October 2026

Arable Extra

Issue 145

Spring nutrient requirement tips

Crop nutrient requirements

Nutrient requirements for the whole crop (grain + straw) per tonne of grain produced for wheat, barley, oats and maize are shown in Table 1. Crop uptake will come from both soil supply and applied nutrients.

Straw management can have a significant impact on nutrient removal from the paddock. For example, large quantities of potassium (K) are likely to be lost when straw is baled and taken off-site, while stubble burning removes large quantities nitrogen (N) and sulphur (S).

Table 1. Nutrient uptake for different arable crops, including straw.

Crop[1]	Nutrient (kg per tonne of grain produced)				
	Nitrogen (N)	Phosphorus (P)	Potassium (K)	Sulphur (S)	Magnesium (Mg)
Wheat	25	4.0	18	3.0	2.0
Barley	23	4.0	18	3.0	2.0
Oats	24	5.5	26	3.0	2.0
Maize grain	23	5.0	21	2.5	2.5

[1]For maize silage current N recommendations are based on 12.5 kg N/ tonne of biomass produced.

Soil optimums

Different crops have different optimal values. The general optimum ranges suitable for most crops can be seen in Table 2. Most New Zealand agricultural soils naturally hold adequate calcium (Ca). Phosphorus fertilisers (e.g., SSP or TSP) and agricultural lime also supply Ca.

Table 2. General soil test optimum ranges for most arable crops.

Soil test[1]	General optimum	Example: Wheat requirements
pH	6.0	5.8—6.2
Olsen P	20-25	≥15
QT-K	• Sedimentary: 5-8 • Other soils: 7-10	5—8 7—10
Sulphate-S	>10	10—15
QT-Mg	>10	≥10

[1]Olsen P range of 20—30 is a requirement for all crops that are grown in rotation with ryegrass seed. QT = Quick test units.

Key points

- Review soil tests, soil test optimums and crop nutrient uptake to adjust upcoming paddock nutrient budgets.
- Match nutrient application and soil supply to crop demand and predicted yield.
- Apply fertiliser nitrogen (N) ahead of irrigation or forecast rainfall.
- For more detailed N fertiliser decisions refer to: https://assets.far.org.nz/X143-N-Smart-Six-soil-driven-steps-to-smarter.pdf

Timing of N application

Soil temperature: apply N fertilisers (such as urea) only when soil temperatures rise consistently above 6°C and plants enter active growth.

For cereals apply N at required growth stages: 00, 21—25, 30—32, 39, depending on crop type, background soil N, soil moisture availability, and end-use of the product (feed/milling/malting).

For maize N is often applied at sowing and a side dress at six leaf growth stage (V6).

For ryegrass seed for spring applied N, split N at 33—50% of the total N at closing and the remainder at one or two applications at and/ or after PGR application.

Avoid applying N when soils are waterlogged or saturated to reduce the risk of losses.

To reduce volatilisation losses from urea, apply N ahead of irrigation (where available) or forecast rainfall (avoiding large events that may saturate the soil), and/or use a coated urea product. Alternatively, switch to products treated with a urease inhibitor.

Herbage testing

Herbage testing complements soil tests and can provide valuable insights into the trace element status of crops. Visual symptoms (Table 3) can help indicate when herbage testing may be worthwhile. Deficiencies should be confirmed through testing by an accredited laboratory as many nutrient deficiencies produce similar symptoms, and some pests or diseases can resemble nutrient deficiency symptoms.

Quick field guide to visual deficiency symptoms

- Older leaves affected first → Suspect N, P, K, or Mg deficiency.
- Younger leaves affected first → Suspect Ca, boron (B), S, zinc (Zn), iron (Fe), manganese (Mn), copper (Cu), chloride (Cl) or molybdenum (Mo) deficiency.
- Leaf margin scorch → Often K deficiency.
- Purple leaves → Often P deficiency or cold temperatures.
- Interveinal chlorosis (yellowing) on older leaves → Often Mg deficiency.
- Interveinal chlorosis on younger leaves → Often Fe, Mn, or Zn deficiency.

Environmental conditions (e.g. low soil temperatures, dry conditions or waterlogging) can restrict plant uptake of some nutrients, leading to apparent deficiencies even where soil nutrient levels are adequate. See Table 3 for more detail on visual deficiency symptoms.

Table 3. Nutrient deficient symptoms: white background (mobile nutrients = symptoms in older leaves) and grey & green (immobile nutrients, symptoms in new/ young leaves).

