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Effects of Biochar and the Use of TLUD-Reactors in Rural Areas for Cooking and Soil

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Abstract

On-farm crop residues are often left unutilised or not efficiently used. Often they are left to be decomposed or, sometimes, in-situ used by livestock. Crop by-products, like maize cobs and residues from primary processing, especially from threshing and shelling, have a high percentage of lignified structural components and therefore are suitable for thermo-chemical conversion. A pyrolysis-treatment of these residues can provide thermal energy for cooking applications as well as for biochar production, which can be used as a soil amendment to improve soil structure and cation exchange capacity as well as to contribute to carbon sequestration. A top-lid-up-draft (TLUD) barrel-reactor was developed at the University of Hohenheim and iteratively adjusted (in the project of Trans-SEC) for the use at grass-root level, which led to a cooking extension of the device. It can be built from scrap material (oil drums) locally available and is capable of sustaining high temperatures of up to 400°C. The drum has a screw-top lid, and a central pipe with a diameter of 10 cm perforated with a dense array of 10 mm holes made throughout its height. Test results from the UPS farmers group in one of the case study villages showed that after pyrolysis for about two hours from 15 kg of maize cobs about 4.4 kg of biochar (29 %) could be produced. In the poster we will discuss the amount of biochar amendment needed to increase soil fertility and crop productivity for certain farming areas and site conditions derived from data of field trials with soybean and grains in China and Germany and different maize cropping systems in Tanzania. According to soil types and water regimes we found different yield responds after biochar application. Recommended rates of 5–10 (up to 20) tons biochar per hectare limit the suitability to small gardens or need to extend the size of the reactor to the scale of a big charcoal kiln.

Keywords: Biochar, charcoal, crop residues, energy stacking, energy transition, field trials, pyrolyzer, soil improvement, woodfuel

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