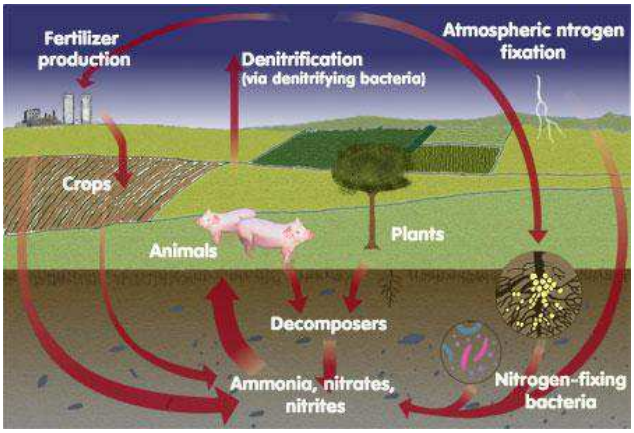
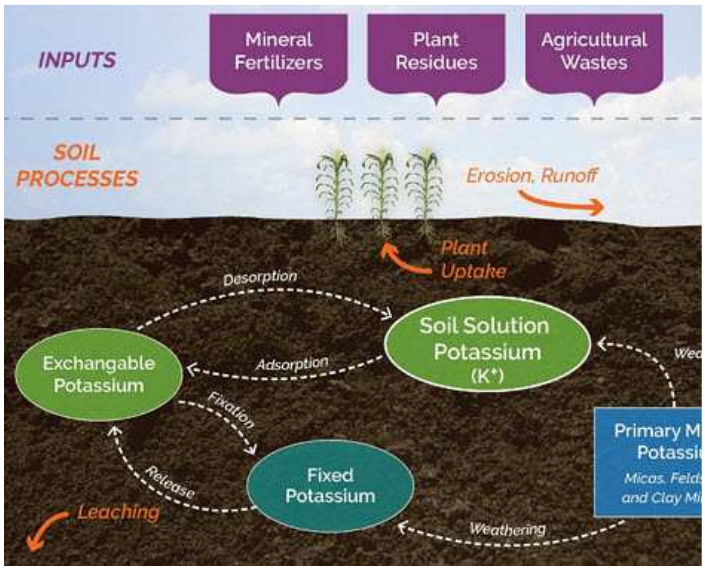
Nitrate nitrogen (mg/kg)

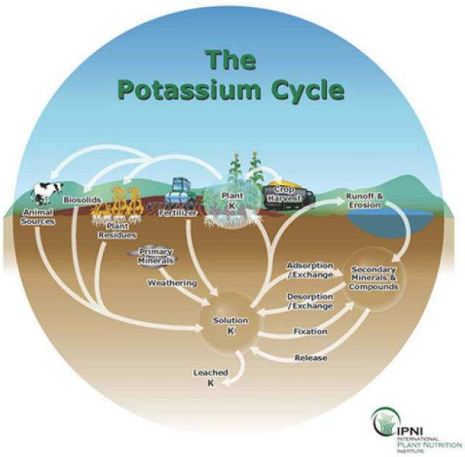
Low	Caution	Good	Good	Caution	High

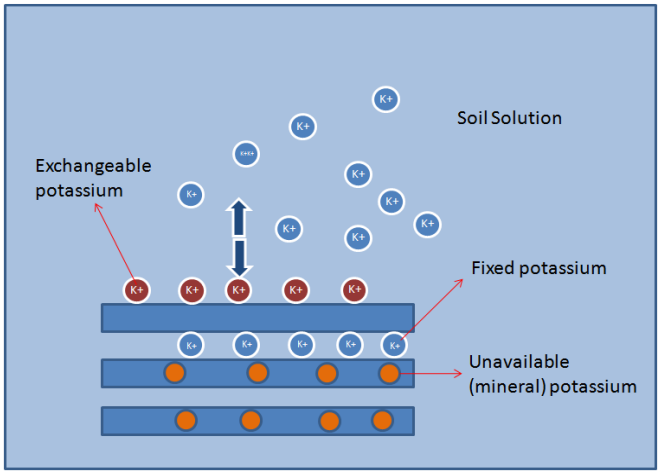
0 10 20 30 40 50 60

Figure 1: Guide to the interpretation of nitrate-nitrogen values for soils (Source: Soil health for vegetable production in Australia—Part 4)






The
Potassium Cycle
Animal Sources
Biosolids
Plant Residues
Fertilizer
Plant K
Crop Harvest
Runoff & Erosion
Primary Minerals
Weathering
Adsorption /Exchange
Secondary Minerals & Compounds
Desorption /Exchange
Solution K
Fixation
Release
Leached K
IPNI


Soil Solution
Exchangeable potassium
Fixed potassium
Unavailable (mineral) potassium
K+

CONCEPT ABOUT SOIL TEST

Introduction:

A soil analysis is a process by which elements such as P, K, Ca, Mg, Na, S, Mn, Cu and Zn are chemically extracted from the soil and measured for their "plant available" content within the soil sample.

Significance of Soil Analysis:

- It increases the knowledge of what nutrients are especially available in our soil.
- It reduces the environmental impacts due to soil amendments.
- It increases the efficiency of resource inputs such as fertilisers and water.
- It helps to predict the nutritional values needed for crop production.
- It helps to evaluate the fertility status of soils of a country or a state or a district.

