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The North of Scotland Grassland Society
Year 2014-2015

Chair
John Veitch, Drum Blair, Forgue, Huntly
Vice-Chair
Patrick Dickson, North Camalynes, Auchterless, Aberdeenshire
Past Chair
John Penny, Shannas, Mintlaw

To retire in March 2015
James Hardie, Gates of Birselawsie, Midmar, Aberdeenshire
Mark Ingram, Cornyard, Newmachar, Aberdeenshire
James McIntosh, The Craig Farm, Knock, Huntly
Yvonne Stewart, SAC Thainstone, Inverurie

To retire in March 2016
Jim Fowlie, North Essie, St. Fergus
James Riddell, Nether Coulliie, Kemnay
Andrew Farquharson, Finzean Estate, Banchory
Sjirk Oosterhof, Savoch, Lonmay
George Davidson, Inschfield Farm, Insch

To Retire in March 2017
George Auchnie, North Cliftbog, Turriff
Ronald Barron, Darrahill, Udny
Chris Gospel, Auchmacleddie, Strichen
Lawrence Greig, 9 Stewart Road, Alford
Ian Moir, Middle Farm, Rothienorman

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Chair 2014-15 – John Veitch

Born in Glasgow the family moved to Huntly when John was 12. Though knowing little about farming, weekend work on local farms soon became an eagerly anticipated activity. On leaving school John worked as an architectural technician in Glasgow. However farming being of more interest he then did an HND at the North of Scotland College of Agriculture.

Vacation employment was as a seed inspector for DAFS in Aberdeenshire, Perthshire, Lothians and Northumberland. After working on farms in the Borders, Norfolk and Ayrshire, John returned to the North East as farm manager at South Fornet Estates on getting married.

When the family started arriving, living in a tied house and buying his own car, it seemed a better idea to buy his own house, let someone else buy the car and have more time to spend with the family so he joined Dalgety Agriculture in 1988 as Sales Representative and later was Dairy Specialist for 3 years. In 2001 when Dalgety sold their grain business to Grainfarmers he joined them as Arable Business Manager. Currently John is employed by Openfield, the successor company when Grainfarmers merged with Centaur Grain.

His other hobbies/interests over the years have been playing the clarinet, judo, rugby, canoeing, Young Farmers, youth football, caravanning, computing, vintage tractors, gardening and DIY. He is a member of both NORGRASS and the FACTS examination board, and is chairman of the local neighbourhood watch scheme. John also helps at the foodbank and cuts the church grass.
Novogen Advert
On a beautiful warm and sunny day in May the Society members and friends visited Finzean Estate by kind permission of the Farquharson & Haslam families. Finzean Estate which has passed through 15 generations is now owned by Donald and Andrew Farquharson, together with their sister, Jean, (Mrs Haslam) who owns part of the Estate called Easter Clune. They represent the 16th generation of Farquharsons. In 2012 Andrew, who manages the farms, entered their silage into the NORGRASS Silage Competition winning the best newcomer award, he then went on to join the Norgrass committee in 2013.

The total area extends today to more than 4000 hectares, half of which is grouse moor. The land is managed as an integrated family business with an interest in conservation and the preservation of a viable community. In April 2006 the Estate converted a steading into a Farm Shop & Tearoom to concentrate on selling the Estate produce, in particular the beef, game and venison and is located to take advantage of the stunning views over the Feugh Valley to Clachnaben.

The in hand family farm amounts to just under 340 arable hectares with rough grazing. The farm grows 82 hectares of spring barley aimed for the malting market and also 3 hectares of turnips for winter cattle feed. They have a suckler herd of 165 cows served by Simmental, Limousin and Aberdeen Angus bulls. Good grade beef calves are produced which are finished on the farm. Two men are employed on the farm. A gamekeeper and estate worker complete the Estate staff.

We began our visit with a welcome cup of tea and cakes at the family home Finzean House where Andrew gave us an insight into the working of Finzean Estate. This was followed by an introduction to Hedge Shand, the estate gamekeeper who informed us of his role on the estate, stalking, game and shooting. We then bundled into vehicles and toured around some of the
Silage field Above  Below naturally regenerated birch pine forest
estate stopping to view the cows and calves, followed by a walk through an excellent field of grass destined for silage.

To conclude our tour we visited a forest which has been naturally regenerated with native species. Over 520 hectares have now been replanted to restore the forest cover. Forestry is now providing an increasing amount of employment for local people as the woodlands mature. Contractors are also employed in the woodlands for planting, felling and extraction. Local tradesmen are employed for improvements and repairs to local Estate property.

Each department of Finzean Estate – farm, forestry, game and recreation, to some extent, depend on each other. The income from forestry provides the necessary capital which is then reinvested in the Estate by making improvements to tenanted and in hand properties. The Home Farm depends on the woodland’s resources for repairs and improvements to buildings and for field fencing posts. Shelter from the woods is vital for the cattle, game and wildlife generally. Several of the Finzean farming families are long-standing tenants with a history going back over 200 years on the Estate.

This visit to Finzean showed members not only well managed grassland and stock but an immense amount of the Estate’s history, diversity, conservation, being packed full of information, by way of an understanding as to how the Farquharsons are supporting their local community with employment, small scale producers, housing, and encouraging the public to enjoy the estate.

Grateful thanks go to the Farquharson & Haslam families for hosting the society and providing refreshments.

This event was sponsored by D & K Singer to which we extend our appreciation.
Autumn Visit

“Cream of the Crop!”

On Thursday 6th November NORGRASS members and friends visited Mains of Culsh, New Deer for our Autumn visit. Weather was less kind to us and sadly it rained during our visit but fortunately most of the visit was inside. Mains of Culsh Dairy Unit is farmed in partnership by Jean McLean & her son John. Jean and her husband Robert McLean also farm 186 acres at Mains of Culsh with a further 80 acres of grass rented seasonally.

With the help of an SRDP grant and a friendly bank manager (quote from Jean!), the family have invested in a new dairy. This was completed in June 2014 and includes the installation of a Boumatic 24 x 24 Rapid Exit Parlour which is unique in Aberdeenshire. It includes full height glazed doors at the south end of the parlour affording the milker views of the countryside. Included in the development were a new collection area with automatic gates, a new bulk tank and farm offices. This has enabled the family to increase cow numbers to 170.

Cows are housed all year. All cows are AI’d to top quality bulls and they also use sexed semen. They no longer keep stock bulls on the farm. Male calves are reared on a barley beef system in rented farm steadings close by whilst female calves are kept as herd replacements. The calves are initially reared in kennels situated in the concrete yard. Once the calves are moved into straw bedded accommodation the kennels are lifted and the area cleaned and washed.

A new silage pit has also been constructed. Thirty acres of winter wheat is grown to produce alkalage and two cuts of grass silage are made. Around 18 acres of spring barley are grown and the grain is used for the bull beef and the straw for bedding. In addition to the family involvement, the unit employs one tractor man. Some machinery and labour are shared with Ardmiddle Farm, Turriff where Robert and his brother Michael farm in a separate partnership.
The next future project which the family plan is to replace the straw bedded court with another cubicle house. They are also planning to start milking three times a day, but this is on hold till the price paid for their milk increases.

A tremendous afternoon was enjoyed by 40 members and guests. The knowledge, enthusiasm and passion of the family to invest in dairying was very impressive. A warm cup of tea and home bakes was very welcome on the cold wet day. While having our tea we were able to view the new parlour in operation from the viewing area within the farm office.

Sincere thanks go to the McLean family for providing refreshments and hosting our autumn visit.

This event was sponsored by East Coast Viners to which we extend our appreciation.
The uncluttered milking pit on the Boumatic parlour

Mike Martin receiving the Scottish Silage Cup from John Veitch
Norgrass Silage Competition 2014

The annual competition this year drew a disappointing entry from only ten farms. Entrants came from Buckie in the North to Laurencekirk in the South. Fortunately some farmers entered more than one sample, eight pit and eight bale entries in total.

As is the mandatory format, the entries were first assessed on the analysis and allotted marks for Dry Matter, ME, Crude Protein and Intake Factor. The short list of the highest ranking silage was settled which included five pit and five bale silages to be judged on-farm.

The judge this year was Mr Mike Martin from Muir of Ord, winner of the pit silage competition in 2011 and 2013. In the on-farm assessment Mike assessed pits on lack of waste across the shoulders, side and top of pit. He also checked face uniformity, effluent control, and management of farm waste. Mike then viewed the stock utilising the silage and scored each farm on their production. The farm enterprises covered organic milk and conventional milk production, suckler herds and fattening cattle. Mike commented on the farms he visited and his views and thoughts are as follows.

