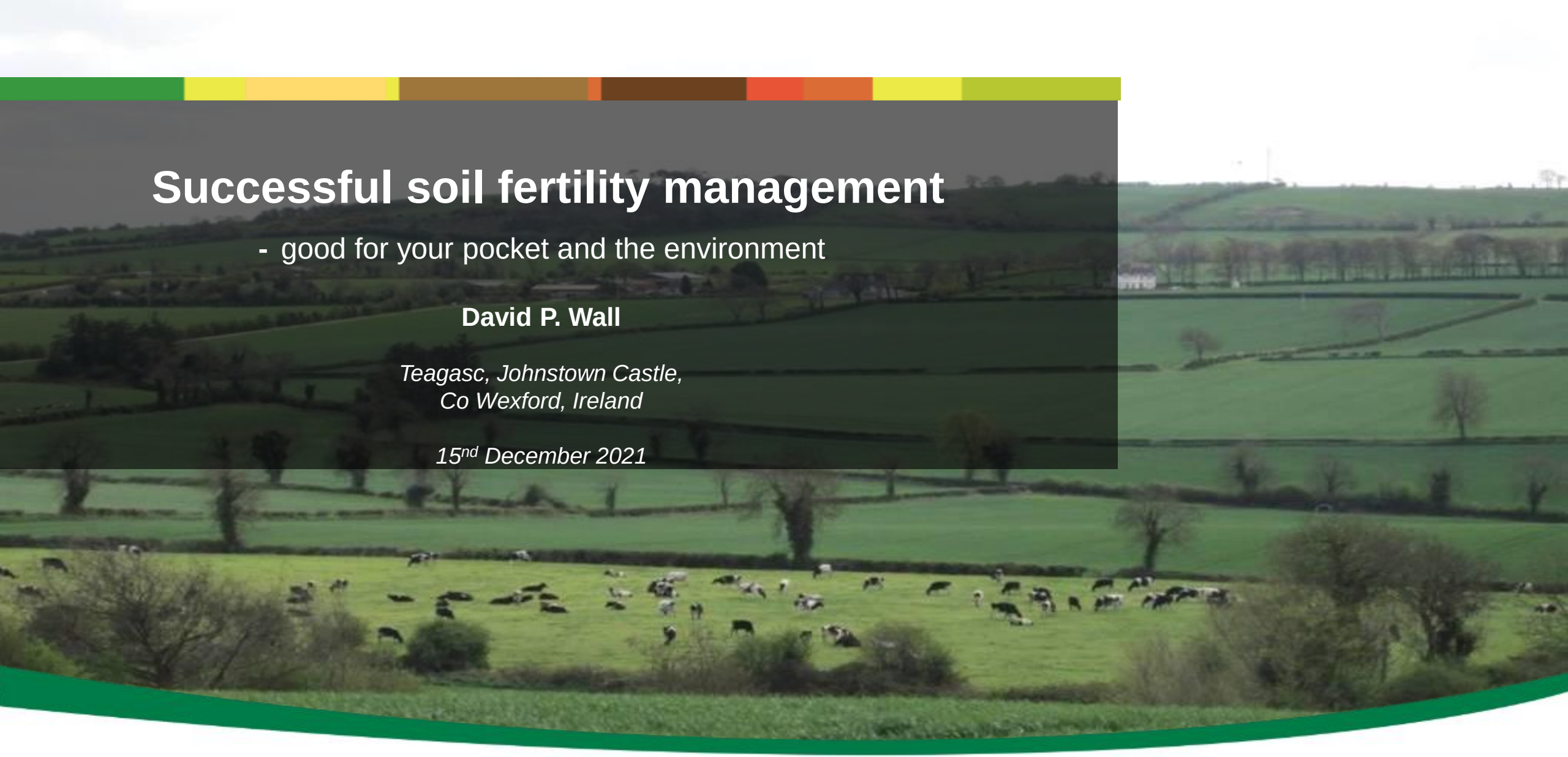


Successful soil fertility management

- good for your pocket and the environment

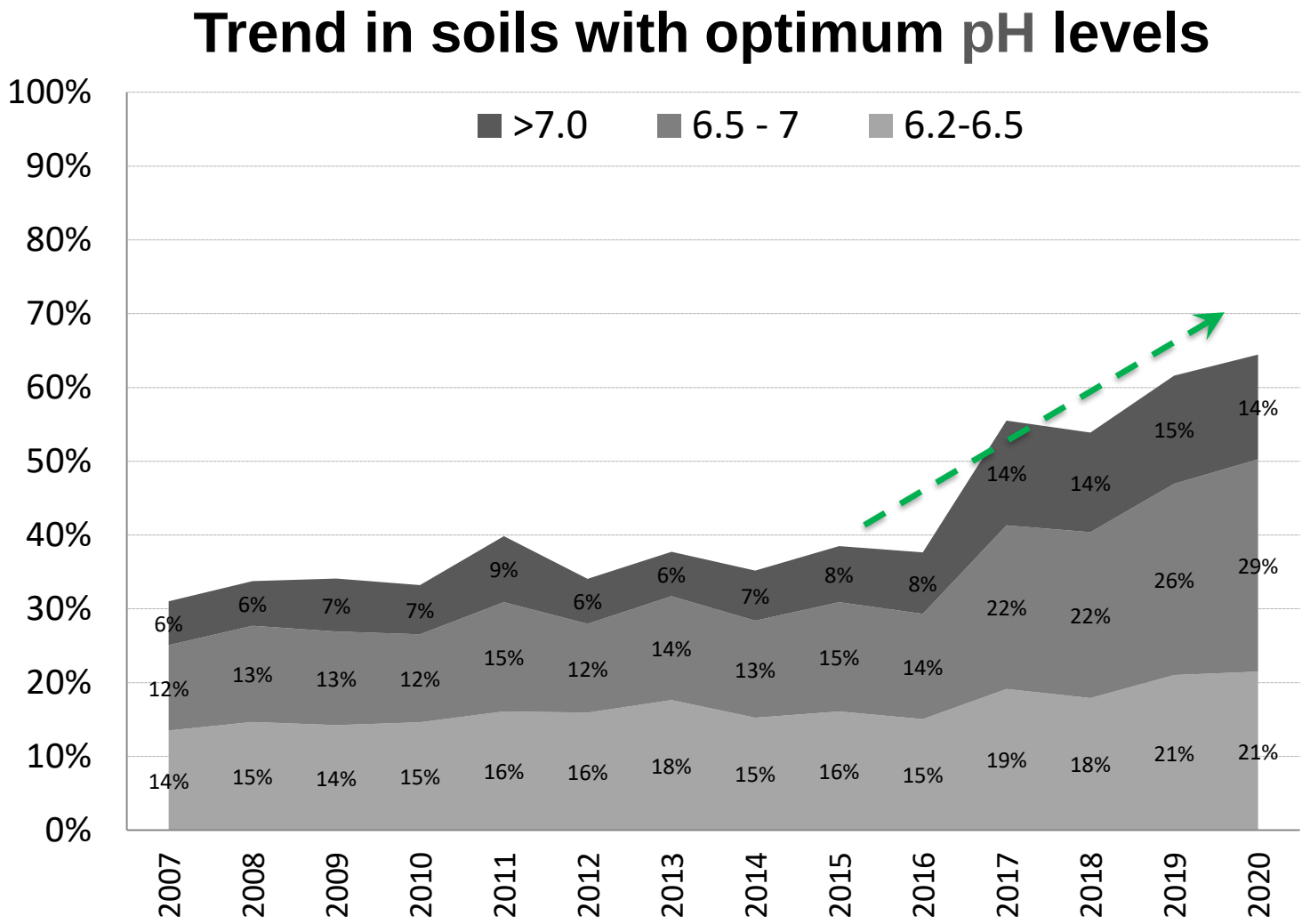
David P. Wall

Teagasc, Johnstown Castle,
Co Wexford, Ireland

15nd December 2021

Teagasc
Agriculture and Food Development Authority

National soil fertility trends



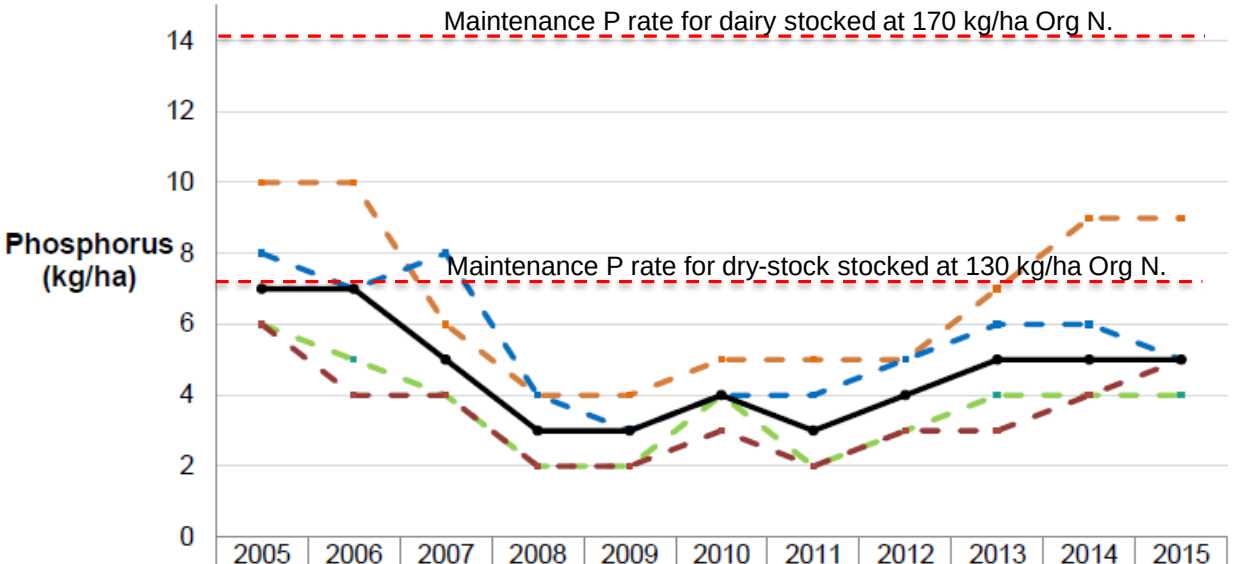
Target = pH >6.2 (low acidity)

What can we learn from the past?

