheep scab in Scotland through serological testing to guide targeted treatments. An exemplar study on the Isles of Lewis & Harris

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A report for the Scottish Government, Disease Control branch, Animal Health and Welfare Division

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Background

Sheep scab, caused by infestation of the skin with the ectoparasitic mite, *Psoroptes ovis*, is endemic in the UK, causes serious harm and is estimated to cost the industry between £78-202 million per annum[1]. The incidence of scab dramatically increased following the deregulation of compulsory preventative dipping in 1992, with the number of outbreaks rising from <100 per year to an estimated 8-10k per year currently. Sheep scab was recently identified as a top priority endemic disease in the Ruminant Health and Welfare Group national survey. Unlike the rest of the UK, sheep scab is a notifiable disease in Scotland under the Sheep Scab Order (Scotland) 2010. Treatment of scab relies heavily on just two drug classes, the macrocyclic lactone (ML) injectables and organophosphate (OP) dips. *Psoroptes ovis* mites in the UK have recently been shown to have developed resistance against the MLs with ML-resistant mites now in all areas of the UK. OP dipping remains an effective treatment for sheep scab but carries significant environmental and health concerns if not used correctly.

Accurate diagnosis of the disease is essential for the selection and timing of appropriate treatments. Conventional diagnosis, which is based on the direct detection of the mite by microscopy in wool plucks or skin scrapings, is time-consuming, lacks sensitivity and specificity and is unlikely to detect sub-clinical cases, which play a key role in the persistence and spread of the disease. The recent development and commercialisation of a sheep scab blood test by Moredun (supported by funding from Scottish Government & Defra) offers a potential step-change in how scab is managed in the future; allowing disease to be detected before the appearance of clinical signs, limiting its spread and providing an opportunity to control scab effectively in local and regional control efforts. A recent study which evaluated the uptake of the sheep scab ELISA test by livestock farmers using a stochastic game theory model showed that the greatest gains in terms of disease control are achieved by increasing test adoption amongst farms at high-risk of infestation, as this provides most of the epidemiological benefits[2]. Hence, identifying regional hotspots with high sheep scab prevalence, which make good targets for such a programme, may be an effective approach. This study also showed that subsidising testing costs would likely incentivise farmers towards such cooperative schemes[2].

This approach to controlling the disease using the sheep scab ELISA test has already been successfully demonstrated in small-scale pilot projects in Scotland, including the Pentland Hills, Angus Glens and The Isle of Mull, resulting in the identification of problem areas, targeting treatments and ultimately in the local control of scab in these areas. More recently, a larger scale project, funded by the RDPE has been underway in England (value £450k) aiming to tackle the disease in three sheep scab hotspot areas (The North West, The Midlands and The South West) identified through a modelling approach[3]. The RDPE project started in January 2021 and worked closely with local vets and coordinators to bring farmers together within defined clusters based on contiguity of properties and/or shared common grazing. This project is now coming to an end and has clearly demonstrated the potential for this type of collective approach to achieve lasting control of disease in the target regions, with significant reductions in the prevalence of scab in all three areas. A larger scheme “The all Wales sheep scab eradication programme” with a total budget of £7.5M over 5 years, started in autumn 2023 and is funded by the Welsh Government. A further scheme was recently completed in Northern Ireland, funded by the BBSRC under the Endemic Diseases of Livestock call (value = £218k – July 2022-Dec 2023).

The aim of this project was to undertake a similar hotspot approach to the RDPE scheme to control sheep scab in a defined region in Scotland, with the island setting of Lewis & Harris representing an excellent candidate for this approach. Data from the same modelling study[3] used for the definition of hotspot areas in England, clearly identified areas where sheep scab represents a significant issue; one of which is Lewis & Harris (Figure 1). In addition, sheep scab notification data collated by the Scottish Government also demonstrated an increase in the prevalence on Lewis & Harris in recent years (Figure 2). As shown in Figure 1, there is a high degree of connectivity between properties on the island, largely due to the predominance of crofting systems and a reliance on areas of common grazing for sheep

production. These farming practices represent a significantly increased risk for scab, the spread of which thrives under the increased contiguity of properties and leaky boundaries associated with common grazing and crofting. This creates a particularly challenging situation for the control of sheep scab on Lewis & Harris, meaning that without the additional support and coordination provided by the project, it would be extremely difficult for the islanders to successfully tackle the issue of scab.

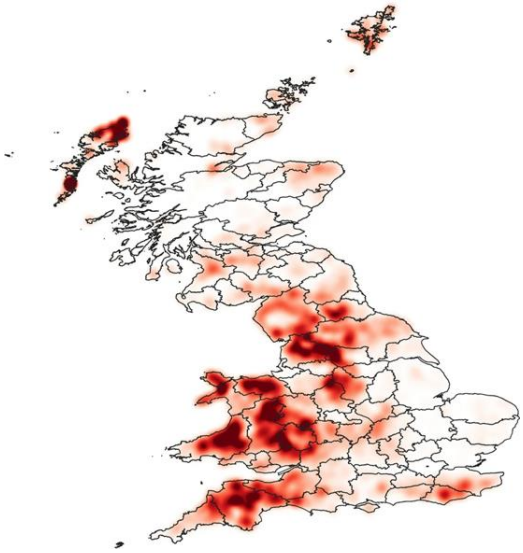

Figure 1. Density of sheep farms in the UK weighted by the number of contiguous farms. The darker the shading, the higher the density of farms and the higher the number of connections[2]

