

Household solid waste management in San José Bachillero parish, Ecuador: knowledge, practices, and priority gaps

Gestión de residuos sólidos domiciliarios en la parroquia San José Bachillero, Ecuador: conocimientos, prácticas y brechas prioritarias

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ABSTRACT

Household solid waste management is an environmental issue linked to health and quality of life in rural communities. This study aimed to describe the knowledge, practices, and access to household solid waste collection services in the community of San José de Bachillero in order to identify priority gaps. An observational, quantitative, descriptive, cross-sectional study was conducted in September 2024 using a structured survey administered to 303 adults (one participant per household). The analysis covered sociodemographic characteristics, knowledge of regulations and basic concepts, and practices regarding waste separation, reduction, and final disposal. Self-reported knowledge was predominantly rated as "fair" (41.3%); 62.4% of respondents reported separating waste (primarily plastics); 68.6% indicated weekly collection, while 14.5% lacked service entirely. Practices such as burning and burying waste were also identified, highlighting gaps in environmental education and local waste management.

Keywords: waste management, household solid waste, environmental health, rural communities, environmental education.

RESUMEN

La gestión de residuos sólidos domiciliarios representó un aspecto ambiental relacionado con la salud y la calidad de vida en comunidades rurales. El objetivo del estudio fue describir los conocimientos, prácticas y condiciones de acceso al servicio de recolección de residuos sólidos domiciliarios en la comunidad de San José de Bachillero, cantón Tosagua, para identificar brechas prioritarias. Se realizó un estudio observacional, cuantitativo, descriptivo y transversal en septiembre de 2024, mediante una encuesta estructurada aplicada a 303 adultos, con un participante por hogar. Se analizaron características sociodemográficas, conocimientos sobre normativa y conceptos básicos, además de prácticas de separación, reducción y disposición final. Predominó el conocimiento autoinformado regular, con 41,3%; el 62,4% reportó separar residuos, principalmente plásticos; el 68,6% indicó recolección semanal y el 14,5% no contó con servicios, también se identificaron prácticas de quema y enterramiento, lo que evidenció brechas en educación ambiental y gestión local.

Palabras clave: gestión de residuos, residuos sólidos domiciliarios, salud ambiental, comunidades rurales, educación ambiental.

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INTRODUCTION

Health is determined by social, economic, and environmental conditions, and includes prerequisites such as housing, adequate resources, and a stable ecosystem (Rana, 2025). Within this framework, the management of household solid waste is related to air, water, and soil quality, as well as to the population's exposure to preventable health risks (De La Guardia & Ruvalcaba, 2020).

Population growth increases waste generation and the demand for collection and disposal services. When these services are insufficient or irregular, practices such as dumping waste in ravines, burning, burying, or accumulating it in public spaces may occur, contributing to environmental pollution, the proliferation of disease vectors, and visual pollution (Calderón-Cedeño & González-Arteaga, 2020). In rural areas of Ecuador undergoing urbanization and growth, local governments face increasing demands in maintaining basic services, including the collection and proper disposal of waste (Peñafiel et al., 2021; Chamorro et al., 2023).

In Ecuador, the 2022 census reported a national waste collection coverage of 88.7% of households; however, in the parish of San José de Bachillero, Tosagua canton, this coverage was only 65.3%. This difference reveals territorial inequalities in access to the service, especially in rural areas (National Institute of Statistics and Censuses, 2022). Furthermore, some waste is still disposed of in places with limited sanitary control, which poses a challenge for local environmental management (National Institute of Statistics and Censuses, 2023).

The relevance of this study lies in the fact that practices such as open dumping, burning, and improper waste management can increase exposure to pollutants, toxic compounds, and biological agents linked to respiratory, digestive, skin, and neurological problems, as well as other health risks associated with environmental pollution (Limache, 2025). Local assessments allow for the identification of specific conditions regarding knowledge, access to services, and household practices, in order to guide environmental education programs and improve waste management.

The objective of this research was to describe the knowledge and practices related to household solid waste management in the community of San José de Bachillero, Tosagua canton, as well as the conditions of access to collection services, to identify priority gaps that will guide local actions for environmental education and the strengthening of waste management.

METHODOLOGY

An observational, quantitative, descriptive, and cross-sectional study was conducted in the San José de Bachillero parish, Tosagua canton, Manabí province, Ecuador. Data collection took place in September 2024 through a structured survey administered in person to the adult resident population.

