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MANAGEMENT SYSTEM CERTIFICATION
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Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig
Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
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Mae Aled Roberts wedi'u cymeradwyo i ddarparu y wasanaeth cynghori ar ran Cyswllt Ffermio
Aled Roberts has been approved to deliver the Advisory Service on behalf of Farming Connect

Mae Aled Roberts wedi'u cymeradwyo i ddarparu y hyfforddiant ar ran Cyswllt Ffermio
Aled Roberts has been approved to deliver training on behalf of Farming Connect

Mae Cyswllt Ffermio yn gynllun o fewn Cymunedau Gwledig Llywodraeth Cymru - Rhaglen Datblygu Gwledig 2014-2020, sy'n canolbwyntio buddsoddiad sylweddol gan Lywodraeth Cymru a'r UE i adfywio cymunedau gwledig a darparu cefnogaeth ar gyfer amaethyddiaeth a choedwigaeth yng Nghymru.

Darperir Rhaglen Trosglwyddo Gwybodaeth Cyswllt Ffermio a'r Gwasanaeth Cynghori gan Menter a Busnes. Mae Lantra Cymru yn arwain ar ddarparu Rhaglen Ddysgu a Datblygu Cydol Oes Cyswllt Ffermio.

Farming Connect is a scheme within the Welsh Government Rural Communities - Rural Development Programme 2014-2020, which is focusing significant investment from Welsh Government and the EU to revitalise rural communities and provide support for agriculture and forestry in Wales.

The Farming Connect Knowledge Transfer Programme and Advisory Service is delivered by Menter a Busnes. Lantra Wales leads on the delivery of the Farming Connect Lifelong Learning and Development Programme.

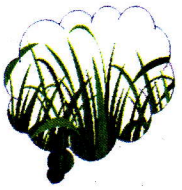
Contents

1 INTRODUCTION

The aim of this soil nutrient management plan is to:

Save you money

Maximise productivity



Improve the environment

The report will highlight actions that will maximise productivity through the efficient use of nutrients, soils and manures, minimise costs and improve water quality of the streams and rivers in your area. This is achieved by implementing nutrient management best practice. The report is provided in order to improve knowledge relating to soil, manure and nutrient management.

Ten fields have been soil sampled to check nutrient and lime status. The report recommends a fertiliser plan, incorporating manures produced on the farm, based on information gathered for soil nutrient status, cropping and stocking on the farm. The ten fields sampled are outside the grazing range of the area where the hens have access.

The accuracy of the plan is dependent upon the accuracy of the information provided by Mr Martin Reah. All reasonable efforts have been taken by RSK ADAS to verify that the information is correct and so RSK ADAS cannot be held liable for any inaccuracy in the information provided.

2 SUMMARY AND ACTION POINTS

This report provides conventional fertiliser recommendations for the main crops grown on the farm along with advice on effective use of any home produced manures.

2.1 Specific advice for this Nutrient Management Report

Aim to carry out a standard soil analysis [pH, phosphorus (P), potassium (K), magnesium (Mg)] over 25% of the fields each year, or once every 4 years. This will provide a picture of the soil fertility on the farm and a basis of future fertiliser/manure planning.

Soil pH: - Optimum soil pH is vital to maximise the uptake of nutrients. The optimum pH for grass in mineral soils is 6.0 and 6.5 for arable crops. 90% of the samples required lime to be applied to correct soil pH.

Soil Phosphorus (P):- the optimum phosphorus index for crop yield is 2 (16-25 mg/l). Only 10% of the samples were below the desired soil index of 2 requiring additional P for optimum crop growth. The other 9 samples were satisfactory at P index 2-3.

Soil Potassium (K): - the optimum soil potassium index for crop yield and the utilisation of other nutrients is 2- (121-180 mg/l). Only 10% of samples (1 field) was below the desired soil index, which would warrant additional potassium to be applied to meet crop needs.

Soil Magnesium (Mg): - the optimum soil magnesium index for crop yield and the utilisation of other nutrients is 2 (51-100 mg/l). Soil magnesium indices were generally satisfactory with none of the samples requiring additional magnesium.

Organic Manures:- 90%+ of the layer manure produced is exported off the farm. Only a small amount of layer manure is applied at a light application of 1t/acre (2.5t/ha) during the summer months on a few of the fields sampled. This policy is to be continued in the future, although it should be noted that the dates, quantity and destination of the exported manure should be accurately recorded to conform with the good code of agricultural practice.

