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Local Environment

The International Journal of Justice and Sustainability

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/cloe20

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To cite this article: Mélanie Surchat, Micline Irakoze, Speciose Kantengwa, Matieyedou Konlambigue, Leonhard Späth, Benjamin Wilde, Johan Six, Pius Krütli & Michael Stauffacher (2024) "The bad job brings the good one": photovoice study with female and male waste workers in Rwanda, Local Environment, 29:5, 565-592, DOI: 10.1080/13549839.2023.2287052

To link to this article: https://doi.org/10.1080/13549839.2023.2287052

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Published online: 08 Dec 2023.

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LOCAL ENVIRONMENT
2024, VOL. 29, NO. 5, 565–592
https://doi.org/10.1080/13549839.2023.2287052

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"The bad job brings the good one": photovoice study with female and male waste workers in Rwanda

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ABSTRACT

Within the circular economy framework in Africa, sustainable waste management can contribute to improving the environment and creating green jobs. However, recycling activities are mostly carried out by informal workers, who are often forgotten in discussions about the circular economy. To ensure the development of a socially just circular economy, their voices must be heard and their needs accounted for. This study took place in Rwanda, a circular economy leader in Africa, and explored the experiences of workers engaged in biowaste recycling, with a particular focus on the distinctions between the experiences of female and male workers. We used photovoice as a methodology, allowing waste workers to visually report on the benefits and drawbacks of being involved in biowaste recycling. Seventeen waste recyclers took pictures representing different working experiences, which was followed by individual in-depth interviews to elicit the meaning behind each picture. Data analysis consisted of a reflexive thematic content analysis of interview transcripts and a participatory data analysis with the workers. The results show that the workers valued their jobs for their social relations at work, being responsible for a task, being productive, and generating savings. Workers negatively highlighted the health risks associated with waste sorting, difficult working conditions, and low salaries. We found gendered differences in workers' marital status and access to paid work opportunities. Although working in waste recycling encompasses occupational risks, this photovoice study highlights that access to work improves workers' relative well-being and that this type of circular economy can help create meaningful jobs.

ARTICLE HISTORY
Received 9 May 2023
Accepted 10 November 2023

KEYWORDS
Circular economy; gender; informal waste workers; recycling; photovoice; social justice

1. Introduction

1.1. A "worker-blind" circular economy in low- and middle-income countries

Transitioning to a circular economy (CE) can contribute to achieving Sustainable Development Goals (Desmond and Asamba 2019; Gower and Schröder 2016; Schröder, Anggraeni, and Weber 2019). However, one sector requiring improvement is solid waste management, which

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This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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poses serious challenges to many low- and middle-income countries (LMICs) (Cointreau 2006). In countries with growing demographics and increasing consumption, improving the functioning of solid waste management systems is essential (Srivastava et al. 2015). It is estimated that a CE transition will not only create job opportunities by developing solid waste management but will also reduce pollution and associated health, environmental, and financial costs (Gower and Schröder 2016).

In many LMICs, dysfunctional state-led municipal waste systems push individuals, cooperatives, and small and medium-sized enterprises (SMEs) to dominate the collection, transport, sorting, processing, and recycling of waste (CWG and GIZ 2011). Medina (2007) estimates that up to 2% of LMICs' populations live by collecting and selling waste, and most of this work is done by informal workers. In this study, informality is understood as "activities by informal economy workers and units [that] are not covered or are insufficiently covered—in law or in practice—by formal arrangements" (ILO 2009, 47). For most workers, this means their informal work should not necessarily be considered a negative characteristic, as informality is often the norm rather than the exception, and informal work provides employment and income. According to the International Labour Organization, approximately 90% of rural and urban workers in sub-Saharan Africa work in the informal economy (ILO 2009). In that sense, waste management and recycling in LMICs are the basis of livelihood for millions of people (Scheinberg et al. 2011).

