

# ZeroNsite



Red Clover Establishment will start at 8pm



*Bringing Science and  
Farming together*

- An independent farmer-led levy body
- **PURPOSE:** To make the NI ruminant livestock sector more competitive, profitable and sustainable
- Strong emphasis on-farm research and innovation



# Why ZeroNsilage?

- High quality silage is of great importance for livestock farmers
- Increased cost of manufactured fertilisers
- Fertiliser use accounts for ~20% of GHG emissions on NI livestock farms
- Plot and field studies at Hillsborough have shown that red clover based swards can give high DM yields with no N fertiliser.
- However, there has been a low uptake of this on commercial farms. Particularly in the west.

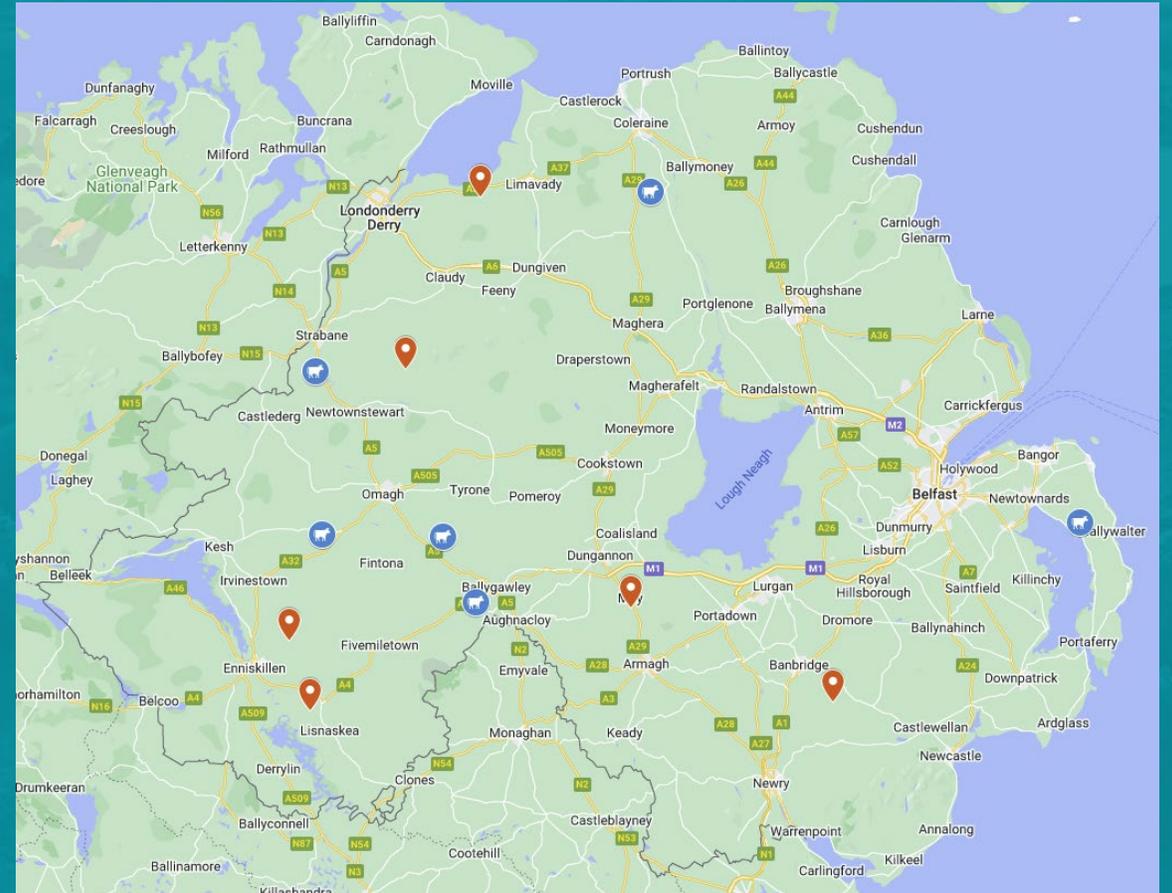


# ZeroNsile



## Making Silage without manufactured Nitrogen

- Twelve Farms were selected to trial red clover based swards
- Swards established on eleven of the farms during 2023
- This will be the first intensive year of monitoring
- Small scale Lucerne study will be trialled on 3 farms in County Down