2.2 General nutrient management advice

Where fields are subject to management prescriptions laid down in a Glastir agreements, ensure that you adhere to the scheme requirements. Currently the farm is not subject to any Glastir agreement.

Farm Yard Manure (FYM) and slurry should be regarded as a valuable resource. Manures should generally be returned to fields with the lowest indices and cropping fields to help balance offtake.

Re-assess fertiliser applications and manure rates in 4 years' time, when soil samples should be taken again.

The Code of Good Agricultural Practice for the Protection of Water, Soil and Air for Wales currently states that, to reduce leaching losses from manures, you should not apply more than 250 kg per ha of total nitrogen in organic manures in any 12 months. This equates to 42 tonnes/ha (17 t/ac) cattle FYM, 36 tonnes/ha (14 t/ac) sheep FYM, 8.9 t/ha broiler manure (60%D.M.) or 3.6 t/acre) or 13 t/ha layer manure (40% D.M.) or 5.3 t/acre), based on standard figures from RB209 Nutrient Management Guide.

Environmental Impact Assessment (EIA) screening- unimproved grassland. Please be aware that if you intend to carry out an agricultural improvement project on any uncultivated or semi- natural land, you will need to receive a screening decision from the Welsh Government (WG) before you proceed.

Uncultivated or semi natural land is any area containing **Less than 25% of improved agricultural species** (e.g. Perennial Ryegrass and/or White Clover). This can include a range of land from lowland meadows to moor.

Examples of agricultural improvement projects could be cultivation (ploughing, harrowing, rotovating, etc) reseeding, new drainage and clearing scrub.

Existing highly improved agricultural land (e.g. silage fields) will not need screening if it contains **more than 25%** of Ryegrass and/or White Clover.

FARM DETAILS

Gwynfaes is 50 ha upland farm laid down to permanent pasture situated near the village of Rhandirmwyn. The farm is not within the Glastir environmental scheme.

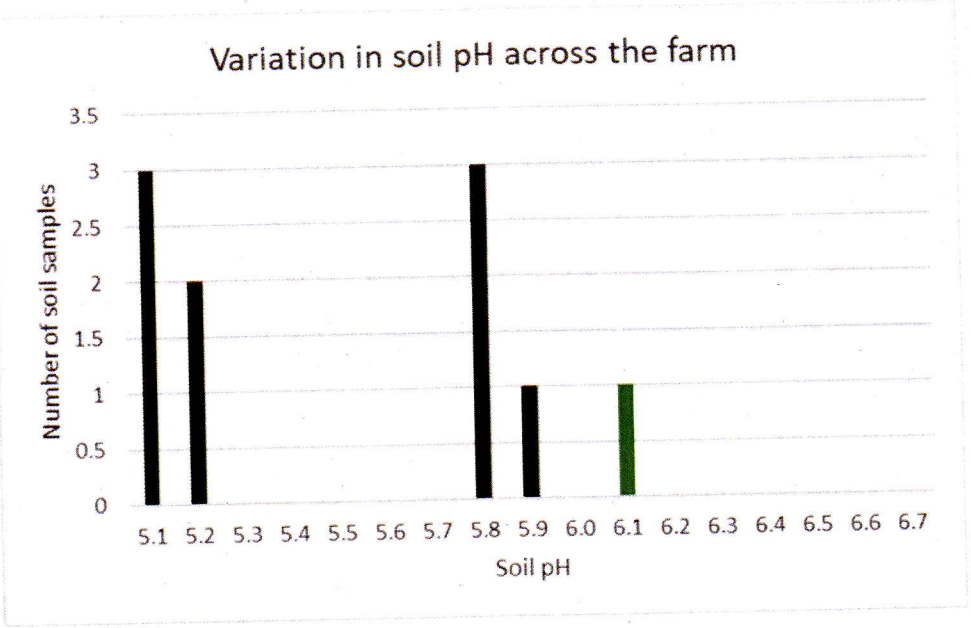
Current farm stocking at Gwynfaes comprises of 22,000 free range laying birds based around the farmstead where the buildings are situated. It is intended to erect a new poultry shed in order that the laying birds can be increased to a total of 30,000 hens.

