Farming for Conservation in the Burren

‘Animal Health and Nutrition on Conservation Grasslands’
- Workshop Report

Carron, Monday 25th September 2006

Contents

Introduction:

This workshop was held as part of the BurrenLIFE project (www.burrenLIFE.com), which aims to develop a new model for the sustainable agricultural management of the Habitats Directive Annex I priority habitats of the Burren. The workshop was held on the 25th of September 2006 at the Máirín de Valera Research Station, Carron, Co. Clare, Ireland.

The main focus of the workshop was to discuss animal nutrition and health on conservation grasslands with specific reference to winter grazing systems on the orchid-rich calcareous grasslands and heaths of the Burren. Particular topics explored included:

1. A review of current knowledge on animal nutrition on conservation grasslands in an Irish, British & European context, including case studies from the limestone grasslands of the UK;
2. Basic animal nutrition (energy & protein): forage quantity & quality, supplementation requirements and options, including new data from the Burren;
3. Trace minerals and animal health on conservation grasslands: a review of current knowledge

Twenty seven participants attended the workshop (Appendix 1: Workshop participants) including the BurrenLIFE Project Team, Project Partners from the National Parks & Wildlife Service, Teagasc (the Agriculture and Food Advisory Service) and the Burren branch of the Irish Farmers Association, together with representatives from feed mills, veterinary experts, and a range of other professionals from across Ireland and the UK.

The workshop consisted of a number of presentations followed by discussions in the morning and early afternoon (Appendix 2: Workshop Programme). The morning session of the workshop was chaired by Mr. Ruairí Ó Conchúir and the afternoon session was chaired by Dr. Brendan Dunford. The presentations were:

1. Introduction to the BurrenLIFE Project: *Dr Brendan Dunford – BurrenLIFE.*
2. Balancing the Needs of Conservation Grazing with those of Animal Health & Welfare: *Dr Barbara McLean, Livestock Research Scientist, ADAS.*
3. Forage Quality, Supplementary Feeding & Animal Health on Burren Winterages: *Dr. James Moran Teagasc & BurrenLIFE & Dr. Sharon Parr - BurrenLIFE.*

4. Trace Minerals & General Animal Health: *Dr. Phil Rogers MRCVS (ex-Teagasc).*
5. Grazing of Limestone Grasslands: Practical Experiences & Lessons Learnt : *Mr. Bill Grayson, Grazing Animals Project, UK*

These were followed by workshop discussions groups in the afternoon on:

1. Conservation Grazing & Animal Health – the Key Issues
2. Conservation Grazing in an Irish Context: Future Research Priorities
3. Animal Supplementation on Burren Winterages – Developing A Blueprint

Each of the afternoon workshop discussion group sessions had nominated facilitators and recorders. The recorder of each session reported back in detail to the plenary session where further discussion took place.

Presentations

Introduction to the BurrenLIFE Project: *Dr Brendan Dunford – BurrenLIFE*

Background to the BurrenLIFE Project

The Burren is one of the most important and best-known landscapes in Europe. It is unique in that it is a landscape which has been shaped by the elements but modified and maintained by farming activity over many millennia. It is a landscape which contains a wealth of diversity in the form of both the natural and cultural heritage and the extent of the priority habitats present. As a result, much of the Burren has been designated as part of the Natura 2000 Network under the EU Habitats Directive. Five Special Areas of Conservation (SAC) covering 47,000ha have been designated: Galway Bay Complex, Ballyvaughan Turlough, The East Burren Complex, Black Head-Poulsallagh Complex and Moneen Mountain. The latter three are the focus of the BurrenLIFE Project (BLP). All nineteen project sites (LIFE farms) now included in the BLP are located within these three SACs. The sites represent an area in excess of 2, 870ha, 2279ha of which is SAC. They contain a variety of habitats, including limestone pavements, grasslands, limestone heaths and hazel scrub. Many of these habitats, e.g. limestone pavements, orchid-rich grasslands and turloughs are priority habitats under the Habitats Directive and are accorded the highest level of protection.

The spectacular Burren landscape has been shaped by the elements and by the hand of man for thousands of years. The legacy of this relationship extends far beyond the innumerable cultural features present. Intensive exploitation of the landscape by generations of farmers and their livestock has ensured that vast expanses of limestone pavements have remained free of scrub. Research has shown that traditional pastoral systems, in particular the reverse-transhumance 'winter grazing' regime, are integral to ensuring the presence of over 70% of Ireland's native flora in the region, including a number of rare and very localised species, and a rich fauna. The Burren landscape is also an important agricultural resource, one with a long and proud tradition of human use. However, recent years have seen the withdrawal, restructuring or reduction of farming activity from a region now viewed as 'marginal' from an agricultural perspective. This has led to the degradation of habitats through changes in grazing regimes, expansion of scrub, land abandonment and the loss of important land management practices. Under the Habitats Directive, Ireland is obliged to maintain the listed habitats in the Burren in 'favourable conservation status'.

The BLP is examining alternative land use practices in order to ensure that these habitats are not lost. New challenges and opportunities, including the recent CAP reforms and single farm payment system, have the potential to accelerate the withdrawal of farming activity, but may also facilitate a move away from the prevailing production-driven mentality towards a more multifunctional approach to land use that incorporates concepts such as 'farming for conservation'. This is what the BLP is working to develop to ensure through comprehensive research and the development of a new, integrated system for the agricultural management of the Burren - a 'farming for conservation' approach which will secure a bright future for Burren people and their heritage.

Objectives of the Project

The overall project objective is to develop a new model for sustainable agriculture in the Burren in order to conserve the habitats of the region designated under the Habitats Directive. To achieve this, an ambitious work programme has been developed and approved by the European Commission. A strong partnership has been built between the Burren Irish Farmers Association (IFA) and Teagasc (both Project Partners) and the National Parks and Wildlife Service (Project Beneficiary) with a total five year budget of €2.23 million (75% from the EC LIFE Nature Fund). A range of diverse but complimentary actions are presently being implemented to meet the main Project objective. These actions include:

- Implementing best-known land management practices on over 2,000ha of the Burren, through whole farm planning on selected 'LIFE' or 'Monitor' farms, including new feeding systems, redeployment of existing livestock and targeted scrub removal.
- Increasing understanding of the relationship between land management practices and the natural heritage of the Burren and working in a practical way with BLP Partners and Supporters on 'best practice' approaches and guidelines.
- Developing new support mechanisms for the sustainable management of the Burren habitats through research and advisory services, a marketing and branding initiative for Burren beef and lamb, the establishment of a co-operative structure, a farming for conservation grouping and through the revision of existing agri-environmental schemes.
- Enhancing awareness and skills relating to the heritage of the Burren and its management through a range of practical initiatives, including a comprehensive 4

year school and community based Heritage Education Programme and various public awareness actions aimed at empowering local communities.

- Disseminating information relating to the agricultural management of areas of high natural and cultural conservation value in Europe through literature and the media.

Overview of Main Conservation Issues Being Addressed

The BLP is a partnership-based 'Farming for Conservation' project. It is the only such project in Ireland geared specifically towards engaging farmers in actively 'farming for conservation' in priority habitat areas. It is significant in national terms in that it is taking place in the Burren, Ireland's flagship heritage landscape. The priority habitats which feature prominently in the Burren, and which are the focus of this project include:

- **Limestone pavement** - a glacio-karstic feature of limited distribution in Europe. In Ireland it is largely confined to the Burren region, with 60% (18,000ha) of the national total (c. 30,000ha) included in the Project area. This is very high quality limestone pavement habitat, largely intact, with a wide array of interesting karst and karren features and related pavement flora.
- **Orchid-rich limestone grasslands** (Festuco-Brometalia) are closely associated with the Burren in the Irish context, and the grasslands present represent c. 26% of the national cover of 6,000ha of this habitat. The grasslands, within the Project area, are of very high quality containing species such as blue moor grass, bird's-foot trefoil, tormentil, bloody cranesbill, ladies bedstraw, eyebrights and yellow rattle among many others. Orchid species include the frog orchid, bee orchid, fly orchid, dense flowered orchid and spotted orchids among others.
- A range of wetlands including **turloughs** (275 ha, c. 9% of the Irish total), **petrifying springs with tufa formations** (a good proportion of the estimated national cover of 0.5 ha) and **Cladium fens** (200 ha, c.8% of the national total for this habitat).

The scale, diversity, quality and uniqueness of these priority habitats in the Burren are internationally significant. However, they are threatened by a number of factors, largely related to recent changes in land management practices resulting in an imbalance in the traditional relationship between farming and the local Burren environment. There has been a move towards

more efficient ‘modernised’ farming systems in the Burren by many of the remaining farmers. This has contributed to the modification or neglect of the traditional extensive ‘outwintering systems’ which have shaped the Burren.

The result has been undergrazing or even abandonment of some areas with consequent scrub (mainly *Corylus avelanna* and *Prunus spinosa*) encroachment on priority habitats. Equally, the production and distribution of feedstuffs (particularly silage) into an intrinsically low-nutrient environment is also of some concern, particularly in terms of the impact on oligotrophic wetlands. The loss of farmers from the land, and the limited time available among those remaining (mostly working off-farm) is also an issue of concern, as is the impact of mass tourism on parts of this fragile environment.

