Does rhizosphere priming effect explain the greater soil respiration in well-watered and drought-stressed maize?
Background;

- **What is the Rihzosphere priming effects (RPEs)?**
  - RPEs are changes in the rate of SOM decomposition (SOM-derived CO$_2$) in the presence of living roots (Kuzyakov et al., 2000).

Kuzyakov et al., (2000)

- **Research hypothesis:**
  - it’s well accepted that soil moisture directly affects microbial activity, whereas, drought stress was recently postulated to increase root exudates, which in turn will accelerate SOM mineralization “priming effects”.

- **Research Objective:**
  - To investigate the interplay between soil moisture (well-watered and drought stressed) and maize (Zea mays L.) root exudates on soil CO$_2$ efflux.
- Three treatments; *well-watered, drought-stressed* maize plus a control.
- Drip irrigation systems to adjusted water flow based on the treatments.
- Soil CO\(_2\) efflux, soil temperature and moisture content measured twice and once a month for *growing season* and *fallow period*, respectively.
CO₂ emissions were continuously measured twice a month in wet seasons and once a month in the dry season using LICOR 6400xt.

CO₂ Conc for carbon isotopes were sampled using the static chamber.

Soil temperature and soil moisture measured continuously at 10, 25, 50 and 75 cm depth.

Greatest CO₂ effluxes variations under well-watered treatment.

Overall average, CO₂ efflux was significantly greater in well-watered by 24.4 and 20% than the drought-stressed and the control, respectively.

Lower 25th and 75th range being observed in drought-stressed treatment.
- **CO₂ efflux**, changed greatly over time, with high variations between the treatments in the rainy season.
- **CO₂ effluxes** were significantly greater in 5 events in well-watered compared to drought-stressed and the control.
- **CO₂ efflux** decreased with soil temperature and increased with soil moisture content.

- **CO₂ efflux** correlated positively to soil moisture and negatively to soil temperature.
- The strongest correlations were found at the top-soil and then decreased with the soil depth.
- Rhizosphere priming effect (RPE) seems to be the strongest factor controlling **CO₂ efflux** in the optimum soil conditions.
**Discussion and conclusion:**

- Changes in soil CO₂ effluxes over time were attributed to the changes in soil microclimate, particularly the changes in soil temperature and moisture content.
- Optimum soil moisture in well-watered treatment enhanced maize growth, thus alter soil microorganism leading to high rhizosphere priming effect compared to the other treatments.
- The higher rhizosphere priming effect explained the greatest CO₂ efflux under well-watered treatment in comparison to the drought-stressed and the control.
- Greater soil microbial biomass carbon and nitrogen in well-watered treatment than drought-stressed and the control observed in the top-soil (data not shown).
- More factors such as soil factors i.e. C and N content, microbial biomass and activities and soil below and above-ground biomass will be included in later stages to confirm this preliminary findings.