

INTISARI

Tingginya volume sampah rumah tangga di Kota Yogyakarta belum diiringi dengan partisipasi masyarakat yang optimal dalam program bank sampah. Padahal, bank sampah merupakan salah satu program berbasis masyarakat yang diharapkan mampu mendukung pengurangan sampah sejak dari sumbernya. Menurut Sistem Informasi Pengelolaan Sampah Nasional (SIPSN), timbulan sampah di Kota Yogyakarta pada tahun 2024 mencapai 121.356 ton, dengan 63,75% berasal dari rumah tangga. Namun, angka serapan bank sampah baru mencapai sekitar 4,9%, menunjukkan adanya ruang peningkatan yang besar untuk mendukung keberlanjutan program ini.

Penelitian ini mengembangkan model simulasi berbasis agen (Agent Based Modeling) untuk menganalisis pengaruh perubahan harga terhadap profit bank sampah. Model ini mencakup interaksi antara agen resident, bank sampah, dan pengepul, dengan mempertimbangkan jenis sampah (plastik, kertas, logam, dan gelas), perilaku agen, dan variabel ekonomi. Harga beli dan jual sampah bersifat stokastik, dan perilaku agen dipengaruhi oleh faktor *benefit-cost*, waktu, serta pengaruh tetangga sekitar.

Hasil simulasi menunjukkan rata-rata profit bank sampah sebesar Rp13.908.000 per tahun, jauh lebih rendah dari rata-rata pendapatan bank sampah sebesar Rp265,66 juta per tahun. Beberapa skenario diuji dalam model, termasuk layanan antar jemput, peningkatan retribusi, skema *pay-as-you-throw* (PAYT), dan peningkatan harga jual. Skema PAYT terbukti paling efektif, mampu meningkatkan angka serapan hingga 8,45% dalam setahun dan meningkatkan profit tahunan secara signifikan.

Kata Kunci: Sampah rumah tangga, Kota Yogyakarta, Bank sampah, *Agent Based Modeling*, Perubahan harga, Profit, Jenis sampah

ABSTRACT

The high volume of household waste generated in Yogyakarta City has not been matched by optimal community participation in waste bank programs. Waste banks are a community-based initiative expected to support waste reduction efforts at the source. According to the National Waste Management Information System (SIPSN), the city produced 121,356 tons of waste in 2024, with 63.75% originating from households. However, waste banks currently absorb only around 4.9% of total household waste, highlighting a substantial opportunity to increase uptake and improve the program's long-term sustainability.

This study develops an Agent Based Modeling (ABM) simulation to analyze the impact of fluctuating waste prices on waste bank profit. The model simulates interactions between residents, waste banks, and collectors, taking into account the types of waste (plastic, paper, metal, and glass), resident behavior, and economic factors. Waste buying and selling prices are dynamically adjusted, while resident behavior is influenced by cost-benefit considerations, time, and social influence from nearby neighbors.

Simulation results indicate that the average annual profit per waste bank is Rp13,908,000, which is significantly lower than the average total annual revenue of Rp265.66 million. Several policy scenarios were tested, including door-to-door collection services, increased waste fees, pay-as-you-throw (PAYT) schemes, and higher buying prices. Among them, the PAYT scheme proved most effective, increasing waste bank absorption rates by up to 8.45% within one year and significantly boosting annual profits.

Keywords: Household waste, Yogyakarta City, Waste bank, Agent Based Modeling, Price fluctuation, Profit, Waste type