

## Tillage Crops 2022 – Fertiliser Advice

### 1. Soil Fertility Trends & Soil Sampling

In 2021 there was 3,794 soil samples reported in the Teagasc tillage soil sample database, this represents ~ 25% increase in soil sampling compared to 2020. Soil test results indicate the following:-

1. Soil pH <6.5 has increased by 8% compared to 2020. With 61% of soils with pH >6.5
2. 57% of soils Index 1 & 2 for P, while 24% and 19% index 3 and 4, respectively
3. 32% of soil Index 1 & 2 for K, while 28 and 40% index 3 and index 4, respectively
4. Soils with optimum pH, P & K has reduced from 24% to 18% in 2021

Overall slight slip in soil pH and P (+7% increase in Index 1 & 2) levels while soil K levels continue to improve in 2021.

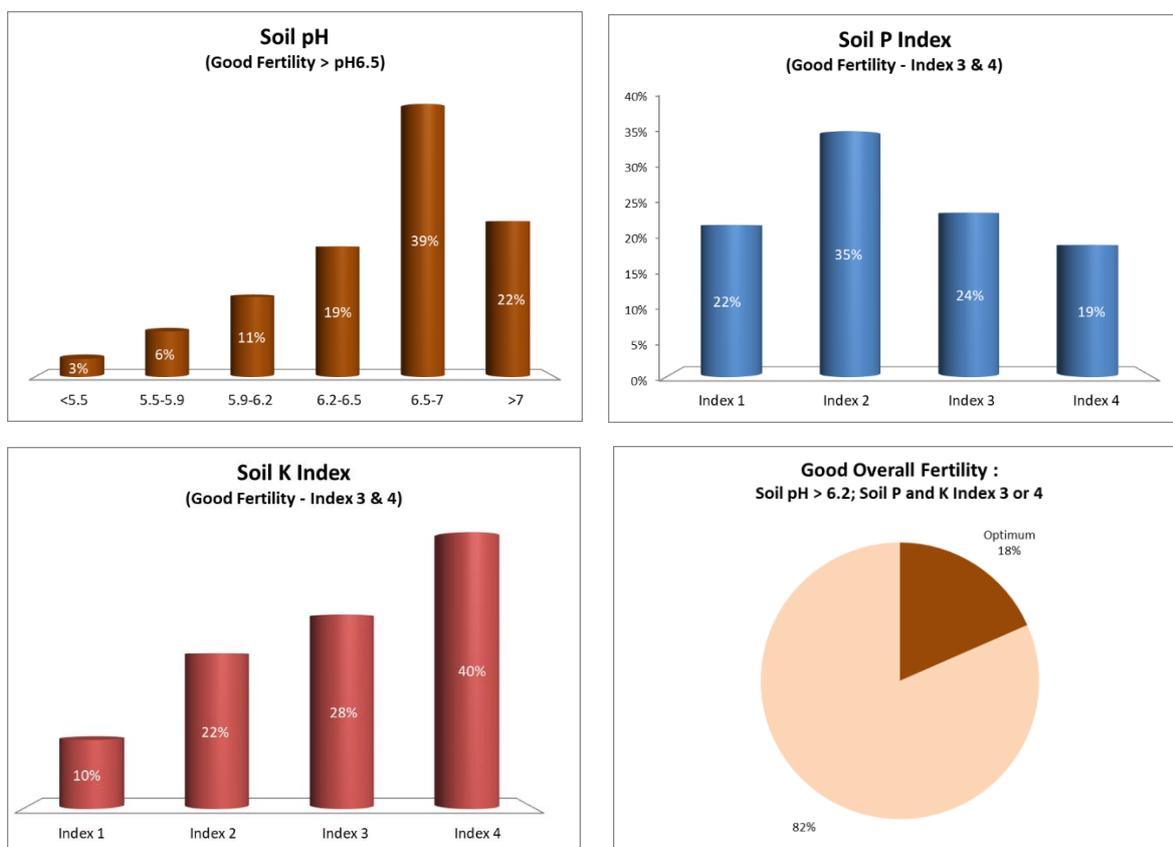


Figure 1:- Percentage of soils in pH ranges, soil P and K index and soils with optimum fertility.

