RED MEAT UPDATES

TASMANIA

26 July 2024

Knowing your stuff

Soil fertility and fertilisers 101

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Pinion Advisory

Overview

- Soil pH
- Target nutrient levels
- Nutrient budgeting
- Fertiliser options.

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Soil fertility considerations

- Research and observations indicates that Tasmanian red meat producing properties have:
  - Adequate soil pH.
  - Sufficient phosphorus (P) levels.
  - Excess potassium (K) and sulphur (S) levels.
  - Unequal distribution of nutrients across a property.
  - And that the decision-making process to apply fertiliser is often not well enough considered and/or understood.

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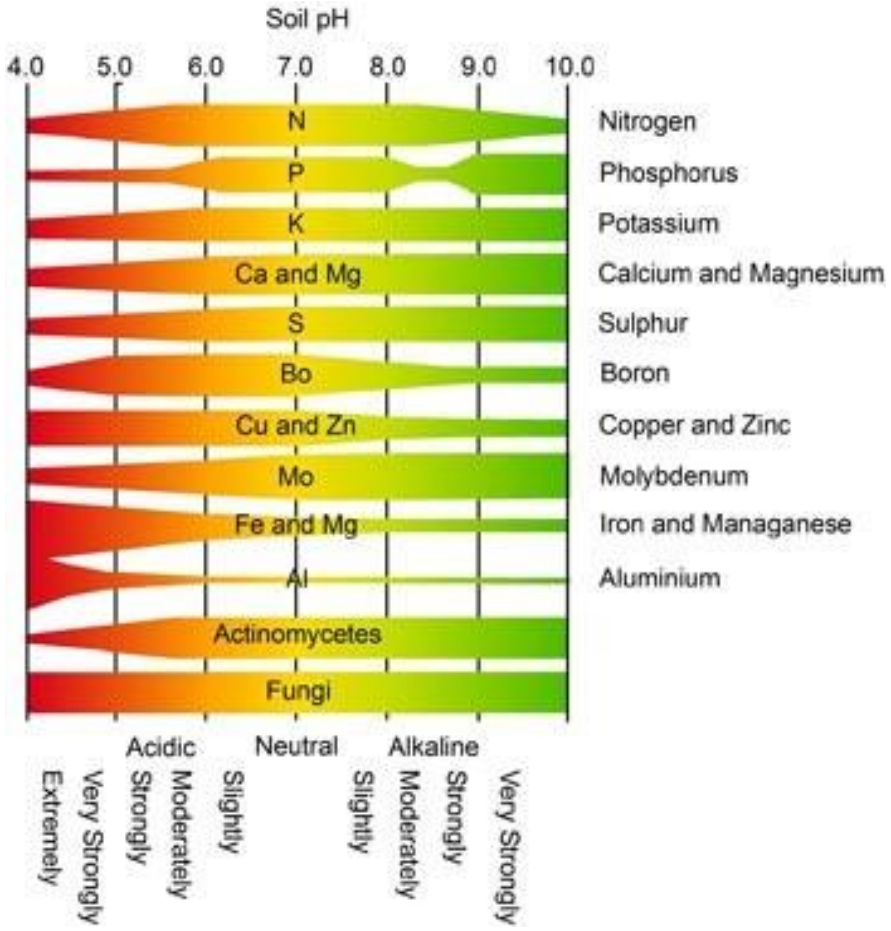
Soil fertility considerations

- We can do better at the 4 “Rs” of nutrient management:
  - Right source
  - Right rate
  - Right time
  - Right place.

- Better nutrient management leads to improved pasture production, more control over economic outcomes and a lower environmental impact.

Soil pH

- Soil pH influences nutrient availability and soil biology.
- Adjust soil pH with:
  - Dolomite (Mg & Ca) ENV 50-65+%
  - Lime (Ca) ENV 50-65+%
  - Lime sand (Ca) ENV 5-65%
  - ↑ Solubility = faster change
  - ↑ Fineness = faster change
  - ↑ ENV = greater pH change



