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1 INTRODUCTION

1.1 OBJECTIVES OF THIS REPORT

The objective of this report is to assess the soil nutrient status on the farm. Through this we can make recommendations for the optimal use of lime, fertiliser, and manures. Options for improving soil management will also be assessed. The report specifically considers how the availability of poultry manure would fit in to the farming system.

By improving soil health and nutrient levels it is hoped that grassland and crop production on farms can reach potential growth.

Lab receipts for soil analyses are included in the appendix.

1.2 DISCLAIMER

This report is prepared from information supplied by Harri Whittingham is prepared in good faith and every effort has been made to ensure accuracy. Gwas cannot accept liability for errors and omissions. Responsibility for action taken lies with the client.

1.3 FARMING CONNECT

Gwas has been approved to deliver the advisory service on behalf of Farming Connect. This technical report is funded through the Farming Connect Group Advice Advisory Service.

1.4 METHODOLOGY

This report is based on discussions with the client about their farming practices and any change in land use and all available soil results. The soil samples were taken according to a standard protocol, with the aim of achieving a representative sample of the upper 7cm of soil from an individual field or a series of similar fields with similar characteristics and soil type. The soils were analysed for pH, phosphate, potassium, and magnesium by NRM and Lancrop.

The standard model used in the UK to establish the optimal application rates of nutrients is the AHDB Nutrient Management Guide RB209. This will be used as the basis for the specific recommendations

2 THE CONTROL OF AGRICULTURAL POLLUTION REGULATIONS

On the 27th of January 2021 the Water Resources (control of Agricultural Pollution) (Wales) Regulations 2021 were announced.

The information in this section is not meant to be exhaustive, but to give a very brief summary of regulations.

Further information is available online at [The Water Resources \(Control of Agricultural Pollution\) \(Wales\) Regulations 2021 Guidance for Farmers and Land Managers \(gov.wales\)](https://gov.wales/government/consultations/water-resources-control-of-agricultural-pollution-wales-regulations-2021-guidance-for-farmers-and-land-managers) and should be carefully read before taking any on-farm action.

2.1.1 Farm Nitrogen Limit

No more than 170kg of nitrogen from manure can be applied each year, averaged across the holding, either directly deposited by the animal or by spreading. This has been currently calculated at 66 kg of N / ha. Even with the introduction of a 16,000 bird free range birds at current cattle and sheep numbers the N loading is calculated at 108 kg / ha of Nitrogen. This is based on 213.12 ha of land available.

2.1.2 Closed Periods for Manufactured Fertiliser

- On grassland, from 15 September to 15 January
 - On tillage land 1 September to 15 January
- *Exemptions apply, notably 80kg/ha of N to grassland up to 31st of October split into two applications.

2.1.3 Closed Periods for Organic Manures

These periods apply to manures with readily available nitrogen (over 30% available N) such as cattle slurry (40% available N). *FYM not included under closed period.* Farm Yard Manure can still be applied during the winter months.

Soil Type	Grassland	Tillage Land
Sandy or shallow soil	1 September to 31 December	1 August to 31 December
All other soils	15 October to 15 January	1 October to 31 January

3 RESULTS AND RECOMMENDATIONS

3.1 SOIL RESULTS GRAZING FIELDS

Field No	P index	K index	Mg Index
Bron 1 Mountain Far Half	1	2-	2
Bron 2 Mountain Close Half	1	2-	2
Bron 11 Big Ffridd Top Farm	1	1	2
Bron 12 Cae Hyll	1	1	3
Bron 13 Little Ffridd	1	1	2
Bron 14 Fron Hen	0	1	3
Bron 15 Gorse Bushes	0	1	2
Bron 16 Mountain Front	1	1	2
Bron 17 Mountain Fron Hen	0	1	2
Bron 18 Mountain	0	1	2
Bron 19 Pointy Field	1	2-	2
Bron 20 Sheep Dip	0	2-	3

3.2 SOIL RESULTS 2 CUT SILAGE FIELDS

Field No	P index	K index	Mg Index
Llandyrnog	4	3	3
Bron 3	0	1	2
Bron 4	0	1	2
Bron 5	0	1	2
Bron 6	0	1	2
Bron 7 Boncyn	2	1	2
Bron 8 Side of House	3	2-	3
Bron 9	2	2-	3
Bron 10 Fron Goch	2	2-	3
Nant y Ne	1	1	2
Cae Nant	2	2-	3
Paddock	2	2-	3
Hirwaen	3	1	3
Wern Fawr	3	1	3

3.3 RECOMMENDATIONS

3.3.1 Lime Recommendations Grazing

Field	pH	Lime required tn/ac grassland
Bron 1 Mountain Far Half	5.8	0.8
Bron 2 Mountain Close Half	5.8	0.8
Bron 11 Big Ffridd Top Ffarm	5.1	2.3
Bron 12 Cae Hyll	5.8	0.8
Bron 13 Little Ffridd	5.0	2.5
Bron 14 Fron Hen	5.3	1.9
Bron 15 Gorse Bushes	5.4	1.7
Bron 16 Mountain Front	5.6	1.3
Bron 17 Moubtain Fron Hen	5.5	1.5
Bron 18 Mountain	5.8	0.8
Bron 19 Pointy Field	5.4	1.7
Bron 20 Sheep Dip	5.5	1.5