In 2022 take fresh soil samples where samples have not been taken in the last 2 to 3 years. The soils database would indicate good opportunity to reduce omit K fertilisers in 2022 on Index 4 soils are now 40% of tillage soils very high.

## 2. Soil pH & liming

Soil test results indicate a slight slip in soil pH levels plus soils testing > pH 7.0 has decreased from 3 to 22% in 2022. This may be due to the soil sample cycle and different fields been sampled each year.

It is recommended to apply lime for spring crops over the coming days and weeks to correct soil pH levels to maximise soils and applied fertilisers (organic & chemical) efficiency.

## 3. Soil P & K Management

In 2022 with a near doubling of P and K's it is recommended to apply P and K based on the average crop yield over the last 3 years. Table 1 below shows P and K requirements for a range of cereal crops at target yields selected for each crop type. In addition, a suggested fertiliser programme are shown. Adjust P and K rates based on crop yield potential for 2022.

Table 1:- P & K requirements based on cereal crop grain yield (t/ha) for a range of cereal crops				
Crop Type	Grain yield t/ha (t/ac)	P kg/ha (units/ac)	K kg/ha (units/ac)	Suggested Fertiliser Product & Rate (kg/ha) (bags/ac)
Winter wheat	11 (4.5)	42 (34)	110 (88)	495kg/ha (4 bags/ac 12-8-20)
Winter Barley	10 (4)	38 (30)	100 (80)	460kg/ha (3.75 bags/ac 12-8-20)
Winter Oats	9 (3.6)	34 (27)	130 (104)	495kg/ha (4 bags/ac 10-7-25)
Spring Barley	7.5 (3.0)	29 (23)	86 (69)	425 kg 13-6-20 (3.5 bag/ac)
Spring Wheat	8.5 (3.5)	32 (26)	97 (78)	495 kg 13-6-20 (4 bag/ac)
Spring Oats	7.5 (3.0)	29 (23)	108 (86)	495 kg 13-6-20 (4 bag/ac)

High pH soils with high Morgan's P see draft P advice to better manage P applications in 2022

Table 2:- Morgan's Soil P and P advice for cereals on soils with a soil pH > 7.2			
Soil P Index	Soil (mg/l)	P Advice	Comments
Index 1 & 2	< 9.0	Apply off takes	Combine drill
Index 3	>9.0 to 22	Apply off takes	Spring cereals apply full off take Winter cereals with high P's reduce P & k applications by 50%
Index 4	> 22	Omit P applications	

## 4. Nitrogen Rates in 2022

High fertiliser N prices in 2022 is resulting in much debate over N rates. Nitrogen rates will have to be reduced to reflect grain price and fertiliser N costs. The increased fertiliser N costs will be offset to some degree with higher grain prices. The break-even ratio (BER) is commonly used to determine the N rates for cereals. The BER is the number of kilos of grain required to pay for a kilo of nitrogen. Take a fertiliser N price of €700/tonne and a grain price of €220/tonne, the BER is 11.8 : 1. In previous years, the BER was ~ 6:1. Dr. Richie Hackett has indicated that for each BER change above 6 N rates for winter wheat should be adjusted by 6kgN ha and for barley 5kg N/ha. Therefore, in the example above N rates for winter wheat would change by (6 x 6.8) ~35kgN/ha and for barley (5 x 6.8) ~ 29kgN/ha. In summary N rates should be reduced by 25-35 kg N/ha this year compared to normal and the calculated average yield loss as a result is 0.2 – 0.3 t/ha.

Tables 3 & 4 show nitrogen rate adjustments based on fertiliser N as CAN and grain price. Refer to Teagasc Green book for economic optimum N rates for cereal crops and apply adjustments as shown below.