The San José de Bachillero parish had 4,438 inhabitants according to the 2022 Census; however, because the study focused on household waste management practices, the reference population for the sample size calculation consisted of 1,418 households (National Institute of Statistics and Censuses, 2022). The sample size was estimated using the formula for finite populations, considering a 95% confidence level, a 5% margin of error, and an expected proportion of 50%, resulting in a sample of 303 households. In each household, one adult resident was surveyed, resulting in a final sample of 303 participants.

Participant selection was conducted using non-probability convenience sampling, aiming to include households from different communities within the parish until the planned sample size was reached. Individuals aged 18 years or older, with habitual residence in the San José de Bachillero parish for at least one year, and who voluntarily agreed to participate through informed consent were included. Visitors, individuals residing in the parish for less than one year, and incomplete surveys or those with inconsistent information that would prevent analysis were excluded.

The data collection technique was a survey, the instrument of which consisted of closed-ended questions organized into three dimensions: sociodemographic characteristics, self-reported knowledge about household solid waste, access to collection services, and self-reported household waste management practices. The instrument was developed by the research team based on the study variables and was designed to collect information reported by the participants. No formal validation of the instrument or pilot test was conducted; therefore, the results should be interpreted as a descriptive approximation of the perceptions, knowledge, and practices self-reported by the surveyed population.

Before the survey, each participant was informed of the study's purpose, the voluntary nature of their participation, and the academic and scientific use of the information. Once data

collection was complete, the responses were reviewed, coded, and recorded in a matrix created in Microsoft Excel. This matrix allowed for the organization of data by dimension, variable, and category, as well as for data cleaning and the identification of potential inconsistencies before analysis.

The data analysis was descriptive. Responses were coded according to the categories of each question, and absolute frequencies and percentages were calculated in Microsoft Excel. For age and household size, the data were grouped into ranges to facilitate presentation. The results were organized in distribution tables. Inferential tests were not applied due to the descriptive scope of the study and the type of sampling used. Throughout the entire process, the principles of voluntariness, anonymity, and confidentiality were respected. Participation was voluntary, requiring prior informed consent; no personal data that could directly identify participants was collected, and the information was used solely for academic and scientific purposes.

RESULTS AND DISCUSSION

The characteristics were described considering place of residence, age, gender, education level, occupation, and number of household members; these data are summarized in Table 1.

Table 1. Sociodemographic characteristics of the participants (n=303)

Variable	Category	n	Percentage
Place of residence (location)	Bachillero (cabecera parroquial)	98	32.3
	Monte Oscuro	92	30.4
	Soco Soco	57	18.8
	Bellavista	19	6.3
	Ciénega Grande	9	2.97
	La Propicia	15	4.95
	Bailón	13	4.29
Age (Years)	18–30	54	17.8
	31–45	80	26.4
	46–60	87	28.7
	≥61	82	27.1
Gender	Male	202	66.7
	Female	101	33.3
Household members	1–2	84	27.7
	3–4	136	44.9
	5–6	63	20.8
	> 6	20	6.6

The sample consisted of participants from various locations within the San José de Bachillero parish, with the largest representation from the parish seat and Monte Oscuro. Regarding age, there was a predominance of adults aged 46 to 60 and those over 61, while males accounted for the majority of responses. Furthermore, households were primarily composed of three to four members.

Fadhullah et al. (2022) found an association between age, location, and housing type with waste segregation practices, while Kalyanasundaram et al. (2025) identified that household size, housing type, and socioeconomic level influence waste generation patterns. Therefore, the predominance of three- to four-member households in San José de Bachillero is a relevant factor, as household waste management depends not only on individual responsibility but also on agreements and shared habits within the home.

Regarding self-reported knowledge of household waste management, 125 (41.3%) rated it as fair, 105 (34.7%) as good, 40 (13.2%) as very good, 29 (9.6%) as poor, and 4 (1.3%) as very poor. Familiarity with national regulations on non-hazardous solid waste management was distributed as follows: 151 (49.8%) responded yes, and 152 (50.2%) responded no. Furthermore, 208 (68.6%) indicated knowledge of waste types, while 95 (31.4%) indicated they did not (Table 2).