Fertilizer price spiked in 2008-2009

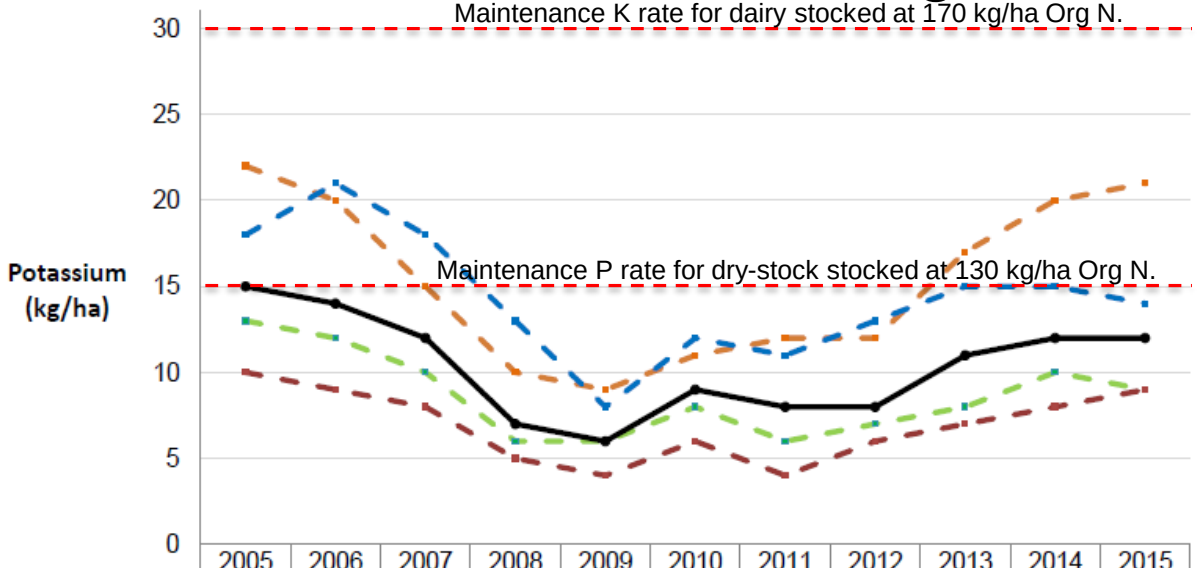
- CAN price 74% higher & Urea price 51% higher
- Phosphorus price 101% higher
- Potash (K) price 173% higher

Phosphorus fertilizer use on grassland



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cattle	6	5	4	2	2	4	2	3	4	4	4
Dairy	10	10	6	4	4	5	5	5	7	9	9
Sheep	6	4	4	2	2	3	2	3	3	4	5
Tillage	8	7	8	4	3	4	4	5	6	6	5
All Systems	7	7	5	3	3	4	3	4	5	5	5