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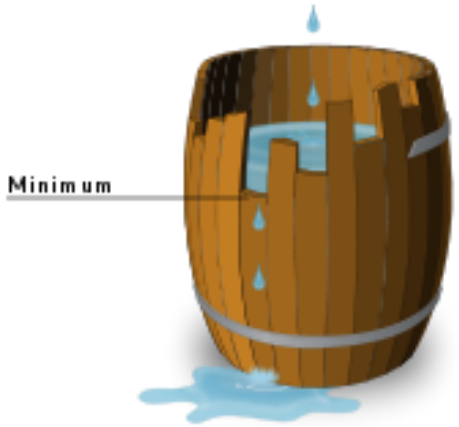
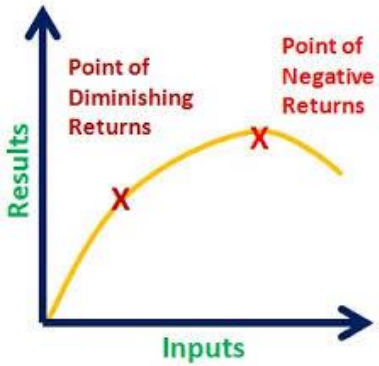
Target nutrient levels - key concepts

- "Liebig's law of the minimum"
  - Plant growth and productivity is limited by the least available resource (e.g light, water or nutrients).



- "The law of diminishing returns"
  - Output will decrease as a single input factor increases.



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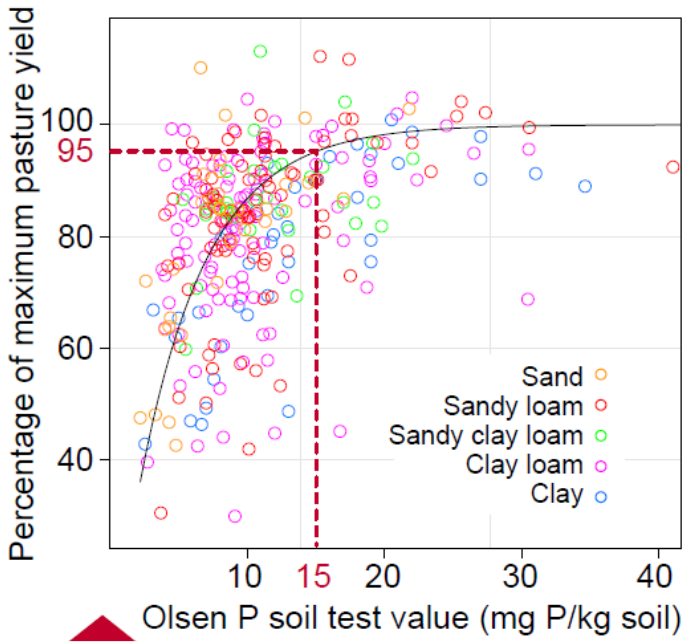
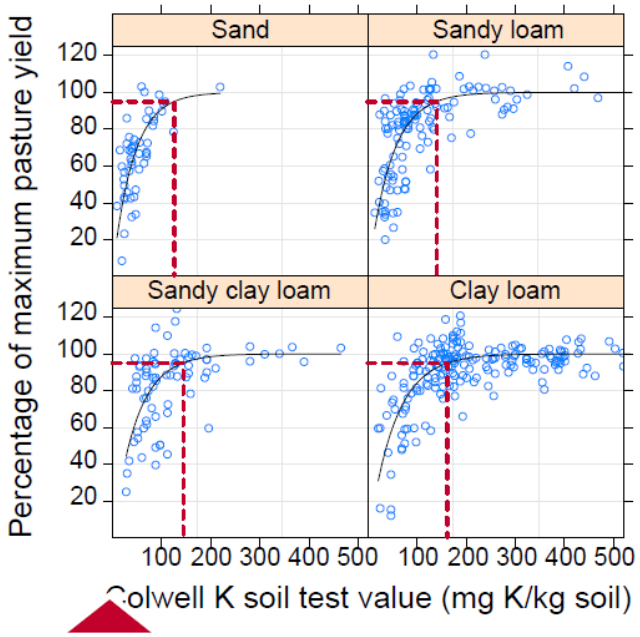
Target nutrient levels

