

## **Combustion parameters and characteristics of clearing fires in the Amazonian arc of deforestation**

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### **Extended Abstract**

This paper describes the characteristics of fire spread around a forest clearing site located in the Amazonian arc of deforestation. The experiment was carried out in 2001 at the Caiabi Farm, near the town of Alta Floresta, state of Mato Grosso, Brazil, as part of a set of tests that have been performed in the same area since 1997. So far, six test plots were burned. The main goal in the experiments of the first five plots was to determine biomass fire consumption and carbon release rates under different conditions of size of burned area and period of curing. The results regarding these tests were already published (Carvalho et al., 2001).

Special care had to be taken to prevent fire from escaping the clearing site into the adjacent forest in all five experiments. This procedure had not been necessary in previous experiments conducted by the group in Manaus, state of Amazonas (Carvalho et al., 1995, 1998), and in Tomé Açu, state of Pará (Araújo et al., 1999). Therefore, during 2001 a site was prepared and burned to investigate under-story fire generated by the forest clearing process, and results of this work are presented here.

The experiments reported by Carvalho et al. (2001) were conducted in five plots, denominated A, B, C, D, and E. Biomass fire consumption and carbon release rates were determined in the central 1-hectare area of each plot. In 2001, plot F was felled in May and burned on August 20. Figure 1 shows the location and dimensions of plots A to F. Differences in time of vegetation felling and burning of each plot are presented in the figure legend.

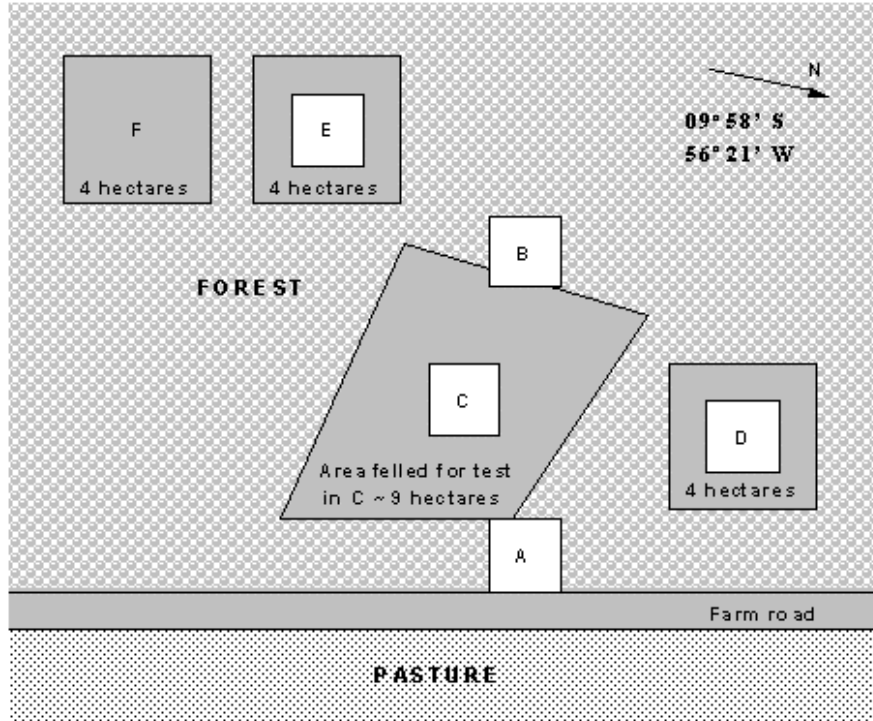


Figure 1 - Location of test plots in Caiabi farm. A, B: felled and burned in 1997; C: felled and burned in 1998; D: felled in 1998 and burned in 1999; E: felled and burned in 1999; F: felled and burned in 2001.

Fire spread rates were investigated with a thermocouple grid in one of the adjacent areas of plot F and using stakes, tapes, and a chronometer in the other three adjacent areas. The nomenclature for each of the sides is shown in the scheme of Figure 2. Complementary measurements using stakes were also performed in side I.

Table 1 shows relative humidity and temperature in the test site just before ignition on August 20, 13:47 h, local time. Ignition was performed with torches from the middle of side III toward side IV. Table 2 presents the sequence of events following ignition.

Thermocouple data are still under analysis and will be presented at the conference in November. Data on litter moisture content will also be presented at the conference. Average spread rates in the hours following the burn of plot F are the following:

- Average I: 0.26 m.min<sup>-1</sup> (five measurements considered);
- Average II: 0.11 m.min<sup>-1</sup> (three measurements considered; fire stopped in other two);
- Average III: 0.17 m.min<sup>-1</sup> (six measurements considered; fire stopped in another one);
- Average IV: 0.23 m.min<sup>-1</sup> (four measurements considered; fire stopped in another one).

