Caomhnú Árann EIP Project

Caomhnú Árann Field Scoring System for Determining Habitat Condition Report 2020

Togra Caomhnú Árann

Teach Ceann Tuí 2

Inis Oírr

Oileáin Árann

Co. na Gaillimhe

Phone: 083-1523930

Email: caomhnuarann@gmail.com

Website: www.caomhnuaranneip.ie

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1. The Scoring System

The Caomhnú Árann EIP scoring system is a simple 5 point scheme based on the presence of positive indicator species (Appendix 8.2). This system has been developed for the Aran Islands but could be easily applied to other grassland habitats, where there is a transition from improved grasslands to species-rich grasslands of high conservation value.

Each land parcel is allocated a score from 1 to 5, which reflects the condition of the grassland habitat; with score 5 indicative of a higher associated biodiversity. A previous project, AranLIFE, identified the main factors that contributed to the production of high quality grasslands, and associated with the grazing the amount of time invested into land parcels was recognised as a main driver influencing species-rich grassland. Additional time is required for maintenance of walls to control the extent of grazing, moving livestock across the farm, constant herding of cattle to ensure removal of vegetation, regular removal by hand cutting of encroaching scrub, and supply of adequate water supply to meet the needs of the grazing livestock. The costings of payments for the higher scores, reflects the higher time input invested in to the production of grasslands of high conservation value.

This scoring system has been developed with a view to farmer self-scoring and training material has been produced to achieve this end goal.

More details of the scoring system can be found in Appendix 8.1. An informational demonstration video also details the score descriptors (https://www.youtube.com/watch?v=cp_QMpvWMEc.).

2. The basis for each score

The score is applied at the LPIS land parcel unit level. However this can be further broken down to management units or habitat units where there is variance within a LPIS land Parcel.

Semi-improved and Improved/Arable land receive a score of 2 whilst areas of shoreline, laneways buildings and ungrazed areas etc., receive a score of 1. For parcels with a percentage of semi-improved/improved grassland, where this area is less than 30% then the dominant score will be given to the whole area, areas with greater than 30% semi-improved/ improved grassland will be scored as separate units.

2.1 Agricultural Activity

The land parcel should have clear signs of grazing visible from the condition of sward, these include areas cleared of vegetation or a range of vegetation heights including tightly grazed patches, indications of livestock tracks, faecal material and lying areas. No signs of agricultural activity, indicates land is not in agricultural use and the land parcel should be given a Score 1.

2.2 Presence of scrub/bracken

The presence of encroaching scrub or bracken will reduce the score of a field when the area of scrub or bracken cover is greater than 20% of the overall land parcel. When scrub or bracken encroaches species-rich grassland, the numbers of positive indicator species present will be reduced.

2.3 Grazing condition

Undergrazing, as evidenced by areas of dead vegetation will also reduce the species-diversity of the grassland and hence the grazing score.

2.4 Damage assessment

The score of the LP will also be reduced if there are areas of damaged vegetation, excessive poaching, damage as a result of feeding troughs or excessive vehicle damage.

2.5 The Species

Using the presence and abundance of specific positive indicator species (Appendix 8.2) it will be possible to determine an overall score for the field. The field scoring procedure is intuitive but can be verified by taking a line transect across the field diagonal and identify the species located in an area of $1m^2$ in a total of 10 random points within the transect. For grazed areas of limestone pavement the survey points should concentrate on the grazed outcrops within the limestone. This scoring system is based on presence of grazing so ungrazed areas receive a score 1.

Where the field contains one or less positive indicator species present in an area of one square metre at six out of ten random points in the area it is likely a semi-improved or an improved field with a grass dominant sward and so will have a score of **2**.

A field having between two and four positive indicators present in an area of one square metre in at least six out of ten random points in the area, is indicative of a moderately species-rich field and will have a score of **3.**

Where four or more, positive indicators are located in an area of one square metre at five out of ten random points in the field, it will have score of **4.** The remaining five points will likely consist of scrub, course grass or semi-improved grassland.

If five or more positive indicators are located in an area of one square metre at eight out of ten random points in the field then the area will have a score **5.** Fields with 5 indicator species between 5 to 7 random points will have a score of 4, with the remaining random points likely to consist of scrub, course grass or semi-improved grassland.