A further 30-60 ponies are kept on a tack basis on the farm to graze the pastures. No arable crops or silage/hay are grown on the farm. The lower pastures are utilised by the free ranging hens whilst the upper pastures are grazed by the ponies. No fertiliser is applied to the land. Manures are produced from the poultry and stored prior to exporting to a local farm. Mr Reah stated that 90%+ of the poultry manure produced is exported whilst only a small amount of poultry manure is spread on some fields on the farm when conditions permit in the summer. Little layer manure has been spread on the farm during 2017 and 2018.

3 SOIL ANALYSIS RESULTS

3.1 Soil pH

Optimum soil pH is vital to maximise the uptake of nutrients. The optimum pH for grass in mineral soils is 6.0 and 6.5 for arable crops. **Lime is required on 9 of the 10 fields.** Recommendations for lime are given along with the results at the end of this report.



	Fields which require an application of ground limestone.
	Fields which do not require an application of ground limestone.

The soil sample analysis results indicate which fields require an application of ground limestone and which fields are at optimum pH and therefore do not require the application of ground limestone.

A summary of the soil analysis results for pH as shown in the above graph shows:

- One of the 10 samples was at target pH of 6 or above for grass crops.
- 90% of the soil samples were below the target pH of 6 and require liming for grass crops.

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

Table 1 Optimum Soil pH based on cropping and soil type

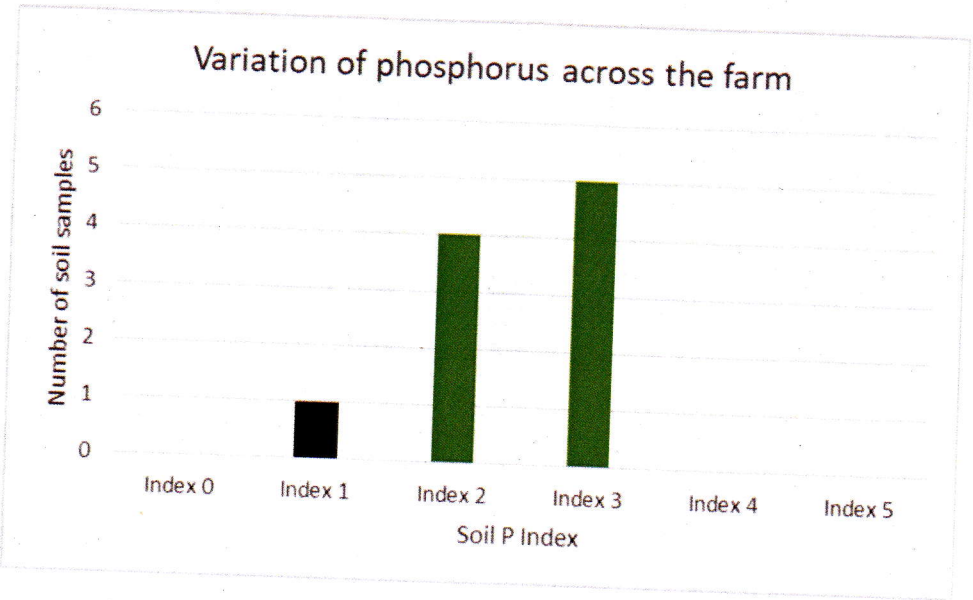
	Application of lime (t/ha)									
	Sands & loamy soil		Sandy loams & silt loams		Clay loams & clays		Organic Soils		Peaty soils	
Initial Soil pH	Arable	Grass	Arable	Grass	Arable	Grass	Arable	Grass	Arable	Grass
6.2	3	0	4	0	4	0	0	0	0	0
6.0	4	0	5	0	6	0	4	0	0	0
5.5	7	3	8	4	10	4	9	3	8	0
5.0	10	5	12	6	14	7	14	7	16	6

Table 2 Application of ground limestone (lime)