3.3.2 Lime Recommendations Silage

Field	pH	Lime required tn/ac grassland
Bron 3	6.3	0.0
Bron 4	6.2	0.0
Bron 5	6.1	0.0
Bron 6	6.1	0.0
Bron 7 Boncyn	5.1	2.3
Bron 8 Side of House	5.8	0.8
Bron 9	6.0	0.0
Bron 10 Fron Goch	5.8	0.8
Nant y Ne	5.7	1.1

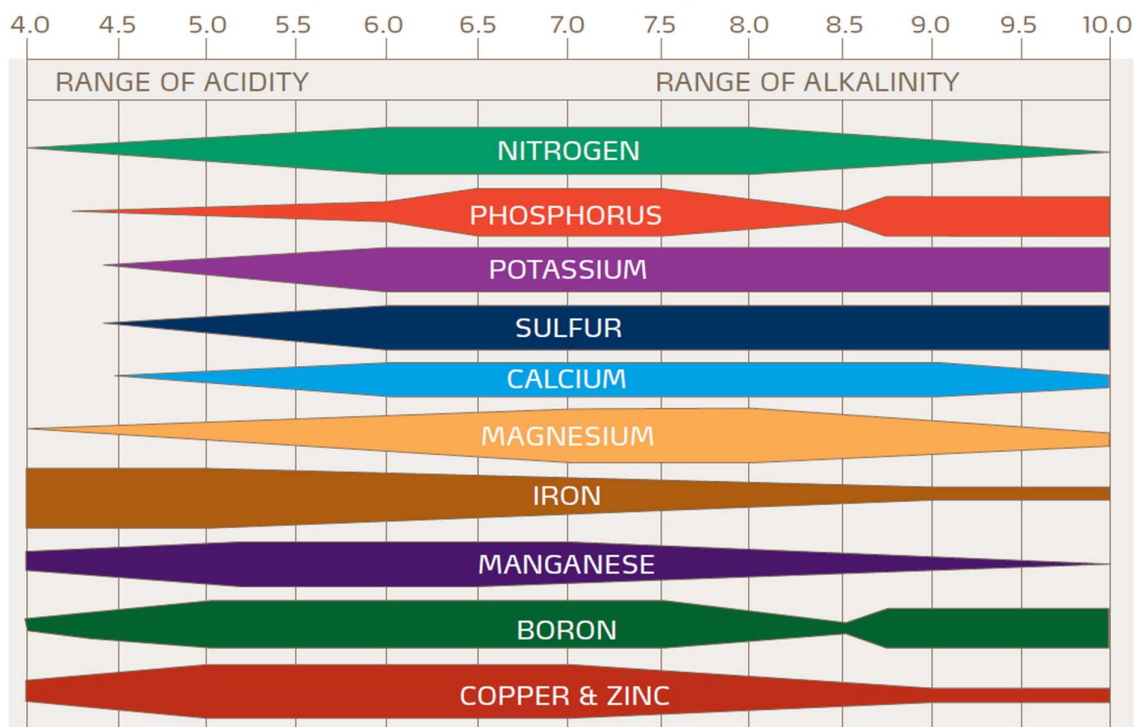
Cae Nant	5.8	0.8
Paddock	6.3	0.0
Hirwaen	6.2	0.0
Wern Fawr	5.7	1.1

3.3.3 Optimum Soil pH

	Optimum soil pH	
	Mineral Soils	Peaty Soils
Continuous arable cropping	6.5	5.8
Grass with occasional barley crop	6.2	5.5
Grass with an occasional wheat or oat crop	6.0	5.3
Continuous grass or grass/clover swards	6.0	5.3

3.3.4 Importance of lime

- The availability of many minerals become limited when the soil is too acidic as shown in figure 1. This will have a big impact on the fertility of the soil and quantity and quality of any crop grown. At current fertiliser prices the importance of optimum pH has even greater significance.



- Strongly acidic soils also have other negative characteristics, the soil fauna including earthworm and microbe populations are affected, as is the soil structure.
- Low pH will also encourage the spread of rushes and reduce the clover content.

Seventeen of the sampled fields are below the target pH. Five silage fields and all grazing fields need additional lime. Target the fields with additional lime application at the recommended rates prioritizing the most productive land first. Silage fields would be the first priority.

All the sampled fields are at the target index of 2 for magnesium, magnesium lime is therefore not recommended.

Prilled lime is another option for increasing soil pH. It offers the flexibility if smaller fields require lime and allows the application of the product using standard fertiliser spreaders. The effectiveness of a liming material depends on its neutralising value (NV), this is the relative effectiveness of a liming material compared to pure calcium oxide.

In the short term (at the recommended rates) prilled lime is less expensive to purchase compared to ground limestone and is far more soluble to be available immediately. The product is useful in ‘topping up’ fields which are close to optimum pH. It is also particularly useful in situations when it is difficult to obtain ground limestone if weather and ground conditions are not great. The disadvantage of prilled lime is that due to its solubility its effect does not last as long as ground limestone. 275 kg / ha (111 kg /ac) of prilled lime is equivalent to 1 tn of calcium limestone / ac.

3.3.5 Principles of P, K & Mg Fertilising

As soil phosphate and potash is increased, there is generally a yield response up to a maximum which we term the target soil index. For phosphorous (P), the target soil index is **2** (16-25 mg/litre) and for potassium (K) it is **2-** (121-180 mg/litre). Magnesium has little effect on crop yield, however it is important to maintain levels in some situations, e.g. in grass leys to prevent grass staggers in cattle.