2.6 Scoring Sheet

The Caomhnú Árann scoring sheet for assessing the score to be assigned to each land parcel provides scope for identifying any negative issues which may reduce the grazing score as well as providing opportunity to provide advice to the farmer on how to increase the score (Table 1). Given the nature of Aran farms, which in some cases could consist of 70 to 80 land parcels, the score card has been designed to facilitate quick completion in the field while inspecting farms. The final score given will reflect the other variables, for example a field could score highly under the Sward Condition but could include excessive damage, and in such cases the field would drop its score.

Table 1. Scoring Sheet

LPIS No.	Main Habitat	Agric. Activity Y/N	Scrub greater than 10%	Damage Assessment	Sward Condition	Management Advice	Score

3. Improving the score

When land receives a score 2, 3 or 4, it is important that the land owner is aware of the justification for the score as well as the management actions that could be implemented to improve the score level. Along with each score, there is a corresponding set of actions that could be implemented to potentially increase the score (Table 2).

Table 2. Management Changes for Improving Scores

Score	Management changes for improving scores
1	For areas where grazing management has ceased, reintroduction of adequate grazing is first step, best achieved through grazing with higher number of cattle over a short period. Areas of dead grass avoided by livestock should then be cut back and encroaching scrub removed. Ensure adequate water supplies for livestock which may mean construction of rain catcher.
2	Short term improvements in biodiversity unlikely. Determine whether semi-improved area is part of overall farming systems, supporting sensitive management of grazing areas elsewhere. If farmer willing to improve species content, reduction of fertility levels is likely first step. Consider taking a hay crop from field, followed by grazing to reduce fertility. No extra added fertility to be added.
3	Increase current grazing levels; the main aim is to remove excess vegetation to allow species diversity. This may mean supplying adequate water facilities by either construction of new raincatcher/spring catchment or using facilities in adjacent fields. For winterage a flash grazing during the summer could be considered early enough to allow regrowth. Areas of encroaching scrub should be removed with retreatment as required. For fields with high levels of *Molinia* (Purple Moor grass), consider spring grazing when the grass is palatable to livestock. Remove any features that increase likelihood of damage, e.g. feeders.
4	Targeted scrub removal or increased grazing will be the main action required here with follow up treatment. A slight increase in stocking level may be required post scrub cutting. Ensure adequate water supplies.
5	Continuation of the existing management is main action required here, ensuring no increase or decrease in stocking levels. Maintain all water structures and access points to ensure stocking levels can be maintained. Small pockets of scrub control may still be required in some areas to prevent further encroachment.

4. The Costings for each score

Farmers perceive that biodiversity targeted management of semi-natural grasslands is a limitation to potential livestock production. Tallowin and Jefferson (1999)[1] showed that the herbage growth rate and harvestable yield of semi-natural grasslands were at least 50% lower compared to intensively managed meadows. The application of fertiliser can increase the livestock carrying capacity of a field but has a negative effect on the species composition of the sward. Plantureux *et al*. (2005)[2] found a reduction of half of the total number of plant species observed for fertiliser rates between 20 and 50 kg of nitrogen per hectare per year, and the average number of forbs species was very low where

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[1] Tallowin, J.R.B., Jefferson, R.G. (1999). Hay production from lowland semi-natural grasslands: a review of implications for ruminant livestock systems. Grass and Forage Science 54:99-115.
[2] Plantureux, S., Peeters, A., McCracken, D. (2005). Biodiversity in intensive grasslands: Effects of management, improvements and challenges. Agronomy Research, 3(2), 153-164.

nitrogen inputs exceeded 75kg of nitrogen per hectare per year. Several years of work at Castle Archdale Experimental Centre on semi-natural wet grasslands showed that applying fertiliser to existing swards resulted in considerable yield increases. O'Neill (1981)[3] showed that for every 1kg of additional nitrogen applied, there was a 21kg dry matter/ha increase in yield on natural (sic) Fermanagh swards.

Previous work by the AranLIFE project identified that the yield of grasslands on the islands vary from 4696kg DM/ha/year on the more improved swards, 2452kg DM/ha/year on intermediate swards to 1299kg DM/ha on the high quality species rich swards. (AranLIFE 2017 unpublished work). This indicates that in terms of yield and agricultural output it is financially advantageous to apply fertiliser to semi-natural grasslands and within the rules of cross compliance and existing agri-environment programmes. However, the high percentage of SAC on the islands limits the use of fertiliser under Notifiable Actions which state, 'adding lime/adding fertiliser of any sort to areas not previously fertilised/ applying fertiliser which would increase the level of nitrogen in the soil/applying fertiliser which would increase the level of phosphorous in the soil'. Survey work by the Heritage Council (Smith *et al*. 2017)[4] highlighted that the main issue on the islands was a general reduction of farming leading to sub optimal grazing of field parcels, an encroachment of scrub and coarse grasses.

