Soil fertility

When aiming to grow the maximum amount of grass per hectare in the year, one of the most important components that must be right is soil fertility. The three key requirements when it comes to soil fertility are phosphorous (P) potassium (K) and having soil at the optimum pH.

Nitrogen might be the fuel that powers grass growth during the growing season but soil P, K and pH levels are the engine in the background that no amount of nitrogen can compensate for.

Figure 1 helps to explain that while many things affect grass yield, a low key element will ultimately limit overall yield.

We now have the lowest P and K use on grassland farms since the 1950s and 1960s. While soil fertilities are, on average, much higher than they were 50 years ago, it has to be remembered that as we sell produce off the farm we are also selling in that produce some of the farm's P and K. If this is not replenished with either slurry/FYM or bought-in fertilizers, overall fertility declines with time. As stocking rates increase, the rate of loss also increases.

Where soil fertility is high, a loss of some soil P and K from the system may not be an issue. However, where their levels are borderline, and are not addressed, it can quickly begin to affect the farm's ability to grow grass to its full potential. The only way to really know where you stand is through regular soil sampling.

SOIL SAMPLING

It is now widely accepted that more intensively stocked farms need to soil sample their farm every three years with all others sampling every five years.

This is the only way that a fertilizer programme for the year can be drawn up.

KEY POINTS

- Each soil test can represent between 2ha and 4ha of grassland and should be taken as late as possible after the last application of P and K from either slurry/FYM or bought-in fertilizer so as not to influence the result.
- Take separate samples from areas that differ in soil type, previous cropping history, slope, drainage or persistent poor yields.
- Avoid any unusual spots, such as old fences, ditches, drinking troughs, dung or urine patches or where organic manure or lime has been heaped or spilled in the past.
- The P that is in the soil will build up over time in the top 2cm to 3cm of the soil so it is important that you take the full 10cm of a soil core each time to get an accurate result.
- To get a representative result, walk in a W shaped pattern across the field and take 20 to 25 cores for each sample tested.
- Remember the 0.5kg of soil you are sending off for sampling will represent about 4,000 tonnes of soil from 4ha to a depth of 10cm, so it is critical you have the correct sampling technique.

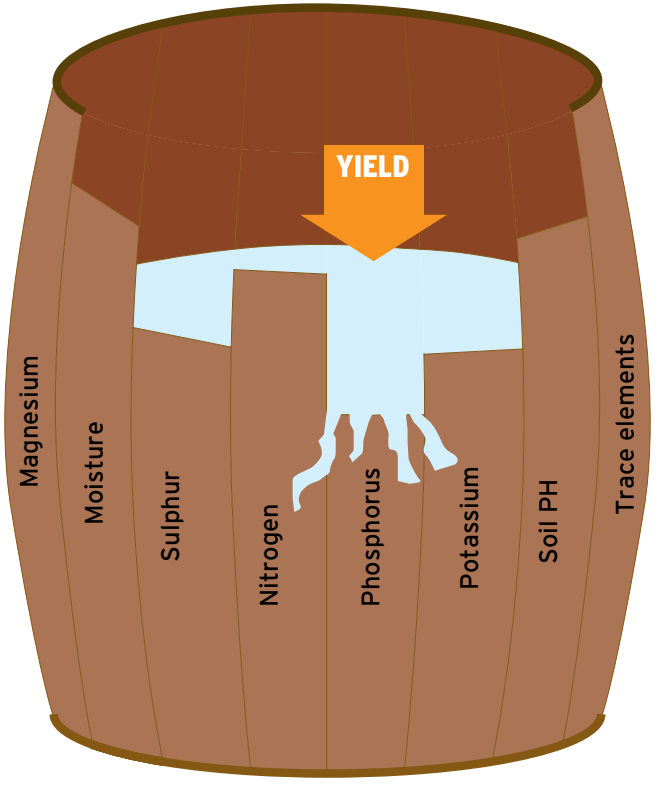
A poor sample can result in poor advice or a costly fertilizer programme which may not deliver.