Balancing the Needs of Conservation Grazing with those of Animal Health & Welfare: *Dr Barbara McLean, Livestock Research Scientist, ADAS.*

The main focus of Dr. Barbara McLean's presentation was on her recent work experience in the UK regarding conservation grazing. This work deals with the concept of the conservation grazing continuum. Examining both the benefits of using grazing animals in conservation and animal health and welfare indicators, this works looks at balancing the needs of the animal with the conservation objectives from various case studies in the UK. What is presented hereunder is the PowerPoint presentation.

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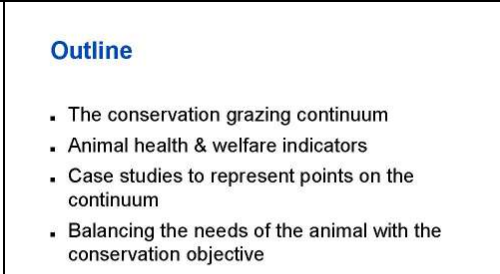
<td> 
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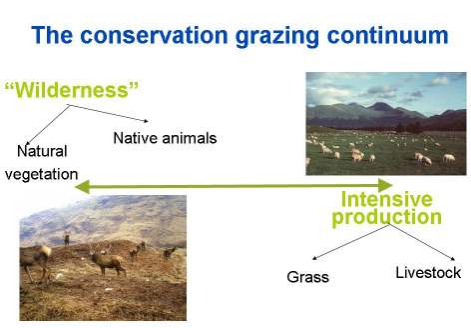
<td> 
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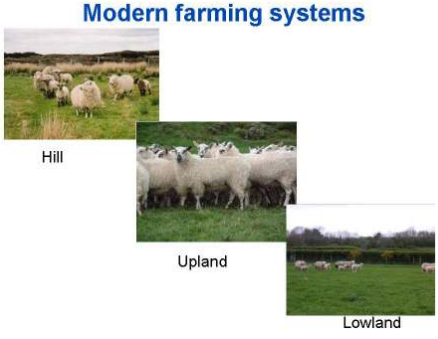
<td> 
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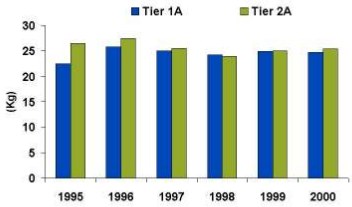
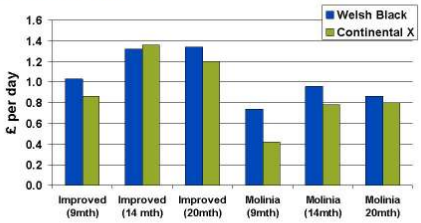
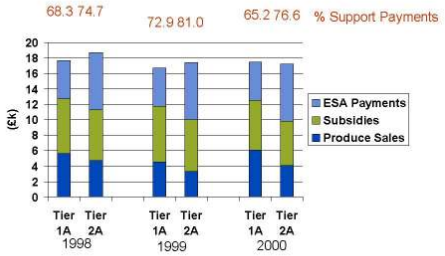
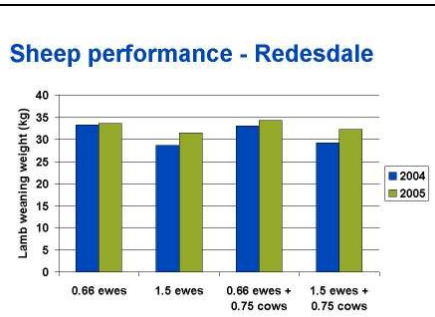
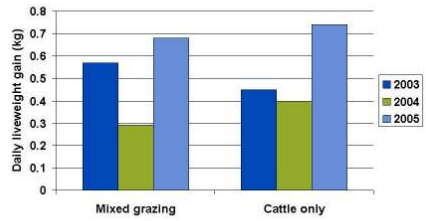
Slide 7	**Why do we need conservation grazing?** ▪ Natural grazers no longer present ▪ Ingress of invasive grasses ▪ Ingress of trees and scrub ▪ Dwarf shrubs becomes rank, no succession ▪ Decrease in diversity ▪ Politics	Slide 11	**Considerations when using grazing animals** ▪ Fencing costs ▪ Water provision ▪ Handling ▪ Transport/Movement (incl.TB testing) ▪ Animal Welfare ▪ Disease ▪ Production ▪ Choice of breed ▪ Wintering costs 
Slide 8	**Benefits of using grazing animals** ▪ Different grazing patterns ▪ Greater ability to remove low digestible biomass ▪ Trampling helps to create bare ground and 'Open up' dense swards	Slide 12	**Animal Health & Welfare considerations** ▪ The Five Freedoms ▪ The ability to undertake constructive action to control its own welfare 
Slide 9	**Factors influencing diet selection - animal** ▪ Body size & digestive capacity ▪ Energy requirements ▪ Mouth size ▪ Environmental conditions ▪ Physiological status ▪ Metabolic status	Slide 13	**Health & Welfare Indicators** ▪ Condition scoring ▪ Social groups ▪ Disease factors 
Slide 10	**Choice of stock** 	Slide 14	**Case Studies** 

Slide 15		Slide 19	**Effect of Cattle Breed on Performance** ▪ Defra funded work at IGER Bronydd Mawr ▪ Welsh Black and Continental X steers ▪ Improved pastures or molinia dominated swards ▪ 3 year study 
Slide 16	**Weaning Weights – 1995/2000** 	Slide 20	**Value of weight gain on different pasture types** 
Slide 17	**Revenue Data 1998/2000** 	Slide 21	**The Use of Cattle to Graze Wetlands** ▪ Valuable feeding areas for birds such as snipe, lapwings and curlew. ▪ Requires grassland to be kept relatively short, and rushes to be controlled. ▪ A combination of grazing with cattle in early spring and cutting in the autumn will help control rushes 
Slide 18	**Effects of Reducing Sheep Numbers** ▪ Increase in Vaccinium but not Heather ▪ Heather became rank ▪ Sheep became selective for grass areas ▪ Initial physical and financial benefits eroded over time ▪ Financial income becomes more dependant on support payments	Slide 22	

Slide 23		Slide 27	
Slide 24		Slide 28	**Checklist - environment** ▪ What is the environmental objective? ▪ Can the objective be met using grazing animals? ▪ Which grazing animal - species/breed/age/ production objectives? ▪ Optimum grazing period - when/how long?
Slide 25		Slide 29	**Checklist - livestock** ▪ Potential animal health/disease risks ▪ Fencing requirements ▪ Provision of water ▪ Level of stockmanship ▪ Away wintering requirements
Slide 26			

Summary of Questions and Answers

- **Is there any tradition of supplementary feeding in the area?**

There has been some work on supplementary feeding, but this has been mainly in relation to the use of mineral blocks to encourage animals into areas rather than for animal welfare reasons. With summer grazing supplementary feeding is not as much of an issue. In areas where supplementary feeding has taken place the main issues are poaching, sacrifice areas and moving feeders.

- **Is there any issues with trace minerals?**

Areas are mainly grazed with sheep as opposed to cattle. Cobalt drenches used where lambs are drenched at weaning. Some cattle have problem with Cu status, noticeable on coats of Welsh Black cattle. Cu boluses have been used.

- **Are estimates of dry matter intake carried out?**

Some work carried out on different proportions of grass heather mixes, results not analysed yet, Use of alkane profile.

- **Are estimates of water intake carried out?**

Did not look at water intake.

- **How do the welsh black compare with the continental cross animals?**

Welsh black do better on improved land. Use of behaviour recorders on animals, difference in intake coming through in performance. On Molinia areas both types do equally as well. Choice of breed does not appear to be an issue on Molinia areas.

- **General points from Q&A.**

In addition to the specific questions addressed above the following general points raised during the questions and answers session were noted:

  - Older the animal on the hill the greater the weight gain.
  - Mixture of cattle and sheep best. In absence of cattle, sheep not able to keep terrain in proper condition. On sheep only hills, Molinia dominates.

Forage Quality, Supplementary Feeding & Animal Health on Burren Winterages:
Dr. James Moran Teagasc & BurrenLIFE & Dr. Sharon Parr - BurrenLIFE.

Introduction:

The overall objective of the BurrenLIFE project is to develop a new model for sustainable agriculture in the Burren in order to conserve the annex 1 priority habitats designated under the EU habitats directive. The project involves the implementation of a wide range of project actions on BurrenLIFE monitor farms covering over 2000Ha of Special Areas of Conservation (SACs). Key actions of direct relevance to animal health and nutrition include: D1 Profiling of the Agricultural Capacity of Burren Grasslands, D2 Formulation of Appropriate Supplementary Feedstuff Rations and F5 Ongoing Agricultural Surveys.

