A thematic network on High Value Farming
Learning, INnovation & Knowledge

LEARNING AREA « The Burren » (Ireland)

A BASELINE ASSESSMENT

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A portrait of the area

The Burren is located on Ireland's mid-western coast and encompasses sections of two Irish counties, Clare (north) and Galway (south).

The Burren is the most extensive glaciated karst landscape in Western Europe and comprises two primary landscape units: the Burren uplands to the west (often 2-300m above sea level) and what are sometimes referred to as the 'Gort lowlands' (<100m asl) to the east. The extent of the Burren is defined by those areas dominated by karst limestone or shallow basic soils with semi-natural grassland. It should be noted however that this does not correspond precisely with administrative units that are used from now on to present agriculture and populataion data (though the differences are small).

The name Burren is derived from the Gaelic word 'Boireann' meaning 'Place of Stone'. The Burren is a geographical, rather than a political, unit and is c.72.000ha in extent, as defined by the presence of outcropping limestone.

Most of the Burren is privately owned and farmed, though c.2000ha is publicly owned, forming a National Park and several Nature Reserves.

Geology

The Burren is dominated by exposed limestone bedrock with occasional shale and sandstone and a thin soil cover.

The limestone is composed of the calcium-rich skeletal remains of marine organisms (e.g. sea-lilies, ammonites, urchins, corals, brachiopods) that populated the warm, shallow sea that lay over the region during the Carboniferous period. These were eventually compressed by their own weight and that of the sea above, and subsequently elevated to reveal the massive, fossil-rich beds that we see today.

This limestone was formed 340m years ago and has been shaped by a range of forces – tectonic, glacial, 'solutional' and human – to create a very unique geological heritage.

The limestone bedrock is important for farming as it offers a 'dry lie' for outwintering cattle, almost like an underfloor heating system!

The geological heritage of the Burren has been recognised by its award of UNESCO Geopark Status (along with the adjacent Cliffs of Moher).

Landscape Structure – Burren Uplands

These hills exhibit bare limestone pavements and deep grikes (depressions). Soils are very thin in places and water drainage is subterranean.

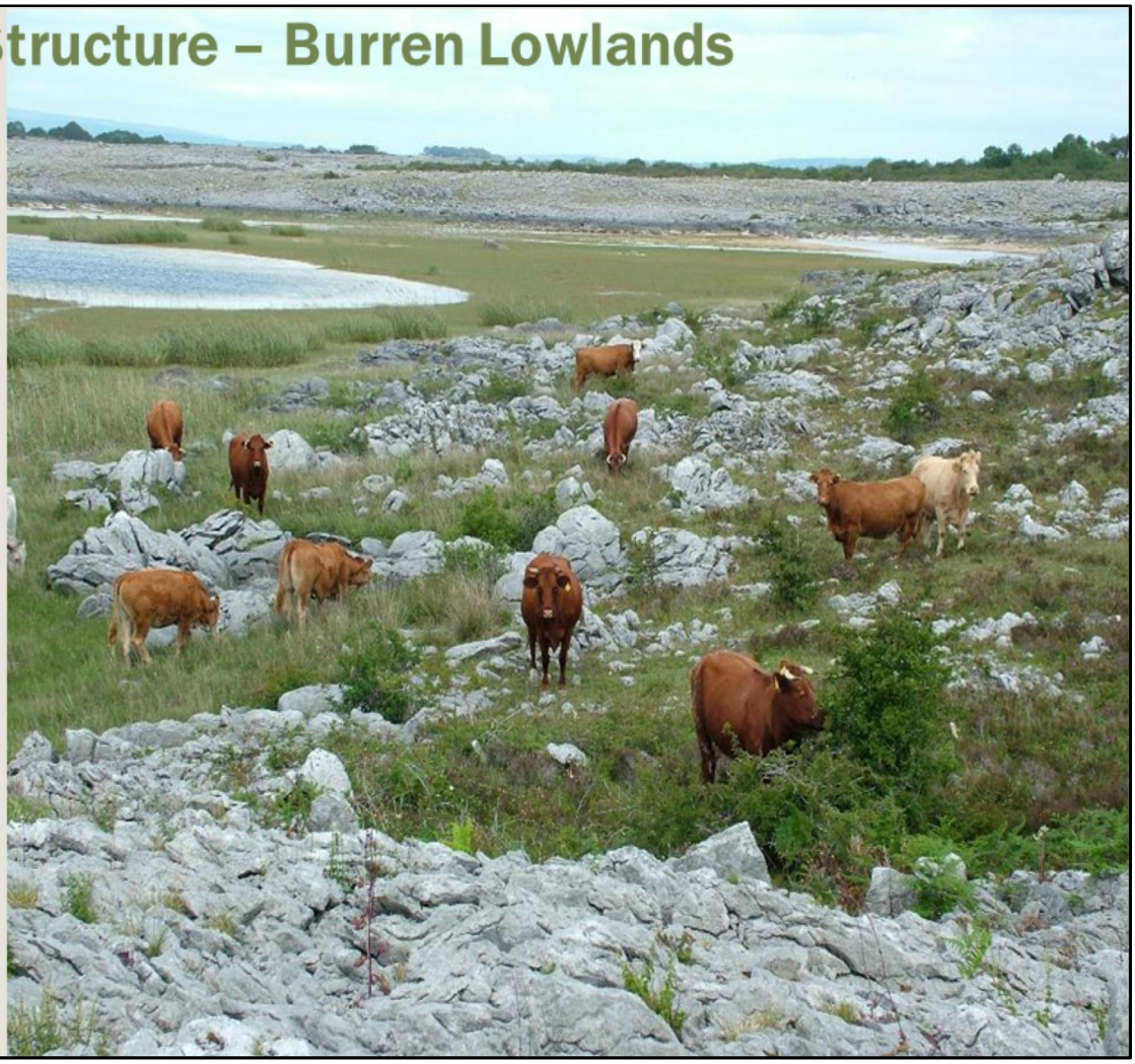
The maximum height of the limestone hills in the Burren is 330m. Many of the hills plateau at 150m.

The Burren Uplands lie in County Clare and are the most widely known and visited part of the Burren. They are particularly rich in archaeological sites, having always been attractive to farmers due to their light, fertile, free draining soils. They also contain some of the best pasture and meadow habitats, the conservation of which is a high priority. A series of terraced hills separate the Burren uplands from the Gort lowlands to the east.

These areas provide the habitats for the celebrated Burren flora and rough winter grazing for livestock. The intervening valleys and a low-lying coastal strip of glacial drift are more species poor and are often used for more intensive farming practices.

Landscape Structure – Burren Lowlands

The east Burren ('Gort') lowlands are much more low-lying and flat than the uplands and feature a wide range of wetland habitats interspersed with outcrops of rugged limestone.



This low-lying limestone plain is a 'covered karst' and is characterised by thin layers of fertile soil with outcroppings of limestone pavement and an extensive system of calcareous lakes and fens of high conservation importance. This includes the most extensive area of naturally functioning turloughs in Ireland. Grazing levels are lower in the Burren lowlands as there is more outcropping rock and less soil cover on much of the area. One of the main conservation priorities in the Burren lowlands is to prevent eutrophication of the wetland habitats.

Typical wetland habitats include calcareous fens, oligotrophic lakes, petrifying springs and seasonal lakes known as turloughs.

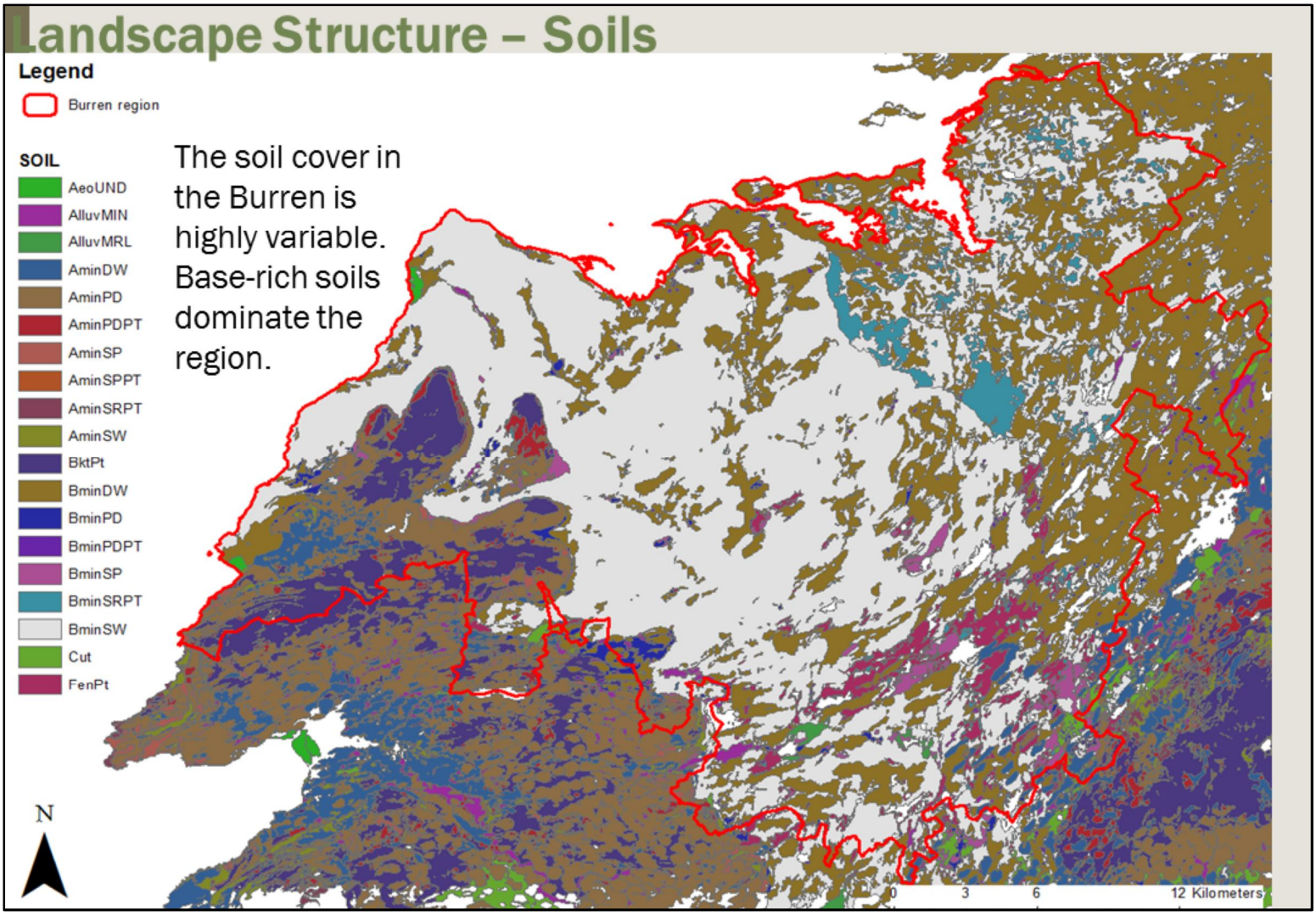
The Burren lowlands also contains important grasslands and heaths. Unlike the upland grasslands, these are not always used
for winter grazing.

Landscape Structure – Hydrology

The Burren has been shaped by water – directly through glaciation and water solution, and indirectly by influencing the human/agrarian use of the landscape.

The unavailability of water in summertime in this free-draining landscape where most of the water flows underground, forced farmers to adopt a system of winter grazing which in turn shapes the biodiversity and cultural traditions of the Burren.

The River Fergus which lies to the south of the Burren drains a considerable part of the Burren plateau to the north and northwest of the river and much of the lowland areas. The catchments north of the Burren plateau drain mainly through submarine outlets in the sea at Galway Bay (Deegan, 2016). The western Burren catchment drains largely into the Atlantic Ocean. Unusually for a karst landscape, there are surface waters in the Burren uplands. To the southeast of the plateau are numerous lakes, for example Loughs Inchiquin and Bunny. These occupy shallow hollows in the limestone and are hydrologically connected to the groundwater body of the lowlands (Drew, 1990). There are also two surface rivers: the Caher River and the Aille River (Drew 1990). Geomorphology and hydrology are intimately linked in a karst landscape and the hydrology of the low Burren is particularly distinctive and complex due to extensive karstification. There is extensive groundwater-surface water interaction in this area and the turloughs in the Burren lowlands appear to be hydrologically linked. There is also groundwater-sea water interaction and the water level of turloughs close to the sea can vary according to the tide (Deegan, 2016).

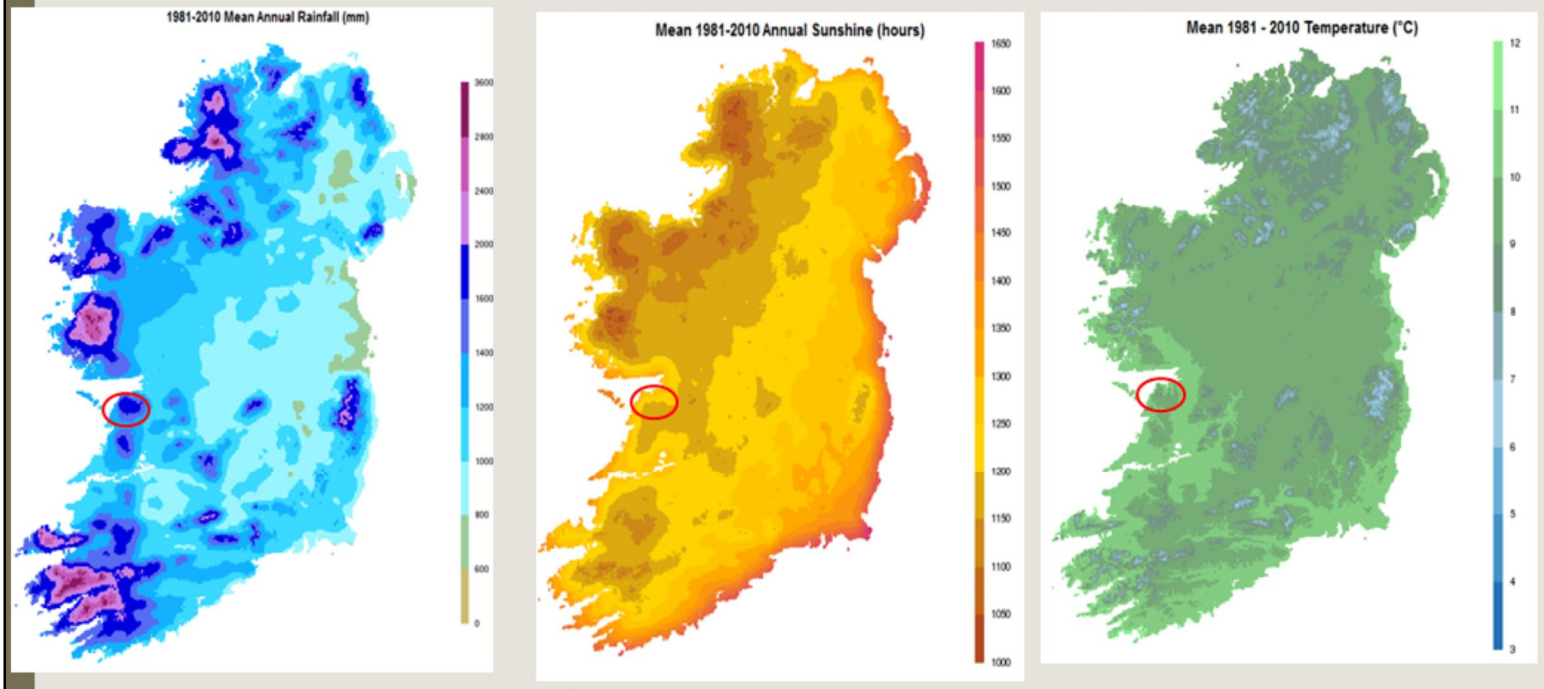


The most common soil type in the area is Rendzina – a young, dark, calcimorphic soil which supports a typical Burren flora and is really only suitable for rough (winter) grazing.