Procedure for Taking Good Soil Samples:

- Determine the soil unit (or plot).
- Make a traverse over the soil unit (or plot).
- Clean the site (with spade) from where soil sample is to be collected.
- Insert the spade into soil.
- Standing on the opposite side, again insert the spade into soil.
- A lump of soil is removed.
- A pit of 'V' shape is formed. Its depth should be 0-6" or 0-9" or 0-12" (i.e., Depth of tillage).
- Take out the soil-slice (like a bread slice) of ½ inch thick from both the exposed surface of the pit from top to bottom. This slice is also termed furrow-slice. To collect the soil-slice spade may be used. Collect the soil samples in a polyethylene bucket.
- Collect furrow-slices from 8-10 or sometimes 20-30 sites. Select the sites at random in a zigzag (or criss-cross) manner. Distribute the sites throughout the entire soil unit (plot). In lieu of spade auger may be used. Do not take the prohibited samples and local problem soils.
- Furnish the following information in two sheets of thick paper with the sample. One sheet is folded and kept inside the bag. Another sheet is folded and attached to the bag.

What is the difference between macro and micro nutrients?

Plants cannot grow without the essential plant nutrients. In addition to carbon dioxide (CO_2) and water (H_2O), plants do need those nutrients to be able to grow and produce biomass. Fourteen essential plant nutrients are known, and based on the amounts of nutrients that are required by plants, macro and micronutrients are distinguished. Macronutrients are taken up in relatively large amounts (10 -100 kg or more per hectare), while the amount of micronutrients that is taken up by plants is mostly limited to several grams per hectare.

Macronutrients are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and sulfur (S). Micronutrients are Manganese (Mn), Boron (B), Copper (Cu), Iron (Fe), Zinc (Zn), Nickel (Ni), Molybdenum (Mo) and Chlorine (Cl).

What are N, P, K and why are they so important for plants and crops?

The nutrients that are required by crops in the largest amounts are N, P and K. For that reason, they are often considered as the most important nutrients.

What is the role of these nutrients in plant growth?

The main functions of N and P are that they are constituents of proteins and nucleic acids, which are important components of plant tissue. K is the only nutrient that is not a constituent of organic plant compounds, but is mainly of importance in the regulation of processes in the plant, such as osmosis

and enzyme activities. K is generally playing an important role for the quality of harvested plant products.

Why is it important for farmers to know the NPK content in their soil?

For the optimal growth of crops, sufficient amounts of nutrients should be available in the root zone of the crops. Those nutrients can be partly supplied by the soil and should be partly added with organic manures and fertilizers. Soils will contain different amounts of available nutrients, depending of the parent material (e.g. sand, clay, peat), and differences in the management history such as preceding crops, management of crop residues and use of manure and fertilizers in the past. Also differences in climatic conditions may alter the available nutrients. For that reason, it is of importance for farmers to know the NPK content of their soil, so that they know how much N, P and/or K they should add with organic or mineral fertilizers, to optimize crop growth, production and yield.

How do crops take up these nutrients? Are there differences per crop?

Nutrients are present in the soil in different forms, which differ in its availability for plants. For example, most nitrogen is present in the soil in organic form as part of organic matter, while it can be taken up only in mineral forms (ammonium and nitrate). The organic nitrogen should be mineralized into mineral forms before plant roots can take it up. Phosphorus in the soil is also present in organic matter, but often mainly in chemical forms, which differ in solubility and plant availability. Potassium is mainly present in the soil solution and adsorbed to soil particles, such as clay and organic matter, from which it can desorb relatively easily by changes in equilibrium between the surface of soil particles and the soil solution.

The crop roots take up the available nutrients from the top layer of the soil. Despite differences in plant root systems, which vary from shallow (e.g. grass) to deep (most tree crops, sugar beet, maize, cereals), all crops take up their nutrients from the top soil.

The mobility of nutrients in soils strongly differs: N and K dissolve in water quite well and are very mobile in soil, while P is rather immobile in soil. The consequence is that the supply of N and K to plant roots is mostly sufficient, provided that the amount in soil is high enough, while the P supply to plant roots, especially in the first stages after sowing or planting, may be difficult.

What are the risks of too little or too much N, P or K in the soil?

The availability of N, P and K in soil should be sufficient, but not too high. Too low availabilities will lead to hampered growth and low yields, while too high availabilities of one or more nutrients may lead to disturbed plant growth and adverse effects for yield and/or quality of harvested products. Moreover, the N, P and K availability should be balanced, so the availability of the other nutrients should be taken into account while the availability of the considered nutrient is adjusted.

What are nutrient deficiency symptoms in plants?

Nutrient deficiency will lead to visual symptoms in the plant, which may be the yellowing of leaves, or the occurrence of brown spots on the leaf. The exact symptoms depend on the function of the nutrient in the plant and the way the nutrient is transported within the plant.

Generally speaking, if a soil falls in the low range for a nutrient, crops will be deficient, and can be improved either in quantity or quality by the supplementation of the deficient nutrient. The medium range is usually an adequate level for most crops. The high range is also adequate for crop growth and yield, and may be necessary for heavy feeding crops such as corn. However, for other crops this could be excessive and could lead to nutrient pollution in surface water run-off.