To maintain or achieve the optimal condition on semi-natural grasslands on the Aran Islands, the following conditions are required:

a) No application of organic or inorganic fertiliser

b) Optimal grazing rates to ensure full removal of biomass

c) Regular removal of encroaching scrub by hand throughout the year

d) Continuation of the winterage based system

e) Increased time involved in management, ensuring adequate water supplies for grazing livestock, greater herding of livestock.

The rough terrain of the Aran Islands, the high proportion of designated land, the high level of outcropping rock, the very small field structure mean that standard methods of scrub control as found on the mainland are not possible, as control by tractor and mower is impossible. Therefore, frequent hand cutting is the only option and designation prohibits or limits the use of herbicide. Scrub areas are affecting the conservation status of the priority habitats and are adding to the seed source for future colonisation of new areas.

Additional time is required for maintenance of walls to control the extent of grazing, time in moving livestock across the farm, constant herding of cattle to ensure removal of vegetation, regular removal by hand cutting of encroaching scrub, and supply of adequate water supply to meet the needs of the grazing livestock. This often involves bringing drums of water to livestock in periods of dry weather when raincatchers are no longer functional. A breakdown of the estimated costs is outlined in Table 3. The calculation is based on estimated times involved in increased land management and time associated with livestock management.   Based on national data figures ([Appendix 8.3](#)), the labour required for an out-wintered cow equates to 3.5 working days per year or

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[3] O'Neill, D. (1981). The Castle Archdale Experimental Husbandry Farm. In: The Biological Potential of Agricultural Land in Fermanagh. Institute of Biology (Northern Ireland Branch).

[4] Smith, G.F., Bligh J., Delaney E., Egan M., O'Donavan G, O'Donaghue, P. and O'Hora K. (2010) Case studies on High Nature Value farming in Ireland: Aran Islands and North Connemara. A report to the Heritage Council.

28 hours. Indications are that slightly higher stocking rates are required to achieve higher scores, this has been based at 0.25LU/ha for score of 3, 0.28LU/ha for a score of 4 and 0.32LU/ha for a score of 5.

The additional labour inputs have been divided into three main groups:

a)   Additional movement of stock and increased herding of livestock;

b)   Provision of water;

c)   Control of scrub regrowth.

These manual inputs increase the time investment on the Aran Islands above the 28 hours per cow rate but have a major positive effect on the quality of the species rich grassland. The third labour input is for work involved in controlling encroaching regrowth of scrub. This extra labour input is for additional control to prevent re-encroachment, which was a feature of the traditional farm management system. The resulting higher quality grassland requires a higher labour input and this is reflected in the final costings. The farmers' time has been costed at €15/hour; this is above minimum wage to reflect the higher skill set of the farmer involved. Finally, it should be noted that the farmers receive a level of agricultural output from all grassland types. Therefore, built in to the overall cost is the farmers' contribution to the project so only 60% of the estimated cost is built into the payment structure. No costs have been allocated to the drop in agricultural yield as a result of low fertility so overall costs could be greater.

Table 3. Costs for additional grazing

Score	Payment per score	Stocking Rate Required to meet score	Cost (Hours per extra LUs)[1]	Scrub mgmt. (€15/hr.) [2]	Cost of Increased herding, water, movement required[3]	Extra Costs to farmer for higher score	60% of Extra Costs to farmer
3	€100.00	0.25	€105.00	€30	€30	€165	**€99.00**
4	€125.00	0.28	€117.60	€45	€45	€207	**€124.56**
5	€150.00	0.32	€134.40	€60	€60	€254	**€152.64**

[1] Based on labour involved in keeping additional livestock (28hrs/LU (Teagasc 2008)
[2] Costs per hour reflecting skill level above minimum wage, scrub management is for encroaching scrub not established scrub.
[3] Costs for additional time required to higher level of management, increase moving of livestock, supply adequate water during dry periods.