Brown earth soils dominate the more fertile valley and coastal areas, lending themselves to more intensive tillage and dairy farming systems.

Climate

The climate of the Burren is similar to the climate of the rest of Ireland and is mild and wet throughout the year. The mean daily temperatures in the Burren are 14 °C in July and August (the warmest months) and less than 5 °C in January and February (the coolest months). The average annual rainfall is high, c.1525 mm, with October to January being the wettest period when rainfall is approximately 160 mm per month. Snow is rare in the Burren. The mild winters in the Burren facilitate the outwintering of cattle, the free-draining substrate enables the rapid evacuation of surface water.



Climate data for Ireland showing mean rainfall, sunshine & temperature per annum 1981-2010. Source Irish Meteorological Service

The high rainfall levels in the Burren flush nutrients from the thin rendzina soils, while summer droughts on can lead to desiccation of soils and vegetation. Thus the Burren can represent a very stressful growing environment for many plants, offering a competitive advantage to more compact, stress tolerant plants such as the herbs for which the Burren is famous. Indirectly, the geology and climate impact on biodiversity through agricultural practices such as winter grazing – farmer's response to the hydrological limitations of the landscape (poor summer water), exploiting the geological (the winter warmth of the limestone) and climatic (mild winters) conditions.

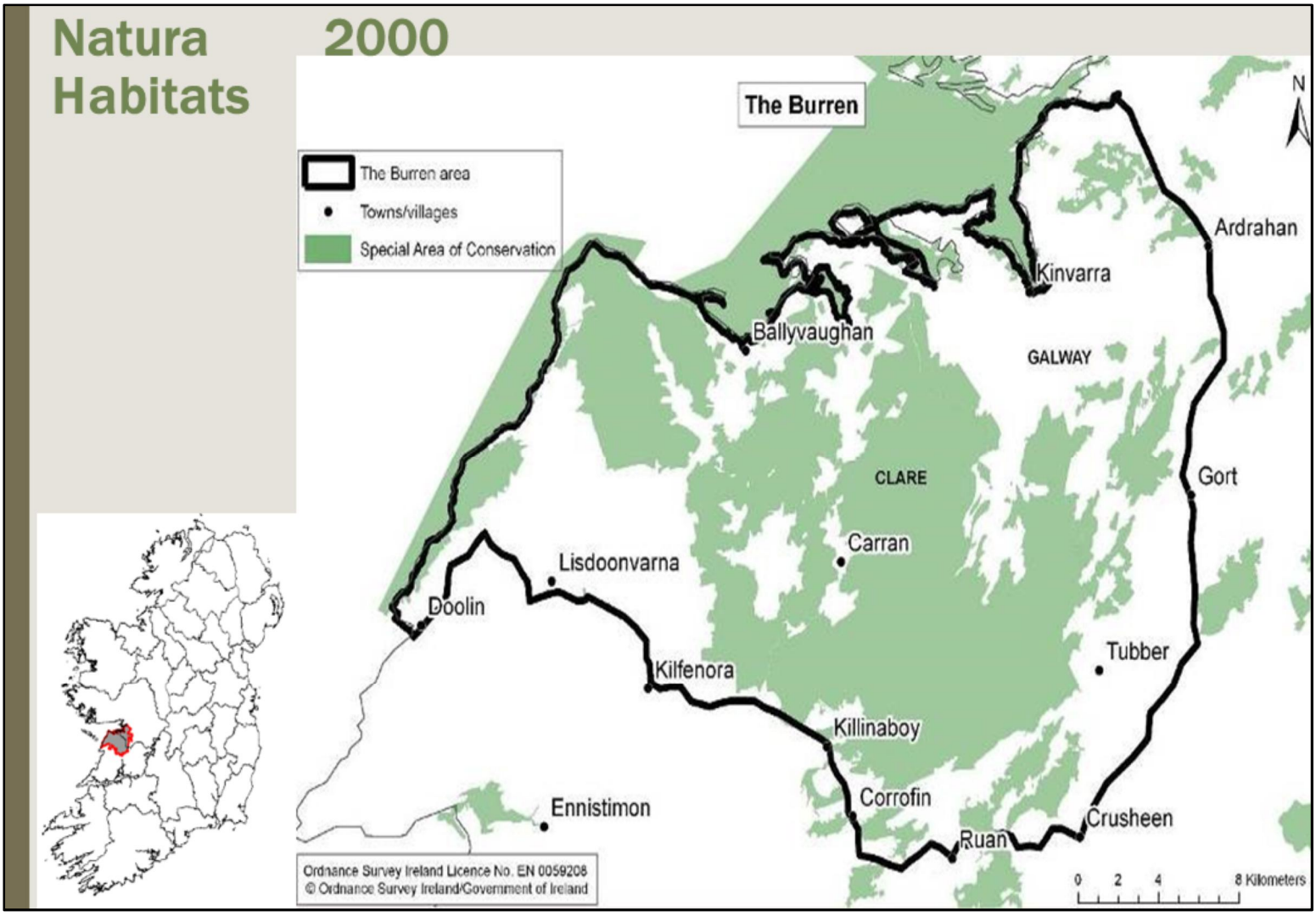
Habitats

The Burren hosts a wide range of habitats. While none of these habitats is unique to the Burren, the scale and quality of these habitats in the Buren is unparalleled.

Habitats include:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites) (6210)
- Alpine and Boreal heaths (4060)
- Juniperus communis formations on heaths or calcareous grasslands (5130)
- Lowland hay meadows (6510)
- Limestone pavement (8240)
- Turloughs (3180)
- Calcareous fens (7210)
- Petrifying springs (7220)

Other important habitats include Atlantic Hazel woodland (the extent of which is increasing in the area as grazing pressure decreases). Hazel woodland contains a rich ground flora and provides extensive habitat for many different fungi and lichens, some of which are extremely rare (Deegan, 2016).



Over 30,000 ha of the Burren have been designated as Special Areas of Conservation under the Habitats and Species Directive (92/43/EEC), while an additional area of almost 2,000 ha is designated as Special Protection Area. These designations were introduced in the late 1990s to encourage biodiversity conservation and environment protection. These policies resulted in a mitigation of some of the negative impacts of agriculture on the environment – including land reclamation and over-intensification which were significant issues in the 1980s and 1990s.

Semi-natural dry grasslands

and scrubland facies on calcareous substrates

The Burren is a very important site for semi-natural grasslands on calcareous substrates. Wet and neutral grasslands are common elsewhere in Ireland but no other area can rival the Burren for concentration or species-richness of calcareous grasslands. The image above shows a grassland near the coastal upland pf Black Head. Harebell (*Campanula rotundifolia*), Ox-eye Daisy (*Leucanthemum vulgare*), Devils-bits Scabious (*Succia pratensis*), Red Clover (*Trifolium pratense),* Crested Dogstail *(Cynosurus cristatus*), Blue Moorgrass (*Sesleria caerulea*), Sweet vernal grass (*Anthoxanthum odoratum*), Eyebright (*Euphrasia sp.*) and Tormentil (*Potentilla erecta*) are all visible.

Limestone pavement

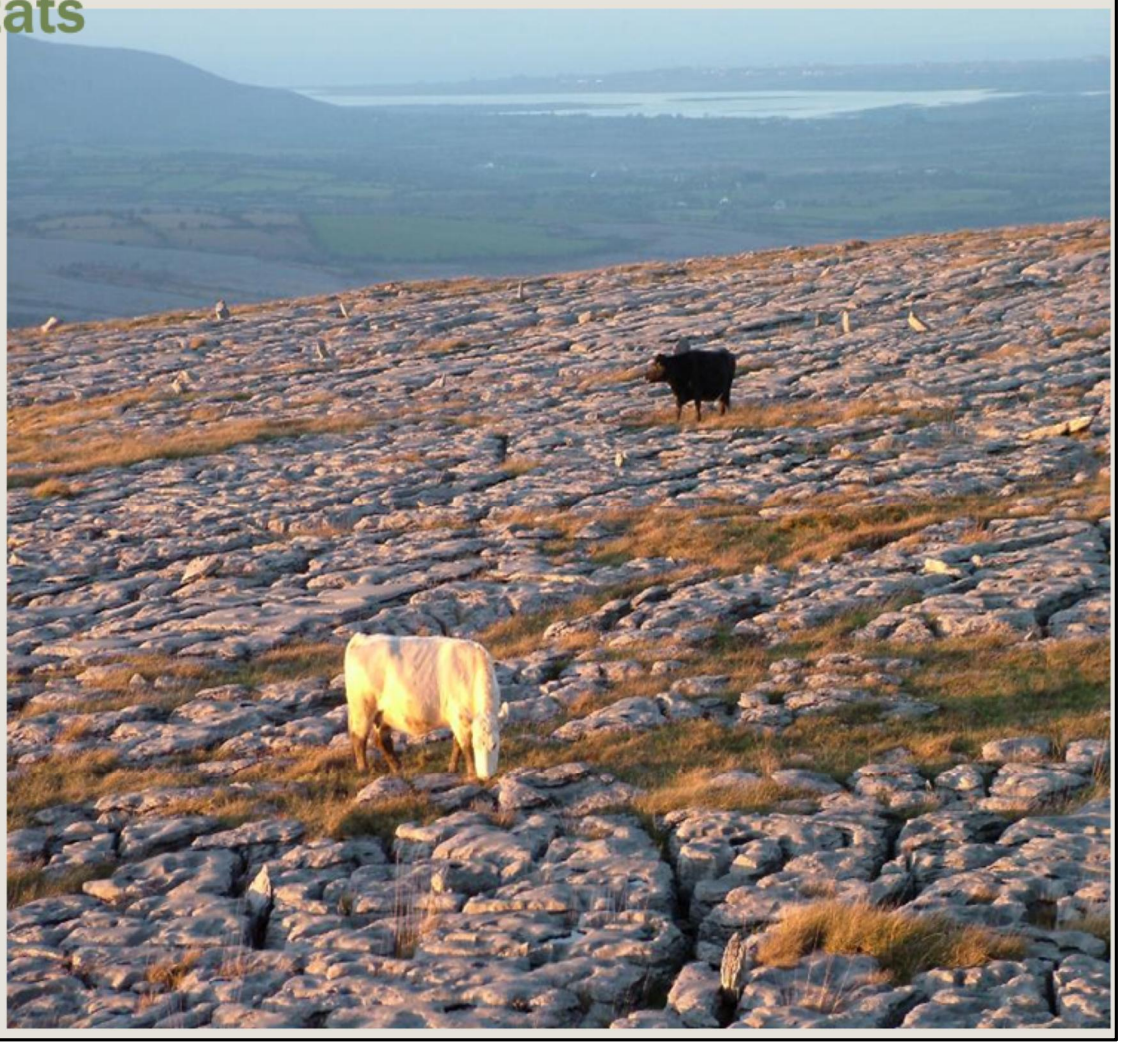
Ireland has the largest area of limestone pavement in the EU and is common throughout the Burren. While it does occur elsewhere in Ireland, notably small areas around Lough Corrib and on the Aran Islands, the most extensive limestone pavement occurs in the Burren. Limestone pavements are both geologically and biologically important resources. The structure of limestone pavement consists typically of blocks of rock, known as clints, separated by fissures, or grikes. There is considerable variation with some areas consisting of massive blocks of smooth, relatively un-weathered pavement with well-developed grikes to areas where the grikes are very narrow and shallow. Finely fractured pavements or shattered pavements, where grikes are almost absent, also occur. The rock surface is almost devoid of overlying soils (considerably less than 50% cover) except sometimes for patches of shallow skeletal soils, although more extensive areas of deeper soil occasionally occur

Turloughs

The Burren is an important area for turloughs. Again, they do occur elsewhere in Ireland but they occur in high densities here. Turloughs are groundwater-dependent wetlands that occur in limestone depressions mainly in the karst landscape of the west of Ireland (Sheehy Skeffington et al. 2006). The hydrological regime of turloughs is linked to precipitation, which may result in flooding at any time of the year during high rainfall events, although flooding generally occurs between October and April (Coxon 1987). Turloughs are traditionally important summer grazing pastures and the substrate and grazing management are also important factors in determining species distribution (Goodwillie 2003).

Farmed Habitats

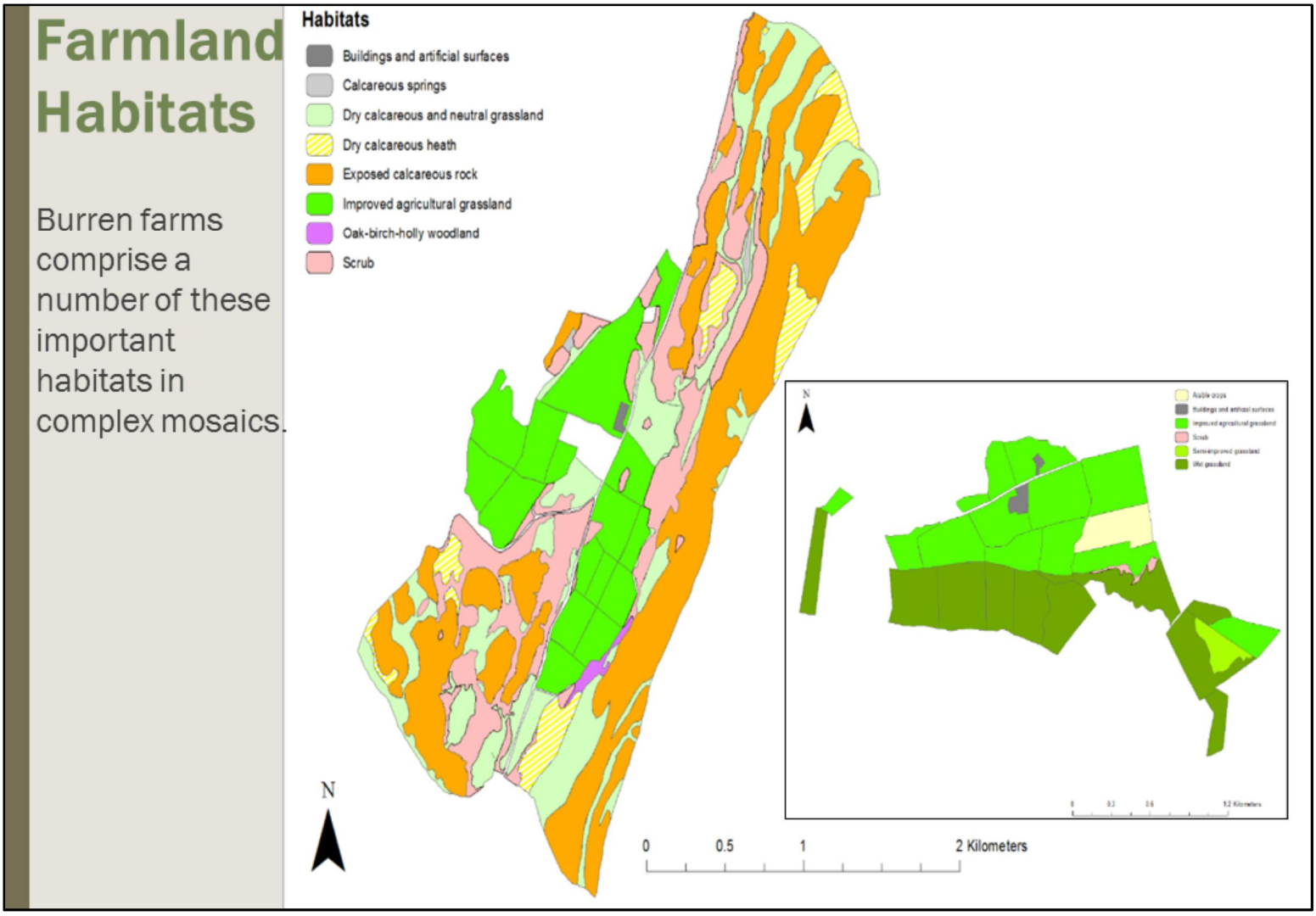
These 'priority' habitats are, of course, also fundamental to the traditional farming systems of the Burren.