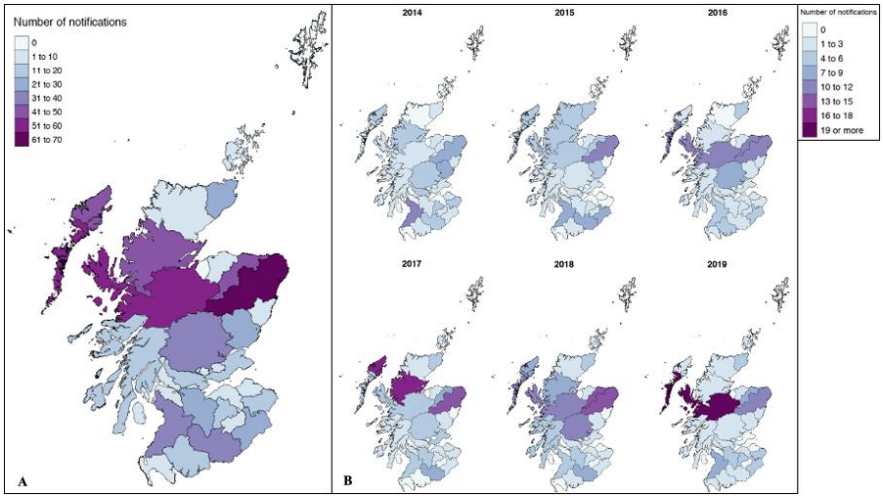

Figure 2. Proportion of sheep registered holdings within Scottish counties notifying APHA of suspect sheep scab cases for each year (2014 – 2019)

The other benefits of focussing on an island-based setting are a defined geographical area with solid borders/boundaries, a single veterinary practice covering both islands, an active and highly engaged group of stakeholders brought together through the Lewis & Harris Sheep Producer's Association and a single livestock market, based in Stornoway.

Achieving a reduction in the burden of an endemic disease like sheep scab, reduces the pressure on the existing medicines, decreasing selection for resistance and reducing residues in the environment and food chain. **This approach also has the benefits of improving the health and welfare of the national flock, whilst simultaneously improving efficiency in livestock growth, reducing carbon and methane footprints per unit output and contributing to Outcomes 1 and 4 of the Agriculture chapter of the Climate Change Plan**.

Outcome 1: A more productive, sustainable agriculture sector that significantly contributes towards delivering Scotland's climate change, and wider environmental, outcomes through increased uptake of climate mitigation measures by farmers, crofters, land managers and other primary food producers.
Outcome 4: Reduced emissions from red meat and dairy through improved emissions intensity.

Project Aims & Objectives:

The aims of the overall Lewis & Harris control project were to use the sheep scab ELISA to facilitate targeted treatments for sheep scab, allowing us to: i) demonstrate a reduction in the incidence of scab on Lewis & Harris and ii) further develop this novel approach as an exemplar framework for the control of scab in other areas of Scotland. Funding was secured for an initial pilot project (Oct 2022-Mar 2023) and then extended for a further two years (Apr 2023-Mar 2025). The overall aims of the project were as follows:

Objective 1: Recruit a suitably experienced local coordinator with knowledge and contacts within the Lewis and Harris sheep-keeping community (Oct 2022-Mar 2025).
Objective 2: Work with the local vet, agricultural merchant (SQP) and LHSPA to increase awareness of sheep scab across key stakeholder groups on Lewis and Harris, providing up-to-date best practice advice for disease control (Oct 2022-Mar 2025).
Objective 3: Identify geographically defined clusters across Lewis and Harris (2-3 clusters with 30-50 farms each with a total target of 100 farms. To be undertaken with the support of the local coordinator and the Lewis and Harris Sheep Producer's Association (Oct-Dec 2022).
Objective 4: First round serological testing using sheep scab ELISA (flock screen with x12 animals per property) to identify cases of scab and highlight potential hot spots (Jan-Mar 2023).
Objective 5: Coordination of treatments as required based on outcome of blood testing (Mar-Aug 2023).
Objective 6: Follow-up blood testing of treated flocks from Year 2 ensuring treatment efficacy and continued freedom from disease (Mar-Aug 2023).
Objective 7: Coordination of an autumn plunge dipping campaign using a mobile contractor, recruiting crofters across L&H and initially focussing on hot spot areas identified through blood testing (May-Nov 2023).
Objective 8: Limit the risk of sheep scab-infested animals being brought back onto L&H from overwintering pastures on the mainland. Provision of treatment advice to crofters across L&H to guide informed treatment and/or testing of returning hoggs and purchased tups (Feb 2023-Mar 2025).
Objective 9: Undertake a second round of coordinated OP plunge dipping across L&H using the same experienced mobile dipping contractor. Providing continuing support and coordination for the gathering and dipping of a further ~30k sheep across L&H (May-Nov 2024).
Objective 10: Follow-up blood testing of treated flocks from Year 3, ensuring treatment efficacy and continued freedom from disease and assessing the overall impact of the project on the prevalence of sheep scab on L&H (Jan-Mar 2025)
Objective 11: Submission of quarterly financial claims, progress reports, and preparation of a final project report for the Scottish Government (Oct 2022-Mar 2025).

Progress by objective:

Objective 1: Coordinator recruitment:

Following discussions with the Lewis & Harris Sheep Producers Association (LHSPA), two experienced local crofters (Ally Williamson & Hannah Mackay) were identified as the best candidates for the role of local coordinators. Mr Williamson, farms sheep on Lewis, he is a local shearing contractor and also works closely with the LHSPA, as such, he was ideally placed to take on the role. Mrs Mackay is also a local crofter and the secretary of the LHSPA. One of her roles on the LHSPA is coordination of the island-wide pregnancy scanning during January-February, as such she brings significant expertise to the project. The role involves engaging with local crofters, recruiting them to the project and coordinating

control efforts, both blood testing and treatments (as and when required) in conjunction with the island vet and other contractors (for example, mobile sheep dipping contractors and the local farmer's merchant (Lewis Crofters Ltd). In addition, to recruiting the two coordinators, we continued to maintain close relations with the LHSPA, ensuring that they are fully aware of progress and remain heavily involved in the project planning.

Objective 2: Increase awareness of sheep scab across key stakeholder groups:

In conjunction with colleagues from the James Hutton Institute (Claire Hardy and Carol Kyle) and SRUC (Kate Lamont) and under the umbrella of the EPIC IV CoE, the Moredun team (Stew Burgess, Dave Bartley & Lynsey Melville (MRI)) arranged a series of stakeholder workshops across Lewis & Harris during October 2022 (Figure 3).

Figure 3. Flyer developed with the LHSPA advertising the series of crofter workshops held across Lewis & Harris in October 2022

Five workshops were held across the island, one each at West Harris (Pairc Niseaboist), North Lochs (Balallan), North Lewis (Bragar), Ness and Stornoway. In total, 35 crofters attended, with sheep numbers ranging from zero to >700. As part of the workshops, farmers were asked to share their opinions on the greatest disease risk to their holding, their understanding of the term 'Biosecurity', their attitudes to sheep scab and roundworm control and barriers to implementing 'best practice' biosecurity and the 'best fit' for their particular situation.