5. The project's approach to determining field scores

One of the outputs of Caomhnú Árann is to investigate if the habitat scoring system can be determined without individual field visits by a member of the project team using other available techniques. These include self-assessment by the participant farmer (which if accurate could be applied to the wider countryside in a range of agri-environment schemes) and remote sensing gathering information/pictures of areas/fields and relate such imagery to a field score.

The approach taken has three elements:

1. Assessing field score using existing aerial photography aided with drone footage obtained in Year 1.
2. Farmer assessment - supplying a selected number of farmers with the visual imagery required
   - scoring information sheet, see Appendix 8.1
   - instructional video: https://www.caomhnuaranneip.ie/grazing-score-system

   and getting them to score their own fields based on this.
3. Field visits by members of the project team to allocate scores over a wide range of land parcels.

Based on initial field visits in 2019 by members of the project team, a range of land parcels scores were determined and from them a standardised procedure was developed when using existing aerial photography as a classification tool. Over the summer each land parcel was viewed using DAFM aerial footage, available drone footage, Google and Bing maps and a score allocated based on the predetermined procedures.

To aid in the classification, the project also assessed the viability of using available satellite data captured from Sentinel 1 and Sentinel 2, to train machine learning models to predict field scores. However it was not possible to successfully train a model which could classify the areas into their respective scores from the resolution provided by the Sentinel satellites, but analysis of the data does suggest that with modifications, satisfactory results could be achieved. COVID 19 restrictions prevented further development of this, but it is anticipated that higher resolution multi-spectral imagery will be captured next year to trial further.

6. Procedures for Determining the Field Score

6.1 Using Aerial Photography

6.1.1 Score 1
Score one is ungrazed land and therefore not under agricultural production. It includes parts of the farm that may be grassland but are ungrazed or grazed at a very minimal level due to lack of water, no fencing to control livestock or rough terrain leading to cattle injury such as extensive areas of limestone pavement, areas with no field boundaries where controlled grazing is not possible. Other examples include area of roadways, buildings, yards that have not been excluded from the farm maps. Examples of score 1 are shown below:
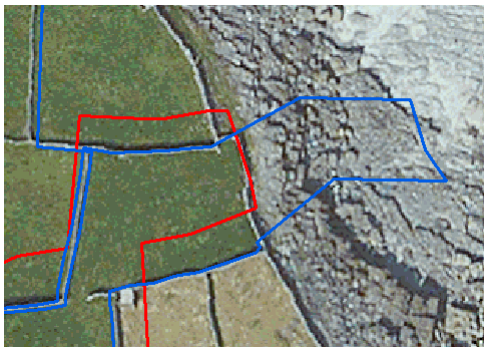

Figure 1. Areas of ungrazed land included areas of coast line not grazable .

Figure 2. Land parcels which include areas of non-eligible land, buildings, roads.

Figure 3. Limestone pavement not grazed and no field walls to control grazing score 1.

6.1.2 Score 2

Score 2 is typically improved and semi-improved habitat with limited indicator species, it is usually grass dominated with higher levels of fertility. It includes more recently made grasslands in the Aran Island context. The use of aerial photos requires an assessment based on the character of the cover of the field, for example, for score 2, the absence of rock outcrop, which if present would indicate shallow soil; the colour of the field (a higher intensity of green is associated with higher level of fertility of a score 2 field). Land adjacent to dwelling houses usually have associated higher stocking rates, higher levels of disturbance and higher fertility and therefore would fit into score 2 category. Land within a cropping rotatation is also included in this score often indicated by presence of ridges or bare soil within the parcel .

Figure 4. Greener areas within the farm likely dominated by agricultural grasses would score 2.

Figure 5. Greener areas adjacent to dwellings usually with low associated species diversity would score 2.

6.1.3 Score 3

This is habitat with reduced numbers of positive indicator species. It can be found in two different contexts. The first is where the land parcel is not optimally grazed and scrub encroachment and/or rank grasses are an issue. The area of visual scrub is greater than 20%. Rank grasses may be visible as lighter area within the field but this may also mean the area is ungrazed. Further details can be obtained from the farmer to aid this. The second type is where the habitat is moving to a more semi-improved state, grasses have become more dominant but there still is a level of positive indicator species. This type of grassland is more difficult to determine using ortho-imagery as the colour of the vegetation is usually a less intense green than score 2, and where in doubt the Score 3 should be given and a later field visit can determine accuracy.