A standard soil test will give the soil's fertility status as follows; soil pH, lime requirement, soil phosphorus (P), soil potassium (K), soil magnesium (Mg), together with nutrient advice based on soil sample details and results.

The cost of sampling should not be an issue at no more than €2 per hectare when spread out over the period covered. Just one extra tonne of grass dry matter grown across an entire farm would pay for the sampling of a 45-hectare beef farm every three years.

Where there is a saving due to less P and K needed, it only takes a few bags of a high P compound to pay for the sampling.

Figure 1
Nutrient uptake from soils and fertilizer is like a barrel of water. The limiting nutrient in soils will determine the yield



Soil pH

When a soil becomes acidic, the availability of the major elements N, P and K are dramatically reduced. This is a huge cost on a grassland farm. For example, a low soil pH can reduce the availability of N by 30%.

Soils that have not been corrected for pH will give a poor response to any applied P fertilizer until the pH is corrected. Knowing your soil's lime requirement is essential and must be acted on. The ideal soil pH on mineral soils to get maximum P release from soils and from organic manures is 6.3 to 6.5. On peat soils the pH should be at least 5.5.

Ground limestone is the most effective way to correct soil pH with the rate depending on your soil test pH result. It takes 18 months for it to fully react in the soil. It is also the most cost-effective method.

At a rate of 5t/ha, it will cost in the region of €20/ha per year spread over five years. Where more than 7.5 tonnes are required per ha, split the application, with 50% applied in the first application and the other 50% applied two years later.

DOs ✓	DON'Ts ✗
Ensure soil corer is sharp, working properly and going to 10 cm depth	Assume that a field either has enough P and K or needs a regular amount each year.
Draw up a fertiliser plan with your adviser based on the soil test results	Ignore the lime requirement as soil pH is crucial to get maximum availability of other nutrients
Split your lime application if there is a big requirement (>7.5 tons/ha)	Apply potash (K) in the autumn/winter on light sandy soils
Apply phosphate in the form of slurry in the autumn if you are in soil index 1 or 2	Apply any P and K during the year on soils that are in index 4
Apply phosphate in small regular amounts during the growing season on soil index 3 soils.	Apply any P and K on peaty soils in the autumn/winter
Aim to get the entire farm to soil index 3 and keep it there.	Waste money on bought in fertiliser when it is not needed.
	Allow your farms P and K levels drop too low as it is costly to get them back up again.

Soil P & K

Your soil test result will again indicate whether or not you need to apply extra P and K. There are four indices for each of them (Index 1, 2, 3 and 4). Table 1 shows the different break points for each index. You will note from this table the revised lower break points that are now in place for P in grassland in the indices 2, 3 and 4.

The aim for most grassland farmers must be to build P and K levels until they are at Index 3 and then to maintain them at that optimum level to get maximum production. Going above this level is not only a waste of money, but it is also a risk to the environment. About 30% of soils are in the agronomically optimum Index 3 range for P and K. Therefore, to assume soil Index 3 in the absence of a soil test will mean that you may be wrong 70% of the time.

Lime can be safely applied to grassland at any time of the year. It is important to ensure that lime is well washed off grass before stock graze it, as it can cause scouring.

Lime should not be applied to

Table 1
Soil P & K Index System

	Soil P (mg/l)		Soil K (mg/l)
Soil P & K index	Grassland	Other crops	Grassland & Other crops
1	0.0 – 3.0	0.0 - 3.0	0 – 50
2	3.1 – 5.0	3.1 - 6.0	51 – 100
3	5.1 – 8.0	6.1- 10.0	101 – 150
4	> 8.0	>10.0	>151

These indexes provide an indication to the likely response you will get from applying either more P or K.