The critical role played by waste pickers within CE is often undervalued, particularly in urban areas of LMICs (Gutberlet et al. 2017; Velis 2017). According to Korsunova et al. (2022), the current CE is "worker blind" because it is driven by policies and innovations characteristic of developed industrial markets. This contrasts with the situation in most LMICs, where CE is "necessity-driven", meaning that many people perform circular practices daily (Korsunova et al. 2022). Similarly, Frey and Stutzer (2002) raise CE's lack of focus on subjective well-being, understood here as "what leads people to evaluate their lives in positive terms" (Diener 1984, 543). Frey and Stutzer (2002) highlight that when social dimensions are mentioned within CE, only job creation is considered, which does not give a clear understanding of the extent to which CE could contribute to subjective well-being. Therefore, some scholars advocate for a more holistic and human-centred approach to CE (Oliveira et al. 2021; Schröder, Lemille, and Desmond 2020), one that integrates the perspectives and needs of waste workers. Only by doing so can we ensure the development of an inclusive and socially just circular economy.

1.2. Experiences and livelihood strategies of informal waste workers

Some authors have focused on the experiences and livelihood strategies of informal waste workers and provided data on what it means to be engaged in this sector in LMICs (Dada et al. 2023; Noel 2010; Scheinberg, Muller, and Tasheva 1999; Srivastava et al. 2015; Wittmer 2021; Yu, Blaauw, and Schenck 2020). For example, Wittmer's (2021) work with female waste pickers in India shows how this occupation can improve workers' mental and social well-being, even though it might impact their physical health negatively. Similarly, Noel (2010) interviewed 390 solid-waste workers in Port-au-Prince, Haiti, to describe their livelihood strategies. The author shows, first, that solid waste management is inclusive in relation to age, while highly segregated between genders, who perform different activities. Second, female workers suffer from different health issues than males (females: fever, headache, stomach problems, chest complaints, coughs, diarrhoea, skin irritation, and rashes; males: sprains/strains, itching eyes, boils, and colds). Third, waste workers suffer difficult working conditions and receive too little financial return in comparison to the multiple services they render society (Noel 2010). Another study compared the contribution of the informal waste sector in six cities within six countries (Romania, Peru, Zambia, Puna, Quezon, and Cairo) (CWG and GIZ 2011). Its authors reported positive elements, including that waste pickers recognise and appreciate the relative autonomy and freedom of their activity, and showed that informal workers' and service providers' wages usually exceed the legal minimum, which balances their difficult working conditions (CWG and GIZ 2011).

Overall, the literature introduced above demonstrates that informal waste workers perceive positive and negative dimensions in their activities and that geographical context matters in shaping waste workers' experiences. One cannot just say that this job is bad or good in absolute terms. Rather, as argued by Ashton et al. (2022), CE advocates should critically interrogate CE frameworks and discuss – for each sustainability pillar – who the winners and losers are. Rather than demonising the informal employment conditions of many waste workers, it is relevant to recognise workers' contributions to CE, and assess how CE plans can improve the working conditions of waste workers and increase their social well-being. This study contributes to the topic of waste workers' well-being by focusing on biowaste recycling in Rwanda. The study's goal is to understand how waste workers perceive and experience their jobs and how their jobs affect their personal lives. We addressed two research questions:

1. What are the experiences of workers employed in biowaste recycling?
2. To what extent do female workers' experiences differ from those of males?

1.3. Research design: Exploring workers' perspectives from the inside through photovoice

While informal workers are at the heart of CE, their perspectives are not sufficiently considered. When they are, it is mostly from a semiquantitative approach, using interviews and surveys with more than 100 respondents (Hayami, Dikshit, and Mishra 2006; Noel 2010; Schenck et al. 2019; Wittmer 2021). We advocate the importance of complementing these research insights with a more inductive participatory approach that gives waste workers more space to express themselves. To answer our research questions, we chose to use photovoice as a qualitative research method grounded in the theoretical underpinning of Paulo Freire's critical pedagogy and feminist theory (Wang and Burris 1997). To our knowledge, this photovoice study is the first that focuses specifically on the lived experiences of waste workers and the first on waste workers in Rwanda. This innovative approach involved risks and uncertainties that we could not anticipate from the previous literature. We will reflect on these challenges in the discussion section.

