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## Variations in the Diurnal Flux of Greenhouse Gases from Oil Palm Plantation in Indonesia

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### Abstract

Climate change continues to be a topic of considerable scientific debate and public concern. The concentration of greenhouse gases including methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) in the atmosphere has been increased due to human activities. Agricultural production plays an important role on atmospheric greenhouse gas concentration. Oil palm plantation has grown rapidly in Southeast Asia, with Indonesia and Malaysia currently meeting more than 85% of global palm oil demand by using huge amount of fertilisers to increase the production. Under such conditions, N<sub>2</sub>O and CH<sub>4</sub> gases tend to be emitted. For accurate emission measurement the diurnal variation need to be investigated. Gas samples were taken from different oil palm plantation fields from North Sumatra and Kalimantan in Indonesia. Diurnal variability in the rate of emission of N<sub>2</sub>O and CH<sub>4</sub> were studied mineral fertiliser and organic residues. Specially made big closed static chambers were established for two hours in the weeded circle position to observe the mineral fertiliser (1.5 kg urea/palm) effect and in the inter-row position to observe the effect of the organic residues (Decanter Cake (DC), Empty Fruit Bunch (EFB)) with 3 replications for periods of 0 d (before fertiliser application), 1<sup>th</sup>d, 3<sup>rd</sup> d, 5<sup>th</sup>d, 7<sup>th</sup>d, 9<sup>th</sup>d, 11<sup>th</sup>d and 15<sup>th</sup>d after fertiliser application. Samples were collected in the morning (8–10 am), afternoon (12–2 pm) and evening (4–6 pm) at 0, 20, 40, 60, 80, 100, and 120 min after the chambers were closed, and the concentrations of N<sub>2</sub>O and CH<sub>4</sub> were determined using gas chromatography. Results indicated that the fluxes of N<sub>2</sub>O and CH<sub>4</sub> from mineral fertilised plots showed significant difference in the afternoon than the morning. The flux was found to be increased as the day progresses and the flux was higher at noon and in the late noon than the morning 8 am. But in organic mulch position both in Kalimantan and Sumatra, the difference in flux during the different parts of the day was not very prominent. So there were no significant diurnal variations for organic mulch position. This finding indicated the importance of sampling time of the day for accurate emission measurement.

**Keywords:** Greenhouse gases, oil palm