

# Caomhnú Árann EIP Project:

LLOC1050: Managing the habitats of the Aran Islands to maximise their agricultural and ecological output

## Final Report



Togra Caomhnú Árann – LLOC1050

Teach Ceann Tuí 2

Inis Oírr

Oileáin Árann

Co. na Gaillimhe

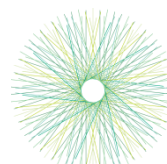
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AGRICULTURE & INNOVATION



Clár Chisti Eorpacha Struchtúrtha  
agus Infheistíochta na hÉireann  
2014–2020

Cómhaoinithe ag Rialtas na hÉireann  
agus ag an Aontas Eorpach

## Caomhnú Árann Final Report

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## 1.0 Executive Summary

Caomhnú Árann was an EIP-Agri Operational Group co-funded by the Department of Agriculture, Food and the Marine and the EU based on the Aran Islands in Co. Galway. The aim of the project was to examine and develop innovative methods of habitat improvement and conservation, in part by addressing labour intensity of conservation and improvement measures, and in part by addressing low farm income levels. A registered company, Caomhnú Árann ctr., was responsible for the implementation of the project who liaised with the partners involved. The other partners included the Aran Island farmers, Department of Culture, Heritage and Gaeltacht (DCHG), Teagasc, National Parks and Wildlife Service (NPWS) and Fáilte Ireland.

This report describes the work of the Caomhnú Árann EIP project team from the beginning to the end of the programme (Nov 2019 to Dec 2023). The focus in the initial months was on project planning, farmer selection and producing farm management plans. Associated with this was the development of a simplified results-based scoring system that encouraged farmers to actively manage the land to improve the overall score and use a number of actions to help achieve this. These included provision of water, scrub management and the re-introduction of grazing. All land parcels were given a quality score derived using available ortho-imagery, targeted drone captured ortho-imagery and the use of multi-spectral data captured for the project by GeoAerospace. The project also worked with a group of farmers who scored their own land to see if such an approach has a role in future agri-environment programmes. Results from this and the use of ortho-imagery as an aid in habitat classification are promising and worth including in future schemes.

Caomhnú Árann looked at the feasibility of collecting wildflower seeds as a potential market for the farmers. Seed was collected using three different methods, hand collection, suction methods and purpose-built seed collectors using a rotating drum. All methods were successful depending on the type of seed required. However, aftercare of the seed was difficult, requiring immediate drying and care, which was a limiting factor for the project.

The project coincided with COVID-19, with intermittent lockdowns across the country in 2020 and 2021. This greatly restricted field works and the timing of some actions and in some cases alternative approaches were necessary. An extension to the project in 2023 aided with the completion of Caomhnú Árann EIP. As a result, the project achieved its objectives, trialled a locally led agri-environment project with a simplified results-based approach, a process that fed into Ireland's new agri-environment climate scheme (ACRES). The approach also had a direct positive affect on 2,509ha of grassland habitat of which approximately 75% is a Special Area of Conservation (SAC)

under the Habitats Directive. The removal of 96.75ha of scrub and construction of 253 raincatchers and 13 repair raincatchers allowed the required grazing to continue and be built on with the new ACRES scheme. The project team involved in Caomhnú Árann EIP will continue to manage ACRES within the ACRES Burren Aran Co-operation programme, allowing continuity with the Aran Island community.

## 2.0 Brief description of the project

The Aran Islands contain some of Ireland's and Europe's scarcest and most valuable limestone pavement, Orchid-rich calcareous grasslands and Machair habitat. This project aimed to build on work done in the earlier AranLIFE project and on other agri-environment schemes. The project trialled innovative technology to reduce the administrative cost of agri-environment schemes (which has been an issue in some earlier ground-breaking schemes) to make them more viable, accessible and transferable to other areas. It also examined non-subsidy methods of improving farm unit income, to make protecting habitats more viable for farmers. The project also sought to examine, innovative and cost-effective ways of selectively delivering phosphorus to cattle on the Aran Islands, whilst minimising any adverse effect on species-richness and diversity.

### 2.1 The objectives of the project were to:

- 1) Examine innovative management techniques to both maintain, and bring sites to, favourable condition by addressing the threats of land abandonment, undergrazing, intensification, loss of traditional management systems and associated loss of knowledge. The project used a simplified outcome based, habitat scoring system along with a range of actions to improve the score of the field and ensure it achieved favourable condition. The scoring system was linked to remote sensing, orthoimagery and multi-spectral imagery and ground troughing to determine if it was an accurate way of measuring habitat quality. In addition, the project trialled farmer self-assessment when carrying out land scores.
- 2) The project examined non-subsidy methods of improving farm income to address the issues of land abandonment and increased intensity of farming practices. These included:
  - a) Examining innovative ways to deliver phosphorous supplementation targeted to most at risk cattle, rather than pasture-based fertiliser which is likely to degrade the species rich attributes of the priority habitat; and
  - b) Seeking to monetise the value of the species rich grasslands as a material resource of seed for regeneration and remediation of degraded habitat in other areas;
- 3) Improve the conservation status of 2,509 hectares of priority habitats
- 4) Enhance understanding, appreciation and engagement of all the key stakeholders with the conservation of priority habitats on the Aran Islands.

## 2.2 The Approach

The project was implemented and administrated by a project team in conjunction with the operational group made up of the different partners. The project team included:

Dr Amanda Browne (**Scientific & Technical Officer**) and Ms Gráinne Ní Chonghaile (**Administration and Financial Officer**) and Dr Patrick McGurn (**Project Manager**) (Fig. 1).



Fig.1 Caomhnú Árann EIP Project Team

After the initial project establishment, a series of meetings were held on the three islands and 125 farmers were willing to engage in the EIP and carry out targeted remediation and maintenance works on priority habitats. Farm plans were developed for each of these farmers and using remote sensing technology and ground truthing each land parcel was given a quality score and associated works identified to raise the score. Works included; provision of a water infrastructure (using raincatchers), scrub and bracken control and the reintroduction of grazing in parts of the farm.

The project team offered an advisory service for each farmer, held farm walks, meetings and one to one meetings to ensure farmers fully understood the plans and ensure all works were carried out to a completed standard. Due to COVID 19, some farm inspections were not possible so farmers supplied photographic evidence of completed works which proved to be a successful approach and continued after the lock down. Unlike other EIP projects, Caomhnú Árann did not use outside planners, all advice, inspections, land scoring were completed by the project team. The project team also developed a farmer self-assessment programme, where farmers were given their field scores,

details of the scoring system and asked to verify the score given and amend where appropriate. Amended scores were then checked by the project team.