Soil P & K should be maintained at the target levels to optimise crop yield. Generally speaking, it is usually sufficient to replace what is taken in the harvested crop. Some crops are more sensitive to deficient levels than others. For example, multi cut grass silage leys are particularly potash hungry. This pattern is not as evident on this farm because the P and K indexes are below target for both the grazing and silage fields.

In recent years cattle have been reintroduced with 180 calves purchased at 5 months of age and reared for 12 months and sold as stores. They are kept on straw yards which provides farm yard manure which is mainly applied to the silage land.

With cattle only being reintroduced in recent years the majority of soil indexes are below target. This would indicate insufficient availability of organic manures to meet crop requirements. This has resulted in the running down of soil P and K indexes. Before cattle were reintroduced the only available FYM has was what had been produced in the lambing buildings. This indicates that the availability of poultry manure would help to build up soil indexes.

Maintenance (M) requirements kg/hectare for P at index 2 and K at 2-

	Phosphate (P ₂ O ₅)	Potash (K ₂ O)

Grass Establishment	50	60
Grazed grass	20	0
1 st cut grass silage	40	80*
2 nd cut grass silage	25	90*
3 rd cut grass silage	15	80

NB – M requirement will vary with yield. These figures are based on typical yields.

Where the soil index is above the target level, dressings of less than maintenance or none at all should be applied to “run down” the index. Where indices are below target, “build up” dressings exceeding maintenance should be applied. Most of the sampled field require building up the soil P and K indexes. In this situation the availability of poultry manure would be a great asset to build up the soil indexes in a sustainable way.

Importance of Phosphorus

- Vital element in plant metabolism and new growth
- Important for developing root systems and seedling development
- Ensuring vigorous establishment of reseeded and regrowth
- Ensure leaf area of a plant is maximised for photosynthesis

Target index for grassland 2

Importance of Potassium

- Important in maintaining cell and plant structure
- Plays a role in sugar formulation
- Assists root development
- Actively involved in the transport of metabolites and nutrients within the plant.

Target index for grassland 2-

3.3.1 Nitrogen Recommendations

In most soils plant growth is limited by the amount of available nitrogen. Increasing the nitrogen inputs will normally lead to increased growth. However, nitrogen is easily lost from soils by leaching and this is particularly a problem in areas of high rainfall. It is not possible to accurately measure N levels in the soils because it is highly mobile, so the application rates are taken from the DEFRA fertiliser manual RB 209. The recommendations from the models in the RB209 book are based on the best economic return and try to account for the likely demand for fodder as well as soil and climatic variables. In practice, there are often other factors involved and the recommendations are not always appropriate.

3.3.2 Nitrogen for Grazing Land

The Table below shows the nitrogen requirement of grazed swards depending on the target DM yield for the season. One would expect production to be in the region of 5-6 tn DM / ha / year in a upland land sheep and beef grazing system. Some of the fields are lowland fields and would produce nearer 10-12 tn DM / ha / year.

Table 3.9 Nitrogen recommendations for grazed swards

Indicative DM yield ^a (t/ha)	Nitrogen application rate per grazing rotation* (kg N/ha)							
	Jan/Feb	Mar	Apr	May	Jun	Jul ^c	Aug ^c	Total N applied
4-5		30						30
5-7		30		20				50
6-8		30		30		20		80
7-9		40		30	30	30		130
9-12		30	30	30	30	30	30	180
10-13	30 ^b	40	40	30	30	30	30	230
12-15+	30 ^b	40	50	50	40	30	30	270

3.3.3 Nitrogen for Silage Land

The table below shows the required amount of N required to achieve the target DM yield for a 2 cut silage system.

Table 3.8 Nitrogen recommendations for grass silage

Target annual DM yield ^a	N application rate				Total N applied ^b
	First cut	Second cut	Third cut	Fourth cut	
t/ha	kg N/ha				
5-7	70	-	-	-	70
7-9	80	50	-	-	130
9-12	100	75	75 ^c	-	250
12-15+	120	90	70 ^c	30 ^c	310 ^d

*IF THERE IS MORE THAN 80kgN/ha FOR THE FIRST CUT IT SHOULD BE SPLIT WITH THE SECOND APPLICATION AT LEAST 6 WEEKS BEFORE CUTTING.

3.3.4 FYM Application Rates for Silage

Organic manure application rates are shown below. Under the new water regulations, you must not apply (spread) organic manure to any field at a rate which would result in the total N supplied exceeding 250 kg/ha in any 12 month period. This does not include manures deposited by grazing animals. In the example below the total N supply applied to silage fields receiving cattle and poultry manure is calculated at 183 kg N / ha which within the rules.

Where crop responses to phosphate and potash are expected (e.g soil indices below target i.e., 0 or 1 for grassland, the **available** (not total) phosphate and potash content of the organic material should be used when calculating the nutrient contribution. Where the soil is at target index (2 for phosphate and 2- for potash for grassland) or above, the **total** phosphate and potash content of the organic material should be used in nutrient balance sheet calculations.

For this farm with the majority of fields below the target P and K soil indexes the total available nutrient supplied will be used in the nutrient balance calculations.

