Soil fertility

- is the ……
- no ……
- includes …….. (CEC), ……..
  …….. (basic igneous rocks), ……. (porous, high water holding capacity, aerated), ……
  ……. (soil organic matter)

significance

- fertility is …….
- determines the performance of ……..
- one determinant of ……..

Use of improved species, intensive management and improved animal production is based on ……

Essential Elements (pg 266)

…….

Essential Micro-nutrients (pg 266)

……

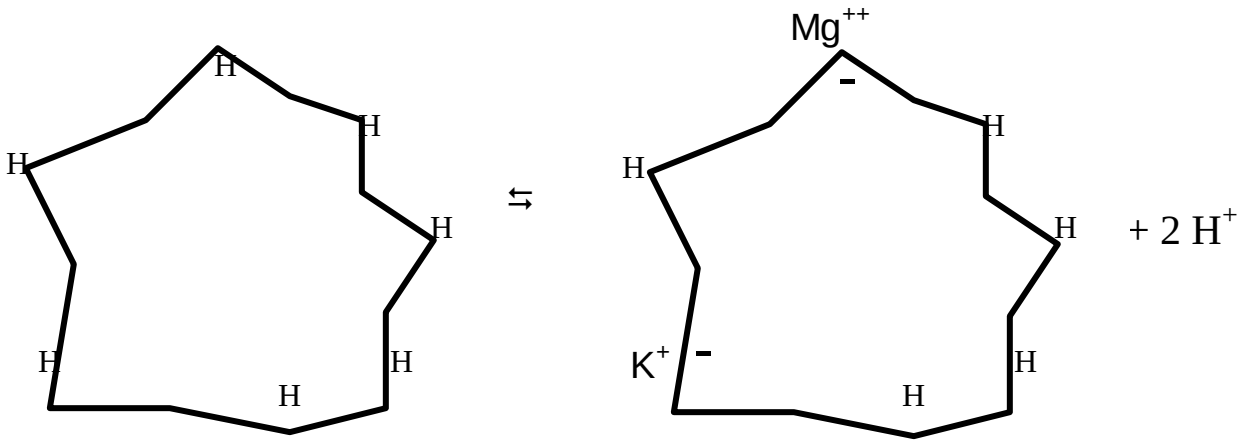
Non-essential nutrients (but essential in animals)

…….

Cation exchange capacity

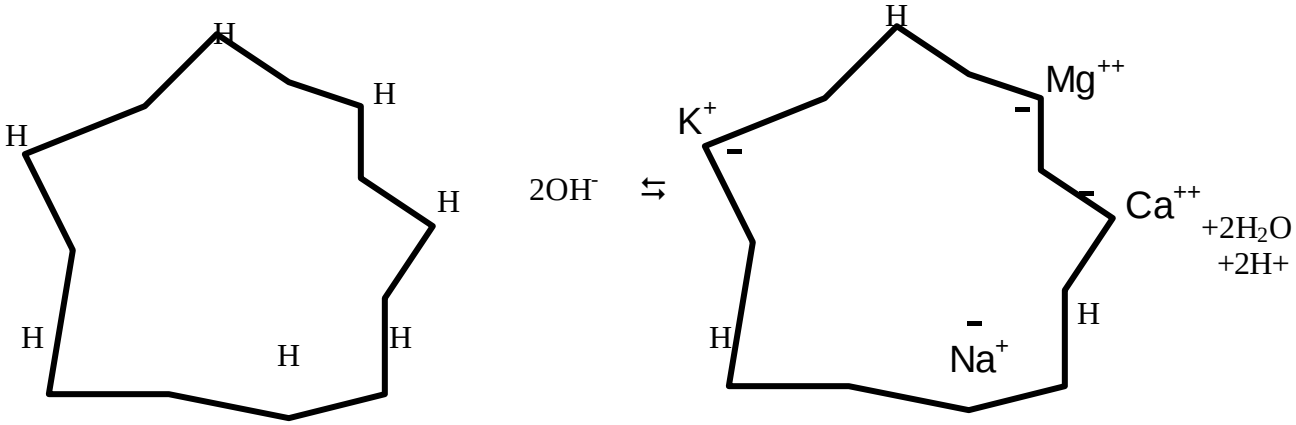
– the weak electrostatic charge of soil particles, resulting from loss of H^+ ions, which attracts soil cations holding them in a plant-available form.

Depends on
- …….
- …….
- ……
- ……..
- ……



Liming

$CaCO_3 + H_20 \leftrightarrows Ca^{++} + HCO_3^- + OH^-$



K (potash) (pg 281-283)

- Released into the soil by the mineral ……..
- or applied as ……..
- essential in plants, promotes ……, important in ……. (drought tolerance and freezing resistance), metabolic processes
- in fertilizer is measured as …….

	MW		
K	39.098	78.2	…….
O	15.9994	16.0	
		94.2	

- in soil is measured as kgK/ha (lb/acre) or ppm ($g/10^3$ kg)
  It takes 4 lbs/acre of K_2O to increase soil test by 1 lb/acre
  It takes 8 lbs/acre of K_2O to increase soil test by 1 ppm

  Soil K should be at least 300 kg/ha (270 lb/ac), depending on CEC, and soil K supplying power

- in forage is measured as ppm ($g/10^6$ g) or % m($g/10^2$ g)
  desirable levels in forage are at least 2.5%
- high losses when forage is removed as hay/silage that must be replaced by fertilizer (see pg 277)

Na
- not required by plants, and in excess can displace K^+
- when present in plants it does help regulate osmotic balance
- it is required by animals, hence is required in forage

Mg
- required by plants for enzymatic function (chlorophyll)
- typical levels are 0.25-0.30%
- it is required by animals, deficiency results in hypomagnesemia of lactating cows
- can be applied as dolomite ($Ca\ CO_3/MgCO_3$)
- can be suppressed by Ca (in lime) or high rates of K

Ca
- minor role in plants, contributes to good soil structure
- typical levels are 1-2%
- it is required by animals for bone growth
- can be applied as lime ($Ca\ CO_3$) or dolomite ($Ca\ CO_3/MgCO_3$)
- increases soil pH

Homework question:
A hayfield produces 4 alfalfa crops of 1.5 ton/acre. How much K is removed from the field? How much fertilizer would be required to replace it? What might the hay be worth, and what might the fertilizer cost?
(K_20 = 83%K, hay is 2.8% K)