### 2.3 Seed production from species rich grasslands

The project examined the potential for sale of seeds from the Islands' species rich grasslands. Evidence shows there is a market for high quality native wildflower seeds in a range of regeneration and replacement planting activities, from managing new roadways through repair and regeneration of damaged grasslands. The project examined methods, technology and regimes for sustainable seed collection.

### 2.4 Phosphorous supplementation

Pasture analysis of Aran Island herbage has shown significantly low levels of phosphorus. The low phosphorus levels are not shown on clinical blood tests, however, since cattle are able to release significant amounts of phosphorus from stores in their bones, so clinical phosphorus deficiency can occur with low to normal phosphorus levels.

Treatment of phosphorus deficiency is generally recommended by feed supplements or licks. However, there is little or no control over dosage to individual animals and the overall addition of phosphorus is higher than in targeted treatment. Alternatively, the addition of phosphorus to the pasture is recommended. However, addition of phosphorus to pastures on the Aran Islands is likely to reduce species richness and the status of priority habitat.

The project tested phosphorus supplementation (Fig. 2) by delivery mechanisms that take advantage of some of the clinical characteristics of chronic phosphorus deficiency, including pica or abnormal appetite, which deliver the lowest possible amount of phosphorus onto priority habitat.



Fig.2 Project tested phosphorus supplementation



### 3.0 More detailed reporting to address

#### 3.1 Baseline data

Under the EU Habitats Directive (92/43/EEC), 75% of the land surface of the Aran Islands is designated as a Special Area of Conservation (**SAC**) and this area includes priority habitats such as limestone pavement (8240\*), orchid-rich calcareous grassland (6210\*), and machair (21A0\*). The SACs are IE001275 Inisheer Island, IE000212 Inishmaan Island and IE000213 Inishmor Island.

The species rich grassland habitats of the Aran Islands are increasingly scarce, highly important and worth protecting. The project aimed to protect and restore priority habitat on the Aran Islands, as the existing measures from government and other stakeholders are not meeting the needs of the unique habitat. This is seen in:

- 1) continuing negative condition assessments for priority habitat, as reported by the NPWS ranges from "poor" and "bad" respectively
- 2) continuing encroachment of scrub, particularly briar, blackthorn and bracken into priority habitat areas;
- 3) continuing land abandonment;

The low-impact farming, combined with the low usage of fertiliser, has maintained the species-richness and high diversity of the island flora. The species found includes: Bloody Crane's-bill (*Geranium sanguineum*), Wood Sage (*Teucrium scorodonia*) and Blue moor grass (*Sesleria caerulea*), along with more rare plants such as Spring Gentian (*Gentiana verna*). Close to the coastline, the Irish Red Data Book species, Hairy Violet (*Viola hirta*), has been recorded. The Limestone pavement occurs mostly as a mosaic with Orchid-rich grassland and Dry heath. Orchid-Rich Grasslands are found on the patches of thin soil in the pavement and are often dominated by Blue moor grass (*Sesleria caerulea*), along with Orchids such as Autumn Ladies-tresses (*Spiranthes spiralis*), Twayblade (*Listera ovata*), Early Purple Orchid (*Orchis mascula*) and Fragrant Orchid (*Gymnadenia conopsea*). The Irish Red Data Book species, Bee Orchid (*Ophrys apifera*) and Dense-flowered Orchid (*Neotinea maculata*), are found in these grasslands.

The economics of this farming system is resulting in a cessation, withdrawal, restructuring or reduction of farming activity on the islands. This has led to the visible degradation of priority habitats through undergrazing, abandonment and the loss of important land management traditions. The project's objective is to reverse these changes and improve the conservation status of these habitats.

Tourism is a major industry of the Aran Islands. One of the challenges was to build the appreciation of key stakeholders, in particular the Aran Island community and farmers, as to the linkage between the quality of the priority habitat on the Aran Islands and community and farm unit revenue, as well as an understanding and appreciation of the value of the priority habitat in encouraging tourism on the islands.



### 3.2 Key Performance Indicators (KPIs)

**Objective 1:** Develop a simplified habitat scoring system to enable.

- a) farmers to self-assess the habitat status of land;
- b) efficient and effective methods for assessing and auditing farmer self-assessment;

**KPI:** Production of a workable habitat scoring system that can be trialled on participant farms that can be used as a measure of habitat condition improvement.

**Target:** Elements of agricultural policy in recent years recognise that food production is not only one of the services delivered by agriculture. The landscape has been shaped by past agricultural production and is made up of a range of ecosystem services which provide society with a range of services termed ecosystem services. The landscape of the islands reflects this, the agriculture system has produced a mosaic of small fields enclosed by stone walls and the associated species rich grasslands. Because of this, under the EU Habitats Directive (92/43/EEC), 75% of the land surface of the Aran Islands is designated as a Special Area of Conservation (SAC) and this area includes priority habitats such as limestone pavement (8240\*), orchid-rich calcareous grassland (6210\*), and machair (21A0\*). Thus, the island provides a range of ecosystem services, especially biodiversity. Existing agri-environment programmes have not addressed the issues on the Aran Islands. One study found that the agri-environment programme REPS increased awareness of the environment but there was a lack of positive management of habitats. This gap was partly addressed by a LIFE project, AranLIFE, which target specific management on 1,021 ha of farmland within the SAC. However, it was felt that for future success in schemes, a results-based approach was required, where payments reflected the quality of habitat and associated with that, a range of habitat management works that addressed any issues that produced a lower score. Such approaches have successfully taken place in other areas including the Burren (Burren Programme), the Hen Harrier and the Pearl Mussel EIP. The Caomhnú Árann approach varied, with a simpler scoring system developed to introduce farmer intuition rather than a set of variables to measure. The process relied on working with farmers to self-assess the habitat status of the land and determine the score. This differs from other projects who used outside planners to score land within the defined parameters. To reduce the risk of error, the scoring system was reduced from a 10-point system used in other projects to a 5-point system, where 5 is high quality habitat easily identified as soon as you walk into the field, 1 is ungrazed habitat or grazed at such a low-level, grassland that it cannot be maintained, 2 was improved grassland, which in the farmers view is good productive agricultural land. 3 and 4 lay somewhere in between with 4 being good but some issues such as a high percentage of scrub or some localised damage. Due to COVID restrictions on the ground farmer training wasn't possible so information booklets and videos were supplied to a number of farmers who were given the task of scoring the different parcels on their farm, along with a more detailed report of the Caomhnú Árann scoring system which can be viewed by visiting:

[https://www.caomhnuaranneip.ie/files/ugd/0ca2f5\\_84173f9537d548cfb329884f4c7d29b4.pdf?index=true](https://www.caomhnuaranneip.ie/files/ugd/0ca2f5_84173f9537d548cfb329884f4c7d29b4.pdf?index=true)



Fig.3 Participant farmer scoring own farm

**Result:** Farmers within the project received a plan for their farm with each land parcel allocated a score based on our habitat scoring system for two consecutive years and given the opportunity to amend scores after receiving training. The mechanism for the allocation of habitat scoring are detailed in Objective 2.

