ARABLE DASHBOARD

October 2021 – September 2022

761 OF BUSINESSES REGISTERED WITH FARMING CONNECT ARE FROM THE ARABLE SECTOR

Demonstration Network

Pantyderi: YEN Grain Nutrient Benchmarking

The Yield Enhancement Network or YEN connects agricultural organisations and farmers who are striving to improve crop yields with the aim of closing the gap between current yields and potential yields. The need for routine grain analysis has grown increasingly evident with grain testing of over 1000 samples from YEN farmers revealing that 74% of cereal crops were deficient in at least one nutrient. This indicates that despite the best efforts of many growers, nutrition was commonly inhibiting the full potential of their crops.

Samples of grain were submitted for nutrient analysis at harvest 2021 from six fields at Pantyderi Demonstration Farm and benchmarked against national results and another seven farms in west Wales.

Headline national results for the 2021 harvest showed:

- Nitrogen, phosphorus and sulphur were most commonly deficient
- Potassium levels tended to be high
- Little variation was explained by soil factors (texture, pH, P, K)

The Pantyderi results for six spring barley fields harvested demonstrated that:

- Nitrogen, phosphorus, potassium and sulphur nutrition was adequate
- Calcium, boron and copper were slightly low
- Manganese and zinc were low on half the crops sampled

YEN Nutrition target diagram

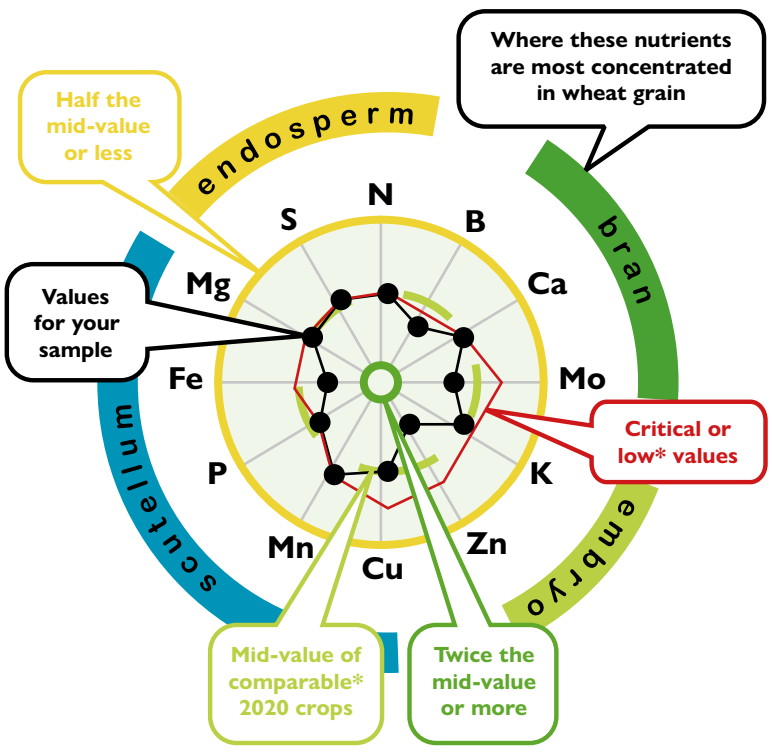


Figure 1. YEN Nutrition Target diagram, 2 July 2021.

Target nutrient levels should be just within the red circle

This information will be invaluable in helping to formulate an appropriate nutrition plan for cereal crops for the coming season, helping to improve yields, save unnecessary costs and provide for a better environmental outcome.

Arnolds Hill Farm: Undersowing maize for environmental and economic benefit

Climate change is delivering more winter heavy rainfall incidences, and river monitoring has indicated that this is accompanied by spikes in river phosphate levels, which has been attributed to soil run-off. Leaving maize stubbles bare over winter is therefore not sustainable, but planning to establish a crop or cover after maize harvest can be problematic because of autumn soil conditions and late sowing.

What are the benefits of undersowing maize?

- Reduces soil erosion
- Builds fertility
- Builds organic matter
- Retains soil nutrients (+/- 40kg/ha N + K)
- Enhances soil structure
- Easier preparation of spring seedbeds
- Cross compliance good practice
- Provides winter/spring grazing opportunity

The target period for sowing cover crops into maize is from one week after the last herbicide is applied through to the stage when the crop is thigh high in early July. The maize crop should be between the 4-leaf and 10-leaf stage.

Approach

A 5ha field situated on a slope and sown with Augustus maize was chosen, and four different trial plot areas were established by undersowing into the standing maize crop on 2 July using a Zocon tine drill:

Plot 1 Italian ryegrass (IRG) blend

Plot 2 Straight tetraploid perennial ryegrass

Plot 3 IRG and winter vetch

Plot 4 IRG and Berseem clover

Figure 2: Drilling the cover crop plots on 2 July 2021.

Figure 3:20 October.

Plot performance

All the grass plots established well, yielding an average of 2.5-3.0 tonnes DM/ha with the two plots based on IRG providing the highest covers. As anticipated, the plot incorporating the berseem clover appeared to be negatively affected by the maize herbicide.

