

**Assessment of Household Plastic Waste Management and Associated Challenges in Communities Bordering
Gambari Forest Reserve, Oyo State, Nigeria**

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Abstract

While plastic waste has become a more frequent occurrence on the rural landscape in sub-Saharan Africa, studies on the management of plastic waste have focused largely on urban and peri-urban areas, ignoring forest-adjacent communities. This study analyzed the socio-economic characteristics, plastic waste management practices and challenges among households in five communities bordering Gambari Forest Reserve, Oyo State, Nigeria: Idi Ayunre, Onipe, Onigambari, Ibusogboro and Olonde. The study employed a multistage sampling procedure to select 120 households, and data were collected using a structured questionnaire through interviews. Data were analyzed using descriptive statistics and Pearson product moment correlation. Results indicated that the majority of the sample was women (55.8%) and married respondents (83.3%), with most respondents being between 41 and 50 years old and having at least secondary education. Most respondents engaged in waste management practices such as encouraging children not to litter (73.3%) and reporting dumping to community leaders (73.3%), but formal recycling and use of reusable alternatives were moderate, with 56.7% of respondents classified in the low-practice group. The most common challenges were lack of designated collection points (57.5%), limited access to recycling facilities (40.0%) and inadequate knowledge of proper disposal methods (40.0%), with 63.3% of respondents falling into the high-constraint category. There was a positive correlation between challenges faced and methods adopted for plastic waste management ($r = 0.421$, $p = 0.000$). The results suggest that infrastructural and awareness gaps, rather than unwillingness, are the main drivers of ineffective plastic waste management in these communities.

Keywords: Plastic materials, Waste product, Management, Challenges and Forest zones

Introduction

In recent time it has been observed that waste is one of the problems of developing countries, especially countries in sub-Saharan Africa. Waste comes in different forms, and it has been noted that plastic materials constitute waste in the environment. Plastics are materials composed of large polymers and interconnected molecular chains (Franzellitti et al., 2019). There are various plastic types with different compositions, which determines their performance

and recycling ability. Some types of plastics, called thermoplastics, can be recycled, such as polyethylene terephthalate (PET), etc while some are non-recyclable plastics such as thermosetting plastics and synthetic fibers. (Geyer et al., 2017). The use of plastic is common in some practical industries, among them the forestry, agriculture, and horticulture industries.

The industries have become major consumers of plastics. These could be in the form of film sheets,

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foam, pipes, and other materials, and these plastics are used for fertilizer transportation, weed control, disease and pest control, storage, and crop conservation as well as in buildings and structures (Yang et al., 2021). These norms might have contributed to generally high consumption pattern coupled with the alarming rate at which plastics are discarded into the environment as litters. Plastic provides convenience as well as efficiency that makes life easier. The rapid growth of plastic production, combined with the non-degradable nature of waste plastic and a lack of waste management, has led to the accumulation of plastic waste in various environments (Kapoor et al., 2024). The issues of plastic waste continue to be a significant environmental contaminant (Bassyouni et al., 2025). To minimize the negative effects on the environment, the management of plastic waste has to be carried out by following a pattern where plastics waste are collected to landfill or adopting reusing, reducing, and recycling plastic waste for more efficient and conscious use (Fayshal, 2024). Van, et al., (2021) emphasized the importance of people's interventions towards more pro-environmental behavior in waste management (particularly waste segregation,

reduction, and recycling), including plastics. For instance, people's intentions to recycle are largely explained by their understanding of the social acceptance of waste recycling in Brazil (Echegaray, et al., 2017). This suggests that social awareness has the power to influence wasteful behavior and intentions. Individuals' awareness of environmental concerns link both barriers and facilitators of environmentally friendly plastic waste management practice.

Despite the growing body of literature on waste products in the rural areas in Sub-Saharan Africa, significant gaps persisted in reference to management in forest zones, and little attention was given to plastic waste materials in areas closer to nature. Most existing literature focuses on plastic waste materials and management but pays little attention to waste products in forest zones of Sub-Saharan Africa. This study therefore addressed that gap by simultaneously examining the socio-economic, waste management methods, challenges faced in the management of plastic wastes, as well as relationships between the methods and challenges faced in management of waste in adjoining communities in Onigambari Forest Reserve, Oyo state Nigeria.

