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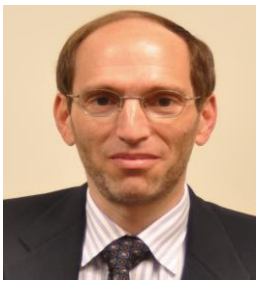
Editorial



Is it time to rethink aerobic composting?

Aerobic composting has long been encouraged by the US EPA, EU Directives, Indian SWM Rules 2016, legislation in Asia Pacific countries and others as an environmentally friendly method of managing organic wastes. Urban leaves and yard trimmings, food wastes and agricultural wastes are all commonly composted, either in managed piles or simply naturally in-situ. Doing so has multiple benefits: there is no need for disposal, the stabilized wastes become a usable soil conditioner and, if done at the point of generation, the economic and environmental costs of transport are avoided. The wide variety of chemical and biological variations occur during composting using different organic wastes differing in their quality and stability, which further depends upon the composition of raw material used for the compost production.

A negative result of aerobic composting is of course the release of CO_2 gas, a major contributor to climate change – probably today's most serious uncontrolled environmental threat. But that is unavoidable - any organic carbon that is present in a waste material will ultimately become a greenhouse gas, whether the waste is burned, landfilled or composted. The only options are for the organic carbon to go directly to CO_2 by burning or aerobic stabilization or for the carbon to be converted to intermediary CH_4 by anaerobic stabilization. CH_4, if burned for energy production, will ultimately also yield atmospheric CO_2. However, energy recovery by direct waste combustion or indirectly by the CH_4 pathway will offset the need for alternative energy production and its resulting CO2 emissions. So aerobic composting of organic carbon may ultimately yield greater CO2 emissions than energy recovery.

This discussion does not necessarily mean that aerobic composting should always be replaced by energy recovery through either direct burning or anaerobic digestion with CH4 burning. The energy loss impacts of wastes' moisture content on burning, non-CO2 emissions from burning, environmental costs of transport and the potential leakage of CH_4 are all concerns that may mitigate the benefits of offsetting other energy production. But this discussion does imply that each specific organic waste should be examined to determine the best management option.

Guidance that recommends aerobic composting was developed at a time when a major concern was diversion of wastes from landfills. Given that today's pressing environmental concern is climate change, a revisiting of that guidance, and perhaps resulting more flexible guidance, is warranted.

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BLENDS COMPRISED WASTE TIRES AND REINFORCING CARBON BLACK: EFFECT OF MIXING SEQUENCE ON PROCESSING AND PHYSICAL PROPERTIES

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ABSTRACT

In this study, a simple recycling strategy for End-of-Life Tires (ELT) was described. The direct incorporation of a large-sized Ground Tire Rubber (GTR) as a major dispersed phase into the elastomer matrix was assisted by the promoter-induced mixing, which canceled the cost-consuming reclaiming step. A macro-dispersion of GTR in the mix was assessed via a surface roughness extent. This method allowed us to predict the behavior of the rubber compound. A nonuniform rough surface while the master step was converted to a smooth roll-processed web after re-milling. The processing steps were correlated with the fragmentation of GTR, partial interfacial adhesion, restoration of tack, and unsaturation. The sequential mixing generated a reasonable level of viscosity, building tack, and green strength. The structural integrity of the re-vulcanizates was provided with a higher curing temperature and was confirmed by the improved abrasion and tear resistance, retention of heat build-up, storage moduli values, and lower standard deviation compared to the unmodified GTR and neat NR/BR blends. The developed compounding and co-curing steps exhibit a practical way of GTR recycling using the standard mixer with lower operational and compound expenses, and the absence of toxic gas release.

Keywords: rubber recycling, mixing sequence, roughness, co-curing, abrasion, tear.