Prior to the start of the workshop, participants were given time to consider an information sheet and sign a consent form. Information was shared in plenary and breakout groups and was collected via notes and audio recordings. The outcomes of the workshops were reported separately via EPIC "Understanding the perception of biosecurity measures surrounding the control of sheep scab and roundworm infections on the island of Lewis and Harris". At the same time as the workshops, we also presented current best practice advice on the control of sheep scab, raising awareness of the disease risks, covering diagnosis of disease and best practice and sustainable treatment of disease.

We continued to work closely with the local vet and agricultural merchant to ensure that up-to-date best practice advice was available to all crofters on L&H. This involved ensuring availability of the best medicines for the effective control of sheep scab, e.g., organophosphate (OP) plunge dip concentrates and the long-acting version of moxidectin (2% Cydectin LA), which provide efficacious treatment and

lasting protection against scab. In addition, when treatments like doramectin (Dectomax) were provided, advice was given to ensure that crofters were made aware that these do not protect against re-infestation and that stock need to be moved to clean pasture.

Objective 3: Identify specific geographically defined clusters across Lewis and Harris (2-3 clusters with 30-50 farms each with a total target of 100 farms:

During the workshops (Objective 2) and as part of ongoing discussions with the local coordinators and LHSPA, we co-designed a plan for the initial pilot phase of the project, which aimed to understand the current state of play with sheep scab across L&H. As the project started in October, it was decided that it was too late to blood sample flocks ahead of tupping and instead, we decided to focus our efforts on pregnancy scanning, which takes place during February on L&H and offered an opportunity to blood sample large numbers of sheep across the island in a short space of time and more importantly fitted in with the crofters planned sheep gathering. The outcome of the testing would then be used to identify areas affected by sheep scab, facilitating targeted treatments and allowing us to identify areas where more support would be required during Year 2 of the project. The LHSPA and local coordinators circulated a flyer to recruit crofters already undertaking scanning to allow their flocks to be blood tested (Figure 4). In total, ~250 farmers participate in the pregnancy scanning and of these, 105 crofters agreed that their sheep could be tested.

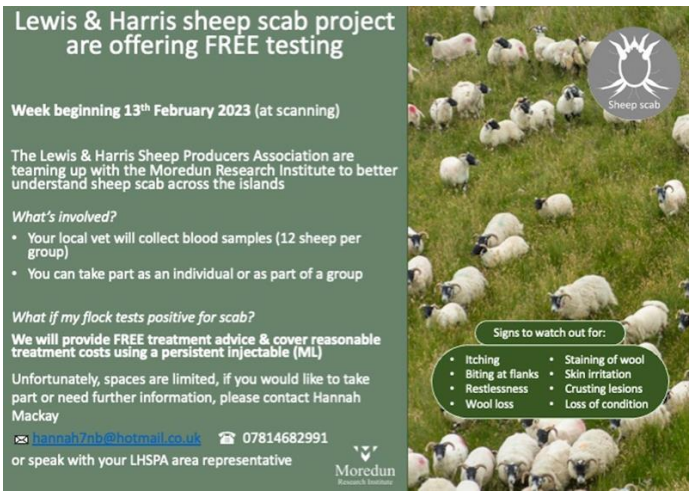

Figure 4. Flyer developed with the LHSPA advertising the opportunity to participate in the scanning-based sheep scab blood testing during February 2023

Objective 4: Sheep scab blood testing:

Using the sheep scab ELISA we arranged for the local vet (Old Mill Veterinary Practice, Stornoway) to travel across L&H during the w/c 13th February 2023, working closely with the local coordinators and the pregnancy scanner to take blood samples (x12 animals per property as a flock screen) from all of the recruited flocks whilst animals were gathered in the local fanks (Figure 5).

Figure 5. From left to right: **A)** Local coordinators and the island vets collecting blood samples from sheep during pregnancy scanning across L&H. **B)** A local fank sheep handling system on Lewis

This resulted in the collection of 1,260 blood samples, from 105 properties, over a period of 6 days, with blood samples being submitted to Biobest Labs Ltd for sheep scab ELISA testing. The outcomes of these tests are presented in Table 1, below:

Group	No of farms	Test outcome	Clinical Signs	Notes	Action
1	16	Positive	No	Many with anecdotal evidence of infestation	Treat
2	3	Positive	Yes	Sheep scab mites identified	Treat
3	21	Negative/Monitor	No	Borderline results	Prophylactic treatment
4	25	Negative	No	Possible contact with positive groups via fank	Prophylactic treatment
5	40	Negative	No		No treatment
	Total = 105				

Table 1: Sheep scab ELISA blood testing outcomes at pregnancy scanning on Lewis & Harris

As shown in Table 1, most animals tested negative for sheep scab on the ELISA, with 65 flocks being negative and a further 21 negative, but with at least 1 borderline animal from the flock-level test. The identification of 19 sheep scab-positive flocks out of 105, equates to an overall prevalence of ~18%, and is slightly higher than the expected prevalence of sheep scab across Scotland (10-15%) at this time of year. There was a clear pattern of clustering with the positive cases, with four main outbreaks of scab being identified across L&H (Marked by red stars, Figure 6). The first outbreak was in the area of Balallan and the South Lochs area of Lewis; the second was around Uig on the West of Lewis, the third was in the Knock area to the East of Stornoway and the final outbreak was around the West of Harris.

Preparing for sustainable farming (PSF): Following discussions with the PSF team at Scottish Government, Moredun worked closely with the crofters who participated in the first round of diagnostic testing to assist them in applying for retrospective support through the PSF scheme for the blood testing that was undertaken as part of the project. As the vet time and testing costs were covered through the project it was initially deemed that the crofters would be ineligible for PSF funding to avoid a potential double funding issue. However, following further discussions with Scottish Government, it was decided that the crofters had clearly made further significant contributions to the testing process, including: time and travel costs for meeting attendance; time spent gathering sheep

for testing and treatment (including “in-contact” animals); gathering and transporting sheep for mobile dipping treatments and the crofter contribution to the cost of OP dip (£0.50p/sheep) and as such their applications to the PSF were successfully processed for payment, with 102 claims being paid out across L&H.