Forage quality of Burren winterages:

In order to profile the forage quality of Burren grasslands used for winter grazing (winterages), 47 sampling points have been set up on monitor farms across the Burren. The winterages of the Burren have been divided into 5 types based on previous work by Dr. Brendan Dunford and Dr. Sharon Parr. These five types include: (a) Molinia (4 samples) dominated by *Molinia caerulea*, (b) Dryas (7 samples) dominated by *Dryas octapetala, Sesleria caerulea* and *Festuca sp*., (c) Sesleria/Festuca (18 samples) dominated by *Sesleria caerulea* and *Festuca sp*., (d) Calluna heath (3 samples) with approximately 25% cover or greater of *Calluna vulgaris* and (e) Meadow grasses (15 samples) dominated by more productive meadow species such as *Anthoxanthum odoratum*, Cynosurus cristatus and *Dactylis glomerata*.

Samples are taken every two months during the winter grazing period from October to April, and will continue to the end of the project in 2009. Approximately 500g of forage are cut using a grass clippers in areas ranging in size from 0.5x0.5m to 5x5m depending on the productivity of the winterage. During each successive sampling period the sampling locations are relocated using a GPS. All samples are sent to the Agricultural Research Institute of Northern Ireland, Hillsborough, Co. Down for analysis. Chemical characterisation of the samples is used as a measure of their nutritional value as initial analysis of the samples using near-infrared spectroscopy did not provide accurate results. Samples are analysed for ash, nitrogen (Kjeldahl nitrogen), crude protein (Nx6.25), oven dry matter, acid detergent fibre (Van Soest analysis) and neutral detergent fibre (Van Soest analysis).

Results of the chemical analysis of the Burren winterages are currently available for Dec. 05, Feb. 06 and April 06 (Appendix 3). To illustrate the nutritional quality of Burren winterages, graphs of crude protein (CP) and acid detergent fibre (ADF) from Dec. 05 to Apr. 06 for the 5 different winterage types are used (Fig. 1 and 2). The mean values for crude protein range from approximately 50 g/kg DM in winterages areas dominated by Molinia caerulea in December to 115 g/kg DM in areas dominated by meadow grasses in April (Fig. 1). For beef production 120 g/kg DM is normally recommended, however, crude protein values below 70 g/kg DM have been shown to limit fibre digestion in the rumen which limits dry matter intake (Allison, 1985). Increases in the supply of N to micro-organisms in the rumen can increase organic matter digestion, thus increasing the breakdown and rate of passage of poor quality forages through the gut allowing the animal to consume more (Romey and Gill, 2000).

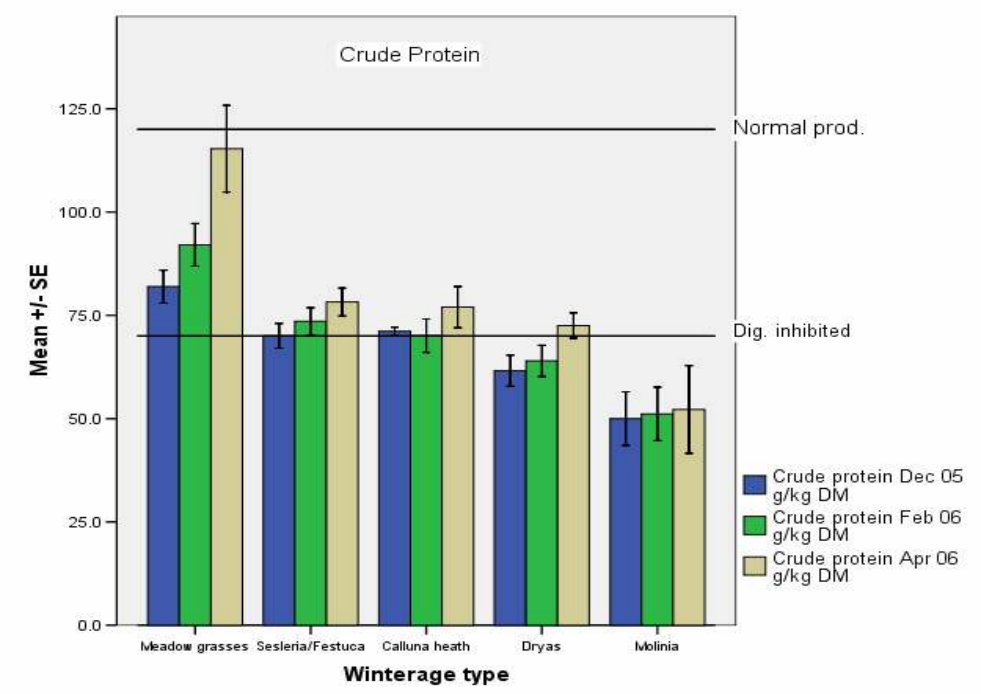


Fig. 1: Graph of crude protein (mean +/- S.E of mean) of 5 winterage types for Dec. 05 to Apr. 06.

Forage fibre is a major determinant of forage quality and forage fibre analysis such as ADF and NDF have been used to predict nutritive value of forage (Cherney, 2000). ADF comprises the lignin and cellulose contents of the plant and in general terms as ADF increases the digestibility of forage decreases. To illustrate the nutritive value of Burren winterage the mean ADF values relative to the ADF values of summer grazing, hay and straw are shown (Fig. 2). The lower ADF

values of meadow grass winterages illustrate higher digestibility relative to the other winterage types. Nutritive value of winterages also increases as growth begins in April as illustrated by the lower ADF values and higher CP (Fig. 1 and 2). This is as expected as fresh growth is generally lower in fibre and as plants mature, the fibre content increases and digestibility decreases (Coleman and Henry 2002).

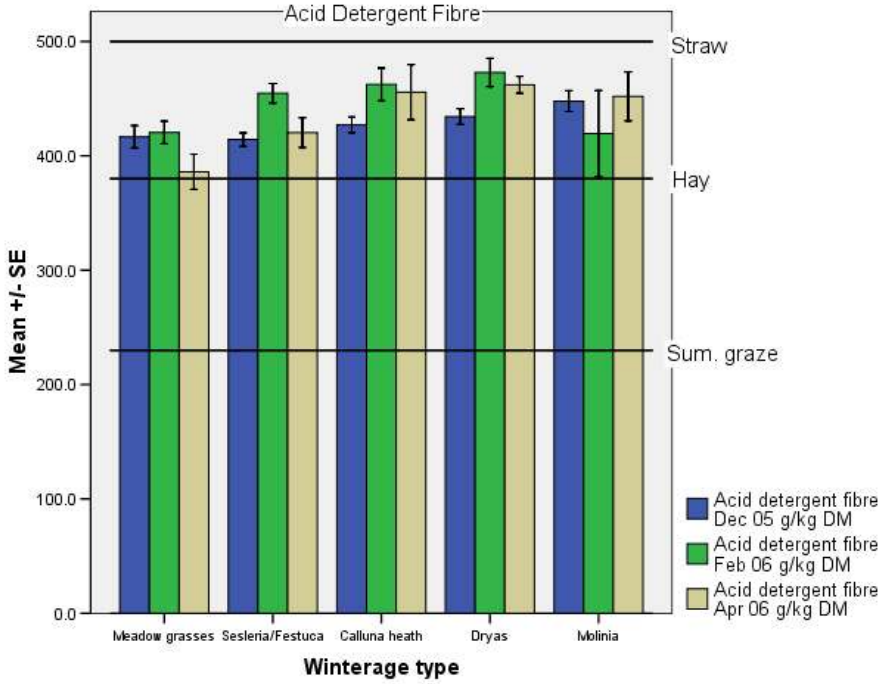


Fig. 2: Graph of acid detergent fibre (mean +/- S.E of mean) of 5 winterage types for Dec. 05 to Apr. 06.

In summary the protein levels in the forage are very variable (5-11.5%) and in some instances can limit intake. The nutritive value of all winterages lies somewhere between that of straw and good hay, however, further sampling is required for confirmation and to investigate if there are significant differences between years and between winterage types.

Concentrate Supplementation on Burren Winterages

Research suggests that supplementary feeding of livestock on low quality forage with concentrate ration containing protein stimulates rumen activity and encourages animals to source grazing to a greater degree than would be the case with no supplementary feed (Allison, 1985). With silage-based systems, most of the roughage is supplied in the bale, meaning the animal has to roam and forage far less. In some cases this may lead to under grazing and scrub encroachment. The

BurrenLIFE project is trying to assess if switching to a concentrate system will help increase grazing levels on Burren winterages, while maintaining animal health and condition. The cost and labour inputs of this system is closely monitored.

On project sites where silage feeding normally takes place, this practice is being gradually scaled back at the discretion of the farmer and replaced with a system based on the use of specially formulated feedstuffs. All concentrates used as part of the BurrenLIFE project are Irish sourced, and the project sources all ingredients from non-GM crops.