We chose the photovoice research design for four reasons. First, when investigating workers' experiences and/or work satisfaction, one must acknowledge that "satisfaction" is not a universal concept and neither is a "good" or "bad" job (Burchell et al. 2014). Workers in Rwanda might have different expectations of what their job should encompass, and researchers might unconsciously ignore certain dimensions of that work because of their "Western gaze" (Mohanty 1984). This is critical when considering the position of the lead researcher in this study: a white, middle-class, Swiss woman who positions herself as a mediator with the power to elevate the lived experiences of often unconsidered Black communities. Second, to decrease researcher bias, it is necessary to follow an inductive approach that leaves space to discover the "unexpected". This is referred to by Plunkett, Leipert, and Ray (2013) as a phenomenological approach with photovoice to understand the "situatedness" of a certain phenomenon. Indeed, participatory data collection and analysis within photovoice allows for balanced power relations between "researcher" and "participants" (Castleden and Garvin 2008). Third, an anticolonial application of photovoice (Fricas 2022) challenges the opposition of so-called "scientific knowledge" to "local knowledge" that co-researchers might share (Chilisa 2017). Both views of the phenomenon should co-exist. Fourth, using photovoice in this study was an attempt to embed the research in the "epistemologies of the South" (Santos 2014) to allow communities with low literacy to express themselves visually and orally (Wang and Burris 1997).

As it is not this study's goal to contribute to photovoice on a methodological level, we refer to articles from Fricas (2022) and Evans-Agnew and Rosemberg (2016). Both articles discuss the ethical challenges of using photovoice and provide guidance and reflection questions that steered us in our application of photovoice. Thus, we decided to name the seventeen waste

workers who participated in this study as "co-researchers", following Fricas (2022, 1): "Using the term 'co-researcher' is intended to convey respect, mutuality, and an intentionality about decolonizing methodologies". Figure 1 summarises the steps in this adapted version of the photovoice methodology.

1.4. Study background and employment characteristics in Kamonyi District, Rwanda

This study is embedded in research for a development project called Rural Urban Nexus RESilience (RUNRES), funded by the Swiss Development and Cooperation Agency (Wilde et al. 2021). RUNRES seeks to recycle organic waste from urban areas to produce animal feed and soil amendments for rural areas, thereby restoring rural-urban-rural nutrient fluxes. RUNRES Phase 1 (2019–2023) supports SMEs that recycle biomass, such as crop residues and biowaste from households. This study focuses on three SMEs in Rwanda supported by RUNRES, which will be referred to as Companies A, B, and C, to maintain their anonymity. All three are in Rwanda's Southern Province in the district of Kamonyi, approximately 30 kilometres from Kigali (Figure 2).

Rwanda is a landlocked country in the East African Community, with approximately 13.2 million inhabitants in 2022 (NISR 2023). Despite strong growth in the last two decades, Rwanda still ranks as a low-income country with a purchasing power parity–adjusted gross domestic product (GDP) per capita of USD 2,363 (the corresponding average for sub-Saharan Africa is USD 4,019) (ILO 2020). A

