



In-Field Biochar Production from Crop Residues: An Approach to Reduce Open Field Burning in Northern Thailand

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Smog in Northern Thailand

In many places of Northern Thailand maize is produced on steep slopes by ethnic minority farmers who use the grain to feed their livestock. Common practice is to manage harvesting residues is open field burning of maize stover, which is the cause of massive air pollution in the region (Fig. 1). The belief is that field burnings sanitize the soil and the ashes return nutrients to the soil.

In field tests, the temperatures at 10cm above and at the soil surface, as well as in 5 cm depth have been determined, showing that above ground high temperatures occur for a short time only. In the soil the fire has no effect on temperature (Fig. 4). It can be assumed that the effect on pest insects is minor.



Figure 1: Open field burning of maize stover

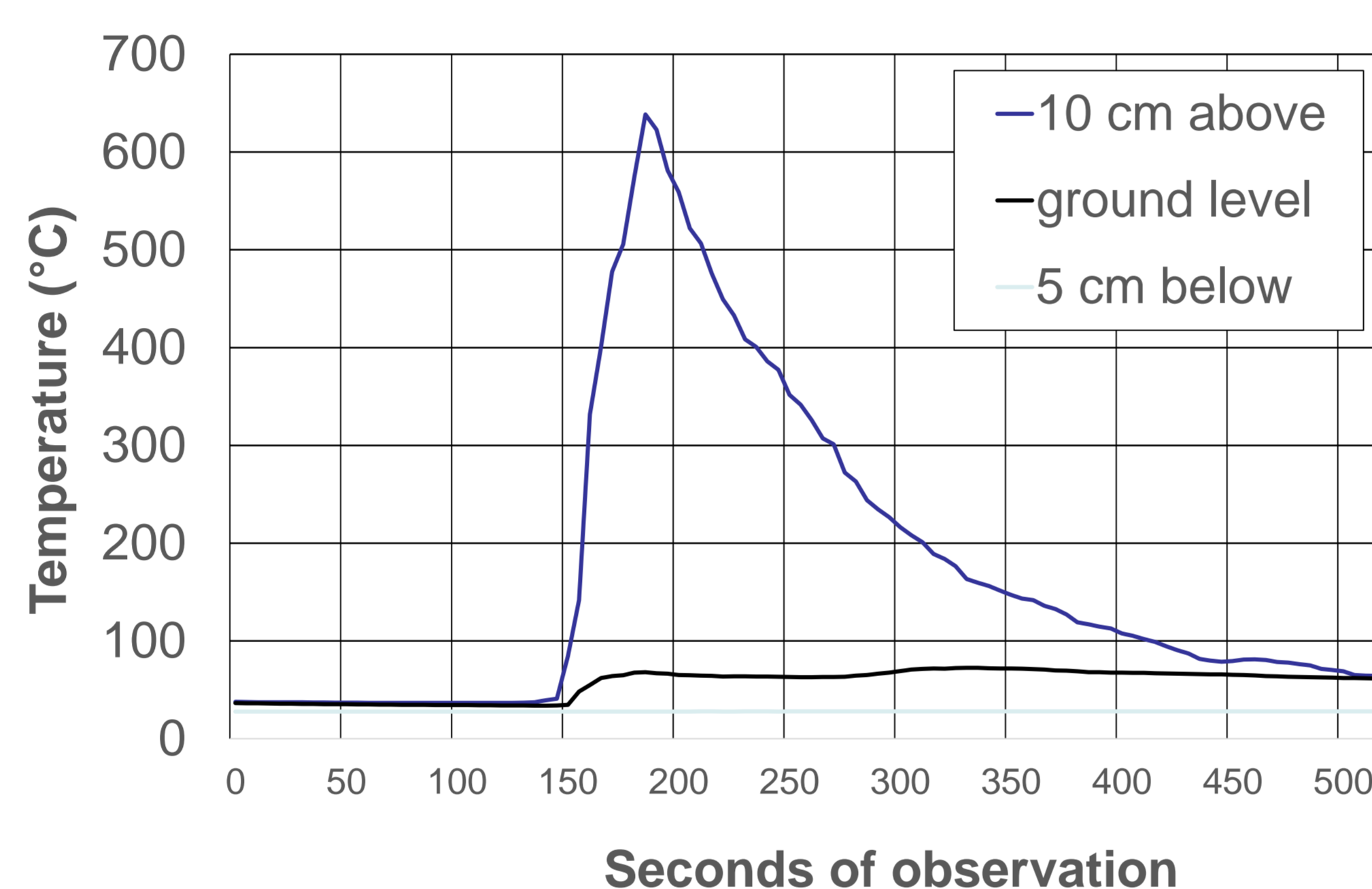


Figure 4: Temperature during open field burning of maize stover

High labor requirement

The advantage of open burning remains solely the low labor requirement, as it is virtually no effort to set fire on the maize stover.

The collection of biomass in the steep sloping lands is a major constraint to the use of biochar. Collection by hand (Fig. 3) was and filling and emptying of the kiln was determined with 45 and 15 man*min/100m², respectively. The time for pyrolysis (Fig. 2) was 55 min/100 m².