Methodology

Study Area

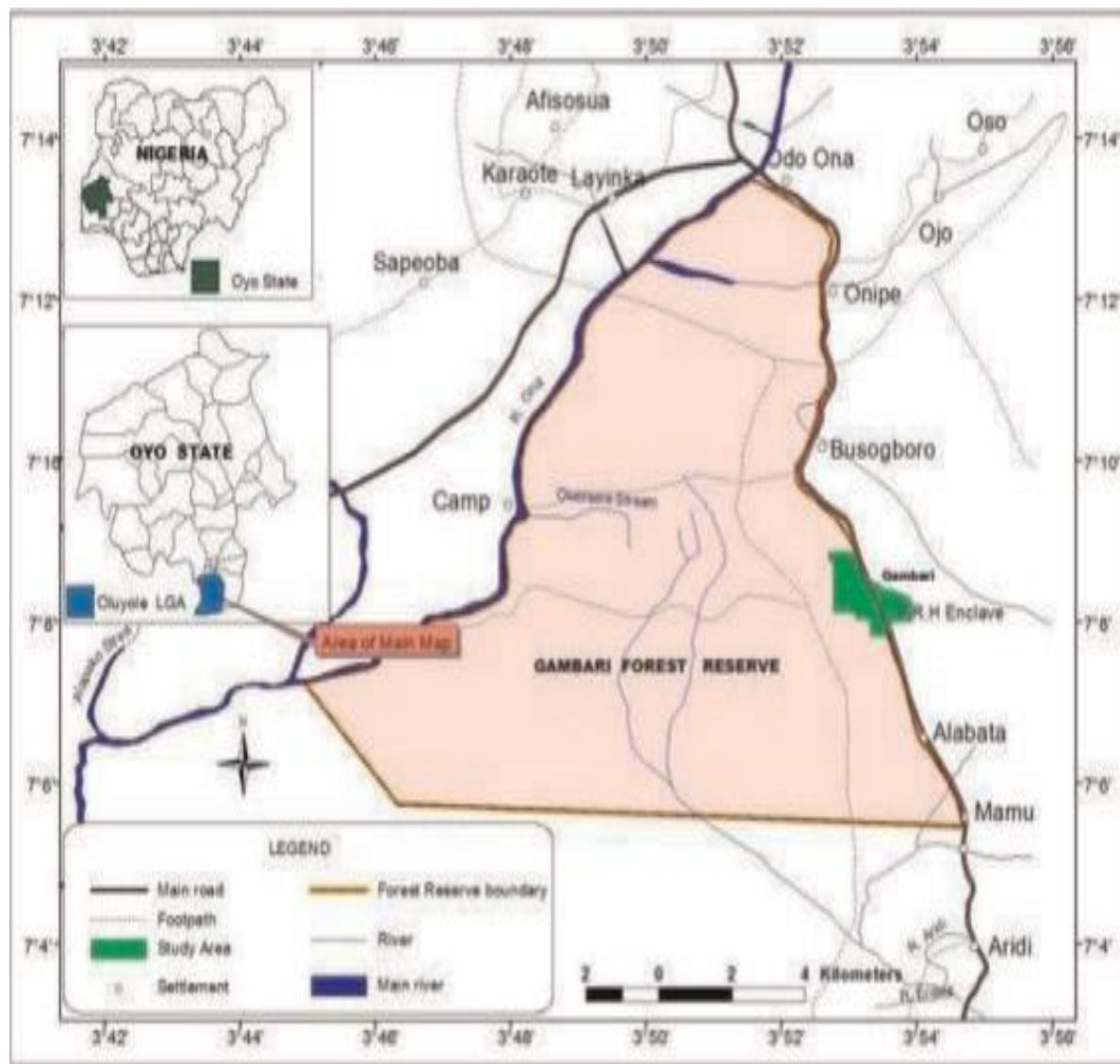
The study was conducted in Onigambari Forest Reserve located in Oluyole Local Government Area (LGA) of Oyo state. It is one of the early forest reserves in the state and it is divided into 5 series namely Gambari, Ibusogboro, Onipe, Olonde and Mamu (Larinde and Olasupo, 2011). Gambari forest reserve is a lowland forest, the reserve is located between latitude 7°25' and 7°55'N and longitude 3°53' and 3°9'E. It is situated at the southern part of Ibadan bounded on the west by River Ona and on the east by the main road of Ibadan to Ijebu-ode. The reserve is bounded by Abanla and Odoona settlements in Oluyole local government area of Oyo State in the north and in the south by Mamu and Abatan settlements in Ijebu-ode local government area of Ogun State. Both dry and wet season are

