Group A03-START-UP and BOPTN FUND
Land Transformation from Forest to Oil Palm: Microclimate and Energy Budget, Surface Roughness and Turbulence and Evapotranspiration

[1]Tania June, [1]. Risdiyanto [1]A. P. Kusuma, [1]Ni W. S. Puspadewi, [1]A. B. Afandi., [1]A. Shalahuddin,[1] H. Khotimah., [2]A. Meijide, [2]D. Fellert and [2]A. Khnol
[1]Department of Geophysics and Meteorology-FMIPA, Bogor Agricultural University,
[2] Faculty of Forest Sciences and Forest Ecology - Bioclimatology, University of Goetting
Email: june.tania@gmail.com

Expansion of Oil palm plantation has been perceived as causing environmental problem such as greenhouse gases emission (especially CO_2), higher water demand, and increase surface/air temperature. However, a comprehensive research and data to clarify/confirm those issues are not yet available. Transformation from forest to oil palm plantation will result in changing surface biophysical characteristics such as surface roughness (roughness length z_o, zero plane displacement *d*, friction velocity, u*), Transfer coefficient, Intencity of turbulence, radiation interception and distribution, energy budget, microclimate and water fluxes (evapotranspiration).

The Research objectives are: 1) to quantify biophysical changes (surface roughness and turbulence, microclimate, energy budget, of land transformation from forest to oil palm; 2) to examine changes in radiation interception and its distribution in oil palm canopies; 3) to estimate changes in water vapor fluxes (evapotranspiration)

Methods: 1) Micrometeorological measurements above oil palm canopy using mini tower : solar radiation, wind speed profile, wind direction, air temperature and RH profiles.2) Canopy and below-canopy measurements: radiation profile, leaf nitrogen profile, wind speed, air/soil temperature, RH, surface temperature, soil heat flux. 3) Analysis of Biophysical Changes of land transformation from forest to oil palm using Remote Sensing: Albedo (α), NDVI, Surface (T_s) and Air Temperature (T_a). Net Radiation (R_n), Heat fluxes (H), Water vapor fluxes (LE). 4) Comparison of Aerodynamic, Penman-Monteith and Bowen Ratio Methods in estimating heat and water vapor fluxes .

Transformation of forest to oil palm plantation result in changing surface biophysical characteristics (zo, d, u*, Transfer coefficient , TKE, NDVI, albedo, temperature), radiation, radiation interception and distribution of energy to heat and water vapor fluxes. As compared with an intact forest, the changes are quite significant when oil palm was young, but as canopy grows and cover the surface, mature oil palm canopy is biophysically closer to forest.