“All were potential winners, and were making full use of some excellent silage, which made the job of judging that much more interesting. The winning entries are to be complimented on their attention to detail on farm and balancing their rations to make full use of their silage analysis.” Mike said “It was a pleasure to be invited to judge this year’s entries”.

Mike was accompanied on day one by John Veitch, visiting farms from Buckie to Oldmeldrum via Banff and Insch. Day two found Mike and James Law having a very early 8am visit to Finzean Estate. This was followed by visits to Alford, Potterton and finally Blackburn.

The prize winners were as follows:

**PIT SILAGE**

**Winner – BP Trophy:**
Mr J.L.I. Thomson, Middleton of Potterton.

**Runner up:** Mr Derek Bruce, Dorsell, Alford

**Best new entrant – Harbro Trophy:**
No new entrant
BALE SILAGE  Winner - Grays of Fetterangus Cup:  
Mr Kenny Christie, Easter Whyntie, Boyndie, Banff.
Runner up:  P & J Don, Freefield, Insch
Best new entrant – Ryeside Cup:  
Mr Kenny Christie, Easter Whyntie, Boyndie, Banff

The other finalists who did not make it into the prize list were:
Andrew Farquharson, Finzean Estate, Banchory.
John Shand, Chapelford, Buckie
William Willis, Kinellar, Blackburn
George Whitelaw, Greenmyre, Old Meldrum.

Prizes and Trophies will be presented at the 2015 AGM.

This competition remains an important part of the Society’s overall aim of improving grassland productivity in North-East Scotland. Congratulations to the winners, and commiserations to the other entrants who narrowly missed out on receiving a trophy. The Society wishes to thank the Judge, Mike Martin and stewards John Veitch and James Law for giving up their time over the two days. We would also like to acknowledge the help shown by SRUC.
The pit and bale winners 2014
Murray Duguid Advert – New 2 Murray Duguid
THE BRITISH GRASSLAND SOCIETY
2014 Summer Meeting
4th – 7th July, 2014

NOWT EWE CANNA DAE WI’ GIRSE
In July 2014 the North of Scotland Grassland Society hosted the British Grassland Society's annual Summer Meeting, returning to North-east for the first time since 1994. With an 18 month lead-in time and an exceptionally able committee we put on a great event and enjoyed the company of members from throughout the UK as well as New Zealand and the USA. Delegates were welcomed at the Airport Thistle Hotel on Friday 4th July at an informal supper where a pithy introduction to the North-east lowlands was given by Peter Cook who along with wife Lynne joined us for the evening.

Over three days we visited a range of farms from coastal Kincardineshire to the uplands of West Aberdeenshire. What linked these diverse units was the focus of their owners on efficiency of production and this was to be evident in both the quality of their livestock and the attention to detail shown in the different production systems. Never lost for words, we worked hard to involve people in what we billed as “a conversation on the move” which seemed to work quite naturally, but was in fact the product of some quite careful choreography.

**Saturday 5th July**

Our first day in the field was spent in Kincardineshire and while travelling we enjoyed a commentary on soils and climate from retired Aberdeen University soil scientist Dr Tom Batey.

Dendoldrum, our first visit, is a rapidly expanding dairy business under the visionary leadership of professional dairy nutritionist Gregor Colquhoun. With cow numbers at 450, waste disposal is constraining expansion although foragable area could support up to 700 cows. Gregor is very focussed on the productivity of his cows, and while the system is high input it is also very technically efficient. Our snapshot of the business on the day included a tour of the cow and calf housing, a discussion in the field on productive grassland and some technical input from sponsor Kelvin Cave on forage preservation.

Our second visit, to Glenbervie Home Farm where we were welcomed by Alastair Macphie and farm manager John Lohoar, delighted our delegates in its diversity: Glenbervie House, Aberdeen Angus cows and calves, the productive grasslands beside the Bervie Water and the fine walled garden. The alluvial plain of the Bervie Water is used to grow silage and these grass leys were used as a case study by principal sponsor Yara to illustrate the
output from different fertiliser regimes. Our return walk took us through the garden and gave delegates a flavour of the Alternative Tour.

Our day in the field ended at Glensaugh which is managed for the James Hutton Institute by event chairman Donald Barrie. Glensaugh has been used for agricultural and environmental research since 1943 and continues to play a role in the science programme of the Institute. Sitting astride the Highland Boundary Fault, a succession of soils and landforms leads from extensive heather moorland grazed by Blackface ewes through old improved leys supporting more productive mule ewes into short term clover rich leys in the heart of the farm that are used to grow grass for conservation. During our walk principal sponsor Animax led a discussion on trace element deficiency, underlining the point that much of our marginal land can only be productive with the targeted use of inputs, a theme which recurred during the Meeting.

Saturday evening provided an opportunity for Norgrass members, host farmers and friends to meet and entertain our delegates at the Thainstone Exchange for dinner and a ceilidh; excellent food, great company and memorable music provided by the Dennis Morrison Ceilidh Band.

**Sunday 6th July**

Back on the road again; this time heading north to meet our first host for the day John Gordon at Wellheads, Huntly. John has a well-deserved reputation as a producer of quality suckled calves and finished crossbred lambs through the targeted use of inputs on this marginal unit. A tractor and trailer trip (a gamble even in July) to the top of the hill overlooking Huntly paid off with fine views, quality livestock and a few moments of excitement on the way down. A running commentary from our host was part of the Wellheads experience, and gave insight into John’s management philosophy which is that he is in it for the long haul and “you must never let your farm know that you are hard up”. 
Much of Scotland’s crossbred lamb production is sired by Texel or hybrid rams, and at Logie Durno, hosts William and Carol Ingram and sons Gregor and Bruce have earned a reputation for producing quality terminal sires, backed up by good genetic data, which they sell on farm in their natural state. After a lunch we set off to look at some of the sheep flock, and also to discuss the clover rich leys upon which they graze. The Ingrams are clear about technical efficiency: investments in time, inputs (fertiliser use is minimal) and livestock feed (silage and distillery by-product) all have to produce a viable return. The careful targeting of inputs was a recurring theme on our tour, but the more efficient utilisation of grass is also being addressed as the Ingrams move towards paddock grazing.
Above Willie Ingram in Clover sward  Below tups at Logie Durno
Our cross section of Aberdeenshire farming continued as we moved a short
distance to Old Rayne to meet beef and lamb finishers George and Bruce
Walker at their lowland unit of Newton of Lewesk. The Walkers grow grass as
an arable break crop, but the mainstay of their livestock production system is
arable and distillery by-products from which they produce carefully costed
rations that produce up to 60 consistent 360 kg carcasses per week. After
viewing state of the art weighing and handling facilities and a park of well-
behaved heifers at grass, our tour ended with a welcome dram before we
returned to our hotel.

Fattening cattle at Newton of Lewesk

One of BGS’s traditional fixtures is the annual gala dinner and this was held
on Sunday evening back in the Thistle Hotel. Our good humoured company
enjoyed a splendid roast beef (sourced by John Sim and cooked to perfection
by the chef), after dinner speeches including guest speaker Professor Iain
Gordon, Chief Executive of The James Hutton Institute on the topic “What
has Grassland Ever Done for Us”.

20
Monday 7th July

Host Ronald Barron at Darrahill’s new cubicle shed

Our final day began with a visit to Ronald and Laura Barron’s innovative and technically efficient dairy at Darrahill, Udny, a lowland mixed arable cropping farm which has been adapted for intensive milk production. The recent re-equipping of Darrahill has seen the building of new cow accommodation and rotary parlour which has allowed energy saving technologies like LED lights, waste heat recovery and waste water flushing to be designed in. While our visits usually end with an open discussion about “the issues”, we are indebted to Ronald for allowing us to air two very “touchy” ones: business succession and “the Referendum” (a favourite conversation topic of the Meeting).

The Summer Meeting ended at SRUC’s grassland trial plots at Kirkton of Kinellar which are managed by George Carr and have been on this picturesque site since 2011. The plots contain cultivars of perennial, Italian and hybrid rye grass, and red and white clovers and are used to assess varieties and seed mixtures for northern Britain. At this point we were joined for lunch by delegates attending the Alternative Tour, who during three days had visited Balmoral, Baxters of Speyside, Spey Bay Dolphin Centre, the University of Aberdeen’s 15th century Chapel and Quadrangle and enjoyed a
boat trip round Aberdeen Harbour. The welcome shelter of Messrs Campbell’s machinery shed was a good place to have lunch and to round off the tour with thanks and acknowledgements before BGS President David Lee brought the 2014 Summer Meeting to a formal close.