Soil Index	Yield Response to Additional Nutrient
1	Definitely
2	Likely
3	Unlikely
4	None

Application Periods for Chemical Fertilisers, Organic Fertilisers and Farm Yard Manure

		Prohibited application periods		
Zone	Storage period	Chemical fertilizer	Organic fertilizers	Farmyard manure
A, Carlow, Cork, Dublin, Kildare, Kilkenny, Laois, Offaly, Tipperary, Waterford, Wexford, Wicklow	16 weeks	15 Sep - 12 Jan	15 Oct – 12 Jan	1 Nov– 12 Jan
B, Clare, Galway, Kerry, Limerick, Longford, Louth, Mayo, Meath, Roscommon, Sligo	18 weeks	15 Sep - 15 Jan	15 Oct – 15 Jan	1 Nov – 15 Jan
C, Donegal, Leitrim	20 weeks	15 Sep -31st Jan	15 Oct – 31 Jan	1 Nov – 31 Jan
D, Cavan, Monaghan	22 weeks	15 Sep - 31 Jan	15 Oct – 31 Jan	1 Nov – 31 Jan

silage fields in the spring prior to cutting or between cuts, as any traces of lime in the pit would have a negative effect on preservation. The autumn is a suitable time on many farms to spread lime where ground conditions allow.

The time of year you apply phosphate will depend on the soil index you are at.

If you are at index 1 or 2, there is a very good reason for applying it in the autumn as there can be many days over the winter (especially in the south of the country) when there is at least some grass growth; remember to adhere to closed period spreading dates for the different zones when spreading chemical and organic fertilizers.

Phosphate is important for root development and to enable new tillers to develop over the winter, root development is essential and this means they must come in contact with some phosphate. Where you are at soil index 3, applying it throughout the grazing year in high nitrogen low phosphate compounds that are on the market should be enough to keep the soil at that index.

The need for potash over the winter is not as crucial. If K levels are at index 2 or higher, applying potash in the spring will suffice. This is because there is some mineralisation of potash over the winter.

EXAMPLE: Calculating a Farm Cover

Paddock No. / Name	Paddock DM yield (kg DM/ha)	Multiply by	Paddock area (ha) (A)	Total Cover (kg DM) (B)
1	900	X	2.1	= 1890
2	100	X	2.5	= 250
3	200	X	1.9	= 380
4	1000	X	2.3	= 2300
5	1200	X	2.0	= 2400
6	600	X	1.8	= 1080
7	200	X	2.2	= 440
8	400	X	2.6	= 1040
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
		X		=
Sum column A and column B			*17.4 (A)*	*9780 (B)*
Divide column B (total cover) by A (area) [B ÷ A]			562	kg DM/ha (Farm Cover)

Decisions for the coming week:

Farm Walk Recorder **Date:**

kg DM/ha	Paddock No./Name					
2500						
2400						
2300						
2200						
2100						
2000						
1900						
1800						
1700						
1600						
1500						
1400						
1300						
1200						
1100						
1000						
900						
800						
700						
600						
500						
400						
300						
200						
100						
0						

Instructions:

- Write the paddock name or number in the first empty column next to the available cover that you have measured/estimated is on the paddock
- The above table has ranked the paddocks in order of the highest cover to the lowest pasture cover
- Plot this information on the Pasture Wedge page