Currently, under the Rural Environment Protection Scheme (REPS), supplementary feeding is normally permitted for a 9 week period between January 15th and April 12th. The maximum amount of supplementary feeding allowed is 50% of the feed requirement of the animal for the feeding period. In order to supplement the low protein levels in the diet and to provide some of the energy requirement of the livestock, Teagasc nutritionists have advised a general purpose mix with a UFL of 1.00 and a Crude Protein of 14% per kg fed. UFL is a feed unit, which gives the energy value of a feed (1 UFL is equivalent to 1kg of barley). The maintenance requirements of a 600kg cow during pregnancy are estimated to range from 5 to 7.6 UFL per day during the 7th, 8th and 9th months of pregnancy.

The following BurrenLIFE ration was supplied by Kerry-Agri last year: 20% Rape seed, 30% Beet pulp, 39% Wheat, 7% Sugar Cane Molasses, 2% Magnesium oxide, 1% Sodium chloride and 1% pre-calver mineral (UFL = 0.97 per kg fed, Crude Protein = 14% per kg fed). Assuming a farmer is feeding no silage on the winterage but that sufficient forage is available on the winterage to meet 50% of the feed requirements of the suckler cow, 2-3kg of concentrate ration per head per day during January to April feeding period were recommended.

Last winter approximately 50 tonnes of the BurrenLIFE ration was fed on 13 BurrenLIFE monitor farms. The feeding period ranged from 15 days to 120 days on farms and was dependent on the stocking rate and the forage quality on different winterages. Feeding began in early January and finished at the end of April. During feeding the farmers fed between 1kg and 3.5 kg per cow, and the average feeding rate was approximately 2kg per cow per day. Some farmers also fed silage or hay on winterage areas. All farmers reduced the amount of silage fed on winterage areas, some by as much as 50% on the previous winter.

The average cost to farmers last year of feeding the BurrenLIFE concentrate was €0.40 (for 2kg) per cow per day. This was fed on average for approximately 70 days giving a cost of €28 per cow over the winter (Table 1). Some farmers also fed silage which increased this cost. The ration was subsidised by 25% by the BurrenLIFE project, further reducing the cost to the farmer of this system.

Table 1: Comparison of suckler cow winter feeding costs.

BurrenLIFE Feeding for 70 days	€/cow/day	€/cow
2 kg concentrate per day and no silage (sufficient forage on winterage)	€0.40	€28.00
2 kg concentrate plus 15kg silage per day	€0.70	€49.00
Feeding silage ad-lib on winterage for 70 days	€1.10	€77.00
Conventional Systems (20 week winter in slatted shed)	€/cow/day	€/cow
Feeding silage ad-lib (Source Teagasc winter feeding Bulletin August 2006)	€1.10	€154.00

As part of the monitoring of this feeding system the project are developing a nutrient export model of the Burren to access the effects of nutrients imported in feed on the priority habitats.

Animal Health, Blood Sampling and Condition Scoring

Blood sampling of selected herds was under taken in April and May 2006 as part of the BurrenLIFE agricultural monitoring. Sampling took place at the end of the winter grazing period to assess the trace mineral status of animals grazing winterage areas. Ten animals per herd were sampled from 5 farms and a further 6 animals were sampled on another farm. Samples were analysed for calcium (Ca), magnesium (Mg), phosphorus (P), copper (Cu), iodine (I), selenium (Se) and haemoglobin at Riverview veterinary Laboratory, Bandon, Co. Cork. Preliminary analysis of the results show Se (94% of samples), haemoglobin (38%), I (27%), Cu (18%) and Mg (19%) to be below the normal range, with 18% of samples analysed for P above the normal range. This reflects the national trend where Cu, Se and I inputs are inadequate to maintain normal trace mineral levels (Rogers, 2001).

A herd health questionnaire is also compiled with each farmer at the end of the winter grazing period gathering information on calving difficulties and general animal health issues such as incidences of pneumonia, calf scour, lameness, etc. Results from May 2006 show March and April to be the main calving periods. From a total of 384 cows calved on 12 farms at the time of the questionnaire, 259 cows calved on the winterage, 30 indoors and 95 on the greenland. Of the

cows calved on the winterage 9 needed assistance, 2 needing "considerable assistance" and 2 needing "veterinary assistance" and there were no dead calves at birth. Of the 412 cows on winterage areas 3 aborted calves. While 4 out of 259 cows calved on winterage areas had retained placentas. In general, animal health on the farms was good with only 37 calves with diarrhoea, 1 coccidiosis and 6 calf deaths. Of the cows, there were 3 incidences of downer cows, 3 cows with bloat and 5 with mastitis. However the biggest animal health problem on the 12 farms was TB with 6 out of the 12 farms recording at least one incidence of TB in the past 12 months. Information on calving intervals and herd fertility on BurrenLIFE farms will also be gathered over the course of the project.

Cattle were condition scored on 3 occasions over the 2005 - 2006 winter grazing period using the 1 to 5 scale adopted by Teagasc. The recommended target condition for spring calving cows is 2.5 to 3 at calving and for mating, 2 to 2.5. Whilst it would have been desirable to condition score the cattle as they went onto the winterage, this was not possible so the first assessments were carried out during late November and December when most of the stock had been on the winterage for a minimum of 4 weeks. The majority of animals were scored by eye as it was not possible to handle them on the winterage. However, some cattle were handled coming off the winterage and this allowed comparison of condition scores estimated by eye and by handling: the results compared favourably. Average conditions scores for each herd and the percentage of each herd with condition scores below 2.5 and 2 were calculated for each of the 3 assessment periods.

The smallest change in the average herd condition between the first assessment in Nov/Dec and the final assessment in Apr/May was -0.14, the highest -0.63 and the average -0.32. Whilst this gives an indication of the changing condition of the individual herds it gives no information as to the actual condition of the herds in terms of the recommended condition scores for spring calving and mating and hence could be misleading. This point is highlighted by the fact that the herd with the biggest drop in condition score was the one that went onto, and came off, the winterage in the best condition in terms of the percentage of animals exceeding the recommended scores.

Table 2: Cattle condition scores showing the lowest, highest and average proportion of herds scoring <2.5 for each assessment period and the number of farms with more than 25% of their cattle scoring <2.5.

	% Cattle with Condition Score < 2.5		
	Lowest % (N°. Farms)	**Highest % (N°. Farms)**	**Average %**
Nov/Dec 2005	0 (4/8 farms @ 0%)	30 (1/8 farms > 25% <2.5)	9
Feb 2006	0 (1/9 farms @ 0%)	58 (4/9 farms > 25% <2.5)	24
Apr/May 2006	3.8	69 (6/7 farms > 25% <2.5)	43

As expected the percentage of cattle below 2.5 increases as the winter progresses and calving begins. The number of farms with more than 25% of cattle below 2.5 also increases, six of the seven farms with stock still on the winterage in Apr/May falling into this category. Although not yet analysed accurately, it appears that scores below 2.5 from February onwards are most commonly recorded in animals that have calved.

Few farms had cattle with condition scores of less than 2 during the course of the winter and in each case it was only a single animal and there was always an obvious explanation for the few that did e.g. unrelated illness, older animal having twins, cow suckling last years calf into the winter.

Whilst condition scores did drop over the winter, the main decrease generally coincided with the onset of calving and suckling. Both the farmers and the project team were happy that the decrease was within the normal range expected for cattle out-wintered in the Burren.

References

Allison, C. D. (1985). "Factors Affecting Forage Intake by Range Ruminants: A Review." Journal of Range Management **38**(4): 305-311.

Cherney, D. J. R. (2000). Characterization of Forage by Chemical Analysis. Forage Evaluation in Ruminant Nutrition. D. I. Givens, E. Owen, R. F. E. Axford and H. M. Omed, CABI Publishing**:** 281-300.

Coleman, S. W. and D. A. Henry (2002). Nutritive value of herbage. In: Sheep Nutrition. M. Freer and H. Dove, CAB International**:** 1-26.

Rogers, P. A. M. (2001). Copper, Iodine and Selenium Status in Irish Cattle. Grange Research Centre, Dunsany, Teagasc**:** 21.

Romey, D. L. and M. Gill (2000). Intake of Forages. In: Forage Evaluation in Ruminant Nutrition. D. I. Givens, E. Owen, R. F. E. Axford and H. M. Omed, CABI Publishing**:** 43-62.

Summary of Questions and Answers

- **General points from Q&A**.
    - Excellent health of animals does not suggest any clinical problems with trace minerals.
    - Methods used to test blood for iodine (T4) underestimates mineral deficiency in animals, PII better test.
    - To meet recommended daily allowances of trace minerals in cows dry cow mineral needs to be increased in feed.
    - Protein levels in feed need to be increased considering the low protein levels in forage. It was noted that preliminary sampling of an area of Burren winterage suggested slightly higher quantities of protein in the forage.
    - It is important to monitor herd fertility and calving intervals on monitor farms.