Table 2. Knowledge of Household Waste Management (n=303)

Variable	Category	n	Percentage
Knowledge about waste management	Very good	40	13.2
	Good	105	34.7
	Fair	125	41.3
	Bad	29	9.6
	Very bad	4	1.3
Familiar with national standards	Yes	151	49.8
	No	152	50.2
Knows types of waste/waste	Yes	208	68.6
	No	95	31.4

In the multiple-choice question about the types of household waste generated, the most frequent responses were plastics (n= 120), organic waste (n= 81), cardboard/paper (n= 76), and glass (n= 71). Less frequently mentioned were inorganic waste (n= 19), metal (n= 17), and

infectious, solid, chemical, toxic, sharps, and rubber waste ($n \leq 8$), in addition to 12 unspecified responses.

This suggests that community knowledge is focused on everyday aspects but is still limited in supporting more comprehensive separation and recovery practices. Fadhullah et al. (2022) point out that knowledge and perception influence household waste management, although they do not always guarantee appropriate practices. Meanwhile, the United Nations Environment Programme (UNEP, 2024) emphasizes that sustainable management requires strengthening source separation, recycling, and waste recovery.

Furthermore, the higher frequency of mentions of plastic can be explained by the fact that, in Ecuador, this material is the main type of waste that households typically sort or separate. According to the National Institute of Statistics and Censuses (INEC, 2024), in 2024, plastic was the most frequently sorted waste nationwide, at 47.5%, followed by organic waste, paper/cardboard, metal, glass, and Tetra Pak. This suggests that the population more readily recognizes plastic waste due to its everyday presence and its increased use in household waste separation practices.

Regarding familiarity with terms related to waste management, recognition of pollution and recycling exceeded 80%, while the least recognized terms were waste treatment, biodegradable, and composting; these are detailed in Figure 1.

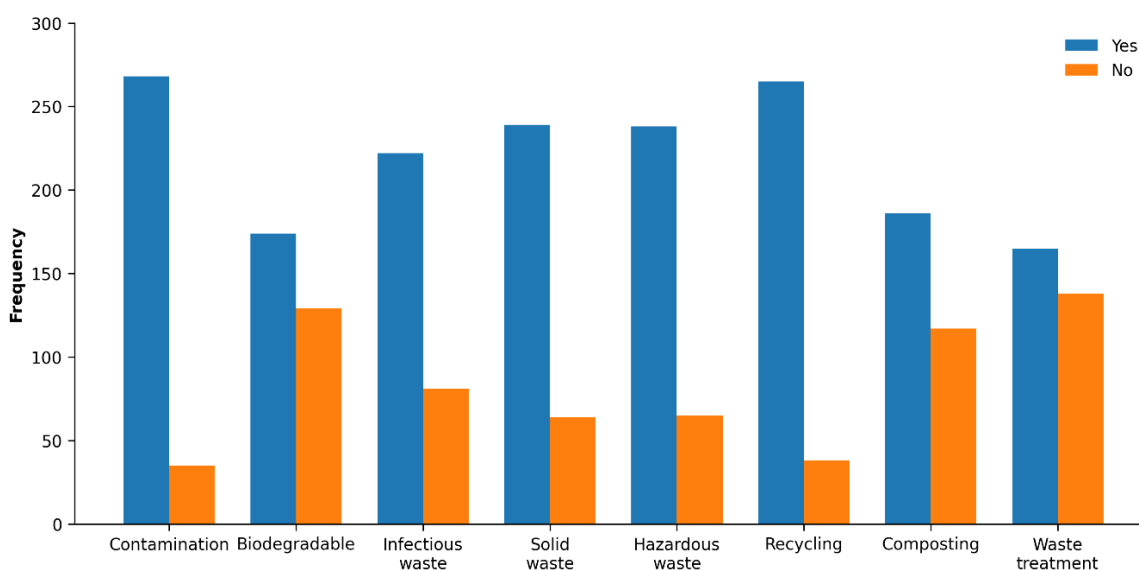


Figure 1. Familiarity with waste management terms.

Figure 1 shows less familiarity with more technical concepts, such as biodegradable, composting, and waste treatment, which were less recognized. This result should be interpreted as reported familiarity, not as conceptual mastery or practical application at home, since environmental awareness and favorable attitudes do not always translate directly into sustained practices of reduction, separation, or recycling (Konstantinidou et al., 2024; Henao-Rodríguez et al., 2024).