# ZeroNsite

AgriSearch & AFBI

Red Clover Establishment  
webinar

28<sup>th</sup> February 2024

David Patterson

[afbini.gov.uk](http://afbini.gov.uk)



- background studies
- establishment
- early management

# Red Clover for Silage

## pros

- fixes Nitrogen from air (>200kgN/ha)
- high yielding crop (>15tDM/ha)
- high animal intake and performance
- improves soil structure

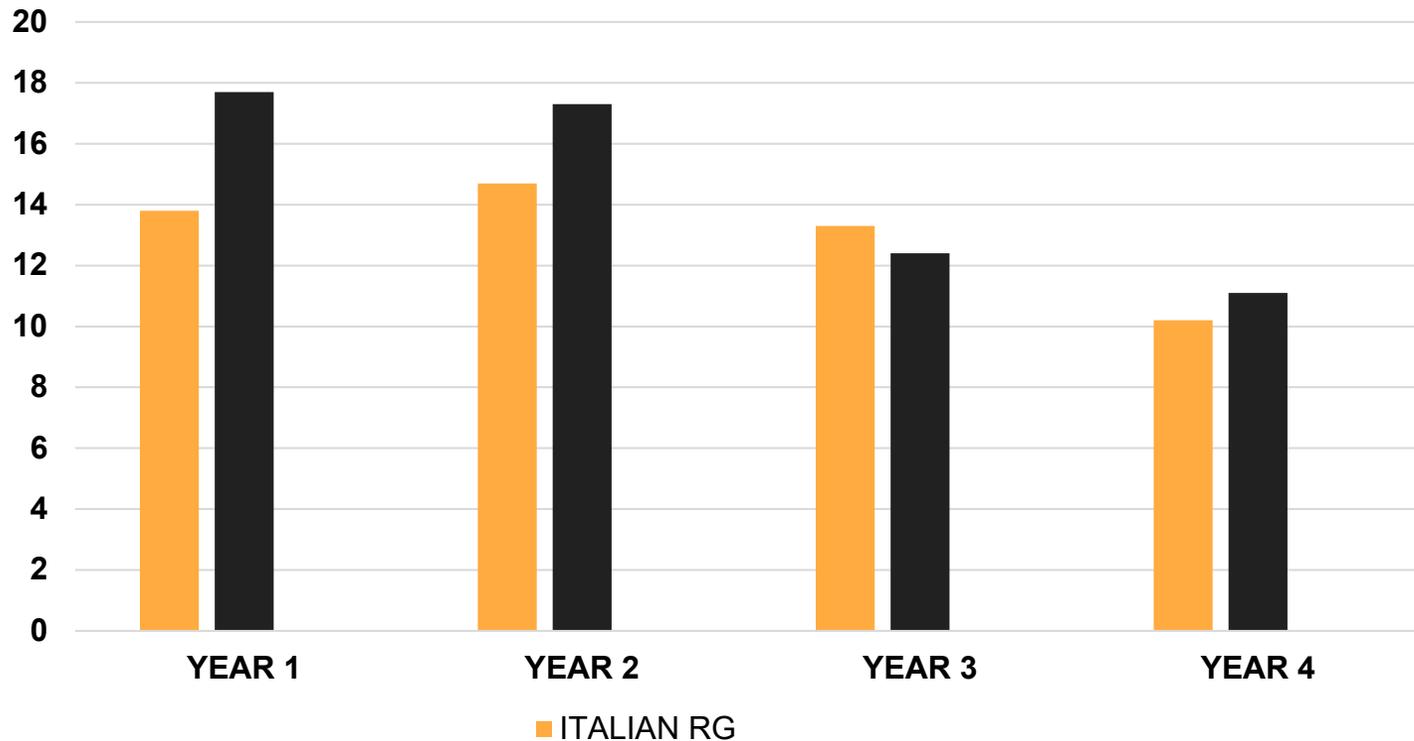
## cons

- persistency (short lived)
- 4 year break needed
- difficult to ensile (?)
- less suitable for grazing (?)