3.3.5 Cattle FYM Application

Cattle FYM is applied mainly to silage land with limited amounts available for grazing land.. An application of 6 m³/ acre (15 m³/ hectare) of FYM this would supply the nutrients shown below. With 180 young cattle housed on straw yards and 550 breeding sheep the farm produces in the region of 400 tonnes of cattle / sheep farm yard manure. At an application rate of 15 tn / ha this is enough to apply to 26 ha of land which is similar to all of the silage fields

Nutrient	N	Phosphate	Potash
Estimated total nutrients in FYM (kg / m ³)	6.0	3.2	8
Estimated available nutrients in FYM (kg / m ³)	0.6	1.9	7.2
Total Nutrients supplied @ 15 m ³ / hectare	90	48	120
Total Available Nutrients supplied @ 15 m ³ / hectare	9	29	108

3.3.6 Poultry Manure Application

With the introduction of a 16,000 bird poultry unit we estimate that in the region of 500 tonnes of poultry manure would be available every year. Based on an application rate of 4.9 tn / ha this could

be applied on 107 ha of land. This would include all the silage land and most grazing fields that are flat enough for a tractor and muck spreader to travel.

We can calculate the nutrients that would be available based on an applications of 2 m³/ acre (4.9 m³/ hectare) of poultry manure. This would supply the nutrients shown below. The information from RB209 has been used for the nitrogen, phosphate and potash based on a 40% dry matter manure. The availability of the nitrogen is very dependent on the time of year that manure is spread.

Nutrient	Nitrogen	Phosphate	Potash
Total nutrients in FYM (kg / m³)	19	12	15
RB209 Book Values @ 40% Dry Matter			
Estimated available nutrients in FYM (kg / m ³)	1.9	7.2	14
Total Nutrients supplied @ 4.9 m ³ / hectare	93	59	74
Total Available Nutrients supplied @ 4.9 m ³ / hectare (Spring)	9	35	69

3.3.7 Recommendations for Grazing Fields

P and K recommendations for grazing land is shown below.

For fields at P index 1 there is an additional phosphate requirement of 50 kg / ha which an application of 4.94 tn / ha of poultry manure will supply 35 kg / ha of phosphate. The phosphate requirement for fields at P index 0 increases to 80 kg / ha. Some additional phosphate fertiliser is required.

At this application rate of poultry manure (4.94 tn / ha) the potash requirement for fields at K index 1 is comfortably met.

If possible, avoid applying more than 4.94 tn / ha of poultry manure to grazing fields because even with the phosphate requirement this will considerably oversupply the potash requirement and would contribute to a significant build-up of the farms K indexes. The availability of poultry manure would provide a valuable and sustainable way of building up the soil P and K reserves. Care is required not to apply too many nutrients that cause an excessive build-up of P indexes. This would increase the risk of phosphate pollution.

Field	P Index	Total Phosphate Required Kg/ha	Phosphate Kg/ha from 4.94 tn / ha Poultry FYM	Fertiliser Requirement Kg/ha of Phosphate
Bron 1 Mountain Far Half	1	50		50
Bron 2 Mountain Close Half	1	50		50
Bron 11 Big Ffridd Top Ffarm	1	50		50
Bron 12 Cae Hyll	1	50	35	15
Bron 13 Little Ffridd	1	50		50
Bron 14 Fron Hen	0	80	35	45
Bron 15 Gorse Bushes	0	80	35	45
Bron 16 Mountain Front	1	50	35	15
Bron 17 Mountain Fron Hen	0	80	35	45
Bron 18 Mountain	0	80	35	45
Bron 19 Pointy Field	1	50		50
Bron 20 Sheep Dip	0	80	35	45

Field	K Index	Total Potash Required Kg/ha	Potash Kg/ha from 4.94 tn / ha of Poultry FYM	Fertiliser Requirement Kg/ha of Potash
Bron 1 Mountain Far Half	2-	0		0
Bron 2 Mountain Close Half	2-	0		0
Bron 11 Big Ffridd Top Ffarm	1	30		30
Bron 12 Cae Hyll	1	30	69	0
Bron 13 Little Ffridd	1	30		30
Bron 14 Fron Hen	1	30	69	0
Bron 15 Gorse Bushes	1	30	69	0
Bron 16 Mountain Front	1	30	69	0
Bron 17 Mountain Fron Hen	1	30	69	0
Bron 18 Mountain	1	30	69	0
Bron 19 Pointy Field	2-	0		0
Bron 20 Sheep Dip	2-	0	74	0

3.3.8 Recommendations for Silage Land

Recommendations based on a 1st cut of 23 and second cut 15 tonnes fresh weight/ha. The recommendations are based on an application of 2 m³/acre (4.9 m³/hectare) of poultry manure

in the spring. Additional cattle FYM would be applied in July / august after second cut. The crop requirements for phosphate and potash are shown below and the nutrients supplied from organic manures. The application rates for individual manures and fertilisers have been refined in the fertiliser application rate recommendations at section 4.

