AHDB Dairy-BGS Demo Farms:

Demonstrating Research in Practice

Farm Visit

J G Quicke and Partners
Home Farm
Newton St Cyres
Exeter
EX5 5AY

26th August 2015
10.30 – 14.30

Event Schedule

10.30	Arrival, Tea and Coffee
10.50	Welcome and Introductions
11.00	Project introduction and AHDB Dairy research
11.10	Farm introduction
11.25	Healthy grassland soils
13.00	Lunch
13.45	Feedback, summary and close

AHDB Dairy-BGS Demo Farms

The AHDB Dairy-BGS Demo Farms project is part of the AHDB Dairy Grassland, Forage and Soils Research Partnership. This is a five year research collaboration with SRUC (Scotland's Rural College) in partnership with Harper Adams University and the University of Reading.

This encompasses 20 different research projects which span a range of topics under the headings of: grass, alternative forages, soil, out-wintering and economics.

To tell farmers about the latest findings of these research projects, AHDB Dairy and the British Grassland Society (BGS) have set a series of demonstration farms across the country. These farms will run demonstrations replicating some of the current research trials, showing how they translate into on-farm practices.

More details of the research projects within the Partnership can be found on the AHDB Dairy website http://dairy.ahdb.org.uk/

Speakers

- Mr Adam Reeves, Farm Manager
- Dr Elizabeth Stockdale, Newcastle University
- Dr Debbie McConnell, AHDB Dairy R&D Manager

University of Reading

SRUC

Harper Adams University

AHDB DAIRY

BGS

Farm profile

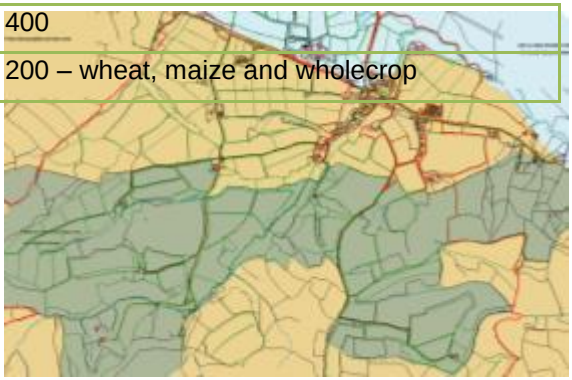
- 580 ha Tenant farm (rented from Quicke Family)
- Part of 1100ha Estate (50% forestry)
- Dairy, Arable, Cheese Dairy, Shop, Café, Rental Property, Stalking
- 116ha Kiwi Style Low Input Grazing Platform for 500 cows – long term grass leys
- 173ha Young stock, dry cow and silage ground – mix of long term and new leys (most long term) and % with HLS prescriptions
- 264ha arable – 164ha cash crops, 100 ha forage crops (wholecrop, maize, fodder beet and fodder rape)

The herd currently comprises of 200 autumn calving and 300 spring calving Montbeliarde X Scandinavian Red X New Zealand Friesian cows, yielding 6600 litres/cow. They graze a platform of 270 acres (109 ha), with an additional 340 acres (337.5 ha) supporting youngstock and dry cow grazing, and silage production, amounting to 4.5 livestock units per hectare.

Farm details

Production (l)	6600
Butterfat	4.38
Cell count	174
Kg milk solids per ha	4.27
Kg milk solids per cow	1.20
Calving pattern	Split spring and autumn
Grazing platform (ac)	270
Other grassland (ac)	340

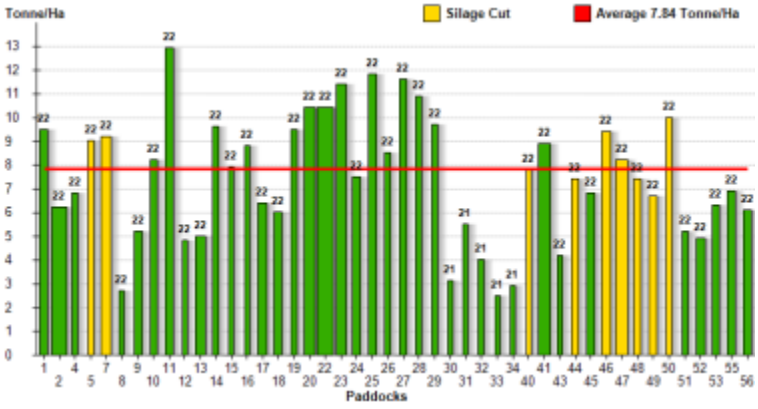
Arable land (ac)	400
Forage crops (ac)	200 – wheat, maize and wholecrop