Potassium fertilizer use on grassland



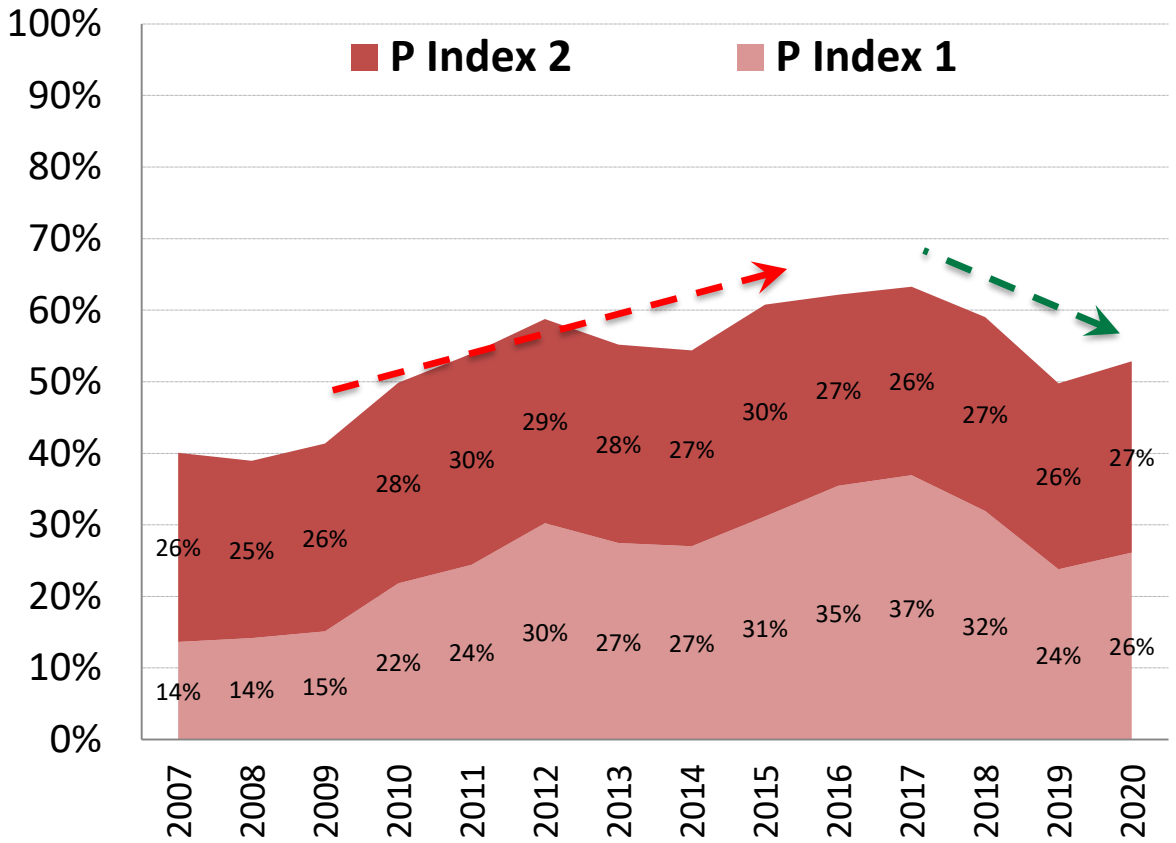
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cattle	13	12	10	6	6	8	6	7	8	10	9
Dairy	22	20	15	10	9	11	12	12	17	20	21
Sheep	10	9	8	5	4	6	4	6	7	8	9
Tillage	18	21	18	13	8	12	11	13	15	15	14
All Systems	15	14	12	7	6	9	8	8	11	12	12

Dillon et al., 2018 , Fert. use survey Teagasc NFS

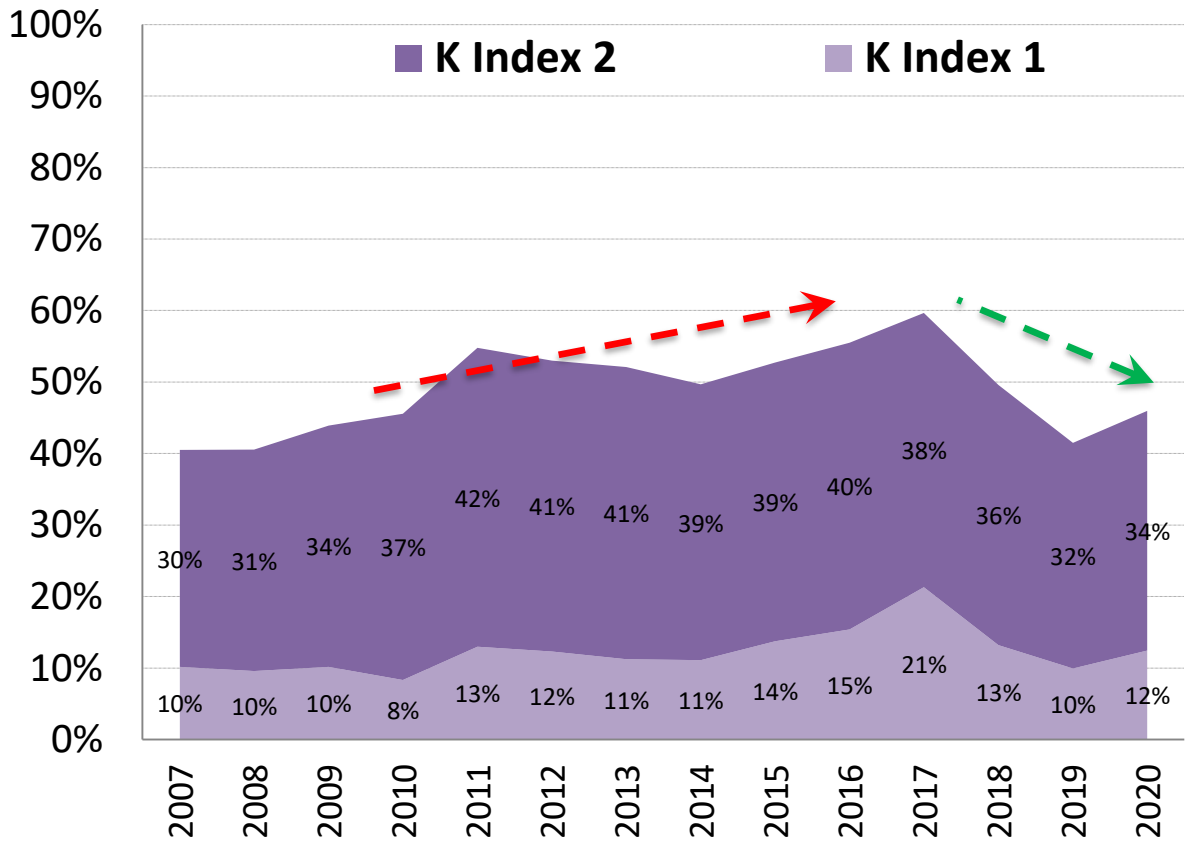
Teagasc
Agriculture and Food Development Authority

