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Economic Empowerment of Women Through the Processing of Household Waste into Marketable Products

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Abstract

Household waste is usually framed as an environmental burden, yet a growing body of community-based initiatives treats it as a raw material through which women can earn income and gain voice. This article examines how the processing of household and domestic waste into marketable products contributes to women's economic empowerment, and what conditions separate short-lived training projects from durable livelihoods. Using a systematic literature review, records were retrieved from the Consensus academic database, deduplicated, and screened against inclusion criteria covering publication between 2021 and 2026, an active DOI, a focus on women, and an explicit link between waste processing and economic value. Twenty studies met the criteria and were synthesised thematically, supported by five recent conceptual and empirical sources. The review identifies five value pathways: organic and biological conversion, plastic and packaging upcycling, textile and agricultural residue crafts, mixed household recyclables, and collective collection services. Across these pathways, empowerment advances through four mechanisms: skill acquisition, product diversification, market and digital access, and collective organisation. However, most evidence comes from short community-service programmes that report outputs rather than measured income or agency. The article proposes a Household Waste-to-Value Empowerment framework and argues that market linkage and collective institutions, not technical training alone, determine whether waste becomes a sustained source of women's economic power

INTRODUCTION

Waste generated by households is one of the most visible failures of contemporary consumption, and it is also one of the most gendered. In many Indonesian and wider Global South households, the daily work of sorting, storing, reusing and disposing of domestic waste falls mainly on women. This labour is rarely counted as economic activity. It is treated as an extension of care work inside the home, and its products, such as cleaner neighbourhoods, reduced burning and recovered materials, are absorbed by the community without payment. The paradox is that the same women who manage waste as unpaid care are often excluded from the parts of the waste economy that generate income, such as aggregation, trading and manufacturing.

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Over the last five years, a large number of community programmes have tried to reverse this paradox by turning household waste into products that can be sold. The circular economy has supplied much of the vocabulary for these programmes. Kirchherr et al. (2023), reviewing 221 definitions, show that the concept has broadened from a narrow focus on recycling toward a systemic view that links resource loops with economic prosperity and social equity. At the community level, this broadened view has been translated into an intuitive promise: if waste is a resource, then the people who handle it, mostly women, can capture its value. Programmes have therefore trained women to convert plastic packaging into crafts (Pasekoenda et al., 2026; Puspitarini et al., 2025), kitchen and organic waste into eco-enzymes, biopesticides and fermented products (Margery & Suryani, 2023; Nugraha et al., 2025; Selpiana et al., 2026), and textile or agricultural residues into fashion items and leather-like crafts (Elvera et al., 2026; Putri et al., 2025).

The Indonesian context makes this question especially urgent. National waste policy has increasingly relied on community structures, including waste banks, PKK groups and village institutions, to deliver reduction targets at the household level. These structures are dominated by women, and their mobilisation has been justified both as environmental policy and as women's empowerment. Syukri (2023) shows that Indonesia's participatory village governance has created new gender policies that bring women into development programmes, yet often in roles that extend their domestic responsibilities rather than expanding their decision-making power. Waste programmes sit squarely within this tension. When women's waste work is organised by the state or by community groups without a clear link to income and authority, empowerment risks becoming a label for additional unpaid labour.

Evidence from outside Indonesia sharpens this concern. Wittmer (2023), using an embodied urban political ecology of women informal recyclers, documents how their bodies and labour sustain the image of a clean city while the work remains stigmatised, hazardous and poorly rewarded. Kristanto et al. (2022) report that waste pickers in Indonesia face health risks, insecure income and weak recognition from formal waste systems. These studies remind us that proximity to waste does not by itself produce economic power. The decisive question is who controls the conversion of waste into value, who sets prices, and who owns the resulting enterprise.

Against this background, the literature on women's waste-based enterprise has expanded quickly, but it has expanded in a particular way. A large share of recent publications are community-service reports that describe a training event, the product made, and participants' enthusiasm. Examples include training housewives in creative recycling (Romadon & Rizkiana, 2026), developing recycled-product social enterprises for village women (Harkim et al., 2025), and building eco-enzyme soap and shampoo products with Nasyiatul Aisyiyah cadres (Amir et al., 2026). These reports are valuable as documentation of practice, yet each one stands alone. Few compare waste streams, few follow participants after the programme ends, and few distinguish between acquiring a skill and achieving sustained income.