To evaluate self-assessment, field parcels were scored by the project ecologist and then a number of farmers were selected to also carry out scoring of the farm (Fig. 3). During this period of work, COVID19 restrictions were in place which limited targeted training and that was an inevitable weakness in the approach. However even with limited training opportunities, results were encouraging with a high correlation between what the farmers scored the land and what the project ecologist assessed it to be. There was some discrepancy between score 3 and score 4 with the farmers more often going for the 3 than the 4. An example of a map of scored fields within the project, with varying scores from 1 to 5, is illustrated in Figure 4.

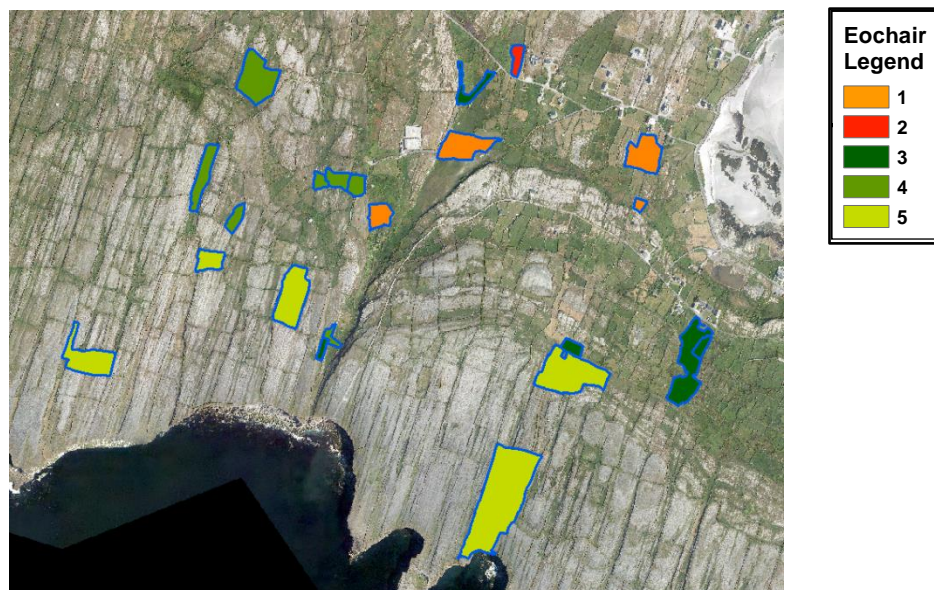


Fig.4 A farm map for Inis Mór. Different colours represent different scores for the land parcel.

One benefit of this approach is that with self-assessment the farmer develops a greater understanding of why a field gets a good score and therefore the reverse as in what equates to a bad score. This greater understanding builds on the farmer's own knowledge of how the area is farmed and what practices are required to maintain or improve a score instead of receiving a list of scores from a planner and maybe not examining or understanding them fully.

**Objective 2:** Develop remote sensing tools for habitat scoring, work targeting, work monitoring and assessment, and auditing.

**KPI:** Obtain the necessary information and trial work at field level.

**Target:** This project trialled remote sensing to reduce the labour-intensive process of walking each field. There has been very rapid advancement in recent years in drone hardware, sensor (camera) hardware, drone operating software and the imaging processing software that allows for the images captured by drones to be accessible on computers or other imaging equipment. This survey work was undertaken in two parts, high quality ortho-imagery using drone footage and the use of multi-spectral imagery to determine if there was a statistical relationship existing between habitat quality and one or more spatial variables, so it could be a tool to aid identification of the quality of semi-natural grasslands.

**Result:** Whilst COVID-19 limited the collection of data through remote sensing, the imagery gathered in 2019 allowed us to continue working with this part of our project and additional data was collected in 2022. The multi-spectrum data was analysed by a Masters student based at Czech University of Life Sciences Prague in the Faculty of Environmental Sciences, to identify the use of multi-spectral data and our field scoring system. From this work it was not possible to accurately relate a grazing score using the multi-spectral data under a supervised classification model. In instances where the resolution was high, orthoimagery worked as an aid in classification. Table 1 details the Remote Sensing Surveys undertaken within the project.

Table 1. Remote Sensing Surveys undertaken within the project

	2019	2021	2022
<b>Inis Oírr</b>	test site with multiple sensors/drones		500 acres with RGB data
<b>Inis Meáin</b>			125 acres with multispectral data and 500 acres with RGB data
<b>Inis Mór</b>	1250 acres with RGB data	1350 acres with Multispectral data	

**Objective 3:** Examine low labour intensity methods of priority habitat management; e.g. delivery of micro-dosage herbicides.

**KPI:** To identify the best practice and identify suitable sites.

**Target:** Scrub encroachment does lead to a degradation of the species -rich grasslands on the islands and some control mechanism is required particularly in areas where there is sub -optimal grazing. Cutting and removing the encroaching scrub is the first stage in grassland habitat restoration. However, regrowth can be problematic and target herbicide control is often needed as uncontrolled

application of herbicide can lead to severe damage. To prevent this the project trialled some micro dosage of herbicides. The hope was to lower the volume of herbicide used in habitat management.

**Result:** The consents and protocols and equipment were obtained and trialled by the farmers on two farms during the COVID-19 lock down period in 2020. The results from the low dosage applicator were disappointing leading to low interest from the farming community. Associated material costs were also high compared to conventional knapsack spraying and unlikely to be undertaken by the farming community.

**Objective 4:** Examine innovative methods of improving farm income to stem the flow of land abandonment on the islands.

a. methods of targeted phosphorus delivery to manage chronic low-level phosphorus in cattle.