National soil fertility trends

Soils with low Phosphorus



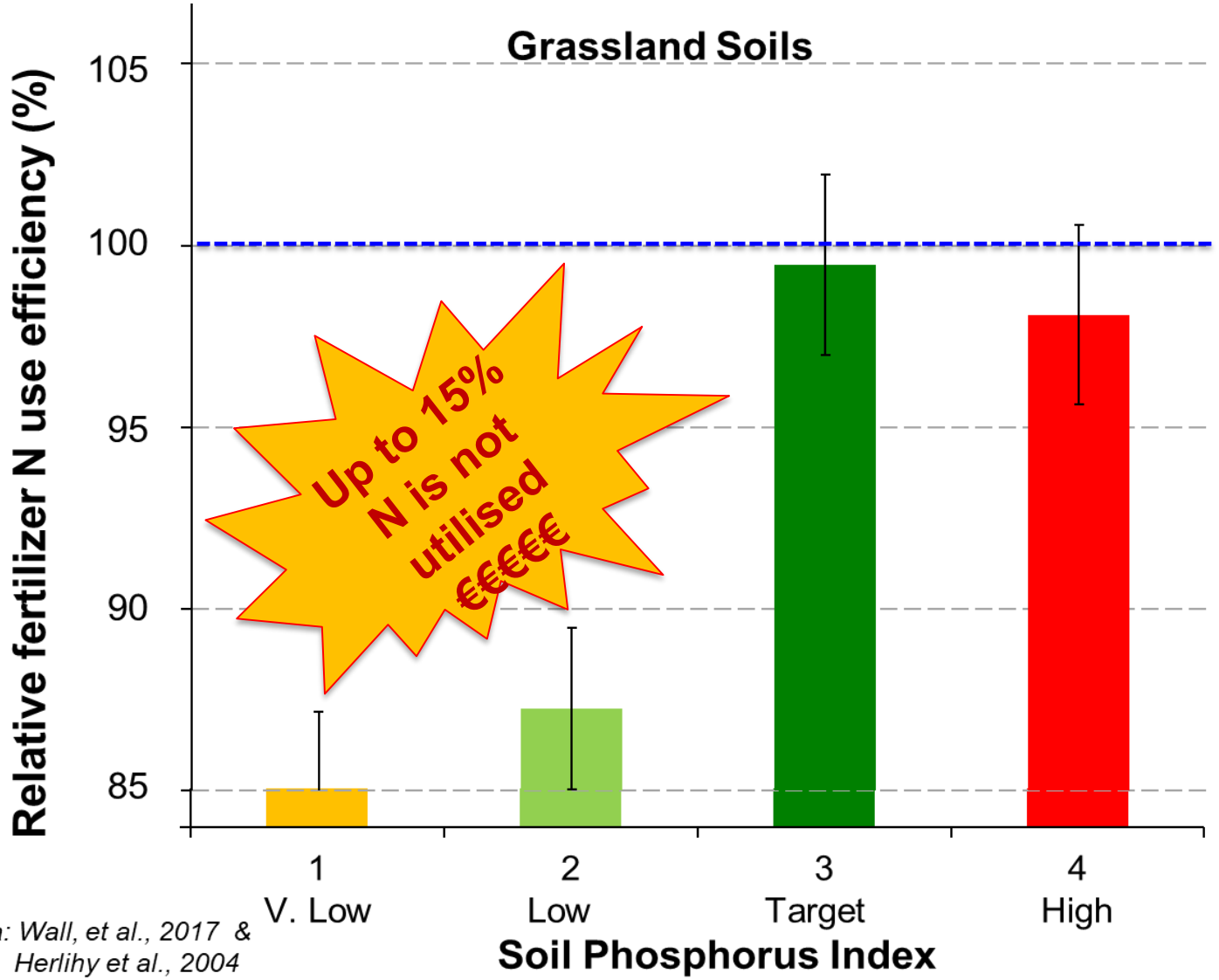
Soil with low Potassium



- Low soil P & K levels (Index 1 and 2) may limit crop growth and yield
- Target P & K Index = 3 where high levels of crop growth are required

Why Build Soil Fertility?

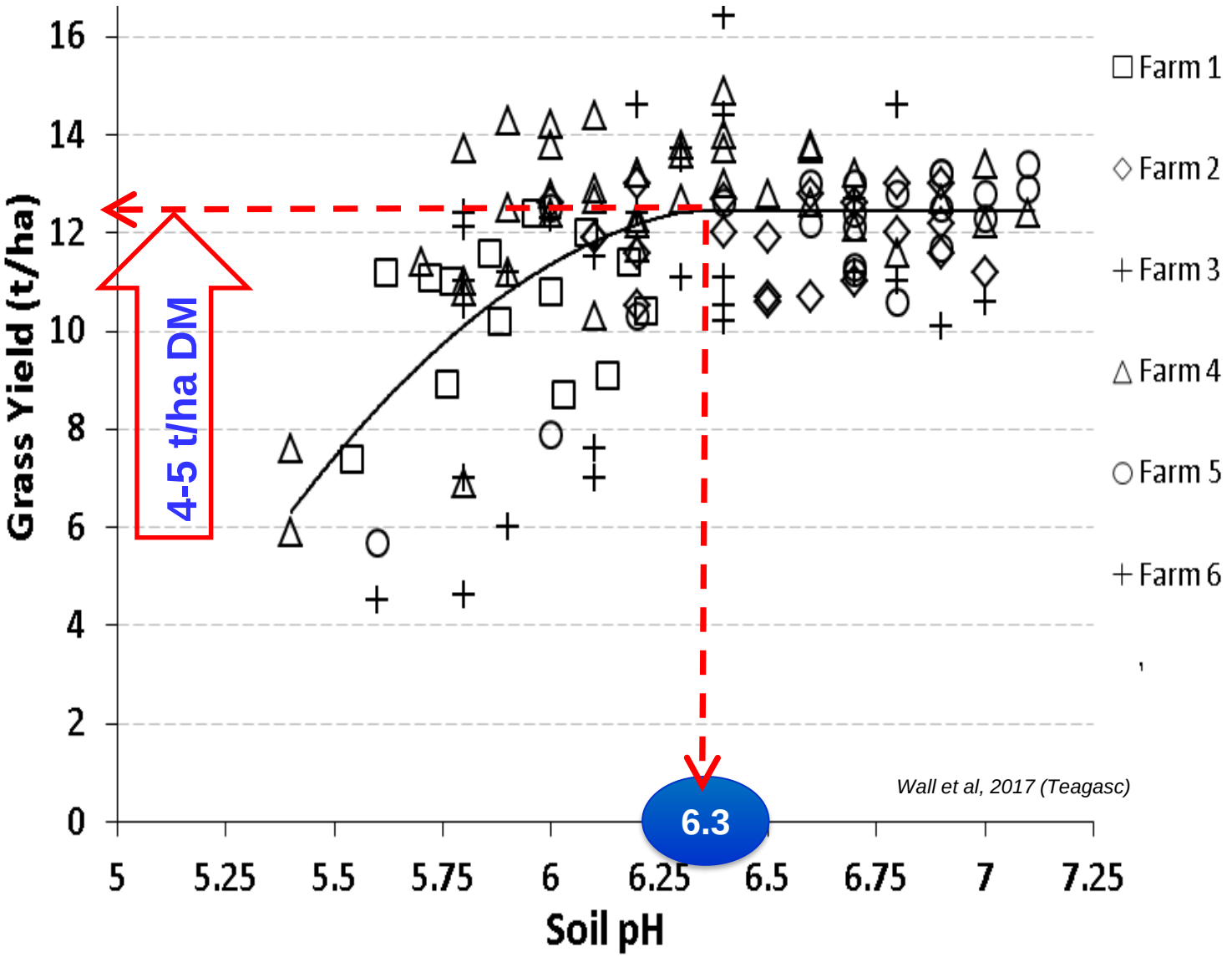
- Increased grass production potential and early season growth.
- Increased sward persistence post reseeding (ryegrass/clover).
- More resilient grass growth to changes in weather.
- Increased environmental sustainability.
- Increased long-term profitability.