Min-Vit Supplementation of Cattle in the Burren: Recommendations to the Burren Project Group Meeting, Carron, Co. Clare, 25th September 2006 : *Dr. Phil Rogers, MRCVS, <philrogers@eircom.net>, 1 Esker Lawns, Lucan, Co. Dublin. (Retired from Teagasc Research Centre, Grange, Dunsany, Co. Meath)*

Background to the need to give Min-Vit supplement to cattle in Ireland

Supplements for use in animal feedstuffs usually combine ***13 essential minerals and vitamins***. These are: ***four essential major minerals*** (calcium (Ca), phosphorus (P), magnesium (Mg), sodium (Na)), ***six essential trace minerals*** (copper (Cu), cobalt (Co), iodine (I), manganese (Mn), selenium (Se) and zinc (Zn)) and ***three essential vitamins*** (Vit A, Vit D3 and Vit E).

Clinical and subclinical signs of trace mineral deficiencies in cattle include reduced survival rate of calves (late abortions, stillbirth, early postnatal death), reduced herd immunity to infections, reduced fertility, reduced growth rates, reduced milk yields, reduced appetite and increased incidence of problems at/after calving (downers, retained placenta, metritis, mastitis, ketosis, etc).

Apart from trace minerals, imbalances of blood Ca and Mg in cows can cause milk fever at calving and grass tetany at pasture, respectively. Also, shortage of P can cause reduced milk yield and fertility in cows and shortage of Na can reduce animal performance.

However, shortage of minerals in the feed, associated with low levels of those minerals in blood, can exist in ***non-clinical form***, i.e. without causing any detectable effect on herd health. However, it is axiomatic that keeping blood Min-Vits in the normal range eliminates the possibility of reduced herd health or performance due to Min-Vit deficiencies. That is the basis for routine Min-Vit supplementation.

Over decades, the Teagasc Lab at Johnstown Castle has analysed thousands of samples of Irish herbage, silage and hay. From the mid 1970s to their closure in 2001, the Teagasc Blood Labs at Dunsinea and Grange analysed hundreds of thousands of blood samples from commercial Irish herds. Also, staff of our Department conducted hundreds of research trials, field trials and on-farm field investigations to study the importance of mineral supplements in cattle and sheep, and to design practical and effective ways to prevent mineral deficiencies and metabolic diseases in ruminants.

The overall conclusions from that Teagasc work are that mineral deficiencies are widespread in Irish forage. Unless cattle receive routine supplements at generous but safe levels, the incidence of low blood values for copper and selenium would be circa 63-67% and the incidence of low levels of plasma inorganic iodine (PII, the only accurate blood test for iodine deficiency in ruminants) would be circa 80-86%.

Internationally, it is recommended that supplements of Vits A, D3 and E be provided in winter, and to cattle on diets that may be short of those vitamins, for example diets containing a high proportion of grains or beet-pulp and stemmy forages (like hay or straw).

Do Burren farmers need to give Min-Vit supplements to their cattle routinely?

Yes. Data from the Grange Blood Lab allowed us to compare the blood profiles from herds sampled from Co. Clare with those from other counties in the State. Those comparisons showed that Co Clare cattle had low copper status and very low selenium and iodine status.

While the data from the Grange Blood Lab do not allow a direct comparison between cattle in the Burren with cattle in the rest of Co. Clare, it is highly likely that Burren cattle would have similar profiles to cattle in the rest of the county.

It is national policy to supplement cattle with minerals and vitamins at critical times in their annual physiological cycle. This applies as much in the Burren as anywhere else in the county or State.

National guidelines on Min-Vit Supplementation of Cattle

Articles detailing target Min-Vit inputs and methods of supplementation are available (see references).

The optimal way to supplement is to give generous but safe inputs to each animal in the group, preferably at fixed rate daily. This means adding the required amount of supplement as **an *inclusion IN the feed, ON the feed, or IN the water supply***.

Free-choice (***ad libitum***) methods of supplementation are second-class – much less reliable – because variation in intake can range from zero to excessively high levels. Daily intakes of

mineralised cattle blocks or licks are not random. Some cattle consistently eat little or none and others consistently eat too much.

Critical times to supplement minerals and vitamins are:

Cows: in the last month pre-calving and the first 4 months post-calving;

Calves: in the calf ration, or as trace-mineral boluses, such as Ionox (Co, Se, I) + CuO capsules, etc;

Weanlings, Growers & Finishers: in the nuts in winter;

All cattle: at other times, as suggested by local knowledge or diagnosed mineral problems. For example if cows abort in mid pregnancy and an iodine deficiency is suspected/confirmed, they need iodine supplementation throughout pregnancy; if cattle scour due to molybdenum-induced copper deficiency in late autumn, they need a copper supplement (such as CuO capsules) in early autumn.

Methods of supplementing cattle in the Burren

The national guidelines, mentioned above, need to be adapted for the unique circumstances that prevail in the Burren.

Cattle-farming in the Burren differs markedly from that on intensively managed herds. Fixed-rate mineral supplementation (***IN feed, ON feed or IN the water supply***) is easy on intensive farms. Burren cattle, however, can roam widely, summer and winter, and optimum mineral-vitamin supplementation of cattle on extensive grazing is much more difficult to implement.

Where possible, we should advise Burren farmers to adopt the national guidelines on fixed-rate Min-Vit supplementation at the critical times. If these guidelines cannot be used, the next best option is to provide optimally supplemented feed at special feeding stations in the area. That feed could be concentrate feed with Min-Vit inclusion at optimal levels, or forage sprinkled with relevant high-specification cattle Min-Vit mixtures (reference 2),

Alternatives include use of slow-release bullets/boluses (CuO capsules, Ionox, Optimag, etc). Finally, provision of relevant Min-Vit blocks at strategic places throughout the area is better than nothing.

Problems with reliance on Min-Vit Blocks

Apart from uneven intakes of block, discussed above, reliance on Min-Vit Blocks has one great disadvantage when different classes of cattle graze a common area. Different blocks are formulated for different classes of cattle (Dry Cow Blocks, Calved Cow Blocks, High-Mg Blocks and Drystock Blocks). It may be impossible to provide the correct Blocks to he correct classes of cattle unless these classes can be separated by stock-proof fences. That is probably undesirable in the Burren.

Optimal Min-Vit levels in a Dry Cow Min-Vit Mix, to be fed at 100g (0.1kg, or 3.5oz)/cow/d to in-calf beef cows in the 4-6 weeks before calving

	MAJOR MINERALS (g/kg)
Mg	150
Na	150
P	100
Ca	0
	TRACE MINERALS (mg/kg)
Zn	7500
Cu	4500
Mn	4500
I	600
Co	100
Se	50
	VITAMINS (iu/kg)
Vit A	600000
Vit D3	120000
Vit E	3000

Assuming an ***inclusion of 100g of the above mix in each of the following feeding rates of concentrate*** (below), the ***additional levels of Min-Vits*** in each concentrate mix would be:

CONCENTRATE MIX#	***a***	**b**	***c***	**d**	**e**	**f**
Feeding Rate	***1.0 kg/d***	**1.5 kg/d**	***2.0 kg/d***	**2.5 kg/d**	**3.0 kg/d**	**3.5 kg/d**
MAJOR MINERALS (g/kg)						
Ca	***0***	0	***0***	0	0	0
P	***10***	6.67	***5***	4	3.33	2.86
Mg	***15***	10	***7.5***	6	5	4.29
Na	***15***	10	***7.5***	6	5	4.29
TRACE MINERALS (mg/kg)						
Co	***10***	6.67	***5***	4	3.33	2.86
Cu	***450***	300	***225***	180	150	128.57
I	***60***	40	***30***	24	20	17.14
Mn	***450***	300	***225***	180	150	128.57
Se	***5***	3.33	***2.50***	2.00	1.67	1.43
Zn	***750***	500	***375***	300	250	214.29
VITAMINS (iu/kg)						
Vit A	***60000***	40000	***30000***	24000	20000	17143
Vit D3	***12000***	8000	***6000***	4800	4000	3429
Vit E	***300***	200	***150***	120	100	86

In discussion with Burren farmers, the Project Team should select ***ONE FEEDING LEVEL OF MINERALISED CONCENTRATE*** (that agreed by most farmers) and have it manufactured to the relevant specification, with Min-Vit ***ADDITIONS*** as above. The Team should recommend THAT feed (and exact feeding rate) to ALL farmers in the project. If farmers need more concentrate, they can add as much as they wish of UNMINERALISED concentrate to the fixed amount.

For example, if most farmers agree to feed ***2kg mineralised concentrate/cow/d (Mix# c, above),*** that mix would contain ***1.9kg concentrates + 0.1kg of the Dry Cow Min-Vit Mix*** (see page 2). If they wish to add more concentrate (say another 1-1.5kg/cow/d in hard winters), they could add that as UNMINERALISED concentrates.

An alternative strategy is to get agreement from ALL farmers to feed ***ONLY 1kg of mineralised concentrate/cow/d (Mix# a, above)*** as the Min-Vit carrier. That mix would contain ***0.9kg concentrates + 0.1kg of the Dry Cow Min-Vit Mix*** (see page 2). If they wish to add more concentrate (say another 2-2.5kg/cow/d in hard winters), they could add that as UNMINERALISED concentrates.