Figure 6. Score 3 land parcels with grassland vegetation likely to be species rich but with high percentage of encroaching scrub.

Figure 7. Greener areas usually located within areas of species rich grassland but have had a higher intensity of management but are likely still to have positive indicator species present, the top field in this case has lower colour intensity and is likely a score 3 than the field mid bottom, which has higher colour intensity and is more likely a Score 2.

6.1.4 Score 4

This is grassland habitat with a high number of positive indicator species and an appropriate grazing regime (lacking indicators of undergrazing and overgrazing) but where scrub or bracken encroachment is an issue. Included in this score category, are fields where farmers have indicated that scrub control was required. Where the estimated cover of scrub within the parcel is greater than 20% a score 4 should be allocated. The grassland within the parcel should equate to the definition given in Score 5.

Figure 8. Score 4 land parcels indicative of high quality habitat but with a higher level of encroaching scrub which is reducing the overall condition of the habitat.

6.1.5 Score 5

This is habitat perceived to be very well managed, indicated by a high number of positive indicator species and an appropriate grazing regime. Small parcels of scrub may be present but are less than 20% of the total area. Intensity of the green is likely more glaucous than an intense green as indicated in score 2 fields. Consideration should also be given on its location, with higher quality habitat tending to be more associated with the winterage areas.

Figure 9. Score 5 land parcels are likely to be species-rich based on vegetation colour, and no encroaching scrub.
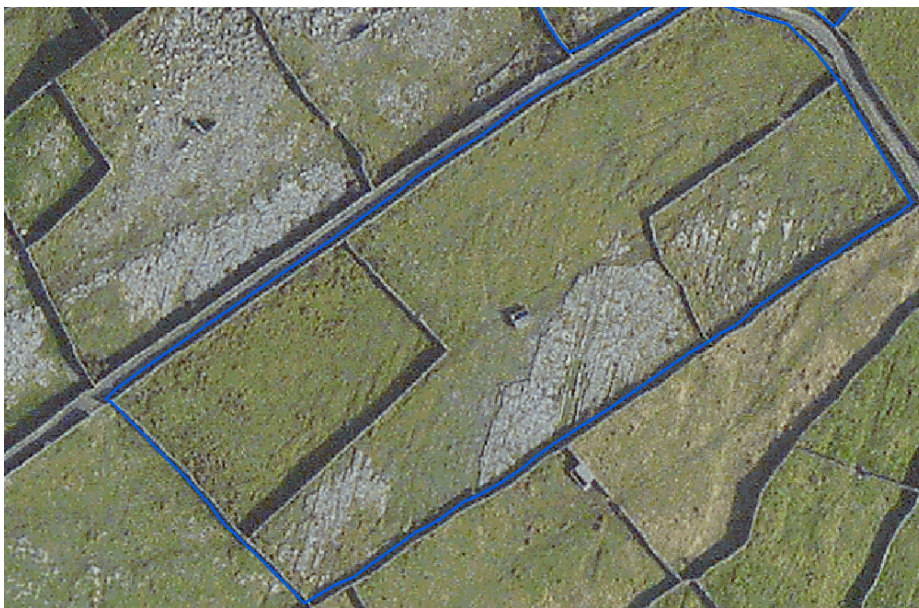

Figure 10. Score 5 land parcels likely to be species-rich based on vegetation colour with some encroaching but less than 20% of the overall land parcel size.

For parcels where the evaluator feels allocating a score is problematic, then a score is not allocated and a visit or further information from the farmer required.

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6.2 Overview Maps of Aerial Scores

The following maps show the distribution of scores 5 to 1 on the 125 Caomhnú Árann EIP farms based on scoring using aerial photographs (Figures 11 to 13).