Acknowledgements

Rhoda and James Law, who did a lot of the early groundwork and without whose continual effort to get the detail right the meeting would not have happened.

The Airport Thistle Hotel and staff who provided first class service, excellent food and looked after us during the three days.

Anne Willis, Yvonne Stewart and Linda Sim who organised and led the Alternative Tour.

Gordon Stewart, Iain Taylor and John Veitch who cajoled a diverse range of companies into supporting our meeting, and of course to all those companies who gave so generously.

Day chairmen Gordon Sharp, John Penny and John Sim who ably led the meeting over three successive days.

Treasurer Ian Edwards who built a good financial model of the event and managed the finances of the event so capably.

Gemma Wiltshier and Charlotte Evans from BGS who took bookings and assisted us during the meeting;

and to all un-named who attended meetings, made great suggestions, sorted things out and helped out over three great days.

Donald Barrie Chair, Summer Meeting, 2014
Inaugural winner in 2012 of the Farmplan Scottish Beef Farmer of the Year presented at AgriScot and joint winner of the 2013 Future Farming Award, Robert Neill of Upper Nisbet Farm near Jedburgh talked about his farming system with particular emphasis on the suckler beef enterprise. Robert had returned only the previous week from New Zealand on the last of his Nuffield Farming Scholarship visits looking at ‘Cattle Electronic Identification (EID) and Traceability’ on which he also spoke. Upper Nisbet has just completed 3 years as a ‘Climate Change Focus Farm’. The farm hosted the final visit of the BGS 2010 Summer Tour of south east Scotland and the 2010 Scottish, EU 5 nations and EU Vintage ploughing championships which required 240 ac of stubble. Robert is a Director of the Royal Highland Education Trust, regularly hosting school visits for which he has a purpose built trailer to take pupils round the farm through the fields of stock.
Robert, the eldest son from a dairy farming family just across the border in Northumberland, commenced farming on leaving school. This was on rented LFA land on a sporting estate in the Scottish Lammermoors with beef cows and sheep. After 16 years, in May 2000 Robert got a Limited Partnership tenancy at Upper Nisbet (836 ac) on the Lothian Estate near the River Teviot, 6 miles equidistant between Kelso and Jedburgh. Lothian Estate comprises 20,000 acres over 40 farms with 30 tenants and some in hand farms. In May 2001 on a tenant’s retiral, an adjacent farm was split between neighbouring tenants adding another 151 acres and farm buildings to Upper Nisbet and again another 100 acres of land in 2007 was added taking the farm to 1084 ac, split 484 ac of grass and 600 ac of cereals, plus 230 ac of grass rented from adjoining farms all within a ring fence, useful in terms of biosecurity. Robert and his wife, who have 2 teenage children, operate the farm with 2 staff, working also with his 2 brothers, who run the home 240 cow dairy farm, for silage making. Sharing this labour intensive operation makes sense, including as it does a self-propelled forage harvester, 3 tractors and trailers, mower, rake and buckrake, requiring more labour than available on each individual farm. A mobile bruiser is also shared with the brothers. Contracting work on nearby farms, including contract farming 400 acres of neighbouring cereals, spreads other machinery costs.

<table>
<thead>
<tr>
<th>Cropping for 2014:</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 ac</td>
</tr>
<tr>
<td>winter barley</td>
</tr>
<tr>
<td>249 ac</td>
</tr>
<tr>
<td>winter wheat</td>
</tr>
<tr>
<td>210 ac</td>
</tr>
<tr>
<td>spring barley</td>
</tr>
<tr>
<td>30 ac</td>
</tr>
<tr>
<td>rented to a neighbour for potatoes</td>
</tr>
<tr>
<td>150 ac</td>
</tr>
<tr>
<td>silage clamped</td>
</tr>
</tbody>
</table>

Due to yield variability spring beans, previously grown for protein, were dropped for 2014, replaced with bought in protein. 100 ac are reseeded after winter or spring barley annually then grazed by overwintered ewe lambs to aid tillering. Grass is an important break crop on the farm which has light land in need also of the muck from the cattle enterprise. While rotational grass yields well, 170 ac of permanent pasture performs poorly and is now needing
reseeding. Silage is made from 150 ac of the grass then grazed by cattle after 2nd cut

Upper Nisbet with new bull pens in the foreground, feed store on left then workshop

On entry buildings were dilapidated, nothing having been done since the early 1960s. Feeding was manual. A program of new building and upgrading has been undertaken by Robert and staff at both steadings. A workshop, five bay feed store with a tank for pot ale and cattle handling pens were built. Feed passages were adapted to allow all stock to be fed with the Keenan complete diet feeder with troughs modified to allow feeding only every day or two. Stock are mostly fed silage-based Total Mixed Rations (TMR) mixed in 5 tonne batches in the Keenan feeder. Stock can be shut from the bedded areas when feeding to allow bedding without staff being in with them. Calving and bull pens were added and two years ago a new drier and storage shed
New cattle handling pens with workshop behind and grain drier below
with weighbridge to handle cereals from the farm and the contract 400 acres produce was erected with aid of an SRDP grant. All grain is dried so at bruising pot ale syrup is added as a dust suppressant and source of protein. All improvements have been self-funded and under the 2003 Act form part of the farms assets.

A 200 cow herd of Limousin cross cows bred from British Friesian heifers at the home farm came to Upper Nisbet in 2000, which now numbers 300 aiming to go to 400 cows. Calving is from mid-March to mid-June. Cows are in wintered in straw bedded courts fed on a Total Mixed Ration (TMR) of silage, straw, pot ale syrup and minerals. Being black, all cows are freeze branded. Calves are tagged, identifying sire and dam. Replacements comprise 25 from the home farm’s British Friesian heifers which are put to Limousin bulls and 25 home bred three quarter Limousin heifers, selected from bulls with high EBV milk figures and good temperament. British Blue crosses put back to Limousin are being tried. To keep feed costs down, cows are not large with average weights of 650 kg. Cows and calves are run in 40-50 cow groups at pasture with one bull through the breeding period so a calf’s sire is known. Cows are pregnancy diagnosed in December after weaning and vaccinated for Leptospirosis, BVD and scour. Though costly, this is considered good value. As members of the Premium Health Scheme an annual blood test is done when pregnancy diagnosing, checking for Johnnes, BVD and Weils. The farm was a Scottish Pilot for BVD eradication. Robert is keen to see complete eradication of BVD nationally, regarding a healthy cow as a profitable cow.

Pedigree Limousin bulls are purchased at Carlisle, being semen tested shortly after arrival and all bulls are given an annual MOT including semen testing. Given the demanding health requirements and the EBV objectives it is difficult to find suitable bulls so a pedigree herd of 12 cows has been established to breed, using AI, commercial bulls for use in the herd. Hopefully only an occasional bull will require to be purchased. Outwith the breeding period, bulls are more of a nuisance so are housed from November to spring in purpose made bull pens where they can be handled, fed and bedded with no need for staff to go in with them.

On calving, cows are transferred straight to one of ten purpose built calving pens in a converted shed for approximately 24 hours before going out onto clean pasture. With self-locking yokes a gate can be swung round and chained at the back then the lower portion of the gate can be swung back to
Calving pens
allow the calf to suckle if there are problems. During calving mucking out by forklift is done weekly then pens are disinfected. Cows are scored for ease of calving, feet, etc, and temperament, so culls can be identified. Calves are weighed at birth, disbudded and males castrated then tagged. DNA tags have been trialled since last year with a sample on tagging going into a test tube and taken weekly to the local SAC vet lab (enroute to market) for analysis. Results are emailed back a few days later. An electronic management tag is used. Calves are introduced to home mixed creep feed from 12 weeks, eating about 1kg/day in the first month, 2kg in the second and 3kg in the third. Total cost per calf was £34.20 but there is no weaning check which helps with pneumonia.