Limestone pavement (8240) provides a dry, warm habitat for out wintering cattle, while turloughs (3180) and springs (7220) provide them with a calcium rich water supply.

Cattle rely on the species rich grassland forage provided by the Burren's grasslands and heaths (6210 & 4060) with hay from medows (6510) providing supplementry feeding for stock in bad weather and for sick animals.

In spite of the importance of these priority habitats for agriculture, much of the area is not considered 'utliizable' for grazing and thus not eligible for Basic Payment Scheme funding. In a survey of 200 Burren farms in 2016, on average only 60% of the area was BPS eligible.



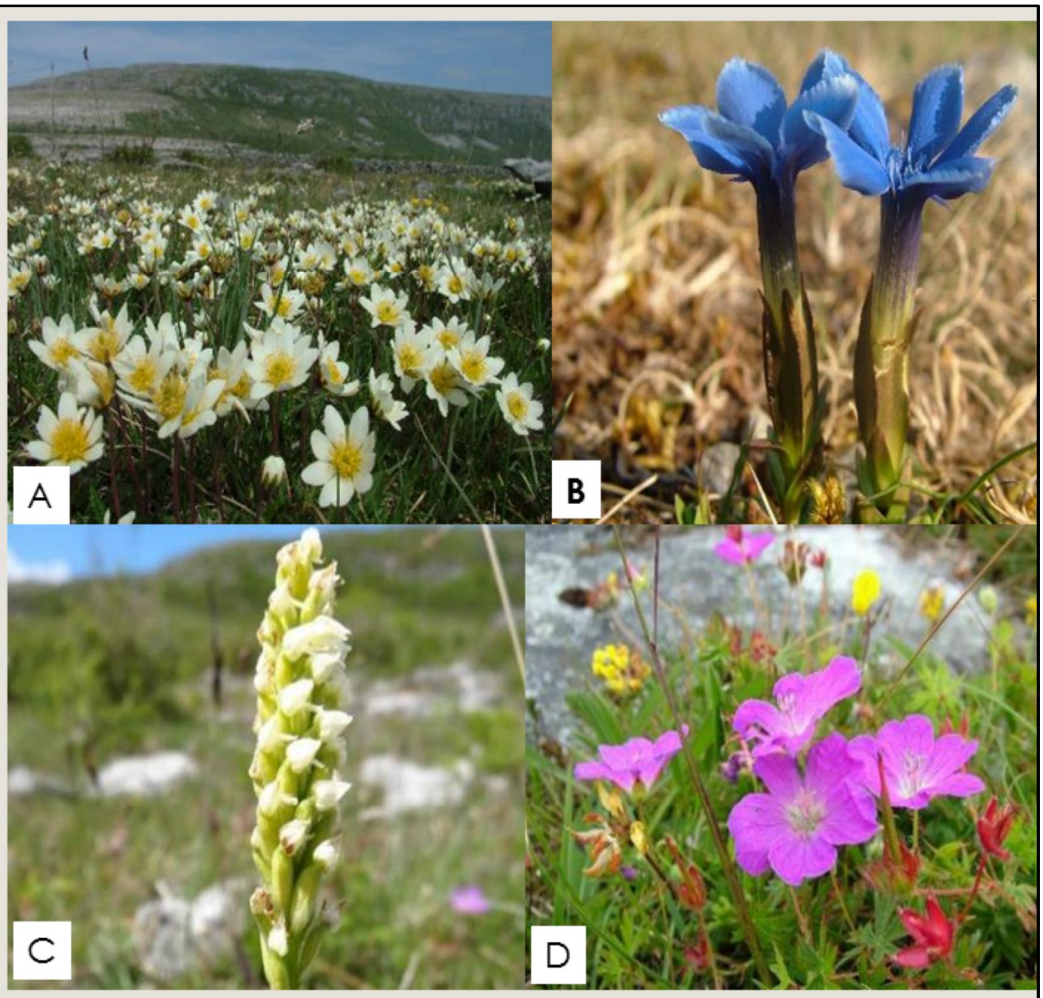
Here is an example of a Burren farm with all habitats mapped as part of the IDEAL-HNV project.
A typical non-Burren farm is presented in the inset for contrast.
Note the complex mosaics of semi-natural habitats on the Burren farm and the more homogenous improved agricultural grassland areas.

Mosaics of hazel scrub, dry calcareous and neutral grassland, dry calcareous heath and exposed calcareous rock with patches of mature woodland are common on these farms. The improved agricultural grassland areas are essential for the functioning of these farms, providing grazing for summer and additional fodder for winter.

Flora

Over 70% of Ireland's 900 native plant species have been found in the Burren uplands, which represents less than 0.5% of the national area.

A) *Dryas octapetala*
B) *Gentiana verna*
C) *Neotinia maculata*
D) *Geranium sanguineum*

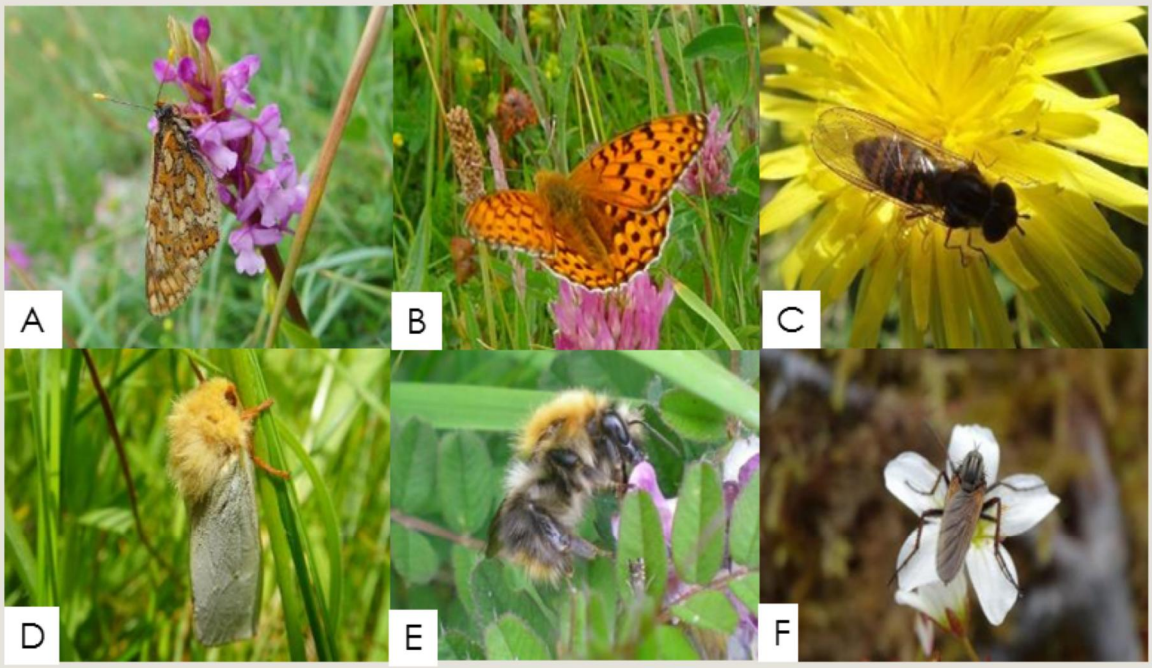


A total of 23 of Ireland's 27 orchid species and regional specialities such as the Alpine G*entiana verna*, the Arctic *Dryas octopetala* and the Mediterranean *Neotinea maculata* whose main British and Irish populations occur in the Burren.

Other relatively common species such as *Campanula rotundifolia*, *Antennaria diocia, Galium verum* and *Geranium sanguineum* are said to 'flourish so much more exuberantly in the Burren than elsewhere in Ireland' (Webb and Scannell, 1983).

Fauna - invertebrates

The diversity of habitats in the Burren supports a wide range of fauna. The flower-rich grasslands, scrub and woodlands are important for butterflies, snails, moths and pollinators such as bees.



A Pearl-bordered Fritillary (*Clossiana euphrosyne*)
B Dark Green Fritillary (*Argynnis aglaja*)
C Hoverfly (*Episyrphus balteatus*)
D Ghost moth (*Hepilaus humuli*)
E Common Carder Bee (*Bombus pascuorum*)
F Diptera sp.

Indeed, the Burren is recognised as one of the best surviving areas for bumblebees in Ireland (Santorum and Breen, 2005) and is home to at least half of the 570 macro-moths recorded in Ireland and 30 of Ireland's 34 butterfly species. Over 60 species of snail are found in the Burren, as are most of Ireland's native bat species.

Fauna - vertebrates

(l-r) Common Lizard (*Zootoca vivipara),* Slow worm (*Anguis fragilis),* Common frog (*Rana temporaria)*

Large herds of feral goats (*Capra hircus*) are also common in the Burren, a reminder of a more diverse farming systems that once pertained here.

Ireland's only native reptile, the common lizard (*Zootoca vivipara)* and the introduced slow worm (*Anguis fragilis)* occur in the area. Ireland's only native frog (*Rana temporaria)*, is also very common in the region

Avian fauna

One hundred and two bird species have been recorded breeding in the Burren which represents approximately 70% of Ireland's breeding birds (Lysaght, 2002).

A Yellowhammer
C Red-billed Chough
B Common Cuckoo
D Eurasian Skylark

Farmland birds such as Yellowhammer (E*mberiza citrinella)*, Common Cuckoo (*Cuculus canorus)*, Red-billed Chough (*Pyrrhocorax pyrrhocorax),* Eurasian Skylark (*Alauda arvensis)* and Common Linnet (*Carduelis cannabina)* are declining and becoming increasing localised in many parts of Europe. However they can still be found in suitable habitats in the extensive, farmed landscape of the Burren.
Several birds of prey may also be found in the Burren, in particular the Peregrine Falcon (*Falco peregrinus*).

The persistence of such nationally and internationally notable biodiversity in this area is intrinsically linked to farming. There is a long and rich tradition of farming in the area. From an agricultural perspective, the Burren is primarily renowned as the land of the 'dry lie' - owing to its capacity for the extensive outwintering of 'store' cattle, or 'outliers', which to this day raise a premium in markets due to their general health and ability to thrive when subsequently removed to finishing grass (Dunford, 2001, 2016).

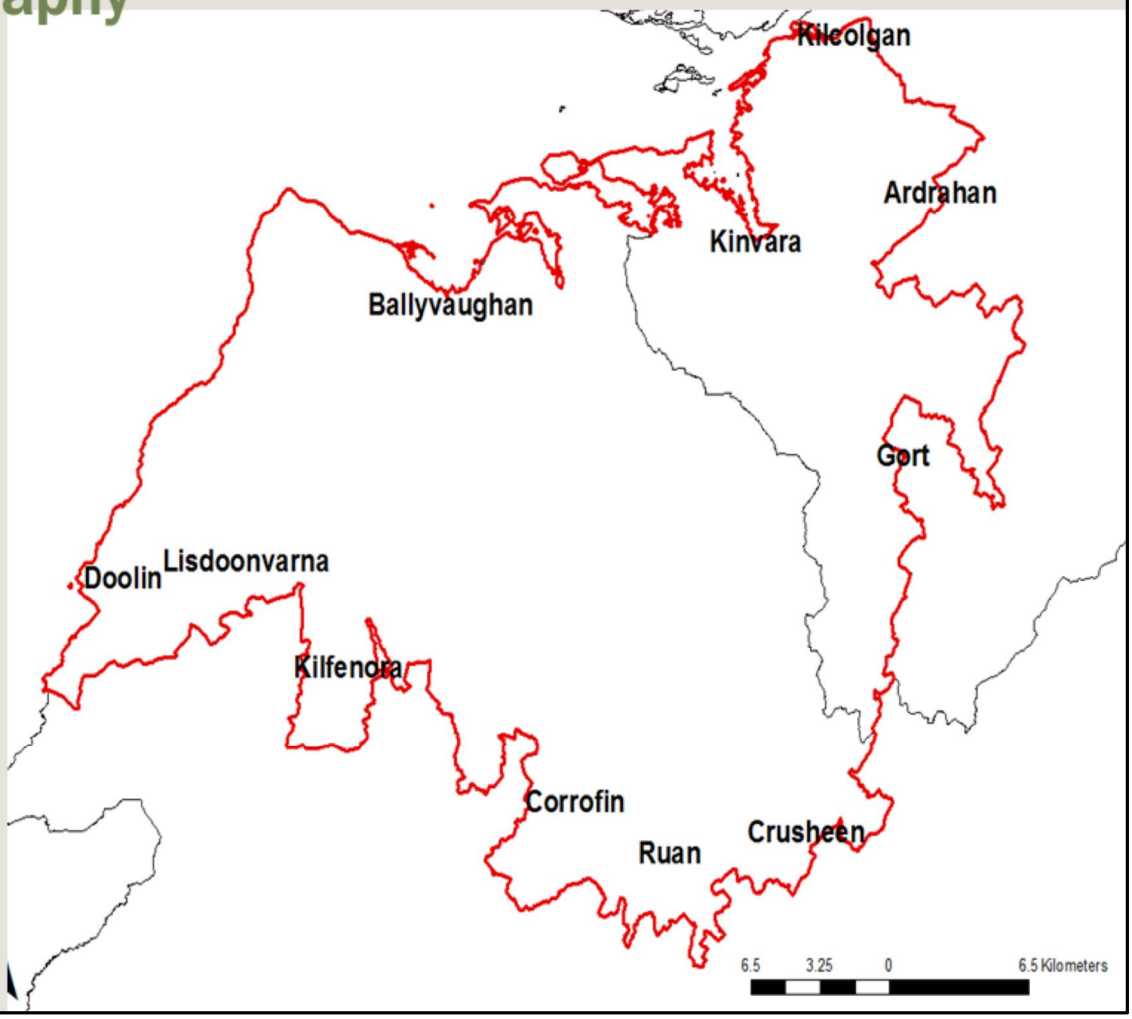
Human Geography

The overall population of the Burren is 15,389 according to the 2011 population census

There are eleven small towns in the region, mainly on its periphery, with populations of up to 2,500 people.

The towns form a necklace around the learning area, and these towns are relatively well connected (better roads) to the main urban centres of Galway, Ennis, Shannon and Limerick where many Burren residents work. The population of these towns has grown in recent years.

Within the Burren itself there are several small rural villages, the population of which has continued to decline in recent years, resulting in a withdrawal of services.



These towns rely to a lesser or greater degree on tourism, being easily accessible and with reasonably good levels of services still available. Most of these towns grew strongly over the course of the ill-fated economic boom known as the 'Celtic Tiger' but some – such as Gort – suffered hugely during the subsequent recession.

