

Number of Arable businesses registered:
765

Number of Horticulture businesses registered:
373

Mentoring programme

21 MENTEES MENTORED ON LAND THEMES
127 NEW MENTEES DURING THIS PERIOD

The most popular topics applied for during this period were:

Water Pollution



Setting up a horticulture enterprise



Woodland management



Clinics

200 CLINICS TOOK PLACE DURING THIS PERIOD

60 of these clinics were soil sampling clinics with 246 businesses benefiting from the clinics.

These clinics were carried out by a consultant who then gave the business an introduction to the topic, results of the samples and then any recommendation following an analysis of the result.

Demonstration Network

Clover living mulches on arable land – Bryn demonstration site

The aim of this project was to demonstrate and validate clover living mulches as a viable, achievable and profitable option for arable farmers in Wales. At Bryn Farm, the two fields we identified both having been under similar historic management and soil samples showed very similar results. Field management was undertaken where spring barley was sown on 31/3/2022. One field was undersown with AberPearl and AberAce white clover. To identify if the clover was having any impact on the barley crop, an assessment was undertaken at the booting stage of the crop. Data on many variables were collected and the table below compares the two fields.

From the initial interpretation of the data, the field with clover mulch performed better than the control field, however it also had a significantly higher severity of the foliar disease Net Blotch. It was promising to discover that the clover had germinated and grown in unison with the barley and not inflicted a yield penalty as a result. When the barley was harvested, the yield from the control field was 2.86t/acre, and the field with clover mulch at 2.93t/acre.

The weather had been very dry over the summer, resulting in a bad drought on the farm. The clover population was very low (figure 1), but since the rain at the beginning of September, the clover regrowth (figure 2) provided a beneficial ground cover until the winter oats were direct drilled on 27 September. Huw, the farmer, was also able to graze cattle on the clover prior to sowing. The effects on clover mulch on winter oat establishment and growth will be monitored further.

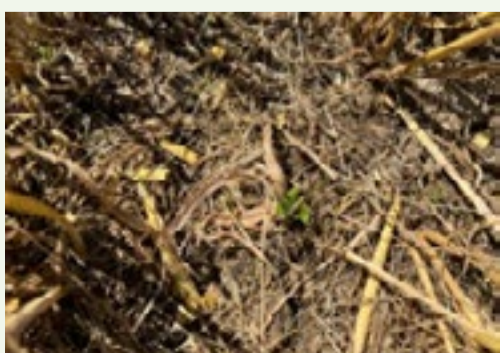





Figure 1. Clover cover 10 August 2022.



Figure 2. Clover cover 27 September.

Knowledge Exchange Hub

-  FARMING'S FUNGI FOCUS: CONSIDERING BELOWGROUND TO BENEFIT ABOVEGROUND
-  MYCORRHIZA MANIPULATION: NATURE VS NURTURE
-  HITTING ROCK BOTTOM: CAN SILICA ROCKS MITIGATE AGRICULTURAL EMISSIONS?

Evaluating BOKASHI (Fermenting organic matter) – Llwynmendy focus site

NRM laboratory analysis of two organic farmyard (FYM) manure samples have been taken at Llwynmendy focus site to determine the nutrient content. The two analyses are for cattle manure, one being standard FYM and the other sample processed FYM. The processed FYM is treated under the Bokashi management regime. This report recommends what nutrients would be applied using the Manner computer software, based on the proposed application rate. The application rate for both FYM samples was stated as a light application of 5t/ha (2t/acre) on the grassland during the growing season.

	Dry Matter % DM	Total Nitrogen Kg/t	Total Phosphate Kg/t	Total Potash Kg/t	Total Sulphur Kg/t	Total Magnesium Kg/t
NRM Standard FYM	21.7	5.36	1.97	12.42	2.08	0.81
RB209 (FYM)	25.0	6.0	3.2	9.4	2.4	1.8

Table 1: Standard FYM sample.

The NRM farm sample standard FYM analysis had a lower total dry matter, total nitrogen, phosphate, sulphur and magnesium content than the RB209 standard figures. The total potash content was higher than the standard figures.