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IMPROVING SOLID WASTE MANAGEMENT PRACTICES IN PRIMARY SCHOOLS IN IBADAN, NIGERIA

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ABSTRACT

School system represents an important outlet for waste generation and advancement of knowledge on waste management. The aim of the study was to improve knowledge, attitude and practices of solid waste management (SWM) among pupils of selected primary schools in Ibadan, Nigeria. The study intended to find out what will be the effect of the intervention (training on solid waste management) on the knowledge, attitude and practice of the students towards solid waste recycling? A quasi-experimental study was conducted among pupils of two primary schools (public and private schools). Using validated questionnaire, information was collected to assess their knowledge, attitude and practices before and after intervention. Waste generated over a two-week period was characterised. A solid waste segregation stand was provided with all students trained on waste craftsmanship. Data were analysed at p=0.05. The post-intervention knowledge scores at increased from 5.3±1.9 to 8.8+1.3 and 5.6±2.4 to 9.1±1.3 in public and private schools, respectively. The predominant waste materials in both schools were paper and nylon with mean weekly values of 5.3±0.6 kg and 4.0±0.4 kg in public school and 14.8±0.2 kg and 8.6±0.9 kg in private school. Plastic and organic waste had mean weekly values of 1.8±0.0 kg and 0.5±0.6 kg in public school and 2.9±0.7 kg and 0.4±0.3 kg in private school, respectively. Different crafts were made by the pupils from the components of waste generated. The intervention led to waste recycling and improved pupils' SWM knowledge, attitude and practices.

Keywords: Primary schools, Solid waste management, Waste recycling, Waste craftmanship. Knowledge and attitude.

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'CLEAN FOOD': A MODEL FOR SAFE AND SUSTAINABLE AGRICULTURE TOWARDS ACCOMPLISHMENT OF CIRCULAR ECONOMY

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ABSTRACT

The core concept of Circular Economy (CE) in Agriculture is targeted towards better sustenance through higher use of renewable sources and facilitating the restoration and regeneration of system resources. However, dearth of effective crop-technology/ies that can ensure the above while sustaining crop yields; form the major bottleneck towards facilitation of CE in agriculture.

The Safe and Sustainable 'Clean Food' (CF) Model can perhaps serve as the best fit road map towards the objective. Driven by Inhana Rational Farming (IRF) Technology this model focuses 'Plant Health Management' and utilizes the safe, cost-effective, waste bio-converted Novcom compost for Soil Health Management to deliver safe food, without crop loss and without raising the cost of production.

The model when evaluated in respect of all the basic principles of circular agriculture; revealed its potential towards improving (by up to 19.5%) crop yield while reducing/ eliminating non- renewable inputs like chemical fertilizers and pesticides; that minimized the risk of pesticide residue in food (vegetables) by about 93%. Resource recycling through bioconversion of MSW/ landfill waste into safe compost improved soil quality by up to 27%. Most importantly, GHG Abatement of 6.4 to 11.7 kg CO_2-eq/ kg food production, 64% increase in energy productivity, 16.7% higher employment generation, and about 19.7% increase in gross income (on an average); indicated that the CF Model delivered the very essence of CE in agriculture i.e., decoupling economic development from the linear dynamics of finite and non-renewable resource extraction, use, and disposal, while improving the access to safe and nutritious food for all.

Keywords: Waste recycling, IRF Technology, Novcom Compost, Safe and sustainable agriculture, GHG mitigation.

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ASSESSMENT OF SOLID WASTE MANAGEMENT PRACTICES AND ROLE OF COMMUNITY PARTICIPATION IN METTU TOWN, ETHIOPIA

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ABSTRACT

Solid waste management has become a major public health and environmental concern in urban areas of Ethiopia. The purpose of this study is to evaluate the status of the existing solid waste management and to assess the attitude and role of the community in Mettu town. In order to accomplish these objectives, both primary and secondary data were gathered and analyzed by descriptive statistics. The sample size included of 96 members of households, business owners, kebele leaders, municipal workers, solid waste collectors and health extension workers who were selected randomly. Based on the data that generated from the respondents municipal solid waste management system is very weak in terms of status, spatial coverage, community involvement, and solid waste management facility. Among 96 about 84 (87.5%) respondents are not satisfied with the existing solid waste management. The communities participate very careless to clean their front yards, street and see it as the responsibility of the municipality. This poor status of solid waste management is intensified by poor contribution of stakeholders. Therefore, the government should be engaged in awareness creation and training all communities and stakeholders to upgrade the existing low status of solid waste management services in Mettu town.

Keywords: biodegradable waste, community, municipal, pollution, solid waste management, waste disposal.