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<th>Ingredient</th>
<th>Protein%</th>
<th>MJ/Kg</th>
<th>Weight/Ration (kg)</th>
<th>Price £</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/B Grains</td>
<td>27.8</td>
<td>14</td>
<td>350</td>
<td>77.00</td>
</tr>
<tr>
<td>Sugar Pellets</td>
<td>10</td>
<td>12.1</td>
<td>150</td>
<td>28.00</td>
</tr>
<tr>
<td>Wheat</td>
<td>12.5</td>
<td>13.8</td>
<td>200</td>
<td>34.00</td>
</tr>
<tr>
<td>Barley</td>
<td>9.7</td>
<td>13.2</td>
<td>225</td>
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<tr>
<td>Limestone flour</td>
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<td>Total Cost per Tonne</td>
<td></td>
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<td>189.16</td>
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</tbody>
</table>

Calves are weaned in November then fed a silage-based TMR plus 16% protein. Before housing they are vaccinated with Rispoval 4 costing £11.36 and wormed with Dectomax Pour On at £1.30. They are weighed and their backs are clipped before moving to winter accommodation. This year, Robert
having seen out-wintering in Canada, some permanent pasture was sprayed off, disced and sown with kale, stubble turnips and rape on which 100 heifer calves have been wintered. This will then be reseeded. Yearling heifers are given Cydectin LA by injection prior to grazing for a second summer to grow them on without fattening and then brought inside in the autumn to be finished on a TMR diet for sale at 18-24 months old. All forward yearling steers are housed inside for their second summer fed on silage based TMR (though this year on ad lib cereals with their current value) to be sold at 12-24 months of age. Marketing requires about 4-5 to be ready for sale each week consistently throughout the year. About 40 British Blue cross male calves have been left entire being fed on Maxammon treated barley as a trial this year.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Protein%</th>
<th>MJ/Kg</th>
<th>Weight/Ration (kg)</th>
<th>Price £</th>
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<td>Wheat</td>
<td>12.5</td>
<td>13.8</td>
<td>400</td>
<td>68.00</td>
</tr>
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<td>Barley</td>
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<tr>
<td>Beans</td>
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<td>Limestone flour</td>
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<td>25</td>
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<td>3.00</td>
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<td>Minerals</td>
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<tr>
<td>Yeast</td>
<td></td>
<td>1.6</td>
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<td>3.84</td>
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<tr>
<td><strong>Total Cost per Tonne</strong></td>
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<td></td>
<td><strong>169.31</strong></td>
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The steers’ ration was costing £2.07/day for consumption of 12.2kg/head with average gain over the previous 60 days of 1.5kg/day. With daily straw usage of 2.2kg costing 7p it was taking 7.6 kg of concentrates plus 1.37 kg of straw to produce 1 kg of beef at a cost of £1.36/kg of finished live weight selling at £2.30/kg. Marketing is through live auction at nearby St. Boswells with 4-5 animals transported in the farm’s livestock trailer. Many local butchers attend to buy
Above preparing cattle  Below cows and calves
though with the closure of the local slaughterhouse animals must then go to Shotts for slaughter. With months of work producing the animals there are only 20 seconds to sell in the ring so cattle are prepared thoroughly taking about 10 minutes clipping the head, belly and back. Butchers who like 600kg animals are interested in the killing out %. Animals are selected on a Friday then clipped and separated, being taken off the ad lib hopper onto reduced feed with nothing from the Sunday night prior to Monday’s sale. This improves the appearance and killing out % and cleans up the cattle. The cattle pens, self-designed and built, are key to the efficient handling of the animals. They ensure ease of handling with minimum staff and very low risk to staff and stock. Gates are air operated so staff do not have to be in with the animals. There are 3-way shedding gates. The weighing of 40 cattle takes 10 minutes while 80 cows per hour can be pregnancy diagnosed, with the vet the slowest part of the operation. The New Zealand galvanised ‘Cattle Master Crush’ is fitted with ‘Tru-test’ XR3000 weighing and panels for reading the electronic tags, all information being electronically imported to the Farmplan software for processing, with births and movements electronically notified to BCMS through the program. Having commenced trialling the Electronic Identification system in 2007, Robert thinks it should be compulsory for cattle and that the EU made a mistake starting with sheep rather than cattle.

**Nuffield Farming Scholarship.**

Robert’s experience with EID led to this being the topic of his 2013 Nuffield Farming Scholarship. Robert’s full report can be found on his web site http://www.uppernisbet.co.uk/. Details of the Nuffield Foundation Awards can be found on the website: www.nuffieldscholar.org.

The study tour involved 21 flights, 61,000 air and 8,000 road miles visiting Canada for three weeks in July then two weeks in Argentina, Belgium in December, then in January 2014 Australia for three weeks and New Zealand for two, from which Robert has just returned.

EID has been compulsory for the 12.5 million head of cattle in Canada since 2006. It is unpopular with ranchers who only tag on these large extensive holdings when animals leave the ranch, so it does not provide lifetime traceability. Progeny go on to large feed lots (some of 45,000 head) with heifers given estrumate, castration taking place late in a calf’s life, then antibiotics and a series of growth hormones administered routinely. Some ranchers are now producing hormone- and antibiotic-free beef for a premium.
Above prize winner at mart  Below new finishing shed
Argentina was in chaos with a police strike when Robert visited. Soya bean production is heavily taxed but is taking over the pampas along with cereals, cattle moving to the rougher higher ground. Of the 50 million cattle, 24 million cows produce 17 million calves per year. With beef consumption at 60 kg per head beef exports are low at present. With cheap labour there is potential for expansion but there is a lack of technology, no EID and no lifetime traceability.

The continent of Australia had a different problem. With two years without any appreciable rain in Queensland and Northern Australia, there was no fodder on their extensive ranches so 10,000 cattle were being lost per day. Animals were so thin haulage companies would not transport them on welfare grounds. Things were better in New South Wales, Southern Australia and Victoria where there was fodder. For the 28.5 million cattle, EID has been compulsory since 1999 but like Canada tagging is on leaving the ranch so there is no life time traceability. In Victoria, tagging of sheep has commenced and will likely become compulsory soon. Production is driven by the extreme climate and its variability. Beef was being exported to Japan, China and Russia.

EID has been compulsory in New Zealand’s 10 million cattle since 2006. Paid for with a levy per tag of 75p it is run on a non-profit making basis, though with less information than available with UK systems. They are looking to move exports from Japan to the EU due to the higher prices in Europe. TB remains a problem in New Zealand where dairy then sheep are the predominant livestock industries.

By contrast, the UK has, thanks to BCMS, the best traceability of any country though it is a costly system and EID is still voluntary. Here 10% of tags are lost but in Argentina 60 % may be lost! Robert is part of a trial with Ultra High Frequency (UHF) versus Low Frequency (LF) tags with the UHF allowing much more information to be maintained. UK beef is the highest priced in the world but the most expensive to produce.
Letter from New Zealand

George Proctor, BSc Agriculture, Aberdeen

While we’re verging on a drought here on the southern edge of the South Island’s Canterbury Plains, thanks to widespread irrigation most of the countryside is lush and green.

Dairy farms dominate the landscape around here, with just over 5 million dairy cows in the national milking herd. New Zealand exports 95% of its production, and due to good world prices in recent years, the conversion of sheep/arable farms to produce “white gold” has been constant. In Canterbury, there’s 100,000 more dairy cows than last year, and the average size of a milking herd is 797 cows.

In New Zealand, irrigation is crucial to the economy. While there is an abundance of water, it doesn’t always fall in the right place at the right time, which is why irrigation and water storage are so important for the future of dairying. Just like in Scotland, there is too much rain in the South Island’s west coast. With several water harvesting schemes being planned to store flood water from the eastern flowing rivers, storage dams will allow more irrigation of the previously drought prone Canterbury Plains.

One project just completed is the Rangitata South Irrigation Scheme which supplies 16,000ha of farmland with water. Floodwater is diverted into 7 ponds which have been excavated on what was previously a 300ha farm. These ponds store 16 million cubic metres of water which is enough to provide 30 days irrigation for the farms in the scheme. This water is usually applied by sprinkler irrigation using centre pivot systems. These centre pivots distribute water more efficiently than other irrigation methods. Another planned scheme is the Central Plains Irrigation Scheme, which will irrigate 60,000ha.

Another interesting development for the dairy industry has been using shorter gestation bulls. Because the NZ dairy industry is based on a mainly grass-fed system, cows calve in the spring, produce milk for 10 months, and are dried off over June and July, when grass growth is very slow. It is vital that calving is condensed to fit into this pattern, so late calving cows are not wanted. Research over 15 years has produced some bulls that have up to 20 days shorter gestation length which translates to an average 10 days shorter
gestation period on farms. The female offspring are not suitable for dairy replacement. This earlier calving means 10 days more milk and this equates to a substantial amount over all of New Zealand’s dairy farms.

Sheep and beef farmers are receiving record prices just now which is all the sweeter because their dairying neighbours are due to get only NZ$4.70 per kilogram of milk solids for this season, compared to a 2013/14 payout of NZ$8.70 per kilogram. An average cow produces around 400kg of milk solids per year, and the exchange rate is NZ$2 to 1 pound sterling. Dairy farms are averaging around $50,000 per hectare and the stocking rate is four milking cows per hectare.