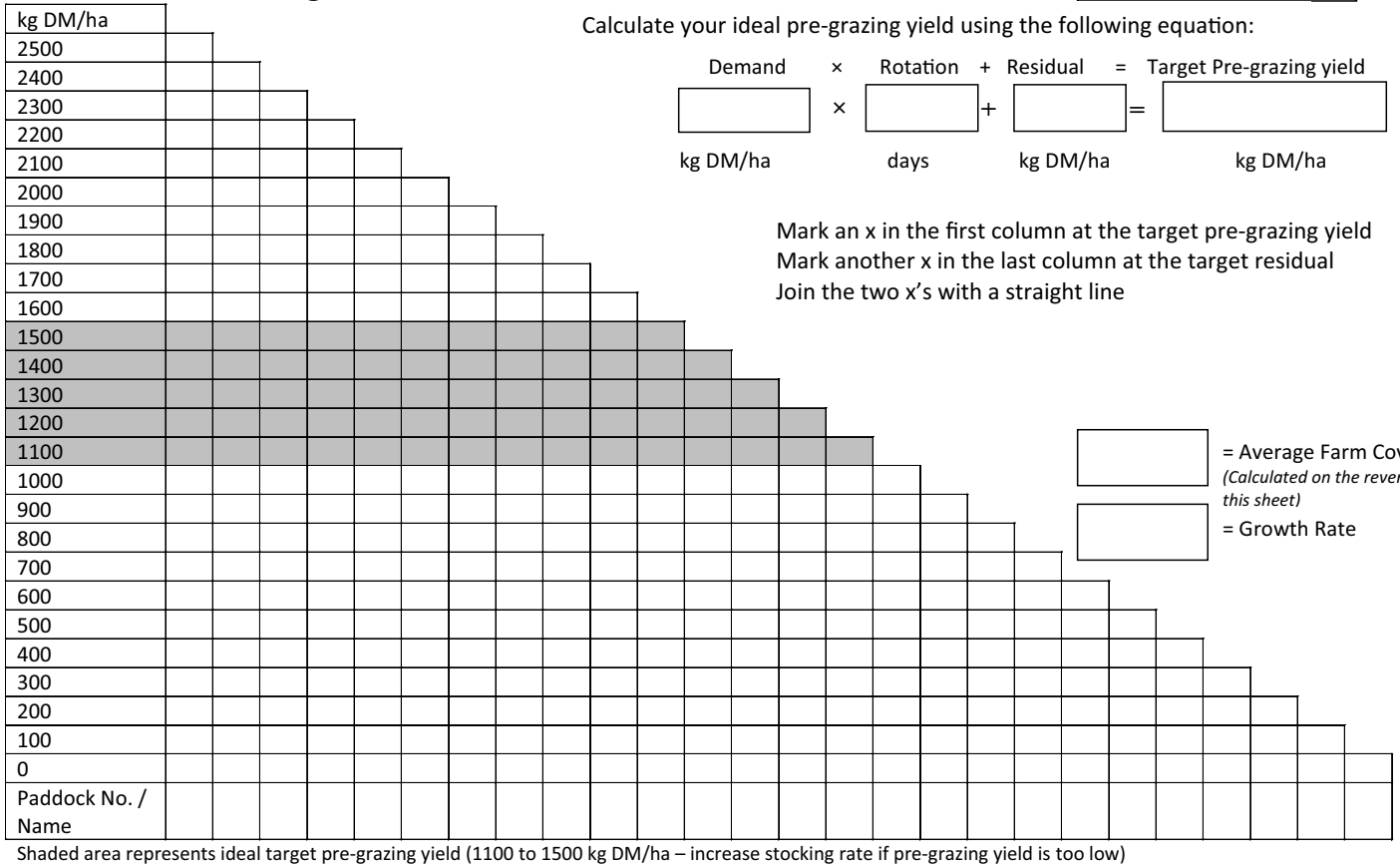
Manual Pasture Wedge

Date:

Calculate your ideal pre-grazing yield using the following equation:

Demand	×	Rotation	+	Residual	=	Target Pre-grazing yield
	×		+		=	
kg DM/ha		days		kg DM/ha		kg DM/ha

Mark an x in the first column at the target pre-grazing yield
Mark another x in the last column at the target residual
Join the two x's with a straight line



Shaded area represents ideal target pre-grazing yield (1100 to 1500 kg DM/ha – increase stocking rate if pre-grazing yield is too low)

= Average Farm Cover
(Calculated on the reverse of this sheet)

= Growth Rate

TOP TIPS FOR JANUARY

Slurry

Spread slurry on light covers that were closed up last in the autumn. Apply 2500 gallons per acre – equivalent to spreading 0.5 bags of urea per acre. Remember to check the dates for your spreading zone.

Paddocks

When dividing paddocks, avoid long narrow blocks. Try to keep them as square as possible. 2ha paddocks are ideal for a 40-cow herd. Position water troughs so that paddocks can be subdivided during periods of peak growth.

