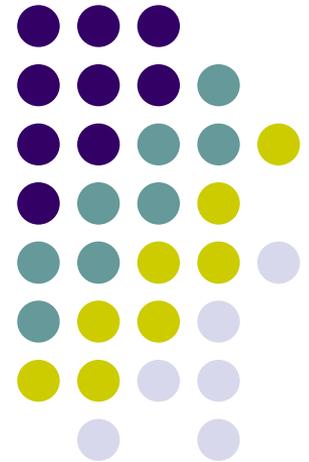
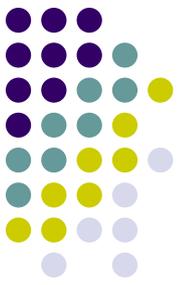


Fertilizer Use in Sri Lanka with special reference to CKDu



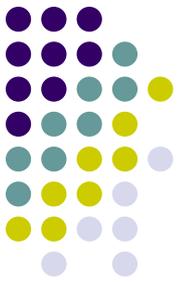
Presented by Dr. C.S. Weeraratna



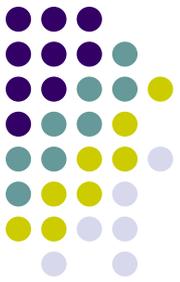
Fertilizer use in Sri Lanka

- Plantation sub-sector and the Food Crop sub-sector
- A few decades ago- bone manure was in use.
- However, since 1950s, farmers started applying imported fertilizers

Fertilizer use in Sri Lanka



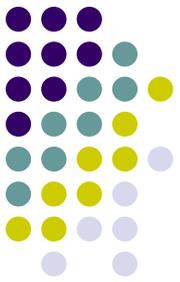
- Around 600,000 t of solid fertilizers and 250,000 l of liquid fertilizers



Amounts of fertilizer use

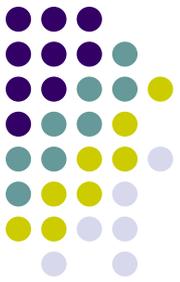
- Annually
- Urea-300,000 t,
- Triple Super Phosphate (TSP)- 120,000t
- Muriate of Potash (MOP) – 150,000t
- Ammonium sulphate - 50,000 t
- Eppawla Apatite – 50,000 t
- Organic fertilizers -

Fertilizer use in the provinces

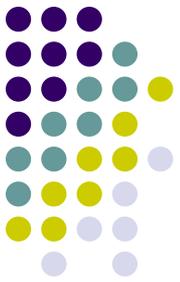


- Fertilizers used in all the provinces
- High in the NCP (128,000 ha)
- NWP – (96,000 ha)
- Eastern province (100,000 ha)

CKDU



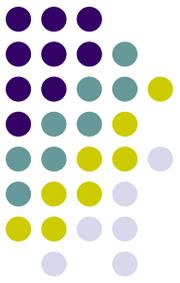
- A number of factors are considered to cause CKDu.
- WHO report - Cadmium is identified as one of the probable causes.



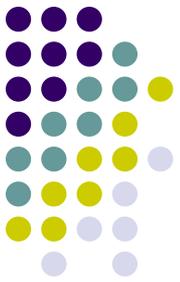
Cadmium

- Present in phosphate fertilizers.
- Produced from naturally occurring phosphate rock.
- A common phosphate mineral is apatite.
- Depending on the phosphate rock TSP can have cadmium from 10-100 ppm

Phosphate and Cadmium Contents of Phosphate Rocks



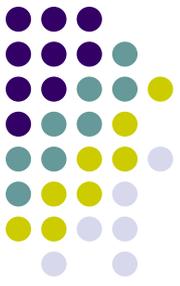
| Country | Average P₂O₅ % (W/W) | Average Cd (ppm) |
|-----------------------|---|-------------------------|
| Algeria | 28.8 | 22.5 |
| Australia | 31.2 | 4.17 |
| Egypt | 29.89 | 5.67 |
| Israel | 31.13 | 30.77 |
| Jordan | 31.9 | 5.42 |
| Morocco | 32.7 | 25.98 |
| Nauru | 36.65 | 85.15 |
| Tunisia | 29.95 | 39.5 |
| Florida | 32.1 | 9.13 |
| North Carolina | 29.8 | 38.21 |