Grain / Fertiliser N (CAN)	€300	€400	€500	€600	€650	€700	€750
€150	-8	- 23	- 38	- 53	- 60	- 68	- 75
€200	+ 3	-8	- 20	- 31	- 36	- 42	- 47
€250	+ 9	0	-8	- 17	- 22	- 26	- 31
€300	+ 14	+ 6	-1	- 8	- 12	- 16	- 20
€350	+ 17	+ 11	+ 4	-2	- 5	- 8	- 12

Grain / Fertiliser N (CAN)	€300	€400	€500	€600	€650	€700	€750
€150	-7	- 19	- 32	- 44	- 50	- 56	- 63
€200	+ 1	-7	- 16	- 26	- 30	- 35	- 39
€250	+ 8	0	-7	- 14	- 18	- 22	- 26
€300	+ 19	0	0	- 7	- 10	- 13	- 16
€350	+ 14	+ 9	+ 4	-2	- 4	- 7	- 10

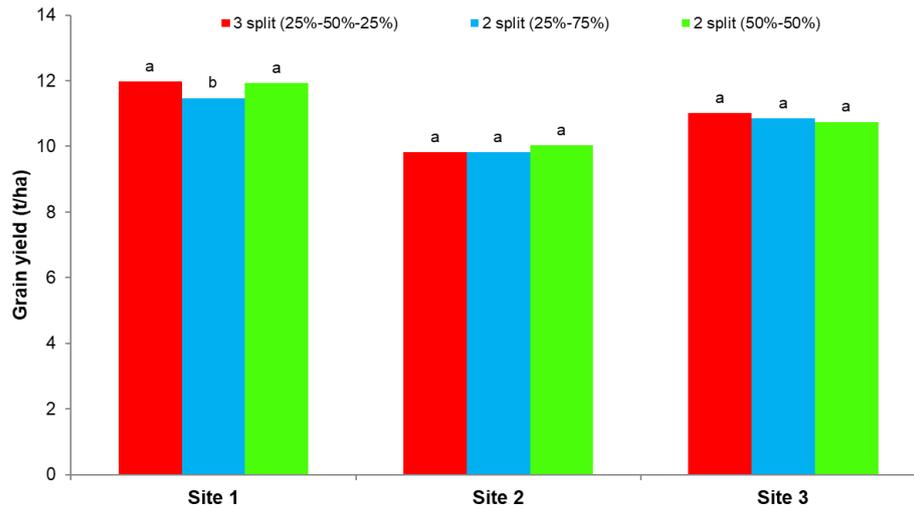
### Increasing N Use Efficiency in 2022

To maximise the return from applied chemical N is very important to consider the following when deciding on N timings

1. Soil temperatures must be > 6°C on a number of consecutive days
2. Ensure good soil tractfficability
3. Ensure good weather cast ahead
4. Ensure good plant growth

### Splitting Nitrogen applications

A further way to improve N use efficiency is splitting N application as it reduces the potential losses through either leaching or volatilization. Figure 2 below shows little effect of N splits on final grain yield over a number of years. Where > 150kg N/ha is applied a third split will reduce the risk of N losses. Apply at least 75% by GS 31.



**Figure 2:- Shows the effects of splitting N in 2 or 3 splits and different rates at time of application**

### 5. Nitrogen and Break crops

Break crops such as beans / peas / beet / oilseeds or fields receiving continuous applications annually of organic manures will supply more N and are classed soil N Index 2. Crops grown on continuous tillage soils are classed as soils N Index 1. Table 4 shows N advice for a range of cereal crops. For example winter wheat target grain yield 10t/ha, following springs beans will be soil N Index 2 and the recommended N rate is 200 kgN/ha. This rate of N will also need to be adjusted for grain and N price as shown in table 5 above.

Table 5:- Recommended N rates for a range of cereal crop based grain yield (t/ha)					
Crop Type	Grain Yield (t/ha)	Nitrogen Soil Index			
		1	2	3	4
Winter wheat	10	230	200	140	100
Winter Barley	9.5	200	175	140	100
Winter Oats	8.5	165	140	105	65
Spring Barley	7.5	155	120	95	60
Spring Wheat	8.5	180	150	95	80
Spring Oats	7.5	130	110	80	50

## 6. Organic Fertilisers

Organic fertilisers such as cattle or pig slurry or some of the solid manures such as poultry / FYM / Mushroom compost / dairy sludges offer a great opportunity to reduce the impact of high fertiliser prices in the current year. In addition valuable soil organic matter / carbon will also be added in the application which will improve soil nutrient supply and soil structure. Table 6 below shows typical values for a range of organic fertilisers.