Data: Wall, et al., 2017 & Herlihy et al., 2004

Optimise soil pH ≥ 6.3 to maximise grass growth

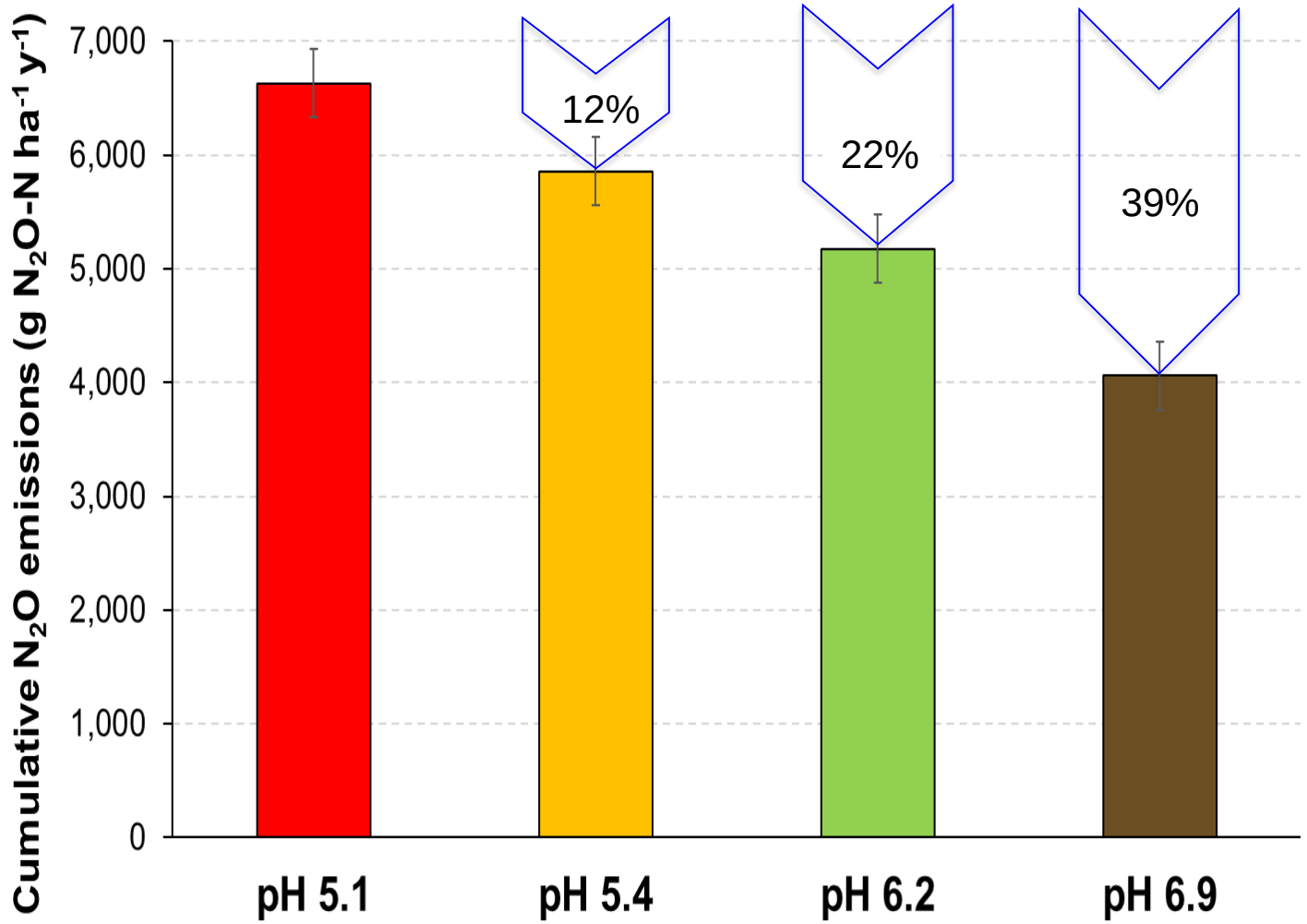
- Optimising soil pH to ≥6.3 reduces the levels of soil acidity.
- Liming acid soils increases fertilizer & slurry N, P, K availability.
- Grass growth rates and N uptake are higher when soils are limed.
- Soil testing will identify fields with acid soils (low pH) and the rates of lime required to correct them.