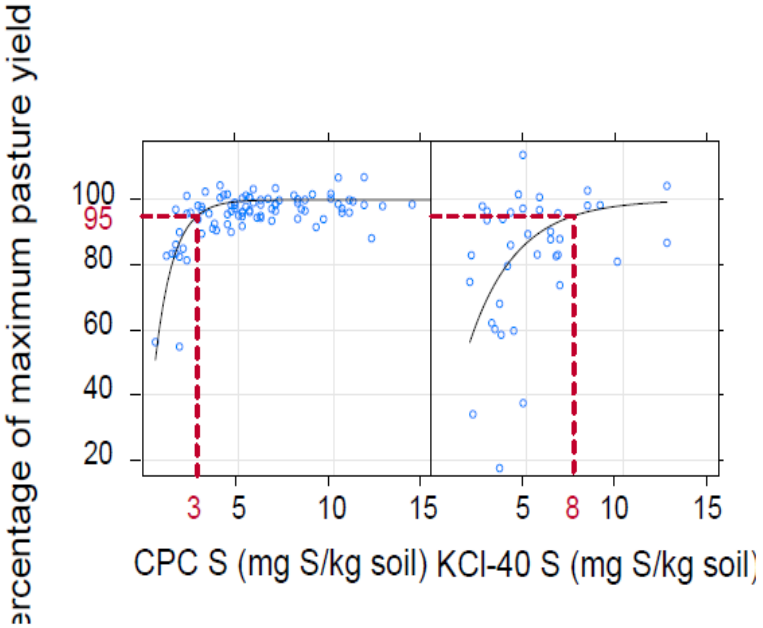
Phosphorus



Potassium



Sulphur



(Gourley C. (2007) "Making Better Fertiliser Decisions for Grazed Pastures in Australia" DPI Vic)

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Target nutrient levels

- Optimum levels for phosphorus (P), potassium (K) and sulphur (S) are well established and widely accepted.

Analyte	Soil type		
	Sand	Loam	Clay
pH_{water}	5.8-6.5		
Phosphorus (Olsen, ppm)	18-25		
Phosphorus (Colwell ppm)	30-40	40-50	50-70
Potassium (Colwell, ppm)	110-170	130-190	150-220
Sulphur (KCl-40, ppm)	8-16		

What about nitrogen?

- Nitrogen (N) content in pasture is an average of 4%/kg DM:
  - 1,000kg DM contains approximately 40 kg N.
  - Note that livestock will excrete most of the N they consume.

- N fertiliser boosts pasture biomass yield, NOT the leaf emergence rate (e.g. rotation length is not reduced).

- Best classified as a bought in feed:
  - use as needed during periods of pasture deficit*.

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What about nitrogen?

Source		Amount (kg N/ha/year)	Comment
Atmospheric N		0-200	Atmospheric N fixation by pasture legume rhizobia in root nodules (symbiotic bacteria). Rule of thumb is 20 kg N per 1 ton DM.
Biological	Mineralisation	20-200	Decay of organic material. Amount depends on soil type and structure, pH, soil carbon levels, temperature, moisture and paddock use history.
	Non-symbiotic free-living bacteria (NSFB)	<50	Azotobacter and Nitrobacter. Activity depends on soil type, pH, SOM, temperature, moisture & paddock use history.
Fertiliser		Variable	Synthetic or 'organic' options: e.g. urea, DAP, compost or animal manure.
Natural oxidation		<10	Lightning discharge.

What about nitrogen?

Sunlight on the stolon initiates leaf bud and root growth

N fixing nodules

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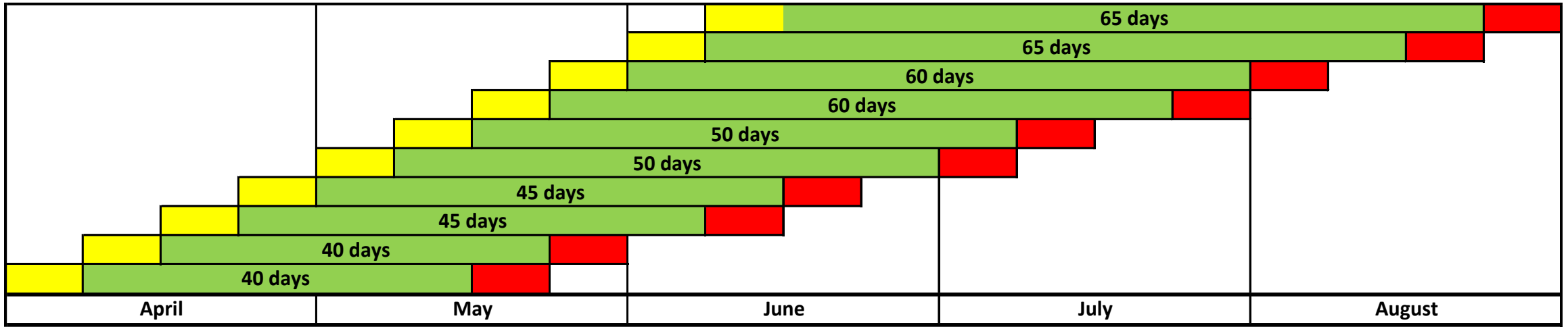
What about nitrogen?