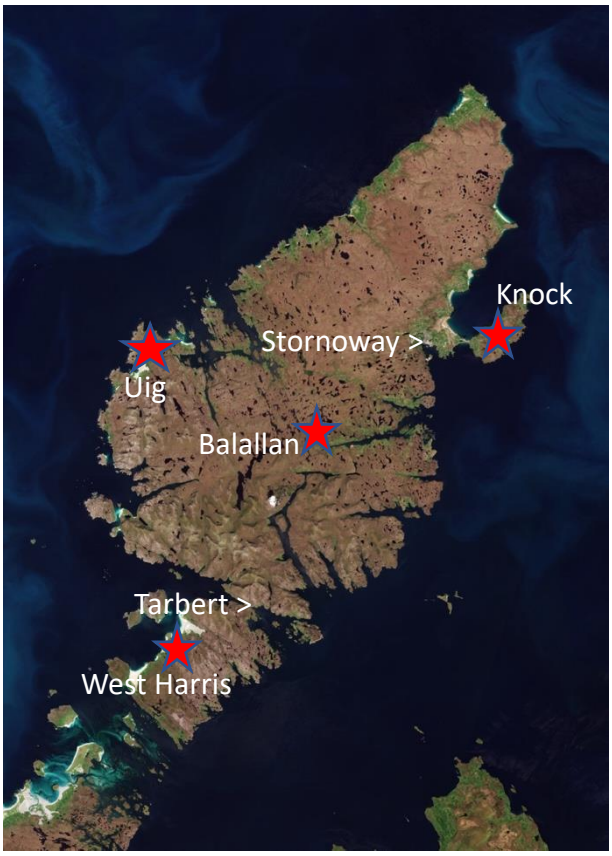

Figure 6. Map of Lewis & Harris, highlighting the areas (red stars) where outbreaks of sheep scab were detected following blood testing

Objective 5: Coordination of treatments based on blood testing:

Due to the timing of the outbreaks identified through the blood testing being so close to lambing (April 2023), many of the crofters were understandably reluctant to use an organophosphate (OP) plunge dip for treatment, which may have placed unnecessary stress on the heavily pregnant ewes. Following consultation with the island vet, the decision was taken to use a long-acting macrocyclic lactone (ML) injectable for treatment of animals in the affected areas (2% Cydectin LA). The main reasons for selecting this treatment were that if used correctly it still remains efficacious for the effective treatment of scab and it also provides up to 60 days of protection against re-infestation, which is crucial in the island setting where many crofters are unable to move their animals to clean pasture post-treatment. Discussions were held with the manufacturer of Cydectin, Zoetis Animal Health Ltd and the company kindly offered to provide all of the Cydectin required to treat the animals in the affected areas, including prophylactic treatments required when otherwise negative animals had potentially been in contact with positive cases during their handling in the local fanks. This required treating approximately 12,000 animals using 36 litres of Cydectin with a total cost of ~£15k, kindly provided by Zoetis. Many of the islanders had not previously used Cydectin as a treatment for scab and it uses a different method of delivery to the other ML injectables, with a sub-cutaneous injection at the base of the ear. In order to disseminate the blood test results correctly and sympathetically to each of the crofters involved, each farmer received a telephone call explaining their flock results, providing further details on the treatment plan and inviting them to a meeting at the Stornoway Golf

Club (30th March 2023) where further information would be available and they would have the opportunity to ask questions (Figure 7).

Figure 7. From left to right: **A)** Flyer developed with the LHSPA advertising the discussion meeting ahead of the coordinated scab treatments in the affected areas. **B)** Crofters attending the meeting at the Stornoway Golf Club, organised by the LHSPA, the local coordinator, island vet and Moredun

Zoetis arranged for their regional manager to visit Lewis for the farmer meeting, where he was able to address specific concerns around the use of the product and also provided further advice and specialist applicators to help with the injections. All of the affected and in-contact animals were treated within a 2-3 week time window, no further outbreaks were reported and there was no recurrence of clinical signs, indicating that the treatments were successful.

Whilst arranging the treatments for the positive and in-contact flocks the project team were contacted by a number of crofters who had not been part of the scanning-based testing but now wanted to be involved in the project. Many of these crofts bordered affected properties or were located in the hotspot areas identified through serological testing. This resulted in a further 26 crofts being recruited to the project, those bordering or in-contact with affected properties were offered prophylactic treatments, others took the opportunity to have their flocks tested and they all expressed an interest in the coordinated dipping campaign in the autumn.

Notification of sheep scab-positive flocks:

Due to the notifiable status of sheep scab in Scotland, we worked closely with APHA to undertake a group notification for all of the flocks on L&H that tested positive for sheep scab during the Phase I testing. This included 3 farms with clinical sheep scab and 16 farms that were positive by the sheep scab ELISA, but were not displaying clinical signs at the time of testing. An email was sent to all affected crofters, carefully explaining the notification process under the Sheep Scab Order (Scotland) 2010 and highlighting the farmers' own responsibilities. The farm details were then sent to APHA (covered under the project GDPR agreement), who then instigated the notification process with each farmer. As shown on Figure 8, this resulted in a significant increase in notifications across L&H with 14 notifications on Lewis & 7 on Harris during the second quarter of 2023.

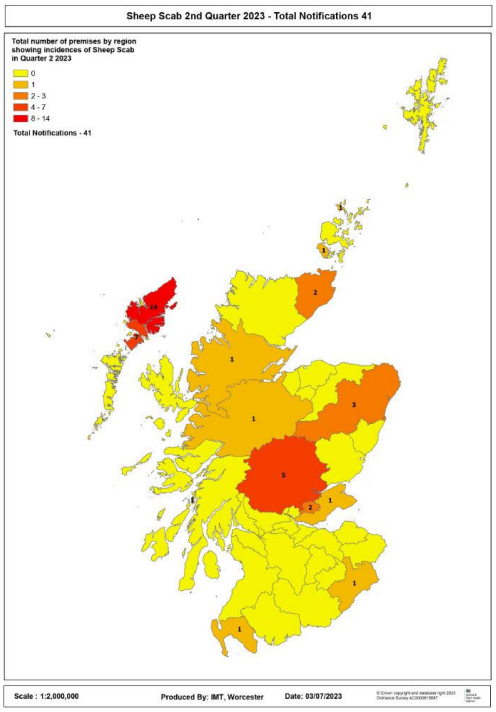

Figure 8. Sheep scab notifications under the Sheep Scab Order (Scotland) 2010, 2nd Quarter of 2023.

