the daily observer
We stand for people's rights

Date:25/02/2026 (P-5)

BRRI develops urea and TSP saving technology

DR M ABDUL MOMIN

Due to the growing population and industrialization, waste management has become a major global challenge. In our daily lives, we generate enormous amounts of waste, which disrupt environmental balance. To address this problem and build an environmentally friendly world, the "3R" (Reduce, Reuse, Recycle) concept has become a well-known global model. The core philosophy of this concept is to consider waste not merely as "garbage," but as a "resource."

The first "R," Reduce, means minimizing resource use. The second "R," Reuse, ensures the sustainable use of materials. The third "R," Recycle, focuses on producing new products from waste. Essentially, the main objective of this theory is to prevent the waste of natural resources through a "circular economy." This article shares the story of how BRRI transformed waste into organic fertilizer through recycling.

Like the rest of the world, waste management is also a major issue in Bangladesh. In large cities including Dhaka, high population density leads to the generation of huge amounts of organic and inorganic waste daily. Due to limited collection and processing capacity, this waste becomes a source of environmental pollution instead of being converted into resources. However, with proper planning, developed countries successfully produce organic fertilizer from waste through proper management.

From 2015 to 2025, analysis of various government and research data shows that in 12 city corporations across Bangladesh, approximately 17,000 tons of waste are generated daily. In Dhaka alone, about 6,465-8,000 tons of waste are produced daily (about 0.61 kg per person per day). Chattogram generates about 2,135 tons per day, Khulna about 1,000 tons, Narayanganj about 1,000 tons, and Gazipur about 4,000 tons per day. Because household, market, and industrial waste are not properly separated, recycling and composting become difficult. Moreover, the country has a limited number of modern landfills, material recovery facilities, biogas plants, and compost plants, and environmental management at existing sites is often inadequate. Research indicates that nearly 80% of Dhaka's daily organic waste is suitable for composting. When composted with rock phosphate, phosphorus availability increases, making it possible to completely eliminate TSP fertilizer in crop production.

Food security in Bangladesh largely depends on rice. About 8.82 million hectares of land are cultivated with rice, requiring large quantities of chemical fertilizers-approximately 3.8 to 5.0 million tons annually. In 2024 alone, about 4.7 million tons of fertilizers, including urea, TSP, DAP, and MOP, were imported. Excessive chemical fertilizer use and intensive cropping have significantly reduced soil organic matter. Ideally, soil should contain 5% organic matter, but in many parts of Bangladesh it is less than 1%.To address this issue, the Soil Science Division of the Bangladesh Rice Research Institute (BRRI) developed BRRI-Organic Fertilizer by combining 10 environmentally friendly bacteria, decomposable kitchen waste, 5% rock phosphate, and 15% biochar.

After long-term field trials in Aus, Boro, and Aman seasons, initiatives have recently been taken to commercialize BRRI-Organic Fertilizer. The recommended application rate is 1 ton per hectare in the Aus season and 2 tons per hectare in the Boro and Aman seasons. Results show that using this fertilizer allows complete elimination of TSP and approximately 30% reduction in urea application without yield loss.

The government provides substantial subsidies for urea and TSP fertilizers every year. Chemical fertilizer production consumes natural gas and emits harmful greenhouse gases. Research shows that producing one kilogram of urea or TSP emits about 6.5 kg of carbon dioxide (CO_2). The use of BRRI's organic fertilizer in rice cultivation reduces 30% of urea and eliminates TSP use, while converting market and kitchen waste into organic fertilizer, thus reducing environmental pollution.

Dr. Umme Aminun Naher, Chief Scientific Officer of BRRI's Soil Science Division, stated that the primary raw material for TSP or DAP fertilizer is rock phosphate. Since rock phosphate is not easily soluble, it cannot be directly applied to short-duration crops like rice. However, phosphate-solubilizing bacteria living in the soil can dissolve rock phosphate quickly, making it available to plants. The inclusion of 15% biochar in the fertilizer directly adds carbon to the soil, improving soil quality. Research also indicates that continuous use of chemical fertilizers reduces the population of beneficial soil microorganisms, such as nitrogen-fixing and phosphate-solubilizing bacteria. The use of BRRI-Organic Fertilizer increases beneficial microbial populations in the soil.

Dr. Umme Aminun Naher initiated this research during her PhD at University of Putra Malaysia in 2005. She developed the biofertilizer using nitrogen-fixing and phosphate-solubilizing bacteria combined with composted waste from peat and palm oil industries. For this innovation, she won first prize in 2012 in a competition organized by the United Nations' International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC) and The World Academy of Sciences (TWAS). Her dream was to return home and develop a unique organic fertilizer for Bangladesh. She emphasized low-cost technology to solve soil fertility problems, increase productivity, and reduce reliance on expensive chemical fertilizers for smallholder farmers.

Nitrogen is the most essential nutrient in rice cultivation and is typically applied as urea. However, only 30-50% of applied nitrogen is utilized; the rest is lost through ammonia volatilization, nitrous oxide emissions, and nitrate leaching. Phosphorus is the second most important nutrient, typically applied as TSP or DAP. Rock phosphate is the natural source of these fertilizers. Direct use of rock phosphate reduces greenhouse gas emissions and production costs, but due to its slow solubility, phosphate-solubilizing bacteria are needed to make it plant-available.

During the 2023-24 Aman and Boro seasons, research at BRRI, Gazipur, showed that applying 70% nitrogen (N), 0% phosphorus (P), 100% potassium and sulfur (K & S), along with BRRI-Organic Fertilizer, increased economic profitability by approximately 1.89 times. This demonstrates that replacing chemical fertilizers with BRRI-Organic Fertilizer can reduce production costs, ensure higher profits, and decrease dependency on chemical fertilizers.

On February 9, a memorandum of understanding was signed between BRRI and ACI to commercialize the fertilizer. Under the agreement, BRRI will transfer the production technology of BRRI-Organic Fertilizer to ACI PLC. ACI will produce and market high-quality organic fertilizer for farmers and establish its own factory and modern laboratory to ensure production efficiency and quality.

This organic fertilizer is not merely an alternative to chemical fertilizers; it is a transformative innovation for Bangladesh's rice production system, ensuring economic savings, environmental protection, and long-term food security. With proper policy support and widespread adoption, this technology can bring sustainable transformation to the country's agricultural sector.

The writer is a Senior Communication Officer, Bangladesh Rice Research Institute (BRRI)