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Nutrient budgeting

Nutrient removal	Liveweight: animals exported off property plus any replacements grown out (e.g. heifers), fodder exports plus others (e.g. wool)
+	
Soil factors	Phosphorus buffer index and leaching
+	
Capital nutrients	Addressing any nutrient deficiencies
-	
Nutrient imports	Fodder (silage, hay, straw) and concentrates (grain, pellets)

Nutrient content

Item	Nutrient content (kg)		
	P	K	S
Fodder - lucerne hay (1,000 kg DM)	3	28	2.4
Fodder – pasture hay (1,000 kg DM)	3	25	2
Fodder – pasture silage (1,000 kg DM)	4.3	27	2.5
Greasy wool (1,000 kg)	0.5	16	28.5
Grain (1,000 kg DM)	3	4	2.5
Red Meat (1,000 kg LWT)	8	1.8	1.5
Straw – cereal (1,000 kg DM)	1	14	1.5
Straw – grass seed (1,000 kg DM)	1.5	15	2

Soil factors

- Soil factors result in nutrients becoming unavailable to the plant which includes:
  - Adsorption - phosphorus buffer index (PBI).
  - Leaching of nutrients beyond the root zone.

Soil type	Phosphorus (Olsen) (kg/ha/yr)					Potassium (kg/ha/yr)	Sulphur (kg/ha/yr)
Nutrient level (ppm)	8-10	11-13	14-17	18-25	26-35+		
Sand	6	8	9	10	10	25	12
Sandy loam	10	15	18	20	20	25	12
Clay loam	13	20	23	25	25	15	12
Clay loam ferrosol	16	24	28	30	30	15	12

Addressing nutrient deficiencies

- Where nutrients levels are deficient then capital nutrient applications may be required.

Soil type	Sand	Sandy loam	Clay loam	Red soil
PBI	<100	100-200	200-400	400+
P required to lift P Olsen by 1 unit (kg/ha)	5-7	7-9	9-11	11-13+
K required to lift K Colwell by 1 unit (kg/ha)	1 (dryland) 2 (irrigated/high rainfall)		2	

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Fertilisers - conventional

Nutrient supplied	Fertiliser	N%	P%	K%	S%
Nitrogen	Sulphate of ammonia (SOA)	20	0	0	24
	Urea	46	0	0	0
Phosphorus	DAP	18	20	0	1
	MAP	10	21	0	1
	Reactive phosphate rock	0	13	0	1
	Single super phosphate	0	9	0	11
Potassium	Muriate of potash	0	0	50	0
	Sulphate of potash	0	0	42	17

Fertilisers - alternative

- Key considerations:
  - Identify the dry matter, bulk density and nutrient load of the material to determine if its economic to apply.
  - **BEFORE APPLYING AN ALTERNATIVE FERTILISER UNDERSTAND IF A REGULATED USE CONDITION APPLIES AND ITS RESTRICTED ANIMAL MATERIAL (RAM) STATUS.**

Fertiliser	DM%	pH	Nutrient content as % of DM		
			N	P	K
Biosolids	15	6.5-7.0	5	2	1
Chicken litter	80	7.0-7.5	4	2	1
Compost - generic	50	6.5-7.5	5	2	3
Feed lot manure	65	7	2	1	2

Fertilisers – pricing of nutrients

- It's worthwhile spending time to price nutrients:
  - Determine exactly what nutrients are required.
  - Check the cost of nutrients on $/kg and on a $/ha basis.
  - Will the spreading rate impact the overall fertiliser cost?

Fertiliser	P content (%)	$/T*	$/kg P	What else?
RPR	13	680	5.23	• Slow P release • Stable form of P
DAP	20	1,100	5.50	• Rapid P release • Contains 180 kg N per tonne of DAP
SSP	9	500	5.56	• Rapid P release • Contains +110 kg S per tonne of SSP

Top three take home messages

1. Soil test routinely:
   - Intensive grazing systems - test every 2-3 years.
   - Less intensive systems - test every 3-4 years.

2. Nutrient budget on an annual basis.

3. From late 2023, pasture production and rainfall received has been lower. This has resulted in lower stocking rates and increased supplementary feeding.

   This scenario = a lower requirement for fertiliser

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Tools, resources & training

Soil Quality (online calculator tool)

Nutrient management for farming in Tasmania (online guide)

Soil management – A guide for Tasmanian farmers (PDF)

MLA phosphorus tool (online tool)

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