Objective 6: Follow-up blood testing of treated flocks from Year 2 ensuring treatment efficacy and continued freedom from disease:

A further round of blood testing was instigated to follow-up on the flocks that previously tested positive for sheep scab, either by the blood test, or through the presence of sheep scab mites/clinical signs. Of the 19 affected flocks, all agreed to be re-tested to ensure the treatments used (injectable MLs in most cases) were efficacious. All of the flocks tested negative for sheep scab, indicating that the treatments provided had successfully dealt with the outbreaks.

Objective 7: Coordinated plunge dipping campaign:

Plunge dipping in OP remains the most effective means of controlling sheep scab. However, there is a lack of suitable dipping facilities in many areas of Lewis & Harris, mainly due to farmers having moved away from using OPs and relying more on the ML injectables over the last 2-3 decades. To overcome this issue, we arranged for a mobile dipping contractor to come to the island and facilitate a coordinated OP plunge dipping campaign covering all the target areas. However, although the testing identified areas of concern, due to the high degree of connectivity between properties and the overreliance on common grazing, it became apparent that a broader control strategy was required to achieve lasting control of scab on Lewis & Harris. This resulted in a far more ambitious plan for the project's second phase, with plans for an island-wide plunge-dipping campaign. Treating the majority of the island flock using an OP plunge dip, ensures that the animals are treated, dealing with any clinical disease and killing any mites that they may be harbouring. In addition, the use of an OP plunge dip also provided an additional 8 weeks of protection against re-infestation ensuring that the animals were less likely to pick up new infestations from any animals that were not dipped or that were missed during the gathering process. To achieve this, we codesigned an extremely ambitious coordinated dipping campaign with the LHSPA and the local vet. This involved supporting the coordinated gathering and back-gathering of stock across Lewis & Harris whilst also bringing in a reputable contract mobile dipper (Neil Fell Mobile Sheep Dipping Ltd) to ensure that all sheep were dipped effectively and within a short time frame. A plan was arranged whereby sheep from across the island were gathered at their local fank (handling facility) for coordinated dipping at the common grazing or

township level whenever possible. When animals could not be gathered at a local fank, the project arranged for them to be transported to the nearest fank for the purpose of treatment. Due to differences in gathering times between Lewis & Harris, the campaign was divided into two phases, with sheep on Lewis being dipped between the 29th of September and the 7th of October 2023 and sheep on Harris dipped between the 6th and 16th of November 2023. Recruitment of crofters for the dipping campaign was facilitated through group email lists and whatsapp groups, a flyer circulated through the vet practice and the local agricultural merchants and by word of mouth.

The degree of interest and participation in the campaign was unprecedented, far exceeding expectations. The crofters clearly bought into the idea of coordinated effort to control a disease that poses a significant cost and welfare risk to flocks. The cost of the treatment (with an OP plunge dip) was covered by the individual crofters, each of whom paid £0.50p per animal, which covered the cost of the OP concentrate. At the same time the project provided support with gathering and covered the costs of coordination and of bringing the mobile dipper to the island for two separate visits. The campaign was highly successful and resulted in almost 30k sheep being effectively treated within a short time frame involving ~500 crofters across L&H, highlighting the high degree of stakeholder engagement and community buy-in that this project has achieved. This required close coordination between the crofters, the local vet and the mobile dipping contractor and was facilitated through the LHSPA and the local coordinators. Figure 9 shows the high degree of coordination required at each of the individual dipping stops, with local crofters working collectively to achieve effective gathering, animal transport, mobile dipping and waste disposal. This becomes even more important when it is considered that many of the dipping days involved 6-7 individual stops with dipping taking up to 18 hours each day.

Figure 9. From left to right: **A)** Image showing one of the fank locations on Lewis used for gathering sheep ahead of plunge dipping in organophosphate. **B)** New design of mobile dipping lorry, which allows faster, more accurate dipping of sheep with significant welfare benefits for animals and improved health and safety for the operator. **C)** Crofters gathering sheep on the hills of Harris.

Following the extensive dipping campaign across L&H we continued to remain vigilant to ensure that we were able to rapidly respond to any cases/suspected cases of scab. During early January 2024 we were informed of a suspected case of sheep scab in a flock that did not participate in the dipping in the Barvas area. The crofter involved did not accept the offer of dipping as he was under the impression that his township would be dipping by themselves and his flock would be included in that activity. Unfortunately, there was a mix-up and his sheep were not treated, and a case of scab was reported. This was dealt with rapidly by one of the coordinators (Ally Williamson) dipping the flock along with some of his own sheep, which had also missed the initial dipping, but in which no disease was suspected. The flock responded to the treatment and no further clinical signs were observed.

As part of a continuing collaboration within the EPIC CoE, researchers from Moredun, the James Hutton Institute and SRUC held a series of follow-up workshops with crofters across L&H to assess the degree to which farmer perceptions around disease control had changed since the start of the project

(Figure 10). The workshops explored measures used currently to control disease, measures they intended to implement and those that were felt would be a challenge in the future. Additional topics touched on: benefits of collaborative working; other diseases that might benefit from collaborative action; barriers to island livestock disease control and decision support tools that might be useful in disease control and management. Expert talks were provided on controlling Roundworms and sheep scab on the Islands and an update was provided on the coordinated mobile dipping campaign, which was taking place during the visit.

Figure 10. Flyer advertising the follow-up workshops across Lewis & Harris for November 2023.