It is important that ALL farmers know that these SPECIAL mixes (highly mineralised, especially MIX# a and b) MUST be fed ONLY to suckler cows and at the rate recommended. If cows or other livestock were to eat 3-4 times the recommended rate, they could be poisoned. These concentrates must be stored securely out of reach of other livestock.

References

1. Rogers PAM. ***Online Technical Notes for Vets, Advisers & Nutritional Consultants***. http://homepage.eircom.net/~progers/tecnotes.htm
2. Rogers PAM. ***Mineral-Vitamin Mixes for Cows and other Cattle.*** http://homepage.eircom.net/~progers/mins_bov.htm
3. Rogers PAM. ***Copper, Iodine and Selenium Status in Irish Cattle.*** Teagasc, Grange Research Centre, Dunsany, Co. Meath. **End of Project Report,** July 2001, Project No. 4382. http://homepage.eircom.net/~progers/abattoir.htm
4. Rogers, Phil & Murphy, Willie. ***Levels of Dry Matter, Major Elements (Ca, Mg, N, P, K, Na and S) and Trace Elements (Co, Cu, I, Mn, Mo, Se and Zn) in Irish Grass, Silage and Hay.*** http://homepage.eircom.net/~progers/0forage.htm
5. Rogers, Phil & Gately, Tom. **Control of Mineral Imbalances in Cattle and Sheep: A Reference Manual for Advisers and Vets.** http://homepage.eircom.net/~progers/3control.htm

Summary of Questions and Answers

- **Does iodine in sea spray lead to better Iodine (I) status in coastal areas?**

I deficiency is also present in coastal areas subject to sea spray. It is soluble I which is washed out with first rain.

- **Spreading trace minerals in fertiliser?**

Cobalt deficiency has been investigated on "hospital plots" where Co spread with fertiliser. Hospital plots are inefficient, of total spread only about 5% come back into system. 95% washed out. Spreading of trace minerals onto fields is not possible on conservation areas as it may change the ecology of the area.

- **General points from Q&A?**

In addition to the specific questions addressed above the following general points raised during the questions and answers session were noted:

  - Routine trace mineral supplementation important.
  - Molybdenum in herbage important as it may interact with other trace minerals such as Copper resulting in induced Cu deficiency.

Grazing of Limestone Grasslands: Practical Experiences & Lessons Learnt: *Mr. Bill Grayson, Grazing Animals Project, UK*

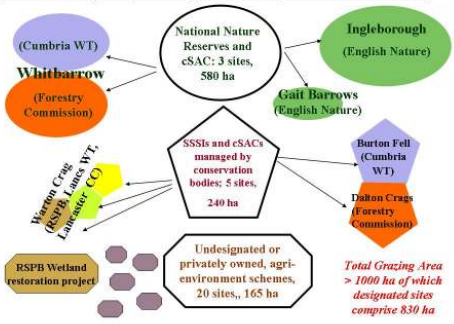
The main focus of Mr. Bill Grayson's presentation was on his years of practical work experience as a farmer (conservation grazer) in various areas across England. His presentation focus was on the description of grazing system; the location and scale of operation; number, size and habitat type of sites; conservation designations of the land and on the key partners and stakeholders he engaged with. He also outlined in practical manner the management objectives and grazing prescriptions for different land parcels, the use of different (traditional) breeds of cattle, classes of stock, summer and winter grazing regimes, feeding strategies and health routines. His presentation also gave an overview of achievements he had made in terms of ecological objectives, economic performance, animal health and addressing management problems. What is presented hereunder is the PowerPoint presentation.

<table>
<tr><td>Slide 1</td><td>the Morecambe Bay Local Grazing Scheme

A presentation to the BurrenLIFE Project Workshop

Animal Health and Nutrition on Conservation Grasslands

25th September 2006

Bill Grayson
Morecambe Bay LGS grazier
Tel.:01524 761347
Email: billgrayson@farmersweekly.net</td><td>Slide 4</td><td>  </td></tr>
<tr><td>Slide 2</td><td>Morecambe Bay LGS; Site Designations, Sizes, Locations and Ownership
 
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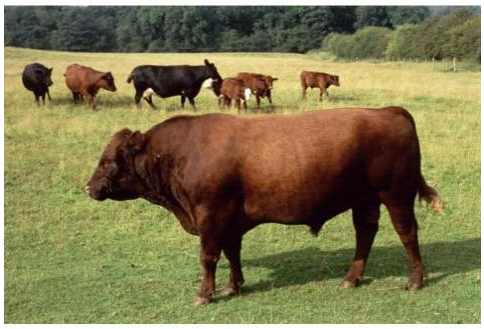
Slide 7		Slide 11	
Slide 8		Slide 12	
Slide 9	**Conservation Grazing Budget for Ingleborough** **Output (per head)** Sale of 4 y.o. heifer with calf at foot …… £ 700 Less purchase of yearling Blue-grey heifer …… £ 350 **Output = £ 350 /hd** **Variable Costs (per head)** Feed…… £ 16 Vet …… £ 8. Other …… £ 30 **Total VCs = £ 54/hd** **Individual Gross Margin = £296/hd (over 3 years)** **equivalent to £100/hd/year)** **Annual Fixed Costs** Travel (14k miles @ £ 0.45p/mile) = **£6280**, Casual labour = £920 Property costs and general overheads = £7500 Direct Costs = £9600 **Total Fixed Costs …… £162/hd/yr** **Annual Loss on Cattle Enterprise = - £ 60/hd** **Viability of this business depends on area payments**	Slide 13	**Animal Performance** **Weight @ 12 months …… 290 kg** **Weight @ 27 months …… 414 kg** ***Growth rate for rearing period…… 0.29 kg/day*** **Weight @ 30months…… 510 kg** ***Growth rate during finishing period … 1.23kg/day*** **Routes to Market** 1. Auction Mart *(liveweight; size and appearance on the day* 2. Specialist Processors *(often by contract; deadweights and grades!* 3. Direct sales *(selling to public/caterers; taste, appearance and story!* **Financial Performance** **Commodity value** (live auction @ £1.10/kg LW) **£561** ***Killing-out percentage …53%*** **Niche value** (organic/traditional @ £2.40-2.60/kg DW) **£702** ***Carcass yield …… 65%*** **Retail value** (avg beef box price @ £6/kg) **£1054** ***Processing Costs ……£150-£250***
Slide 10		Slide 14	

Slide 15		Slide 19	
Slide 16		Slide 20	
Slide 17		Slide 21	
Slide 18		Slide 22	

Slide 23		Slide 24	

Summary of Questions and Answers

- General points from Q&A.
    - The relative level of progress made in partnership arrangements with UK conservation agencies was noted by many delegates.
    - Dry matter intake goes down with lack of water. Animals need approximately 40 litres/head.

Workshop Discussion Groups

Group 1 - Conservation Grazing & Animal Health – the Key Issues.

Group Facilitator: Bill Grayson
Group Recorder: Sharon Parr
Group Members: Vivian Silke, Bryony William, James Keane, Jervis Goode, Thomas Holmes, Michael Silke, Frank Macken and John Keane

Summary of Discussion – Key Points

- Main health issues: TB, trace minerals, calving success, implications of pushing animals to forage more, parasites (blood scour).
- TB: this year particularly bad, what role do feral goats play?
- Breed choice and livestock type: different livestock types have different animal health issues. Possible that continental breeds of suckler cow more susceptible to mineral deficiencies? Different livestock type in different conservation systems, identify conservation grazing uses of different types i.e. drytock, in-calf suckler cows, sheep, etc. Stock type fitted to grazing areas so that they are able to extract their requirements from available forage.
- Stocking rates important: Problems occur if animals pushed to eat unsuitable forage.
- Labour requirement: herding issues due to part-time nature of farming. Scrub control: very little experienced personnel. Practical problems of lack of trained personnel.
- Grazing schemes: Animal health needs to be taken into account in grazing schemes on conservation designated areas. Objectives of grazing need to be clear.
- Animal condition: With today's animal welfare requirements past levels of condition loss not acceptable. Quantity and quality of forage important.
- Fertility and calving intervals: Is herd fertility affected on conservation grazing areas?
- Supplementary feeding: Important not to over supplement protein. Need mineral supplements. Need to balance inputs appropriately so that conservation status is not adversely affected by imported nutrients.

Group 2 - Conservation Grazing in an Irish Context: Future Research Priorities.

Group Facilitator: Ruairí Ó Conchúir
Group Recorder: James Moran
Group Members: Michael Walsh, Enda Mooney, Seamus Kelly, Jude Lynch, Barbara McLean, Donal Kelly, Harry Jeuken, Penny Bartlett and Catherine Keena.

