Our Concept of Resource Management and Its Technical Development <Part 2>

Efforts to Establish Compost Production Technology in Sudan

Have you ever seen the ingenuity behind wastewater pits used for flush toilets in rural Sudan? The system begins with the excavation of a large underground pit, several meters deep, dug beside the house. The key is to dig down until reaching the groundwater table. As a result, groundwater seeps into the bottom of the pit, forming a thin water layer, and the covered pit itself functions as the treatment tank. Wastewater from a nearby flush toilet is conveyed through a pipe and discharged into the pit through an opening made in its side wall. The waste accumulates at the bottom, where it mixes with groundwater and gradually decomposes.

In Sudan, where temperatures of 30–45° C are common throughout the year, the decomposition of organic matter is naturally accelerated. Under such conditions, microbial activity remains highly active, and the balance between the accumulation and decomposition of organic waste is maintained. As a result, waste does not build up toward the surface of the pit, allowing the system to function for long periods. This represents an excellent example of how organic matter decomposition can be promoted through appropriate moisture conditions under high-temperature environments.

Incidentally, similar underground pits were observed about 20 years ago in rural Mongolia. However, unlike Sudan, these were simple pit latrines rather than flush systems. Due to the cold climate, the water layer at the bottom did not function effectively, and in winter the contents often froze. As a result, organic matter did not decompose sufficiently and gradually accumulated. Eventually, such latrines were abandoned and sealed, and new pits were dug elsewhere. This contrast illustrates how climatic conditions, particularly temperature, influence the efficiency of organic matter decomposition.

Another example can be seen in everyday life. Donkey carts are a common means of transport in Sudan, and donkey manure scattered along roadsides is a familiar sight. Yet, if one observes carefully, such manure disappears within a few days. This is not due to cleaning, but rather the result of rapid microbial decomposition under high temperatures.

Inspired by these observations—the wastewater pits and the disappearance of donkey manure—I began to consider the rate of organic matter decomposition under high-temperature conditions and initiated efforts to develop compost production technologies in Sudan. Since 2017, composting trials have been conducted within the premises of a technical cooperation project office in River Nile State, testing different types of organic materials, moisture levels, and degrees of shredding. Because the project targets irrigated schemes, water application at the field level could be adjusted relatively easily. Discussions were also held with counterparts, national staff, and researchers from the Agricultural Research Corporation (ARC) and local universities on microbial activity under high temperatures, decomposition processes, and the feasibility of farmer-level compost production.

At the farmer level, the most important considerations for compost production are cost reduction and labor-saving. Our basic approach has been to avoid heavy machinery for turning by spreading organic materials in thin layers (approximately 10–15 cm thick) and carefully managing moisture to ensure uniform decomposition. At the same time, for the shredding process, we have promoted the use of choppers to reduce labor requirements. As compost materials, we focus on locally available resources such as food residues, livestock and poultry manure, animal waste, and leguminous weeds, while also testing practical aspects such as transportation and field-level operation.

Underground pits for wastewater, digging to reach the water level

Although the ongoing conflict in Sudan currently limits our ability to travel and conduct on-site activities, we hope to establish farmer-level compost production as a practical and sustainable resource management technology under high-temperature environments.