The inland Burren in contrast is very rural and with very poor infrastructure (roads, signage, broadband, mobile phone signal) and contains a few small villages – running west to east these are Fanore, Carron, Boston and Tubber. In general, these smaller 'agricultural' villages and their associated townlands continue to suffer from steady population decline and the withdrawal of services (post offices, shops, church) and decline in school enrolments and social outlets. Traditionally the economy of the Burren, as with the rest of rural Ireland, has been dominated by agriculture. In the last few decades however the market has changed substantially with the development of other industries such as tourism and technology. Many Burren families have at least one member working off-farm. Many of these work in Galway, Ennis, Limerick and Shannon where some large biotech, transport and IT companies are based, as well as major hospitals and universities. Most such work is within one hour's commute from the Burren, and while such workers continue to reside in the Burren they may not interact and utilise local facilities e.g shops, schools etc which, partly as a result, continue to decline. This off-farm work usually provides a reliable source of good income for a fixed work day, so the associated farm business has to be restructured to become more efficient to facilitate this off-farm job, which has a big impact on how the land is managed and which in turn has a big impact on the landscape itself.

Farming population

1,561 people in the Burren identified themselves as farmers in 2010, a (surprisingly) small decrease from the 1991 figure.

	Burren					Ireland				
	1991		2010			1991		2010		
Farmer age	No.	%	No.	%	% Change since 1991		%	No.	%	% Change since 1991
under 35	237	14.7	106	6.8	-55.3	21504	13.3	8658	6.2	-59.7
35 to 44	360	22.3	279	17.9	-22.5	32247	20.0	24480	17.6	-24.1
45 to 54	323	20.0	378	24.2	17.0	35312	21.8	34500	24.8	-2.3
55 to 64	333	20.7	410	26.3	23.1	36077	22.3	34946	25.1	-3.1
65 and over	359	22.3	388	24.9	8.1	36479	22.6	36510	26.2	0.1
Total no of farmers	1612		1561		-3.2	161619		139094		-13.9

The main change from 1991 would appear to be the increasing age profile of Burren farmers with a substantial loss of younger farmers (under 44) to the older cohorts, but very low levels of young farmer recruitment. This mirrors the National trend of an ageing farmer population. Turnover of land is very low in the Burren, and it is common for those inheriting land to retain the land while either farming it as a part-time occupation or renting it to other farmers. Increasingly, Burren farmers are working part- or full-time off the farm, further reducing the labour available.

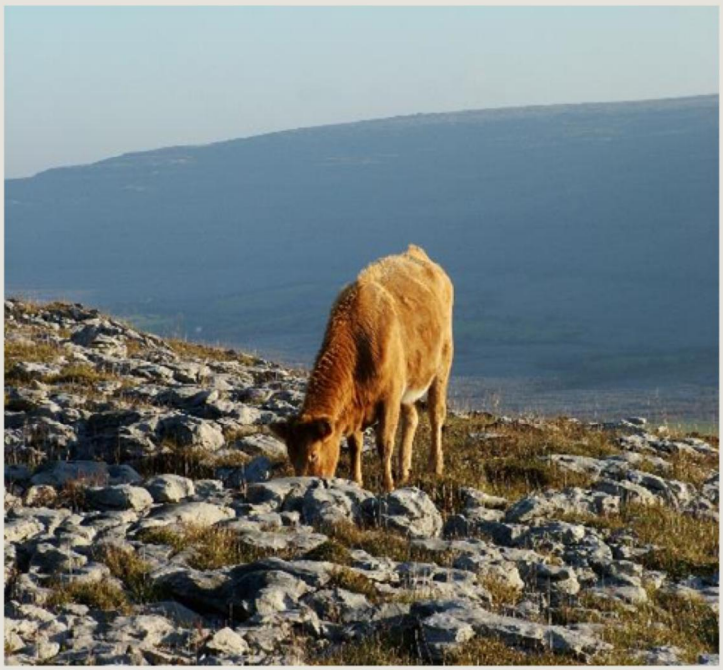
Farm size

The average farm size owned in the region estimated to be 39.39 ha (32.5ha Nationally). In the last twenty years the number of small farms (up to 30 ha) has steadily decreased as these are consolidated to form larger units. Similar trends can be seen nationally. The Burren has a higher percentage of larger farms than the National average – this is a reflection on the low productivity levels of Burren holdings where large holdings are often required for relatively low stock numbers.

	Burren					Ireland				
	1991		2010			1991		2010		
	No.	%	No.	%	% Change since 1991		%	No.	%	% Change since 1991
<10 ha	247	15.3	172	11.1	-30.4	43128	25.4	25337	18.2	-41.3
10-20ha	451	28.0	294	19.1	-34.8	48228	28.4	33481	24.0	-30.6
20-30ha	373	23.1	289	18.7	-22.5	30964	18.2	24618	17.7	-20.5
30-50ha	306	19.0	431	27.9	40.8	28406	16.7	30595	21.9	7.7
50-100ha	176	10.9	269	17.4	52.8	15532	9.1	20695	14.8	33.2
>100ha	60	3.7	88	5.7	46.7	3844	2.3	4663	3.3	21.3

Almost 80% of Burren's UAA was grassland that was used for pasture, hay or silage, and nearly 11% of the area was used for rough grazing. Farmland occupies almost 85% of the Learning Area.

Farm Size – Utilizable Areas



Many of the farms in the Burren uplands region are in excess of 100ha in size. Though this appears large, stocking rates are low as in reality an average of c.60% of a typical Burren winterage field/LPIS is deemed 'eligible' for farm payment (i.e. considered grazeable) (Dunford, pers comm).

Such 'ineligible' areas are shown above – areas with scrub (l) and exposed limestone (r). However, these marginal, extensively managed agricultural areas are among the most significant from a natural - and cultural - perspective.

Farming Systems

The Burren is a pastoral landscape. While in the past, mixed livestock farming was practiced (beef, dairy, sheep, goat) in recent years farming systems have become increasingly specialised in Suckler Beef production. Typically, a Burren farm today might contain an average of 30-40 suckler cows.

	Burren					Ireland				
	1991		2010			1991		2010		
Livestock type	No.	%	No.	%	% Change since 1991		%	No.	%	% Change since 1991
Dairy Cows	5,397		3186	1.7	-41.0	1,328,241	4.2	1,067,596	4.7	-19.6
Total Cattle	68,527		68677	37.3	0.2	6,894,245	21.8	6,587,155	29.0	-4.5
Total Sheep	63,714		22477	12.21	-64.7	8,866,863	28.1	4,732,875	20.8	-46.6

Suckler Herds

Beef Steers

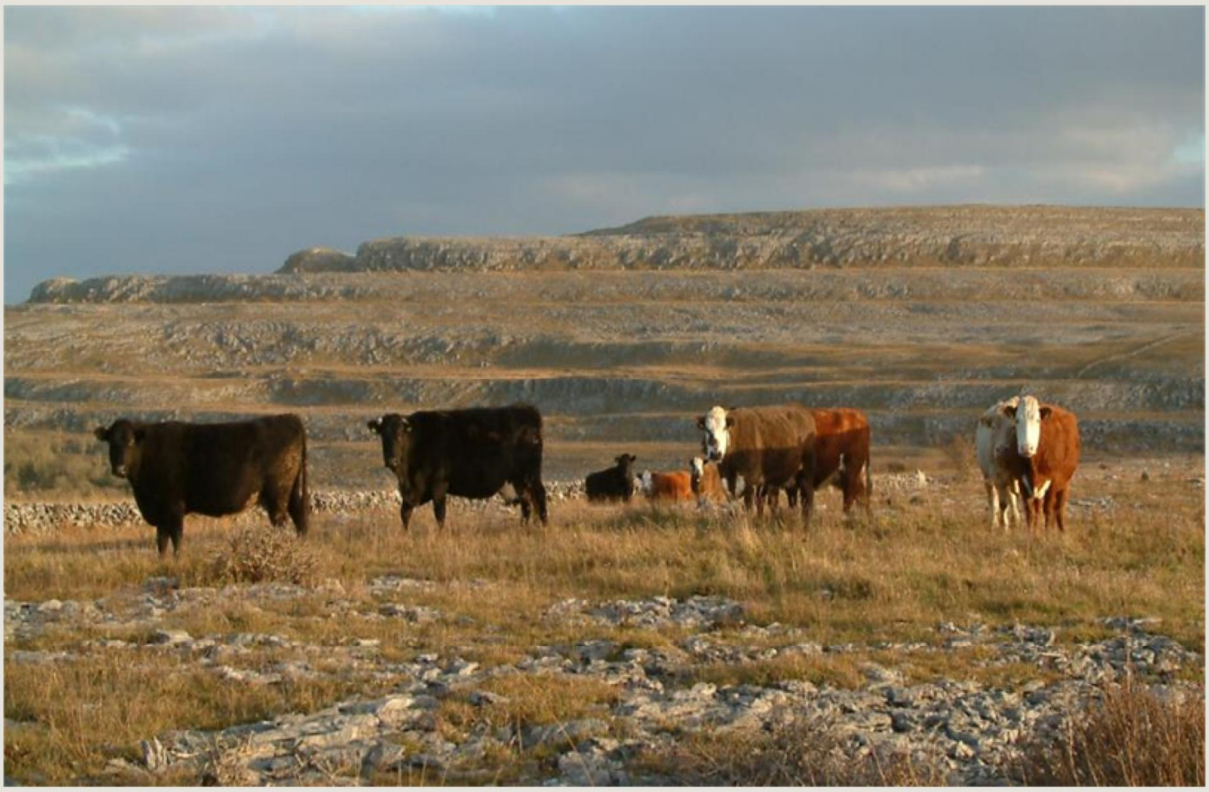
Cattle & Sheep

Dairy Herds

Cattle are the dominant livestock in the region. The numbers of dairy cows fell by over 40% between 1991 and 2010. There were also falls in the number of sheep in the region (c.65%). Suckler cow-based beef systems are the dominant farm enterprise in the region, a change driven primarily by EU agricultural policy, most notably, the 'Suckler Cow Premium'. The extent of dairy and sheep farming in the region is, as a result of this and other factors, increasingly limited. The traditional system of grazing older beef cattle, along with some sheep and goats on the uplands is no longer widely practiced. Farmers concentrate on the production of high quality weanling (under one year) cattle due to the demand for these for export market. Breeds have also changed; formerly Shorthorns and Herefords were dominant, while today continental breeds are becoming increasingly popular, especially Charolais, Limousine, and Simmental, again due to their marketability. The nutritional and husbandry requirements of these animals is much higher than that of the native breeds, and so supplementary feedstuffs and housing are often necessary for their care.

Farming Systems – Stocking rates

Stocking rates in the Burren vary widely. Land is often sold/rented based on the grazing capacity rather then on the acerage.



Rocky winterage areas may have a carrying capacity as low as 0.1LU/ha while stronger winterages would suport 0.56LU/ha.
Middling winterages such as that shown here would have a carrying capacity of 0.28LU/ha.

Stocking rates in the Burren remain relatively low compared the national rates. They were estimated at an average of 0.65LU/ha (Dunford, 2001) an increase on previous figures and reflective of the more intensive management of the productive lowland areas – fertiliser and slurry inputs have enabled higher levels of production on these areas. Upland areas in contrast have seen a reduction in stocking levels, or in some cases, increased levels of supplementary feeding of silage – in either case, grazing levels continue to decline as a result.

Winter grazing

A unique agrarian practice known as 'winterage' occurs in the Burren. Winterage is a form of 'reverse transhumance' whereby cattle are put up on the rough grazing of the Burren uplands in October. They remain there until the following Spring at which point they are brought back down to the more fertile/improved lowland pastures.

This is a low-cost farming system that requires no housing nor large amounts of feedstuff but does require a higher labour input due to the inaccessible nature of the winterage lands.

This system is possible due to a combination of factors:

- Mild marine-temperate climate
- Long growing season
- Heat retention capacity of the limestone rock
- Well-drained permeable limestone pavements

For many generations, farmers have prized the 'dry lie' of the Burren as a place for storing cattle over winter. The warmth of the limestone, as well as the calcium-rich water and herb-rich diet, produced beef and lamb of superior quality described as far back as 1681 as 'much sweeter [than any land in this kingdom] by reason of the sweet herbs intermixed and distributed everywhere'.

Benefits of Winterage practice

Such benefits are many, including:

- Produces good quality store cattle
- Creates suitable environment for unique Burren flora
- Cattle graze off standing vegetation over the winter creating the ideal environment for the Burren's rich annual crop
- Keeps scrub encroachment at bay
- Very cost effective and efficient way of controlling scrub
- Animal's hooves create pockets for new plant species to colonise
- Animal dung is an important habitat for a range of insects and animal carcasses support a range of bird, mammal and insect species

Without grazers, plants such as blue moor-grass *(Sesleria caerulea*) , purple moor grass (*Molinia caerulea*) and heather (*Erica sp. and Calluna sp.)* would begin to dominate, out-competing smaller herbs for which the Burren is famous.

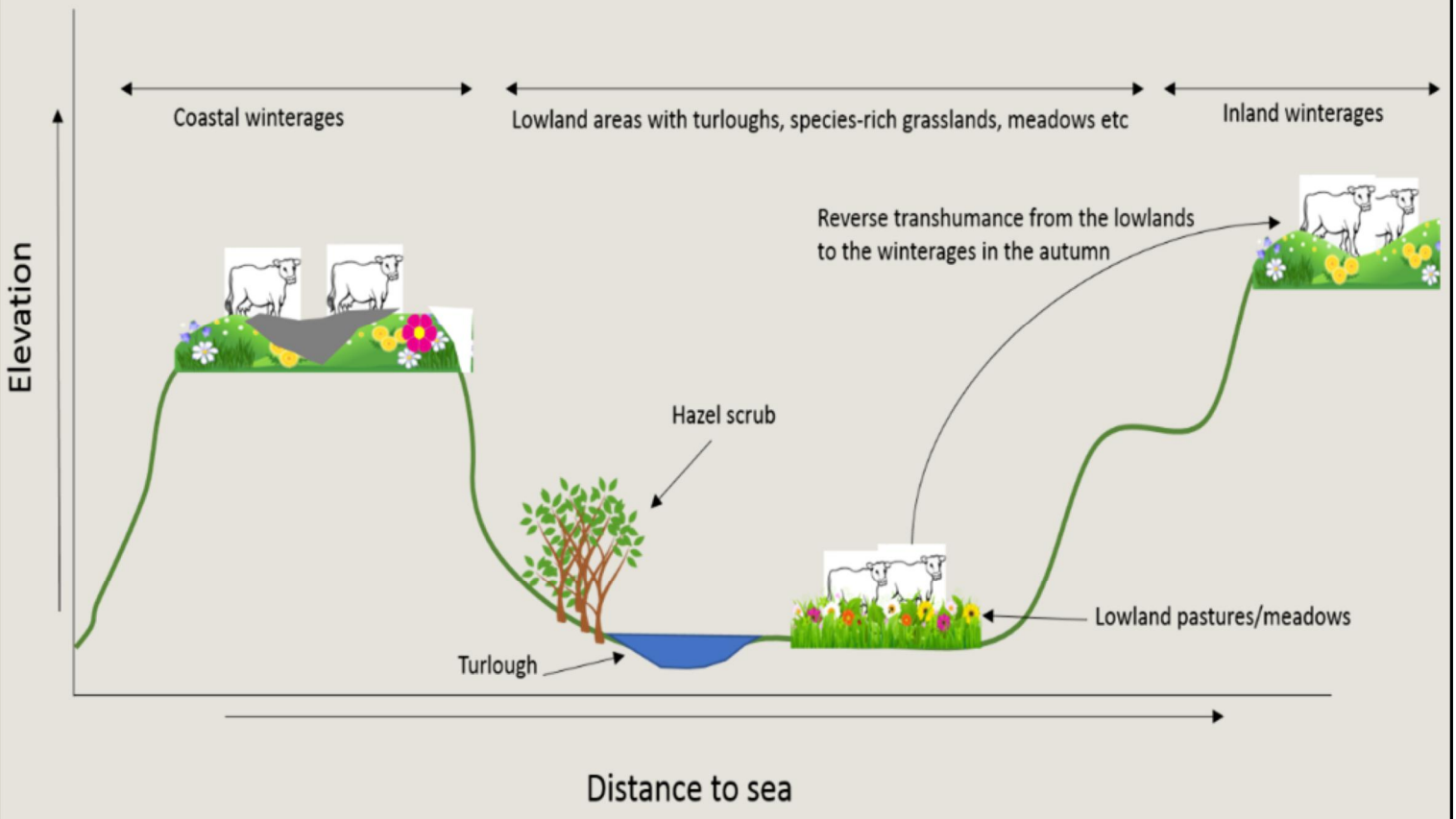
Over time shrubs such as hazel (*Corylus avellana*) and blackthorn (*Prunus spinosa*) would spread over the landscape, smothering the grasslands and any monuments they might contain.