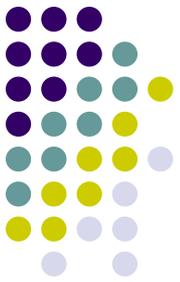
Cadmium in TSP

- 50 kg of TSP (this is the average amount of TSP applied to a crop at a time) will have only 0.5 g of cadmium.
- What are the forms of cadmium in TSP?
- What happens to this Cd when TSP is applied.

Changes Cd will undergo

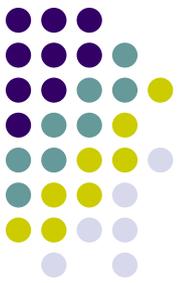


- Physical - Adsorbed
- Chemical – Form insoluble complexes
- Biological – Absorbed by micro and macro organisms



Kinetics of cadmium?

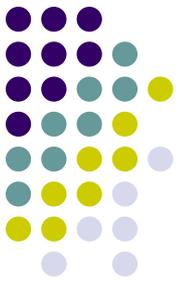
- When TSP is applied to soil an appreciable amount of the phosphate gets fixed and hence becomes unavailable for plants.
- Cadmium (Cd) concentration in soil - controlled by sorption-desorption reactions.



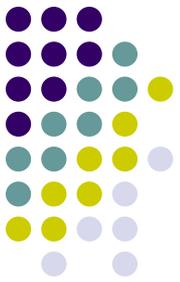
Cadmium in soils

- The sorption characteristics of Cd varies among different soils and is influenced by some soil properties such as pH, OM, CEC, and clay content.
- As pH increase from 5 to 9, the adsorbed fraction increased and the free ionic fraction decreased markedly

Cadmium in soils

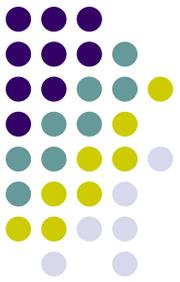


- Tendency for Cd adsorption is high at low Cd concentrations.
- The adsorption capacity of the soils for Cd increased with an increase in pH, CEC and calcium carbonate equivalent (CCE).



Cd uptake

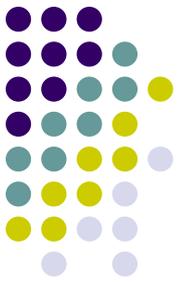
- The uptake by plants from soil is greater at low soil pH



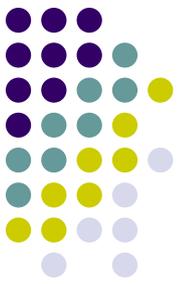
Cadmium availability?

- If the cadmium content of TSP is 10 ppm,, 50 kg of TSP (this is the average amount of TSP applied to a crop at a time) will have only 0.5 g of cadmium. Of this amount how much will be available to plants?

Cadmium retention in kidney?



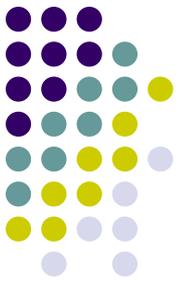
- What is the app. amount of cadmium ingested by a person who consumes 100g of rice?
- Out of that amount of cadmium how much is retained in the kidney?



Activities for future action

- The objective of the symposium- Scientific basis for future action
- Kinetics of Cd in soil
- Uptake of Cd by plants
- Retention of Cd in kidney

Is Cadmium the causal factor?



- It is not conclusively proved that Cd is responsible for CKDu.
- TSP is used all over the country but CKD is reported only in some parts of NCP, NWP and Uva province.
- If TSP is responsible for CKDu then this disease should be reported in all parts of the country where TSP is used.