This increase in dairying has resulted in a shortage of staff and there are now many workers from South America and the Philippines who fill this gap.

Where irrigation is possible, Canterbury is an ideal place to grow grass with its long growing season, warm temperatures and short, mild winters. Unfortunately there has not been much rainfall for the last few months, and we are now in a drought. With temperatures in their mid-twenties however, this weather is perfect for the many tourists who visit this lovely part of New Zealand.

Water Storage for Irrigation on the Canterbury Plains
East Coast Viners Advert  ECV jpg
'A brave new world for one dairy farmer - keeping the calves with the cows!'?

David Finlay, Cream O’Galloway, Rainton, Gatehouse of Fleet, Castle Douglas

At an event, many moons ago, I was impressed by the variety of speakers and their very different farming approaches, all of which seemed to be successful. The event was about how the system was less important than the management of that system. 'Keep your farming tight and efficient', was the general theme. It's a thought I've kept with me since then and is the basis of our proposed new innovative and counter-intuitive dairy/beef system.

We've farmed organically for over 15 years now, and in the early years it was painful. On top of having our weed sprays and bagged fertiliser taken away, they were constantly on about our use of drenches and antibiotic. To add insult to injury we were paying almost double for our feed and seeds. It was like being taught to walk again by having your crutches kicked away! But the thought of 29p per litre and having to repay the organic conversion subsidy kept us going. By talking to others who'd been through the process and reading the scant research on the subject (and here, if I may, I would like to commend David Younie's work at Craibstone, which was a beacon in a dark place) I began to realise that it was not about finding replacements for the stuff that had been taken away, but to change the way I farmed so that I didn't need the stuff in the first place. And that is not easy.

The old saying, 'give a man a fish and you feed him for a day, but teach a man to fish and you feed him for life', comes to mind here. Over the subsequent years I've learned (often the hard way) how to farm without 'stuff'. I've learned the value of white and, more recently red clovers, grazing and slurry (now digestate) management for a productive sward - never one of my stronger points - and it's beginning to pay off. When my neighbour, who cuts our silage, says 'I've seen worse on fertilised fields', I take that as a compliment, albeit grudging! Sure, 11tDM/ha is not record breaking but it's going in the right direction.

So we've completely cut out vaccines, bagged fertiliser and weed spays. Cut antibiotic and drenches by over 90%. We generate most of our electricity and
hot water from the anaerobic digester at the same time as enhancing the fertiliser value of the slurry by about 25%. Cell counts are averaging under 100k and lameness is under 5%. Yields are averaging 6800 litres per cow at a supplementation rate of 0.2kg/l, and 3500 litres from forage. Not exceptional but this is a journey, isn't it?

My objective is to simplify the system by using natural processes to get results (clovers, cross-breeding, digester, etc.), cutting down on waste (managing out disease, infertility and digestive disorders, utilising slurry and grass toppings for the digester, etc) and taking control of costs by producing more of our critical inputs like feed, fuel and fert. (the infamous four letter 'f'-words!). This is not an original idea. It is based on the concept of 'Lean Production', which seems to be gaining traction in some quarters - simplification, waste reduction and cost internalisation. At a time when costs seem to be spiralling out of control, it certainly makes sense. I should add that as this is a management-based approach, the quality of the people making up the team is vital for its success.
That is where we've got to and I hope in principle, you are still with me.

Where do we go from here? There is undoubtedly still a lot of fine tuning of the system to be done, but at this time it is working as well as I could have hoped. However life moves on and the threats and opportunities are constantly changing. When we were planning our new dairy, we tried to foresee events that would impact on the livestock industry over the next 20 years (ho ho!). Crystal balls are notoriously unreliable, but we came up with the following: increasing commodity price volatility, environmental regulations (particularly bathing water directive and carbon emissions), social responsibility ('living wage', etc.) and increased scrutiny from a more informed consumer (probably enforced through retail contracts).

What we've been doing on the farm over the past 10 years or so has addressed, to some degree, most of these threats, thereby creating an opportunity. We market our ice-cream with an ethical message already but ice-cream and ethics are not easy bed-fellows. Forty five years or so ago we were still making 15t of farmhouse cheddar a year. The only added ingredient to that is salt and it can be sent by courier anywhere, literally, in the world! Having spent a few years exporting ice-cream to unsustainably complicated overseas markets, the simplicity of cheese is remarkably attractive, believe me.

What about a USP - unique selling proposition? The cheese market is a mature market and to get market share you need to knock someone off the shelf. That is usually difficult and expensive. But if you can offer something that no one else is, then that can be a different matter. Back in '99 we were one of only two ice-cream manufacturers making organic ice-cream in the UK, and the other was even smaller than we were. That summer my daughter went down to London and opened 60 new accounts in just two weeks. Life for a small producer just doesn't get better than that!

Very interesting, I'm sure, but what has this got to do with anything?

Well, as we were hunting around for a USP for the cheese idea, and planning the layout of the dairy, Wilma and others at our visitor centre had been banging on about why we had to take the calves off the cows. This came up constantly as an issue with our visitors on our daily farm tours in the summer. My standard response was always 'the calf will drink a greater value of milk than it (the calf) would ever be worth, so we'd be out of business in no time.
Don't go there!. Never mind the nightmare of trying to manage cows with calves in a dairy.

But something about the idea was very appealing and as a USP it ticked all the boxes. OK, so if we could work out a way of managing the cows and calves, what would we have to charge extra to cover the loss of milk? I'd heard about some Dutch farmers milking and suckling, so on our 10th wedding anniversary (well it was special!) I whisked Wilma off to look at cows in the Netherlands - who said romance was dead? I was so taken with the system that I sent the rest of the team over to take a look and we agreed that it might be a runner.

The next bit was to work out the bones of the model and put some costs, and returns, on it. A distant relative in New Zealand had been trying out once-a-day milking and was so taken with the system that he was transferring his second herd onto it. That would let him milk one 400-cow herd in the morning and the other one at night....

Back to the number crunching. My cousin was getting seven lactations from 4000l cows in NZ, so 150 cows on once a day milking (O-A-D) and 6500 litres with calves at foot and high welfare housing should manage at least that. After all, our sucklers were often well into their teens. Using dairy semen for replacements (we crossbreed three-ways with Montelibard, Swedish Red and Holstein) and Angus for the rest would allow us to finish at 16-18 months using 2/3rd of the current feed supplementation. Heifers would calve down at 24 months - an 8-month saving in both enterprises. How much milk would the calves drink? They do fine on 5 litres a day and Canadian work suggested they might drink 15 litres on ad lib. We could handle that.

Ok, let’s run the model on paper and see what it shows. By the fifth year, once we were up to full numbers, the model was showing a profit. I spent the next few weeks checking and re-checking the numbers. My final excuse for not suckling was withering on the vine.
In the meantime we were bashing on with the new 160-cow dairy set-up, which we were building ourselves - it took us four exhausting years! - so we had plenty of time to build-in the calf creep areas. In October 2012 we started the trial with our 40 autumn block calvers and ran it through to the following spring. Talk about a steep learning curve! Thankfully we’d put in an auto-tandem parlour which was ideal for the system of calves at foot. To say that the model was problematic would be a gross understatement, but none of the problems with the model we encountered was insurmountable. One of the biggest issues was the amount of milk the calves drank. If they were hungry, thirsty, bored, needed comfort, etc, etc, they drank milk. Some must have been drinking 25-30l a day! Of course they were totally uninterested in creep feed. After 4 months of this, we separated them from the cows for 14 hours and this was transformational.

We weaned the calves fully after 6 months, though they remained in the creep areas in sight and nose contact with their mothers. There was little complaint from cows, calves or people!

Getting back to normal in the spring of 2013 was a relief for everyone. That spring wasn't helped by the late March snow that lay around until early May. Typical of most farmers, I suspect, we didn't get around to analysing the mass of data on the various stock performances until a PhD student arrived 18 months later to crunch the numbers. He very much confirmed our gut feeling that, if we can manage the calf milk consumption and sort out the other management issues, which I think we can, the system might fly. Certainly we
achieved our target growth rates, finishing times and age of calving down. I must say that even though we are intending rolling the system out this next winter to the whole herd, I don't relish the thought of going through all of that again, even though we will be better prepared. I'm getting too old for these adventures!

One of our biggest issues is cash flow. Over the first 3 years the loss of milk to the calves is pretty critical, but thereafter the extra cows we can carry, due to the faster finishing/breeding, largely offsets that milk-loss.

But hey, just think of that USP!!!