A smaller set of research studies offers more analytical depth. Muktar et al. (2025) examine the role of income and skill development in plastic waste-to-wealth entrepreneurship among women in Sub-Saharan Africa. Estrada et al. (2023) show how the SWaCH cooperative in Pune turned women waste pickers into recognised service providers capable of influencing urban waste governance. Sultana et al. (2024) analyse how household food waste management using a 5R approach can strengthen women's roles in Bangladesh, and Rokis et al. (2022) highlight informal leadership education that frames women as "eco-heroines" in solid waste management. In Yogyakarta, Azzahra and Prihatin (2024) read women's waste bank activity through an ecofeminist lens, showing that women's

environmental roles can become a basis for collective agency. Together, these studies suggest that empowerment depends on organisation, recognition and market position, not only on technical capacity.

The gap is therefore threefold. First, there is no integrative synthesis that maps the full range of household waste streams and products used in women's economic empowerment programmes over the last five years. The literature is organised by single projects rather than by value pathways. Second, the mechanisms through which waste processing becomes empowerment are rarely made explicit. Studies often assume that a new product leads to new income and that new income leads to greater agency, without examining each link. Third, the quality of evidence is uneven. Most published work is descriptive and short-term, which makes it difficult for policymakers and practitioners to know which models are worth scaling.

This article addresses these gaps through a systematic literature review of studies published between 2021 and 2026. It asks three questions. (1) What types of household waste and products are used in women's economic empowerment initiatives? (2) Through what mechanisms does waste processing contribute to women's economic empowerment? (3) What conditions limit or sustain these outcomes?

The novelty of the article lies in three contributions. First, it classifies recent initiatives into five value pathways, organic and biological conversion, plastic and packaging upcycling, textile and agricultural residue crafts, mixed household recyclables, and collective collection services, which allows comparison across studies that are usually read in isolation. Second, it proposes the Household Waste-to-Value Empowerment (HWVE) framework, which separates four mechanisms, namely skill acquisition, product diversification, market and digital access, and collective organisation, and links them to distinct empowerment outcomes. Third, it brings a sociological reading to a literature dominated by technical and extension reports. Drawing on feminist political ecology and the circular economy debate, it treats waste processing as a site where gendered labour, market access and institutional recognition are negotiated, rather than as a neutral technical activity.

The remainder of the article is organised as follows. Section 2 describes the review protocol and the selection of studies. Section 3 presents the characteristics of the included studies, the value pathways, the mechanisms of empowerment, and the constraints identified in the literature. Section 4 concludes with implications for policy, practice and future research

METHODS

This study is a systematic literature review followed by a qualitative thematic synthesis. The review was designed to map, rather than to estimate, the effects of household waste processing on women's economic empowerment, because the included studies differ too widely in design and outcome measures to support a meta-analysis.

Data source and search.

Records were retrieved on 13 October 2026 from Consensus, an academic search engine that indexes peer-reviewed literature. Two searches were run, one in English ("Economic Empowerment of Women Through the Processing of Household Waste into Marketable Products") and one in Indonesian ("Pemberdayaan Ekonomi Perempuan Berbasis Pengolahan Limbah Domestik Menjadi Produk Bernilai Jual"), so that both international and Indonesian-language journals were captured. Each search returned 20 records, which were exported in RIS format.

Eligibility Criteria

Studies were included if they (a) were published between October 2021 and October 2026; (b) carried a resolvable DOI; (c) focused on women or women's groups as the main beneficiaries or actors; (d) involved processing household, domestic or

community-level waste; and (e) linked that processing to economic value, such as products, income, enterprise or paid services. Studies were excluded when the processed material was not waste, when the programme did not address women, when the publication fell outside the time window, or when bibliographic metadata were too incomplete to verify authorship and DOI.