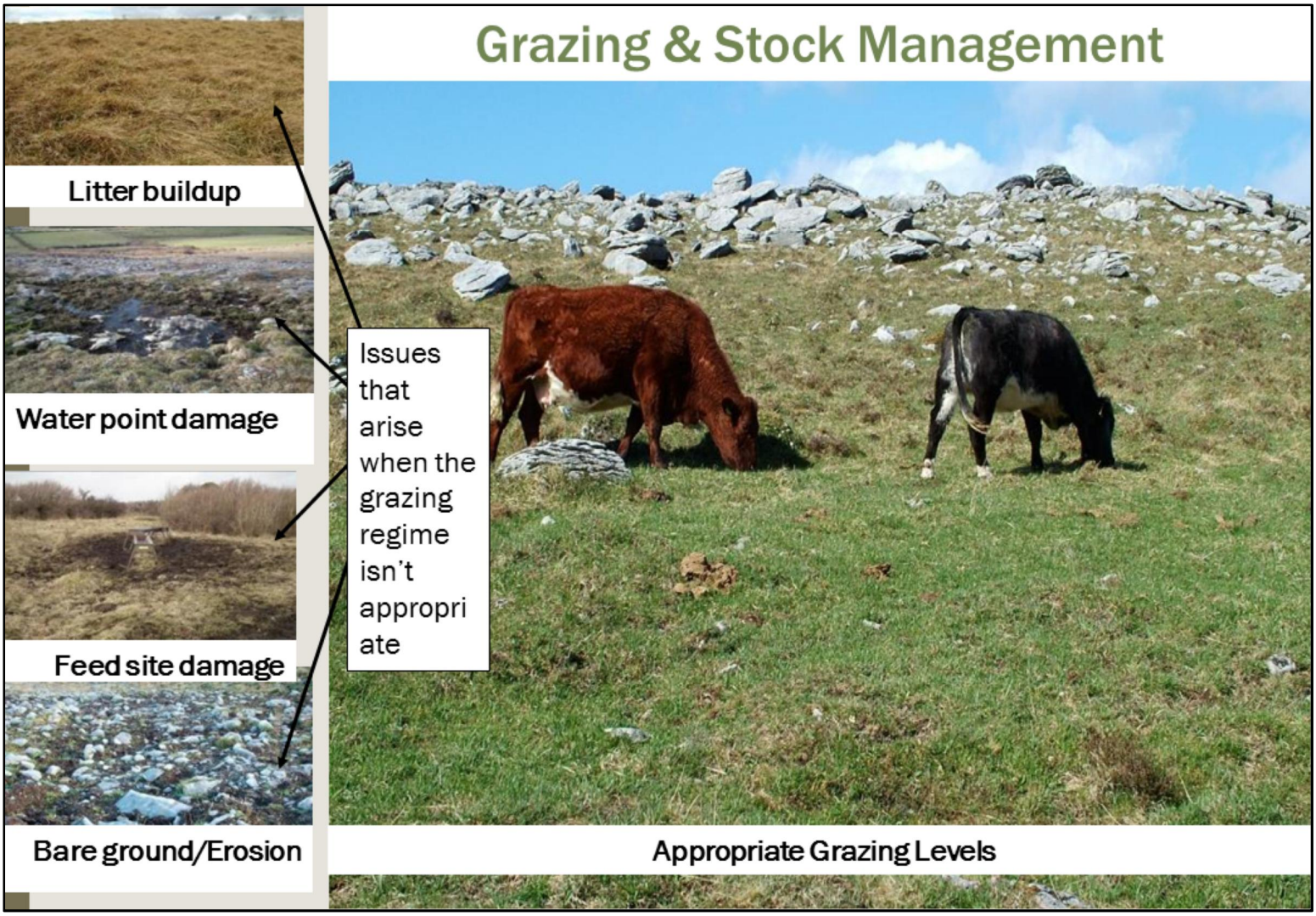
Cattle tracks would close up, further restricting access and movement and making herding more difficult.

Removing scrub is very costly and difficult, and maintaining a suitable grazing regime is the most cost effective way of avoiding, or at least delaying, scrub encroachment.

Burren transect

A representation of the Burren landscape from the coast to the inland areas





Grazing by livestock is the key to the conservation of the biodiversity and landscape of the Burren. Too little grazing, or too much - particularly in summertime or with heavy feeding - can badly damage the Burren habitats. Getting the grazing balance right requires skill, experience and time, but also ongoing work by the farmer such as maintaining walls, providing clean fresh water for livestock and improving access. Only by grazing a winterage well will the farmer make the most of the available forage, thereby reducing feeding and housing costs while also maintaining animal health and keeping the winterage in prime condition for future grazing.

Non-Winterage areas

As mentioned earlier, Burren farms have complex habitat make-ups. As well as winterages, most Burren farms also contain areas of 'improved' land which are vital support areas for the HNV farmland areas of the farm.

The proportion of improved land to rough grazing (summer land to winter land) varies from farm to farm and is a key determinant of how that farm is managed. The improved summer land allows stock to regain condition while winterages are rested during the flowering season.

To ensure good, early spring grass, summer fields can be closed off in early Autumn (Sept - Oct) and stock moved to the winterage.

Stock can be moved back on to the green land in April or May though of course the timing of grazing will depend on the farming system, the weather, market and disease conditions that prevail on the farm in any given year.

The most popular marketplace among Burren farmers for trading livestock is Kilfenora mart in the south Burren, and also Ennis andGort marts. Many marts have recently introduced night-time sales to cater for the large number of part-time farmers in the area. Another significant aspect of modern farming practices in the Burren is the high level of mechanisation and external input involved. These efficiency-driven changes have led to the more intensive use of accessible 'lowland' areas of the farm, with fertiliser use and silage harvesting facilitating greater production levels on these areas. As a consequence of this, many upland areas have become disused, with silage and/or 'slatted' animal housing being used for overwintering animals instead.

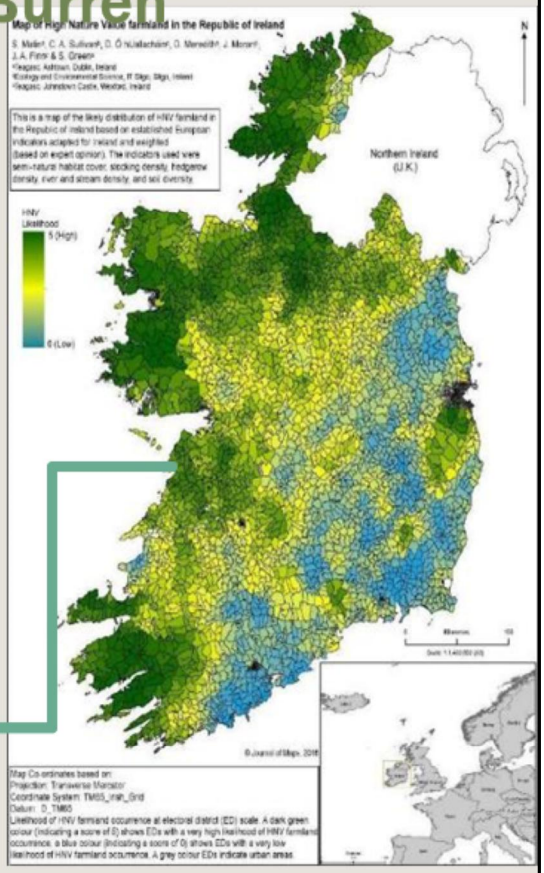
This contributed to a steady loss in plant species diversity, and indeed cultural heritage, on some holdings. Similar to other HNV areas, over half of all Burren farmers have a source of off-farm income. Many farmers are increasingly disenchanted with the relatively long hours, poor holidays and limited income available, and are electing to leave the land, at least on a part-time basis. With them goes a vast store of management knowledge and experience, a multigenerational link with the land, and a loss in the cultural and natural diversity of these farms.

High Nature Value farming in the Burren

The Burren region represents one type of High Nature Value (HNV) farmland in Ireland (see inset below). Much of the western seaboard and several upland areas in the south and east comprise HNV farmland.

The Burren is unique as most other HNV farmland areas are dominated by peatlands or wet grasslands but the Burren comprises large areas of karst limestone landscape. The Aran Islands and some small areas around Lough Corrib are the only areas comparable to the Burren in the country.

According to Sullivan *et al,* (in press) the region is typical Type 1 HNV farmland with no common land. It is dominated by semi-natural habitats (>75%) with a high proportion of grasslands. The average stocking density is >0.6 LU/ha



Distribution of areas with high HNVf potential in Ireland (green areas indicated HNVf) (Matin et al 2016).

Cultural landscape

The Burren has been aptly described as one 'vast memorial to bygone cultures'

The magnificent portal tomb at Poulnabrone – built by farmers 5,800 years ago- in the rocky heart of the Burren is one of the most easily recognised monuments in Ireland, but is only one very small piece of an extraordinary wealth of heritage to be found in the Burren

Clockwise from top left: Portal tomb (3,800BC), Stone wall (19-20th century), Turf Thuile (for fuel production), mid 19th century), Stone fort (c.6-900AD)

The density and diversity of monument and settlement types spanning from the Neolithic to modern times is staggering.
There are thousands of hectares of intact ancient agricultural landscape in the Burren, from the Neolithic and Early Bronze Age, particularly in the uplands

These archaeological landscapes include ancient field systems and associated settlements, boundary walls and enclosures which often occur in tandem with monuments such as megalithic tombs and cairns. The most numerous megalithic tombs in the Burren are the wedge tombs from the Late Neolithic – Early Bronze Age. The densest concentration of wedge tombs in Ireland can be found in the Burren on Roughan Hill, an intact 150 ha ancient landscape (Deegan, 2016). Other dominant built features include the ubiquitous drystone field walls from prehistoric and more recent eras, numerous ancient settlements including approximately 500 ringforts from the Early Christian Period, including the magnificent triumvallate (three walled) Cahercummaun and the chevaux-de-frise (an ancient defensive structure composed of upright stones) ringed Ballykingvarga and hundreds of abandoned pre-famine villages (Deegan, 2016). The density of monuments and settlement landscapes indicate the intensity of landuse and settlement over the course of the Burren's history. These ancient landscapes of intensive settlement are in stark contrast to the unpopulated areas of winter pasture in the uplands today.

Stonewalls

Stonewalls are the dominant field boundary in the Burren, and also on the nearby Aran Islands and east Galway landscapes.

Some of the walls in the Burren are thought to be of Stone Age origin (over 4,000 years old) and form extensive field systems which are of great archaeological significance.

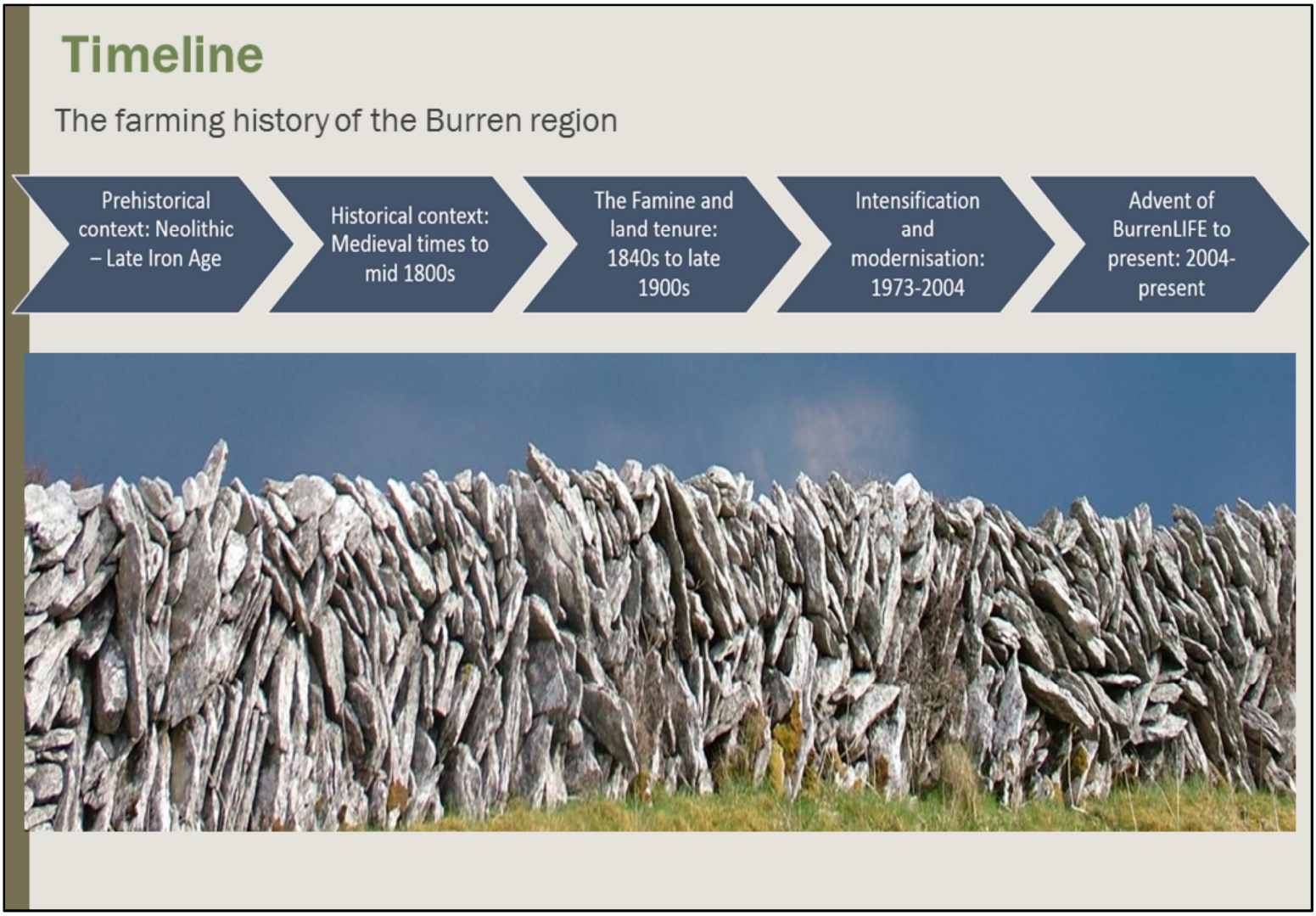
Many others – including the characteristic single stone wall – date from more recent times, in particular the past 200 years. These walls perform important agricultural functions enclosing parcels or forming characterstic shelter walls (T-shaped structure to protect the animals from prevailing winds). They also mark townland boundaries. Many of these stone structures have fallen into disrepair due to the high labour required for their maintenance

Farming activity in the Burren has been moulded by the very individual limitations and strengths of the unique landscape, as is reflected in the evolution of practices such as winterage, herding and physical features such as rainwater troughs and shelter walls to name but a few. However, the agricultural tradition that contributed to the creation and maintenance of such features, and is reflected in them, is seriously threatened by changes in agriculture which have served to render many of these traditions functionally and economically obsolete. In much the same sense as some species-rich grasslands have been reclaimed and/or fertilised to produce uniform swards, so too has much of the diversity in farming activity succumbed to the increasing specialisation and intensification in the agricultural sector threatening the HNV of the landscape.