'Calves running with cows in the new dairy building at Rainton'
BRUCE WELCH Advert
The Wonder of Clovers

David Lawson, SRUC
Grassland Specialist

With the increasing costs of nitrogen (N) fertiliser, there is a return to the concept of using clovers and other legumes to fix nitrogen to grassland and forage. Within grazing and grass cropping, white and red clovers have commonly been used for this purpose. Both species of course are the driving forces in organic systems, where bagged N fertilizer is not permitted. It is well known that these species form a relationship with the soil-living rhizobium bacteria that are able to take atmospheric nitrogen, fix it, and make it plant-available. It is probably less well known that clover will survive without the rhizobial relationship, i.e. they can take up available N from the soil, whether it is mineralised from soil organic N, or from inorganic fertilisers.

But why apply nitrogen fertiliser if it can be fixed from the air for free?

The process of nitrogen fixation by clover is increasingly important in agricultural production and it may be worth stopping to consider the process in more detail. When you take into consideration that the industrial process to produce inorganic fertiliser from atmospheric nitrogen requires temperatures of 450 °C and pressures of over 200 atmospheres it is remarkable that these rhizobial bacteria can carry out the same process at a soil temperature of 10 °C and one atmosphere.

So it is worth looking more closely at the nitrogen fixing process. This will assist in providing conditions for optimising it in grassland production.

The Process

As mentioned above, legumes such as clover fix atmospheric nitrogen by dint of their association with rhizobium bacteria, which colonise nodules on the roots. Why does this association exist? It is a symbiotic relationship – in other words both parties benefit. The clover benefits from the N fixed and supplied
by the rhizobium, and the rhizobium benefits from energy supplied by the clover.

The actual species of rhizobium bacteria differs between clover species. If clover is being sown for the first time in a rotation then seed should be inoculated with the appropriate species. However, if cropped previously, the rhizobia will already be present in the soil. This is the case virtually everywhere in North-East Scotland, where clover has been grown for over two hundred years!

The actual process of atmospheric nitrogen fixation is the same and in all cases depends on the nitrogenase enzyme within the rhizobia. The nitrogenase enzyme contains iron and molybdenum. Both of these nutrients are crucial and if the soil is low in the availability of either of them it will result in severe reduction in N fixation. Soils in the North East are not low in iron or molybdenum, but it is important that pH is kept right so that they remain available. In essence the nitrogenase converts atmospheric nitrogen (N2) to ammonia (NH3) which can be taken up by the plant root as ammonium (NH4+). The actual biochemical process is relatively complex and is inhibited if excessive oxygen is present. Therefore the ambient oxygen concentration has to be controlled and this role is carried out by the red coloured leghaemoglobin (also containing iron), giving active nodules their reddish coloration. (Similar to the red coloration from haemoglobin in blood)

How does the association between the rhizobium bacteria and clover first take place?

In clovers the rhizobia form nodules at the root hairs. Chemical compounds released by the roots act as triggers and stimulate the bacteria to produce nodules, firstly by causing a curling round of the root hairs and then inducing the root cells to form nodules. The cells in the nodules are then invaded by the rhizobium bacteria: individual cells within the nodule may contain up to 20,000 bacteria. Nodulation in white clover takes between one and three weeks. There are a number of soil factors which will affect the nodulation phase:-

- Soils of low pH inhibit nodule formation. This is particularly through the resultant low calcium levels associated with acidic soil conditions. Nodule formation has a much greater calcium requirement than the clover plant itself.
• A high phosphorus supply is needed for nodulation, and again it is higher than that needed for growth of clover itself.
• Adequate soil iron concentration is needed for the division of the plant cells to produce the nodule. On highly alkaline soils iron may be deficient.

The rate of N fixation is maximised when the soil pH is around 6.0 to 6.5 and soil has at least a Moderate phosphate status.

Once the nodules have established and are fixing nitrogen there are a number of factors needed to maintain optimum rates of nitrogen fixation:

• Adequate pH and phosphate concentrations, as for nodule establishment.
• Adequate molybdenum for the nitrogenase enzyme. On acid soils molybdenum is locked up, so again liming may be required to increase soil pH.
• Iron is required for the nitrogenase and associated enzymes (leghaemoglobin) to function.
• Cobalt is needed for the production of leghaemoglobin, and cobalt deficiency reduces the numbers of bacteria in the nodules.

Therefore in practical terms soil pH is an important factor. Too low a pH value will induce aluminium toxicity which will affect phosphate (and other nutrient) uptake, as well as reducing the availability of molybdenum. However, a high pH value will reduce the availability of iron and cobalt, as well as phosphate. So the ideal soil pH for N₂ fixation is around pH 6.0. Fixation will occur at lower soil pH than this but you should aim to maintain pH at 5.8 at the least.

The process of nitrogen fixation in the nodules requires carbohydrate (energy) from the leaves so when overgrazing (or cutting) takes place the process is severely curtailed. Moreover where the clover or legume is shaded then rate of N₂ fixation will be reduced.
Red clover

Soil temperature

Rhizobial bacteria are inactive at temperatures below 5°C and their activity increases with soil temperature up to 25 °C. Their activity is likely to be in parallel to that of the clover growth, which does tend to be more temperature sensitive than pasture grasses, and so spring growth is delayed relative to most grass species.

Nitrogen environment

The question often arises as to the effect of fertiliser nitrogen application on clover management. The effect is actually quite complex: Prior to nodulation taking place adequate clover growth is needed so that carbohydrate can be obtained from the leaves in order to activate the nitrogen-fixing system in the roots. In most soils except very sandy, low
organic matter soils, there is sufficient mineral N supplied from the soil to activate initial clover growth from seed. Once the nodules are established however, increasing the nitrogen supply from fertiliser reduces the activity of the nitrogenase enzyme. It also leads to a reduction of the numbers of root nodules with the effect being greater from nitrate, as opposed to ammonium based, nitrogen fertiliser or from livestock manures.

So, on very sandy, low organic matter soils only, an initial starter application of between 10 and 20 kg/ha of nitrogen might be appropriate at sowing, preferably from a non-nitrate source. No N fertiliser will be required on most soils. Subsequent fertiliser application should not contain nitrogen.

Hopefully the above outline of the clover nitrogen-fixing system provides some appreciation of its complexity and some assistance in helping it along through creation of the right soil conditions.
Watson Advert
**Festulolium: Grasses for agriculture and ecosystem service under a changing climate**

Professor Mike Humphreys  
IBERS, Aberystwyth University

I have been researching and breeding Festulolium grasses at the Institute of Biological, Environmental and Rural Sciences (formally known as IGER, and for many years before that as the Welsh Plant Breeding Station; WPBS) for more than 30 years. To be honest, for most of that time it’s been a struggle to convince others that what I was doing was anything more than just an interesting scientific pastime having no real application for UK-based grassland agriculture. Happily for me that is no longer the case and there is growing evidence, and widespread belief across the sector that Festulolium offer us some considerable future safeguards for grassland production and certain unique opportunities for additional benefits, many not directly obvious as they feature underground, by improving soils, through their stability, content, structure, and hydrology, and for maintaining a rich and healthy ecosystem biodiversity.

So what are Festulolium? Firstly, they are not all the same, although many people still do not realise this as true. Basically, Festulolium are any species combination between Italian or perennial ryegrass and any fescue species. There are more than 500 fescue species indigenous to temperate grasslands world-wide, and these are extremely diverse and harbour many and various adaptive properties. Many of the fescues hybridise with ryegrasses naturally through conventional plant breeding technologies, and if this is the case, then they can be termed as Festulolium. This was decided in 2004 by the EU following some campaigning by ourselves and colleagues, as prior to that date, grasses could only be called Festulolium if they were hybrids between Italian ryegrass and meadow fescue, a grass combination known taxonomically as Festulolium braunii. There is now no impediment to commercially growing any Festulolium species’ combination within the EU. The restrictions associated with GM technologies do not apply because all has been achieved using conventional breeding methodologies involving
pollination and fertilisation, these days combined with some interesting genetic and selection techniques. Many current Festulolium varieties still involve the Festulolium braunii species’ combination, but for a UK market, particularly suitable for use in improved pastures in the uplands, it will be species’ combinations involving fescue species and perennial ryegrass that will be more applicable. Notwithstanding that, the very first Festulolium variety to gain entry onto the UK National Recommended Varieties List was in 2012, AberNiche, a tetraploid high yielding, winter hardy, and drought tolerant Italian ryegrass/meadow fescue species’ combination produced by IBERS and marketed by Germinal Seeds, our commercial partner. It is expected to be the forerunner for many new Festulolium varieties involving various species’ hybrids.

