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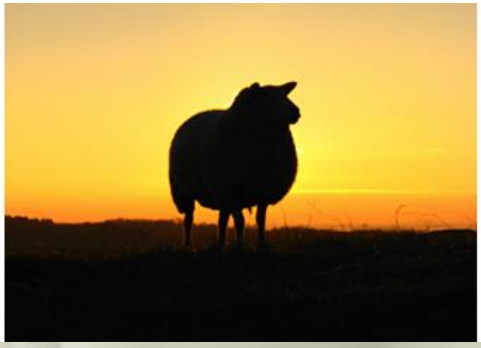

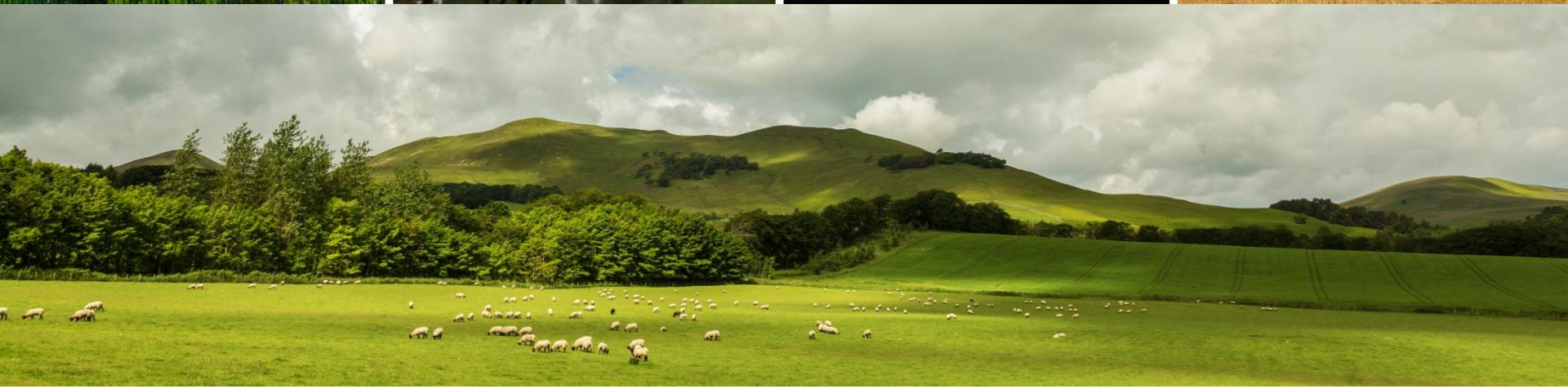

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# Major Nutrients

- Donald Dunbar
- SAC Consulting

# Nitrogen

- Yield driver
- Key in chlorophyll production and protein (amino acid) synthesis.
- Deficiency symptoms – pale older leaves and stunted growth.

Supplied to plant as;

- Nitrate (NO3) most readily form taken up by plant.

- Ammonium NH4

but toxic to plant so NH4 converted by soil microbes to nitrate NO3 (nitrification).

- Urea (NH2) convert to NH4 then NO3 (soil enzymes) some lost to environment as NH3 (volatilisation).

  Loss greater on high pH soils >6.5 and also dry warm conditions.

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# Phosphorus

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- Key for root development (early growth) and ripening process
- Deficiency symptoms – dull blue green purple leaf, delayed ripening.
- Finite non renewable resource, calcium phosphate 30% $P_2O_5$(ground rock phosphate).
- Soluble forms -treat with acid to increase concentration and availability. Triple super phosphate 46% $P_2O_5$ (95% water soluble).
- Phosphate sorption capacity (lock up) dependant on soil type
- Timing important if deficient - seedling establishment, early spring growth, dry soil condition in spring sown crops. (FYM contains 3kg/ton)
- Grassland target status: Moderate (-) or ADAS index 2
- Losses occur when washed out in soil sediment. Can causes nutrient enrichment in water course and algal growths.

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# Potassium

- Key for water regulation in cell sap, osmotic potential plant turgidity and enzymes for photosynthesis
- Deficiency symptoms – lighter older leaves + scorched tip similar to frost damage, older leaves can become totally white.
- Potash natural resource mined as Murate of Potash 60% $K_2O$ or manufactured as Potassium Sulphate 50% $K_2O$ + sulphur
- Water soluble, large amounts taken up by vegetative growth so immature harvested crops e.g. silage, remove high levels from soil reserves and can reduce soil status over time.
- FYM is good source of Potassium (8kg/ton)

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# Sulphur - Secondary Nutrient

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- Deficiency symptoms – pale younger leaves, also stunted crop in cereals.

  Deficiency more likely on sandy, shallow or soils low in organic matter.

  Soil analysis helps to identify high risk soils with low or very low status

- Supplied as elemental sulphur (slow release) or in readily available sulphate form in fertilisers e.g. ammonium sulphate. Grass 40kg S/ha per season or per cut

- Apply in spring as very little taken up by leaf (2%), main uptake by roots from soil

- Muck and slurry is useful source of sulphur

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# Lime

- Not a nutrient taken up by the plant
- Regulates soil acidity measured as pH
- Scottish soils naturally acidic and require lime to maintain soil at optimum pH for nutrient availability and uptake
- Liming materials effectiveness determined by Neutralising Value (NV) Calcium

  Calcium Limestone 50%  Magnesian Limestone 50 – 55%
- In ground products particle size important to speed of neutralising action
- Micronized granulated products (Calciprill) can be applied by fertiliser spreader
- Raising low pH soils also increases availability of Phosphate

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# Thank You

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