Teagasc
Agriculture and Food Development Authority

Lime applications to increase soil pH also reduces greenhouse gas emissions

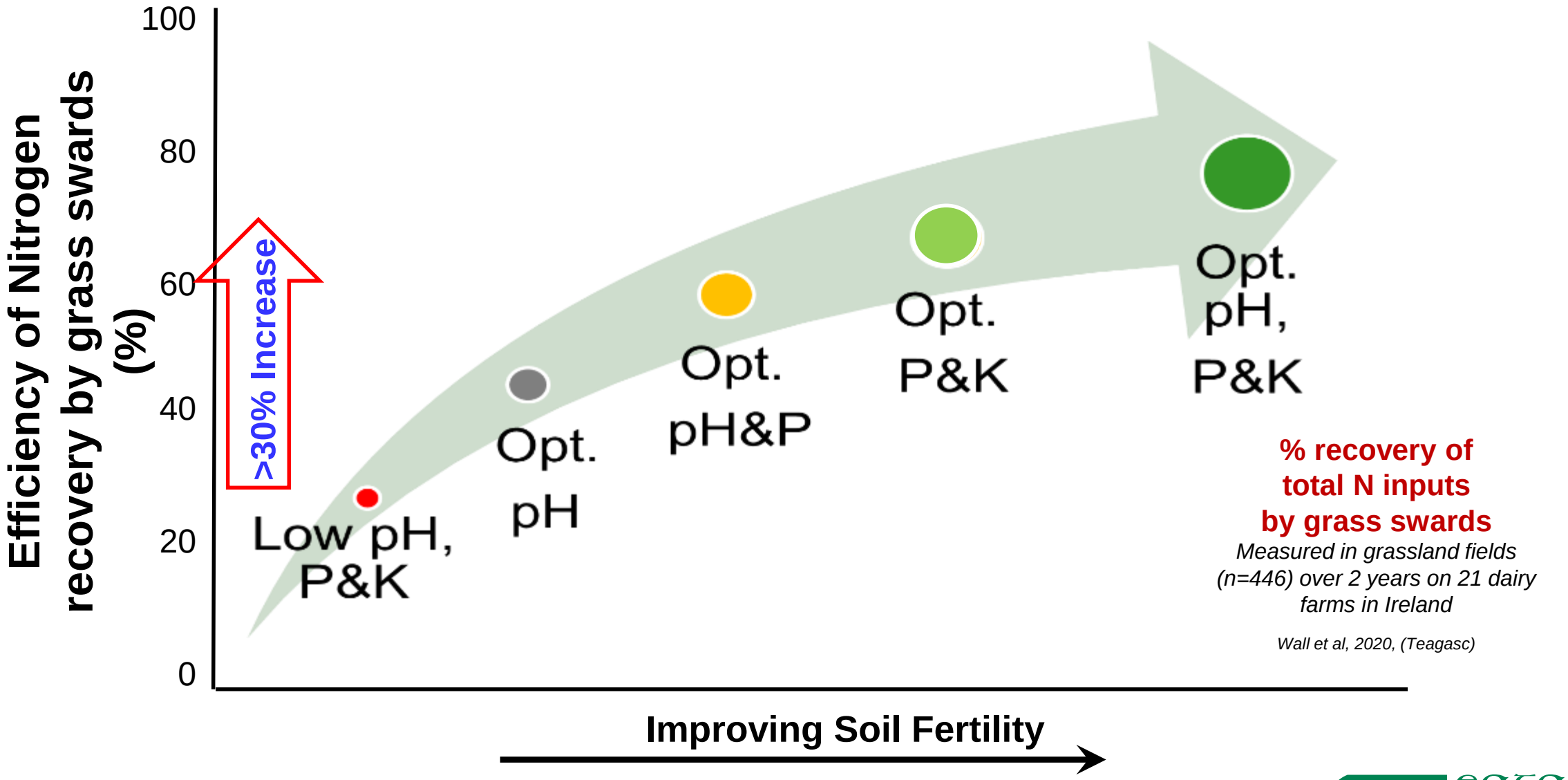
- Limed grassland soils have reduced Nitrous Oxide (N_2O) emissions by up to 39%.
- Increased N uptake when soils are limed leads to less N available for loss.
- Maintaining optimum pH may also contribute to increased C-sequestration.



Long-term grassland pH experiment at Johnstown Castle where N_2O emissions were measured

Zurovec,O., Wall, D.P., Richards, K.. et al. 2021

Good Soil Fertility drives Nitrogen recovery



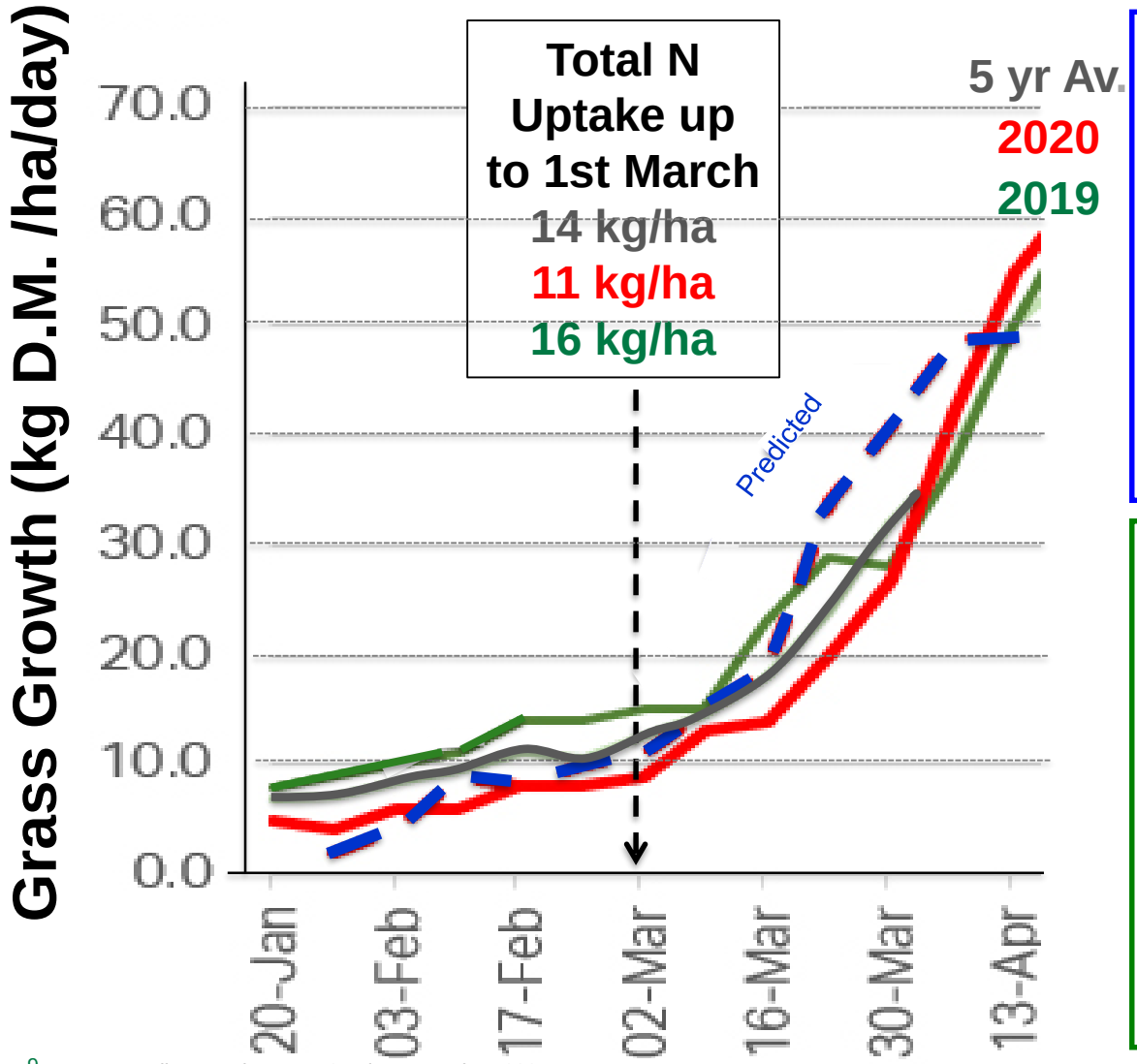
% recovery of total N inputs by grass swards

