MEASURING SOIL RESPIRATION

Kumaradevan a/l Saminathan
Ong, Jin Eong
Gong, Wooi Khoon
Soil Respiration

• Soil CO$_2$ efflux
• the sum of CO$_2$ that is released from the soil
• CO$_2$ source:
  – microbial respiration
  - root respiration
  - fauna respiration
Factors affecting Soil Respiration

- Soil organic matter
- Soil temperature
- Soil nutrient content
- Soil depth
- Soil moisture
- Vegetation type
- Soil – air $\text{CO}_2$ gradient
- Air temperature
- Wind speed
- Soil pore size
Different Measuring Techniques

• Closed Dynamic Chamber System
• Closed Static Chamber System
• Open Chamber System
• Eddy Covariance Correlation System
Closed Dynamic Chamber System

LICOR LI-6400 Portable Photosynthesis System

LICOR LI-6400-09 Soil CO₂ Flux Chamber
Collar area :  78.5cm²
Collar height :  4.4 cm
Insertion Depth  :  2.0 cm
Closed Static Chamber System

- Soda Lime technique

58.0 g of soda lime

Beach Ball = ≈ 8.6 L
Bucket = ≈ 14.1 L
Opening Area = 620.2 cm²
Absorption Reaction

2NaOH + CO₂ → Na₂CO₃ + H₂O

Ca(OH)₂ + CO₂ → CaCO₃ + H₂O

**Calculation**

<table>
<thead>
<tr>
<th>Soil Co2 Efflux (gC m⁻² day⁻¹)</th>
<th>Sample weight gain (g) – mean blank weight gain (g) X 1.69</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chamber Area (m²) X (24(h) / 44) X 12 X Duration of Exposure (h)</td>
</tr>
</tbody>
</table>

Sample weight gain (g) – mean blank weight gain (g) X 1.69

Chamber Area (m²)

24(h) / 44

Duration of Exposure (h)

12

44
Soil Respiration Rates

Soda lime technique – 1.97 ± 0.09 gC m\(^{-2}\) day\(^{-1}\)

LICOR LI-6400 – 1.33 ± 0.12 gC m\(^{-2}\) day\(^{-1}\)
Thank You