Lime recommendations in terms of tonnes of Lime (NV50) to apply per hectare

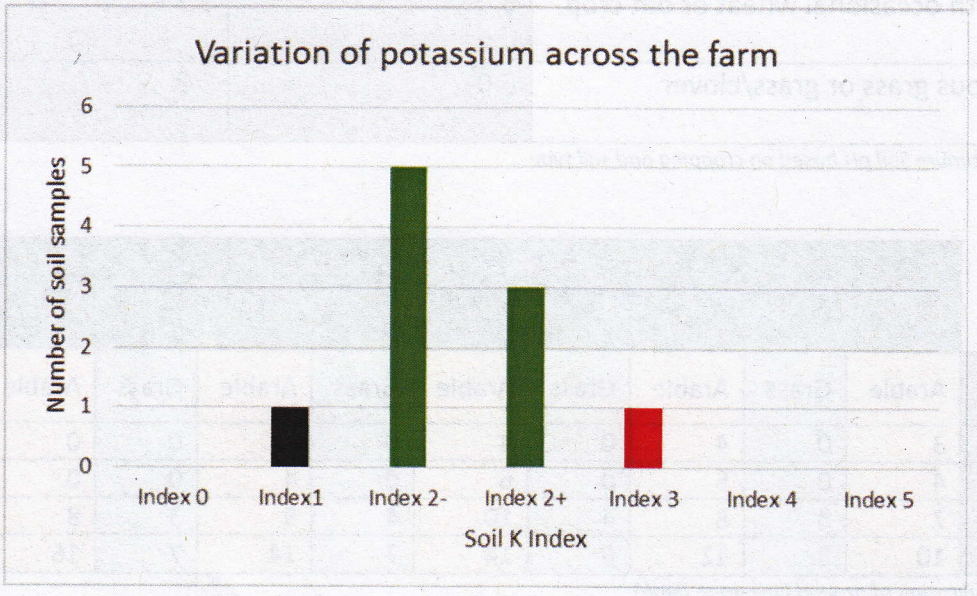
3.2 Soil Phosphorus (P)

The optimum phosphorus index for crop yield is 2 (16-25 mg/l). Nine of the 10 fields have a soil index for phosphorus at or above the target maintenance index of 2. One of the fields (7644) has a low phosphorus index of 1 and requires additional phosphate nutrients to meet grass crop needs.



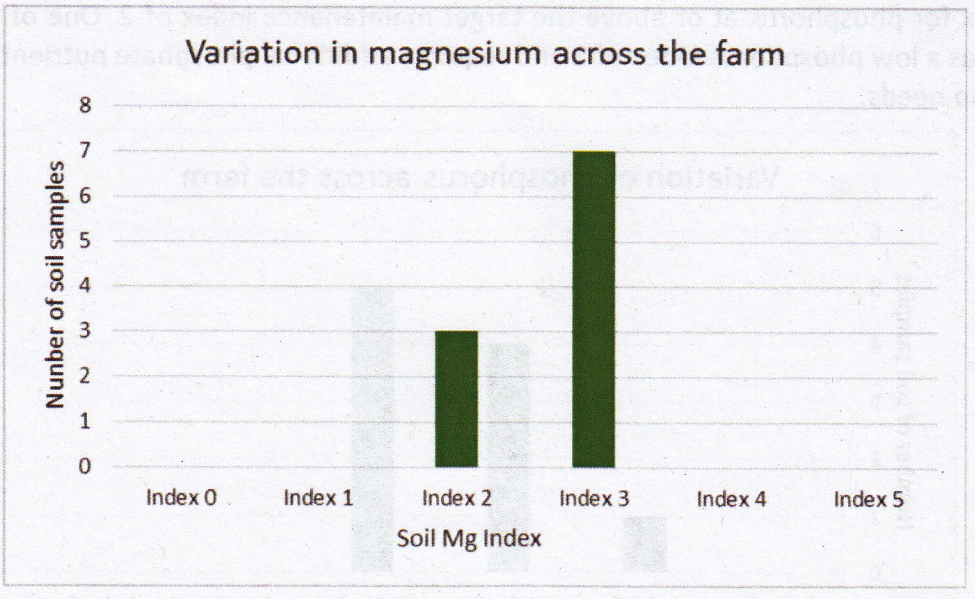
3.3 Soil Potassium (K)

The optimum soil potassium index for crop yield and the utilisation of other nutrients is 2 - (121-180 mg/l). Nine of the ten fields have a soil index for potassium at the target rate of 2- or above with only 1 field low at Index 1. With 1 field (2437) at Index 3, you have the potential to make cost savings in terms of use of potash.



3.4 Soil Magnesium (Mg)

Soil Mg was noted as adequate (Index 2-3) in all of the fields sampled. When liming in future the use of Magnesian limestone is not specifically required on these fields.



4 CROP NUTRIENT REQUIREMENTS FOR A RANGE OF P AND K INDICES

Matching soil nutrient conditions with crop needs is an important step in maximising profit for your farm. The Agricultural and Horticultural Development Board (AHDB) have recently updated the Nutrient Management Guide (RB209) which provides guidelines for crop nutrient requirements and the nutrient content or organic materials.
Relevant extracts for this NMP group are provided here.