**KPI:** Develop a mechanism for farmers on the islands to target the supply of phosphorous to specific stock with do risk to habitat quality.

**Target:** Previous work from the AranLIFE project had identified deficiencies in trace elements, Selenium, Cobalt, Copper, which were easily rectified using mineral licks and specific boluses. Rectifying phosphorous deficiencies proved more problematic. Phosphorous deficiency is not an issue in Ireland in general as it is supplied through general grassland fertiliser. This behaviour is limited in occurrence on the islands and doesn't occur within the SAC area. The target of this work was to place phosphorous supplementation in accessible areas where cattle deficient cattle would likely target.

**Result:** The research work was completed and prototype design developed and manufactured and trialled on participant farms. Purchased supplements with a higher phosphorous content were placed in plastic holders and attached to the water tanks in a grazing parcel. Using a motion camera, it was possible to see if cattle access these and how often. From the imagery cattle did lick the supplements when coming for water suggesting they are a suitable method of supplementing phosphate. There were some issues, licks were only sold by one company and not always available. They were also designed for indoor feeding of dairy cows (where deficiencies are also encountered) and quite soluble so high rainfall lead to their deterioration. The costs of the blocks were also an issue but the method can be used to target particular groups of cattle, particularly older cows at calving whose phosphate levels are depleted (Fig. 5).





Fig.5 Targeting phosphate delivery through provision of high phosphate blocks.

b) Seed harvesting and treatment from the islands' species rich grasslands.

**KPI:** Complete a literature review on seed collection and determine the necessary procedures.

**Target:** Collect sufficient wildflower seeds to trial a number of growing plots in other areas of the country.

**Result:** Sufficient wildflower seeds were gathered over a range of sites, trialled in other areas and the results assessed. Farmers involved in the project helped with the collection of wildflower seed but germination percentages (tested through DAFM) have been poor and too low for commercial success. In 2021 a mechanised seed collector was trialled and a higher volume of seeds collected. The project worked with our partners, Teagasc on the possibility of developing and utilising Aran Island's Birdsfoot Trefoil (*Lotus corniculatus*) genetic pool in the breeding of a new improved cultivar suitable for Irish farm systems. This work will continue after Caomhnú Árann.

**Objective 5:** Demonstrate the best management techniques for the sustainable management of priority habitats, through the maintenance of optimal grazing on the Aran Islands.

**KPI:** Carry out the necessary actions to improve habitat quality on the islands.

**Target:** Identify works on 1,500 hectares incorporating approximately 90ha of scrub control, provision of 250 water facilities, access improvements to 200ha and provision of 6 training events to participant farmers.

**Result:** The work in total to date includes 97ha of scrub cleared of 95ha mapped, 253 new raincatchers and 13 repair raincatchers of 306 new and 18 repair raincatchers mapped and 2,509 ha habitat paid under results based grazing payments.

### 3.3 Closing Evaluation

The Caomhnú Árann project worked in an agricultural area where 75% of the land surface of the islands is designated as a Special Area of Conservation (SAC) under the EU Habitats Directive (92/43/EEC). The habitats on the islands are agriculture dependent and in addition there is a direct link between the visual landscape, small species rich grassland fields surrounded by stone walls, and tourism, which is now a major industry on the islands with up on 300,000 people estimated to visit every year. Within the EU Habitats Directive, there is a requirement for member states to set site-specific conservation objectives that reflect the ecological needs of the species and habitats and deliver the type of management required to achieve this. This EIP brought together all the stakeholders, the farming community, the competent authorities, advisory and research, into an operational group to deliver the type of management required and trial measures to aid in future management. It addressed a number of elements, a simple result based agri-environment measure that was easily implemented and allowed self-assessment by the farming community

The administration of the project trialled a range of innovative procedures to simplify implementation, for example, the use of drone footage to determine habitat quality and habitat works. This approach trialled both orthoimagery and multi-spectral data along with technical expertise. Farm clinics were held regularly with farmers ensuring they were involved at all stages, including verification of works.

The EIP also provided the infrastructure and necessary habitat management tools which led to improved habitat quality and associated score. Further to that, it addressed issues of concern for the farmer through aiding with phosphorous supplementation. Finally, it looked to add further value to farm outputs by looking at the feasibility of wildflower seed collection as a possible market product.

The delivery of the EIP was through a dedicated project team which allowed full commitment to the running of the project with its own identity. As the Islands are also designated Gaeltacht regions, with Irish as the first language, a bilingual approach was required, this was aided greatly in that a member of the project team was a fluent Irish speaker.

The approach in gaining commitment from the participating farmers to complete the work through the use of a farm plan, with the works documented was successful. There was a lot of additional work required in the selection of the farms, but that was a positive aspect in that a large number of farmers were willing to work with the project. These plans were developed using orthoimagery, ground truthing and local knowledge. The use of an outside contractor, GeoAerospace, to collect and analyse the collected imagery allowed an expertise that was beyond the capacity of the project team. Existing orthoimagery did exist, Google maps, Bing and the through DAFM's GLAM system and were investigated. However, the quality of the drone footage was at a higher level and allowed a much better analysis of field conditions (Fig. 6 & Fig.7). This footage along with the botanical expertise of the project team aided greatly in developing farm plans and in assessing habitat score.