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experienced in the reserve. Dry season lasts for 3 months (December to February). The reserve has been reduced to secondary high forest dominated by trees like *Mansoniaaltissima*, *Triplochiton scleroxylon*, *Terminalia superba*, *Celtiszenkeri*, *Sterculia spp*, *Terminalia ivorensis* and *Cola spp*; the planted area is dominated by *Tectona grandis*, *Gmelina arborea*. The average annual rainfall in the area is 1592.3mm with high relative humidity (72–86.5%) and high mean daily temperature of 30° C (Chukwu and Olajuyigbe, 2017). The forest reserve is rich in many forest resources such as fuel-wood, food, bushmeat, medicine and other raw material.



Source: (Chukwu and Olajuyigbe, 2017).

Fig 1.0 Map of Oyo state showing the Onigambari Forest Reserve

Sampling Population

The target populations for study were the rural dwellers in communities around Onigambari forest environment

Sampling Procedure and Sample Size

Multistage sampling technique was used for the study.

Stage 1: Purposive sampling was applied in selecting the forest environment (Onigambari forest reserve), due to their engagement in forest activities. There are five zones in the forest reserve which include Mamu, Onigambari, Busogboro, Odo-Ona/Onipe and Alonge

Stage 2: Simple random sampling was used in selecting five communities based on their proximity to the forest reserve at about 5km, the selected communities include Idi Ayunre, Onipe and Onigambari, Ibusogboro and Olonde.

Stage 3: Systematic sampling techniques was used to select 25 household in Idi Ayunre, 25 in Onigambari, 20 in Onipe, 25 in Ibusogboro and Alonge respectively. The differences in the number of respondents selected per communities are due to the differences in the number of households.

Sampling size

A total number of 120 household was selected for the study across the five selected communities for the study.

Data Collection

Data for this study was collected from both primary and secondary sources. The primary source was the use of a well-structured questionnaire with interview. The secondary source was the use of relevant literatures, research journals and other relevant publication.

Method of Data Analysis

The data collected was analyzed using descriptive and inferential statistics. Descriptive statistics will be used to analyze the objectives. Inferential statistics Pearson product method of correlation (PPMC) was used to test the hypothesis of study.

Pearson product method of correlation (PPMC)

$$P = \frac{\sum(X)(Y)}{\sum X^2 \sum Y^2}$$

Where P= Pearson product of moment correlation

$\sum$ = summation of the frequency

X= means of frequency

Y= Means of frequency.

Result and Discussion

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The Table 1 below shows the socio-economic characteristics of respondents in the study area. It shows female constitute about 55.8% of the respondents while 44.2% were male, indicating a slightly higher participation of women in the study area which could be attributed to the fact that women may play a more visible role in household and community-level waste handling and management practices, particularly in rural and peri-urban settings where domestic waste disposal is often gendered. The responsibility of waste in Nigeria at the household level solely lay on women, who carried out the waste sorting, disposal, and environmental sanitation activities (Adeniran et al., 2017). Also, the highest percentage of respondents (45.0%) were within the 41–50 years age category, followed by those aged 51–60 years (29.2%), while only 2.5% were between 20–30 years. This indicates that middle-aged and older adults dominate the study population and likely possess greater experience and long-term exposure to environmental changes within the forest reserve communities. This is in line with (Ojedokun & Balogun, 2010) that reported older individuals often develop stronger view about environmental degradation because they can compare current conditions with past environmental quality

Furthermore, larger percentage (83.3%) of respondents were married, while 4.2% were divorced (4.2%), and 5.8% were separated. This implies that most of the respondents are having family members which may generate more domestic plastic waste due to increased consumption activities and influence waste management practices. This is in line with Aminu and Ladipo (2020) who reported that household decision-making among married respondents significantly influence waste disposal behavior and environmental practices. The findings also shows that 56.7% of respondents had household sizes of 1–5 persons, while 43.3% had 6–10 persons indicating majority have moderate to large household size and therefore tend to produce more solid waste, including plastic materials as according to the report of Kaza, et al., (2018). Half of the respondents (50.0%) had secondary education, while 27.5% attained tertiary education, 17.5% had primary education, and only 5.0% had no formal education. The result shows there is a high level of education in the study area which is more likely to influence their understanding of the environmental consequences of improper plastic disposal and adopt environmentally friendly behaviors.