The tables below give the RB209 recommendations for most of the crops grown on the farm, and provides a useful reference point for nutrient planning.

GRAZED SWARDS	P OR K INDEX			
	0	1	2	3 or over
	Kg/ha (units/acre)			
Phosphate	80 (64)	50 (40)	20 (16)	0
Potash	60 (48)	30 (24)	0	0

FIRST CUT SILAGE	P OR K INDEX				
	0	1	2	3	4 or over
	Kg/ha (units/acre)				
Phosphate	100 (80)	70 (56)	40 (32)	20 (16)	0
Potash – Previous autumn	60 (48)	30 (24)	0	0	0
Potash – spring	80 (64)	80 (64)	80 (64) *	30 (24)	0

* Recommendation is for K Index 2-. If the K index is 2+, apply only 60kg/ha (48 units/ac)

SECOND CUT SILAGE	P OR K INDEX				
	0	1	2	3	4 or over
	Kg/ha (units/acre)				
Phosphate	25 (20)	25 (20)	25 (20)	0	0
Potash	120 (96)	100 (80)	90 (72)	40 (32)	0

* Recommendation is for K Index 2-. If the K index is 2+, apply only 60kg/ha (48 units/ac)

THIRD CUT SILAGE	P OR K INDEX				
	0	1	2	3	4 or over
	Kg/ha (units/acre)				
Phosphate	15 (12)	15 (12)	15 (12)	0	0
Potash	80 (64)	80 (64)	80 (64)	20 (16)	0

* Recommendation is for K Index 2-. If the K index is 2+, apply only 40kg/ha (32 units/ac)

GRASS ESTABLISHMENT	P OR K INDEX				
	0	1	2	3	4 or over
	Kg/ha (units/acre)				
Phosphate	120 (96)	80 (64)	50 (40)	30 (24)	0
Potash	120 (96)	80 (64)	60 (48) *	0	0

* Recommendation is for K Index 2-. If the K index is 2+, apply only 40kg/ha (32 units/ac)
For further information refer to RB209 – AHDB Nutrient Management Guide

5 CONCLUSIONS

5.1 Specific conclusion for this Nutrient Management Plan

The current farm management and soil analysis results show that:

An increase in grassland production can occur in areas where the soil analyses reveal that soil pH is too acidic i.e. below pH 6 or where there are nutrient deficiencies. Results show that 9 of the fields sampled has the potential to improve grassland production where soil results indicate deficiencies.

Cost savings can be made where pH or soil indices are above target levels. **90% of the fields sampled require additional lime to raise the pH.**

Manure inputs can be reduced on fields with higher indices especially on grazed swards only. The bulk of the layer manure is exported and this policy is to be continued, with only a small amount of layer manure to be applied on the lower index grazing fields. The export of manure should be accurately recorded with the dates, quantity and destination of exported manure noted when undertaken.

Optimising grassland and crop management can also offer environmental benefits in terms of reducing the potential for diffuse water pollution. No fertiliser is applied to the grazing swards and this policy is to be continued as the sampled fields are all grazed and no additional fertiliser inputs are required.

5.2 Supporting advice

Regular soil testing should be done every 4-5 years, to inform you of the appropriate use of fertilisers, lime and organic manures.

Target the soils that require more nutrients. The soil analysis results indicate which fields need manure and which ones don't.

Results also indicate that cost savings can be made where soil results show pH or soil indices above optimum levels. The application of lime on fields that have a pH above 6 is not required and should be considered as a financial loss. The loss of money occurs because of unnecessary purchase of lime, your time, wear and tear on machinery and unnecessary compaction of soil during application.

Optimising grassland management can also offer environmental benefits in terms of reducing the potential for diffuse water pollution. Excessive nutrients that are applied to land can enter into groundwaters and surface waters such as streams, rivers and ponds. The nutrients, that encourage plant growth on land, continue to work in the river thereby causing excessive algal growth and poor water quality conditions for natural aquatic life.

Appendix 1 – Gwynfaes - Recommendations & Soil Analyses

1. CURRENT FARM INORGANIC & ORGANIC FERTILISER USAGE

The manure management plan (see Roger Parry & Partners manure management plan) shows the area of the farm available for spreading manures. Current fertiliser and approximate manure applications are shown below in the following table:

Crop	Compound	Amount Applied	When Applied
Grazing	Nil fertiliser Layer manure	Nil 2.5 t/ha	When convenient on some fields in the summer

Records of exports need to be maintained as evidence of compliance with this requirement, and should include as a minimum, the type of organic manure exported, volume, and date of movement and name/address of recipient.