One other aspect that was mentioned after the initial coordinated dipping campaign, was that after ~2-3 weeks some sheep were showing signs of being infested with ticks. This is not surprising, as the OP dip used only provides ~3 weeks protection against re-infestation with ticks (compared to 8 weeks protection against re-infestation with sheep scab) and the environmental tick burden on L&H has also been shown to be very high. Nevertheless, this highlighted that tick control was an ongoing issue for crofters on L&H, especially around the crofters understanding of best practice control of ticks. In response to this, we worked with industry to arrange a tick-awareness and best practice treatment workshop on Lewis (14th of June 2024), with presentations from Moredun, Zoetis Animal Health Ltd, Bimeda Animal Health Ltd, Elanco Animal Health Ltd, The University of Liverpool and NHS Scotland. The workshop covered aspects of best practice control for ticks on livestock, including selection and application of the correct treatments for maximum efficacy, it also provided advice on tick avoidance to prevent tick borne diseases and up to date advice on the diagnosis of Lyme disease, which was of particular importance due to the elevated risk of Lyme disease on the Western Isles.

Objective 8: Limiting the risk of sheep scab-infested animals being brought onto L&H from the mainland:

The largest risk of scab coming onto properties during the autumn is through the movement of tups, which are often purchased from the mainland markets (e.g. Dingwall), and this risk was limited by offering each farmer the option of plunge dipping their tups in OP during the coordinated dipping campaign, or if they were reluctant to dip the tups, they were also offered the option of an ML injectable treatment. The other significant risk is the potential for the re-introduction of scab through the return of animals (mostly hoggs) from overwintering on the mainland in the Spring. Often, these animals are overwintered in the NE of Scotland (e.g., the Black Isle), where the risk of sheep scab is relatively high (based on elevated sheep scab notifications in this region). The majority of these animals return to L&H from the end of March -mid-April. This activity coincides with the start of lambing and so the reintroduction of scab at this time was considered to be a high risk activity that needed to be mitigated. This was achieved in two ways, the first was the circulation of a flyer across

L&H raising awareness of the risks involved and the need to either test or treat returning stock prior to them mixing with the home flock (Figure 11). The second was through the provision of best practice advice and injectable treatments (2% cydectin LA) to allow the crofters to treat their ownanimals on their return to L&H, before they mixed with the home flock. In total, we provided treatments for ~5,000 returning hoggs, during the Spring of 2024 & 2025. It is hoped that this activities not only limited the risks involved at the time but also demonstrated the use of best practice for continued uptake by the crofters in future years. Finally, we worked with the local vet and the agri-merchant (Lewis Crofters Ltd) providing free "tup packs" for the crofters, including best practice advice on diagnosis, quarantine and recommended treatments.

Figure 11. Image showing the flyer used to advertise best practice advice for treating bought in tups.

Objective 9: Second round of coordinated OP plunge dipping across L&H:

Following consultation with the LHSPA, the decision was taken to build on the success of the initial coordinated OP dipping campaign with a further round of dipping across L&H. Further funding for the project was secured from the Scottish Government to cover the costs for a second round of coordinated dipping. This involved employing the same mobile dipping contractor (Neil Fell Mobile Dipping Ltd) for two further autumn visits, one for Lewis (14th – 30th Sept 2024) and one for Harris (4th – 16th Nov 2024). As previously, the project provided support for the coordination, gathering and dipping of sheep across L&H, but with the crofters contributing a slightly increased levy of £0.80p per sheep towards the cost of the OP dip concentrate. In addition, the local crofters were heavily involved in the planning and facilitation of the dipping. Two areas had been identified where some crofters did not take up the opportunity to have their sheep dipped in the previous year (Ness & Point). To address this, two stakeholder engagement meetings were held on Lewis (Ness and Stornoway – both 16th Aug 2024), with crofters being provided with an update on the project to date along with a Q&A session to answer queries on the upcoming dipping campaign and to attempt to recruit additional crofters in these two areas (Ness & Point). Both meetings were very well attended, in Ness 12 crofters attended as well as a journalist from the local paper, whilst in Stornoway we had 25 attendees, including crofters from Harris. Both meetings were extremely positive and several crofters who did not take part in the dipping in the previous year, agreed to dip their sheep this time around. The dipping campaign was very successful, showing a further increase in the number of dipped sheep, with >30k sheep collectively gathered and treated over this period, constituting >90% of the breeding animals on L&H.

Objective 10: Follow-up blood testing of treated flocks from Year 3:

The project continued to offer free sheep scab blood testing to ensure that any missed cases of scab were detected and dealt with and also to support the use of injectable treatments for any farmers reluctant to take part in the dipping campaign. As previously carried out in the initial pilot project, in the spring of 2025, we offered crofters the opportunity to have their sheep tested during pregnancy scanning. The local vet visited 40 flocks during scanning, collecting blood samples from 12 sheep/flock,

which were sent to Biobest Labs Ltd for sheep scab ELISA testing. The blood testing showed that whilst the majority of flocks were negative post-dipping, two areas of concern were identified on Lewis (Arnol and Upper Carloway). Each of these areas contained flocks in which some animals tested positive for sheep scab (2 flocks each in Arnol and Upper Carloway). In each case, some of the stock were not included in the coordinated OP dipping campaign and appeared to be harbouring scab. As these cases arose whilst animals were being gathered for scanning, treatments were provided (injectable MLs) for all in contact groups in each of the two areas. Follow up testing demonstrated the efficacy of the treatment, and no further cases were identified in these areas during lambing in 2025.

Objective 11: Submission of quarterly financial claims, progress reports, and preparation of a final project report:
All quarterly financial claims and project reports have been delivered. This report provides the final project summary.

Project Legacy:

Societal benefits:
In addition to the disease control benefits, increased production and improvements in animal health and welfare, we also observed a significant societal benefit from the project. By helping to bring crofters together through a collective enterprise, the project helped to rekindle the spirit of community working, lost in recent years due to an ageing demographic and further exacerbated by the COVID-19 pandemic (Figure 12). This has had a significant impact on the mental health of many of the crofters, who often find themselves working long hours in isolation, particularly through the winter months. The coordinated dipping campaign acted to remind some and show others what collaboration as a community can achieve. Working together to ensure the flock health and wellbeing has led to renewed understandings and helped forge new working relationships. The social aspect of the mass venture has had advantages for all members of the communities. The social capital built by the massive collective undertaking (including the gathering and coordinated treatment of sheep across the island) has allowed the crofters to recall the advantages of working together to overcome issues, whilst showing newcomers what collective action can bring to the community. Crofters commented on the 'feel good factor' accompanying the combined action. Members of the community, including the elderly and the young came together to help and watch the massive logistical task of dipping the majority of the island flock. Collectively, the islanders expressed hope that this renewed action is the start of a journey that can lead to continued working together to achieve a disease-free island flock.