<b>Table 6:- Organic Fertiliser Values (N, P &amp; K) units / 1,000gals or tonne</b>				
<b>Manure Type</b>	<b>N</b>	<b>P</b>	<b>K</b>	<b>€/1,000gals or € /tonne</b>
<b>Cattle Slurry (6% DM) '000</b>	9	5	32	39
<b>Pig Slurry (4% DM) '000</b>	19	7	20	48
<b>Layer Manure (55% DM) (t)</b>	23	11	24	61
<b>Broiler Manure (t)</b>	28	12	36	77
<b>SMC (t)</b>	3	3	16	20
<i>On Index 1 or 2 soils P &amp; K availability 50% &amp; 90%, respectively</i>				

Steps to take to maximise nutrient value of organic fertilisers at time of application

1. Apply to low fertility fields (Index 1 or 2)
2. Test manures for DM%, N, P & K
3. Ensure well mixed / agitated before application
4. Apply evenly from start to finish
5. Aim to supply ~50% of crop P and K requirements
6. For high N manures incorporate rapidly within 3 to 6 hrs to maximise N recovery
7. For autumn applied manures assume 10% N recovery for current crop
8. On Index 1 & 2 soils reduce P and K availability to 50 and 90%, respectively.
9. Where applying poultry manures check latest guidelines from the DAFM

See examples of organic fertiliser applications and fertiliser advice

Continuous winter wheat averaged 10.0 t/ha in 2021 (highest yield achieved in 2019, 20, 21), the soil N index 1 (low soil N), soil P & K index 2 and the crop received 22m<sup>3</sup>/ha of cattle slurry. What fertiliser should I apply to meet crop requirements? (it is assumed only 10% of N available, P 50% available & K is 90% available). Assumes a fertiliser N prices of €650 for CAN & Grain prices €250. P and K based on supplying off takes in 2022 due to high fertiliser prices.

<b>Table 7:- Winter wheat fertiliser advice with 22m<sup>3</sup>/ha autumn applied cattle slurry &amp; suggested fertiliser programme</b>				
<b>Nutrient Advice</b>	<b>Kg/ha</b>	<b>Cattle Slurry</b>	<b>Crop N, P &amp; K Req.</b>	<b>Suggested Fertiliser Programme</b>
<b>N</b>	208	2.2	206	320kg/ha 15-10-10 SulCAN – 590kg/ha <i>Splits – 370kg/ha @ GS 30/31 220kg/ha @ GS 33/37</i>
<b>P</b>	38	5.5	32	
<b>K</b>	100	69	31	

Continuous spring barley averaged 7.5 t/ha in 2021 (highest yield achieved in 2019, 20, 21), the soil N index 1 (low soil N), soil P & K index 3 and the crop received 22m<sup>3</sup>/ha of pig slurry. What fertiliser should I apply to meet crop requirements? (it is assumed 50% of N available, P 100% available & K is 100% available). Assumes a fertiliser N prices of €650 for CAN & Grain prices €250. P and K based on supplying off takes in 2022 due to high fertiliser prices.

Table 8:- Spring barley fertiliser advice with 22m <sup>3</sup> /ha spring applied pig slurry & suggested fertiliser programme				
Nutrient Advice	Kg/ha	Cattle Slurry	Crop N, P & K Req.	Suggested Fertiliser Programme
N	137	46	91	185kg/ha 13-6-20 SulCAN – 245kg/ha <i>Splits – 165kg/ha @ GS 25</i> <i>80kg/ha 2 wks later</i>
P	29	18	11	
K	86	48	38	

## 7. Nitrogen Type

Consider alternative N source to CAN. Protected Urea ~ 20% cheaper. Protected urea will deliver similar grain yields to CAN as shown below in figure 2. Calibrate / check spreader evenness across spreader width.

