

Effects of fire on vegetation and soil in dry dipterocarp forest,

Sakaerat, Nakhonratchasima.

SURADEN SUNYAARCH.

Thesis. Kasetsart University., 1989.

ABSTRACT

Effects of fire on vegetation and soil in Dry Dipterocarp Forest were conducted at the Sakaerat Environmental Research Station, Amphoe Pak Thong Chai, Changwat Nakhon Ratchasima from February 1984 to February 1986. Three permanent sample plots, 20X40 m.² size of each, were set up and were assigned for different burnings which include single burn, double burn and unburn or control. Each of the sample plots was divided into four subplots, 10 X 20 m.² size of each for studying tree growth and 4 X 4 m.² plot was laid out within each subplot for collecting sapling data together with 1 X 2 m.² permanent sample plot was set up within each of the 4 X 4 m.² plots for investigating seedlings and undergrowth. Surface soil samples, 10 cm. deep, were randomly collected in each 20 X 40 m.² plot by using triangle system method, 10 m. apart for determining physical and chemical properties of soil. The soil samples were collected before burning and every three months after burning. Experimental burning was carried out in February, every year and fire behaviors was classified as creeping surface fire with the average flame length of 2.58 m. the average rate of fire spread was 2.0 m/min, and the average fire intensity was 266.03 kW/m. (77.15 Btu/ft/sec).

The mortality after burning of under growths which include herb, forbs, small shrubs and grasses was 100 %. The average mortality of seedlings and saplings, which the diameters at basal stem ranged from 0.5 - 4.0 cm., was 58.06 %. The diameter at basal stem of the survived seedlings was 2.45 ± 0.67 cm. The density of seedlings was increased after burning. Two years after burnings, the densities of seedlings in single burn and double burn plots were increased at 800 % and 348 %, respectively, but the seedling density of unburn plot was decreased at 17.39 %. The rate of height growth of the seedlings in unburn plot was increased at 12.35 cm./yr. (increased 23.57 %), but the rates of height growth of seedlings in single burn and in double burn

plots were decreased at 3.2 cm./yr. (decreased 5.61 %) and at 7.4 cm./yr (decreased 14.20 %), respectively. The density of grasses in double burn plot was higher than those in single burn and unburn plots. The density of herbaceous plant was shown an increasing trend in unburn plot. Species composition of undergrowth was highest in rainy season which was about 28 species and was lowest in dry season which was about 10 species.

Regarding to fire affects on saplings after two years of experiment, the numbers of saplings in unburn plot and in single burn plot were increased at 133.33 % and 25.00 %, respectively, but the number of saplings in double burn plot was decreased at 42.86 %. With respect to growth of sapling, the diameter and height growth of saplings in unburn plot were higher than those of saplings in double burn and in single burn plots and the diameter and height growth of saplings in the single burn plot were the lowest. However, the rates of diameter and height growth of the saplings in unburn, double burn, and single burn plots were increased at 0.74 cm./yr (44.55 %) and 0.39 m./yr (23.05 %), 0.95 cm./yr (25.00 %) and 0.51 m./yr (16.04 %), 0.33 cm./yr (6.46 %) and 0.24 m./yr (7.27 %), respectively.

There was no marked effect of fire frequencies on tree growth after two years of experiment. However, the average rates of diameter and basal area increments of the trees in unburn, single burn, and double burn plots were 0.56 cm/yr. (2.46 %) and 0.722 m²/ha/yr (4.45 %), 0.48 cm/yr. (2.46 %) and 0.56 m²/ha/yr (4.35 %), 0.35 cm/yr. (1.93 %) and 0.347 m²/ha/yr (3.26 %), respectively.

Results of effects of fire on soil properties revealed that after immediate burning, soil moisture content was decreased at 58.49 % but contents of soil organic matter, cation exchange capacity, phosphorus, potassium, calcium, and magnesium were increased at 35.13, 26.67, 33.33, 93.75, 62.04 and 42.62 % respectively. Soil pH and sodium content were also slightly increased. After two years of experiment, the soil properties of unburn and single burn plots were slightly different but some soil properties of double burn plot were rather different from those of unburn and single burn plots. However, after burning for two years, the soil bulk density of double burn plot was increased, but those of unburn and single burn plots were decreased. The soil moisture content of double burn plot was decreased which was more than those of unburn and single burn plots. The contents of organic matter, cation exchange capacity, phosphorus and calcium of the double burn plot were increased whereas those of the unburn and single burn plots were decreased. The contents of potassium and sodium and soil pH of the double burn plot were

decreased which were less than those of the unburn and single burn plots. It was shown that the more fire frequencies of low fire intensity, the more improvement of the soil properties. However, the effects of fire on vegetation and soil should be furtherly carried out for some years to acquire more information for better understandings.