The potential advantages that breeding Festulolium may provide has been recognised for more than 70 years. Ryegrasses and fescues offer a range of complementary traits that if combined would provide us with varieties providing high yielding nutritious fodder (from ryegrass) with some resilience to a range of stresses both abiotic (drought, cold, flooding) and biotic (disease resistance), and with efficiency in water and nutrient use suitable for inclusion in low-input agricultural systems. Current species combinations under development and test at IBERS include both Italian ryegrass and perennial ryegrass hybrids in combinations with meadow fescue, tall fescue, glaucous fescue, and Atlas fescue. Whilst meadow fescue is indigenous to the UK and to Northern Europe, where because of its winter hardiness, it is itself developed for commercial use in agriculture, the other three fescue species derive either from Mediterranean regions or from North Africa. They are particularly drought and heat resistant. Tall fescue, like meadow fescue is also itself developed for commercial use. The stress resistance of the fescues derives from various mechanisms e.g. meadow fescue has a more efficient winter hardening process than ryegrass involving its chloroplasts, the plant organelles responsible for photosynthesis. The drought resistance is achieved through efficient water regulation, uptake and use helped in part by their characteristically large deep root systems. The fescues also tend to require lower nutrient availability than ryegrass making them suitable for low input and organic systems.

Two principal breeding approaches have been employed to develop Festulolium varieties. The first referred to as amphiploidy combines whole
genomes of ryegrass and fescue and has been the favoured approach used by many breeders, particularly in Central and Eastern Europe. It is a relatively straightforward breeding approach but has some serious flaws. Firstly, combining whole genomes of a highly productive ryegrass variety with that of a fescue species’ ecotype will undoubtedly include detrimental characters in addition to those desirable traits that had been chosen for selection. Secondly, such hybrids tend to be genetically unstable over generations leading to reduced fertility and loss of the desirable traits initially selected. The outcomes include reduced seed production, which affects costs of seed multiplication and therefore affects seed sales, and lack of stability and uniformity preventing variety development and National List inclusion. These negative outcomes have definitely deterred development of Festulolium and have affected peoples’ appreciation of their potential, in particular in countries such as the UK where due to our moderate maritime climate more climate-sensitive perennial ryegrass has been preferred and widely incorporated for use in grassland agriculture. The second approach, developed initially at IBERS in the 1980s and 1990s, is known as introgression breeding and is a more targeted breeding approach where fescue genes associated with expression of a desirable trait are selected preferentially and transferred into the ryegrass genome, usually using genetic marker technologies. Whilst this approach is technically more demanding, the advantages are considerable as frequently there are little or no negative impacts on ryegrass performance and the fescue genes are transmitted normally across generations without loss of effect or genome stability. In truth, both breeding approaches have their place and value and the choice of which to use will depend on the species combination, the traits desired, and the purpose intended and location chosen for the grasses use.

Both breeding approaches have been employed at IBERS with the introgression approach responsible for the development of the agricultural Festulolium grass variety AberNiche and prior to this the stay-green amenity perennial ryegrass, AberNile. New introgression lines for drought tolerance have been developed at IBERS and improvements of >80% in water-use-efficiency (grams of forage matter produced/unit of water consumed) have been reported. It has been reported that perennial ryegrass yields are reduced by 1 tonne/hectare for every 50mm soil water deficit, a significant production loss for most UK grasslands.
The amphiploid approach has also been used, in particular using perennial and Italian ryegrass with glaucous and Atlas fescue. Initial assessments indicate these have greater genome stability than some of their predecessors and provide unique and very promising advantages for future agricultural use. The hybrids have very high forage production combined with high tolerance to multiple stresses. There is no obvious negative impact on forage quality and the Festulolium hybrids have very deep and extensive root systems providing advantages in terms of efficient water and nutrient capture and for establishment and stabilising soils and for preventing erosion. In addition to their potential for future use in agriculture, the grasses are being assessed currently for their use in bioremediation and restoring industrial sites such as returning land given to mine spoils to become again natural grasslands. These Festulolium have other benefits too.

It is slowly being realised that Festulolium will also provide us with some important ecosystem services, in addition to safeguarding a future for grassland farming through provisions for sustainable and maintained forage production in the face of increasing exposures to extreme weather events due to climate change, all achieved under low input management systems. Government agencies should be made aware of the benefits possible and farmers provided with incentives to grow Festulolium for public benefit. Plant breeding at IBERS is holistic and takes account not only of the need to feed livestock but the impact that the crop has on its surrounding environment. It is for this reason that the breeders at IBERS belong to the “Public Good Plant Breeding Group”.

Much has been made of the developments of high sugar perennial ryegrass at IBERS and several varieties e.g. AberMagic, AberBite, and AberWolf are currently available. The varieties mitigate some of the inefficiencies found in ruminant nutrition by providing more energy for rumen-based microbes to convert plant into animal protein to increase meat and milk yields. The benefits to the environment are reduced greenhouse gas emissions by livestock. However, certain Festulolium hybrids can also assist. Ryegrass combinations with glaucous fescue (Festuca arundinacea var glaucescens), compared to ryegrass, provide for lower protein intake by ruminants, but also for longer retention of that protein when inside the rumen, thereby allowing more time for rumen-based microbes to utilise the ingested feed. This should also benefit ruminant digestion and lower harmful releases of greenhouse
gases. It is believed that the protective mechanisms that have evolved in the fescue to combat heat when exposed in its native environment to Mediterranean-like temperatures may also assist to combat the stresses encountered by ingested and living plant cells when inside the rumen.

The strong, deep rooting Festulolium also benefit soil structure, combat soil compaction, and assist in soil aeration and hydrology. A recent study has shown how one IBERS-bred Festulolium variety reduced overland flow of water and nutrients by 50% compared to perennial ryegrass. Current research in a project called SUREROOT (http://www.sureroot.uk/) is investigating this further and the potential, given a range of livestock management systems, locations and soils for Festulolium hybrid combinations to mitigate incidents of flooding. One of the explanations for this property is we believe, the impact on soil porosity that results from high root turn-over especially at depth in the soils. This property provides us with another potential benefit by providing opportunities to sequester carbon into soils at depth and thereby reduce the UK’s “carbon-footprint”. Certain Festulolium combinations may be particularly resistant to water-logging conditions. The natural hybrid Festuloilum loliiaceum (a perennial ryegrass, meadow fescue species combination) is found particularly in water-logged soils in mature water meadows in areas where its parent species are either absent or in reduced number.

As our understanding and knowledge outreach of the potential of Festulolium increases, then inevitably widespread take-up by grassland based industries will ensue. New high-throughput and precision plant breeding technologies and accompanied plant growth development and performance screens now becoming increasingly available will accelerate the development of future Festulolium and ensure its design is “fit-for-purpose” for UK farming in future years.
Festulolium Trial Plots at IBERS Aberystwyth
Andrew Allan Don Valley Seeds Advert  To Come From Printer
Improving profitability through better grazing utilisation

Ian Edwards and David Younie

Maryfield Farm, Dess is the location for one of six new Grazing Groups in Scotland, set up by Quality Meat Scotland (QMS) with the objective of ‘increasing profitability by increasing the kilograms of meat produced per hectare through better utilisation of grass.’ Maryfield is a 100ha farm tenanted by Ahren and Louise Urquhart, new-start farmers who took over the tenancy of the farm in February 2013. The farm is mainly grass except for about 9ha of rape and kale for finishing lambs. They have stocked it with 520 Mule, Cheviot and Cheviot Mule ewes and are finishing all the progeny.

The third meeting of the Grazing Group, in early February 2015, was led by New Zealand Grazing Consultant Trevor Cook. Trevor has been working on improving pasture utilisation in New Zealand where 99% of production is from pasture albeit with a much longer growing season and generally milder winter than Scotland. In New Zealand’s Southland, which experiences some snow cover, swedes are grown to be grazed by breeding stock mid-winter to pre lambing to supplement pasture.

Trevor had been impressed by the high level of livestock performance on Scottish farms, in terms of lambing percentage and individual liveweight gain. He suggested, therefore, that improved profitability had to come from reducing costs by improving management and utilisation of grazed grass (and thus output of meat per hectare), rather than by aiming for still higher levels of animal performance.