In addition, about 39.2% had lived in the area for 11–20 years, while 30.8% had resided there for 21–30 years. This shows most of the respondents have lived in the area for long indicating strong familiarity with local environmental conditions and enhances respondents' ability to assess changes in waste accumulation and ecological impacts over time as also found out by Sogbanmu et al., (2021) that asserted long-term residents serve as valuable community informants and environmental ambassadors. Less than average (35.8%) earned between ₦20,000–₦50,000 while 33.3% earn between ₦51,000–₦80,000 indicating generally low to moderate income levels. The study also shows 24.2% of respondents were traders and farmers each respectively with 21.7% being artisans indicating that livelihoods are strongly connected to informal economic activities and natural resources. This shows there is a mixed population and also suggest a possibility of generating higher waste due to the different nature of business as they depend on plastic packaging materials, such as fertilizer bags, water sachets, and product wrappings, contributing to

environmental plastic load. This result is in line with Food and Agriculture Organization, (2021) that identify economic activities of a study area also determine the nature and amount of waste generated.

Table 1: Socio Economic Characteristics of Respondents in the Study Area

Variables	Frequency	Percentage
Gender		
Male	53	44.2
Female	67	55.8
Age		
20-30	3	2.5
31-40	16	13.3
41-50	54	45.0
51-60	35	29.2
>61	12	10.0
Marital status		
Married	100	83.3
Divorced	5	4.2
Widowed	8	6.7
Separate	7	5.8
Household size		
1-5	68	56.7
6-10	52	43.3
Religion		
Christianity	62	51.7
Islam	55	45.8
Traditional	3	2.5
Education level		
No formal education	6	5.0
Primary education	21	17.5
Secondary education	60	50.0
Tertiary education	33	27.5
Years of residency		
1-10	14	11.7
11-20	47	39.2

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21-30	37	30.8
31-40	17	14.2
>41	5	4.2
Monthly income		
20000-50000	43	35.8
51000-80000	40	33.3
81000-110000	26	21.7
111000-140000	4	3.3
>141000	7	5.8
Occupation		
Artisan	26	21.7
Trader	29	24.2
Teacher	8	6.7
Farmer	29	24.2
Civil servant	10	8.3
Nurse	2	1.7
Clergy	2	1.7
Unemployed	14	11.7
Total	120	100.0

Source: Field Survey, 2026

The results in Table 2 shows that 33.3% of respondents always separate plastics from other waste, 36.7% sometimes, while 22.5% never practice separation which could be attributed to the fact that this method helps them to reuse the plastics. Similarly, 42.5% sometimes and 26.7% always store plastics before disposal. In addition, 25% always take plastics to recycling points, 36.7% sometimes, 10.8% often, while 27.5% never engage in the practice. These findings shows that the recycling of plastics is common among the respondents which could be due to the fact that plastics can be used for other purposes such as refilling and selling of other liquid materials and also due to the delay in reaching the waste management authorities for proper disposal. Wilson et al. (2015) also found that the distance to facilities affects recycling participation in developing regions is a major factor to recycling of waste.

The reuse rate is somewhat higher than reuse of single-use plastics, which reflects practical household adaptation, that reuse behavior is culturally and economically embedded, with 34.2% always reuse plastic containers, 44.2% sometimes, 9.2% often, while 12.5% never. For alternatives to single-use plastics, using cloth or reusable bags was always practiced by 20.8% and 48.3% sometimes, while 12.5% never use them, indicating moderate adoption of

