



UNIVERSITI PUTRA MALAYSIA

**THE EFFECTS OF CLIMATIC VARIATIONS ON PEAT SWAMP
FOREST CONDITION AND PEAT COMBUSTIBILITY**

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CONDITION AND PEAT COMBUSTIBILITY**

By

LAILAN SYAUFINA

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirement for the Degree of Doctor of Philosophy**

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April 2002

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Faculty: Forestry

A study on the effects of climatic variations on peat swamp forest condition and peat combustibility was conducted in peat swamp forest of Sungai Karang Forest Reserve, Tanjong Karang, Selangor, Malaysia. The objectives of the study were to determine: 1). Climatic variations in the study area, 2). The effects of climatic variations on peat swamp forest condition; 3). Peat combustibility and its influencing factors, and 4). The effects of forest fire on peat swamp forest condition.

The study was conducted in compartment 127 during two periods, namely: October 1999 to January 2000 and May 2000 to October 2000, while, the study on forest fire effects was conducted in compartment 132 from October 1999 to January 2000.

Climatic water balance, drought occurrences analysis and drought index using Keetch-Byram Drought Index (KBDI) were used to describe climatic variations. Investigation on peat swamp forest condition included peat characteristics such as moisture content, pH, organic content, ash content, calcium, potassium, magnesium, sodium and water level. Heat content and combustion rate were measured to determine peat combustibility. All data obtained were analysed statistically by using multivariate cluster analysis, univariate and multiple regression.

The study defined dry season and wet season as a period when monthly rainfall is similar or less than 125 mm and more than 125 mm respectively. The area has two drought periods, namely: January, February, and March as the first period and May to August as the second period. Statistically, the season affected moisture content, bulk density, potassium, magnesium, sodium and water level. By using weekly rainfall prediction, the critical peat moisture content to fire is 355 %.

The high stages of KBDI in 1999/2000 were observed twice, namely on 25 and 26 April 2000. KBDI can be used in predicting moisture content and water level in the study area.

Based on the area burned, burning depth and ash color, forest fire occurred on 9 August 1999 was a light intensity fire. The fire, however, caused the decreasing of hydraulic conductivity and magnesium and the increasing of potassium and sodium.

Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KESAN VARIASI IKLIM TERHADAP KEADAAN HUTAN GAMBUT DAN
KETERBAKARAN GAMBUT**

Oleh

LAILAN SYAUFINA

April 2002

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Suatu kajian mengenai kesan variasi iklim terhadap keadaan hutan gambut dan keterbakaran gambut telah dijalankan di kawasan hutan gambut Hutan Simpan Sungai Karang, Tanjong Karang, Selangor, Malaysia. Tujuan kajian ini ialah untuk menentukan: 1). Variasi iklim di kawasan kajian, 2). Kesan variasi iklim terhadap keadaan hutan gambut; 3). Keterbakaran gambut dan faktor-faktor yang mempengaruhi, dan 4). Kesan kebakaran hutan terhadap keadaan hutan gambut.

Kajian ini dijalankan di kompartmen 127 dalam dua jangka masa, iaitu: Oktober 1999 sampai dengan Januari 2000 dan Mei 2000 sampai dengan Oktober 2000. Manakala, kajian mengenai kesan kebakaran hutan dijalankan di kompartmen 132 dari Oktober 1999 sampai dengan Januari 2000.

Variasi iklim menggambarkan keseimbangan air iklim, kejadian kemarau dan indeks kemarau dengan menggunakan Keetch-Byram Drought Index (KBDI). Keadaan hutan gambut meliputi kandungan lembapan, keasidan tanah (pH), ketumpatan pukal, keberkonduksian hidraulik, kandungan bahan organik, kandungan abu, kandungan kalsium, potassium, magnesium, sodium dan aras muka air. Kandungan haba dan kelajuan pembakaran diukur untuk menentukan keterbakaran gambut. Semua data dianalisis secara statistik dengan menggunakan analisis kluster multivariat, univariat dan regresi berganda.

Kajian ini memperolehi musim kering dan musim tengkujuh masing-masing sebagai suatu jangka masa ketika hujan bulanan sama dengan atau kurang daripada 125 mm dan lebih daripada 125 mm. Kawasan kajian mempunyai dua jangka masa kering, iaitu: Januari, Februari dan Mac sebagai jangka masa yang pertama dan Mei sehingga Ogos sebagai jangka masa yang kedua. Secara statistik, musim memberi kesan terhadap kandungan lembapan, ketumpatan pukal, potassium, magnesium, sodium dan aras muka air. Dengan menggunakan penafsiran hujan mingguan, kandungan lembapan gambut yang kritikal terhadap kebakaran hutan ialah 355 %.

Tahap yang tinggi dari KBDI pada 1999/2000 telah diperolehi sebanyak dua kali, iaitu pada 25 dan 26 April 2000. KBDI boleh digunakan untuk menafsirkan kandungan lembapan dan aras muka air di dalam kawasan kajian.

Berdasarkan luas kawasan terbakar, kedalaman kebakaran dan warna abu, kebakaran hutan yang berlaku pada 9 Ogos 1999 adalah kebakaran hutan yang ringan. Kebakaran itu, bagaimanapun, boleh menurunkan keberkonduksian hidraulik dan magnesium dan mempertingkatkan potassium dan sodium.

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I certify that an Examination Committee met on 12th April 2002 to conduct the final examination of Lailan Syaufina on her Doctor of Philosophy thesis entitled "The Effects of Climatic Variations on Peat Swamp Forest Condition and Peat Combustibility" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



LAILAN SYAUFINA

Date: 22nd April 2002

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Reserve, Tanjong Karang, Selangor

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