Figure 12. Images of the collective working carried out by the crofters from L&H, demonstrating the strong community spirit, which was critical to the projects success.

Safe disposal of spent OP dip: OP dip is harmful to both human health and the environment. Throughout the project we were able to mitigate the human health aspects of the OP dip through the use an experienced and licensed mobile dipping contractor. This meant that the dipping was carried out in a safe manner with full PPE and it also guaranteed that all animals were dipped in the same way (a minimum of 1 minute emersion and their heads dipped under twice) ensuring effective treatment across the project. However, OP dipping generates significant volumes of spent OP dip waste which most also be safely disposed of in a manner which does not pollute the environment. From the start

of the project, the crofters were keen to ensure that the spent dip was disposed of safely on-island using either existing, or new licensed dip disposal sites. We worked closely with common grazing clerks across L&H to make sure that OP dip waste generated at each of the dipping sites could be disposed of locally using the existing land disposal licenses. We also worked with the dip disposal license holders and SEPA to increase capacity of disposal sites where this was suitable and to license new sites where previous licenses had lapsed. SEPA provided significant assistance in this process by waiving fees and supporting the rapid processing of new license applications. This process ensured that the OP dip waste generated during the project could be safely disposed of on-island, and also ensures a lasting legacy for the project with an overall increased capacity for the safe disposal of OP dip across L&H.

Provision of an on-island mobile dipping facility: During the stakeholder workshops there was much discussion about the potential for an on-island mobile dipping facility. This was very well received, and it was felt that this would be a positive step for the self-management of disease control and biosecurity and could provide a lasting legacy for the project. This would remove the current reliance on the use of an external dipping contractor, reducing the cost of the current collective treatments, facilitating rapid treatment in response to outbreaks and also allowing the collective dipping of returning hoggs and bought-in tups throughout the year to reduce the risk of re-importing sheep scab. However, the crofters voiced their concerns around the management, organisation and maintenance of this type of resource and as such, SAOS Ltd were contracted by the Scottish Government to carry out a business feasibility study looking at the different options available for the continuation of sheep scab control on Lewis & Harris. This study analysed the different models of managing an island-owned sheep dipping facility and produced a cost benefit analysis of an owned dipper, a contracted dipper service (based on the previous two years of contracted mobile dipping) and a hybrid approach where a mobile dipping contractor would still be used for the main autumn dipping but the LHSPA would own a small mobile dipper for the management of outbreaks and treatment of returning animals. The report made a number of recommendations for how best to secure a lasting legacy for the project and for disease control across L&H:

1. For 2025, the LHSPA should seek to recruit an external dipping contractor to carry out the autumn dipping on a similar basis (but not rate) to the previous trials. This will allow them to assess the level of demand at a more commercial rate and avoids making a large purchase for a resource which may not be utilised as anticipated.
2. For 2025, the LHSPA should consider purchasing mobile yards (i.e. Rappa, Pratley etc, est. £10k) as a central resource for use by crofters, which would help during the autumn dipping programme, but also at other times of the year for individuals to use. This will allow the LHSPA to assess whether they have the capabilities to manage an owned piece of equipment.
3. A review of the 2025 autumn dipping operation should take place in Jan/Feb 2026 to assess the success of the approach and whether a different methodology could be more appropriate. Linked to this a wider review of an “island machinery pool” should be explored to assess if future activities could be managed through LHSPA to generate an effective and sustainable route for management.
4. Consideration should be given to a scaled approach to different sizes of flocks, i.e. cheaper rate for larger flocks. Consideration should also be given as to whether this could help retain the larger flocks in the process without upsetting smaller flock owners to an inequity of charging approach.
5. Whilst it is evident that the professional coordination of the dipping is a key success factor to the project. This has involved a very considerable volunteer time commitment on which the whole operation depends. Consideration should therefore be given to seeking financial support for these costs. There is potential for a new role as a dedicated animal health and welfare coordinator to be created for Lewis & Harris that could combine sheep and cattle

activities. As detailed in the analysis, the challenge of animal health management will likely evolve and change, an on-island management resource would be best placed to react nimbly to any changes and needs. Similarly, a need could arise for a machinery pool coordinator in 2026, which could potentially sit with LHSPA.

Third round of coordinated OP plunge dipping:
Based on the findings of the SAOS report, further discussions were held with the LHSPA and a decision was taken to undertake a third round of coordinated OP plunge dipping in the autumn of 2025. As in the previous two years, this will be carried out by a mobile dipping contractor (Neil Fell Mobile Dipping Ltd), however the costs for the dipping will be borne by the crofters. The LHSPA has negotiated a suitable commercial rate of £2.18p per sheep including VAT, which represents an increase from the previous crofter contribution of £0.50p per head in Year one and £0.80p per head in Year 2. However, the LHSPA feel that this cost will be acceptable to the majority of crofters and we expect again to dip in excess of 20k sheep during the autumn of 2025. The costs of gathering animals will also be borne by the individual crofters and each township will coordinate the gathers ahead of their dipping stop. The dipping dates are planned for Sep-Oct 2025 on Lewis and Nov 2025 on Harris. It is expected that this 3rd round of coordinated OP dipping will act to further cement the process of collective dipping on L&H, delivering further improvements in disease control and animal welfare whilst also building onto the future legacy of the project.

Pan-island network for animal disease control:
One further aspect of the project has been to facilitate networking opportunities between islanders from L&H, the Orkney Isles and the Shetland Isles. Whilst each of these island groups are unique there stakeholders face similar challenges in terms of disease control and significant opportunities exist for them to collaborate, working together and learning from each other's experiences. For example, the Shetland Isles is currently the only part of the UK, which is officially free of sheep scab. They have achieved this status through the introduction of strict biosecurity and the compulsory treatment of imported animals to prevent the re-introduction of sheep scab. Meanwhile, the crofters on Lewis & Harris are currently on a journey towards achieving lasting control of sheep scab and can learn lessons from Shetland on how to hold on to the gains that they have made, keeping sheep scab out in the longer term. In contrast, Orkney has reported a recent increase in cases of sheep scab across the archipelago and are now seeking to learn lessons from the crofters on L&H as to how to plan and perform a coordinated treatment campaign to bring the disease under control. In the short-term sheep scab can act as an important exemplar for disease control between the islands. However, the new pan-island network will foster future interactions between these island groups, which will expand beyond just disease control. In February 2025, the first Pan-island network workshop was held in Inverness over two days with funding from the EPIC CoE, with representatives from each of the islands attending. The link to the workshop report is included at the end of this report.