Further research will be needed to determine the optimal size of the kiln and to optimize biomass collection procedures.



Figure 2: Local biochar kiln



Figure 3: Collection of biomass

Biochar is produced with low emissions

At four sites in Northern Thailand in the Provinces of Mae Hong Son, Chiang Mai and Nan, field trials have been established on commercial fields of ethnic minority farmers. In a regular arranged trial three treatments have been set up in three repetitions in plots of 10m x 10m: a) farmers' practice: burning b) production of biochar c) mulching. Soil samples have been taken before the start of the experiment and will be collected each year. The trials have been established in May 2015 and are projected to continue for four years. After that period of time it will be possible to assess the impact of the different treatments on soil properties. But preliminary results show, that the production of biochar has virtually no emissions. CO₂-emissions were not detectable, when measured at Chiang Mai University by use of an xxx-gas analyzer system. The same was true for NO_x and SO_x, however, a certain amount of CO is produced towards the end of the pyrolysis process at decreasing temperatures (Fig. 5).

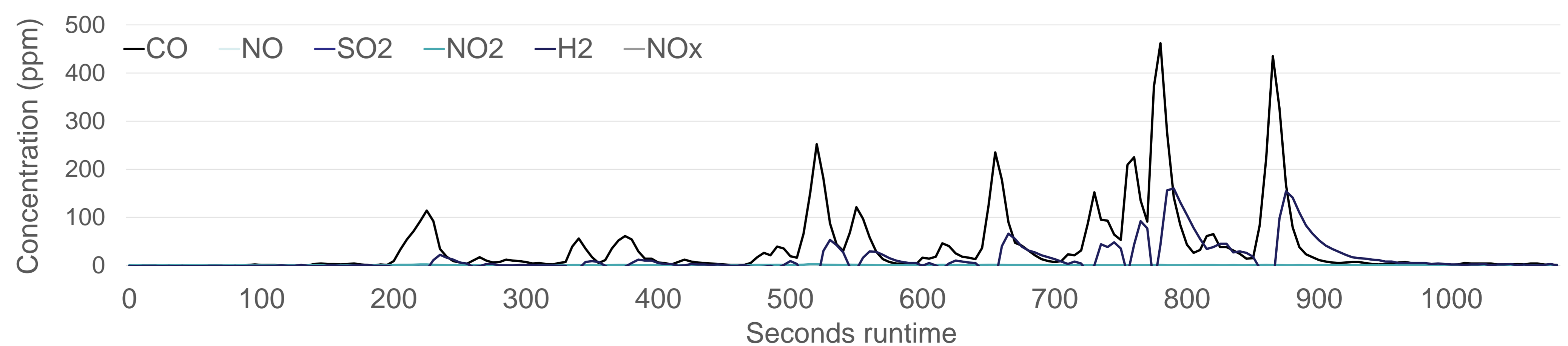


Figure 5: Analysis of gas efflux from the pyrolysis process of producing biochar in a small kiln