International recognition of the Burren region

- The Burren (along with the neighbouring Cliffs of Moher) was awarded UNESCO Global Geopark designation in 2011 for its outstanding geological and cultural heritage.
- The Burren has also been awarded a European Diploma for Protected Areas (EDPA) by the Council of Europe. The Burren is the only Irish recipient of the EDPA award and one of the few largely privately owned regions in Europe to have received this distinction.
- The Burren was (re)listed in 2010 by the Irish government on its Tentative World Heritage Site List. A Tentative List is an inventory of those properties which a country intends to consider for nomination to the World Heritage List.

UNESCO Global Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. A UNESCO Global Geopark uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society (UNESCO, 2017).
The EDPA is a prestigious international award granted since 1965 by the Committee of Ministers of the Council of Europe. It recognises natural and semi-natural areas and landscapes of exceptional European importance for the preservation of biological, geological and landscape diversity and which are managed in an exemplary way (Council of Europe, 2017).



In terms of telling the story of the Burren over time, we have an exceptionally well preserved prehistoric record in stone, supplemented by a strong written record including the Annals of the Four Masters which recorded information from as far back as the early Christian Period, and including the superb record of Hely Dutton and his Agricultural Census of County Clare in 1808. These written records tell a fascinating story, from the Mediaval Period when the Burren contained vast sheep walks owned by the landed classes, to the unspeakable tragedy of the Famine when the land and its people were laid bare.

There are a number of significant time periods in the history of the Burren, each of which influenced the landscape we see today. Times of exploit were often followed by lulls which allowed the natural resources to recover. The development of farming was one of the most significant events, particularly in the Bronze Age which saw a significant reduction in woodland cover in the region. This was followed by a period of recovery during the Iron Age lull. Similarly, the early 1800's resulted in an increased pressure on the landscape with the Famine in the 1840's forcing the exploitation of any available natural resource to feed desperate people. This was also followed by a lull which allowed the landscape to recover and resulted in more sustainable agriculture for a time.

From the early 20th century until Ireland's accession into the then European Economic Community (EEC) in 1973 advancements in agricultural technologies had a major influence on the region from the advent of the use of fertilisers to the increased mechanisation of farming systems. These advancements largely took place unchecked by national policies.

From 1973 onwards, the policies of the EEC influenced Irish farmer's decisions both nationally and in the Burren region. The increased exposure to the international marketplace and continuing advances in farmland technology all impacted farming practices in the area with much intensification and modernisation taking place. During this period, the designation of Natura 2000 sites and the advent of agri-environment schemes precipitated an unfavourable situation in the Burren region that was positively addressed through applied research initiatives that took place from 2004 onwards.

Prehistorical context: Neolithic – Late Iron Age (400BC-500AD)

The first evidence of farming activity in the Burren is from the early Neolithic period, around 6,000 years ago. An excavation of the Poulnabrone portal tomb (c. 3,800 BC) revealed the remains of up to 22 people who appear to have farmed cattle, sheep, goat and some cereals.

Poulnabrone Tomb in the central Burren dates from 3800BC and is the first known structure built by farmers in Ireland

During the early Neolithic, farming activity was of a small scale and transient nature characterised by sporadic clearances, followed by abandonment and subsequent regeneration of the woody vegetation.
Farming developed significantly during the late Neolithic and early Bronze Age, when a phase of more structured, and settled agricultural activity seems to have developed.
The presence of over seventy-five wedge tombs (almost 20% of the national total), and the high number of farm settlements (incl. stone walls) from this period in the Burren indicate a prospering agricultural-based economy.

Pollen records from the Neolithic-Bronze Age show an increase in the presence of grassland species at the expense of species typical of wooded habitats – a reflection of increased farming activity. Parts of the Burren at this time were quite intensively farmed. However, during what is known as the 'Iron Age Lull' (up to 500AD) this trend reversed, possibly as a result of a climactic downturn, and forest cover recovered significantly.

Historical context: Early Christian Period (500-1200AD)

At the beginning of the Early Christian Period (c. 500 AD) agriculture began to recover strongly. Early Christian communities such as the Cistercian monks introduced new crops and farming systems. Lowland areas in the Burren – hertofore neglected due to their wettish nature and more dense cover - began to be more intensively exploited, most likely to meet the needs of tillage and milk production that the uplands could not provide.

Huge number of circular enclosures known as Ring Forts were built during this time (6-900AD) by farming communities. This may reflect innovations in dairying such as butter and cheese production, allowing communities to store food year-round and improve nutritional levels, thereby releasing the human resources needed to build these massive structures. The increased value of the milk cow would also have warranted the construction of these forts to protect cattle from raiding parties. Cattle became the currency across Ireland at this time. Land was valued on the basis of the number of cows it supported. The number of cattle one owned was a measure of one's standing in society. Fines, rents, tributes and gifts were paid in cattle (Kelly, 1997). Tributes of beef cattle, cows, sheep, pigs and cloaks were paid to the kings of Ireland from the tribes of the Burren.

Historical context: Medieval Period (1200-1700AD)

The increasing levels of agricultural productivity and prosperity of early Christian society in the Burren continued largely unabated into the medieval period. Pollen diagrams show increasing levels of arable farming and reduced levels of woodland cover. Dairying and sheep production levels also grew.

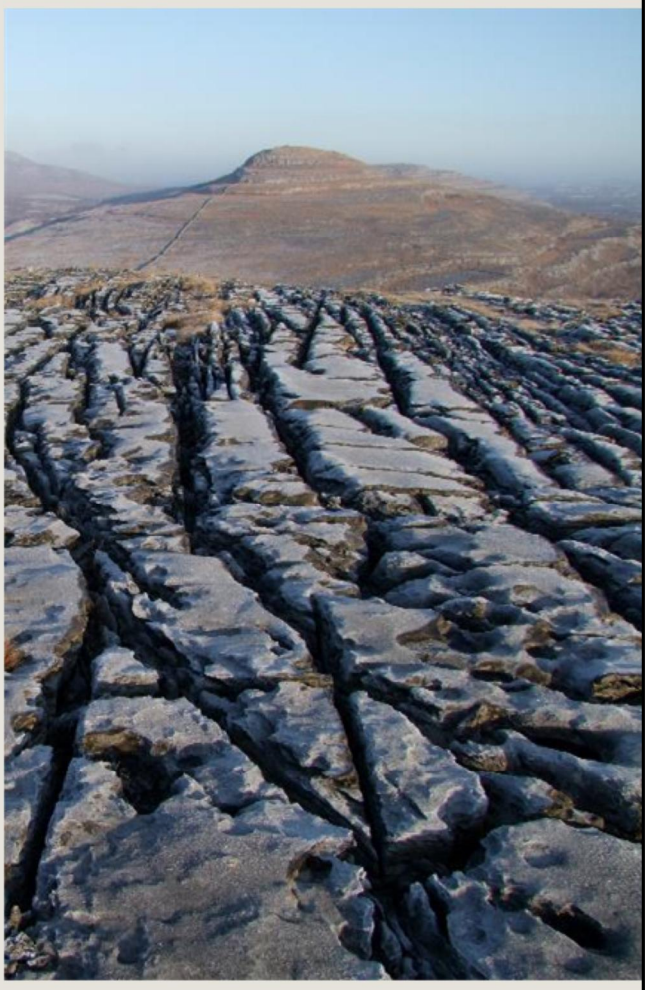
Written records from this time highlight the frequency of raids into the Burren, and the generous spoil secured - consisting mainly of herds of cattle and flocks of sheep. Warfare – particularly in the mid 17th century - and disease also impacted on society and farming.

Tower houses were built from the 14th to the mid-17th century by Anglo-Irish noblemen and Gaelic lord, soften featuring walled yards or 'bawns' employed 'for fear of theft, and on account of the ravages of wolves which had grown much in numbers while the wars engaged the attention of the people' (Ua Cróinín and Breen, 1996)

Towards the end of the 17th century, 'huge flocks of sheep numbering from 5,000 to 20,000 were commonly owned by the planters', while the stock of the peasantry was limited to 'generally a cow or two, some goats and six or eight small Irish sheep which they clip twice a year' (O'Donovan, 1940).

Historical Snapshot: 1641

In 1641 the book of Book of Survey and Distribution was published (Simington, 1641) - a survey of all lands within various baronies, prior to their distribution to the 'planted' classes.



In the Barony of the Burren 35 categories of land type were described, which in turn were broken down into 121 grades of different value. Under 'pasture' for instance, there are fourteen different classes, such as 'Dwarfwood pasture' and 'Rockie pasture'. These classes are further differentiated into 69 subdivisions based on profitability, such as 'Rockie pasture 1/3 profit', 'Rockie pasture 1/8 profit', etc. This shows the variation in habitats, and most likely farming activity, across the Burren at this time, prior to the redistribution of land to the settlers, a redistribution that was to last until the early 1900s, 250 years later.

A record by a traveller named Dineley, describes the Burren in 1681: 'it consists of one entire rock with here and there a little surface of earth, which raises earlier beef and mutton, though they allow no hay, than any land in this kingdom, and much sweeter by reason of the sweet herbs intermixed and distributed everywhere.'

Historical Snapshot: 1808

Hely Dutton's statistical survey of Clare (1808) describes the Burren as 'extremely rocky, but produces a herbage fit for sheep of middling size and short clothing wool, of which immense numbers are annually reared, and usually sold at the fair of Ballinasloe in October, and from thence drove into Leinster to be fattened at three years old; a small part feeds store bullocks, and a much smaller fattens them for Limerick or Cork market'. He estimates that nearly 10,000 acres of land is grazed by sheep.

Dutton describes the tenant farmers: 'A few farmers near towns hire their cows to their tenants, whose wives retail the milk; farmers generally have from four to eight; scarcely a cottier without a cow, some two, besides their succession'.

He also describes 'the limestone crags of Burrin ... are, with some exceptions, devoted to the rearing of young cattle and sheep, and some so very rocky that four acres could not feed a sheep'. He notes that it is the 'custom of many graziers ... to permit the grass to remain for feeding store cattle or sheep in winter, and frequently for the purpose of turning in cattle until their fattening round is ready, which in backward springs is of great value ... very high prices are often paid ...'

Historical context: Pre and post Famine (1700-1900AD)

The population of Ireland grew from 1 million in 1600 to 8.1 million in 1841, facilitated by the introduction of, and subsequent dependence on, the potato, first introduced in the late 1500's. The onset of potato blight in 1845 resulted in potato crop failures which persisted until 1849 depriving the poorest in Irish society of food. 1 million people died and over 1m emigrated.

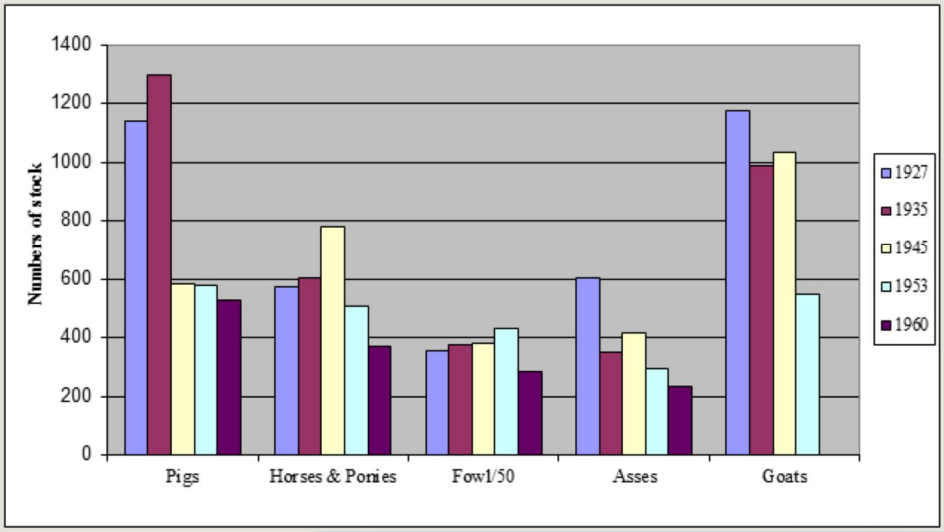
BRIDGET O'DONNEL AND CHILDREN.

Mitchell (1982) claims that around the time of the Famine 'every usable scrap of land was being turned over by spade, and no combustible material was left undisturbed'. Old stems of mountain avens, sods of earth and cow dung were common fuels in the Burren reflecting the absence of scrub at the time, as it had all been exhausted for fuel and as forage for goats.

However, in the fifty years following the Famine (1854-1904), the numbers of cattle and sheep in Ireland almost doubled, as the collapse in population facilitated the consolidation of the highly fragmented small holdings of pre-Famine times. Various land Acts in the late 19th century helped give some security of tenure to tenants. The Congested Districts Board was established in 1891 with the goal of creating holdings sufficient to support families in the poorest areas of the north-west and west of Ireland. They amalgamated and restructured many holdings.

By March 1919 the Congested Districts Board had resold around 585,000 acres (of some 23,000 holdings) in its area of operation, and together with the Land Commissioners and Estates Commissioners had sold 9.3 million acres of land (285,000 holdings). From the 1860s to 1915, most of the increase in livestock occurred with cattle, with numbers increasing from 3.5 million to 4.5 million (Huttman, 1972). Land reform finally gave Irish farmers control over the land they had been farming for many years previously.

20th Century



Over the course of the early 20th century, Burren farmers became increasingly exposed to international market forces – higher prices during the World Wars, lower prices in between due to Civil and Trade wars. Mixed farming systems, dominated by cattle and sheep with some tillage, but also other smaller stock (see graph of stock between 1927 and 1960) helped build a certain level of resilience.

Goat farming was an important source of additional income: the 'milk kid' – a goat kid reared on mothers milk – was a popular local delicacy up until the 1970s when most goat farming ceased.
Shorthorn cattle – first introduced in 1860 – were the dominant breed, considered excellent 'dual purpose' animals, good milkers and good beef cattle. In the 1960 census, 99% of cows kept were Shorthorn – though Angus and Hereford breeds were soon to grow increasingly popular.
The tradition of 'herding' whereby farmers with land in the Burren but living elsewhere employed local men to herd their livestock continued, with such herdsmen being granted a 'freedom' in exchange for their services. Such 'freedoms' included the free grazing for a defined number of the herder's own stock on the owners holding.

Modern Context: Accession to the EC (1973)

In 1973 Ireland joined the European Economic Community (EEC). This led to enormous changes in the agricultural sector of the Burren due to increasing exposure to the international marketplace, as well as the greater availability of innovative developments in the field of agricultural science (Dunford, 2001, 2016).

During the decades following Ireland's accession to the EEC in 1973, the relationship between Burren farmers and their landscape changed in a way that was unprecedented in terms of its speed, scale and impact. This was encouraged by a range of factors including the Common Agricultural Policy (CAP), which offered grant aids and subsidies designed to improve the lot of the Irish farmer, while also ensuring food security for the consumer.

