

# Biochar and Resource Convalescence Burgeoning from Municipal Solid Waste in Pakistan

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## Abstract

Municipal Solid Waste Management System (MSWMS) has been a smoldering and exigent concern of most of the mounting economies. Inhabitants explosion, industrial expansion and economic development consequences



Ash Content (%)	14	17	15
Fixed Carbon (%)	6	7	7
Energy content (MJ/Kg)	15.8	17.1	16.7

**Table 1:** Proximate analysis.

The above information signifying that more than 90 % (maximum) of moisture content has been predicted in the food waste, followed by about 58% and 9% in the yard waste and paper respectively. Ash content was found 15%, 17% and 14% in papers, yard waste and food waste respectively. The reason of highest ash value in paper was lowest moisture content and lowest value in food waste was due to higher moisture content, this inverse relation among moisture content and ash content has already been ascertained by various researchers. In addition, this ash content has also great effects on the yield of biochar.

The predictable values of HHV revealed that yard waste and paper have high energy recovery potential, with 17.1 and 16.7 MJ/Kg respectively due to minor moisture content. On other hand the energy content of food waste found was 15.8 MJ/kg due to high water content possession; inverse relation has also been investigated by. The predicted energy content in the organic waste stream is enough to use this fraction as a renewable energy source such as Biochar.

## Energy and Resource Recovery Potential

The waste composition and generation rates revealed that Mardan and Peshawar cities have huge potential of biochar due to significant organic waste in municipal solid waste stream. About 95.1 tons per day of organic waste are being generated, is suitable for biochar production. Various research studies such as have been conducted for yield and biochar production from organic solid waste via slow pyrolysis. The former study has determined 35% Biochar yield for Belgium with 30% moisture content, while the latter study has predicted 20.4% yield of biochar with 55% moisture content in municipal solid waste stream for Haripur city of Pakistan. Variation in the yield of biochar is due to different moisture content in waste stream [11].

The combustible waste invention rate is estimated to be 18.4 tons per day. However, some studies have found momentous quantity of combustible fraction in MSW stream [12]. This combustible fraction is called RDF (Refuse Derived Fuel), which has higher concentrations, quality and uniformity of characteristics of combustible materials like plastic and paper etc. than their parent municipal solid waste stream which can be used as a fuel or as a supplement by different energy consumer for energy and heat production resulting reduction of mass and volume by 70% and 90% respectively. This route consequently reduces the waste quantity to be disposed-off at landfill sites [13-18].

The lowest fraction is recyclable, which is 9.2% of total waste; about 11.5 ton of recyclable produced daily [19]. The recyclable material retrieved from the waste stream, yields multiple benefits; such as reduction of production cost, minimizing burden on the indigenous resources, saving of procurement cost, and revenue generation from recyclable's selling as well as reduction of cost for waste dumping at landfill. The reason of low quantity of recyclable is

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