Nutrient	Key symptoms of deficiency
Nutrients that are mobile (translocated) within the plant	
N	• Plants are small and pale green to light yellow. • Older leaves turn yellow (chlorosis) first. • Yellowing begins at the leaf tip and progresses along the midrib (e.g., in maize).
P	• Plants are stunted with a dark green appearance. • Often develop a purple cast, especially on leaves and stems.
K	• Yellowing, browning, and scorching along leaf margins of older leaves. • Symptoms begin at the leaf tip and move along the edges (e.g., maize).
Mg	• Pale green discoloration near the leaf tip progresses to bright yellow interveinal chlorosis. • Advanced deficiency may produce reddish-purple coloration from leaf margins inward.
Nutrients that are relatively immobile in the plant (terminal buds die)	
B	• Young leaves near the growing point become yellow. • Growth buds die and appear as white or light brown dead tissue.
Ca	• Delayed emergence of primary leaves. • Terminal buds deteriorate and die.
Nutrients that are relatively immobile in the plant (terminal buds remain alive)	
S	• Young leaves and veins become pale green to yellow. • Chlorosis appears first on new growth.
Mn	• Yellowish-grey or reddish-grey leaves with green veins. • Marginal and interveinal chlorosis occur but leaves generally retain normal shape.
Fe	• Young leaves develop interveinal chlorosis. • Leaves become yellow while veins remain green. • Severe deficiency results in brown spots and tissue death.
Zn	• Interveinal chlorosis. • Plants become stunted with shortened internodes. (e.g., in maize). • Broad white-to-yellow bands develop on either side of the midrib (e.g., in maize).
Cu	• Young leaves become uniformly pale yellow and may wilt without obvious chlorosis. • Twisted leaves, necrotic tips, lodging, and poor grain set (e.g., in cereals).
Mo	• Young leaves wilt and develop necrotic margins. • Older leaves may become chlorotic because the plant cannot properly utilise nitrogen.

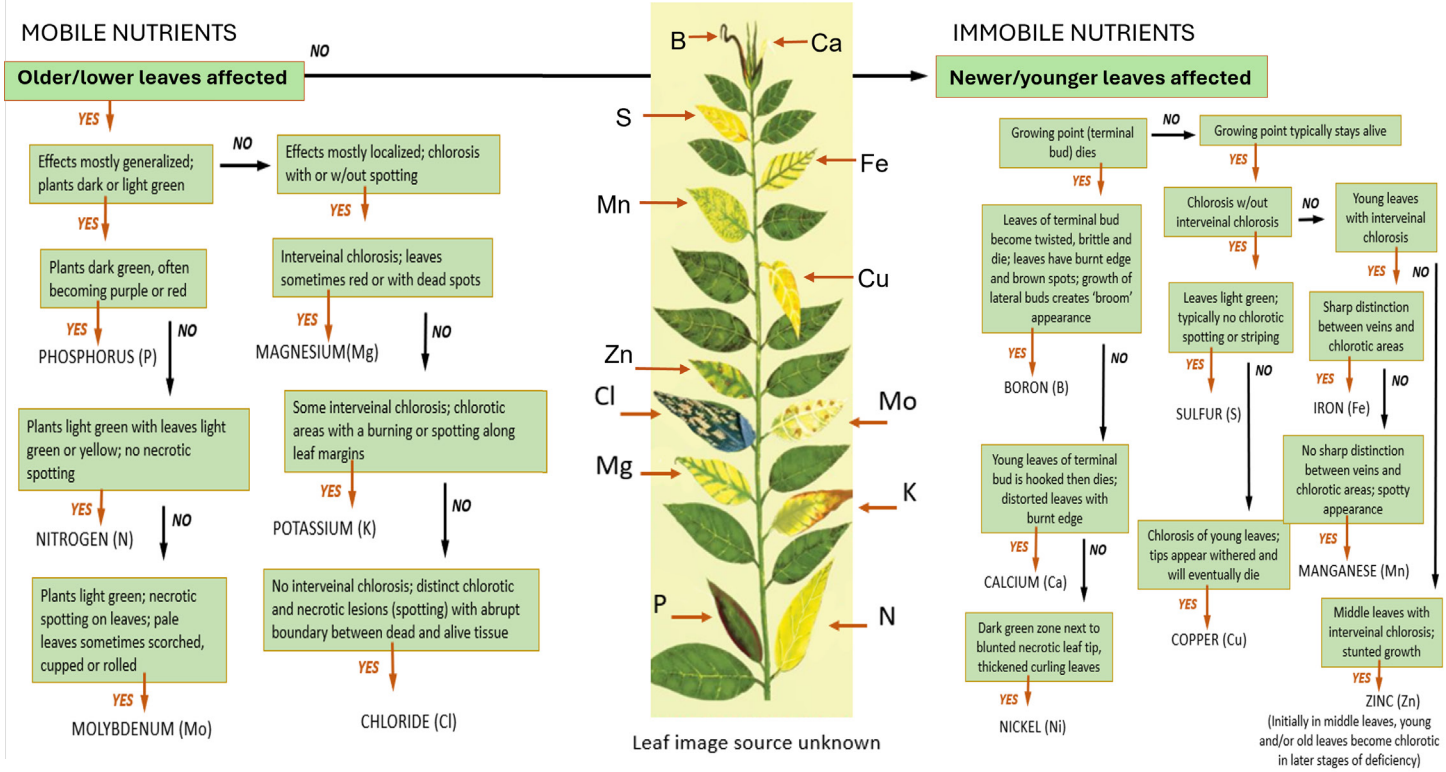


Figure 1. Visual tissue nutrient assessment. Adapted from 'Nutrient Management Module 9' (http://landresource.montana.edu/nm)

Acknowledgements

This Arable Extra was written by Emmanuel Chakwizira, FAR.

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