Major changes were enabled by new agricultural technologies—cattle breeds, heavy machinery and agrochemicals—as well as technical support from farm advisors. Up to this time Ireland had one of the lowest levels of application of artificial fertilisers in Europe (O'Sullivan, 1968; Potter, 1997). Since the early 1970s, agriculture-related activities have led to habitat loss and change in Ireland. These activities include ploughing, reseeding, arterial and field drainage, commonage division, land reclamation, the substitution of silage-making for hay-making, increased use of fertilisers and increased nutrient inputs through supplementary feeding of increased stock numbers (Hickie *et al.*, 1999; Feehan, 2003). *The Irish Farmers Journal* even reported on an experiment to fertilise parts of the Burren via helicopter. All of this raised real concerns of nutrient leaching to oligotrophic lakes, turloughs and groundwater. Reclamation, increased fertiliser and slurry usage all resulted in a substantial increase in production. There was also an increase in the use of silage as supplementary feedstuff, produced in the lowlands but often fed-out on upland grasslands ('winterages').

Intensification and modernisation 1970-2000

A rapid intensification of farming practices was largely driven by agricultural policies in the 1970s and 1980s such as the Farm Modernisation Scheme, the Western Drainage Scheme and the Headage Payment Scheme (Bleasdale and Sheehy Skeffington, 1992; Emerson and Gillmor, 1999; Hickie *et al.*, 1999; Feehan, 2003).

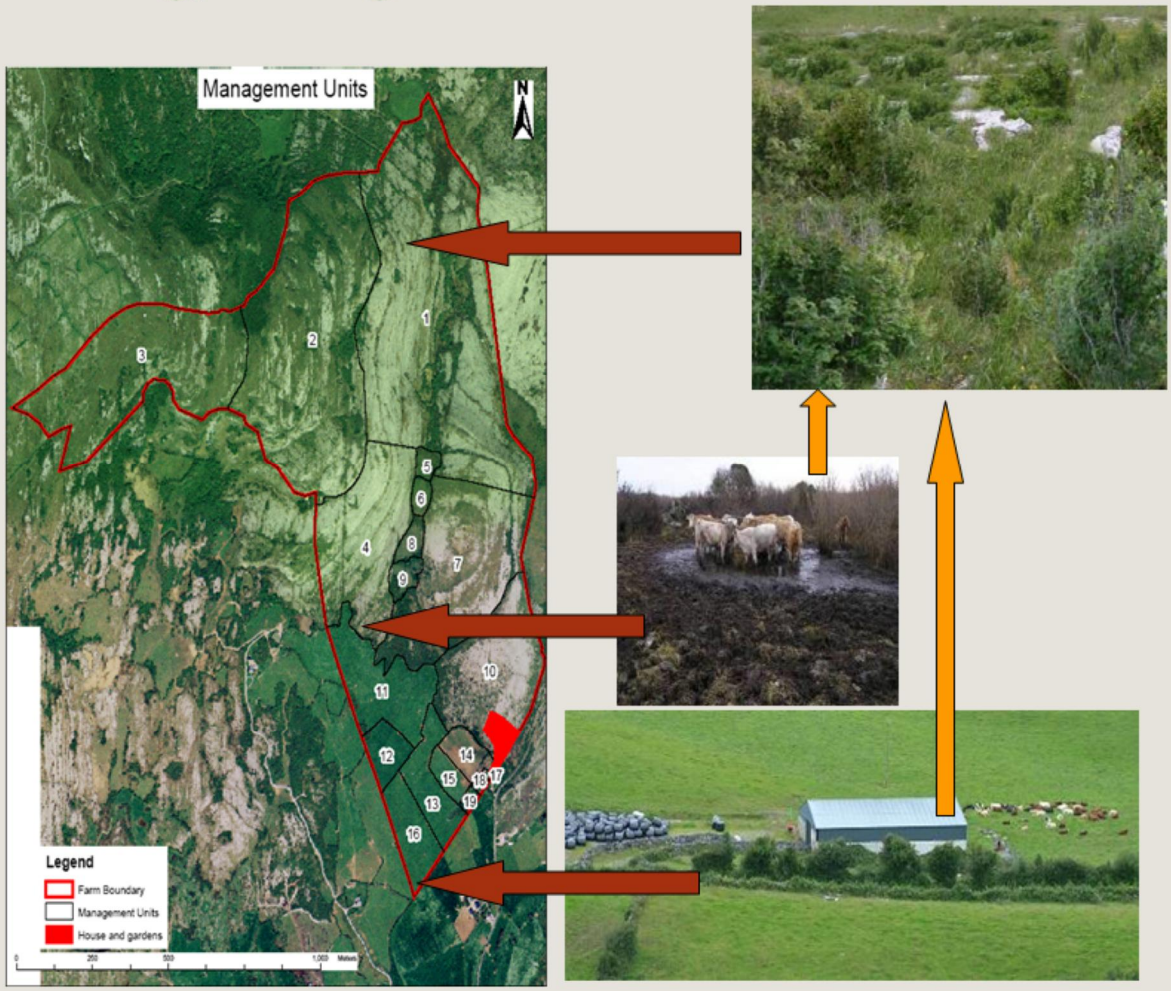
By 1986 arterial and field drainage schemes had funded 'improvement' of lands covering nearly one third of Ireland including areas of high scientific interest. For many farmers, these were welcome developments.

A 2001 study estimated that stocking levels in the Burren increased from 0.38LU/ha in 1970 to 0.66LU/ha in 2000, a 72.8 per cent jump over 30 years (Dunford, 2001).

Changes in Marketing and Dairy production also occurred.

The environmental impact of changing practices was very significant; extensive areas of rough grazing were 'reclaimed' and improved, silage production increased significantly (facilitated by higher nutrient inputs which impacted on local wetlands) and increasingly displaced the tradition of out wintering cattle on the hills.

Changes in farming, Changes in environment



While every farm in the Burren is unique, and equally so the management changes and challenges on each farm, in general the changes in farming and landscape over the past 4 decades is summarized in this slide of a 'typical' Burren farm. Increasing focus on lowland grasslands (fertilisers, slurry, machinery, silage, housing) may result in environmental damage such as reduced water quality while contributing to the undergrazing of species-rich uplands and the encroachment of scrub on these areas.

Corkscrew hill in the Burren in 1900 and 2000AD showing the changes in the landscape over time, mainly due to the reduction in farming levels on this area.

Natura 2000 Designations

Another EU policy that had major implications for the Burren was the Habitats and Species Directive (92/43/EEC). The EU Habitats Directive was transposed into Irish law in 1997, leading to the designation of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), a move that set out to, and succeeded in, halting significant land reclamation work in these areas.

The designation of land was not greeted positively by farmers, for a number of reasons. Farmers resented the erosion of their 'freedom to farm'. Also, in most cases, farmers in Ireland were officially notified of the designation through the post, receiving a list of activities on their land that would henceforth require ministerial consent.

The wholesale lack of consultation caused a lot of upset throughout the country. A report by the Consultative Committee on the Heritage of the Burren (2000) found that farmers were 'bewildered and some angered by the lack of proper consultation before their lands were lumbered with SAC categorisation.'
Land designated as a Natura 2000 site would not receive planning permission for building a house or developing a wind farm for example. This had an impact on some farmers. With so much of the Burren region designated as Special Area of Conservation, farmers in the area felt at a disadvantage compared with non-designated areas.

The designation of SACs was not greeted positively by farmers, for a number of reasons. In most cases, farmers in Ireland were officially notified of the SAC designation through the post, receiving a list of activities on their land that would henceforth require ministerial consent. The wholesale lack of consultation caused a lot of upset throughout the country. A report by the Consultative Committee on the Heritage of the Burren (2000) found that farmers were 'bewildered and some angered by the lack of proper consultation before their lands were lumbered with SAC categorisation.' O'Rourke (2003) described the 'strong criticism' by local farmers of the 'top down autocratic approach' with 'no prior consultation with the landowners' and plans 'designed solely on "the best scientific grounds"'. The study goes on to say that 'Burren landowners frequently complained about their inability to contest the designation, because it can only be done on "scientific grounds"—which they feel puts them at a distinct disadvantage.' It is further noted that 'given the history of the land struggle in County Clare and throughout Ireland, the imposition of legally binding restrictions on how landowners use their land is naturally quite emotive, even if they are once more given some financial compensation.'

Agri-environment schemes

One of the biggest changes Irish agriculture following EU accession was the introduction of agri-environment schemes. The first Irish scheme was called the Rural Environment Protection Scheme (REPS). Through REPS, for the first time ever, farmers were being asked to move beyond their production-orientated mentality and carry out measures that were supposed to conserve the environment.

Changes in Burren farming. Clockwise from the top left, trackway damage due to increased use of heavy machinery, large slatter shed for housing cattle over winter, cattle eating silage over winter instead of foraging outside, impact of silage feeding outside on the Burren.

By 2007, almost 40% of the farmed land in Ireland was covered by REPS including most of the Burren. REPS was a single, national, prescription-based scheme with no accounting for regional variation.

While Burren farmers welcomed the income provided by REPS and its impact in 'tidying up' the area, they were unhappy with rules which limited their freedom to farm the and as they saw it. Severe restrictions on grazing periods and feeding systems were introduced which, farmers felt, didn't sufficiently accommodate the unique circumstances of the Burren. From an environmental perspective, REPS didn't significantly address key concerns around pollution or undergrazing.

End of a Millenium: the seeds of change are sown

As a result of SAC restrictions and REPS prescriptions, as well as other local issues, by the late 1990s there was much concern, negativity and division regarding the Burren and its management. Certainly the balance between farming and the Burren seemed to have been upset by a number of, mainly external, factors and, as a consequence, the Burren's environmental health had deteriorated significantly, with neither SAC designations nor REPS proving effective in addressing this.

Significantly, the Agreement also stated that 'research and monitoring... is deemed essential... include those of an environmental, agricultural, and socio-economic nature, and results should be used to modify the above-listed conditions' (Department of Agriculture & Food 1995). Thus began a new path for the Burren.

The public's perception of the role of farming in the Burren had also grown very negative. Farmers themselves were feeling very embattled and disrespected. Against this backdrop, the Burren Irish Farmers Association (IFA) was established. These were farmers from nine local parish branches of the IFA who disagreed with the perceived inappropriateness of the REPS guidelines in the Burren. Consequently, the Burren IFA group negotiated the 'Conditions for the Conservation of the Burren to be applied under REPS' in 1995. This included a number of important concessions that made it possible, and more attractive, for Burren farmers to enrol in the scheme. This early success, including the group's ability to negotiate at high levels with public officials, instilled confidence and belief in the group and its potential.

2000 - Today: Steps towards success

Problems with Designations and REPS measures
1995

Research PhD: The Impact of Farming on the Burren
Teagasc & UCD
1998-2001

BurrenLIFE Project
NPWS, Teagasc, Burren IFA
2005-2010

Burren Farming for Conservation Programme
DAFM & NPWS
2010-2015

The Burren Programme
DAFM & NPWS
2016 - 2020

HNV Vision?

Step 1: Identifying the issues (1998-2001)

A number of research projects took place in the Burren during the early 2000s. These were instigated as a consequence of the introduction of new AES and SACs which raised many research questions

Key among them was a PhD thesis entitled 'The Impact of Agricultural Practices on the Natural Heritage of the Burren' which examined the relationship between farming and the landscape of the Burren over the previous six millennia, looking closely at traditional management practices (Dunford, 2001).

This research incorporated ecology, sociology and agriculture (both theoretical and applied) identified the key environmental challenges such as the limitations of existing management approaches, and also suggested some potential solutions.
In addition, a survey of local farmers was carried out to identify existing, and likely future, trends in Burren farming, to explore attitudes to the land and its management (with a particular focus on existing agri-environment schemes) and to identify issues that encouraged (or discouraged) farmers to engage with such programmes.
Importantly, it also helped to reframe the relationship between farming and the Burren in a much more positive light and identified areas of common ground for local and regional stakeholders.

Step 2: Shaping a new, inclusive, narrative (2002-2004)

The findings of these research projects were published in he form of a book 'Farming in the Burren' which was launched in the Burren by the Minister for Agriculture. This book helped restore farmers' sense of pride in, and ownership of, their landscape.

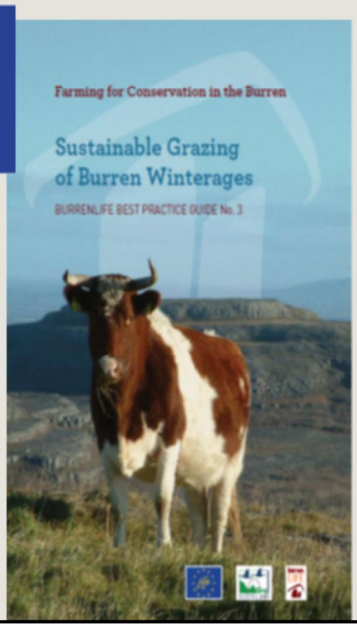
The more inclusive story and emerging partnerships was key to the application for EU LIFE Nature funding in 2003.

The findings were also used to set up a website 'Burrenbeo' (the living Burren) which told the broader world about the importance of farming to the biodiversity and landscape of the Burren. Burrenbeo also began a number of local school and community educational initiatives which invested in farmers as Burren custodians. Burrenbeo Trust is now a major national ENGO focussing on 'connecting people with their place and its care'.

Following this, a successful application was made in 2003 for funding from the EU LIFE Nature fund (a fund dedicated to the sustainable management of SACs across Europe) for €2.23m. The National Parks and Wildlife Service (NPWS), Teagasc (the Irish agricultural advisory body) and the Burren Irish Farmers Association (IFA) participated as co-funders and key stakeholders. The project's objective was to develop a blueprint for the sustainable agricultural management of the Annex I habitats of the Burren.
Its approach was simple; to implement a range of management interventions across a selection of working farms in the Burren and to monitor the agricultural, economic and environmental impact of these interventions. To achieve this an ambitious programme, with a range of project actions, was developed. These included implementing best-known management practices on 2,000ha of the Burren.

Step 3: Developing a Blueprint (2005-2010)

The BurrenLIFE Project (2005-2010) was a 2.23m project funded through the EU LIFE fund (75%) and local partners (NPWS, Teagasc, Burren IFA).



The project worked on 20 pilot farms. On these farms, key management challenges were identified and potential solutions (mainly proposed by farmers) were tested and costed.

Key achievements of the project included the development of new cattle feeding systems, livestock watering facilities and scrub removal techniques

The final output of the project was a blueprint for the sustainable agricultural management of the Burren which included a range of actions, their impact and cost.

Step 4: Implementing the Blueprint (2010-present)

Burren PROGRAMME

'The European Agricultural Fund for Rural Development: Europe investing in rural areas'.

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

The success of the BurrenLIFE Project led to the Dept of Agriculture allocating €1million p.a. (2010-2016) to implement the Burren Farming for Conservation Programme (BFCP) and in 2016 to expand this funding through CAP Pillar 2 funding.