# Silage without Fertiliser?

Yield (tDM/ha) of Italian RG and Red Clover with slurry only



SWARD TYPE	4 YEAR YIELD AVERAGE (tDM/ha)	% Difference (Relative to PRG)
PERENNIAL RG	10.1	
HYBRID RG	11.8	+17%
ITALIAN RG	13.0	+29%
PRG/WHITE	12.6	+25%
RED CLOVER	14.6	+45%

# Red Clover Silage Productivity

Teagasc monitored grass-red clover silage mixtures over 6 years:

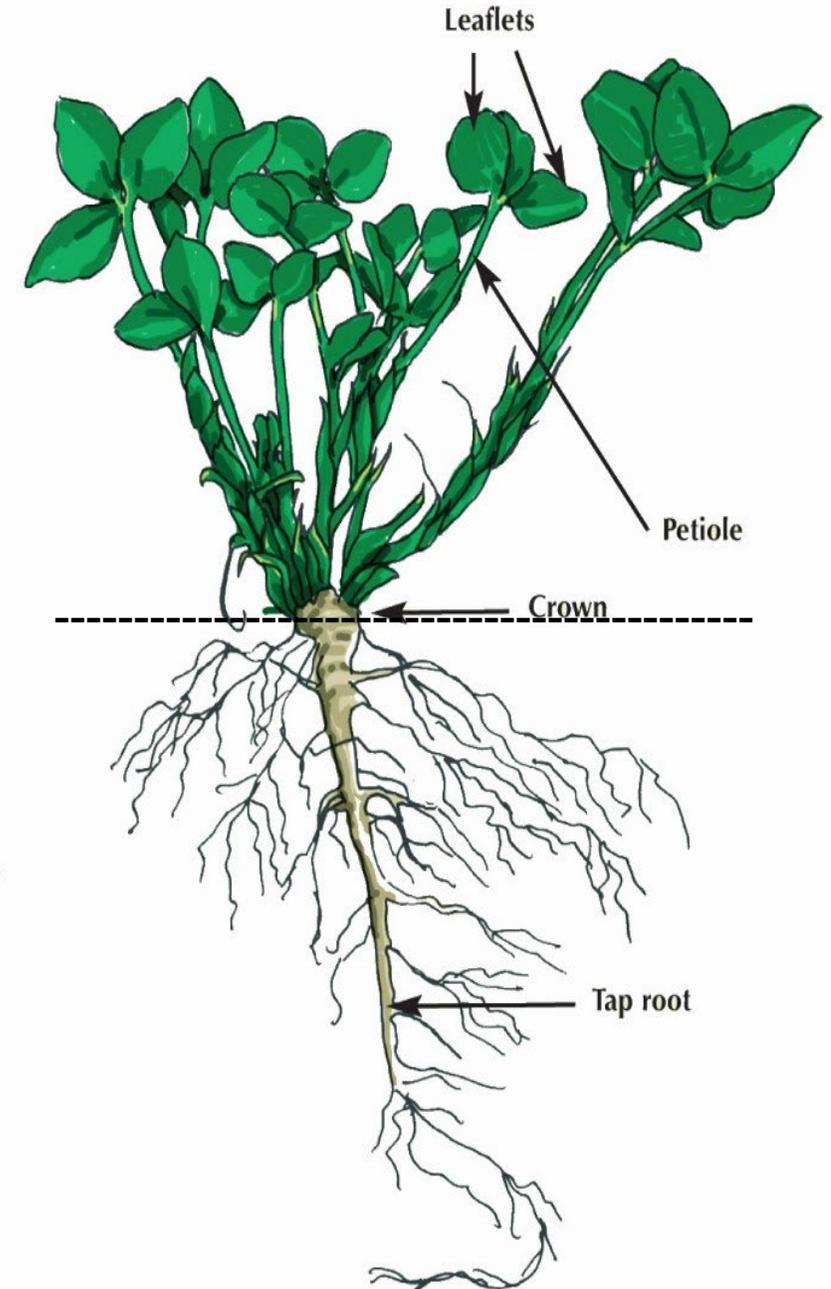
- Grass-red clover & zero N fertiliser produced similar annual DM yield to grass-only & 412 kg N/ha  
(15.8 vs. 15.7 tDM/ha)
- Early harvest (26th May) compared to late harvest (11th June) increased sward red clover content (62% vs. 46%)
- Red clover content and herbage production were greater when 0 kg N/ha was applied (61% and 15 tDM/ ha, respectively) compared to 50 kg N/ha applied (48% and 14.8 tDM/ha, respectively)





# Establishment

- sward kill, plough/disc/power harrow cultivation, stale seed bed – time dependent
- overseeding: less suited to stitching in than WC - distribution
- fine, firm fertile seedbed (rolling)
- do not sow too deep:– 5-10mm max
- 500 000 seeds per kg (x3 size of WC)
- warm soil temperature required (8°C) late April/early May – late June
- mixture: 9kg grass & 4kg red      monoculture: 6kg red
- hybrid and PRG grass companions
- soil pH to 6.5 – n.b. not just for the soil
- seed bed fertilizer – P/K only required