Table 2. NRM analysis and comparison for the processed FYM sample with standard average RB209 manure analysis.

	Dry Matter % DM	Total Nitrogen Kg/t	Total Phosphate Kg/t	Total Potash Kg/t	Total Sulphur Kg/t	Total Magnesium Kg/t
NRM Processed FYM	20.1	3.9	2.5	7.77	2.17	1.09
RB209 (FYM)	25.0	6.0	3.2	9.4	2.4	1.8

Table 2: Processed FYM sample.

The NRM farm sample processed FYM analysis had a lower total dry matter, total nitrogen, phosphate, potash, sulphur and magnesium content than the RB209 standard figures.

Note: The nutrient content of livestock manures is closely related to the dry matter, with higher dry matter manures having higher nutrients per tonne or m³ applied. Thus, application rates need to be adjusted in line with crop requirement relative to the dry matter of the manure applied.

Manure application results

Results from Manner show the total amount of nutrients which are applied for each application when the cattle FYM is applied in April to grassland at an application rate of 5t/ha (2t/acre) for both samples. The nutrient content of the standard FYM sample, surface applied during April at 5t/ha, shows a total of 2kg/ha of available nitrogen, 10kg/ha of total phosphate and 62kg/ha of total potash supplied to the grass crop. The nutrient content of the processed FYM sample, surface applied during April at 5t/ha, shows a total of 1kg/ha of available nitrogen, 12kg/ha of total phosphate and 39kg/ha of total potash supplied to the grass crop. The manure nutrient content has a considerable financial value based upon current prices for nitrogen phosphate and potash fertilisers. The programme calculates this as £98/ha for the standard FYM, and £72/ha for the new processed FYM sample. In practice, the dry matter will vary thus this needs to be taken into account when applying organic manures.

Using LoRaWAN connectivity to collect real time soil nitrate, temperature and moisture readings in a winter wheat field – Pantyderi Demonstration Site

Winter wheat was sown following the peas and beans at Pantyderi demonstration site and to help assess any residual nitrogen fixed by the legume crop, nitrate sensors being developed as part of an Innovate UK project at the John Innes Centre, Norwich, were placed in the soil at 15cm depth along with temperature and moisture sensors. Data was collected and transmitted every two hours via a LoRaWAN gateway on the farm. An app was developed so that all parties could view the results.



Figure 3: Set of soil nitrate, temperature and moisture sensors with LoRaWAN transmitter.

Soil Nitrate readings ppm

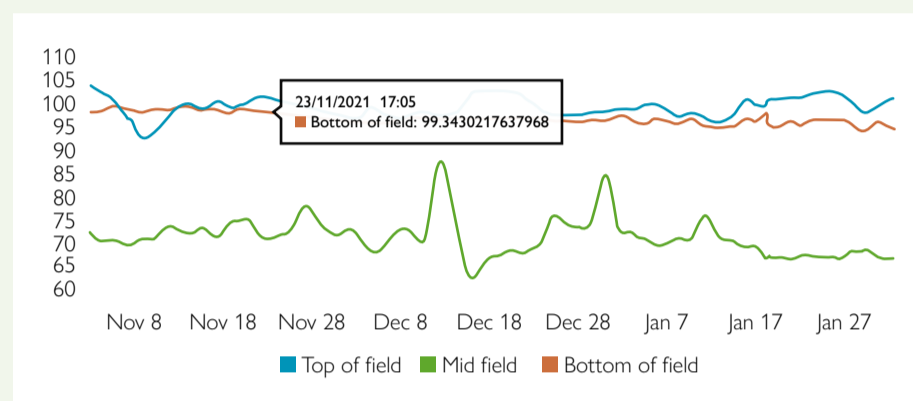


Figure 4: Nitrate sensor readings from December to March.

At installation, sensor data results showed that soluble nitrate levels were two to three times higher than would normally be expected as a soil basal level, and there was no evidence of a subsequent drop in levels representing leaching or denitrification over winter. Advice given was to allow the soil nitrate levels to drop by around 20% before the application of any nitrogen fertiliser.