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alternatives to single-use plastics .Furthermore, the table shows using cloth or reusable bags was always practiced among 20.8% and 48.3% sometimes while 12.5% never use them. This shows moderate adoption of alternatives to single-use plastics. This in line with Xanthos and Walker (2017) who reported that adoption of reusable bags is often slow due to convenience and availability issues. Likewise, the results indicate that 27.5% always participate, 31.7% sometimes, 25.0% often, and 5.8% never participate in clean-up activities and this could be attributed to the fact the area is actively involved in community-based environmental action through organized sanitation programs. This is in line with Ferronato and Torretta (2019) who emphasized that community participation is a key driver of waste management success in areas with limited formal systems. Regarding composting food waste instead of mixing with plastics, the findings indicate that 26.7% always compost, 42.5% sometimes, 20.8% often, and 10.0% never compost separately. This illustrates limited integration of organic waste management, which was also discovered by Hoornweg and Bhada-Tata (2012) that composting remains underutilized in many developing communities despite its environmental advantages. The research also indicates that 54.2% always instruct family members on how to dispose of waste correctly, 30.0% sometimes, 3.3% often, and 12.5% never do. This shows strong household-level environmental communication and implies that households serve as important units for environmental knowledge transfer and behavioural reinforcement. This is supported by Miafodzyeva, et al., (2013) explains that behavioural norms are often reinforced through social learning within families. In the same line, 73.3% always encourage children, 16.7% sometimes, 9.2% often, and 0.8% never do so. This is one of the strongest behavioural indicators.

Table 2: Method Used in Managing Plastic Wastes in the Study Area

Methods	Always	Sometimes	Often	Never
1. Separating plastic from other waste	40(33.3)	44(36.7)	9(7.5)	27(22.5)
2. Taking plastics to recycling points	30(25.0)	44(36.7)	13(10.8)	33(27.5)
3. Using plastic containers again at home	41(34.2)	53(44.2)	11(9.2)	15(12.5)
4. Using cloth or reusable bags	25(20.8)	58(48.3)	22(18.3)	15(12.5)
5. Joining community clean-up activities	33(27.5)	38(31.7)	30(25.0)	19(5.8)
6. Keeping plastics in one place before throwing them away	32(26.7)	51(42.5)	25(20.8)	12(10.0)
7. Composting food waste instead of mixing it with plastics		51(42.5)	25(20.8)	12(10.0)
	32(26.7)			
8. Refilling water, oil, or soap instead of buying new plastic bottles	45(37.5)	38(31.7)	29(24.2)	8(6.7)
9. Throwing plastics only in proper waste bins	32(26.7)	49(40.8)	25(20.8)	14(11.7)
10. Giving or selling plastics to recyclers	30(25.0)	47(39.2)	28(23.3)	15(12.5)
11. Avoiding single-use plastics	38(31.7)	47(39.2)	22(18.3)	13(10.8)

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12. Teaching family members how to dispose plastics properly	65(54.2)	36(30.0)	4(3.3)	15(12.5)
13. Encouraging children not to litter	88(73.3)	20(16.7)	11(9.2)	1(0.8)
14. Using strong, long-lasting items instead of plastics	57(47.5)	44(36.7)	12(10.0)	59(49.2)
15. Reporting plastic dumping to community leaders	88(73.3)	20(16.7)	11(9.2)	1(0.8)

Source: Field Survey, 2026

The distribution of respondents into low and high categories based on the methods of managing plastic waste in the study area is shown in the table below, where it can be seen that 56.7% of the respondents are in the low category and 43.3% are in the high category, which means a slightly larger number of respondents practice plastic waste management than adopt management methods. By implication, this means ineffective waste management methods may continue to contribute to environmental pollution, blockage of drainage systems, and poor sanitation outcomes if improved waste management practices are not strengthened through awareness, access to facilities, and behavioural change interventions.

Table 3: Categorization for Method Used in Managing Plastic Wastes in the Study Area

Variable	Frequency	Percentage
Low	68	56.7
High	52	43.3

Source: Field Survey, 2026

Table 4 shows the findings on challenges affecting plastic waste management practices in the adjoining communities of Onigambari Forest Reserve. The challenge identified include the lack of designated waste collection points, reported by 57.5% of respondents which reflects inadequate waste infrastructure and limits proper disposal behaviour within the communities. This aligns with Kaza *et al.*, (2018), who noted that the absence of accessible collection systems is a major barrier to effective solid waste management in low- and middle-income settings. Similarly, limited access to recycling facilities was major challenge among 40.0% of respondents and in the same line, irregular waste collection services was minor among 44.2% which further demonstrate systemic weaknesses in waste service delivery. This is consistent with findings by Ogwueleka (2013), who emphasized that inefficient municipal waste systems significantly reduce recycling participation and encourage informal dumping practices.