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REMOVAL OF MALACHITE GREEN DYE FROM AQUEOUS SOLUTION USING LEMON LEAF POWDER AS AN ADSORBENT

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ABSTRACT

The majority of developing nations experience significant water contamination from textile sector wastewater. The use of low-cost, environmentally friendly adsorbents has been researched as a means of addressing problems of water contamination and high costs for waste - water treatment processes. Malachite green is an incredibly dangerous colour that not only damages mammalian cells but also has a key influence in the growth of liver cancers. The life cycle of aquatic creatures, plants, and people is hampered by dye released into bodies of water without sufficient treatment. In this study, the powdered lemon leaves are utilized for removal of the aniline green dye. By using batch-style setting and design of the experiment (the Box–Behnken technique) adsorbent has been investigated & have been developed to evaluate the process's critical factors, including agitation time, size of adsorbent, dosage of adsorbent, pH, initial concentration and temperature.

The acquired values were fitted with adsorption isotherms. Malachite green dye sequestration onto Lemon Leaf Powder was chosen using kinetic models. The results of the trials showed that employing powdered lemon leaves, malachite green could be removed to a maximum of 82.21%. Malachite green dye concentration of 50 mg/L, temp of solution 303 K, and dosage of adsorbent 20 g/L are the ideal parameters. Lemon leaf powders have a maximum sorption capacity (qmax) of 8.08 mg/g. The equilibrium was more accurately modelled using the Freundlich isotherm. When compared to other models, the data which fits the pseudo 2nd order kinetics model is better. Previously researchers had proved several low – cost materials such as wheat bran, marina alga, wood apple shell etc… In the current work, to remove malachite green dyes the efficacy of citrus lemon leaves is thoroughly done. The operating parameters that are optimized include dye solution concentration, initial solution pH, sorbent dose, and temperature. Studies on thermodynamics have demonstrated that the adsorption process was endothermic & spontaneous.

Keywords: Lemon leaves, Malachite Green dye, Concentration of dye solution, adsorbent dosage, agitation time, sorbent size.

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ROLES OF PUBLIC FINANCING TO ADDRESS URBAN FAECAL SLUDGE MANAGEMENT (FSM) SERVICES IN BANGLADESH: A STUDY OF DHAKA AND FARIDPUR CITIES

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ABSTRACT

Prior to adopting Sustainable Development Goals (SDGs), Bangladesh achieved 100% access to sanitation by 2015 mostly by on-site sanitation systems (OSSs). The major drawbacks of the OSSs are the deposition of the Faecal Sludge (FS) underground and environmental pollution due to the indiscriminate disposal of FS. As an overpopulated country, 40% out of 162 million people live in urban areas. However, the national planning process; the Five-Year Planning (FY 2016-20) did not put emphasis on the Faecal Sludge Management (FSM). Major policies also did not address FSM though there are various policies relevant to promote safe sanitation. Against this backdrop, it is difficult to manage the second-generation sanitation challenge like FSM services for the enormously growing urban population. However, to achieve the target of sustainable sanitation (SDG 6.2), the country needs much attention to address the FSM services with a huge public investment to build necessary infrastructures and initiate service delivery by involving stakeholders. This study investigated the role of public finance in addressing urban FSM services in two urban centers: Dhaka and Faridpur. The current public financing addressed FSM service for 39% of inhabitants in Faridpur; while in Dhaka, FSM service is very negligible and Dhaka Water Supply and Sewerage Authority (DWASA) is facilitating only the emptying service by engaging the private enterprises and NGOs shows a resource gap for FSM financing. Lack of institutional coordination, role clarity on service delivery, service provisioning, capacity, leadership, and inappropriate resource sharing among the utilities are the key challenges. The study has drawn a set of public financing mechanisms to achieve urban FSM service.

Keywords: Public Finance; Faecal Sludge Management; Desludging; On-site Sanitation System; Urbanization; Institutional and Regulatory Framework.

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MICROBIAL FORMULATION OF BIO-BRIQUETTES USING LIGNOCELLULOSIC AND FLORAL BIOMASS