Selection

The two searches produced 40 records. After 16 duplicates were removed, 24 unique records were screened by title and metadata. Two were excluded as off-topic because they concerned batik staple fabric processing and family business training rather than waste. The remaining 22 records were assessed for eligibility. Two more were excluded: one was published before the five-year window and carried a malformed DOI, and one lacked author information in its metadata. Twenty studies were included in the synthesis. In addition, five recent sources were identified through targeted searching to supply conceptual and contextual grounding: the circular economy concept (Kirchherr et al., 2023), women informal recyclers (Wittmer, 2023), waste pickers in Indonesia (Kristanto et al., 2022), gender policy in Indonesian village governance (Syukri, 2023), and an ecofeminist study of a waste bank in Yogyakarta (Azzahra & Prihatin, 2024). These five sources inform the framing and discussion but are not counted among the 20 reviewed studies. Figure 1 summarises the selection process.

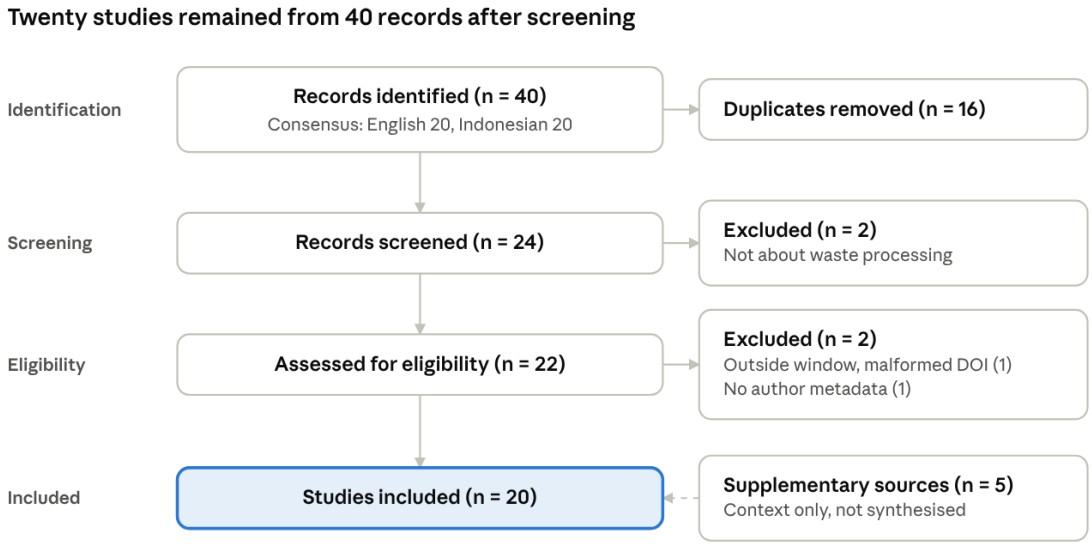


Figure 1. Study selection flow (PRISMA-style) · 40 records to 20 included studies

Data Extraction and Analysis.

For each included study, the following attributes were extracted from titles, bibliographic metadata and publisher pages where accessible: year, setting, waste stream, product or service, beneficiary group, and study type. The studies were then coded inductively in two rounds. The first round grouped them by waste stream and product into value pathways. The second round coded the mechanisms through which each initiative was expected to produce economic empowerment. Codes were compared across studies and refined into four mechanisms, which form the basis of the HWVE framework presented in Section 3.

Limitations of the method.

The review relies on a single database and on two search strings, so relevant work indexed elsewhere may be missing. Because many included studies are short community-

service reports, extraction relied mainly on what the authors reported about their programmes rather than on independently measured outcomes. The synthesis is therefore best read as a map of practice and mechanisms, not as evidence of effect size.

RESULTS AND DISCUSSION

Characteristics of the included studies

The 20 included studies show a field that is young, fast-growing and dominated by practice reports. Fourteen of the 20 are community-service or training reports, and six are research studies using case study, qualitative or survey designs. Publication is concentrated in the most recent period: two studies appeared in each of 2022, 2023 and 2024, eight in 2025 and six in 2026 up to October. Most studies are set in Indonesian villages, urban neighbourhoods and women's organisations such as PKK and Nasyiatul Aisyiyah, while three are explicitly set in Sub-Saharan Africa, India and Bangladesh, and several do not name their site in the title. Table 1 lists the studies with their waste stream, product and beneficiary group.