Table 9:- Cost per Kilo of Nitrogen (N)			
	CAN (27% N)	Protected Urea (46% N)	Urea (46% N)
Kg N/ton	270	460	460
Price € / ton	720	980	930
Cost€/kg	2.67	2.13	2.02

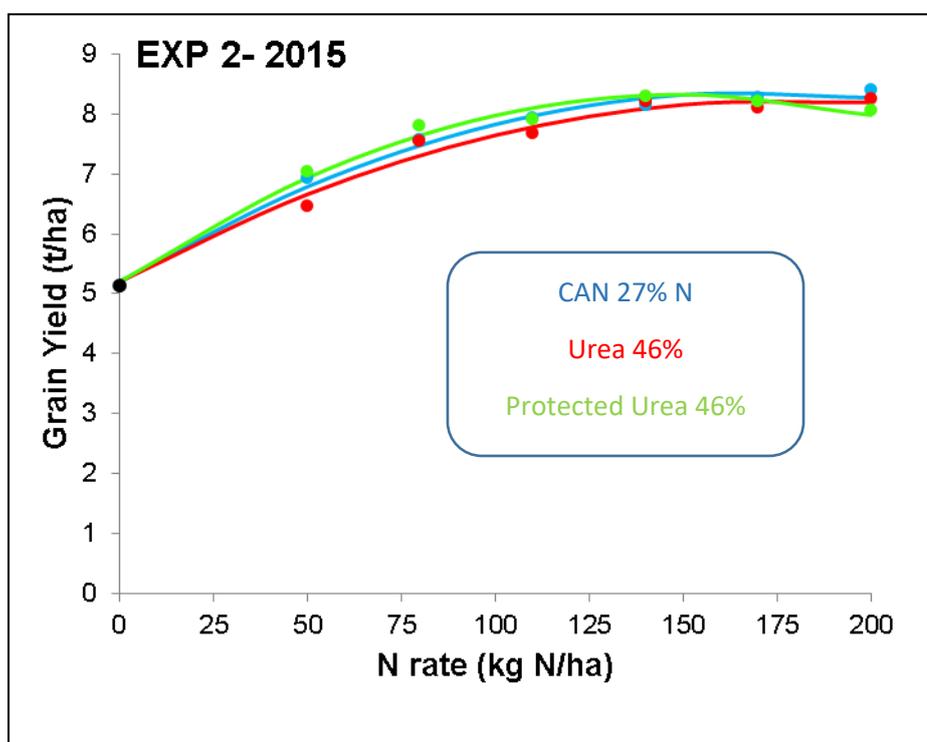


Figure :- Shows the effect of nitrogen type on grain yield in spring barley production

## 8. Apply Sulphur

Apply 15 to 25kg S/ha cereals & 25 to 35kg S/ha for oilseeds

## 9. Adjust for P & K's in chopped straw

Where straw was chopped in 2021 make adjustment to fertiliser advice especially for potassium rates applied. See table 10 below.

Table 10:- P & K supply from chopped straw				
Crop Type	Grain yield (t/ha)	P (kg/ha)	K (kg/ha)	Value /ha (savings)
Winter wheat	10	4	51	€86
Winter oats	9	3.6	87	€135
Spring Barley	7.5	3	50	€81

## 10. Combine drill P & K for Spring Cereals

Most efficient method to deliver especially P to spring barley. On high pH soils benefits to combining drilling and reducing the incidence of such trace elements as manganese.

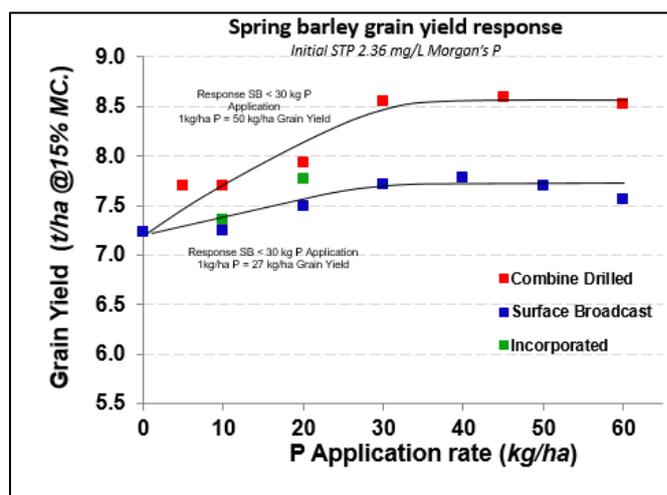


Figure 3:- Combine drilling P on low index soils increases P efficiency and delivers higher grain yields especially in spring barley.