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ABSTRACT

Considering the cost of fuel, it is the need of the hour for the utilization of waste as a fuel source. Leaf litter waste and floral waste biomass present in the surrounding serve as potential materials in bio-briquettes formulation. Leaf litter wastes (Almond leaves, Ashoka leaves, Cluster fig leaves), and floral wastes such as (Marigold, Tuberose, and Rose) was used for the study. The waste was microbially treated using *Lactobacillus plantarum* ATCC 8014 and Lactobacillus brevis ATCC 14869 for rapid decomposition of wastes. The briquettes were formulated using wet briquetting, manual pressure, and cylindrical mould methods. Paper pulp along with wheat bran at a 35:5 ratio was used as an artificial binding agent. The preliminary analysis includes the contents of moisture, volatile matter, ash, fixed carbon, etc. Bio briquettes were ultimately analyzed by FESEM, FT-IR, TGA, Density, and Calorific values. Comparisons were done using untreated lignocellulosic biomass-based briquettes and commercially available briquettes. Briquettes made from waste that has undergone microbial processing have a calorific value of 5968.20w kJ/Kg, a density of 0.26 kg/cm3, 8.4% moisture content, 10% volatile matter content, 13.65% ash content, 67.95% fixed carbon content, a maximum burning time of 17 minutes, and a minimum ignition time of 3 minutes. While the briquettes made from untreated waste have calorific value of 4205.10 kJ/Kg, density of 0.20 kg/cm3, 10.8% moisture content, 15% volatile matter content, 15.11% ash content, 59.05% fixed carbon content. This comparative study shows microbially treated bio briquettes can offer good agriculture waste management and new fuel opportunities.

Keywords: Bio-briquettes, floral waste, Leaf litter waste, Wet briquetting.

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REMOVAL OF NICKEL (II) ION FROM AN AQUEOUS SOLUTION USING RED BRICK AS AN ADSORBENT

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ABSTRACT

The concentration of pollutants has risen to unsafe levels in environment due to industrial, mining and agricultural processes leading to disposal of waste materials. Nickel ion is one of the heavy metal pollutants from power plants, metal fabrication facilities, and waste incinerators are the main sources of nickel ion's discharge into the environment. Even at very low concentrations, nickel ions in drinking water can cause serious kidney, lung, and cardiovascular diseases. Even though several heavy metal removal techniques like chemical precipitation, ion exchange, reverse osmosis, ultrafiltration, electrodialysis, nanofiltration etc., are available. Adsorption became one of the most successful technologies for removing dangerous chemicals from water because it is simple, affordable, efficient, and flexible. So far several materials were used as adsorbents for the removal of different pollutants in water. In this study, one of the common construction waste material, red brick was used as an adsorbent to remove nickel ion from water. It is cheap and easily available. The adsorbent capacity is examined using non-flow batch process for the red brick adsorbent with varying nickel initial concentrations. The max percentage removal of 95% was achieved at optimum pH-7, 30 minutes of contact time, 1.5 g of adsorbent dosage and particle size of 41.5 microns. Adsorption process is verified for equilibrium and kinetic studies.

Keywords: Heavy metal pollution, Nickel Ion, Adsorption, Red Brick, Construction Waste.

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HOUSEHOLD SOLID WASTE GENERATION AND MANAGEMENT SYSTEMS IN RURAL AREAS OF BHUTAN

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ABSTRACT

Globally, waste is accepted as an emerging issue and it concerns everyone, locally, nationally, and globally. However, studies on waste generation, composition, and management systems are often focused on urban areas. Similarly, Bhutan lacks information and reliable data about rural household solid waste generation and its composition at large and there is vague information on its management systems. This paper presents precise information on waste generation, composition, and management systems in rural areas in three administrative units called Gewogs namely Khatoed, Semjong, and Phangkhar under Gasa, Tsirang, and Zhemgang districts respectively. These study areas are located in different regions of the country with varying geographic locations, natural resources, altitudes, cultural diversity, lifestyles, and consumption patterns. The study envisioned narrowing the data gap, creating a yardstick for similar studies to be undertaken henceforth, and delivering sufficient and reliable information for informed decision-making for the successful progression of waste prevention and management programs to achieve "Zero Waste Bhutan", the vibrant vision of the country towards attaining zero waste society. On average, each household generated about 0.17 kg per day in the study areas and the per capita waste generation was 0.039 kg, 0.037 kg, and 0.032 kg a day in Khatoed, Semjong, and Phangkhar Gewogs respectively. On average, at least 72.9% practiced reduction, 86.8% reported that they reused, and 29.4% practiced recycling in their daily lives. At least 95.7%, 73.7%, and 82.1% of the household under Semjong, Phangkhar, and Khatoed Gewogs respectively practiced waste segregation into wet and dry at the source.

Keywords: Household solid waste, composition, rural household, waste generation, and management system.

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