

## **Evaluation of hybrid briquettes from corncob and oil palm trunk bark in a domestic cooking application for rural communities in Nigeria**

### **ABSTRACT**

This study developed hybrid briquettes using corncobs and the bark of oil palm trunk (OPTB). The objective was to assess the performance of the briquettes in a cooking application as a potential fuel source for domestic utilization. Corncob was mixed with OPTB in ratios of 100:0, 75:25, 50:50, 25:75 and 0:100 by weight, and wastepaper pulp (10% by weight) was added to each mixture as the binder. The mixtures were densified manually at room temperature using a 20-tonne hydraulic piston press under a  $\leq 7$  MPa compaction pressure. The calorific value of the briquettes was determined by a bomb calorimeter, while other fuel properties were determined by proximate and ultimate analysis. The briquettes' performance was evaluated by a water boiling test, and gaseous emission was determined and reported based carbon-dioxide equivalent (CO<sub>2</sub>e). Results showed that the volatile matter, ash content, and calorific value increased with the increase in OPTB in the ratios while fixed carbon decreased. Additionally, briquettes produced from ratios 50:50 and 25:75 were similar in values based on the total time taken to ignite briquettes and boil 1 L of water (17.54 min and 17.13 min), fuel burning rate (0.69 kg/h and 0.70 kg/h) and specific fuel consumption (0.16 kg/l and 0.15 kg/l). However, ratio 50:50 performed better in terms of thermal fuel efficiency (17.25%) and produced less ash during combustion and thus, is considered the optimum combination. Greenhouse gas emission of all briquettes ranged from 241 to 281 gCO<sub>2</sub>e. The results suggest the possibility of producing briquettes with adequate fuel properties for combustion from a blend of corncobs and OPTB. The calorific value and performance of the hybrid briquettes have confirmed and justified the use of OPTB, which have previously not been used for briquette production, thus making a novel contribution to biomass options. The study shows a means of reducing waste, energy shortages, and indoor air pollution in rural communities in Nigeria. Overall, the hybrid briquettes are sustainable, environmentally friendly and cost-efficient compared to fossil fuels.

**Keyword:** Corncobs; Oil palm trunk; Briquettes; Water boiling test; GHG emission; Unit cost