Management of phosphorus deficiency

1. Detection of phosphorus deficiency

- Crop plants are stunted (slow growth compared with plants with sufficient P)
- Maize leaves are coloured reddish-purple
- Soil analysis shows that the amount of phosphorus in the soil is less than 20 mg kg^{-1} P (Bray II test) or less than 30 mg kg^{-1} P (Olsen test)
- Presence of indicator plants

-P   +P

- Crops deficient in phosphorus have poor root systems that result in:
  > Delayed and retarded growth
  > Stunted roots resulting in poor nutrient uptake
  > Poor drought tolerance
  > Poor anchorage

2. Effect of phosphate fertilizer on crops grown on phosphorus deficient soil

Soybean — Without phosphate fertilizer ✗

Soybean — With phosphate fertilizer ✔

Maize — Without phosphate fertilizer ✗

Maize — With phosphate fertilizer ✔

- Apply phosphate fertilizer at planting and close to but not touching the seed
- Phosphate fertilizers improve growth and biological N_2 fixation in legume crops

3. Prevention of phosphorus deficiency

- Install soil conservation barriers.
- Retain crop residues in field or apply farmyard manure (10-15 tonnes per hectare) each cropping system.

4. Correction of phosphorus deficiency?

- Use phosphate fertilizer
- Common phosphate fertilizers include TSP (46% P_2O_5), SSP (20% P_2O_5), rock phosphate (30% P_2O_5), DAP (18% N, 46% P_2O_5)
  > TSP is a fast acting soluble fertilizers
  > SSP is a fast acting soluble fertilizer that also contains sulphur (10%)
  > DAP is a fast acting soluble fertilizer that also contains nitrogen (18%)
  > Rock phosphate is slow acting sparingly soluble fertilizer
  > Compound fertilizers usually contain phosphate
- Apply 30-50 kg P per hectare equivalent to:
  > 120-200 kg per hectare of TSP or DAP
  > 200-400 kg per hectare of SSP
  > 300-600 kg per hectare rock phosphate
- If soil pH is low (<5.5) it may be beneficial to apply lime (2-5 tonnes per hectare).
- Is phosphate fertilizer use economic?
- Calculate the fertilizer response (output:input ratio)
- Assess the ratio of input to output prices
- Calculate the value:cost ratio
- Calculate the net returns (value:cost ratio)