



**Scottish Farming
Innovation Network**  **Soil Association
Scotland**



*Supported by the Duchy Originals
Future Farming Programme*



FIELD LAB REPORT:

***Farm-Scale Anaerobic Digestate in an Organic Dairy System
Meeting 2 – Wednesday 21 May 2014***

The AD field lab will run until the end of 2014, and will look at the practical, environmental and economic implications of using anaerobic digestate as an integral part of an organic dairy system.

The second meeting of the AD Field Lab took place in May, with the main focus being a comparison of digestate application methods on the silage crop, as well as catching up on what had happened with the digester itself since the last meeting.



Before focussing on the digestate application trial, the group had a look around around the 25kw digester and a discussion about the practicalities of running a small farm-scale digester; which led some to ask why more farmers aren't yet going for small resource-efficient systems such as this one. David Finlay hopes that more farmers will begin to recognise the benefits of smaller digesters, which can make resource use on the farm more efficient and also reduce and make use of waste. A 25kw unit is often too small to get an economical grid connection, but provides electricity and hot water to the farm which is a real asset for the Finlays. The group also discussed feedstock composition (such as growing silage for the digester) and some of the factors influencing production of quality digestate.



An umbilical dribble bar bandspreeder

Digestate Application

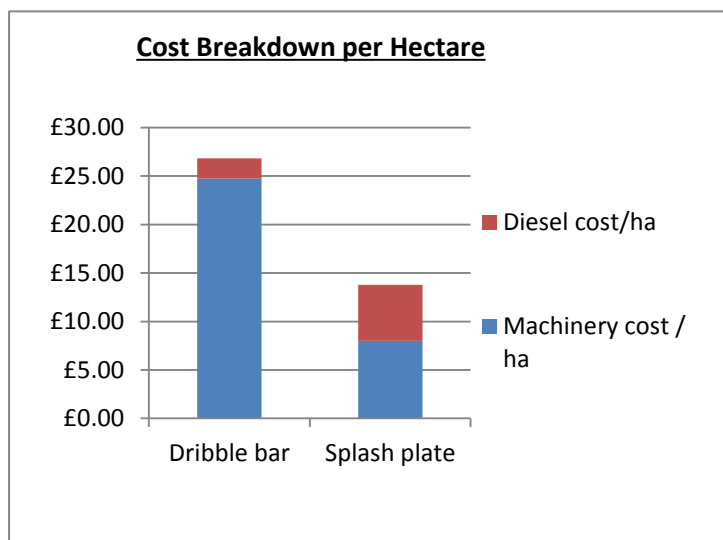
In meeting 1 researcher Audrey Litterick emphasised that timing and application method were the most critical factors to reducing nitrogen (N) losses during slurry and digestate application. For this reason, one of the first things the group decided was that the field lab should include a comparison of spreading equipment – specifically between the broadcast (splash plate) system which David currently used and a bandspreeder system.

In comparison to a surface broadcaster, a bandspreeder (in this case an umbilical dribble bar) has the potential to greatly reduce N losses, particularly ammonia and nitrous oxide, as the material is put in direct contact with the ground surface and gets into the soil very quickly. This is particularly important when slurry is replaced with digestate, as digestate typically contains higher levels of ammonia. Timing and weather conditions are also critical – spreading after September or in very wet or windy weather could see as little as 10% of available nitrogen being used by plants, compared to 60% on a dry spring day when grass is actively growing.

One suggestion from the group for further reducing N losses was to add sawdust to digestate before spreading; which can act to soak up some of the nitrogen and boost soil organic matter (which can be as low as 1% in digestate). However this would potentially block bandspreeder pipes so would have to be tested carefully first as it may not work.

Equipment Comparison: Cost and Practicality of Broadcast vs Bandspread

Two areas of silage were set out in adjacent (& similar) fields to compare the cost and practicality of application methods. Figure 1 shows the machinery and fuel costs for each system per hectare, and reflects the higher equipment cost of hiring contractors to spread the first area with the bandspreeder (dribble bar) system. This higher cost was mitigated to some extent however by a reduced diesel cost and a higher spreading rate of 3.15 ha per hour, compared to 1ha per hour on the area spread with the broadcast (splash plate) system. The ‘dribbled’ digestate also went further; using only 8kl/ha compared to 20kl/ha spread with the splash plate.





Although the bandspreader system was shown to be more expensive than the broadcaster currently used by the farm, this is not the only factor being taken into account. David found that the bandspreader was very easy to use; it noticeably reduces compaction because the umbilical cord means a heavy trailer is not needed, and if desired cattle can be put into the field to graze very quickly as there are still 'stripes' of clean grass which they will eat. In addition to this, he also found

that working with digestate rather than slurry caused there to be no smell, very few seagulls (possibly because worms are not having to come to the surface for air), and reportedly 'a dream to work with', as it is macerated before going into the digester so is a very uniform material making it quick to spread. Because of these factors, David has decided that going forward bandspreader equipment will be used to apply digestate to silage crops at Rainton.

Unfortunately it was not possible to measure nitrate losses as planned, due to changes in circumstances at Glasgow University who were going to be involved in data collection.

During the next phase of the trial, measurements will also be taken of silage yields at harvest to look at whether application method (and potential reduction in N losses) has an impact on yield; and this information will also be compared to yield data where slurry was used instead of digestate.

Nutrient Budgeting for Efficient Resource Use

As nutrient budgeting is a significant factor in farm efficiency and "climate smart" agriculture, the group decided that the next meeting should focus on nutrient budgets; including nutrient analysis of the digestate, soil analysis and crop requirements. Non-organic farms especially can significantly reduce nitrogen inputs (and save money) by calculating the fertiliser replacement value of slurry and digestate and optimising application methods and timings.



There are a number of calculation tools available to farmers, including PLANET and MANNER NPK; the last of which will be demonstrated at the next meeting using data collected during the trial. We will also use SAC Technical Note TN650 as a reference.

Two different carbon audits for the farm will be compared at the next meeting, the first one having been carried out by SAC and the second one being Soil Association's Farm Carbon Assessment Tool which was done by David at the beginning of the field lab. Finally Audrey Litterick will also share some relevant results from a recent Defra/WRAP-funded study in Ayrshire, which looked at ammonia and nitrous oxide losses during and following digestate application.

The third meeting of this field lab will take place on Wednesday 10th September 2014, and is open to all who are interested. You can find more information on [our website](#), where you can also read the report from the first meeting.

For more information please contact Colleen McCulloch at cmcculloch@soilassociation.org or call 0131-666-2474.



**Scottish Farming Innovation Network
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