Field	P Index	Total Phosphate Requirement Kg/ha	Phosphate Kg/ha from Poultry and Cattle Manure	Fertiliser Requirement Kg/ha of Phosphate
Llandyrnog	4	0	107	0
Bron 3	0	125	64	61
Bron 4	0	125	64	61
Bron 5	0	125	64	61
Bron 6	0	125	64	61
Bron 7 Boncyn	2	65	107	0
Bron 8 Side of House	3	20	107	0
Bron 9	2	65	107	0
Bron 10 Fron Goch	2	65	107	0
Nant y Ne	1	95	64	21
Cae Nant	2	65	107	0
Paddock	2	65	107	0
Hirwaen	3	20	107	0
Wern Fawr	3	20	107	0

Field	K Index	Total Potash Requirement Kg/ha	Potash Kg/ha from Poultry & Cattle Manure	Fertiliser Requirement Kg/ha of Potash
Llandyrnog	3	70	194	0
Bron 3	1	210	177	33
Bron 4	1	210	177	33
Bron 5	1	210	177	33
Bron 6	1	210	177	33
Bron 7 Boncyn	1	210	177	33
Bron 8 Side of House	2-	170	194	24
Bron 9	2-	170	194	0
Bron 10 Fron Goch	2-	170	194	0
Nant y Ne	1	210	177	33
Cae Nant	2-	170	194	0
Paddock	2-	170	194	0
Hirwaen	1	210	177	33
Wern Fawr	1	210	177	33

4 ACTUAL FERTILISER RECOMMENDATIONS

4.1 GRAZING FERTILISER APPLICATION

The fertiliser and manure application rates for grazing fields are shown below, With the majority of the grazing fields below the target soil index there is plenty of demand for the use of manures. The recommendations include the inclusion of poultry manure to be used carefully to meet crop demands and reduce purchased fertiliser costs. Individual field and groups of fields recommendations are given below based on the soil P and K indexes and crop requirements.

Crop	Grazing									
Fields	Cae Hyll & Mountain Front									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index							Medium	1	1	
Grazing - Crop Recommendations (KG/ ha)							30	50	30	15
Grazing - Crop Recommendations (KG/ ha)							30	0	0	0
Total Nutrient Recommendations							60	50	30	15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	123	1	42	0	0	0
Poultry Manure April	1.9	7.2	14	1.5	4900	0	9	35	69	7
Cattle FYM July	0.6	1.9	7.2	1	15000	0	9	29	108	15
Fertiliser June	0	45	0	0	0	0	0	0	0	0
					0	0	0	0	0	0
Total Nutrients Supplied							61	64	177	22
Surplus/Defecit (+/-)							1	14	147	7

Some fields are below the target P index but at the target K index, the recommendation is not to apply cattle FYM to these fields and only use poultry manure. This will avoid the further build-up of the K index if increasing amounts of cattle FYM was applied. To ensure that the phosphate requirement is met apply Triple superphosphate at the recommended rates.

Crop	Grazing									
Fields	Fron Hen , Gourse Busges, Mountain Fron Hen & Mountain									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index							Medium	0	1	
Grazing - Crop Recommendations (KG/ ha)							30	80	30	15
Grazing - Crop Recommendations (KG/ ha)							30	0	0	0
Total Nutrient Recommendations							60	80	30	15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	148	1.2	51	0	0	0
Poultry Manure April	1.9	7.2	14	1.5	4900	0	9	35	69	7
Cattle FYM July	0.6	1.9	7.2	1	0	0	0	0	0	0
Fertiliser June	0	45	0	0	123	1	0	55	0	0
					0	0	0	0	0	0
Total Nutrients Supplied							60	91	69	7
Surplus/Defecit (+/-)							0	11	39	-8

Crop	Grazing									
Fields	Sheep Dip									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	0	2-		
Grazing - Crop Recommendations (KG/ ha)						30	80	0		15
Grazing - Crop Recommendations (KG/ ha)						30	0	0		0
Total Nutrient Recommendations						60	80	0		15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	148	1.2	51	0	0	0
Poultry Manure April	1.9	7.2	15	1.5	4900	0	9	35	74	7
Cattle FYM July	0.6	1.9	7.2	1	0	0	0	0	0	0
Fertiliser June	0	45	0	0	123	1	0	55	0	0
					0	0	0	0	0	0
Total Nutrients Supplied						60	91	74		7
Surplus/Defecit (+/-)						0	11	74		-8

Several grazing fields are too steep to apply FYM and in that situation the use of Triple superphosphate and nitrogen fertiliser is recommended or a 21 8 11 type compound where there is a need to build up the P and K index. The recommendations are included below.

Crop	Grazing									
Fields	Mountain Far & Mountain Close									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	1	2-		
Grazing - Crop Recommendations (KG/ ha)						30	50	0		15
Grazing - Crop Recommendations (KG/ ha)						20	0	0		0
Total Nutrient Recommendations						50	50	0		15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	148	1.2	51	0	0	0
Poultry Manure April	1.9	7.2	14	1.5	0	0	0	0	0	0
Cattle FYM July	0.6	1.9	7.2	1	0	0	0	0	0	0
Fertiliser June	0	45	0	0	123	1	0	55	0	0
					0	0	0	0	0	0
Total Nutrients Supplied						51	55	0		0
Surplus/Defecit (+/-)						1	5	0		-15

Crop	Grazing									
Fields	Big Ffridd Top farm									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	1	1		
Grazing - Crop Recommendations (KG/ ha)						30	50	30		15
Grazing - Crop Recommendations (KG/ ha)						25	0	0		0
Total Nutrient Recommendations						55	50	30		15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	20	8	11	7	123	1	25	10	14	9
Poultry Manure April	1.9	7.2	14	1.5	0	0	0	0	0	0
Fertiliser June	20	8	11	7	123	1	25	10	14	9
Fertiliser June	0	45	0	0	74	0.6	0	33	0	0
					0	0	0	0	0	0
Total Nutrients Supplied						49	53	27		17
Surplus/Defecit (+/-)						-6	3	-3		2