Fig.6 DAFM aerial view drone vs GeoAerospace aerial view

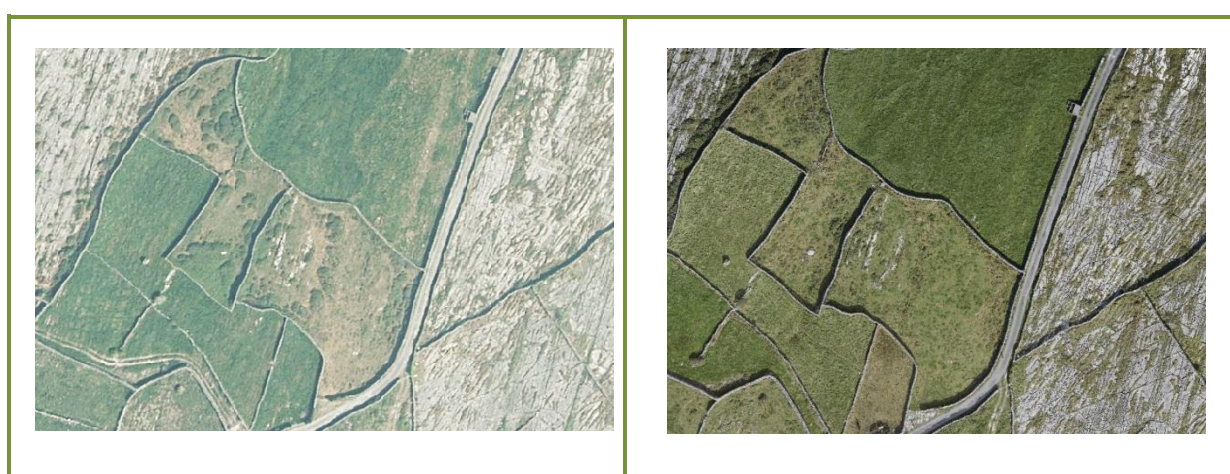


Fig.7 DAFM aerial view drone vs GeoAerospace aerial view

The viability of using data captured from Sentinel 1 and Sentinel 2 to train machine learning models to predict grazing scores was also assessed. Unfortunately, no model could be trained that could reliably classify the different land cover types using the spectral response from the two satellite sources. While Sentinel 1 and 2 are an excellent source of free data, due to their lower (10m) resolution, the relatively small field sizes on the Aran Islands require higher resolution data to achieve satisfactory results. Further details of this work can be found in the *Caomhnú Árann Satellite Grazing Scores Classification Report* at the following link:

[https://www.caomhnuaranneip.ie/files/ugd/0ca2f5\\_6443fd5351144049931e8f6a5bba794a.pdf](https://www.caomhnuaranneip.ie/files/ugd/0ca2f5_6443fd5351144049931e8f6a5bba794a.pdf)

The Caomhnú Árann EIP looked at the ability to assess habitat quality in semi-natural grasslands using multi-spectral imagery. The sites were flown on June 28th & 29th, 2021 with a DJI Phantom 4 Multispectral Drone. Further analysis of the data was completed as part of a M.Sc. study with Czech University of Life Sciences Prague. The results were disappointing as it was not possible to accurately relate a grazing score using the multi-spectral data under a supervised classification model. There were some banding issues with the data and therefore the consensus was it was not possible to solely use multi-spectral data to accurately classify each parcel. However, there are some classes that the data will be able to accurately classify. Remote sensing could be used as an aid to classification rather than the sole contributor.



Further details of this work can be found in the following reports: *Caomhnú Árann UAV Workshop and Site Survey*, *Caomhnú Árann UAV Surveys 2019-2022* and Nicholas Liquori's Diploma Thesis are available at the following links:

[https://www.caomhnuaranneip.ie/files/ugd/0ca2f5\\_323065164c5b42c09f9b13a07a7742e5.pdf](https://www.caomhnuaranneip.ie/files/ugd/0ca2f5_323065164c5b42c09f9b13a07a7742e5.pdf)

[https://www.caomhnuaranneip.ie/files/ugd/0ca2f5\\_d91de5d7137f4e01a995a442816e1267.pdf](https://www.caomhnuaranneip.ie/files/ugd/0ca2f5_d91de5d7137f4e01a995a442816e1267.pdf)

[https://www.caomhnuaranneip.ie/files/ugd/0ca2f5\\_c28980e544c84475a86314918be0d8e5.pdf](https://www.caomhnuaranneip.ie/files/ugd/0ca2f5_c28980e544c84475a86314918be0d8e5.pdf)

### Phosphorous supplementation

Maintaining the grassland habitats on the island is dependent on adequate grazing. Mineral deficiencies are present on the island, particularly phosphate. In general, phosphate applied in fertiliser meets the requirements of the grazing animal with the exception of some intensive dairy farms where phosphate can be administered through the drinking water system. Phosphate fertiliser is known to reduce species diversity and the water supply for grazing animals on the islands is through collected rain water in the field. However, these two standard methods of phosphate supply are not suitable whilst maintaining the species rich grasslands of the island. The high phosphate licks were accessed by cattle and the placement on the rainwater catchers made them immediately available to stock. Whilst this method will not guarantee supply of phosphate to individual cattle it can be targeted at specific times of the year when the animals' reserves are depleted.

### Seed Collection

Three methods of seed collecting were trialled by the Caomhnú Árann EIP; hand collecting, a suction harvester (Fig. 8) and a machine drawn brush harvester (Fig. 9 & Fig. 10). The equipment needed was hired by the project from the Ulster Wildlife Trust. Hand collecting, whilst time consuming, did allow collection of seeds of particular species. The suction harvester and brush harvester allowed higher volumes of seed but required high levels of aftercare as both methods collected large volumes of chaff (Fig. 11). This material needed to be dried and cleaned of debris using seed sieves. This was achievable with small amounts of seed but there were issues with drying larger volumes of collected.



Fig.8 Gathering Wildflower Seed, suction harvester



Fig.9 Gathering Wildflower Seed, machine drawn brush harvester



Fig.10 Gathering Wildflower Seed, machine drawn brush harvester





Fig.11 Gathered Wildflower Seed and Chaff

Once the seed was cleaned it was planted in a number of different locations and evaluated. Success varied greatly with different species showing higher germination rates. Species including Ox eye daisy (*Leucanthemum vulgare*), Birds foot trefoil (*Lotus corniculatus*), Bloody Cranesbill (*Geranium sanguineum*), Kidney vetch (*Anthyllis vulneraria*), Greater Knapweed (*Centaurea scabiosa*) responded better than other species. Germination rates for the seed were tested using DAFM Seed Testing Laboratory (STL) in Backweston. Germination results were very low for some species and the presence of fungal growth indicated that the drying process was insufficient.

The species listed above with higher germination success were planted in a seed bed to identify the potential to grow the seed as a crop. The seed was planted in pots initially and then supplied to a Caomhnú Árann participant farmer who incorporated the plants into their vegetable production (Fig. 12).



Fig.12 Rows of Planted Seed

This proved to be successful with good quantities of seed harvested by hand over the growing season. The outcome of the work was that seed can be collected, cultivated on the islands with no negative affects on the existing vegetation. However, aftercare of the seed is difficult, requiring immediate drying and care. Companies such as Ecoseeds in County Down have these facilities and presently collect seed throughout Ireland using purpose-built equipment and then grow individual seed similar to “row crop” vegetable production. To further the work on the island a similar approach would be required however there is the potential for individual farmers to work with seed collectors who pay the farmer and deal with the harvest and aftercare and marketing of the seed. However, the field structure on the island does limit machinery access for this to be successful.