Much of the farm is located in the Creedy valley where deep, fertile alluvial soils support much of the dairy grazing ground. This consists 116 hectares north of A377 of loamy and clayey floodplain soils with naturally high groundwater (Uton Series). Other soils on the holding include the Middle Redland (Crediton Series), freely draining slightly acid loamy soils, and slightly acid loamy and clayey soils with impeded drainage (clays) (Redburn, Dunsford and Halstow Series).

The farm also outwinters replacement heifers and dry cows using fodder beet and deferred grazing.

Average grass growth across the platform so far this season has been 7.84 tonnes per hectare (3.5 tons per acre) to 12/08/2015.



Showing growth by paddock, Home Farm 2015 – numbers above bars indicate the number of times growth has been measured, period 22/01/2015 – 12/08/2015 .

Farm Walk

Plan showing fields involved in the demo project.

Field name	Demonstration		
Broadgate	Slurry Utilisation		
	(N) Slurry & Aerate	(S) Slurry Only	(W) Control
Broadmarsh	Sward Lift		
Marles	Sward Lift		
Far Paddock	Sward Lift		

Soil compaction

The farm adopted use of a spike aerator and sward lifter on an ad hoc basis to alleviate compaction some years ago.

Shallow compaction caused by cow trampling on the grazing platform lead to poor drainage in areas that are susceptible to waterlogging.

Visual assessment of soil pits during 2014 identified paddocks for autumn sward lifting trials (images below). Marles and Far Paddock showed signs of compaction and had yields that were close to or below average throughout the 2014 season.


Soil structure of Marles, 19/08/2014, showing platy and angular structures.


Soil structure of Far Paddock, 4/09/2014, showing dense surface layering and angular agregates below. Also visiable are patches of moss and bare soil, which increase when compaction inhibits tillering of desired grasses; and thick tap roots of compaction tolerant weed species.

Please note that soil sturucture is ideally assessed in spring or autumn conditions, not mid-summer. Moisture should be about mid-way between wilting point and field capcity.

Sward-lifting should only be carried out under suitable conditions. It is important that soils are neither too wet nor too dry to carry out aeration operations. In wet conditions soils are vulnerable to increased compaction and smearing can also be caused. In dry conditions the sward can be damaged by excessive drag.

Soil behaviour	Moisture State		
	Hard - dry	**Friable - moist**	**Plastic - wet**
Resistance to compaction	High	Moderate	Low
Resistance to smearing	Very High	High	Low
Draught requirement	Very High	Low	Machinery slip & shrinkage

Results from other demo farms:

On sandy-clay loam soils in Cheshire, exhibiting severe compaction, sward lifting and spike aeration resulted in a 11 and 4% increase in grass yield, respectively over the grazing season.

However, in contrast, following aeration at the demo farm near Yarm, there was little visible improvement in soil structure or grass yield with aeration at early grazings. In this example, aeration was undertaken in

slightly wetter conditions on heavy clay soils and therefore may have had a negative impact initially. By the end of the season grass growth across all plots was equal.

AHDB Dairy Research: The impact of compaction

Researchers at SRUC and HAU are currently investigating the impact of cattle trampling and tractor compaction on soil structural damage and grass yield. In 2011 researchers imposed three treatments on a permanent grassland sward: cattle trampling, tractor and no compaction.

Results:

a) Impact of compaction on soil structure.