In addition, 40% reported inadequate knowledge about proper plastic disposal was major challenge likewise lack of awareness campaigns each respectively which indicate persistent information gaps, which relate closely to the observations of Wu, *et al.*, (2022) that environmental behaviour is strongly influenced by awareness and perceived knowledge. Also, high cost of alternatives to single-use plastics (31.7%), lack of incentives for recycling (27.5%) further highlighted economic disincentives that discourage sustainable practices, as similarly reported by Adeniran *et al.*, (2017) in studies on waste behaviour in Nigerian communities. Other major challenges include cultural practices encouraging dumping (34.2%), low community participation (34.2%), and weak enforcement of regulations (33.3%) which collectively indicate that both social norms and institutional weaknesses reinforce improper waste handling.

Table 4. Challenges Faced By the Respondents in Adopting Plastic Waste Management Practices by the Respondents in the Study Area

Challenges	Major	Minor	Not A Challenge
1. Lack of designated waste collection points.	69(57.5)	34(28.3)	17(14.2)
2. Inadequate knowledge about proper plastic disposal.	48(40.0)	55(45.8)	17(14.2)
3. Limited access to recycling facilities.	48(40.0)	51(42.5)	21(17.5)
4. High cost of alternatives to single-use plastics.	38(31.7)	48(40.0)	34(28.3)
5. Poor enforcement of waste-management regulations.	40(33.3)	52(43.3)	28(23.3)
6. Low community participation in waste-management programs.	41(34.2)	59(49.2)	20(16.7)
7. Lack of awareness campaigns on plastic pollution.	48(40.0)	44(36.7)	28(23.3)
8. Insufficient tools or equipment for managing plastic waste at home.	47(39.2)	48(40.0)	25(20.8)
9. Cultural practices that encourage dumping plastics in the environment.	41(34.2)	47(39.2)	32(26.7)
10. Irregular waste collection services by local authorities.	33(27.5)	53(44.2)	34(28.3)
11. Limited space to store plastic waste before disposal.	41(34.2)	41(34.2)	38(31.7)
12. Poor attitude or negligence among community members toward plastic waste.	31(25.8)	53(44.2)	36(30.0)
13. Lack of incentives for recycling or reusing plastics.	33(27.5)	51(42.5)	36(30.0)
14. Difficulty distinguishing recyclable from non-recyclable plastics.	41(34.2)	41(34.2)	38(31.7)
15. Plastic waste from neighboring communities adds to the problem.	45(37.5)	41(34.2)	34(28.3)

Source: Field Survey, 2026

The Table 5 shows the proportion of respondents categorized by the constraints faced for the adoption of plastic waste management practices in the study area, which indicates that 63.3% of the respondents are in the high category and

36.7% are in the low category, suggesting that most respondents face multiple constraints to adopting effective plastic waste management practices in their communities.

Table 5: Categorization based on the Challenges Faced by the Respondents in Adopting Plastic Waste Management Practices by the Respondents in the Study Area

Variable	Frequency	Percentage
Low	44	36.7
High	76	63.3

Source: Field Survey, 2026

As seen in Table 6 below, there is a statistically significant relationship between the challenges faced by the respondents and the methods used in managing plastic wastes ($r = 0.421$, $p = 0.000$), which means the challenges experienced by the respondents significantly affect the methods used to manage plastic wastes in the study area.

Table 6: Relationship between challenges faced by the respondents in adopting plastic waste management practices and methods used in managing plastic wastes in the study area

Variables	r-values	P-value	Decision
Challenges Vs Method used	0.421	0.000	S

Source: Field survey, 2026

Conclusion

Households in communities bordering the Gambari Forest Reserve were found to have adopted some positive plastic waste management practices but overall adoption remained low due to inadequate waste management infrastructure, limited access to recycling facilities, and low environmental awareness, which was influenced by the challenges faced by households, implying that improved infrastructure, environmental education, and institutional support are needed to promote sustainable plastic waste management in the study area.

Recommendations

The study suggested that waste collection and recycling facilities be provided, environmental awareness campaigns be intensified, waste management regulations be strengthened, incentive-based recycling programmes be introduced, and communities surrounding the Gambari Forest Reserve get more involved, and plastic waste management education be integrated into agricultural extension services to ensure sustainable environmental management.

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