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Future Farming Programme***



## **FIELD LAB REPORT:**

### ***Farm-Scale Anaerobic Digestate in an Organic Dairy System***

#### ***Meeting 4 – Thursday 2<sup>nd</sup> July 2015, Rainton Farm (Cream o' Galloway)***

*The AD Field Lab ran from November 2013 until July 2015, and explored the practical, economic and environmental implications of producing and using anaerobic digestate as an integral part of an organic dairy system.*

The AD Field Lab has focused on three main areas: comparing cost & practicality of digestate application methods; assessing the effects of these methods on silage yield; and quantifying the effects of application timing & method on soil quality, crop-available nitrogen and air & water emissions. Due to a number of factors it was not possible to measure the environmental aspects, such as ammonia emissions, at Rainton; however researcher Audrey Litterick was able to present representative environmental data from a [WRAP DC-Agri](#) project which was running during the trial period.

The final meeting was an opportunity for host farmer David Finlay to give an update on 2015 silage yield, Audrey to report on results from the recently completed digestate field experiments from the WRAP/Defra-funded DC-Agri project, and to reflect on the findings of the past 18 months, drawing together some conclusions on the benefits and challenges of farm-scale AD.

Rainton's whole silage crop in 2015 was treated with digestate using a dribble bar; slurry and the splash plate spreader were not used. The 2015 silage yield was compared to the farm's 5-year average, when slurry had been applied using the splash plate spreader. 2015 silage yields were found to be more than 20% above the farm average; which, despite a very cold and wet spring, was in line with what David had been hoping for. In 2014, the yield from areas treated with digestate using the band spreader was as much as 40% above the average yield for the same fields when slurry had been applied; however it was not possible to tease out how much of this could be attributed to

the digestate having more available nitrogen (N) compared to slurry, the method of application, or the unusually warm weather.



*Farm-scale AD has the potential to make some farms more resilient, sustainable and resource-efficient*

Digestate has the same total nutrient content as the slurry from which it is derived. However, it can be capable of delivering more N to growing plants in the season of application, because more of it is in readily available form (RAN). However because the weather was so good in 2014, yield comparisons between slurry and digestate-treated areas showed no significant difference.

David also discussed the financial implications of farm-scale AD. At less than one third of the cost of a larger industrial unit, David believes farm-

scale AD could be within financial reach of many livestock farmers. The slurry store and micro AD system were constructed mainly by farm staff, with a gross capital expenditure of around £220k including labour. A recent cost-benefit analysis showed that if the system had been designed for new-build or retro-fit, and an assumed capital expenditure of £250-300k, the pay-back period would work out at roughly 6½ years. This assumes a 70% substitution rate of purchased electricity, 75% operational efficiency, 10-year depreciation for the plant, 25-year for the civil engineering work, and a Feed in Tariff (FiT) value of 14p/kWh and export value of £40/MWh. Financial incentives for this scale of system are available, but the Finlays received 50% grant funding so were ineligible for FiTs or Renewable Heat Incentive (RHI), and the 25kW capacity is currently too small for Renewables Obligation Certificates (ROCs).

Audrey reported on the findings of the recently completed [WRAP DC-Agri Project](#), which over the last 3 years has run replicated field experiments across around multiple UK sites to quantify the effects of digestate application on N losses & efficiency of N use. The results confirmed that applying digestate with modern band spreading equipment can significantly reduce nitrate leaching & ammonia losses compared to surface broadcast (splash-plate). Shallow injection can reduce these further still. Timing of incorporation (i.e. within 6 hours of application) was also shown to be a very important factor, especially in an arable situation.

DC-Agri project results also confirmed that timing of application is key to minimising losses, and reinforced the message that digestate should only be applied during spring and summer when plants are actively growing. Up to 90% of available N can be lost in autumn and winter when plants are not taking up nutrients, compared to just 35 or 40% loss if applied in spring with favourable conditions using precision equipment.

It was hoped at the beginning of the Field Lab that environmental data could be measured at Rainton, however this was not possible due to a number of constraints so the DC-Agri project data was used to illustrate what might have been seen in terms of environmental & yield data.

Audrey highlighted that many farmers are not getting the full potential from their slurry or digestate. Many are spreading slurry or digestate in autumn/winter due to a lack of slurry/digestate storage. They often then have to buy additional bagged N in spring. Optimising the timing and method of application could save £000s on lost N. Nutrient budgeting and NVZ guidance are also good practice and make financial sense, as does working out the fertiliser replacement value and revised crop requirement for bagged fertiliser for non-organic farmers. Understand when crops need nutrients, and test digestates to match demand with applications.



*Audrey illustrated the difference in N use efficiency between spring & autumn digestate application*

The Finlays reflected that the Field Lab has enabled them to look in more detail at how they made best use of their digestate and how AD fits into their farming system. They have plans to further refine the process and will soon start measuring and benchmarking parameters of the AD unit.

There is huge potential for small-scale AD across the UK. The cost of installation is falling, and the availability of technology and access to practical expertise are increasing. Limited financial and technical support for smaller systems can be barriers to progress, but interest from farmers is growing and appropriate financial support is becoming increasingly available. Initiatives such as Field Labs can also help by bringing together like-minded farmers and industry members to highlight the merits and potential of farm-scale AD.

Farm-scale AD has the potential to provide farmers with a new way to combat everyday problems, and encourage developments within agriculture that will contribute towards a revolution in more resilient, climate-smart, and sustainable farming.

You can find more information about AD on [our website](#), read the meeting summaries [here](#) and see the final field lab report [here](#).

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