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ASSESSMENT OF BIOFUEL ASH IMPACT ON SOIL QUALITY CHANGES

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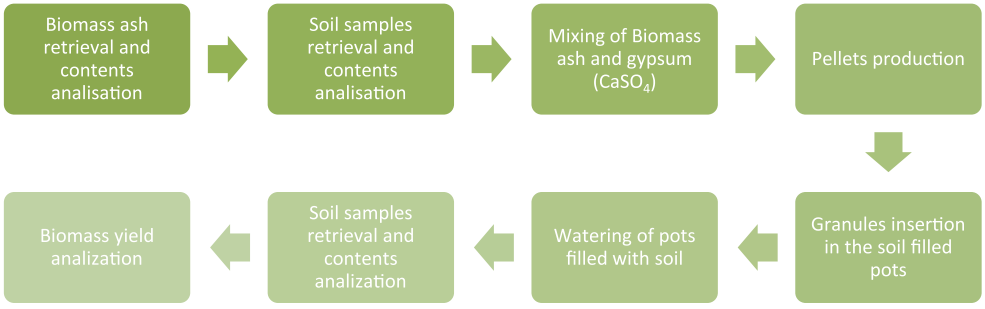
Abstract – The degradation of urban soils quality is an emerging issue caused by rapid urbanization, poor land management practices and pollution. These factors lead to reduced soil fertility and diminished vegetation in certain areas. Biomass ash, a byproduct of the biomass combustion process, proved to be an effective soil amendment due to the high levels of major soil nutrients, most notably calcium, potassium, and phosphorus. However, managing the fine particle size of biomass ash is problematic, because wind could disperse particles into the air and migrate them to unwanted places, possibly causing wastewater pollution or even respiratory health hazards. To address these challenges and produce effective urban soil fertilization technique this study explores pelletization of biomass ash with gypsum as a stabilization technique and its application on degraded soil using various application rates ranging from 1.00 t/ha to 7.00 t/ha. A series of controlled experiments were conducted to determine the ash pellets impacts on soil pH, nutrient availability, and plant biomass growth. The findings show that pellets of biomass ash to gypsum of ratio 5:1 with 12 % of water addition were the most optimal to minimize binder usage and produce pellets durable enough for transportation and field distribution. Biomass ash considerably improves soil quality by increasing nutrient content in soil with potassium increasement in soil from initial 1.2450±0.00225 % concentration up to 1.4889±0.0268 % and calcium increasement from initial 1.8016±0.0213 % concentration up to 2.3438±0.0230 % depending on the fertilization rate. Research has revealed that soil fertilization using ash pellets with rate of 1t/ha showed no significant increase in biomass yield, however higher fertilization rates can increase ryegrass biomass yield by 9–38 % with the highest increase in biomass yield with biomass ash addition of 7 t/ha. The study underlines the potential of biomass ash pellets as an environmentally sound and sustainable solution to urban soil remediation as well as reduction of waste.

Keywords – Ash pelletization; biomass ash waste; soil quality improvement



Biomass ash impact on soil quality and vegetation framework