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Mixing Construction, Demolition and Excavation Waste and Solid Waste Compost for the Derivation of a Planting Medium for Use in the Rehabilitation of Quarries

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Lebanon's very high population density has been increasing since the end of the civil war in the early 1990s reaching 416.36 people per square kilometer. Furthermore, the influx of refugees from conflicts in the region has increased the resident population significantly. All these are exerting pressure on the country's natural resources, pushing the Lebanese to convert more forest and agricultural land into roads, buildings and houses. This has led to a building boom and rapid urbanization which in turn has created a demand for construction material – mainly rock, gravel, sand, etc. nearly all of which are locally acquired through quarrying to the tune of three million cubic meters annually. This boom has been interrupted by a war with Israel in 2006 which resulted in thousands of tonnes of debris. The increase in population has also led to an increase in solid waste generation with 1.57 million tonnes of solid waste generated in Lebanon per year.

The combination of construction, demolition and excavation (CDE) waste along with the increase in solid waste generation has put a major stress on the country and on the management of its solid waste. Compounding this problem are the issues of quarries closure and rehabilitation and a decrease in forest and vegetative cover.

The on-going research reported in this paper aims to provide an integrated solution to the stated problem by developing a "soil mix" derived from a mélange of the organic matter of the solid waste (compost), the CDE waste, and soil. Excavation and construction debris were ground to several sizes and mixed with compost and soil at different ratios. Replicates of these mixes and a set of control (regular soil) were used. In this mix, native and indicator plants are planted (in pots) from which the most productive mix will be selected for further testing at field level in later experiments. The plant species used are Mathiolla crassifolia, a native Lebanese plant and Zea mays (Corn), which is commonly used as an indicator plant due to its sensitivity to environmental conditions. To ensure sustainability and environmental friendliness of the mix, its physical and chemical characteristics are monitored and assessed.

Preliminary results have shown successful growth of both corn and Mathiolla seedlings in the mixes with higher amounts of construction rubble and compost i.e. Rubble: Soil: Compost Ratio of 2:1:1 and 1:0:1. However treatments with no compost and with less quantities of rubble demonstrated the inability of the soil used to sustain plant growth alone (1:1:1 and 1:1:0). Last but not least, the control consisting of soil only ended up being the weakest mix with yellow corn leaves and small Mathiolla seedlings fifty days after planting and fertilizing. Additionally, soil analysis, rubble and compost analysis will be conducted. The samples will be tested for heavy metals, nutrient availability and values of pH and EC. Accordingly, success and failure to sustain plant growth will be justified and the most adequate mix for planting will be selected for conducting a field experiment to test the viability of the developed mix.