# Establishment

Biological nitrogen fixation (BNF): air- soil- plant-animal

*the Clover 50 rule...*

scenario: 15tDM/ha grown/yr (zero fert N)

30% clover = 5tDM

**X 50** = 250kgN as plant available N in soil

BUT

- pH = 5 no BNF even if clover present!
- pH = 7 ideal for BNF



# Establishment

## Weed control

- ideal: clean ground in previous years
- post emergence spray: usually approx. 6 - 8 weeks post seeding
- must be red clover safe – check label!
- target: when majority of clover seedlings have trifoliate leaf present AND small dock leaf size (~£2 coin)
- spray too early = kill too many clover seedlings
- spray too late = canopy closes and protects the dock seedlings from the herbicide --- problems with docks later
- chickweed etc: one or two ‘fast’ grazings normally controls
- alternative? spot spraying



# Post-emergence dock control



# Varieties?



# Recommended List of Red Clover Varieties 2023/2024

			Diploids						Tetraploids				
		Mean of G varieties	Merviot	Lemmon	AberClaret	Harmonie	Sinope	Fearga	Ganymed	Amos	Maro	Atlantis	Magellan
<b>Recommended List status</b>			<b>S</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>PG</b>	<b>G</b>	<b>PG</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>
<b>Conservation: management</b>													
Total yield 1st harvest year (% of 12.06 t DM/ha)		100	104	99	101	98	101	99	103	100	99	102	100
Total yield 2nd harvest year (% of 12.95 t DM/ha)		100	97	98	102	99	100	101	104	100	96	100	101
Total yield 3rd harvest year (% of 10.04 t DM/ha)		100	83	96	105	98	99	106	108	95	88	101	104
Total yield: Mean (% of 11.70 t DM/ha)		100	95	98	103	98	100	101	105	98	95	101	102
<b>Protein content %</b>													
1st cut - 1st harvest year		17.8	17.1	17.6	17.0	18.3	17.8	17.1	16.6	18.1	18.0	17.8	18.0
2nd cut - 2nd harvest year		19.8	19.6	19.5	18.7	19.6	19.5	18.3	18.2	20.2	19.7	20.5	20.2
2nd cut - 3rd harvest year		20.0	19.2	19.7	19.0	20.3	19.1	18.6	19.2	20.5	19.8	20.2	20.2
<b>Agronomic characters</b>													
Ground cover % (1st harvest year)		71	70	71	69	73	69	66	72	72	65	70	72
Ground cover % (2nd harvest year)		62	50	60	59	66	61	58	63	61	50	61	62
Ground cover % (3rd harvest year)		50	33	51	49	56	46	48	52	46	37	49	50
<b>Conservation seasonal growth</b>													
1st harvest year	1st Cut (% of 5.53 t DM/ha)	100	105	99	96	101	102	91	104	100	98	103	101
	Protein yield: 1st Cut (% of 0.98 t DM/ha)	100	101	98	92	103	102	87	97	102	99	103	102
2nd harvest year	2nd Cut (% of 3.63 t DM/ha)	100	97	92	105	99	99	104	102	102	98	101	102
	Protein yield: 2nd Cut (% of 0.72 t DM/ha)	100	96	91	98	98	98	96	94	104	98	105	104
3rd harvest year	2nd Cut (% of 3.31 t DM/ha)	100	86	91	106	97	91	109	104	101	90	100	104
	Protein yield: 2nd Cut (% of 0.66 t DM/ha)	100	83	90	101	99	87	101	100	104	89	102	105
<b>Year First Listed</b>			1980	2003	2010	2012	2018	2018	2022	2005	2010	2011	2014
<b>Breeder</b>			ILVO	ILVO	IBERS, Aberystwyth	Nord. Pflanz/DSV	DLF Seeds A/S	Teagasc, Eire	DLF Seeds A/S	Siechtitelska stanice, The Czech Republic	LSPB	Nord. Pflanz/DSV	Nord. Pflanz/DSV
<b>Agent</b>			Limagrain UK Ltd	Barenbrug UK Ltd	Germinal	DSV	DLF Seeds Ltd	Goldcrop Ltd	Limagrain UK Ltd	DLF Seeds Ltd	Limagrain UK Ltd	DSV	DLF Seeds Ltd
<b>Number of trials for yields</b>													
1st harvest year			15	15	15	15	9	12	6	15	15	15	15
2nd harvest year			13	13	13	13	7	10	6	13	13	13	13
3rd harvest year			13	13	13	13	4	7	6	13	13	13	13

