

Abstract

Emission ratios (ER) of CO and NO relative to CO₂ are reported from real time emission measurements on bio fuel fires in Kenya. The experiments were based on available fuels burning in local popular traditional and improved stoves. The mean dCO/dCO₂ ratios were 71, 79 and 74 mmol mol⁻¹ for firewood, charcoal and agricultural residues, respectively, while the corresponding mean d/NO/d/CO₂ ratios for these fuels, in the same order, were 1.8, 2 and 2.2 mmol mol⁻¹, respectively. Whereas stove design characteristics largely influenced the dCO/dCO₂ ratios, the fuel nitrogen content was the major factor determining the dCO/dCO₂ ratios. The dCO/dCO₂ ratio for fuel derived NO is not affected by fire temperature but linearly depend on the fuel nitrogen content. Other important fuel parameters that influenced the observed emission ratio patterns include fuel moisture content, size and volatile matter content in the case of charcoal. In comparison to savanna and forest fires, bio fuel fires tend to favour formation of reduced or partially oxidised compounds. It is clear that a change in energy preference up the "energy ladder" leads to a reduction in the CO ER, an important result for emission mitigation policy design. A questionnaire survey was conducted in rural and urban Kenya to establish bio fuel consumption rates and patterns. The survey targeted households, commercial catering enterprises and public institutions such as schools and colleges. Firewood was the main bio fuel used, mostly by rural households, who consumed the commodity at average consumption rates in the range 0.8-2.7 kg cap⁻¹ day⁻¹. Charcoal was mostly consumed by the urban households at weighted average rates in the range 0.18-0.69 kg cap⁻¹ day⁻¹. The consumption rates and patterns for these fuels by restaurants and academic institutions, and those for crop residues are also reported. The rates largely depended on the fuel availability but differed significantly among the three consumer groups and between rural and urban households. Other factors which may have influenced consumption rates are discussed. Although good fuel wood sufficiency was reported in the country in 1997, there were increasing difficulties in accessing these resources by most households, a situation having both short- and long-term implications for bio fuel consumption rates and patterns.