Scottish Knowledge Exchange Awards 2025:
In recognition of the hard work and coordinated efforts of the project team and the crofters across L&H, the Lewis & Harris sheep scab control project was awarded a highly commended prize in the Place-based impact category at the Scottish Knowledge Exchange Awards 2025.

Associated reports:
Through the project links with the EPIC CoE, a number of reports have been generated for the Scottish Government based on the outputs of the project:

1. POLICY BRIEF: Inter-island animal disease control. Claire Hardy[1]; Stewart Burgess[2]; Niamh Mahon[1], Dave Bartley[2]. *Available on request via the EPIC CoE.*

2. Understanding the perception of biosecurity measures surrounding the control of sheep scab and roundworm infections on the island of Lewis and Harris. Carol Kyle[1], Stewart Burgess[2], Claire Hardy[1], Kate Lamont[3], Dave Bartley[2], Lynsey Melville[2]. [1]JHI, [2]MRI, [3]SRUC. *Available on request via the EPIC CoE.*
3. Pan-island network for animal disease control - workshop report. Claire Hardy[1], Stewart Burgess[2], Dave Bartley[2], Niamh Mahon[2], Lynsey Melville[2]. [1]JHI, [2]MRI. *Available on request via the EPIC CoE.*
4. Follow-up interviews with crofters on Lewis & Harris exploring changes in attitudes to the incorporation/uptake of biosecurity following the outcome of disease status on the island. Report detailing main findings from the interviews. Claire Hardy[1], Stewart Burgess[2], Dave Bartley[2], Niamh Mahon[2], Lynsey Melville[2]. [1]JHI, [2]MRI. *In draft.*
5. Follow-up workshops with crofters on Lewis & Harris understanding community-level changes in biosecurity and disease control, providing further best practice advice on disease control and biosecurity implementation. Report detailing main findings from the workshops. Claire Hardy[1], Stewart Burgess[2], Dave Bartley[2], Niamh Mahon[2], Lynsey Melville[2]. [1]JHI, [2]MRI. *In draft.*

Additional knowledge exchange outputs:

KE Output	Title	Audience
Press Article – Fios (bi-weekly newsletter for Lewis & Harris) https://www.fiosnews.co.uk/	"Removing the stigma of scab"	Crofters on Lewis & Harris
Press Article – NSA Sheep Farmer Magazine	"Controlling the spread of sheep scab in the Western Isles"	National
An Lot (The Croft) BBC Alba	Series 6: Episode 1: Mìosan a' Gheamhraidh (The Winter Months). https://www.bbc.co.uk/iplayer/episode/m001ll8p/an-lotthe-croft-series-6-1-miosan-a-gheamhraidh-the-winter-months	National
The Crofter Magazine – The Scottish Crofting Federation	"Stop the Spread in the Western Isles" – due April 2023	National
South Harris Agricultural Show – dedicated sheep scab stand	S. Burgess attended the South Harris show (July 2023), talking to farmers about best practice control of scab. He also explained the outputs to date from the L&H project and actively recruited further farmers to the coordinated dipping campaign in the autumn.	Crofters on Lewis & Harris
Westside Agricultural Show (Barvas) – dedicated sheep scab stand	S. Burgess attended the Westside Agricultural Show in Barvas (Lewis) (July 2023), talking to farmers about best practice control of scab. He also explained the outputs to date from the L&H project and recruited further farmers to the coordinated dipping campaign in the autumn.	Crofters on Lewis & Harris

Bays of Harris – sheep scab meeting	To encourage uptake of the dipping campaign in an area, where interest had been low, S. Burgess held an evening meeting at the Bays of Harris Community Centre, speaking to ~60 crofters about the benefits of participating in the scheme (Sept 2023).	Crofters on Harris
A series of workshops were held across L&H (7-9th November) to determine the impact of the project to date on the crofters' perceptions of disease risk	Workshops on Lewis & Harris in November 2023.	Crofters across Lewis & Harris
BBC Alba – An Lot (The Croft) Series 6: Episode 3 (Samhradh). https://www.bbc.co.uk/iplayer/episode/m001v5wc/an-lotthe-croft-series-6-3-samhradh	This episode of An Lot features 'Sweeny' as his flock takes part in the coordinated sheep scab dipping on Lewis in October 2023.	National
Farmers Weekly – Press article – 4th January 2024	Island rallies to dip 28,500 sheep and beat scab.	National
The Press & Journal – Press article – 15th December 2023	Spock, flocks and isle's effort to smite the mite	National
Two workshops held across Lewis (16th August) to inform crofters on progress to date and increase recruitment for the dipping campaign	Workshops on Lewis in August 2024 (Ness and Stornoway).	Crofters across Lewis & Harris
Fios – article in the local newspaper in the Ness area of Lewis to increase awareness around the dipping and recruit further crofters	Fios – press article	North Lewis crofters
Funded through the EPIC CoE, in February 2024, stakeholders from L&H, including the local vet, crofters, members of the sheep producer's association and the owner of the Stornoway auction mart, had the opportunity to visit the Shetland Isles and to have a guided tour of the facilities in place as part of the Shetland Animal Health Scheme.	L&H stakeholder visit to the Shetland Isles	National
Stew Burgess and scientists from JHI gave an invited presentation on the L&H biosecurity project at a meeting of the Cross-Party Group on Crofting attended by multiple MSPs.	Updated on L&H project to the Cross-Party Group on Crofting	National
Best practice control of sheep scab, making use of available tools for sustainable disease control	Invited presentation by S. Burgess at the Edinburgh Infectious Diseases (EID) symposium, Edinburgh 16th May 2025	National

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