Working with 125 farmers, the total area of land within the Caomhnú Árann EIP was 2,509ha. The project was a whole farm approach with all lands entered into a farm plan and given a quality score from 1 to 5. The project then supplied a range of target measures which has the specific purpose of raising or maintaining the habitat score. The farm clinics held by the project enabled discussions with the farmer on why an area received a particular score and what works would be required to raise the score. Such works included the reintroduction of grazing, construction or rebuilding of raincatcher tanks, scrub and bracken control and applications of seaweed on some impoverished sites. With 75% of the land within the Special Area of Conservation, the requirement for member states to set site-specific conservation objectives that reflect the ecological needs of the species and habitats was delivered through the project in a partnership approach with all the stakeholders involved.

### 3.4 Value for Money (VFM)

The Intergovernmental Panel on Biodiversity and Ecosystem Service (IPBES) has published its global assessment on the state of the world’s biodiversity and ecosystem services. Ireland is not immune from the trends reported on in the Global Assessment, facing the same biodiversity crisis. Just over half of the 60 species in Ireland protected under the Habitats Directive are in a favourable condition, while a whole host of important habitats and the species that depend on them are in poor or inadequate condition, including the Freshwater pearl mussel (*Margaritifera margaritifera*), Atlantic salmon (*Salmo salar*), and Marsh fritillary butterfly (*Euphydryas aurinia*). Despite the negative trends, there are some positive local-led initiatives targeting specific species, including the conservation of Hen harrier (*Circus cyaneus*), Curlew (*Numenius Arquata*) and Freshwater pearl mussel (*Margaritifera margaritifera*). In addition, there are also a number of innovative European Innovations Partnership evidence-based projects targeted at specific habitats which test and demonstrate how farming can be of benefit to biodiversity. Caomhnú Árann is one of these projects, working with farmers and other stakeholders targeting limestone pavement, orchid-rich calcareous grassland and machair habitat.

Agriculture on the islands contributes to Ireland’s biodiversity, archaeological and cultural heritage, however the present farming systems on the Aran Islands represent a marginal economic activity. In addition, agriculture plays an important part in the Aran Islands reputation as a tourism destination among national and international tourists. The small species rich field, network of stone walls maintained by agriculture are a major selling point for tourism. However, in recent years the landscape and its biodiversity has come under threat due to a shift in farming methods and management practices. The marginal economic activity of the farms means to survive some support



measures are required. This has been recognised in the past with broadscale voluntary Agri-environmental schemes (REPS/AEOS/GLAS). However, such broad schemes, whilst contributing to farm viability have failed to address some of the habitat issues. The Caomhnú Árann EIP has stepped in to address these issues, building on the previous AranLIFE project. Under the project 2,509 ha of habitat have been actively managed in conjunction with the conservation objectives of the SAC. The training days, newsletters, one to one meeting with farmers managed by the local team on the ground have built awareness of the importance of the islands for wildlife. Anecdotal evidence of this is the number of rare bird species that have been recently identified by different participant farmers and reported to the project team. These include Corncrake (*Crex crex*), Short eared owl (*Asio flammeus*), Lapwing (*Vanellus vanellus*), White tailed Eagle (*Haliaeetus albicilla*), Bufflehead (*Bucephala albeola*) and Velvet scoter (*Melanitta fusca*).

Whilst Caomhnú Árann was a short-term project to trial some innovative methods, the work on the ground will have long-term benefits. Under the Caomhnú Árann project farmers constructed 253 new raincatchers (Fig. 13) and repaired a further 13, giving a total of 266 structures, which are vital for the continued management of the habitat. A construction plan for new raincatchers was developed and issued to farmers for guidance, but participants were allowed to design their own structures to suit conditions, within the agreed size limit. This allowed the farmers freedom to come up with the best suitable option for their farm, leading to more innovation. The facilities supplied are permanent and will last for over 30 years, and therefore will continue to allow optimum grazing of the priority habitats after the end of the project. The provision of a water infrastructure supplied approximately 2,200,000 litres of rainwater annually for grazing livestock. At present, drinking water is shipped to the islands from the mainland. The transport costs for the equivalent volume is in the region of €47,000; the work completed by farmers in the Caomhnú Árann project resulted in significant economic savings.



Fig.13 Construction of Traditional Raincatcher

#### 4.0 Financial Report

A summary of all project expenditure is detailed in Table 2 below and a further breakdown in Table 3.

Table 2. Summary of Total Project Expenditure

	Budget	% Budget	Expenditure to 31.12.23	Remaining	% Expenditure
Personnel Costs	€467,260.00	24.88%	€570,650.33	€103,390.33	122.13%
Travel	€42,275.00	2.25%	€15,213.44	€27,061.56	35.99%
Other Costs	€11,000.00	0.59%	€4,829.24	€6,170.76	43.90%
Administration Costs	€93,112.00	4.96%	€81,486.79	€11,625.21	87.51%
Implementation Costs	€63,300.00	3.37%	€42,469.12	€20,830.88	67.09%
(Farmer Payments)	€1,200,850.00	63.95%	€1,108,646.66	€92,203.34	92.32%
<b>Totals</b>	<b>€1,877,797.00</b>	<b>100.00%</b>	<b>€1,823,295.58</b>	<b>€54,501.42</b>	<b>97.10%</b>

Table 3. Breakdown of Total Project Expenditure

Project Costs	Initial Budget	Updated Budget	Accrued to-date
ADMINISTRATION			
Admin - Personnel	€330,000.00	€467,260.00	€570,650.33
Admin - T&S	€38,775.00	€42,275.00	€15,213.44
Admin - Other	€25,562.00	€25,562.00	€11,684.32
OG meeting room rental	€1,000.00	€1,000.00	€0.00
<b>TOTAL ADMINISTRATION COSTS</b>	<b>€395,337.00</b>	<b>€536,097.00</b>	<b>€597,548.09</b>
<i>% of Total Budget</i>	<b>27.26%</b>	<b>28.55%</b>	<b>32.77%</b>
MANAGEMENT / IMPLEMENTATION			
Drone -			
Photo Drone, Herbicide Drone, Pilot Training / Licensing (8 days)	€23,800.00	€38,800.00	€38,544.51
Workplans / Contracts: Scrub, Raincatchers, Grazing, Seaweed	€889,100.00	€1,140,850.00	€1,108,646.66
Monitoring Payment	€60,000.00	€60,000.00	€956.94
Seed collecting & Processing	€5,000.00	€7,500.00	€1,208.87
Develop Possible dispensing methods	€5,000.00	€7,500.00	€1,758.80
Website / social media	€3,500.00	€3,500.00	€2,000.00
Independent Audit	€5,000.00	€5,000.00	€0.00
Other Costs - dissemination, educational materials	€11,000.00	€11,000.00	€8,654.24
Equipment Costs	€7,500.00	€7,500.00	€3,923.28
<b>TOTAL Management</b>	<b>€1,009,900.00</b>	<b>€1,281,650.00</b>	<b>€1,165,693.30</b>
Overheads	€45,000.00	€60,050.00	€60,054.19
<b>TOTAL COSTS</b>	<b>€1,450,237.00</b>	<b>€1,877,797.00</b>	<b>€1,823,295.58</b>