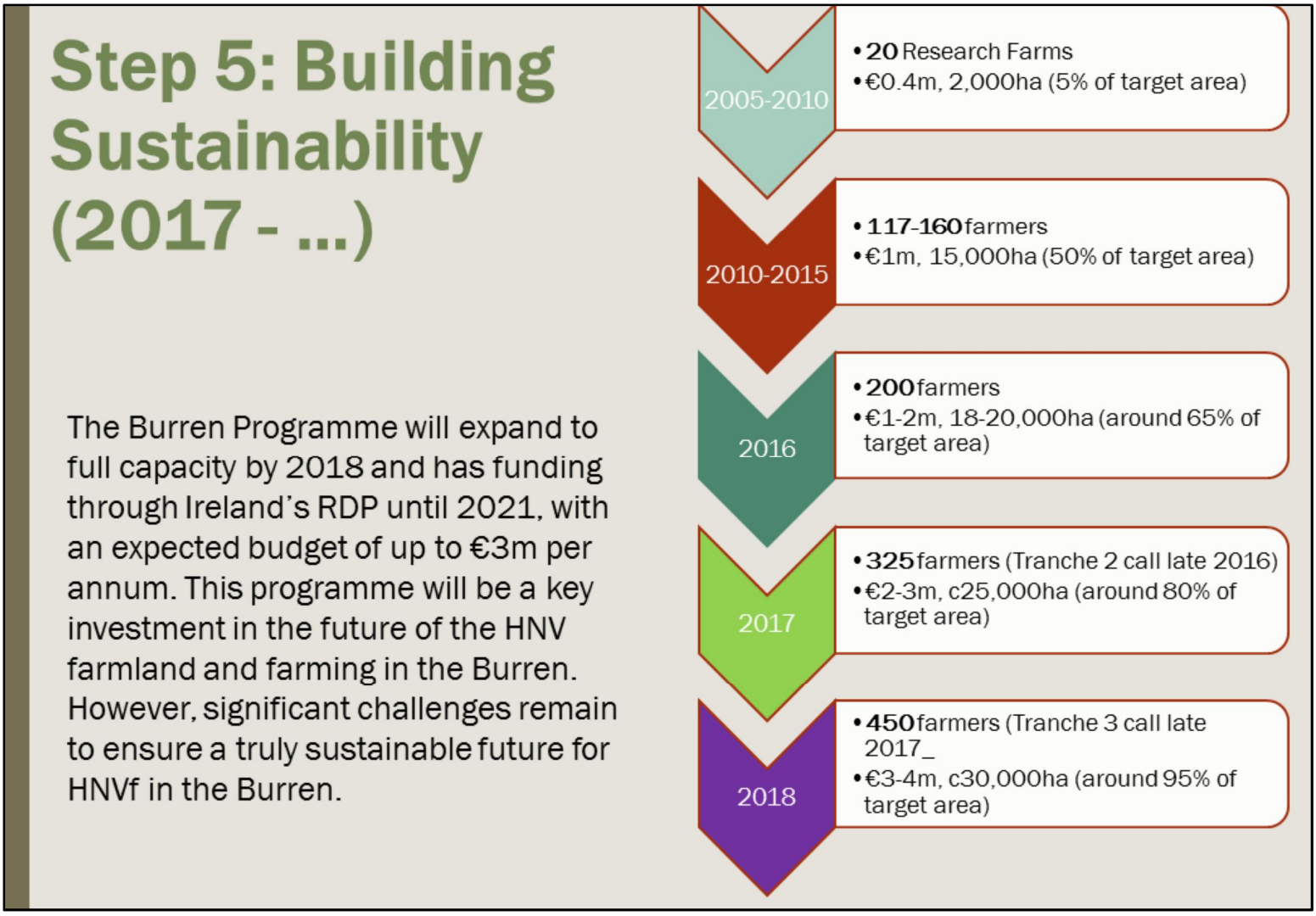
<5/10 = No 'output' payment

<5/10 = No 'output' payment

9 or 10 = Bonus 'output' payment

By 2018, an estimated 450 Burren farmers will partake in the Burren programme, covering 90% of the target area (Annex I habitat).

The BP is a 'Hybrid' AES whereby farmers are paid for project actions (on a co-funded basis) and also for project impact/results. The latter innovation, whereby fields are given an annual environmental health score which determines the payment for that field, has proven very impactful and attests to the success of the approach.



This future include:

Social: an ageing farming population with very few young farmers resulting in a loss of management knowledge and skill and insufficient labour to carry out required conservation actions.

Economic: Farming remains an unviable occupation for most farmers, even with additional funding provided by the Burren Programme. Farmers currently gain very little from tourism or added value gained from livestock sales.

Environmental: Notwithstanding the impact of the Burren programme, scrub continues to encroach onto the Burren's grasslands while on lowland areas there is continued, often damaging intensification (reclamation, nutrient input).

Scenario in the absence of local environmental initiatives (1/2)

In the absence of initiatives such as BurrenLIFE and the Burren Programme, Burren farm families would still continue to be guided in their land management by issues around financial returns and convenience (efficiency) – time and money in other words.

Time-wise, farmers would continue to specialise in suckler beef or drystock beef production and not diversify. The use of time saving technologies would continue to grow – slatted houses, fertilisers and slurry, silage, heavy machinery etc. As would the focus on the 'green land' areas of the farm to which these technologies best lend themselves.

More time would be spent on off-farm work, including tourism-related activity, with less time on labour intensive activities such as herding, wall repair, and scrub removal - all of which are critical to the maintenance of the HNV farmland areas.

Money-wise, farmers would be likely to, at best, maintain stocking levels but in many cases reduce them gradually. Silage would be the main winter fodder source, harvested by contractors and fed in houses or on the green land. There would continue to be a focus on continental cross animals, the progeny of which are in most demand at local markets. There will be minimal investment in HNV farmland areas other than to install vehicle tracks to improve convenience, though permission would be required for these works.

Most farmers would partake in the national Agri-Environment Scheme – GLAS – with the majority availing of options such as Natura, wall maintenance, Low-input Permanent pasture and Traditional Hay Meadow which will have minimal impact on the HNV areas of the farm and indeed have little effect on biodiversity in general (O hUallacháin *et al*, 2016). Increasing levels of environmental legislation and oversight, and the absence of any local support structure to assist with negotiating these issues, would provide a major disincentive to the carrying out of any management interventions on upland/HNV farmland areas. (continued)

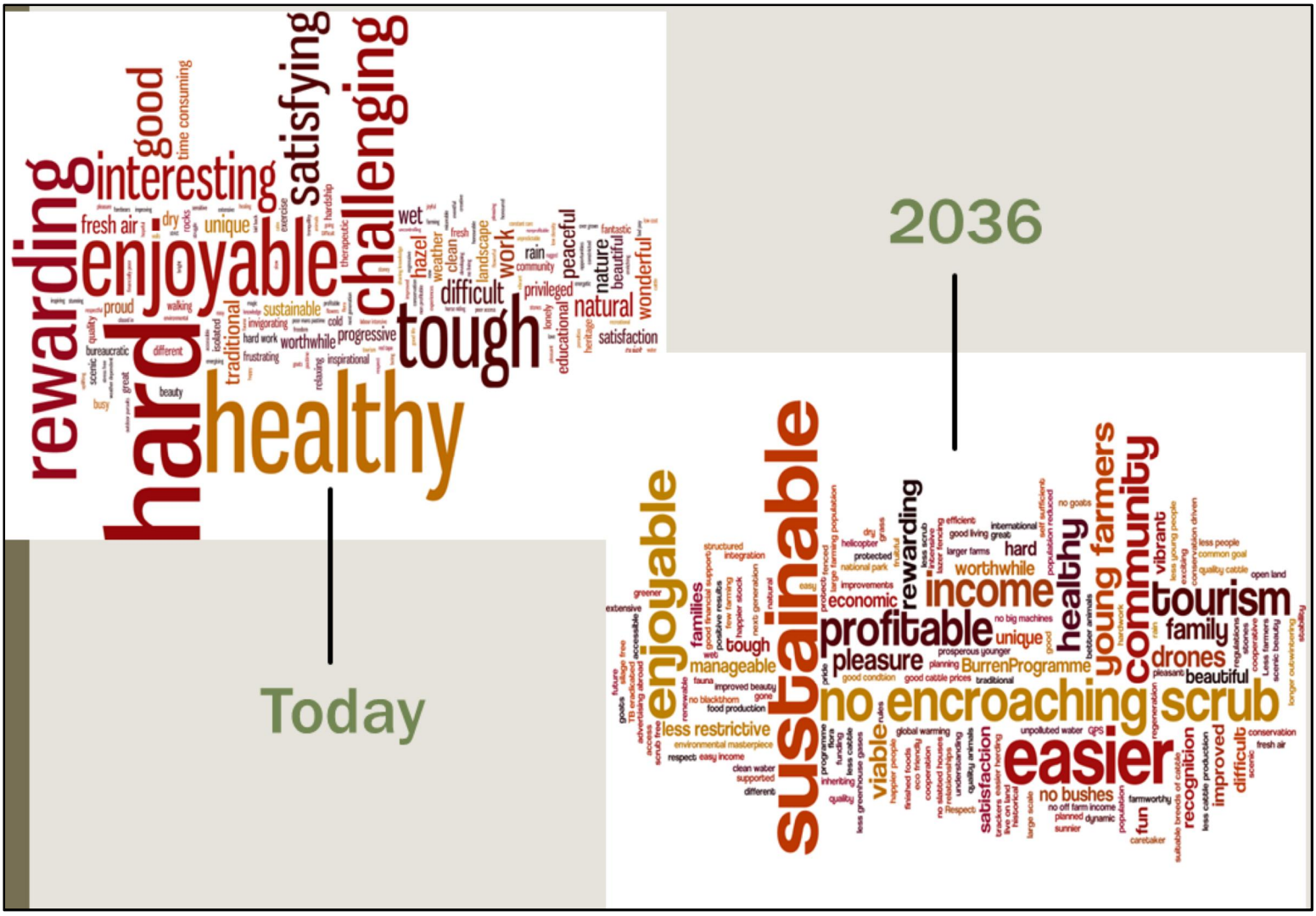
Scenario in the absence of local environmental initiatives (2/2)

Socially the number of farmers would continue to decline (and thus the average holding size increase gradually), the age profile worsen and the level of social isolation increase. Renting-out of land would continue but at relatively low levels.

The environmental impact of this continued withdrawal of activity from upland/HNV areas and increased activity on lowland/green land areas would be largely negative. Levels of grazing on HNV areas would reduce, resulting in increased litter and scrub levels and a general reduction in biodiversity (and impact negatively on built heritage features).

This may not be as noticeable on more exposed coastal areas but would be very pronounced in more sheltered inland sites. While the impact of a reduction in grazing on upland water sources (and soils) may be positive, the impact of increased use of fertilisers, silage and slurry on the lowlands would mean a worsening of water quality and soil health overall.

In the absence of Burren Programme, the environmental, social and economic health of the Burren would be likely to deteriorate. Grazing levels of the rough grasslands would decline further, resulting in continued species loss, while farming on the fertile lowlands would become more efficiency-driven and intensive. Traditional farming communities would continue to decline as farming becomes a smaller proportion of the farm family income and people access services outside of the region.



At a series of Burren Farmer Training Sessions in October 2016, 200 Burren farmers were asked to list 5 words to describe farming in the Burren today. Then they were asked to choose 5 words that would represent their vision for farming in 20 years time. These responses are aggregated into the word clouds above. The word sustainable for the future is noteworthy and is also reflected in terms such as profitable/rewarding (economic), community/young farmers (social) and no encroaching scrub (environmental).

The HNV vision for the Burren

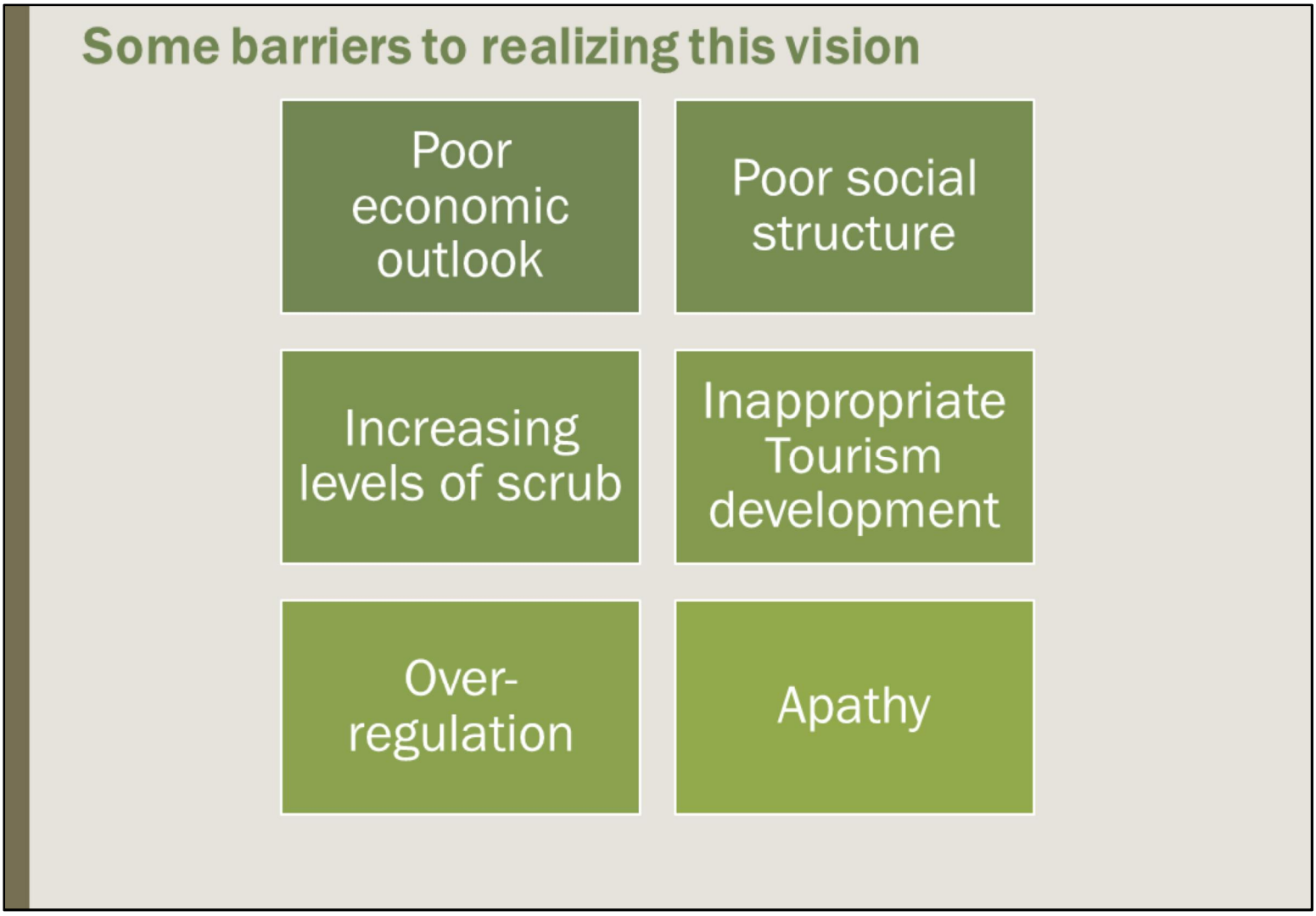
Burren HNV Vision

'Where Burren farmers, working in partnership with the wider community, earn a good living and enjoy a high quality of life as esteemed providers of a range of valuable public services based on an exceptional lansdcape.'

This vision was developed in collaboration with local farm leaders, while also drawing upon three previous studies: The Burren Charter, The Burren Farm Family Survey and Feedback from BFCP Training. It will be presented for discussion by a wider group of stakeholders at the HNV Innovation Seminar.

Some of the key Actors in realizing the HNV Vision

International	• EU • UNESCO • Council of Europe • HNV LINK, EFNCP, Europarc and other EU Networks
National	• Dept of Agriculture, Food and the Marine • National Parks and Wildlife Service • National Monuments Service • Teagasc (Farm Advisory Service)
Regional	• Clare County Council • Galway County Council • Leader Companies (Clare and Galway) • Collegess (Galway, Sligo and Limerick)
Local	• Burren Irish Farmers Association • Burren Programme • Burrenbeo Trust • Burren Ecotourism Network



All these barriers, altogether, call for innovative ways to overcome the difficulties. Life Burren project has shown how to overcome them.

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