December/January

Do's ✓	Don'ts ✗
Divide large paddocks into more manageable grazing blocks	Graze paddocks that are closed for spring
Repair any broken stakes and fences	Spread slurry on paddocks that will be grazed first when animals are turned out or on heavier covers
Drain water troughs – especially concrete troughs that make crack in the frost	
On drier farms spread 2,500 gal/ac of slurry on paddocks closed last in autumn	
Complete the spring rotation planner to plan grazing for 1st rotation	
Close farm by 1st December on drier farms and mid-November on heavier farms	

TOP TIPS FOR FEBRUARY

Slurry
Heavy farms should spread slurry as soon as ground conditions allow.

Early Nitrogen
Nitrogen should be applied on dry farms in early February with heavier farms getting out in mid-late February. Spread at a rate of 23 units (0.5 bags of urea) per acre. Soil temperature should be consistently above 5-6 degrees C. Do not spread if heavy rain is forecast.

Turnout
Dry farms should aim to get out to grass in mid February
Turnout out priority stock first.

TOP TIPS FOR MARCH

Grazing
Try to graze paddocks down as tight as ground conditions allow.
Target to get down to 3.5-4cm before moving stock on. Do not damage swards. When ground conditions are poor, move stock on quicker.
Shift stock onto a hardcore area or rough grazing area during periods of torrential rain.

Slurry
Apply slurry on paddocks with heavy covers after grazing.

February/March

Do's ✓	Don'ts ✗
Apply nitrogen (½ bag urea) on drier farms in early February and from mid-February on heavier farms	Apply no fertiliser/slurry as there won't be enough grass for grazing during the 1st rotation
Spread 2,500 gal/ac of slurry on heavier farms on paddocks closed last in autumn	Turn all animals out together
Turnout priority stock first	Delay turnout date as too much grass will accumulate and quality will be poor resulting in lower weight gains
Graze paddocks to 3.5 to 4cm	Leave a post grazing residual of >4cm during the first rotation as this will reduce grass quality in subsequent rotations
Graze 40% of farm by March 17th on drier farms and by 31st March on heavier farms	Graze more than 40% of the farm by target dates as 'wedge' will not be created for 2nd rotation and grass will run out
Use on/off grazing during wet weather or on heavier soils to prevent poaching damage	

TOP TIPS FOR APRIL

Grazing

On dry farms where stock went out to grass in mid-February the first rotation should be completed around 10 April. The first rotation on dry farms should be 60 days falling back to 40-50 days on heavier farms that are going out to grass later.

Silage

Silage ground should be closed up on dry farms around the 10th of April with heavier farms closing up around the 20th. Remember to take into account carryover N, P&K when calculating fertiliser requirement for silage ground.

TOP TIPS FOR MAY

GRASS MEASURING

Walk the farm weekly, monitoring how much grass is available. Use the grass wedge to react quickly to surplus grass and potential future surplus or deficit. Aim to keep days ahead between 10-14 days.

GRAZING

Aim to start grazing swards at 7-9cm or 1300-1500kg DM/ha. Graze out swards to 4-4.5cm to promote excellent quality re-growth. This should apply until early August.

April/May

Do's	Don'ts
Finish 1st rotation by 10th April on drier farms and 20th April on heavier farms	Finish the 1st rotation too early as there won't be enough grass for the 2nd rotation
Change to CAN from Urea in late April/May	Apply nitrogen to clover rich pastures
Walk the farm weekly	Walk farm infrequently as it makes it very difficult to monitor amount of grass on farm and make decisions
Complete grass wedge	Delay making decisions e.g. removing surplus grass as silage bales
Maintain pre-grazing yields at 1400 kg DM/ha (8cm)	Let pre-grazing yields get too high (>1600 kg DM/ha)
Keep rotation length at 18 – 21 days	Let rotation length extend >23 days
Graze paddocks to 4cm – only top when necessary (post grazing height 6 – 7 cm)	Graze paddocks 5.0 - 5.5 cm

TOP TIPS FOR JUNE

WINTER FEED NEEDS

Calculate winter feed budget to identify if second cut silage is definitely required (excluding surplus bale silage).

GRASS QUALITY

Focus on maintaining quality to maximise animal performance. Continue removing surplus grass as baled silage. If post-grazing heights rise to 6-7cm, topping will be required. Where significant surplus occurs in late June/early July following silage ground re-entering the rotation, take paddocks out as baled silage or consider taking the opportunity to get some re-seeding completed.