Soil temperatures of 7°C are required for nitrogen mineralisation and uptake and these were not recorded consistently until mid-April in this exposed field at 230m above sea level.

With minimal variation in nitrate readings in April after application of nitrogen fertiliser, it was judged that the sensors were flatlining and they were removed and replaced on 26 May. The returned sensors were recalibrated and showed poor sensitivity to nitrate, particularly in the lower concentrations where finer changes are detected.

The trial work was further confounded by the exceptionally dry spring and summer conditions as the nitrate sensors measure water soluble nitrogen. This may have also contributed to the minimal variation seen.

Work is continuing with refining the robustness of the sensors further for application in field conditions, but it is recommended that they should be replaced in the soil every 5-6 months anyway. The application of LoRaWAN connectivity to regularly harvest and transmit such data has worked well and the process has withstood field and extreme weather conditions with no significant problems.

Soil Nitrate readings ppm

Samples of grain were taken at harvest from Pantyderi demonstration site in 2022 and submitted for the 'YEN Nutrition' service, which tests all 12 essential crop nutrients and benchmarks them against national results. Headline results for the four spring barley samples, one winter barley and one winter wheat sample showed:

- Crops all yielded well and presented above the Defra five-year average
- Soil analyses showed no field deficiencies in phosphorus (P), potassium (K) or magnesium (Mg)
- Soil pH was slightly suboptimal and would benefit from being raised to the target of 6.5 for cereal production to guarantee the best nutrient efficiency and availability
- Grain nutrient concentrations for the macronutrients nitrogen (N), P and K were not low or high in the case of N
- Boron was low in all the crops analysed, indicating that foliar application of boron should be considered for the coming season.



Events linked to Demonstration Network

Pantyderi demonstration site event covering:

- Soil texture, pH, phosphorus and potassium results for 100ha of land
- Savings in lime on arable and grassland using variable rate application
- Variable rate sowing of spring barley
- Growing and harvesting a bi-crop of peas and beans
- Cost savings and performance of beef rations including all home-grown feeds
- Carbon footprint benefits of growing peas and beans
- YEN Grain Nutrient Benchmarking results
- Use of LoRaWAN gateway to collect soil nitrate, temperature and moisture readings
- Welsh Soils Project results nationally and for Pantyderi
- Next steps for the farm to further build resilience.



Figure 5: Soil mapping of phosphorus(P) and potassium(K) results.

27.10.22 Building a successful no-dig market garden

This event was held at Cae Newydd focus site, Upper Brynamman, where vegetables are grown on a commercial scale to supply farmers markets throughout south Wales.

The first beds were established five years ago by placing a cardboard barrier on 30-inch wide beds and covering with horse manure, with woodchip paths between rows. Further beds were established in a similar manner but using green waste compost. More recently, green manure cover crops are being used in the newer beds to increase organic matter more rapidly.

Soil spear samples showed that the depth of dark organic matter rich soil was directly related to the length of time the beds had been established. Below this, the soil was clay with rust flecks, indicating gleying and compaction, exacerbated by the heavy rainfall on the south slope of the Black Mountain and at an altitude of 270 metres.

Chris Creed, ADAS horticulture consultant, confirmed that minimum cultivation gardening significantly reduces weeding time requirements and is beneficial for the soil and environment, but raised the following points:

- It can take up to two years for the biological action in the soil to settle, which initially means reduced crop yields
- Bought-in manure should be composted properly on-site using 1.5m high windrows that are turned weekly to aerate and mix the contents, generating high temperatures
- Be aware that residues from pesticide used for clearing ragwort may be present in some manure, requiring a bio-assay using a susceptible crop such as beans before general use
- Test the nutrient status of the manure rich soil and if the phosphate (P) index is 3 or above, do not apply any further P rich amendments
- While leaving crop debris is good as a soil cover, be careful that the crop does not go to seed, resulting in a whole host of new weeds.



Figure 6. Chris Creed at Cae Newydd.



Using biochar as a soil amendment



Figure 7: Tony Davies, William Roberts, Owain Rowlands (EIP Wales), and Oliver Kynaston.