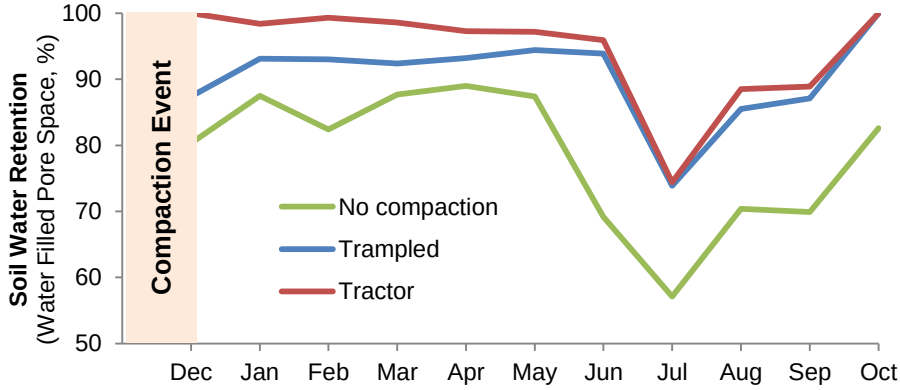

Trampling


Tractor

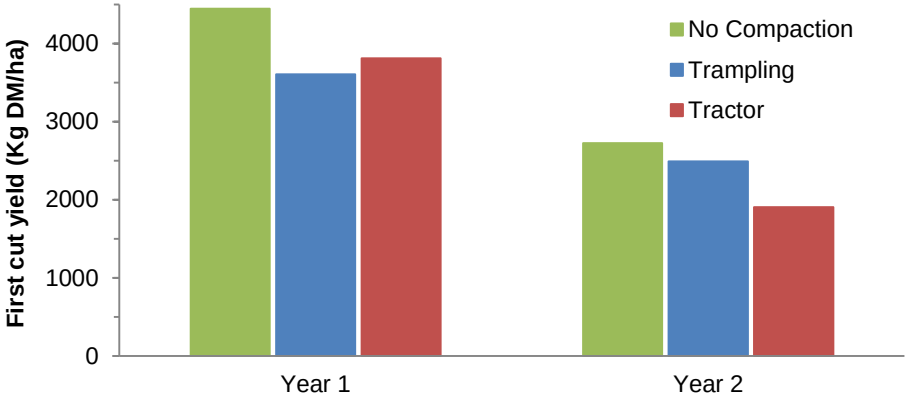

No compaction

Compaction had a negative effect on soil structure, increasing bulk density of the soil and resulting in an increase in the number of large, blocky, angular aggregates (as indicated above).

b) Impact of compaction on soil water filled pore space



c) Impact of compaction on first cut grass dry matter yield



Initial findings:

- Both tractor and cattle compaction increased soil bulk density as indicated by large number of blocky, angular aggregates
- Compaction increased water retention in the soil by 17%
- Trampling and tractor compaction reduced first cut grass yields by approximately 20%.

Top tips for using top-soil looseners*

Guidelines from ADAS work in the 1980s provide some clear messages for producers when using topsoil looseners. The most timely one is to aim to remedy compaction in the autumn, as dealing with compaction in the spring may cause more problems.

The ADAS guidelines are as follows:

1. Do not use topsoil looseners unless there are clear signs of soil compaction and the moisture content is suitable:

- Examine the soil by digging holes to find out the nature and depth of any compacted layers, as well as the moisture content and friability of the soil
- Topsoil loosening in conditions which are too wet will potentially lead to increased soil damage through smearing and wheel slip
- Topsoil loosening in dry conditions is likely to lead to the formation of large clods, sward tearing and excessive surface heave giving an uneven surface finish

2. Topsoil loosening is not recommended in poorly drained soils if there is no drainage system present, as this is likely to cause excessive wetness in low lying areas which will potentially be at further risk of poaching and re-compaction. In these situations, and on heavy textured soils, a mole plough may be more effective in improving the soil drainage status than topsoil loosening

3. Topsoil loosening should be carried out in the autumn when grass growth is declining. If carried out in the spring or summer when grass is growing rapidly, disturbance to the root system can lead to severe sward death

4. Use the appropriate equipment and set it up correctly. The depth of compaction will dictate the depth of working required - make sure the compacted layer is about 2.5 cm above the critical working depth of the

implement used and examine the extent of shatter on a trial run, adjusting the equipment if necessary

5. Recently loosened soil is very sensitive to re-compaction and it is important to allow the newly loosened structure to be stabilised by root activity and natural soil processes:

- Cut or graze the site immediately before treatment to ensure sward height is low (<4 cm)
- Avoid grazing after loosening and conserve rather than graze in the first spring after treatment
- If late growth needs utilising, use sheep rather than cattle to minimise re-compaction damage
- Do not spread slurry on recently loosened fields

*Adapted from ADAS Technical Briefing notes (ADAS, 1984; 1987).