Crop	Grazing									
Fields	Little Ffridd									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	1	1		
Grazing - Crop Recommendations (KG/ ha)						30	50	30		15
Grazing - Crop Recommendations (KG/ ha)						30	0	0		0
Total Nutrient Recommendations						60	50	30		15
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	21	8	11	5	247	2	52	20	27	12
Poultry Manure April	1.9	7.2	14	1.5	0	0	0	0	0	0
Cattle FYM July	0.6	1.9	7.2	1	0	0	0	0	0	0
Fertiliser June	0	45	0	0	93	0.75	0	42	0	0
					0	0	0	0	0	0
Total Nutrients Supplied						52	62	27		12
Surplus/Defecit (+/-)						-8	12	-3		-3

Crop	Grazing								
Fields	Pointy Field								
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash Sulphur
Soil Nutrient Supply/ Soil Index						Medium	1	2-	
Grazing - Crop Recommendations (KG/ ha)						30	50	0	15
Grazing - Crop Recommendations (KG/ ha)						30	0	0	0
Total Nutrient Recommendations						60	50	0	15
Application of manure & fertiliser for season									
	N	P205	K20	S03	kg / ha	Cwt/acre			
Fertiliser March	34.5	0	0	0	123	1	42	0	0
Poultry Manure April	1.9	7.2	14	1.5	0	0	0	0	0
Fertiliser June	34.5	0	0	0	82	0.5	28	0	0
Fertiliser June	0	45	0	0	123	1	0	55	0
					0	0	0	0	0
Total Nutrients Supplied						71	55	0	0
Surplus/Defecit (+/-)						11	5	0	-15

4.2 RECOMMENDATIONS FOR 2 CUTS OF SILAGE

Fertiliser and manure recommendations for 2 cut silage fields are given below. The field recommendations below show how the inclusion of poultry manure significantly reduces the farm fertiliser costs because the crop requirement especially for 2 cuts of silage can be met from a combination of poultry and cattle manure. Even for fields below the target P and K index at index 1 there is no requirement for additional P and K fertiliser. The N requirement is met from a combination of ammonium nitrate and a nitrogen fertiliser containing sulphur such as 27 0 0 9 (Axan) for second cut. The only fields requiring additional phosphate fertiliser will be the fields at P index 0.

Crop	2 Cut Silage									
Fields	Bron 9, Fron Goch, Cae Nant & Paddock									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index							Medium	2	2-	
Grazing - Crop Recommendations (KG/ ha)							15		0	0
1st Cut Silage - Crop Recommendations (KG/ ha)							45	30	90	30
2nd Cut Silage - Crop Recommendations (KG/ ha)							40	25	80	20
Total Nutrient Recommendations							100	55	170	50
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	123	1	42	0	0	0
Poultry Manure April	1.9	12	15	2	4900	0	9	59	74	10
Fertiliser June	27	0	0	9	148	1.1	40	0	0	13
Cattle FYM July	0.6	3.2	8	1	15000	0	9	48	120	15
Fertiliser August	0	45	0	0	0	0	0	0	0	0
Total Nutrients Supplied							101	107	194	38
Surplus/Defecit (+/-)							1	52	24	-12

Crop	2 Cut Silage									
Fields	Side of House									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	3	2-		
Grazing - Crop Recommendations (KG/ ha)						15		0		0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	30	90		30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	0	80		20
Total Nutrient Recommendations						100	30	170		50
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	123	1	42	0	0	0
Poultry Manure April	1.9	12	15	2	4900	0	9	59	74	10
Fertiliser June	27	0	0	9	148	1.1	40	0	0	13
Cattle FYM July	0.6	3.2	8	1	15000	0	9	48	120	15
Fertiliser August	0	45	0	0	0	0	0	0	0	0
Total Nutrients Supplied						101	107	194		38
Surplus/Defecit (+/-)						1	77	24		-12

Crop	2 Cut Silage								
Fields	Llandyrnog								
Soil Type	Clay Loam					Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	4	3	
Grazing - Crop Recommendations (KG/ ha)						15		0	0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	0	30	30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	0	40	20
Total Nutrient Recommendations						100	0	70	50
Application of manure & fertiliser for season									
	N	P205	K20	S03	kg / ha	Cwt/acre			
Fertiliser March	34.5	0	0	0	172	1.4	59	0	0
Poultry Manure April	1.9	12	15	2	0	0	0	0	0
Fertiliser June	27	0	0	9	148	1.2	40	0	13
Cattle FYM July	0.6	3.2	8	1	10000	0	6	32	80
Fertiliser August	0	45	0	0	0	0	0	0	0
Total Nutrients Supplied						105	32	80	23
Surplus/Defecit (+/-)						5	32	10	-27

Crop	2 Cut Silage								
Fields	Hirwaen & Wern Fawr								
Soil Type	Clay Loam					Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	3	1	
Grazing - Crop Recommendations (KG/ ha)						15		0	0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	30	110	30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	0	100	20
Total Nutrient Recommendations						100	30	210	50
Application of manure & fertiliser for season									
	N	P205	K20	S03	kg / ha	Cwt/acre			
Fertiliser March	34.5	0	0	0	123	1	42	0	0
Poultry Manure April	1.9	12	15	2	2700	0	5	32	41
Fertiliser June	27	0	0	9	148	1.1	40	0	13
Cattle FYM July	0.6	3.2	8	1	22000	0	13	70	176
Fertiliser August	0	45	0	0	0	0	0	0	0
Total Nutrients Supplied						101	103	217	41
Surplus/Defecit (+/-)						1	73	7	-9