# Summary of seed mixtures

	1	2	3	Plus Timothy
Diploid PRG	5.0	4.9	6.0	5.5
Tet. PRG	3.0	2.8	4.5	4.0
Timothy	0.0	0.0	0.0	1.0
Total Grass	8.0	7.7	10.5	10.5
Red Clover	3.0	4.9	3.5	3.5
White Clover	1.0	1.4	1.0	1.0
<b>Total</b>	<b>12.0</b>	<b>14.0</b>	<b>15.0</b>	<b>15.0</b>

Red Clover:  
Aberclaret Garant  
Ostro Rozeta

White clover:  
Alice  
Barblanca

# Red Clover Silage making

- First cut mid- late May (50% flower buds present)
- Avoid crown damage – traffic – rolling
- Mowing: Do not scalp (normal 5-6cm)
- Allow to flower once per year - persistency
- Graze or zero graze autumn re-growth
- 3-5 cuts at 6-8 week intervals
- Wilt to 35%DM plus additive (nb more active PPO enzyme)
- Leave in swath – one tedding max – wilt for 36-48hrs max – leaf loss!
  
- **Nutrition:** for each 1tDM harvested, removes 3kgP & 25 kgK/ha
- K luxury uptake – K after each crop (organic or mineral)
- High K reqt (higher for red): 15tDM/ha = 375kg/ha K/ha (300 units/ac)



# Phosphorus Requirements

Source: Nitrates Action Programme Regulations (Northern Ireland) 2019

	<i>Soil phosphorus index</i>					
	0	1	2-	2+	3	4
	<i>Phosphorus recommendation (kg P<sub>2</sub>O<sub>5</sub> per ha)</i>					
At grass establishment	120	80	65	50	30	0
Silage cut <sup>1</sup>						
First	100	70	55	40	20	0
Second	25	25	25	25	0	0
Third	15	15	15	15	0	0
Fourth	10	10	10	10	0	0

<sup>1</sup> The amount of phosphate applied for establishment shall be deducted from the first season's grazing, silage or hay crop requirement for phosphorus.

# Derogated Farmers have to keep within a P balance of <10kgP/ha/year (1kg P = 2.291 kg P<sub>2</sub>O<sub>5</sub>)

# Potash Requirements

Source: RB209 (March 2022)

	Soil Potash Index					
	0	1	2-	2+	3	4 & higher
	<i>Potash recommendation (kg K<sub>2</sub>O per ha)</i>					
Establishment	120	80	60	40	0	0
First Cut - Previous Autumn	60	30	0	0	0	0
First Cut - Spring	80	80	80	60	30	0
Second Cut	120	100	90	60	40	0
Third Cut	80	80	80	40	20	0
Fourth Cut	70	70	70	40	20	0

To minimise luxury uptake of potash, no more than 80–90 kg potash per ha should be applied in the spring for the first cut. The balance of the recommended rate should be applied in the previous autumn

# Available phosphate (P<sub>2</sub>O<sub>5</sub>) values

Source: Nitrates Action Programme Regulations (Northern Ireland) 2019

Liquid or slurry manure types	Dry matter content (%)	Soil phosphorus index of 2- or greater, available phosphorus (kg P <sub>2</sub> O <sub>5</sub> /m <sup>3</sup> )	Available Potash (kg K <sub>2</sub> O/m <sup>3</sup> ) (from RB209)
Liquids <sup>2</sup>			
Dirty water	0.5	0.10	1.0
Cattle slurries <sup>2</sup>			
Cattle slurry <sup>3</sup>	2	0.6	1.5
	<b>6</b>	<b>1.2</b>	<b>2.3</b>
	10	1.8	3.0
Farmyard manures <sup>4</sup>			
Cattle manures	25	3.2	8.5
Sheep manures	25	3.2	7.2
1m <sup>3</sup> = 220 gallons			

# Making use of slurry nutrients

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$$\begin{aligned} & \text{gals per} \\ & 2,500 \text{ acre} \quad / \text{divided by } 89 \\ & = 28.1 \text{ m}^3 / \text{ha} \end{aligned}$$