Biochar, a type of charcoal produced during pyrolysis and known to increase carbon sequestration, was put to the test on four sites as a European Innovation Partnership (EIP) Wales study.

During a Farming Connect open day at one of those sites, Cae Newydd at Upper Brynamman, the results showed a strong case for applying biochar mixed with a sheep's wool compost.

Both the biochar, made from Molinia grass, and the compost were produced by Tony Davies on his farm at Rhayader.

When a combination of biochar and compost was applied at 30t/ha, the trial showed a 14.8% increase in crop performance on average across all sites and vegetable types when compared to the control plots.

Biochar alone, incorporated at 10t/ha, achieved an 8.2% increase.

For the plots where only wool compost was applied, at 30t/ha, yield reduced by 7%.

The trials involved crops of radish, basil, courgettes, maize and cabbage and 14 experiments were conducted with each of the applications at different rates, to compare to control plots.

Oliver Kynaston, a consultant with expertise in this area, oversaw the trial and analysed the results.

"Adding biochar to the soil during these trials has been shown to be good for crop performance," he said.

"And when growing conditions are quite poor, for instance in the heat of summer when there is not quite enough moisture, the crops grown with biochar and compost performed twice as well because it improved the water holding capacity of the soil.

"This trial has shown me that biochar could be an input to consider going forward when it is more readily available and affordable."

Webinars (relevant to Land theme)



39 WEBINARS AND EVENTS held with 1,519 VIEWERS OR ATTENDEES

Examples of webinars and events held include:

Risk Map Workshop



Welsh Pasture Project Review 2022



Zoom around the World

Film released under this theme in this period include:

- ▶ MAKING THE WORLD A BETTER PLACE BY PERMACULTURE FARMING
- ▶ GRASS CULTIVATION PRACTISES IN FINLAND
- ▶ REDUCING WINTER GRAZING NITRATE LEACHING WITH CATCH CROPS



Advisory Service

Number of business who have received support through the Land Categories of the Advisory Service during this period:



37 individuals received one-to-one support through the Land Categories of the Advisory Service during this period.



90 groups made up of 292 individuals received support through the Land Categories of the Advisory Service during this period.

Feedback from businesses on delivery of this Advisory service:

"This service will save the farm money and be better for the environment. It is a win for both."

"Extremely useful discussions to understand our results."

"Excellent service and communication."

Discussion Groups



Cheryl Reeves, chair of the Beef Finishers Discussion Group in North Wales had taken part in trialling bio-fertilisers supplied by Russell IPM, specialists in insect pheromones and other bio-rational solutions for crop protection. The company is based in Deeside, North Wales and has developed the liquid bio-fertiliser in-house. Bio-fertiliser is a natural fertiliser that consists of live biomass or dormant cells of effective microbial strains, that increase the availability of nutrients to the plants. It is applied in liquid form, penetrating the plant and activates on a cellular level.

Abu Ali of Russell IPM was invited to speak to the group about this new approach and alternative to synthetically manufactured fertilisers, and how the mini-trial had gone on Cheryl's farm. Bearing in mind that the cost of conventional fertilisers has increased dramatically in the last 12 months, and is still looking to be expensive in spring, the group members were interested to learn about any alternatives, as well as the results of the mini trial. Cheryl had treated one half of a field with standard manufactured fertilisers and the other half with bio-fertilisers, therefore a visual comparison could easily be done. She reported positive results in grass growth in the area of the field that was treated with bio-fertiliser.

Group members are interested in trialling the product themselves in the coming year.

Training

Courses	Number of individuals trained during this period
Rough terrain telescopic lift truck	23
Level 2 award in safe use of pesticides PA1 & PA2	22
Woodland management for onservation	13
Mole control trapping techniques	11
Chainsaw maintenance and cross cutting	10

E-learning

Some of the e-learning courses completed within this period include:

FARM SAFETY – WORKING SAFELY WITH TRACTORS



IMPROVING SOIL HEALTH



GRAZING SYSTEMS



TREE IDENTIFICATION



Click here to visit the website.