Furthermore, familiarity with recycling can be explained not only by environmental campaigns but also by its presence in local economic dynamics. In Ecuador, household waste sorting continues to be primarily associated with recyclable materials, as reported by the INEC (2024), and studies in Guayaquil have documented that waste recovery constitutes a source of income for informal recyclers (Hidalgo-Crespo et al., 2023).

Waste separation at home was reported by 189 (62.4%) participants, while 114 (37.6%) indicated they did not separate their waste. Among those who did separate their waste (n=189; multiple responses), 172 (91.0%) separated plastics, 117 (61.9%) separated glass, 102 (54.0%) separated metals, 85 (45.0%) separated organic waste, and 48 (25.4%) separated paper/cardboard. Five (2.6%) did not specify. Collection service frequency was reported as weekly by 208 (68.6%), daily by 40 (13.2%), bi-weekly by 7 (2.3%), and monthly by 4 (1.3%). Additionally, 44 (14.5%) indicated that there was no collection service (Table 3).

Table 3. Waste management practices

Variable	Category	n	Percentage
Waste separation at home	Yes	189	62.4
	No	114	37.6
Garbage collection frequency	Daily	40	13.2
	Weekly	208	68.6
	Bi-weekly	7	2.3
	Monthly	4	1.3
	No collection service	44	14.5
Method for reducing waste (multiple choice)	Composting	20	6.6
	Reuse	62	20.5
	Recycling	175	57.8
	Does not use any method	63	20.8

In response to the question about mechanisms used in the absence, delay, or irregularity of the collection service (multiple response), the following were reported: keeping the waste until the service arrived in 149 (49.2%) cases; burning the waste in 118 (38.9%) cases; depositing it in containers away from the home in 34 (11.2%) cases; burying it in 28 (9.2%) cases; and disposing of it in water sources in 1 (0.3%) case. Regarding methods to reduce the amount of waste generated (multiple response), recycling was reported in 175 (57.8%) cases; reuse in 62 (20.5%) cases; and composting in 20 (6.6%) cases; in addition, 63 (20.8%) indicated that they did not use any method (Table 3).

Finally, 263 (86.8%) reported not having received any training or workshops on household waste management, while 40 (13.2%) reported having received such training from educational institutions (8; 20.0%), external foundations (7; 17.5%), the UO Bachillero (6; 15.0%), the parish government (5; 12.5%), other sources (9; 22.5%), and those who did not specify (5; 12.5%). Among the "other" sources mentioned were the Association of Municipalities of Ecuador, the Fire Department, the Tosagua Cantonal Government, the Provincial Government of Manabí, the Technical University of Manabí, and a tuna company.

The results show partial household waste separation: although more than half of the participants reported separating waste, this practice was concentrated on plastics, glass, and metals, while organic waste and paper/cardboard were separated less frequently. This pattern may be related to how the population recognizes and prioritizes certain materials within the home, along with the environmental conditions where waste management takes place. Fadhullah et al. (2022) point out that household waste segregation varies according to population characteristics and the residential context.

Likewise, Trushna et al. (2024) indicate that source separation requires information, infrastructure, and community support. Weekly collection frequency was the most frequently reported; however, some households reported a lack of service, delays, or irregularity, a situation accompanied by temporary storage, burning, and burial. In rural communities, limitations in coverage, infrastructure, and management tools are associated with informal disposal practices, such as uncontrolled disposal and burning of waste (Vinti & Vaccari, 2022). In Ecuador, Peñafiel-Arco et al. (2022) documented that burning was a common strategy for managing household waste in a rural community. This practice also has health implications, as the World Health Organization

(World Health Organization [WHO], 2025) warns that open burning of waste affects air quality and community health.

CONCLUSIONS

Although partial household waste separation is practiced in the San José de Bachillero parish, important gaps persist in knowledge of regulations, composting, recovery processes, and waste reduction strategies. Irregular collection services and limited coverage in some areas promote unsafe practices such as burning or prolonged storage. This study provides an integrated overview of sociodemographic characteristics, knowledge, and waste management practices in this rural area of Manabí, identifying priority needs and informing actions in environmental education, recycling, composting, and community–institutional coordination. Limitations include convenience sampling and self-reported data, which may affect generalizability and introduce bias. Future studies should incorporate mixed-method approaches, direct observation, and evaluations of educational interventions to generate stronger evidence and support more effective waste management strategies.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

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