Crop	2 Cut Silage								
Fields	Boncyn								
Soil Type	Clay Loam					Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	2	1	
Grazing - Crop Recommendations (KG/ ha)						15		0	0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	30	110	30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	25	100	30
Total Nutrient Recommendations						100	55	210	60
Application of manure & fertiliser for season									
	N	P205	K20	S03	kg / ha	Cwt/acre			
Fertiliser March	34.5	0	0	0	123	1	42	0	0
Poultry Manure April	1.9	7.2	14	2	4900	0	9	35	69
Fertiliser June	27	0	0	9	123	1	33	0	11
Cattle FYM July	0.6	1.9	7.2	1	20000	0	12	38	144
Fertiliser August	0	45	0	0	0	0	0	0	0
Total Nutrients Supplied						97	73	213	41
Surplus/Defecit (+/-)						-3	18	3	-19

Crop	2 Cut Silage									
Fields	Nant y Ne									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	1	1		
Grazing - Crop Recommendations (KG/ ha)						15		0		0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	70	110		30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	25	100		20
Total Nutrient Recommendations						100	95	210		50
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	123	1	42	0	0	0
Poultry Manure April	1.9	12	15	2	4900	0	9	59	74	10
Fertiliser June	27	0	0	9	148	1.1	40	0	0	13
Cattle FYM July	0.6	3.2	8	1	20000	0	12	64	160	20
Fertiliser August	0	45	0	0	0	0	0	0	0	0
Total Nutrients Supplied						104	123	234		43
Surplus/Defecit (+/-)						4	28	24		-7

For fields Bron 3-7 there is an additional requirement for phosphate which can be met from an application of 123 kg / ha of Triple superphosphate. The manure application rates should not be increased further without going over the 250 kg N / ha limit from organic manure. Ammonium nitrate and Axan fertiliser would meet the nitrogen and sulphur requirement.

Crop	2 Cut Silage									
Fields	Bron 3 4 5 7 6									
Soil Type	Clay Loam						Nitrogen	Phosphate	Potash	Sulphur
Soil Nutrient Supply/ Soil Index						Medium	0	1		
Grazing - Crop Recommendations (KG/ ha)						15		0		0
1st Cut Silage - Crop Recommendations (KG/ ha)						45	100	110		30
2nd Cut Silage - Crop Recommendations (KG/ ha)						40	25	100		30
Total Nutrient Recommendations						100	125	210		60
Application of manure & fertiliser for season										
	N	P205	K20	S03	kg / ha	Cwt/acre				
Fertiliser March	34.5	0	0	0	123	1	42	0	0	0
Poultry Manure April	1.9	7.2	14	2	4900	0	9	35	69	10
Fertiliser June	27	0	0	9	123	1	33	0	0	11
Cattle FYM July	0.6	1.9	7.2	1	24000	0	14	46	173	24
Fertiliser August	0	45	0	0	123	1	0	55	0	0
Total Nutrients Supplied							99	136	241	45
Surplus/Defecit (+/-)							-1	11	31	-15

5 ACTION PLAN

- 5.1 There is a need to increase soil pH on 20 silage and grazing fields. This will increase nutrient efficiency. Target the most productive fields first to maximise returns. Ensuring optimum pH will also ensure that all of the available phosphate and potash is used by the crops.
- 5.2 With a number of grazing and silage fields below the target P and K index, currently there is a real requirement for additional phosphate and potash fertiliser to be purchased on to the farm.

- 5.3 The nutrient balances show that the addition of poultry manure would be a tremendous asset to the business to build up the soil indexes to optimise efficient grass production. The proposed nutrient plan with the inclusion of poultry manure shows very little need to purchase any additional phosphate and potash fertiliser. This will create a far more sustainable farming system from an economic and environmental point of view
- 5.4 Additional phosphate fertiliser will be required for the fields at P index 0. This requirement cannot be met from organic manures without going over the 250 kg N / ha field limit. The recommendation is to apply Triple superphosphate at the recommended rates.
-

ANALYSIS REPORT

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B153

Please quote the above code for all enquiries

Client : HARRI WHITTINGHAM
BRON Y FELIN
LL15 1TD

Distributor : PO 607-00014

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 75268/23

Date Received 22-Nov-23

Date Reported 24-Nov-23

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
395359/23	1	NANT Y NE Grazing into Grazing	5.7	1	1	2	11.0	89	56
395360/23	2	CAE BONCYN Silage 2 Cuts into Silage 2 Cuts	5.5	2	2-	2	17.8	143	70
395361/23	3	CAE NANT Silage 2 Cuts into Silage 2 Cuts	5.8	2	2-	3	24.8	156	120
395362/23	4	PADDOCK Silage 2 Cuts into Silage 2 Cuts	6.3	2	2-	3	16.6	133	116

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron On behalf of NRM Date 24/11/23

ANALYSIS REPORT

DATE 24th November 2023
SAMPLES FROM HARRI WHITTINGHAM, BRON Y FELIN,
LL15 1TD

SAMPLED BY PO 607-00014

Report reference 75268/23

TRYSTAN SION
MABIS AMAETH
T/A MENTER A BUSNES
UNIT 3 SCIENCE PARK
ABERYSTWYTH
CEREDIGION SY23 3AH
Tel: 01970 636565
Fax:

Fertiliser Recommendations

The amount of phosphate and potash applied for establishment may be deducted from the first season's grazing or silage/hay requirement.
Liming fields above pH 7 should be avoided as it can induce deficiencies of trace elements such as copper, cobalt and selenium which can adversely affect livestock growth but will not affect grass growth. Where a deficiency does occur, treatment of the animal with the appropriate trace element is usually the most effective means of control, though application of cobalt and selenium to grazing pastures can be effective.

Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime
CAE BONCYN	Silage 2nd / Silage 2nd	Units/Acre	52	136	T/Ac 1.5
395360 / Medium	(Yield: 38 t/ha)	Kg/Ha	65	170	Te/Ha 3.7

Please see Silage table on last page.

Grass/clover swards are more sensitive to phosphate and potash shortages than pure grass swards. Early spring growth can benefit from a small quantity of spring-applied

ANALYSIS REPORT



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Y170

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Client : BRON Y FELIN

Laboratory Reference

Card Number 63981/24

Date Received 30-Jan-24

Date Reported 01-Feb-24

Local Rep : E JEWKES

Telephone :

Sample Matrix : Agricultural Soil

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
347816/24	1	BRON 1 <i>Grassland into Grassland</i>	5.8	1	2-	2	10.0	127	92
347817/24	2	BRON 2 <i>Grassland into Grassland</i>	5.8	1	2-	2	11.4	171	92
347818/24	3	BRON 3 <i>Grassland into Grassland</i>	6.3	0	1	2	9.2	84	88
347819/24	4	BRON 4 <i>Grassland into Grassland</i>	6.2	0	1	2	9.4	82	80
347820/24	5	BRON 5 <i>Grassland into Grassland</i>	6.1	0	1	2	9.2	117	93
347821/24	6	BRON 6 <i>Grassland into Grassland</i>	6.1	0	1	2	8.8	111	88

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Released by Sandy Cameron On behalf of NRM Date 01/02/24

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ANALYSIS REPORT



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Date Received 30-Jan-24

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SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
347822/24	7	BRON 7 <i>Grassland into Grassland</i>	5.1	2	1	2	23.6	103	81
347823/24	8	BRON 8 <i>Grassland into Grassland</i>	5.8	3	2-	3	29.4	172	143
347824/24	9	BRON 9 <i>Grassland into Grassland</i>	6.0	2	2-	3	23.8	151	172
347825/24	10	BRON 10 <i>Grassland into Grassland</i>	5.8	2	2-	3	25.2	135	156

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ANALYSIS REPORT



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Client : BRON Y FELIN

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Telephone :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 63982/24

Date Received 30-Jan-24

Date Reported 01-Feb-24

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
347826/24	1	BRON 11 <i>Grassland into Grassland</i>	5.1	1	1	2	9.6	84	79
347827/24	2	BRON 12 <i>Grassland into Grassland</i>	5.8	1	1	3	14.4	83	103
347828/24	3	BRON 13 <i>Grassland into Grassland</i>	5.0	1	1	2	11.6	65	81
347829/24	4	BRON 14 <i>Grassland into Grassland</i>	5.3	0	1	3	7.2	93	141
347830/24	5	BRON 15 <i>Grassland into Grassland</i>	5.4	0	1	2	4.6	90	90
347831/24	6	BRON 16 <i>Grassland into Grassland</i>	5.6	1	1	2	11.6	64	94

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Released by Sandy Cameron On behalf of NRM Date 01/02/24



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ANALYSIS REPORT



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Please quote the above code for all enquiries

Client : BRON Y FELIN

Local Rep : E JEWKES

Telephone :

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 63982/24

Date Received 30-Jan-24

Date Reported 01-Feb-24

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
347832/24	7	BRON 17 <i>Grassland into Grassland</i>	5.5	0	1	2	8.2	102	89
347833/24	8	BRON 18 <i>Grassland into Grassland</i>	5.8	0	1	2	6.4	87	86
347834/24	9	BRON 19 <i>Grassland into Grassland</i>	5.4	1	2-	2	11.2	155	72
347835/24	10	BRON 20 <i>Grassland into Grassland</i>	5.5	0	2-	3	8.4	138	102

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron On behalf of NRM Date 01/02/24



Soil analysis report

Customer Rg & rm whittingham
Bron y Felin, Hirwaen, Llanbedr D C
LL15 1TD

Sample no. PUK254-12/01-3

Samples 3

Distributor S & S AGRICULTURAL LIMING LTD - LLYR
GETHIN

Sampled 06/08/2026

Received 11/08/2026

Issued 20/08/2026 (issue 1)

Order summary

Order number	Crop	pH	P (ppm)	K (ppm)	Mg (ppm)	OM (%)
PUK254-12/ 01 Hirwaen - 01	GRASS ESTABLISHMENT (RESEED)	6.2	39 (3.7)	92 (1.5)	102 (3.0)	4.7
PUK254-12/ 02 Wern Fawr - 01	GRASS ESTABLISHMENT (RESEED)	5.7	34 (3.4)	95 (1.6)	112 (3.1)	4.3
PUK254-12/ 03 Llandyrnog - 01	GRASS ESTABLISHMENT (RESEED)	6.3	53 (4.3)	315 (3.5)	160 (3.8)	5.3

Index: (0-9) Soil nutrient indices from AHDB Nutrient Management Guide (RB209)