There was no apparent impact on maize yield, with the crop averaging 43t/ha (17t/acre), similar to previous years when the crop was not undersown.

It is also likely that the undersown sward helps to retain nitrogen in the soil for the next crop, to the extent of up to 40kg/ha. Incorporating vetch would add to this with the establishment of nitrogen fixing nodules on the plant roots acting as a reservoir for the next crop.

Winter grazing

Ewe lambs being wintered on tack were turned into the trial field in December; and 160 lambs were grazed for 17 days followed by another seven days in February. In April, the field supported grazing for another 70 store lambs for 20 days, plus 12 cattle were turned in to clear the field.

Conclusions

Undersowing grass seed into a standing maize crop resulted in complete ground cover by the time of harvest and prevented any surface soil runoff during the winter period.

The cost of the grass seed and drilling at £87/ha were well covered by achieving 1,048 sheep grazing days per hectare, valued at £135 from the resulting sward.

All treatment plots performed well but the treatment of choice for this farm moving forward to support winter tack sheep grazing is likely to be the IRG blend, which produces the greatest dry matter output potential for the period from November to April.

Pantyderi: Evaluating home grown peas and beans as a protein feed for beef cattle

In September 2021, Pantyderi demonstration site were the first in the UK to grow and harvest a bi-crop of peas and beans as a source of protein feed for finishing 400 head of beef cattle, making them completely self-sufficient in beef feed. The crop was combined moist, passed through a crimping machine, treated with preservative and stored in an outside clamp ready to feed out in the winter.

Yields and analyses

The crop yielded 5.25tonnes/ha of peas and beans and 22 haulm bales/ha. Feed analyses:

	Peas/beans	Haulm
Dry matter (DM %	61.7	32.5
ME MJ/kg DM	13.6	7.5
Crude protein % DM	26.6	8.0
D Value %:	93.4	47

Crop costings

The farmer kept detailed costings of labour and fuel costs for all operations, to provide a cost to the farm for growing the crop, and an external consultant used contractor rates to calculate crop costings, also including a land rental value.

	Farmer costings	Contractor costings (inc. land rent)
Growing costs £/ha	432	917
Harvesting cost £/ha	100	100
Crimping & additive £/t	24	24
@ Fresh weight 62% DM £/t	84	161
@ Concentrate equivalent 86% DM £/t	117	223

For comparison, buying in cost of beans was £275 delivered and milled.

Feed rations

Beef rations of equal energy and protein to the previous winter's diets were formulated; the cost savings for feeding the peas and beans are shown below.

	Growing	ration	Finishing	ration
Year	2020	2021	2020	2021
Cost/head/day £	1.35	1.29	2.39	2.18
Cost saving £*		1800		3788

*Cost saving based on 200 cattle being fed for five months on the growing ration and three months on the finishing ration, using contractor costings for peas and beans.

"Working with Farming Connect is an opportunity to increase efficiency and output from our own resourses. This will allow us to strengthen the business for the future."

Wyn and Eurig Jones

Pantyderi: Using LoRaWAN connectivity to collect real time Nitrate sensor readings in a winter wheat field

Winter wheat was sown following the peas and beans at Pantyderi. To help assess 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, therefore that all parties could view the results.

Figure 4: LoRaWAN

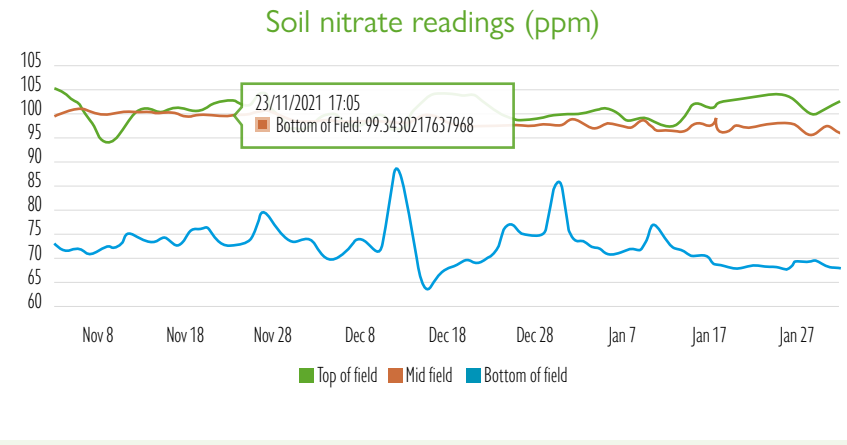


Figure 5: Soil Nitrate reading results.

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. The advice given was to allow the soil nitrate levels to drop by around 20% before applying any nitrogen fertiliser.

Soil sensor readings at 15cm depth showed that temperatures of 10°C were not achieved until late April in this exposed field, this being the level at which it is indicated that mobilisation and utilisation of nitrogen occurs in the soil.

With minimal variation in nitrate readings in the first two weeks of 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, and 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 six months. 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.