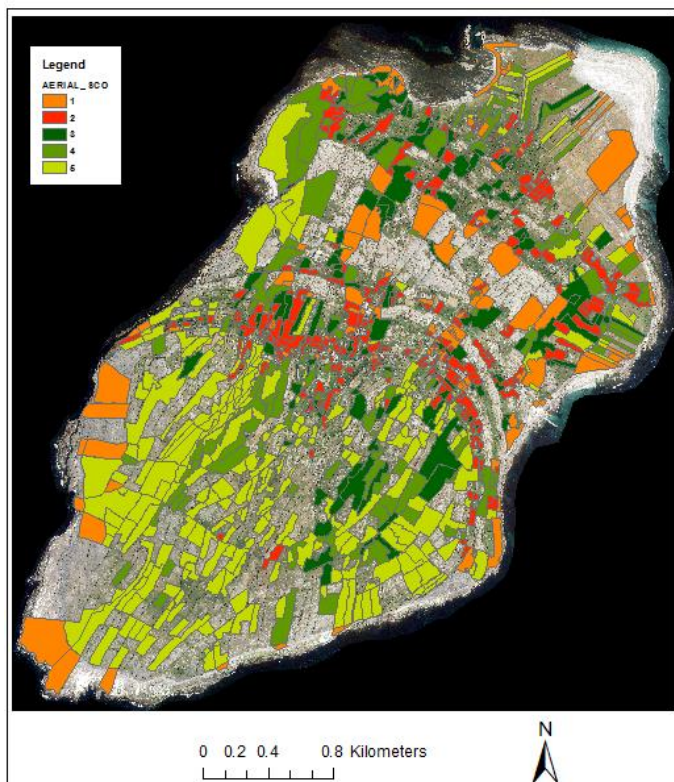Figure 11. Inis Mór Aerial Grazing Scores

Figure 12. Inis Meáin Aerial Grazing Scores

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Figure 13. Inis Oírr Aerial Grazing Scores

6.3 Farmer self-assessment

Prior to the Covid-19 pandemic, a series of workshops and training days were planned to train the farmers to identify fields and land parcels that could be assigned the different scores and recognise the issues that may reduce scores. Unfortunately with the travel restrictions in place over much of the spring and summer of 2020, the Caomhnú Árann training programme had to be adapted. The project team produced an information sheet and instructional video which provided guidance on allocating scores (https://www.caomhnuaranneip.ie/grazing-score-system.) To trial farmer assessment the project randomly selected 25 farmers and supplied them with the scoring information material (information sheets and instructional video). A member of the project team spoke to each farmer, explained the scoring process and asked them to allocate a score based on their interpretation of the score bands. Farmer training and further development of the scoring system guidance material will continue in 2021.

6.4 Ground truthing

To check both the accuracy of the remotely sensed data and the interpretation of the farmer assessment, members of the project team completed a number of farm visits, scoring land parcels and using in-situ observations for comparison. This is a time consuming practice due to fragmented nature of the farms and large number of field parcels and therefore this ground-truthing process will continue for the duration of the project's field work. Initial results indicate that after minimal training, there is up to 60% to 70% correlation between farmer score and the project team scores.

7. Paying land parcels based on each score

7.1 GLAS/Caomhnú Árann: Interaction between GLAS Low Input Permanent Pasture and scores under Caomhnú Árann.

To ensure no double funding between Caomhnú Árann and national agri-environment measures (GLAS), a comparison was made between measures. This approach was agreed by DAFM for the previous project AranLIFE. The only similar action was the Low Input Permanent Pasture (LIPPS) a measure to promote a grassland management system that through appropriate grazing levels and restriction on fertiliser and pesticide. For eligibility under LIPPS, grasslands must contains "a minimum of four grass species (excluding Ryegrasses), for example cocksfoot, timothy, bent grasses, fescues, sweet vernal, Yorkshire fog, etc. and a minimum of three other non-grass plant species, for example plantain, chickweed, trefoils etc. and these must be reasonably dispersed throughout the field." The sward must be maintained by grazing. To achieve this there is a payment of €314/ha and a set of management requirements.

Under Caomhnú Árann scoring system, a payment is available for participating farmers ranging from €100 to €150 per hectare. The payment under the project has been calculated on supplying the additional labour required in terms the moving and management of livestock needed to maintain and/or maximise biodiversity. Grazing advice is delivered by the Project team through the Farm Management Plan, farm demonstrations and individual field visits with the farmer throughout the life of the project. Whilst the GLAS LIPPS option and the higher Caomhnú Árann scores involve a hectarage payment, the payments are for separate actions. GLAS is based on a set of requirements which are calculated on costs foreseen/income foregone. The payment received under Caomhnú Árann reflects the additional time involved in the achieving optimal grazing management, with a management input by the project team in conjunction with the farmer. As this is particularly

applicable at Score 4 and 5, the two payments are for separate deliverables and do not constitute double funding, Score 3 includes the requirements with LIPPS, so for farms in Caomhnú Árann with a Score 3 that are also included in LIPPs, no additional payment is made. Based on DAFM recommendations, interaction between the two are detailed in Table 4.