Arable land compaction strategy

As well as sub-soiling the farm also implements use of deep rooted over winter break crops in rotation.

Mixes have included Ryegrass, vetches, clovers, peas, sunflower and Phacelia. The phacelia is very good as it has a very deep root, plus it exudes sugars from the roots that the soil micro flora thrive on and increase their number, leading to a far more healthy and alive soil. The vetches and clovers help with fixing N

Slit aeration and slurry application

The liquid fraction of the separated slurry at Home Farm is applied via an underground hydron and umbilical system to grazing paddocks

throughout the grazing season. This is done in conjunction with simultaneous slit aeration, the spiker fitted to the front linkage of the tractor.

As there is very little research currently available on this practice, the farm has set up a demonstration to assess the value of adding slit aeration to the slurry spreading procedure. On one hand, this practice may encourage infiltration of the slurry, reducing sward contamination and resulting in better nutrient uptake. However, recent research results would suggest that slit aeration in actively growing sward can result in root damage and a potential loss in yield through plant death.

Two adjacent paddocks are monitoring the effect of this combined practice on grass growth and soil structure:

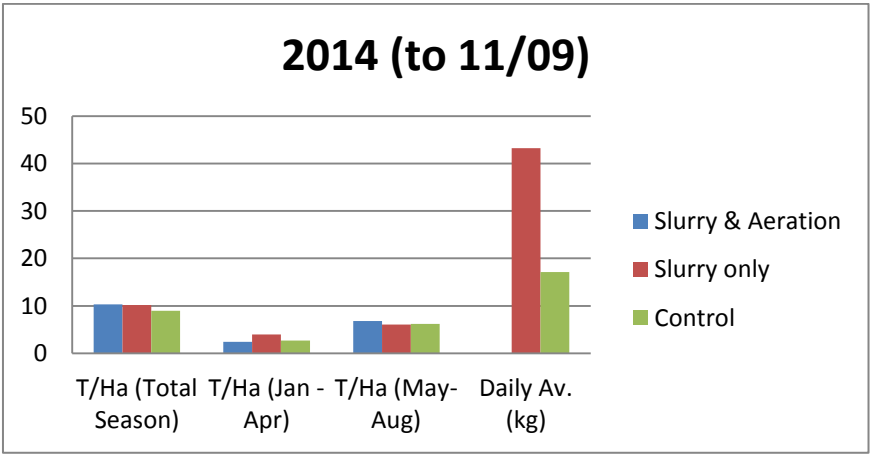
1. Slurry only
2. Slurry and Aeration

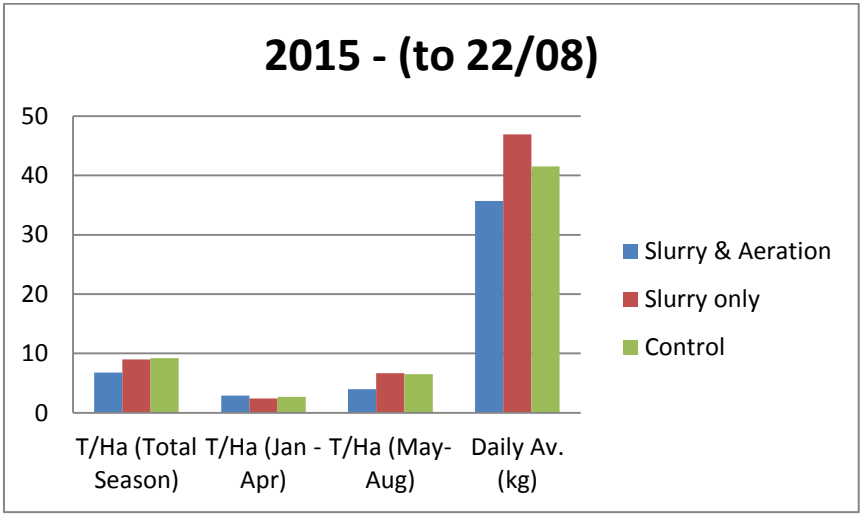
The table below shows the soil nutrient status of these two plots.

	pH	P	K	Mg	LoI*(%)
Slurry only	5.0	3	3	4	11.4
Slurry & Aeration	5.8	3	3	4	11.4

Slurry applied kg/ac since April 2014	
Slurry Only	2.33
Slurry and aeration	5.7

Grass growth throughout the demo on these test plots is shown in the graphs below.