Other observations were: a) under-story fire was always tilted towards the burned side; b) flame length varied from 15 to 30 cm.

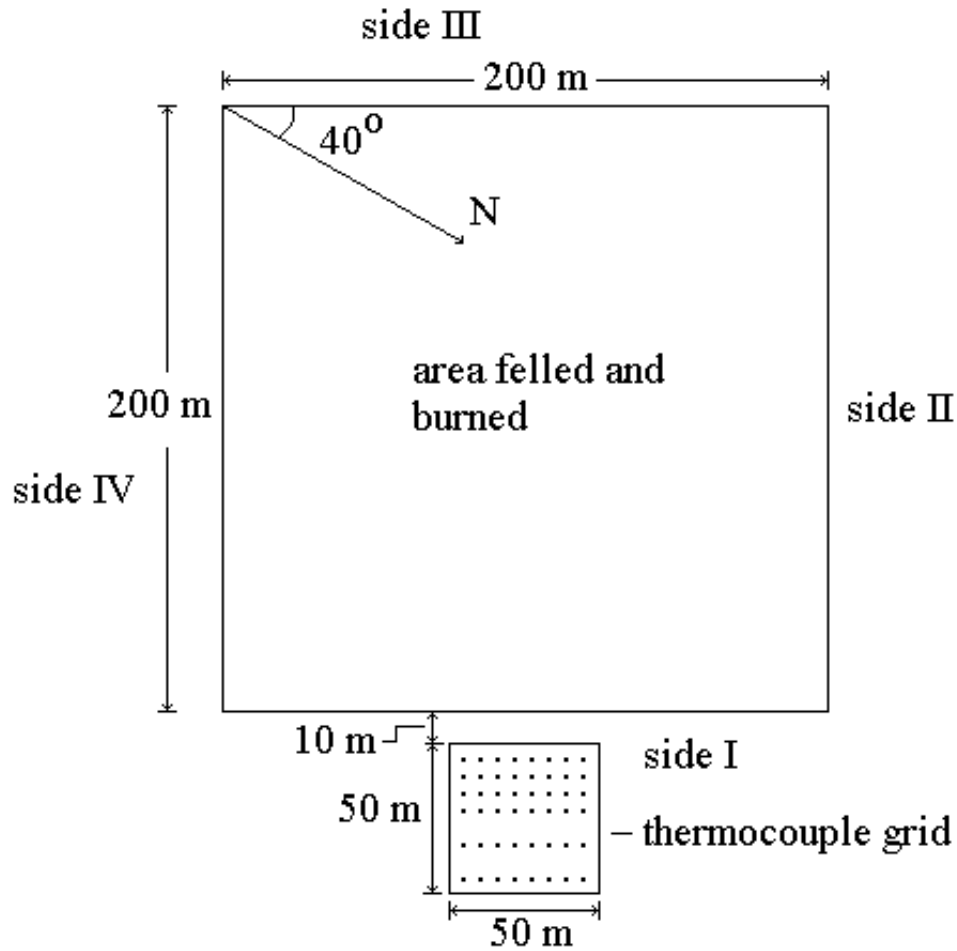


Figure 2 – Test plot F and the location of the thermocouple grid.

Table 1 – Relative humidity and temperature just before plot ignition.

Parameter	Value
Air relative humidity at 1m from ground	31 %
Air relative humidity close to the ground (at approximately 10 cm)	25 %
Air temperature at 1 m from ground	39 °C
Air temperature near the ground	45 °C
Ground temperature	42 to 46 °C
Temperature of dry vegetation inside deforested area	37 °C
Temperature of dry vegetation along side I	37 °C
Temperature of large log inside deforested area	38 °C
Temperature inside adjacent forest	33.5 °C

Table 2 – Sequence of events following ignition.

Local time (h)	Event
13:47	Ignition; first spot of smoke.
13:48	Flames become visible from opposite side.
14:04	Central area is burning; dark smoke raises from fire; flames are 15 to 20 m tall; flame front approximately 120 m long, parallel to side I; flame front at approximately 70 m from side I.
14:08	Flames proceed coming to side I, now at a distance of approximately 50 m.
14:12	Ignition proceeds along side IV, coming near side I.
14:18	Fire starts reaching the border of side I.
14:23	Fire definitely reached the border of side I.
14:35	Fire continues burning slowly along the border of side I.
14:40	Under-story fire starts along border of side I.

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