Table 1. Characteristics of the 20 included studies

No.	Study	Setting (as named)	Waste stream	Product or service	Beneficiaries	Study type
1	Selpiana et al. (2026)	Ulak Segelung Village	Organic waste	Eco-friendly biopesticide	Village women	Community service
2	Elvera et al. (2026)	Dusun Kepuh, Pancarejo	Hybrid batik waste	Fashion accessories	PKK members	Community service
3	Pasekoenda et al. (2026)	Not named	Plastic waste	Keychain crafts	Women	Training analysis
4	Amir et al. (2026)	Indonesia	Eco-enzyme from organic waste	Soap and shampoo	Nasyiatul Aisyiyah cadres	Community service
5	Kartini et al. (2026)	Not named	Shrimp waste	Local wisdom-based products	Women	Community service
6	Romadon & Rizkiana (2026)	RW 15, Meteseh	Household recyclables	Creative recycled goods	Housewives	Training
7	Muktar et al. (2025)	Sub-Saharan Africa	Plastic waste	Waste-to-wealth enterprise	Women entrepreneurs	Research
8	Nugraha et al. (2025)	Sukamiskin	Organic waste	Eco-enzyme (marketed)	PKK groups	Community service
9	Harkim et al. (2025)	Sampali Village, Deli Serdang	Recyclable waste	Recycled products, social enterprise	Village women	Community service
10	Heriberta et al. (2025)	Maro Sebo Village, Jambi	Household waste	Reuse and recycling business, cooperative	Women	Community service
11	Putri et al. (2025)	Nagari Lareh Nan Panjang	Corn residue	Corn leather crafts	Young mothers	Training

12	Rofiah et al. (2025)	Morowali	Household waste	Creative economy products	Women	Training
13	Puspitarini et al. (2025)	Not named	Spunbond bags	Recycled crafts	Women	Training
14	Kaunang et al. (2025)	Fishing communities	Fisheries waste	Alternative income products	Women in fishing households	Research
15	Winih & Wahyudi (2024)	CV. Witama Plastindo	Plastic waste	Recycled plastic (green economy firm)	Women workers	Research
16	Sultana et al. (2024)	Bangladesh	Household food waste	5R practices	Women	Research
17	Estrada et al. (2023)	Pune, India	Municipal solid waste	Cooperative collection services	Women waste pickers	Research
18	Margery & Suryani (2023)	Sei Mencirim Village	Fermented kitchen waste	Processed products sold online	Village community	Community service
19	Rokis et al. (2022)	Not named	Solid waste	Informal leadership education	Women "eco-heroines"	Research
20	Putra et al. (2022)	Margatani Village, Serang	Domestic waste	Recycled products	Community	Community service

Two patterns stand out. First, the Indonesian literature is overwhelmingly framed as community service, which reflects the academic incentive structure of *pengabdian kepada masyarakat*. Second, the international studies are more likely to examine institutions and markets, such as cooperatives, firms and income, while Indonesian studies more often focus on the product and the training event.

Five value pathways

Coding by waste stream and product produced five value pathways, summarised in Table 2. They differ in how much skill they require, how easily their products reach a market, and how much control women keep over the value created.

Table 2. Value pathways from household waste to marketable products

Pathway	Typical products	Studies	n
Organic and biological conversion	Eco-enzyme, biopesticide, fermented food, soap, shampoo, shrimp- and fish-based products	Amir et al. (2026); Kartini et al. (2026); Kaunang et al. (2025); Margery & Suryani (2023); Nugraha et al. (2025); Selpiana et al. (2026); Sultana et al. (2024)	7
Mixed household recyclables	Creative recycled goods, reuse businesses, waste cooperatives	Harkim et al. (2025); Heriberta et al. (2025); Putra et al. (2022); Rofiah et al. (2025); Romadon & Rizkiana (2026)	5