Summary of Discussion – Key Points

- Research needs to be multidisciplinary in nature incorporating agriculture, conservation and socio-economic aspects of conservation grazing.
- Conservation grasslands on hill areas in the west of Ireland are similar to those of Molinia swards in the UK. There is considerable scope for collaborative research.
- Due to current viability problems of farming in conservation areas, land abandonment is a real threat to conservation grasslands. Incentives need to be investigated both LFA and agri-environmental schemes. Economic research needs to cost conservation grazing and quantify what levels of payment are required for agri-environment schemes.
- Grazing preferences and dry matter intake: Need to quantify DMI and diet selection of livestock types on conservation grasslands. GPS collars, direct observations, alkane quantities in faeces may be some of the methods to be used. This is important in terms of matching livestock type to conservation objectives.
- What is the nutrition value of conservation grassland? What proportion of the energy, protein and mineral needs of the animal are meet by conservation grassland. Are the nutritional requirements of the animal grazing conservation grasslands different from that on intensive systems?
- Supplementary feeding: Energy, protein and mineral requirements of livestock need to be quantified on conservation grasslands. What are the effects of supplementary feeding on nutrient balance on conservation grasslands? When is feeding required (feeding periods) and what are supplementation requirements to maximise dry matter intake and optimise animal performance?
- Breeds: What are breed differences e.g. diet selection and breed interaction.
- Marketing and branding: What is the quality of meat produced from conservation grasslands in comparison to intensive farming systems?
- Ecology of TB: what are the links to trace mineral deficiencies, wild animal populations etc.
- Other aspects of habitat quality besides floral diversity need to be considered on conservation grasslands. For example do invertebrate or bird species require different stocking rates and timing of grazing. Importance of diversity of grazing systems on conservation grasslands? Range of grazing herbivores should be considered and investigated as conservation tools.

Group 3 - Animal Supplementation on Burren Winterages – Developing a Blueprint.

Group Facilitator: Brendan Dunford
Group Recorder: Liam FitzGerald
Group Members: Mark McGee, Caitriona O Dea, Phil Rodgers, Conn O' Brien, Mariecia Frazer, Des Cronin and Ute Bohnsack

Summary of Discussion – Key Points

The main areas of animal feed supplementation on conservation grasslands are water, energy, protein, mineral and vitamin requirements.

- Water: supply is critical especially with dry feeds.
- Energy: requirements are very difficult to estimate because forage intake on Burren winterage areas is not known. Possibly a need for higher inputs and consideration should be given to the use of oil in the diet to increase the energy concentration of the feed.
- Protein: The digestibility of the crude protein in the diet is low and a much higher protein concentration in the feed is considered necessary. General recommendation for 20-30% crude protein. The use of non-GM and Irish sourced ingredients is a constraint to increasing the protein concentration in the diet. Availability of Irish sourced ingredients with high protein concentrations such as distillers grain, beans and peas are in short supply.
- Minerals and vitamins: Fixed rate feeding of minerals and vitamins should be used. This should be formulated to give the recommended daily allowances at a feeding rate of 2kg of concentrate. Mineralised supplements are needed 1 month prior to calving. If additional feed is required above 2kg at certain times, then un-mineralised ration could be used.
- Should use pelleted feed.
- There is possible conflict between supplementation rates needed for production and the conservation requirements on the grasslands.

Plenary Session.

Each group recorder summarised the discussions that took place during each workshop discussion group.

The main topics discussed during the plenary session related to the formulation of the concentrate ration for the Burren winterages. There was considerable debate around the GM status of the feed, concluding that non-GM ingredients should be used where available. The protein concentration in the feed also needs to be carefully formulated for the coming winter feeding period.

The issue of TB and its possible relationship with the mineral status of animals was also raised during the plenary season.

In general in relation to conservation grazing it was noted that each farmer should have the flexibility to work to a system that best suits their particular situation.

Appendix 1: Workshop Participants

	Name	Full Postal Address	Tel. No. (wk, & mobile)	E-mail address (if possible)
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Appendix 2: Workshop Programme

Chair – Mr. Ruairí Ó Conchúir

Session 1: Animal Health & Nutrition on Conservation Grasslands – Introduction and Overview

1. 10.00 – 10.45am
Official Opening and Welcome - Mr Ruairí Ó Conchúir - BurrenLIFE
Overview of Workshop & Workshop Objectives – Dr Ruairí Ó Conchúir - BurrenLIFE
Introduction to the BurrenLIFE Project - Dr Brendan Dunford - BurrenLIFE

2. 10.45 – 11.30am (30 minute presentation plus 15 minute discussion):
Balancing the Needs of Conservation Grazing with those of Animal Health & Welfare:
Dr Barbara McLean, Livestock Research Scientist, ADAS
Focus of the presentation will be on the recent experience in the UK regarding the conservation grazing continuum, animal health and welfare indicators and balancing the needs of the animal with the conservation objective

Session 2: Animal Health on Conservation Grasslands:

1 11.30 – 12.00: Forage Quality, Supplementary Feeding & Animal Health on Burren Winterages
Dr. James Moran Teagasc & BurrenLIFE Project & Dr. Sharon Parr - BurrenLIFE Project

2. 12.00 – 12.30: Trace Minerals & General Animal Health
Dr. Phil Rogers MRCVS (ex-Teagasc)

3. 12.30 - 13.00: Discussion on General Animal Health

Lunch (1:00pm – 2:00 pm)

Chair – Dr. Brendan Dunford

Session 3: Conservation Grazing on Limestone grasslands –from 'Cumbria' North of England

1. **14.00 – 14.45** (30 minute presentation plus 15 minute discussion):
Grazing of Limestone Grasslands: Practical Experiences & Lessons Learnt
Mr. Bill Grayson, Grazing Animals Project, UK
Focus on description of grazing system - location and scale of operation; number, size and habitat type of sites and conservation designations of the land - key partners and stakeholders, management objectives and grazing prescriptions for different land parcels, Breeds of cattle, classes of stock, summer and winter grazing regimes, feeding strategies and health routines. Also an overview of achievements thus far in terms of ecological results and economic performance, health and management problems.

2. **14.45 – 15.00**: General Discussion and Breaking into Working Groups

Coffee (3.00pm – 3.15pm)

Session 4: 3.15 pm – 4.45 pm - Workshop Discussion -Topics - 30 min each:

1. Group 1 Conservation Grazing & Animal Health – the Key Issues
2. Group 2 Conservation Grazing in an Irish Context: Future Research Priorities
3. Group 3 Animal Supplementation on Burren Winterages – Developing A Blueprint

Session 5: 4.45 pm to 5.00pm - Closing Session & Departure

Report back session to plenary
Review of Workshop Objectives Set – Mr. Ruairí Ó Conchúir - BurrenLIFE
Final Summary, Vote of Thanks and Official Closure - Dr Brendan Dunford - BurrenLIFE

Departure

Appendix 3: BurrenLIFE Forage Chemical Analysis.

Result summary tables: Oven Dry Matter, Ash, Nitrogen, Crude Protein, Acid Detergent Fibre and Neutral Detergent Fibre.

Winterage type		Oven dry matter Dec 05 g/kg F	Oven dry matter Feb 06 g/kg F	Oven dry matter Apr 06 g/kg F
Meadow grasses	Mean	208.927	405.380	394.507
	N	15	15	15
	Std. Deviation	30.7998	79.7024	148.0208
	Std. Error of Mean	7.9525	20.5791	38.2188
	Minimum	147.1	269.7	163.0
	Maximum	261.1	520.1	562.0
Sesleria/Festuca	Mean	294.356	489.811	480.494
	N	18	18	18
	Std. Deviation	45.2356	64.1386	93.2795
	Std. Error of Mean	10.6621	15.1176	21.9862
	Minimum	227.4	373.1	244.0
	Maximum	414.0	580.1	611.0
Calluna heath	Mean	280.933	360.867	379.000
	N	3	3	3
	Std. Deviation	26.0581	72.5598	92.6769
	Std. Error of Mean	15.0446	41.8924	53.5070
	Minimum	263.6	291.7	324.0
	Maximum	310.9	436.4	486.0
Dryas	Mean	340.357	469.086	497.071
	N	7	7	7
	Std. Deviation	53.1189	113.3530	124.7324
	Std. Error of Mean	20.0771	42.8434	47.1444
	Minimum	259.0	294.4	258.1
	Maximum	428.2	587.2	593.2
Molinia	Mean	308.600	606.525	612.125
	N	4	4	4
	Std. Deviation	40.3084	86.4834	217.1775
	Std. Error of Mean	20.1542	43.2417	108.5887
	Minimum	268.2	485.5	363.0
	Maximum	361.3	690.8	808.5
Total	Mean	274.298	461.481	460.245
	N	47	47	47
	Std. Deviation	62.1983	98.4126	139.9111
	Std. Error of Mean	9.0726	14.3550	20.4081
	Minimum	147.1	269.7	163.0
	Maximum	428.2	690.8	808.5