#### 4.1 Comments on the project expenditure:

At 31 December 2023, the project was 100% complete and expenditure was at 97.1%, €1,823,295.58 from an overall budget of €1,877,797.00. The project had a small monetary underspend of €54,501.42 but the majority of the project objectives were met.

#### Administration Costs:

1. **Personnel:** 122.13% (€570,650.33 of €467,260) budget spent; higher personnel costs are related to a time extension of the project. Furthermore the project team also acted as planners within the project, which cut out any additional consultancy fees, which would have been associated with specialised planner works.
2. **Travel & Subsistence:** 35.99% (€15,213.44 of €42,275) budget spent; significant underspend due to reduced travel costs during COVID travel restrictions.
3. **Other:** 52.18% (€13,338.56 of €25,562.00) budget spent; underspend due to continued use of AranLIFE databases, GIS software and aerial photography licenses and as a result no new purchases were necessary. Insurance and professional indemnity costs were lower per annum than originally estimated by project team.
4. **Overheads:** 97.25% (€60,054.19 of €60,050.00) budget spent.

#### Management / Implementation Costs:

1. **Drone work:** 99.34% (38,544.51 of €38,800) budget spent.
2. **Participant Farmer Workplans / Monitoring Payment:** 92.32% direct farmer payments (€1,108,646.66 of €1,200,850) budget spent. The monitoring payment was incorporated into the results based grazing payment, as an element of this work included direct participation from the farmer.
3. **Seed Collecting and Processing:** 16.12% (€1,208.87 of €7,500) budget spent. Seed collection machinery was hired from the Ulster Wildlife so purchases weren't required.
4. **Phosphorus Dispensing Methods:** 23.45% (€1,758.80 of €7,500) budget spent. COVID-19 resulted in less trial work being conducted and the work was concentrated on a smaller number of farmers.
5. **Website / social media:** 57.14% (€2,000 of €3,500) budget spent.
6. **Independent Audit:** 0% (€0 of €5,000) budget spent. An independent audit was not a requirement of DAFM, but had been included in project's original estimated costs and was not spent.
7. **Other Costs – dissemination, educational materials:** 78.67% (€8,654.24 of €11,000) budget spent.
8. **Equipment Costs:** 52.31% (€3,923.28 of €7,500) budget spent.



## 5.0 Lessons learned

- A simple 5-point scoring system for a results-based habitat assessment is an effective tool for categorising grassland habitat based on quality. Such an approach is easy to convey to farmers and farm planners, it has an intuitive element but is backed up by measurable parameters. This scoring system was developed for the Aran Island grasslands but could work equally well in other locations where there is a continuum of grassland quality from intensively managed to species-rich.
- Ortho-imagery through the use of drones is an aid to habitat assessment but is best used only as an aid to classification. With a standard consumer drone (e.g. DJI Mavic/DJI Inspire 2), it is possible to map up to 30 hectares on a single flight i.e. 1 battery/20 mins. The resulting data can then be processed using one of the cloud-based solutions in approximately 2hrs. For maximum area coverage during a survey, the maximum flying height is preferred i.e. 120m/400ft, however in the context of Aran Islands surveys a balance should be found which allows identification of plant species. As such, this may require a lower flying height resulting in less area coverage but a higher resolution map (Fig. 14).

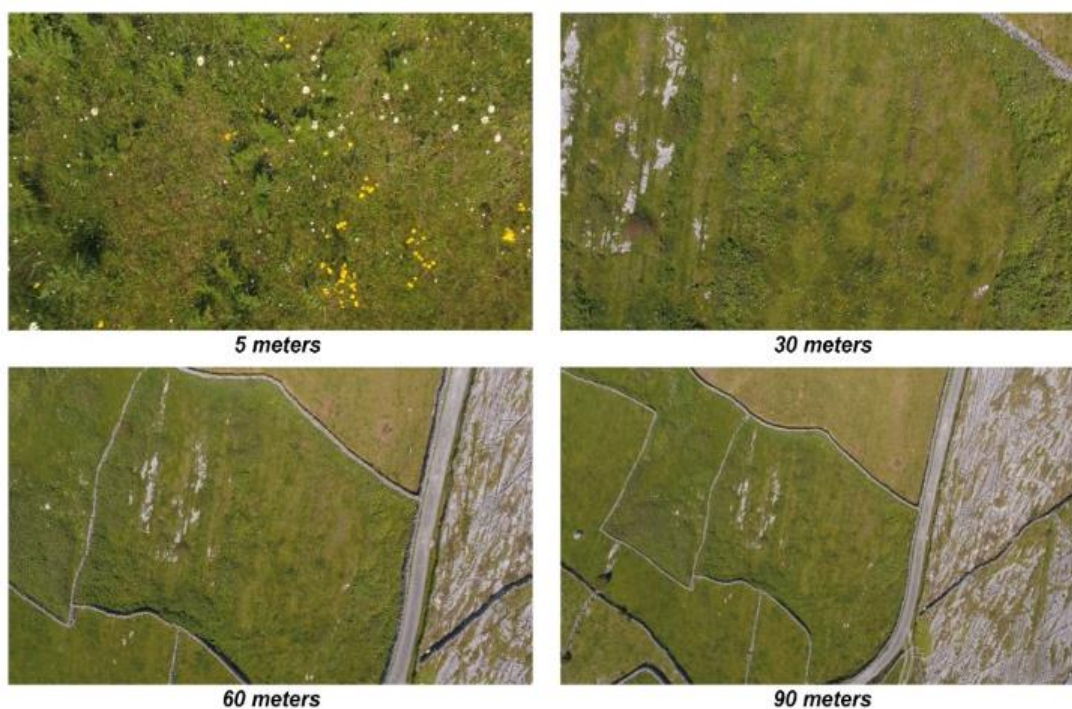


Fig.14 Ortho-imagery at varying heights

- A supervised classification model such using the multi-spectral imagery was not proven to accurately classify any grazing score. However, there was promise in the ability to classify fields scored 2 and 5. If the large sample size of these two groups is affecting the model's ability to classify these fields, then there is also promise in the prospect of the model being more successful with a larger data set or perhaps temporal data.