Plastic and packaging upcycling	Keychains, crafts from spunbond bags, recycled plastic	Muktar et al. (2025); Pasekoenda et al. (2026); Puspitarini et al. (2025); Winih & Wahyudi (2024)	4
Textile and agricultural residue crafts	Batik accessories, corn leather crafts	Elvera et al. (2026); Putri et al. (2025)	2
Collective collection services	Paid waste services, leadership in waste governance	Estrada et al. (2023); Rokis et al. (2022)	2

The organic and biological pathway is the largest. It turns the most abundant and most frequently handled household waste, kitchen and food scraps, into products such as eco-enzymes, biopesticides and cleaning products (Amir et al., 2026; Nugraha et al., 2025; Selpiana et al., 2026). Its advantage is low entry cost: inputs are free and the techniques can be learned in a short time. Its weakness is product sameness. When many groups produce eco-enzyme in the same area, local demand is quickly saturated. Studies that move further, for example by turning eco-enzyme into soap and shampoo (Amir et al., 2026) or by using shrimp and fisheries waste for local food products (Kartini et al., 2026; Kaunang et al., 2025), show a deliberate attempt to add value and to differentiate.

The plastic and packaging pathway responds to the most visible environmental problem. Craft products such as keychains and bags (Pasekoenda et al., 2026; Puspitarini et al., 2025) make the circular economy tangible and are well suited to training. Yet crafts depend on labour-intensive production and on buyers who value their story. The two research studies in this pathway point to a different model. Winih and Wahyudi (2024) examine women's employment in a recycling firm, and Muktar et al. (2025) focus on income and skill development in waste-to-wealth entrepreneurship. In both, empowerment is tied to stable economic roles rather than to one-off products.

The mixed household recyclables pathway includes programmes that train women to handle several waste types at once and to build small enterprises or cooperatives around them (Harkim et al., 2025; Heriberta et al., 2025; Rofiah et al., 2025). Heriberta et al. (2025), for example, mentored women on recycling, reuse and income-generating business models, with a women-led cooperative as the intended outcome. The textile and agricultural residue pathway is small but distinctive. Batik waste and corn residue carry cultural and design value, allowing products to be positioned as local fashion rather than as recycled goods (Elvera et al., 2026; Putri et al., 2025). Finally, the collective services pathway shifts the focus from products to paid work. The SWaCH cooperative shows that women can be organised to sell waste collection services and to negotiate with municipal authorities (Estrada et al., 2023).

Mechanisms of empowerment: the HWVE framework

Across the pathways, the studies describe four mechanisms through which waste processing is expected to empower women. Table 3 presents them as the Household Waste-to-Value Empowerment (HWVE) framework.

Table 3. The Household Waste-to-Value Empowerment (HWVE) framework

Mechanism	What changes	Empowerment outcome	Illustrative studies
1.Skill acquisition	Women learn sorting, processing and production techniques	Capability and self-confidence	Puspitarini et al. (2025); Putri et al. (2025); Romadon & Rizkiana (2026)
2.Product diversification	Waste becomes higher-value or	Potential income and product identity	Amir et al. (2026); Elvera et al. (2026); Kartini et al. (2026)

	differentiated products		
3. Market and digital access	Products reach buyers through social enterprise and online sales	Realised income and economic independence	Margery & Suryani (2023); Nugraha et al. (2025); Muktar et al. (2025)
4.Collective organisation	Women form cooperatives, groups and leadership roles	Bargaining power, recognition and voice	Estrada et al. (2023); Heriberta et al. (2025); Rokis et al. (2022)

The four mechanisms form a ladder rather than a menu. Skill acquisition is the most common entry point and appears in almost every programme. It produces capability and confidence, which matter for women whose domestic work is rarely recognised as skilled. Yet a skill without a buyer does not become income. Product diversification is the step at which waste becomes something distinct enough to sell. Moving from raw eco-enzyme to soap and shampoo (Amir et al., 2026), or from batik offcuts to fashion accessories (Elvera et al., 2026), raises both price and identity.