Measured in grassland fields (n=446) over 2 years on 21 dairy farms in Ireland

Wall et al, 2020, (Teagasc)

Agriculture and Food Development Authority

Early season grass growth and response to nutrient applications

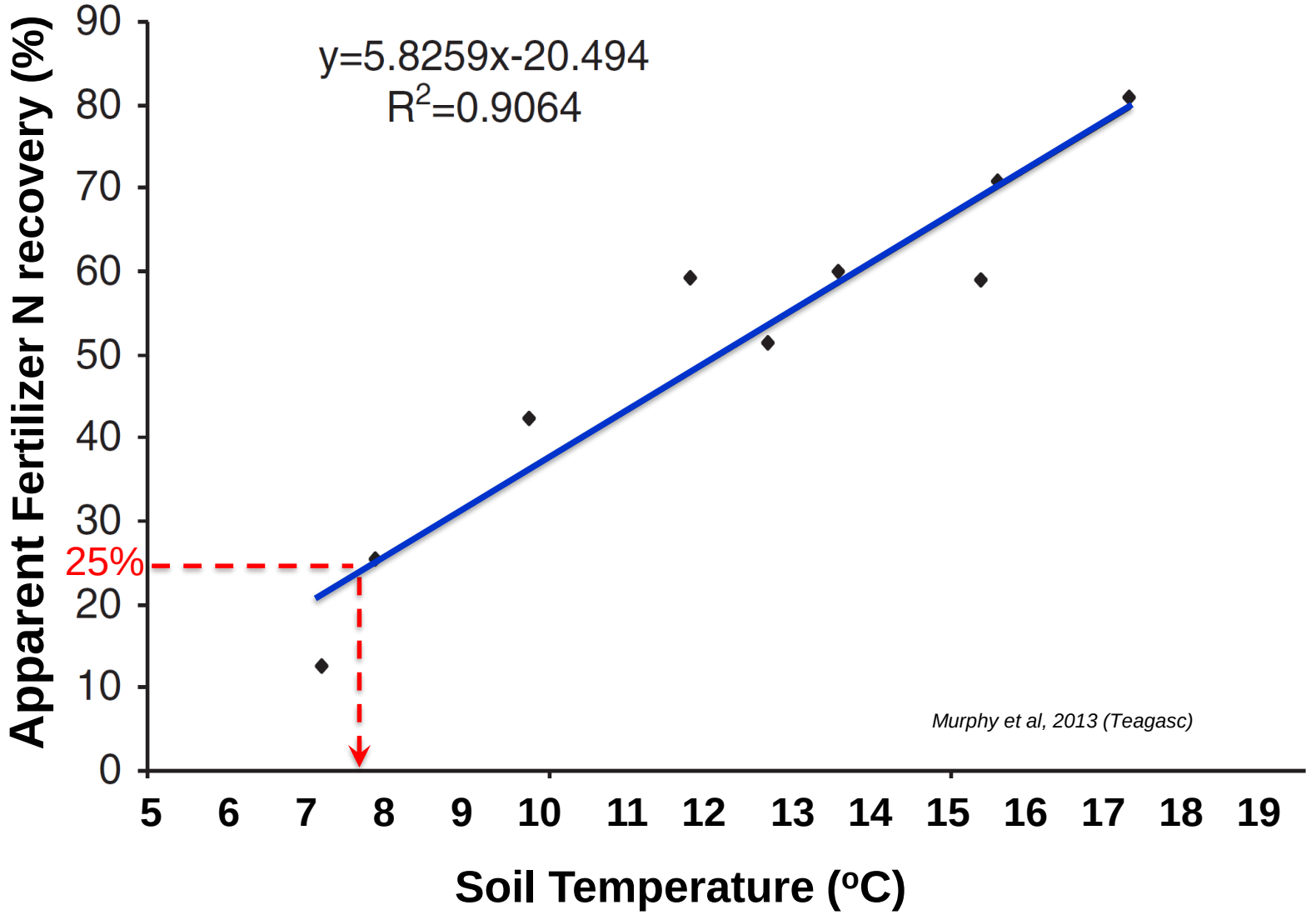


- Lower Grass Growth Rates in early spring!
- High variability between years
- Soil temperature & moisture control growth
- Growth commences @ 5.5°C and above
- Light is a key driving factor (day length!!!)

- Apply early N on dryer soils first
- Better response with moderate grass cover
- Utilise some slurry N first (≤ 2,000 gal's/ac)
  - Hold chemical fertilizer N applications
- Only apply fertilizer N to remaining soils when conditions allow

