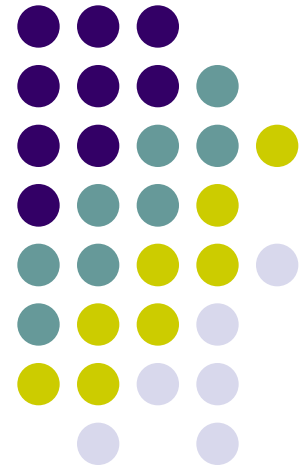
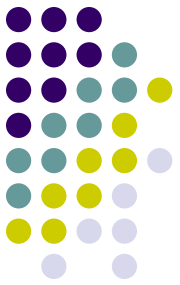


# Fertilizer Use in Sri Lanka with special reference to CKDu

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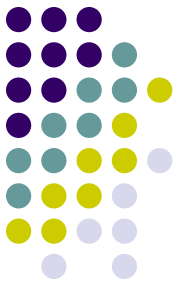
Presented by Dr. C.S. Weeraratna



# 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

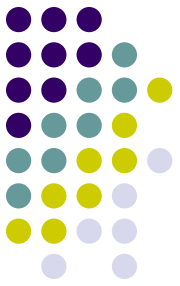
- Annually
- Urea-300,000 t,
- Triple Super Phosphate (TSP)- 120,000t
- Muriate of Potash (MOP) – 150,000t
- Ammonium sulphate - 50,000 t
- Eppawla Apatite – 50,000 t
- Organic fertilizers -

# 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



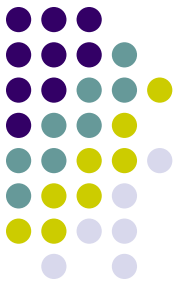
- A number of factors are considered to cause CKDu.
- WHO report - Cadmium is identified as one of the probable causes.



# Cadmium

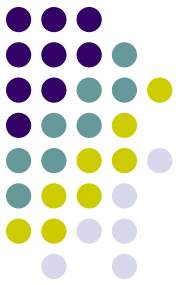
- Present in phosphate fertilizers.
- Produced from naturally occurring phosphate rock.
- A common phosphate mineral is apatite.
- Depending on the phosphate rock TSP can have cadmium from 10-100 ppm

# Phosphate and Cadmium Contents of Phosphate Rocks



<b>Country</b>	<b>Average P<sub>2</sub>O<sub>5</sub> % (W/W)</b>	<b>Average Cd (ppm)</b>
<b>Algeria</b>	<b>28.8</b>	<b>22.5</b>
<b>Australia</b>	<b>31.2</b>	<b>4.17</b>
<b>Egypt</b>	<b>29.89</b>	<b>5.67</b>
<b>Israel</b>	<b>31.13</b>	<b>30.77</b>
<b>Jordan</b>	<b>31.9</b>	<b>5.42</b>
<b>Morocco</b>	<b>32.7</b>	<b>25.98</b>
<b>Nauru</b>	<b>36.65</b>	<b>85.15</b>
<b>Tunisia</b>	<b>29.95</b>	<b>39.5</b>
<b>Florida</b>	<b>32.1</b>	<b>9.13</b>
<b>North Carolina</b>	<b>29.8</b>	<b>38.21</b>





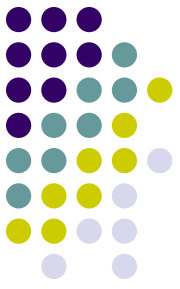
# Cadmium in TSP

- 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?

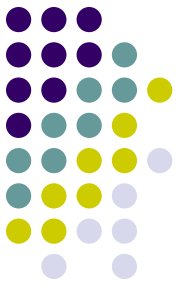
- When TSP is applied to soil an appreciable amount of the phosphate gets fixed and hence becomes unavailable for plants.
- Cadmium (Cd) concentration in soil - controlled by sorption-desorption reactions.

# Cadmium in soils



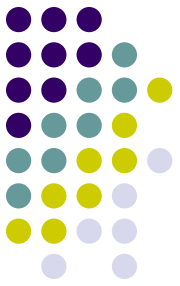
- The sorption characteristics of Cd varies among different soils and is influenced by some soil properties such as pH, OM, CEC, and clay content.
- As pH increase from 5 to 9, the adsorbed fraction increased and the free ionic fraction decreased markedly

# Cadmium in soils

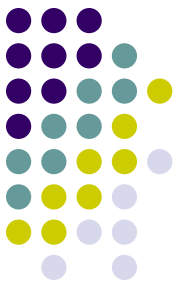


- Tendency for Cd adsorption is high at low Cd concentrations.
- The adsorption capacity of the soils for Cd increased with an increase in pH, CEC and calcium carbonate equivalent (CCE).

# Cd uptake



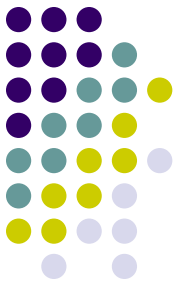
- The uptake by plants from soil is greater at low soil pH



# Cadmium availability?

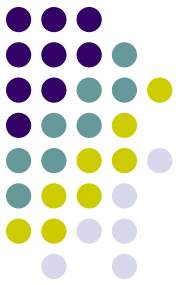
- If the cadmium content of TSP is 10 ppm,, 50 kg of TSP (this is the average amount of TSP applied to a crop at a time) will have only 0.5 g of cadmium. Of this amount how much will be available to plants?

# 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.