

Turning waste to wealth

OPINION: THE FUTURE FOOD SYSTEM

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Food production requires the use of valuable resources (energy, land area, biodiversity, water, minerals etc.) and its wastage results in high water and carbon footprint losses. The global estimate of agricultural waste produced yearly is approximately 998 million t. Nigeria's palm oil production industry alone generates over 90 million t of effluent annually. The country is also generating 4.34 million t of rice straw and 0.9 million t of rice husk, and has an estimated 19.5 million cows which also generate waste.

With the increasing global population, it is projected that the quantity of solid waste generated in sub-Saharan Africa will triple by 2030. This could constitute environmental and health threats as African countries collect only about half of their urban wastes and just a quarter of rural waste, leaving the remainder to aggregate in the environment. With respect to agricultural waste, in Nigeria, [up to 80% of all farm waste is organic](#) and thus, there exists the potential of resourcefully reusing these materials to reduce environmental harm and boost soil fertility and farm productivity.

Waste awareness and potentials

Ignorance to the opportunities for biodegradable agricultural wastes, and the often

limited or total lack of government incentives, impel many farmers prefer not to manage this waste. In most African settings, farmers try to get rid of waste using environmentally harmful methods, such as burning or do nothing with the waste. The resulting **impacts** of untreated waste on farms include the contamination of soil, surface water and groundwater; proliferation and release of disease-causing organisms; and the release of ozone-depleting gases during decomposition, such as methane and nitrous oxide, which are a direct threat to the environment and to human health.

But waste can be recycled using simple science-backed approaches, whilst helping to protect the environment:

Charring technology: Animal and plant waste can be charred via pyrolysis (condition of little or no oxygen), and the resulting product is referred to as biochar. An awareness of the characteristics of the biomass to be used for the biochar is important for the purpose of soil amendment. For instance, in a project I lead at Bosso village, Niger State in Nigeria, my team demonstrated the use of rice husk biochar to improve sorghum yields. Tests at the study location showed the soil to be acidic and low in potassium – which was found to be abundant in the alkaline rice husk biochar. We applied 5 t biochar/ha and realised an approximately 105% increase in sorghum yield compared to untreated plots.

Treating waste water: The use of high-cost activated carbon or sophisticated digesters to treat agricultural wastewater could also be substituted with simple biochar technology. In another **experiment** by my team, we successfully treated olive mill wastewater, a complex vegetable oil mill effluent, with pinewood biochar produced from pinewood waste in South Africa. The treatment removed the polyphenolic toxic component of the wastewater and released essential agricultural nutrients (nitrogen and phosphorus). This provides the opportunity of reusing the treated wastewater for irrigation and wetting farm composts for composting processes.

Bioenergy: Agricultural waste can also be used to produce biofuel. Estimating the calorific value of cow dung, **1,000 kg** will generate approximately 8,000 KJ of energy. Anaerobically, the same 1,000 kg will produce about 450 m³ of biogas which, if used as fuel, provides 1,260 kW/h of energy. With rice wastes, 4.34 million t of rice straw and 0.9 million tons of rice husk produces around 337.67 MW/year of electricity at a conversion rate of 1.7 kg of rice husk/straw/kWh of electricity. Resourcefully reusing wastes to generate biofuels reduces greenhouse gases as well as global warming, increases rural manufacturing jobs and incomes, and improves circulation within the food supply chain.

A call to action

Economically, Africa is not only losing energy and organic nutrients by not managing its waste but also risks increasing environmental degradation. There is an urgent call for African leaders to invest in agricultural waste management given the direct and glaring implications of waste on human health, agriculture, the environment, and the economy of its nations. African leaders should thus make the move from hydropower and petroleum fuel, and tap into the energy and recycling opportunities for using waste to improve the food system.

COUNTRY MY TEAM CONTAMINATION TREATMENT AFRICAN COUNTRIES AWARENESS PURPOSE
USE QUANTITY FARMS GLOBAL ESTIMATE AGRICULTURAL WASTEWATER NIGERIA OPPORTUNITY
CHARACTERISTICS DIRECT THREAT OPPORTUNITIES POTENTIAL DECOMPOSITION

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