The policy of exporting the bulk of the poultry manure is to be continued with no artificial fertiliser to be applied to the land with only a small amount of poultry manure applied to the spreadable areas on some fields.

Phosphate Loading

The figures below are taken from Planet V3 and RB209. The table shows the phosphate loading when 30,000 layers are carried on the farm.

Livestock Type	Annual Production Kg/P_2O_5	Average Number	Occupancy	Kg/ P_2O_5 Produced
Free range layers	390	30,000	97%	11,700
Ponies	20	30	100%	600
Total Kg/P_2O_5				12,300

Export of layer manure

Type of manure	Kg/P_2O_5/T	Tonnage exported	Kg/ P_2O_5 Exported
Layer manure (40%)	14	100	1,400

The table above shows the effect of exporting every 100 tonnes of layer manure off the farm on reducing the total phosphate farm loading. Thus accurate recording of tonnage, dates of movement and destination of the exported layer manure need to be kept to enable the phosphate loading to be accurately calculated.

2. NUTRIENT APPLICATION RECOMMENDATIONS FOR THE FARM

Grazing (higher P and K index fields) – no manures proposed to be applied

Fields – 2437, 1995, 2957, 4160, 5746 (total field size for these 5 fields = 16.34ha)

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure	Balance to be Supplied
Nitrogen	Low	50 (40)	0	50 (40)
Phosphate	3	0	0	0
Potash	2- and above	0	0	0

Recommended fertiliser type and quantity:

- There is no requirement for additional phosphate or potash fertiliser to be applied for grazing at P index 3 and K index 2- and above.
- If 2.5t/ha of 40% dry matter poultry manure is applied on the spreadable area in summer this would supply 14kg/ha of available N, 30kg/ha of phosphate and 37kg/ha of potash.

Grazing – 2.5 t/ha poultry manure proposed to be applied summer

Fields – 6555, 5128, 4120, 3609, (total field size for these 4 fields = 15.19ha)

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure	Balance to be Supplied
Nitrogen	Low	50 (40)	14(11)	36 (29)
Phosphate	2	20 (16)	30(24)	0
Potash	2- and 2+	0	37(30)	0

Recommended fertiliser type and quantity:

- An application of 2.5t/ha (1 ton/acre) would supply sufficient P and K nutrients for crop grazing needs on the spreadable area of these 4 fields.

Grazing – 3.7 t/ha poultry manure proposed to be applied summer

Fields – 7644 (total field size 3.02ha)

Soil Nutrient	Soil Index	Crop Requirement Kg/ha (units/acre)	Contribution from Manure	Balance to be Supplied
Nitrogen	Low	50 (40)	21(17)	29 (23)
Phosphate	1	50 (40)	27(22)	22(18)
Potash	1	30 (24)	52(41)	0

Recommended fertiliser type and quantity:

- The table above assumes the application rate is increased to 3.7t/ha (1.5t/ac). An application of 3.7t/ha (1.5ton/acre) would supply insufficient P but sufficient K nutrients for crop grazing needs on the spreadable area of this field.

The 3 tables above show that no fertiliser is required to be spread on the grazing pastures and that the bulk of manure will be exported as is the plan. There is a requirement to apply a small amount of layer manure on the lower index fields, and (if applied) will be applied during the summer period,

RESULTS FOR GWYNFAES

Sample Name	pH	Lime Requirem Tonne/ha	P mg/l	P Index	K mg/l	K Index	Mg mg/l	Mg Index
2437	6.1	0	37.4	3	256	3	117	3
1995	5.8	2.1	39.8	3	179	2-	107	3
2957	5.9	1.6	43.4	3	149	2-	105	3
4160	5.8	2.1	34	3	167	2-	85	2
6555	5.2	5.2	16.4	2	137	2-	88	2
7644	5.1	5.8	10.4	1	118	1	92	2
5746	5.8	2.1	28	3	202	2+	126	3
5128	5.1	5.8	18	2	192	2+	159	3
4120	5.2	5.2	21	2	169	2-	105	3
3609	5.1	5.8	25	2	201	2+	104	3