2- or greater P soils

33.6kg Available  $\text{P}_2\text{O}_5$  /ha

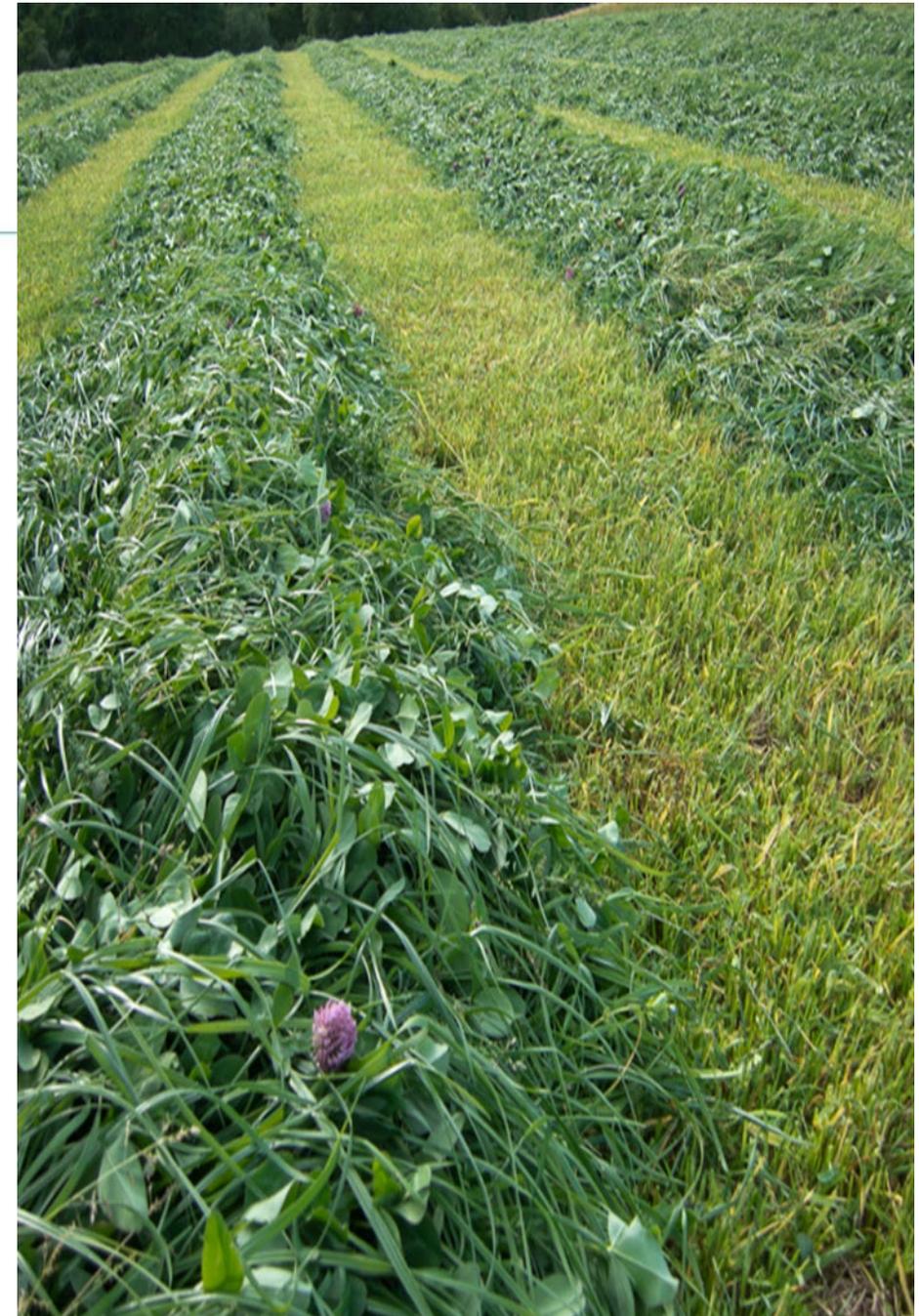
All Soils

64.4kg Available  $\text{K}_2\text{O}$  /ha

# to sum up:

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- **pre-sowing weed control**
- **soil pH 6.5+ fertility P/K Index 2+**
- **fine, firm seedbed**
- **variety/mixture selection**
- **avoid crown damage**
- **utilise slurry nutrients**
- **avoid fertilizer N – persistency & BNF!**



# Farm walks on Red Clover taking place in early spring



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Driving Excellence & Innovation