TOP TIPS FOR JULY

MAXIMISE PERFORMANCE

Target silage aftergrass for creep grazing suckling calves, weaned calves and priority stock. Where swards are previously under-grazed, improve quality by using dry cows or mature in-calf heifers to graze off properly. On all cattle farms, topping may be needed to improve grass quality.

MANAGING BULLS

Consider housing beef bulls if weather conditions deteriorate and bulls become unsettled.

June/July

Do's	Don'ts
Continue to monitor farm cover weekly	Walk paddocks fortnightly or less frequently
Identify surpluses and deficits early and take immediate action	Increase stocking rate on grazing area by closing too many paddocks for long term silage
Maintain pre-grazing yields at 1400 kg DM/ha (8cm)	Miss nitrogen on paddocks if possible
Keep rotation length at 18 – 21 days	Let pre-grazing yields get too high (>1600 kg DM/ha)
Keep nitrogen applications up-to-date	Let rotation length extend >23 days
Use light applications of slurry/dirty water if available	Graze paddocks 5.0 - 5.5 cm
Treat animals for worms	

TOP TIPS FOR AUGUST

BULLS

The performance of bulls deteriorates rapidly as the year progresses and especially in unsettled weather. Offer fresh grass more regularly or house onto ad-lib diet.

BUILDING GRASS SUPPLIES

From mid to late August, start to build days ahead to 25 to 35 days ahead.

TOP TIPS FOR SEPTEMBER

HOUSING

In general there should be enough grass available in September for grazing. However, animals targeted for finishing by Christmas should be housed and built onto a high-energy diet.

SURPLUS GRASS

Do not take surplus grass out of the rotation as baled silage or top heavily as it will limit re-growth and reduce grass supplies into autumn.

WEANING

Many herds follow a regimental weaning date. First calvers and thin cows should be weaned early if necessary.

August/September

Do's	Don'ts
Build grass from mid-August onwards	Don't build grass from mid-July
Harvest surplus grass as bales by end August	Remove surpluses as silage in September as grass growth is reduced and paddock may not be available for grazing again
Complete any autumn reseeding by end August at latest	
Start lengthening rotation from August – 25 – 30 days by mid/late August	
35 – 40 days by late September	
Target pre-grazing yields of 2000 – 2300 kg DM/ha by mid-September	
Highest farm cover should be achieved by late September	
Ensure sufficient nitrogen has been spread before the 15th September	

TOP TIPS FOR OCTOBER

PLANNED CLOSING

Closing on dry farms starts from 10th October while heavy farms should start closing from 1st October. For a dry farm 60% should be grazed within 4 weeks and the remaining 40% grazed in the next 4 weeks. On a wetter farm this changes to 60% grazed in 4 weeks and the remaining 40% grazed in 3 weeks. House priority animals first reducing group size as grass supply diminishes. Heavy farms should have 100% grazed in-mid Nov. Dry farms graze 100% by 1st December.

TOP TIPS FOR NOVEMBER

When ground conditions begin to get wet all heavy stock should be housed and paddocks should be grazed out with light animals; e.g. yearlings or weaned calves. Heavy poaching should be avoided at all costs.

October/November

Do's	Don'ts
Plan your closing pattern on the farm by using the 60:40 autumn rotation plan	Start autumn grazing without a plan
Start closing paddocks from 10th October on drier farms and 1st October on heavier farms	Start closing paddocks from late October
Close drier more sheltered paddocks 1st (these will be the first ones grazed in spring), wetter paddocks should be closed next, followed by the remainder	Re-graze paddocks that have been closed
Graze paddocks to 4cm to encourage tillering over the winter months	Graze paddocks to 5 – 6cm
Keep pre-grazing yield <2300 kg DM/ha, a strip grazing wire can help improve utilisation	Graze covers > 2500 kg DM/ha
Graze 60% of farm by 1st week of November on drier farms and 20th October on heavier farms	