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Characterisation of Food Waste Generation in Retail Markets in Quito, Ecuador: Efficiency and Composition Analysis for Circular Management

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Abstract

This study provides a comprehensive characterisation of food waste (FW) generation in three strategic municipal supply centres in Quito, Ecuador: La Carolina, Santa Clara, and La Magdalena. The research addresses the critical issue of products that are systematically discarded for various reasons despite retaining organoleptic properties suitable for human consumption (FAO, 2019). In the absence of data (United Nations Environment Programme, 2024) and a standardised national methodology for measuring FW due to methodological gaps in the field of food waste valuation (Chaboud et al., 2017), a direct weighing protocol was employed in combination with Mexican Standards NMX-AA-061-1985, NMX-AA-015-1985, and NMX-AA-022-1985. These methods were adapted to the retail market context, aligning with the global FLW Standard (World Resources Institute, 2016) and combining two valuation methods to provide a better estimation as a hybrid approach (Elimelech et al., 2018). Data collection was executed over seven consecutive days to capture the complete weekly commercial dynamics. The operational phase integrated stakeholder engagement with merchants and daily in-situ weighing using calibrated instruments, allowing for the calculation of FW Generation Per Capita (PPC) by stall and supply centre. Statistical analysis was conducted using Minitab® 17.1.0 (Minitab Inc., 2014), employing measures of central tendency, dispersion, and Anderson-Darling normality tests with a 95% confidence level. The results reveal a weekly generation of 593.1 kg in La Carolina, 591.1 kg in Santa Clara, and 192.1 kg in La Magdalena. The highest Per Capita Production (PPC) is recorded at La Carolina market with 4.5 kg/stall·day, followed by La Magdalena (4.3 kg/stall·day) and Santa Clara (3.7 kg/stall·day). Regarding composition, vegetables predominate in La Carolina (46%), whilst roots, tubers, and plantains prevail in Santa Clara and La Magdalena (38% and 39% respectively). The analysis evidences high data dispersion and positive asymmetry, reflecting that generation is non-homogeneous and depends on the intrinsic dynamics of each stall and market, a phenomenon also observed in international household contexts (van der Werf et al., 2018). This research constitutes the most up-to-date database for designing circular management strategies within municipal commercialisation systems in Ecuador. The findings underscore the potential of these centres to implement food redistribution nodes and coordinate with other stakeholders, such as associations or food banks, in line with regional frameworks for waste reduction. Such integration strengthens regional food security under a sustainability framework and provides critical technical evidence for formulating waste mitigation public policies in the absence of

prior official data.

Keywords: Food waste, retail markets, Quito, circular economy, waste characterisation, food security, supply centres

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