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Master-Thesis

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Optimization of pyrolysis temperature for Biochar Production from Different Feedstock

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VI. Abstract

The following study was realized at the faculty of agriculture, Chiang Mai University, Thailand, in cooperation with Hohenheim University, Germany. It seeks to optimize the benefits of biochar by comparing the quality of biochar produced with different pyrolysis temperatures. The raw materials are coffee shells, corn cobs and bamboo. The analyzed quality parameters of the biochar are pH, electrical conductivity, organic matter content, nutrient availability and ash content. Samples of each material were pyrolyzed in an evenly arranged pyrolysis box inside an experimental kiln for one hour at a temperature of 300, 400, 500, or 600°C respectively. The temperature deviation was kept at <5% and three repetitions were made per test.

The quality parameters of the biochar were analyzed in a laboratory. The weight loss, determined by weighing before and after the pyrolysis, resulted in a logarithmical curve that showed that the higher the temperature the lower the weight of the resulting biochar. The pH and EC value also increased with temperature, as well as other parameters depending on the feedstock. Organic matter content decreased accordingly and nitrogen availability proved to be constantly low, regardless of temperature or feedstock. All parameters except nitrogen depend on what temperature and material were used. Practical experiments and a comparison of the laboratory results with the nutrient demand of three sample crops determined that in all three cases coffee shells and corn cobs show the best crop related fitting at 300 °C. For bamboo the ideal match to the crop demand is accomplished at a temperature of 400 °C.