Market and digital access is where economic empowerment is actually realised. Margery and Suryani (2023) explicitly pair the processing of fermented kitchen waste with internet-based selling, and Nugraha et al. (2025) combine eco-enzyme production with marketing under a social entrepreneurship model. Muktar et al. (2025) emphasise income itself as a key factor in waste-to-wealth entrepreneurship. These studies suggest that market linkage is the step most often missing from training-based programmes.

Collective organisation is the mechanism that turns income into power. Estrada et al. (2023) show that a cooperative gives women waste workers a collective identity and a seat in urban governance. Rokis et al. (2022) point to leadership education that allows women to act as recognised "eco-heroines". Azzahra and Prihatin (2024) find a similar dynamic in a Yogyakarta waste bank, where women's environmental roles become a basis for collective agency. Without this step, individual earnings remain small and vulnerable, and women stay at the bottom of the waste value chain.

Constraints: why many programmes stop at the first rung

The synthesis also reveals why many initiatives do not climb the ladder. The first constraint is programme duration. Community-service reports usually describe a training event and its immediate products. They seldom report what happens months later, so it is unclear whether production continues. The second constraint is market saturation and weak demand. Many groups produce similar low-priced items, such as eco-enzyme or simple crafts, for the same local buyers. The third constraint is the double burden. Waste processing is often added to women's existing domestic and care responsibilities. Syukri (2023) warns that participatory village programmes can extend women's duties without extending their authority, and waste programmes are vulnerable to the same pattern.

The fourth constraint is position in the value chain. Wittmer (2023) and Kristanto et al. (2022) show that women and waste workers can sustain the waste system while capturing little of its value. Household processing programmes avoid the worst hazards of informal picking, yet they can reproduce the same hierarchy if women supply cheap products to intermediaries who control prices. The fifth constraint is evidence quality. Very few included studies measure income, savings, decision-making or time use before and after the programme. This makes it difficult to compare models or to justify public investment.

Discussion

Read through the lens of feminist political ecology, the findings suggest that household waste is not simply a free resource waiting to be converted. It is embedded in a

gendered division of labour that assigns waste management to women while reserving its economic value for others. Programmes that only teach techniques risk turning women's unpaid environmental care into unpaid or low-paid production. Programmes that link processing to markets and collective institutions, by contrast, can begin to shift both income and recognition.

This reading also qualifies the circular economy narrative. Kirchherr et al. (2023) note that the concept increasingly includes social equity, yet the reviewed studies show that equity does not follow automatically from closing material loops. The distribution of value inside the loop matters. In the HWVE framework, the third and fourth mechanisms, market access and collective organisation, are the points where circular economy practice becomes women's economic empowerment.

For Indonesia, the implications are practical. Village funds, PKK networks and waste banks already provide the infrastructure for the first two rungs. What is missing is systematic support for the upper rungs: product standards and branding, access to digital and institutional markets, and the formation of women-controlled cooperatives with legal status and bargaining power. Programme evaluations should also move beyond counting participants and products toward measuring income, control over earnings and participation in decision-making.

CONCLUSIONS

Processing household waste into marketable products can contribute to women's economic empowerment, but only when it moves beyond training. This review of 20 studies published between 2021 and 2026 identified five value pathways, led by organic and biological conversion and followed by mixed household recyclables, plastic and packaging upcycling, textile and agricultural residue crafts, and collective collection services.

The proposed HWVE framework shows that empowerment unfolds through four mechanisms: skill acquisition, product diversification, market and digital access, and collective organisation. Most programmes reach the first two. Far fewer secure markets or build women-controlled institutions, which are the steps that turn skills into sustained income, bargaining power and recognition.

Three implications follow. For practitioners, programmes should be designed around a market from the start, with product differentiation, branding and digital sales built into the plan rather than added afterwards. For policymakers, village funds, PKK networks and waste banks can be used to support women-led cooperatives with legal status and fair pricing, while guarding against adding unpaid work to women's existing burdens. For researchers, the field needs longitudinal and mixed-method studies that measure income, control over earnings, time use and decision-making, so that effective models can be distinguished from one-off events. Future reviews should also extend the search to additional databases and test the HWVE framework against field data.

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