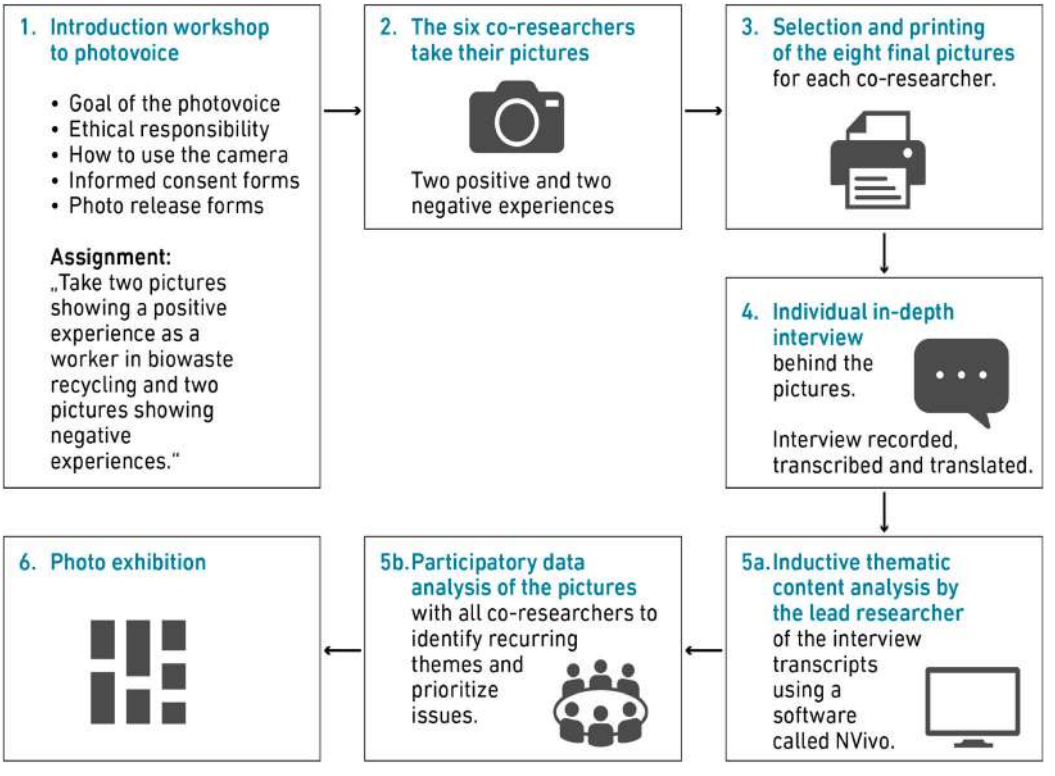

Figure 1. Summary of the six phases carried out in this photovoice study (own figure). Box 1. Workshop introducing photovoice, clarifying goal, and assignment "Take two pictures showing positive experiences as a worker in biowaste recycling and two pictures showing negative experiences". Box 4. Individual, in-depth interview about the pictures. Box 5a. Inductive thematic content analysis of the interview transcripts by the lead researcher using software NVivo. Box 5b. Clustering themes and prioritising issues in groups. Box 6. Four photo exhibitions were organised, three in Kigali (Rwanda), and one in double blind. The virtual audio-guided exhibition is available here: https://youraudiotour.com/tours/listen-through-their-eyes-stories-from-rwandan-biowaste-workers/

Figure 2. Rwanda and Kamonyi District (K on the map) in the Southern Province (own figure).

study of the Rwandan labour market estimates that only 10% of total employment is in the formal sector (Danish Trade Union Development Agency 2021). In 2018, 49% of Rwandan workers were in extreme poverty – living with their families on less than USD 1.90 per person per day – compared to under 33% in Africa as a whole (ILO 2020). Agriculture is the main economic activity in Rwanda, employing around 70% of the population and contributing to 26% of the national GDP (Republic of Rwanda and National Institute of Statistics of Rwanda 2022).

Kamonyi District has an unemployment rate of 24% and a labour force participation rate, representing the percentage of the population either working or actively looking for work, of 55% (Republic of Rwanda 2018). Approximately 34% of the population in Kamonyi is identified as extreme-poor, 23% as poor, and 53% as nonpoor (Republic of Rwanda and National Institute of Statistics of Rwanda 2021). An extreme-poverty line was set as the cost of buying the food consumption basket if nothing was spent on nonfood at all; this line corresponds to RWF 83,000, and the poverty line corresponds to RWF 118,000 (Republic of Rwanda and National Institute of Statistics of Rwanda 2021, 14). Compared to other districts in Southern Province, Kamonyi is second in terms of nonpoor levels, just after Huye, the main city in Southern Province (Republic of Rwanda and National Institute of Statistics of Rwanda 2021). Agriculture is the main economic sector, with 78% of the population aged 16 and

above usually working in agriculture, followed by trade (7%) and construction (4%) (Republic of Rwanda and National Institute of Statistics of Rwanda 2021, 30). However, as over 80% of Kamonyi's economy is based on agriculture, arable land is largely subjected to soil erosion, which negatively affects productivity (Republic of Rwanda 2018, 14).