Low Carbon Show, Stoneleigh, 9 March 2022

Welsh Government stand: Panel information for Pantyderi

Winter wheat has followed a bi-crop of peas and beans and it is estimated that the nitrogen fixing capacity of the legume crop will contribute up to 100kg/ha residual nitrogen for the cereal crop worth £1,508 for the 8ha field.

Farm carbon footprint

Feed C savings not purchasing 40 tonnes protein concentrate

- 40 x 1.5 tonnes CO_2e/tonne = 60 tonnes CO_2e

Fertilizer C savings for following winter wheat crop

- 2.32 tonnes 34.5% N fertilizer x 3.4kg CO_2e/kg N = 2.72 tonnes CO_2e

Ferilizer cost saving = £1508

Events linked to demo network

4.11.21 Undersowing maize for environmental and economic benefit

Focus site on-farm event to view grass trial plots following maize harvest.

25.11.21 Soil mapping to enable precision land management and growing a protein concentrate feed crop

Pantyderi demonstration site event covering:

- Soil mapping data results
- Savings in lime on grassland and arable land using variable rate application
- Variable rate sowing of spring barley
- Growing and harvesting a bi-crop of peas and beans
- Formulating beef rations with peas and beans

28.4.22 Integrated weed management in grassland, combinable crops and field-based horticulture

Webinar to discuss principles of integrated weed management and cover results of two EIP projects:

- Electrical weeding of docks in grassland
- Robotic weeding of field vegetables

29.9.22 Regenerative farming and building resilience

Pantyderi demonstration site event covering:

- Soil texture, pH, phosphate and potash results for 100ha of land
- Savings in lime in 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 Soil Project results nationally and for Pantyderi
- Next steps for the farm to further build resilience

Venture

1 OPPORTUNITY INCLUDE ARABLE LAND

13 SEEKERS

Knowledge Exchange Hub

The following technical articles have been produced by the KE Hub:

- UNLOCKING THE POTENTIAL OF ALTERNATIVE CROPS: NEW INCOME AND ENVIRONMENTAL SUSTAINABILITY
- FEEDING LEAVES NOT SOIL: AN ALTERNATIVE ROUTE THAN THE ROOTS
- BIOLOGICAL INDICATORS OF SOIL HEALTH
- GROWING CROPS FOR THE PHARMACEUTICAL INDUSTRY
- INDOOR OR IN-FIELD: CLIMATE IMPACTS OF CONTROLLED ENVIRONMENT GROWTH
- CHANGING CROPS IN A CHANGING CLIMATE: THE IMPACT OF RISING CO2 LEVELS ON THE NUTRITIONAL QUALITY OF CROPS
- NITROGEN AND AGRICULTURE – WHERE DO WE STAND?

Discussion Groups

24 DISCUSSION GROUP MEETINGS RELATED TO THE ARABLE SECTOR held with **178** ATTENDEES

Pembrokeshire Arable Discussion Group

The Pembrokeshire Arable Discussion Group over this period undertook a series of meetings looking at the carbon footprint of their businesses with Becky Wilson from the Farm Carbon Toolkit. The meetings included an introduction to the carbon calculator, a data collection meeting as well as a meeting to analyse and discuss the findings from the results.

Having undertaken this series of meetings, the businesses were then able to compare their results within the group, as well as against some of the Farm Carbon Toolkit's data. Specific graphs shared and discussed included:

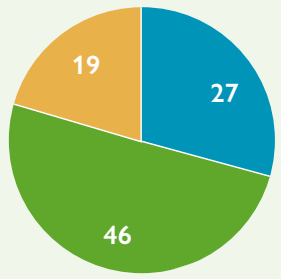
- Carbon balance per farm (tonnes CO_2e/farm)
- Carbon balance per ha
- Carbon balance per tonne of produce
- Gross emissions
- Gross emission compared with net emissions
- Group data compared to Farm Carbon Toolkit averages for arable farms
- Different emission categories
- Input emissions
- Cropping emissions
- Sequestration categories – detailed discussion on soil organic matter and organic matter sampling

Group discussions on the above looked at positive areas and what can be done to improve on certain areas. Becky Wilson then explained that the calculator can be used to look into different 'what if' scenarios for each farm business and how the data can be used to calculate how different management decisions affect their current carbon balance. Examples of this would include how an increase in organic matter would affect the carbon balance or how reducing N fertiliser would affect their carbon balance.

Training

There have been **6** application windows between October 2021 and September 2022 with **1,064** instances of training delivered during this period. Of this number, **92** instances were from the Arable sector.

Individuals trained by category



E-learning

Some of the e-learning courses completed within this period relating to the Arable sector:

IMPROVING SOIL HEALTH

PESTICIDE SAFETY

CAUTION

CLIMATE CHANGE AND LAND MANAGEMENT

For more information on e-learning, please visit the website.

Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig: Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
European Agricultural Fund for Rural Development: Europe Investing in Rural Areas
Llywodraeth Cymru Welsh Government