Showing aeration of the demo plot a few days after operation, 19/08/2014.

2014 summary

- Control plot yielded about 1 tonne per ha less than the two plots receiving slurry
- Slurry and slit aeration plot has done marginally better overall.
- Biggest difference between the plots was seen in January to April growth, when the slurry only plot yielded about 1.7 tonnes per hectare more.

AHDB Dairy Research: Slurry separation on grazing pastures

- This higher available N and lower DM content of the liquid fraction of separated slurry may encourage better grass growth but currently there is little information available on the actual performance of swards grown from separated slurry

- To examine this option, researchers at SRUC are investigating the performance and grazing behaviour of mid-late lactation cows grazing pastures treated with:

  1. Whole slurry
  2. Separated slurry
  3. Fertiliser

Slurry was applied via a dribble bar tanker, 18 days pre-grazing. Cow groups were given access to 2-day paddocks which were grazed to a

target residual of 1500 kg DM/ha.

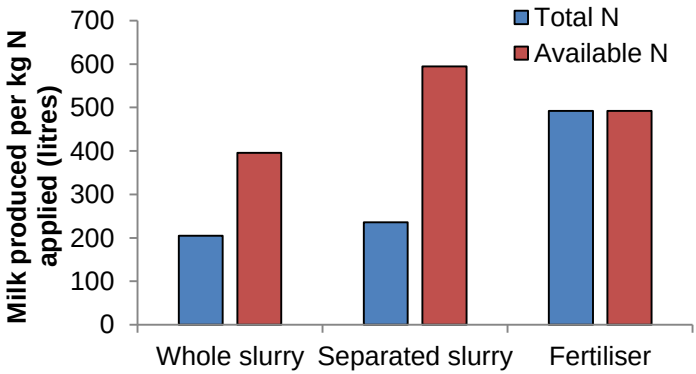
d) Differences in nutrient application rates across the three treatments

	Whole slurry	Liquid fraction	Fertiliser
Dry matter (%)	5.2	2.8	-
Total N applied (kg/ha)	67	64	36
Ammonia N applied (kg/ha)	35	25	36

Initial findings:

- Whole slurry application increase soil potassium content compared to separated slurry.
- Grass DMI was greater on the separated slurry treatment than either the fertiliser or the whole slurry treatment and consequently resulted in a higher milk yield (16.8 l/cow/day) compared to the fertiliser (16.0 l/cow/day) or whole slurry (15.1 l/cow/day) treatments.
- As a result nutrient efficiency was greatest on the separated slurry treatment per kg of available N.

e) Milk production per kg of available or total N applied.



Contact details

AHDB Dairy:
Ms Sarah Bolt
Devon Extension Officer
T: 07717 501564
E: Sarah.Bolt@ahdb.org.uk

Dr Debbie McConnell
R&D Manager
T: 02476 478704
E: Debbie.McConnell@ahdb.org.uk

British Grassland Society:
A: Arthur Rank Building, Stoneleigh Park, Kenilworth, Warks CV8 2LZ
T: 02476 696600

Miss Charlotte Evans
Technical Project Manager
T: 07960 007649
E: charlotte.evans@britishgrassland.com

Dr Elizabeth Stockdale
Soil Scientist: School of Agriculture, Food and Rural Development
A: Agriculture Building, Newcastle University, NE1 7RU
E: elizabeth.stockdale@ncl.ac.uk

Feedback

Please use this space to make notes during the event. Your feedback is important and we will review it at the end of the session.

What worked?	What could be improved?
Ideas or suggestions for improvements?	Questions / things I would like to find out more about?
Other	

AHDB Dairy and BGS would like to thank J.G. Quicke and partners, and all the farm staff at Home Farm for their hospitality, interest and support towards this project.