Table 4. Caomhnú Árann/GLAS interaction for the Low Input Permanent Pasture Option (LIPPS)

Score	Rationale	GLAS Elig.	CA Elig.	CA ha. payment	Payment as per DAFM
5	Priority habitat perceived to be very well managed, indicated by a high number of positive indicator species and an appropriate grazing regime (lacking indicators of undergrazing and overgrazing).	Yes	Yes	€150	**Farmer can be paid both GLAS & Caomhnú Árann.**
4	Priority habitat with a high number of positive indicator species and an appropriate grazing regime (lacking indicators of undergrazing and overgrazing) but with scrub or bracken encroachment an issue.	Yes	Yes	€125	**Farmer can be paid both GLAS & Caomhnú Árann.**
3	Priority habitat with reduced numbers of positive species indicators. Habitat is not optimally grazed and scrub encroachment may be an issue.	Yes	Yes	€100	Farmer only receives GLAS payment.
2	Semi-improved habitat with limited indicators of priority habitat, grass dominated, usually with higher levels of fertility or more recently made grasslands in an island context.	Yes	No[1]	€0	Farmer only receives GLAS payment.
1	No grazed habitat.	No	No	€0	N/A

[1] Payment is not available under the Caomhnú Árann for Score 2 as it is deemed that the grazing payment alone is not sufficient to maximise biodiversity within the duration of the Caomhnú Árann EIP programme.

7.2 Paying land parcels based on each score

Based on a combination of aerial photography, farmer assessment and ground truthing, each farmer was sent a score for each land parcel on their holding. Included with this were details of the scoring system and the informational video. Farmers were given the opportunity to amend the score if based on the information sheet and information video they felt there was an error. Any changes were investigated by the project team either by using aerial photography or field visits and the change was either accepted or rejected. The trial nature of the project was explained to the farmers and there is a good understanding of the process, the margins for error and the need for co-operation between the partners to perfect the process. The scores represent broad bands within a grassland spectrum and small difference in payments between the bands also means that errors do not lead to major financial gains or losses for any particular farmer. The proposal is to make payments to the participant farms in the latter half of 2020 and 2021. For 2020, all participant farms have been issued with the field scores based on a range of evaluation detailed elsewhere. Any changes requested by farmers will be investigated by the project team. It is envisaged that next year full training courses with field visits will take place to improve the accuracy of scoring.

Once agreed by the farmer (no changes to be made or changes agreed), payments will be issued to the farmers using the normal payment procedures. Due to the trial nature of this process it is anticipated that there may be some errors but overall the scores are likely to be a good reflection of the habitat of the land parcel, additional digital imagery and farming training courses should improve accuracy rates further next year.

7.3 The Budget

Within the original Caomhnú Árann payment, the total estimated budget was for €305,400 over a two year period (€152,700 per year); this was based on 1500 hectares of grassland amongst an estimated 100 farmers. Based on a higher number of farmers expressing an interest to join the project and an agreement from the partners to accommodate all the applications with a reduced payment to each farmer the overall hectare is now approximately 2574ha with 127 farmers.

The correlation between score 3 and LIPPs under GLAS created difficulties in estimating the total potential payment as comparisons could not be made prior to assessment. Based on the total initial scores given, the total cost of the grazing payment is outlined in Table 5 (initial estimates).

Table 5. Summary of Scores / Grazing Payment

Score	Hectares	€/ha	Annual Cost (€)
1	385.30	0	0
2	340.40	0	0
3[1]	222.62 (In LIPPS)	0	0
	297.55	100	29,755
4	439.63	125	54,953
5	791.21	150	118,681
Totals	2,476.71		203,389

[1]Total area under Score 3 is 520.17 hectares, but payment is only based on areas not under LIPPs action (See section 7.1)

To reduce the overall costs an upper limit was placed on all farms of €2,500 per annum (total payment of €5,000), in total this affected 22 farmers. For some farmers the overall returns were low, less than €500 per annum, due to the trial nature of the system a minimum payment of €500 per annum was applied to encourage continued commitment. Total grazing payments per farm therefore ranged from €1,000 to €5,000 with an average payment per hectare of €121. Due to the short nature of the payment system (2 years) it is envisaged that in 1 year scores will not increase dramatically but there will likely be some movement between Score 4 and 5 due to scrub removal and provision of water and the aerial photography likely underestimates the score on "greener land" where ground truthing shows a higher level of biodiversity. This may mean an increased movement between score 2 and 3, however, in general some of this land will be under the Low Input Permanent Pasture, which already receives a payment under GLAS.