Winterage type		Ash content Dec 05 g/kg DM	Ash content Feb 06 g/kg DM	Ash content Apr 06 g/kg DM
Meadow grasses	Mean	51.953	68.526	77.203
	N	15	15	15
	Std. Deviation	19.6670	33.1876	27.5360
	Std. Error of Mean	5.0780	8.5690	7.1098
	Minimum	37.0	38.8	40.0
	Maximum	107.5	175.0	125.9
Sesleria/Festuca	Mean	37.706	36.720	39.135
	N	18	18	18
	Std. Deviation	7.4017	6.3450	7.1493
	Std. Error of Mean	1.7446	1.4955	1.6851
	Minimum	27.8	27.6	28.1
	Maximum	52.6	51.0	57.0
Calluna heath	Mean	34.300	36.507	43.613
	N	3	3	3
	Std. Deviation	5.6045	11.8990	8.5635
	Std. Error of Mean	3.2357	6.8699	4.9441
	Minimum	28.3	27.7	36.0
	Maximum	39.4	50.1	52.9
Dryas	Mean	35.743	36.560	44.553
	N	7	7	7
	Std. Deviation	3.5776	7.9472	7.0982
	Std. Error of Mean	1.3522	3.0038	2.6829
	Minimum	30.2	27.1	34.4
	Maximum	39.6	52.2	52.7
Molinia	Mean	22.525	30.148	35.615
	N	4	4	4
	Std. Deviation	5.1771	7.4753	25.2261
	Std. Error of Mean	2.5886	3.7377	12.6131
	Minimum	17.0	22.6	18.7
	Maximum	29.5	37.9	73.1
Total	Mean	40.451	46.274	52.077
	N	47	47	47
	Std. Deviation	14.9206	24.6679	24.6813
	Std. Error of Mean	2.1764	3.5982	3.6001
	Minimum	17.0	22.6	18.7
	Maximum	107.5	175.0	125.9

Winterage type		Nitrogen Dec 05 g/kg DM	Nitrogen Feb 06 g/kg DM	Nitrogen Apr 06 g/kg DM
Meadow grasses	Mean	13.113	14.732	18.453
	N	15	15	15
	Std. Deviation	2.4547	3.1828	6.4919
	Std. Error of Mean	.6338	.8218	1.6762
	Minimum	10.4	10.7	12.5
	Maximum	20.6	23.2	35.2
Sesleria/Festuca	Mean	11.217	11.772	12.519
	N	18	18	18
	Std. Deviation	2.0426	2.2334	2.2894
	Std. Error of Mean	.4814	.5264	.5396
	Minimum	8.4	8.2	8.8
	Maximum	15.2	15.5	16.9
Calluna heath	Mean	11.400	11.217	12.320
	N	3	3	3
	Std. Deviation	.2646	1.1181	1.3821
	Std. Error of Mean	.1528	.6456	.7979
	Minimum	11.2	10.2	11.1
	Maximum	11.7	12.4	13.8
Dryas	Mean	9.857	10.237	11.606
	N	7	7	7
	Std. Deviation	1.5852	1.5891	1.2961
	Std. Error of Mean	.5991	.6006	.4899
	Minimum	7.8	8.5	10.0
	Maximum	12.2	12.6	13.9
Molinia	Mean	8.025	8.183	8.353
	N	4	4	4
	Std. Deviation	2.0903	2.0686	3.3995
	Std. Error of Mean	1.0451	1.0343	1.6997
	Minimum	6.5	5.2	5.5
	Maximum	11.1	10.1	13.3
Total	Mean	11.360	12.147	13.910
	N	47	47	47
	Std. Deviation	2.5125	3.1308	5.1929
	Std. Error of Mean	.3665	.4567	.7575
	Minimum	6.5	5.2	5.5
	Maximum	20.6	23.2	35.2

Winterage type		Crude protein Dec 05 g/kg DM	Crude protein Feb 06 g/kg DM	Crude protein Apr 06 g/kg DM
Meadow grasses	Mean	81.960	92.075	115.333
	N	15	15	15
	Std. Deviation	15.3946	19.8927	40.5744
	Std. Error of Mean	3.9749	5.1363	10.4763
	Minimum	64.8	67.0	77.8
	Maximum	129.0	144.9	219.8
Sesleria/Festuca	Mean	70.061	73.573	78.247
	N	18	18	18
	Std. Deviation	12.7017	13.9585	14.3089
	Std. Error of Mean	2.9938	3.2901	3.3726
	Minimum	52.6	51.3	54.7
	Maximum	94.8	96.6	105.8
Calluna heath	Mean	71.167	70.104	77.000
	N	3	3	3
	Std. Deviation	1.6166	6.9884	8.6379
	Std. Error of Mean	.9333	4.0347	4.9871
	Minimum	69.7	63.4	69.3
	Maximum	72.9	77.4	86.3
Dryas	Mean	61.600	63.982	72.536
	N	7	7	7
	Std. Deviation	9.8924	9.9316	8.1005
	Std. Error of Mean	3.7390	3.7538	3.0617
	Minimum	48.9	53.3	62.2
	Maximum	76.3	78.8	87.1
Molinia	Mean	50.000	51.141	52.203
	N	4	4	4
	Std. Deviation	12.9910	12.9288	21.2468
	Std. Error of Mean	6.4955	6.4644	10.6234
	Minimum	40.4	32.8	34.6
	Maximum	69.1	63.1	83.1
Total	Mean	70.962	75.919	86.936
	N	47	47	47
	Std. Deviation	15.7145	19.5673	32.4554
	Std. Error of Mean	2.2922	2.8542	4.7341
	Minimum	40.4	32.8	34.6
	Maximum	129.0	144.9	219.8

Winterage type		Acid detergent fibre Dec 05 g/kg DM	Acid detergent fibre Feb 06 g/kg DM	Acid detergent fibre Apr 06 g/kg DM
Meadow grasses	Mean	416.653	420.447	386.053
	N	15	15	15
	Std. Deviation	37.8166	37.9211	59.3143
	Std. Error of Mean	9.7642	9.7912	15.3149
	Minimum	372.5	364.5	234.9
	Maximum	505.3	489.4	456.0
Sesleria/Festuca	Mean	414.294	454.706	420.350
	N	18	18	18
	Std. Deviation	24.9022	36.0407	54.8528
	Std. Error of Mean	5.8695	8.4949	12.9289
	Minimum	376.0	416.0	232.5
	Maximum	473.8	540.8	499.3
Calluna heath	Mean	427.100	462.500	455.667
	N	3	3	3
	Std. Deviation	11.8579	24.7897	41.7931
	Std. Error of Mean	6.8462	14.3123	24.1293
	Minimum	415.0	442.4	410.3
	Maximum	438.7	490.2	492.6
Dryas	Mean	434.329	472.886	462.143
	N	7	7	7
	Std. Deviation	18.0126	32.9701	19.6004
	Std. Error of Mean	6.8081	12.4615	7.4083
	Minimum	414.6	423.6	426.2
	Maximum	464.8	525.3	489.2
Molinia	Mean	447.850	419.450	452.000
	N	4	4	4
	Std. Deviation	18.0902	75.2447	42.7670
	Std. Error of Mean	9.0451	37.6223	21.3835
	Minimum	430.5	311.1	405.6
	Maximum	470.0	480.3	504.3
Total	Mean	421.704	443.977	420.577
	N	47	47	47
	Std. Deviation	29.1478	43.3923	56.9719
	Std. Error of Mean	4.2516	6.3294	8.3102
	Minimum	372.5	311.1	232.5
	Maximum	505.3	540.8	504.3

Winterage type		Neutral detergent fibre Dec 05 g/kg DM	Neutral detergent fibre Feb 06 g/kg DM	Neutral detergent fibre Apr 06 g/kg DM
Meadow grasses	Mean	705.520	736.507	698.293
	N	15	15	15
	Std. Deviation	34.1175	37.0346	72.3783
	Std. Error of Mean	8.8091	9.5623	18.6880
	Minimum	639.7	645.9	490.6
	Maximum	740.1	796.1	764.3
Sesleria/Festuca	Mean	698.106	750.217	733.644
	N	18	18	18
	Std. Deviation	36.5277	23.3894	54.2493
	Std. Error of Mean	8.6097	5.5129	12.7867
	Minimum	620.7	708.8	538.2
	Maximum	762.6	790.4	775.6
Calluna heath	Mean	696.733	744.933	760.067
	N	3	3	3
	Std. Deviation	19.1730	58.1881	19.0266
	Std. Error of Mean	11.0695	33.5949	10.9850
	Minimum	676.1	705.8	748.0
	Maximum	714.0	811.8	782.0
Dryas	Mean	703.486	758.386	719.143
	N	7	7	7
	Std. Deviation	21.5740	22.0834	36.5891
	Std. Error of Mean	8.1542	8.3468	13.8294
	Minimum	675.7	730.4	676.4
	Maximum	733.5	793.9	768.6
Molinia	Mean	784.750	749.175	801.500
	N	4	4	4
	Std. Deviation	33.3863	118.5266	56.5428
	Std. Error of Mean	16.6931	59.2633	28.2714
	Minimum	742.2	573.3	723.5
	Maximum	823.4	832.0	858.9
Total	Mean	708.560	746.632	727.664
	N	47	47	47
	Std. Deviation	39.5012	42.5073	62.6876
	Std. Error of Mean	5.7618	6.2003	9.1439
	Minimum	620.7	573.3	490.6
	Maximum	823.4	832.0	858.9