

PENGARUH FAKTOR LINGKUNGAN TERHADAP EMISI CO₂ DI TANAH HUTAN RAKYAT CANGKRINGAN, SLEMAN, YOGYAKARTA

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INTISARI

Jumlah karbon dioksida (CO₂) di atmosfer semakin meningkat sehingga dapat mempercepat terjadinya pemanasan global. Respirasi tanah merupakan jalur utama karbon berpindah dari ekosistem ke atmosfer. Faktor lingkungan turut memengaruhi emisi CO₂ dari hasil respirasi tanah. Penelitian ini bertujuan untuk mengetahui potensi emisi CO₂ di tanah hutan yang dipengaruhi oleh faktor lingkungan, yaitu intensitas cahaya, suhu tanah, dan kadar lengas tanah serta membuat pemodelan pengaruh lingkungan tersebut terhadap emisi CO₂ dari respirasi tanah.

Plot pengamatan dengan ukuran 31,5 m x 31,5 m dibuat di 3 lokasi hutan rakyat Cangkringan yang memiliki kemiripan lahan. Pada setiap plot ditanam 3 *soil collars* sedalam ± 3 cm di sekitar pohon sengon yang telah ditentukan untuk mengukur emisi CO₂ dari tanah hutan. *Collar* pertama ditempatkan sejarak 0,5 m dari pohon, *collar* ketiga sebatas tajuk terluar, dan *collar* kedua diantara *collar* pertama dan ketiga. Pengukuran emisi menggunakan IRGA dengan metode *Closed Dynamic Chamber*. Ketika pengukuran emisi CO₂, dilakukan juga pengukuran suhu tanah dan intensitas cahaya matahari serta pengambilan sampel tanah di setiap titik pengamatan. Sampel tanah ditimbang kemudian dioven hingga mencapai berat kering konstan.

Hasil penelitian menunjukkan emisi CO₂ paling tinggi (44913,13 g CO₂/m²/jam) terjadi ketika intensitas cahaya cenderung rendah (304 lux). Pada suhu tanah 25,6°C, emisi CO₂ dari tanah berada pada titik tertinggi (35688,39 g CO₂/m²/jam), dan kadar lengas yang memengaruhi emisi CO₂ paling tinggi (32363,70 g CO₂/m²/jam) yaitu sebesar 31%. Hasil analisis menunjukkan bahwa faktor suhu tanah dan kadar lengas memiliki korelasi terhadap emisi CO₂ di Cangkringan namun korelasinya sangat lemah (koefisien korelasi 0,112 dan 0,132) yang disebabkan oleh kurangnya sampel/ulangan dan keragaman vegetasi yang tinggi. Persamaan regresi ganda untuk memprediksi emisi CO₂ dari tanah hutan rakyat Cangkringan yaitu $y = -6974,60 + 1074,05 \text{ suhu tanah} + 121,74 \text{ kadar lengas}$. Faktor intensitas cahaya tidak diikutsertakan karena menunjukkan korelasi yang tidak signifikan.

Kata kunci: emisi CO₂, respirasi tanah, intensitas cahaya, suhu tanah, kadar lengas, hutan rakyat

THE EFFECT OF ENVIRONMENTAL FACTORS ON CO₂ EMISSIONS ON THE FOREST SOIL AT CANGKRINGAN, SLEMAN, YOGYAKARTA

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ABSTRACT

The amount of carbon dioxide (CO₂) in the atmosphere has increased and can cause global warming. Soil respiration is the main flux of carbon release from the ecosystem to the atmosphere. Environmental factors also influence the CO₂ emissions from soil respiration. This research aimed to determine the potential for CO₂ emissions in forest land that influenced by environmental factors, which are light intensity, soil temperature, and soil moisture and make the model of those environmental effects on CO₂ emissions from soil respiration.

Plot of observation 31,5 m x 31,5 m made in 3 Cangkringan forest which have similar physiognomi. In each plot, 3 soil collars were planted on \pm 3 cm depth near sengon trees that have choosen for replications for measuring CO₂ emissions from forest soil. The first collar placed 0,5 m from the tree, the third collar was placed on the outer canopy extent, and the second collar was placed between the first and the third collar. CO₂ emission was measured by using Closed Dynamic Chamber method. Soil temperature and light intensity were also measured when CO₂ emission was measured. Soil samples were also taken in each observation point. The soil samples were weighed and then dried by using oven until reached a constant dry weight.

The results showed the highest CO₂ emissions (44913,13 g CO₂/m²/h) occurred when light intensity was low (304 lux). When soil temperature was 25,6°C, CO₂ emission was on peak (35688,39 g CO₂/m²/h), and soil moisture that affected the highest CO₂ emission (32363,70 g CO₂/m²/h) was 31%. The result of analysis showed that soil temperature and soil moisture has a correlation with CO₂ emission but very weak (correlation coefficient 0,112 and 0,132) caused by lack of samples/replications and high diversity of vegetation. Multiple regression equation obtained for predicting CO₂ emission from forest land of Cangkringan is $y = -6974,60 + 1074,05 \text{ soil temperature} + 121,74 \text{ soil moisture}$. Factor of light intensity was not included because it has no significant correlation with CO₂ emission.

Keyword: CO₂ emissions, soil respiration, light intensity, soil temperature, soil moisture, forest soil