8. Appendices

8.1 Details of the Scoring System

The Grazing score information booklet is available at

https://www.caomhnuaranneip.ie/grazing-score-system.

8.2 Indicator species lists for species-rich grasslands

The following list of positive indicator species for species-rich grasslands is derived from vegetation surveys (AranLIFE 2014-2019) as well as national grassland (O'Neill *et al*. 2013)[5] and sand dune habitats (Delaney *et al*. 2013)[6] surveys.

Positive Indicator Species

Agrimonia eupatoria (Hemp agrimony)	*Leontodon* species (Hawksbit species)
Aira praecox (Early hair grass)	Leucanthemum vugare (Ox-eye daisy)
Antennaria dioica (Catspaw, Mountain everlasting)	*Linum catharticum* (Fairy flax)
Anthyllis vulneraria (Kidney vetch)	*Lotus corniculatus* (Bird's-foot-trefoil)
Asperula cynanchica (Squinancywort)	Orchid species
Blackstonia perfoliata (Yellow-wort)	*Pillosella officinarum* (Mouse-ear hawkweed)
Briza media (Quaking grass)	*Pimpinella major* (Greater burnet saxifrage)
Campanula rotundifolia (Harebell)	*Plantago maritima* (Sea plaintain)
Carex species (Sedges)	*Polygala vulgaris* (Common milkwort)
Carlina vulgaris (Carline thistle)	*Potentilla anserina* (Silverweed)
Centaurea nigra (Knapweed	*Primula veris* (Cowslip)
Centaurea scabiosa (Greater knapweed)	*Ranunculus bulbosus* (Bulbous buttercup)
Crepis capillaris (Smooth hawksbeard)	*Rhinanthus minor* (Yellow rattle)
Daucus carota (Wild carrot)	*Sanguisorba minor* (Salad burnet)
Euphrasia officinalis agg (Eye bright)	*Sanguisorba officinalis* (Greater burnet)
Galium verum (Lady's bedstraw)	*Sedum acre* (Biting stonecrop)
Gentiana verna (Spring gentian)	*Sesleria caerulea* (Blue Moor grass)
Gentianella campestris (Field gentian)	*Succisa pratensis* (Devil's bit scabious)
Geranium sanguineum (Bloody cranesbill)	*Thymus polytrichus* (Wild thyme)
Hydrocotyle vulgaris (Marsh pennywort)	*Vicia cracca* (Tufted vetch)
Hypochaeris radicata (Cat's ears)	*Viola canina* (heath dog violet)
Koeleria macrantha (Crested hair grass)	*Viola riviniana* (common dog violet)
	Viola tricolor (Wild pansy)

[5] O'Neill, F.H., Martin, J.R., Devaney, F.M. &Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No.78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Ireland.

[6] Delaney, A, Devaney, F.M., Martin, J.M. and Barron, S.J. (2013). Monitoring survey of Annex I sand dune habitats in Ireland. Irish Wildlife Manuals, No.75. National Parks and Wildlife Service, Department of arts, Heritage and the Gaeltacht, Dublin, Ireland.

8.3 National Data Figures

The attached document is from Teagasc Management Data for Farm Planning 2008. It sets out the costings for managing cattle in terms of labour input. The costings for additional grazing have been based on this Teagasc research.

SUCKLING (Calf to 6 months)

	Self feed Silage cubicles	Outwintering, Hay/Silage
Single suckling	2.5	3.5
Suckling 2 - 3 calves	3.5	5.5
Suckling more than 3 calves	5.5	12.0

CATTLE

Standard man days required per head	Self Feed Silage, efficient layout		Inefficient building, poor farm layout	
	Modern calf houses, slats etc.	Loose calf house, cubicles	Self feed silage, loosehousing	
0 - 6 months	1.0	1.2	1.5	
6 - 12 months (Wintering)	0.6	0.7	1.0	
12 - 18 months (Grazing)	0.3	0.3	0.4	
18 - 24 months (Wintering)	0.6	0.8	1.1	
Total (0 - 24 mths)	2.5	3.0	4.0	

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