The most effective way of achieving improved grassland utilisation is through rotational grazing (or, as Trevor prefers to describe it, controlled grazing). Utilisation can be improved from 60-65% to 75-85%. It is much easier to control the allocation of pasture dry matter (DM) with rotational grazing than with continuous grazing, although farmers need to become familiar with the
concepts of grass cover and residual grass cover (i.e. the standing grass DM per hectare as the flock enters a paddock and when they leave a paddock). In addition to facilitating the allocation of pasture DM to the animals, rotational grazing also has a beneficial effect on pasture quality – the rest periods following each grazing allows an opportunity for the better species and varieties of both grasses and clovers in the sward to outperform the weed species, ultimately resulting in an overall improvement in the nutrient value and clover content of the sward. Another take home message was that having as few mobs of sheep or cattle as possible (i.e. as few tupping or bulling dates), thus making management easier, was key to maximising the efficiency of pasture utilisation. Rotational grazing also allows the farmer to manipulate more precisely the amount of herbage on offer to ensure adequate pasture is available at the most critical periods of daily feed requirement of the ewe or cow and to be hard on them at periods of low feed requirement.

Trevor went through the reproductive year to identify these key nutritional points in the year that affect production and profitability, which are not the periods of peak demand (lactation) and grass production in the summer. As ewes will eat all they can it is not their demand but requirements that must be met. Starting at tupping when in order to maximise lambing percentage, ewes need to be at a condition score of no lower than 3, which means that farmers need to be condition scoring ewes about six weeks prior to tupping so that they can improve the condition of lean ewes. There is a period of 20 days (the ‘golden 20 days’) – 10 days before and after the date the tups go out - when ovulation rate can be influenced significantly by nutrition. He recommends starting to move the flock every day on to new paddocks, from 10 days prior to the start of tupping, continuing until at least 10 days after the start of tupping. This allows ewes to actively select the best grass and can provide a benefit of up to 1MJ ME more than set stocking. This enhanced benefit is thought to last another 10 days after the daily moves stop. By 25 days after the tups go out most of the ewes should be in lamb, and during the following 35 days it is important to ensure ewes maintain condition as placental development occurs during this period. Although good lambing percentages are generally achieved in Scotland perhaps better pasture utilisation could be achieved at this period.

Approaching the start of lambing, Trevor emphasised that the difference in nutritional demand between single and multiple ewes starts to become really
apparent from about 35 days prior to lambing. From this point onwards, under-nutrition of multiple bearing ewes will start to affect their condition score and has a major influence on lactation performance and how vigorous their lambs will be. The main factor affecting lamb survival is how quickly after birth they stand up and start to suckle. Under-nutrition causes ewes to mobilise body fat which results in the production of beta-hydroxy butyrate, which is the cause of twin-lamb disease and low vigour, dopy lambs. Having a condition score of at least 3 going into this period is essential but overfat ewes are precarious, more difficult to maintain in positive energy balance and then at greater risk of mobilising fat. Even in New Zealand pasture only systems, the variability in pasture quality and quantity makes this a challenge. In Scottish conditions with greater potential snow cover this may be more difficult particularly with earlier lambing flocks. In Scottish conditions it is not advised to carry over to spring more than 5-6 cm of growth. Spring growth will only start above 4-5°C thereafter nitrogen will improve production but not commencement of growth. Thus supplementary feeding, possibly forage or swedes may be required. When supplementary feeding, it is easy to lose sight of animal requirements and to over or under feed. It is however important to plan and set up in autumn the grazing and nutrition for this critical 35 day pre-lambing period.

Because of the critical importance of nutrition during this 35 day period prior to lambing, it is at this time that animals should be introduced to grazing paddocks and the rotational grazing system started, although it will be recognised that, in our Scottish conditions, this will be a lot easier to do with a late lambing (May) flock than a March or April lambing flock. Controlling grazing can avoid overgrazing and running out of grass during this key period. Dietary changes to ewes must be gradual as it takes 10 days for the rumen to adapt to marked changes in diet. Of course not all ewes lamb at the same time at the start of lambing. For this reason, Trevor argues that there is a case, in flocks which have a high scanning percentage (and therefore a small percentage of singles) for ewes to be grouped into 10 day scanning groups, so that pasture allocation can be controlled more accurately. At peak lactation (3-4 weeks after lambing), ewes will exhibit their maximum DM intake - approximately 5% of body weight – i.e. 3.25 kg DM/head/day in 65kgLW ewes. This information is used, along with grass cover data for each paddock (measured by grass height) to make decisions about pasture allocation and moving sheep. However, correctly managed ewes can safely
utilise body fat to maintain lactation over short periods of under-nutrition, unlike pregnancy. Management should then be based on mean lambing date of the group.

Trevor also argues for weaning at a relatively young age – 90-100 days of age (based on a mean lambing date which is set at 10 days after lambing starts). Research has shown that ewe milk yield after 56 days following lambing does not affect the date of weaning, and that by 90 days after lambing, milk yield is not contributing at all to lamb growth rate – grazed herbage is the prime source of nutrition for the lambs. Lambs need herbage quality of 12.5 ME/kgDM to maximise growth rate, but when they are still with their mothers the ewes will be competing and will tend to consume most of the best quality herbage, hence the suggestion that weaning should occur earlier rather than later. If rotational grazing during lactation, creep grazing will allow the lambs access to better pasture, improving growth rates and pasture utilisation.

Trevor noted that Scottish ewes were much heavier than those in New Zealand so questioned whether slightly smaller ewes kept at optimum condition score (not overfat) with lower maintenance cost would be more efficient, allowing higher stocking rates. In New Zealand it is routine to test liver samples from the first lambs killed to check on vitamin/mineral status particularly vitamin B12 and common to take live liver biopsies before planning mineral and vitamin supplementation. Testing the liver is important as this is effectively the mineral store. ‘Just because you are giving voluntary minerals, does not mean you don’t have a deficiency.’

The principles are similar for cows though multiple births are not desired, while gestation is longer and more variable than sheep in duration. Grazing management to support lactation should ensure good conception rates. About 150 days after mean calving date the contribution of lactation to calf growth will have declined, so to maintain their growth calves should be weaned. This will halve cow requirements allowing them post weaning to be used to mop up poorly grazed grass and set up pasture quality for the next season. As for sheep, from 30 days pre-calving it is crucial that cows are in positive energy balance. Thus weaning to 30 days pre-calving is when cows can lose 0.5 – 1 condition score which has been found to improve cow longevity, reaching a score of 3 for the pre calving period.
Internal Parasite Control

Moving to more reliance on pasture will mean that internal parasite control, particularly stomach worms, will become more of an issue. The effect on production is the host animal’s immune response to infection – inflammation. With drug resistance developing there is a need to use more options. Well-fed animals have a lower immune response to infection thus there is a less adverse effect. Ewes in late pregnancy are more susceptible. Some forage crops such as plantain nullify the effects of worm infection. Breeding work is ongoing in selecting resistant sheep that are more resilient showing less disease.

Production is affected on the ingestion from grazed pasture of the L3 stage, which in warm weather die in 6 – 8 weeks if not ingested by a host animal. In Scotland’s cooler summers this may be longer, but L3s can last months on pasture over winter. Spring contamination can be from overwintered L3 and newly hatched eggs. It is important to avoid stocking young stock on grass heavily contaminated with L3 larvae. Even if drenched there can be a 46% difference in growth rate to those on clean pasture. Avoiding pasture previously grazed by young stock, ensuring a high level of residual dry matter after grazing young stock and using the more palatable forms of Plantain (e.g. variety Ceres Tonic) will reduce infection.

Trevor questioned the drenching of adequately fed ewes at lambing based on his experience in New Zealand. However the warmer weather there will kill L3 larvae sooner than in Scotland and Nematodirus is not a problem there. It is important to avoid lambs returning to contaminated lambing pastures. Grazing policy should be based on the risks to ewe and lamb productivity and using the appropriate product at the correct time, aiming to avoid accumulation of L3 larvae on pastures, particularly for lambs.
Rainfall and Soil Temperature Data From Craibstone and Glensaugh

Soil temperature data for Glensaugh and Craibstone both show the effect of a wet and mainly mild winter where soil temperatures at depth only briefly fell below 5 degrees, and then recovered quickly in mild spring conditions. Warm ground conditions were maintained well into the autumn of 2014, making this an unusually long and productive grass growing season. The continuity between the more stable deep soil temperature and the more volatile shallow temperature is unusual and reflects the lack of extremes in the season.

2014 was an excellent growing season with rainfall for the year close to average, but significantly lower than normal between April and July.
Rainfall Data – Glensaugh, Fettercairn

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Monthly Rainfall 2013, 2014 and Ten Year Rolling Average - Glensaugh, Fettercairn
## Rainfall – Craibstone

### Monthly Rainfall 2013, 2014 and Ten Year Rolling Average - Craibstone, Aberdeen

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