Avoid nutrient applications to cold wet soils

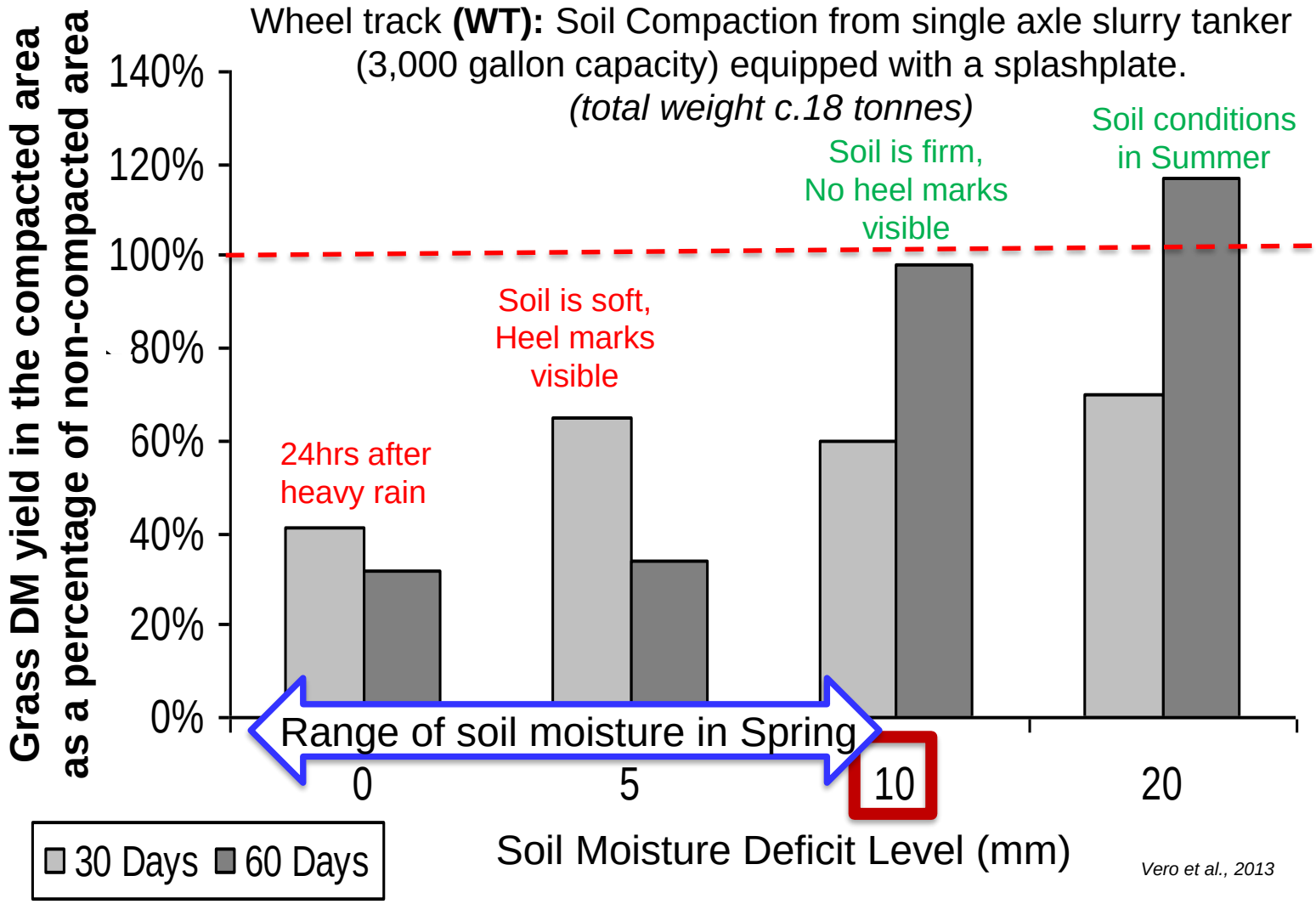
In spring when soils are saturated, the water keeps them colder for longer



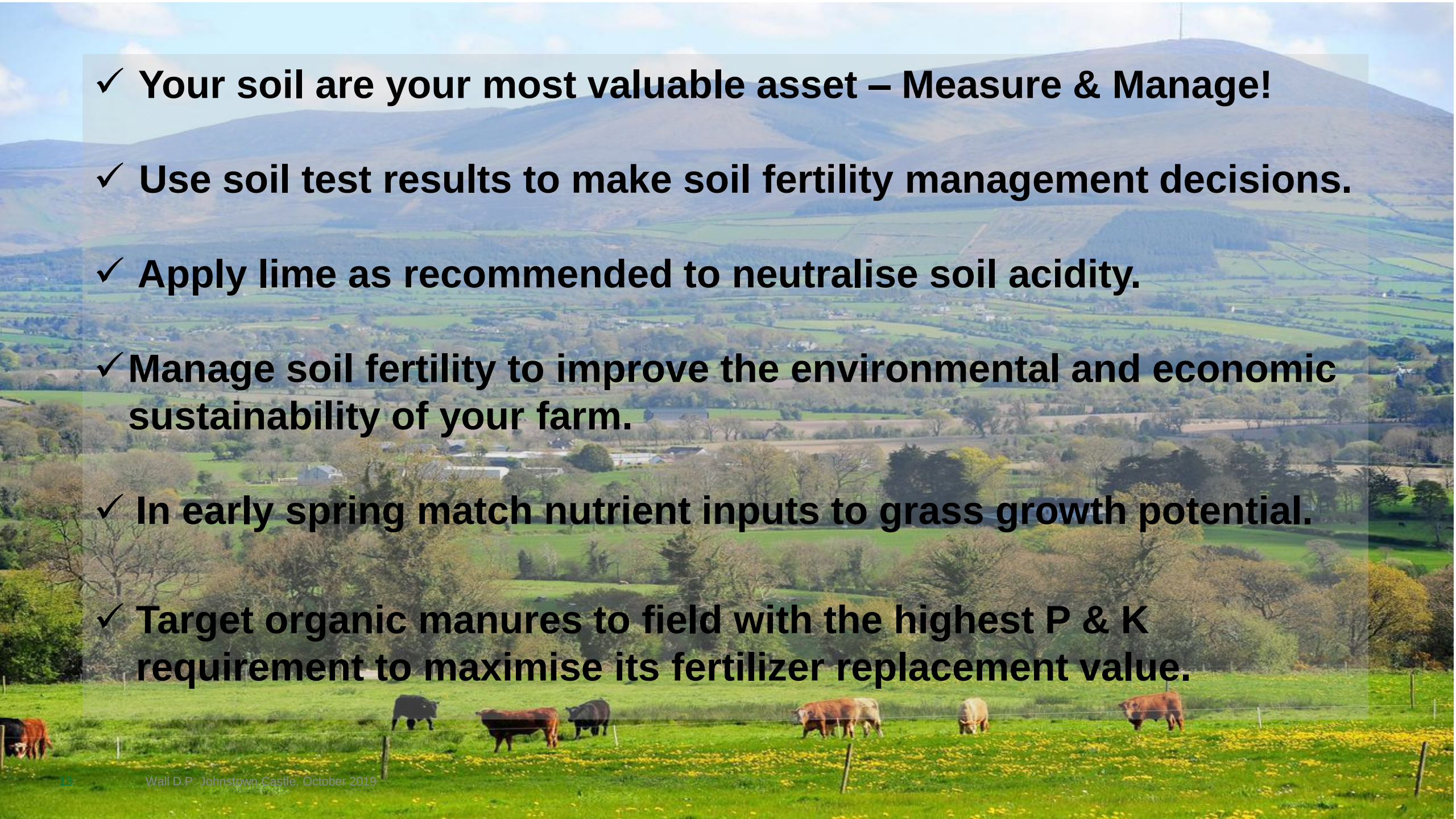
Agriculture and Food Development Authority

What happens if the soil is damaged?

- Compaction in soil impedes root growth, nutrient uptake, drainage and trafficability.
- The wetter the soil the more long lasting compaction effects have on grass growth.
- Soil Moisture Deficit (SMD) needs to be > 5mm before applying slurry in spring



Grass Dry matter yield in the wheel track (WT) relative to the non-wheel track (Non-WT) area in the 30 and 60 day period after traffic.



- ✓ Your soil are your most valuable asset – Measure & Manage!
- ✓ Use soil test results to make soil fertility management decisions.
- ✓ Apply lime as recommended to neutralise soil acidity.
- ✓ Manage soil fertility to improve the environmental and economic sustainability of your farm.
- ✓ In early spring match nutrient inputs to grass growth potential.
- ✓ Target organic manures to field with the highest P & K requirement to maximise its fertilizer replacement value.