- Farmer self-assessment is a feasible option for future agri-environment programmes. One main benefit of this approach is that with self-assessment a greater understanding of why a field gets a good score and therefore the reverse of what equates to a bad score. This greater understanding will build on the farmers own knowledge of how the area is farmed and what practices are required to maintain or improve a score instead of receiving a list of scores and maybe not examining or understanding them fully.
- The Aran Islands habitats and farming system are suitable for the collection of wildflower seed; however, management of seed post harvesting is difficult and sufficient volumes would require additional infrastructure.
- Ox-eye daisy (*Leucanthemum vulgare*), Birds foot trefoil (*Lotus corniculatus*), Bloody Cranesbill (*Geranium sanguineum*), Kidney vetch (*Anthyllis vulneraria*), Greater Knapweed (*Centaurea scabiosa*) and Yellow Rattle (*Rhinanthus minor*) appear to be species better suited for collection and subsequent re-sowing.

## 6.0 Actions to carry forward

The Caomhnú Árann EIP farm plans finished in December 2022. This coincided with the arrival of the new agri-environment scheme ACRES. The Aran Islands are part of the ACRES Burren Aran Cooperation Project (BUA CP) and will carry on working with farmers in managing and conserving the rich ecological, archaeological, geological and cultural heritage of the Islands. The scheme is financed by the Department of Agriculture, Food and the Marine (DAFM). Of the 125 participant farmers in the Caomhnú Árann project, 76 have entered into the new ACRES scheme and it is likely that up to 90% of eligible Aran Island farmers will enter ACRES on completion of the Tranche 2 of ACRES. Therefore, the results-based approach operated by Caomhnú Árann will continue for the next 5 years. DAFM have opted for a 10-point results-based programme, not the approach taken by Caomhnú Árann. The project team who implemented Caomhnú Árann will continue with the new ACRES Burren Aran scheme. This team were also previously responsible for delivering the AranLIFE project which ran from 2014-2018. This means there has been a continuity of the project team working with the farmers on the islands for 10 years and this continues on into the ACRES scheme. Lack of continuity of staff has been cited as an issue in many environmental programmes, so this is a very positive aspect of the project which will carry on. Lessons learned and knowledge acquired by the Caomhnú Árann project team can be implanted within the parameters of the new ACRES scheme aided by the experience of the Burren projects.

The Caomhnú Árann project manager was a member of the Farming for Nature Technical Group (FFNTG), under the auspices of the HNV Ireland programme. This brought together a range of initiatives and pilot programmes in Ireland working on High Nature Value Farming, high status objective water bodies, testing and developing novel agri-environment schemes. In late 2020 - early 2021, FFNTG was part of an inter-departmental technical working group on the CAP green architecture with representatives from DHLGH (NPWS, Water Advisory Unit and Wild Atlantic Nature LIFE Integrated Project), DAFM. The objective of the working group was to assist in the design and development of an agri-environment programme for specific HNV farming regions to be rolled out across Pillar II of the CAP. This allowed for the experiences of the Caomhnú Árann project to feed directly into policy and the new ACRES agri-environment programme.

The Caomhnú Árann project differed in other EIPs in that the project team also did the planning work associated with developing the farm plan. Due to the small fragmented nature of the farm and associated plans, islanders do have difficulty getting a planner, due to the high time associated with the work for the planner. This issue was fed back to DAFM and as a result a Farm Advisory Service (FAS) advisor within the project team can work with island farmers when difficulties arise.

Overall the new ACRES scheme, with its results-based approach, maintenance of stone walls and the possibility of Non-Productive Investments (NPIs) in improving scores, ensures the continuity of the maintenance and enhancement of habitat, both designated and non-designated, and working with the same experienced project team also allows for continuity.

During the period 2019-2022 the Caomhnú Árann project collated just under 2,000ha of ortho-imagery including multi-spectral and RGB data. This is at a higher definition than existing readily available data (Google, Bing, GLAMS). This information is an important resource and has been passed on to the NPWS and is included in the ACRES Burren Aran information layers. Post Caomhnú Árann this data will be available if required as classification models improve with technological advances.

Seed collected under the Caomhnú Árann EIP has all been distributed with some going to habitat restoration works elsewhere. The project held information days with locals to inform them of their findings. Caomhnú Árann worked with our partners Teagasc to look at the possibility of developing and utilising Aran Island's Birdsfoot Trefoil (*Lotus corniculatus*) genetic pool in the breeding of a new improved cultivar suitable for Irish farm systems. Birdsfoot trefoil forage contains condensed tannins which confer a number of animal benefits particularly relevant for environmental sustainability and climate change mitigation including reduced enteric methane emissions and Nitrogen losses, bloat preventative and reduced/inhibited internal parasites in livestock, and increased animal production potential. Breeding a new cultivar of Birdsfoot trefoil adapted for Irish farm systems from the Aran Island gene pool could help Irish farms reach their environmental and climate change targets. This work will commence in 2025 and highlights the importance of maintaining genetic diversity in the landscape.

## 7.0 Details of dissemination of project findings

Dissemination of information to raise public awareness and provide technical advice to farmers and environmental managers was an important part of the Caomhnú Árann project. Dissemination of the project findings was important:

- to provide suitable information to raise awareness of the ecological importance of the islands and inform a wider audience of the present threats and possible solutions in the management of the islands' habitats.
- to increase knowledge in the scientific and policy arena on the ecological makeup of the island and how future support mechanisms could work better using result-based schemes and labour-saving methods to determine habitat quality which fed into agri-environment programme implementation.

Dissemination of the project and its findings were achieved at a broad level through the use of a website and social media and at a local level through public meetings, farm walks and information guides. On a national and international level, we have facilitated college visits, undergraduate studies, information meetings combined with farm walks and by engaging in conferences both national and international.

The project will maintain a website presence into the foreseeable future and information and reports will be accessible from this. As the project team is continuing work through the ACRES Burren Aran Cooperation Project, personnel can still be contacted to provide information or provide help to other projects.