The government of Rwanda is well aware of CE's potential, as it is already considered the cleanest country and a CE pioneer for Africa (Desmond and Asamba 2019). In December 2022, Rwanda hosted the "World Circular Economy Forum", during which it officially launched the "Rwanda National Circular Economy: Action Plan and Roadmap". The action plan identifies four priority sectors for CE development: agriculture, waste, construction, and water. The plan aims to ensure that waste is collected separately and sorted properly to achieve high-quality waste fractions, which is a prerequisite for a higher recovery rate across all waste streams (Republic of Rwanda and National Institute of Statistics of Rwanda 2022). Regarding agriculture, the focus is on producing food based on regenerative and resource-efficient principles, integrating closed loops into farming operations, and optimising transport and storage to reduce post-harvest losses. The report mentions the transformational societal impact that can be observed in both sectors. Youth and women have the potential to play an important part in the recycling and reuse economy (Republic of Rwanda, Ministry of Environment, and UNDP 2022). Some of the plan's policy interventions mention informal workers and the need to secure and improve their working conditions by sorting waste at source and integrating them into the formal economy. These governmental concerns highlight the relevance of our photovoice study.

2. Materials and methods

2.1. Sampling and selection of co-researchers

The co-researchers selected for photovoice are part of the RUNRES research project, which gave access to three enterprises and their workers. Multiple interactions occurred with each company's leaders prior to the study to explain the need to make the workers' perspectives visible. These interactions were necessary to build trust and avoid being perceived as working "against" the leaders. They were updated about our activities throughout the research, and we organised a workshop at the end of the study to discuss potential improvement measures. Once this was clarified, the first and second authors started working with the co-researchers by visiting them at the three sites in November 2021 and explaining the photovoice research process. As all the workers wanted to be involved, we had to randomly pick a subset of female and male co-researchers for each site (six in Company A, five in Company B, and six in Company C).

2.2. Characteristics of participants and biowaste companies

The three biowaste companies considered in this study belong to different business types within CE. Company A is a cassava flour production company that recycles cassava peels to produce an animal feed component. Company B recycles raw fruit waste from a local juice factory and household food waste to feed black soldier fly larvae, which grow and are sold as a protein source for animal feed (pigs, poultry, fish). Company C collects municipal waste. After the organic and inorganic fractions are separated, the decomposable portion is used to produce compost. Of the seventeen co-researchers involved in the photovoice study, there were nine women and eight men, as Table 1 shows.

2.3. Data collection

Once the co-researchers were selected, we organised an introduction workshop (November 2021) in Kinyarwanda to explain the goal of the photovoice research, raise awareness of ethical guidelines when taking pictures, and practice using the digital camera. We distributed to each co-researcher

Table 1. Characteristics of the seventeen co-researchers at the time of the photovoice study.

	Gender	Age	Marital Status	# of children	Biowaste Company
Felicite	F	40	Widowed	3	A
Liberata	F	50	Widowed	3	A
Elise	F	21	Single	0	A
Julienne	F	19	Single	1	B
Alphonsine	F	30	Widowed	1	B
Jeanette	F	22	Single	0	B
Alphonsine	F	33	Single	1	C
Vestine	F	46	Single	2	C
Groliose	F	24	Single	2	C
Thierry	M	23	Single	0	A
Paul	M	21	Single	0	A
Michel	M	39	Single	1	A
Ernest	M	28	Married	1	B
Ismael	M	20	Single	0	B
Yusuf	M	54	Married	5	C
Alexandre	M	41	Married	4	C
Pierre	M	31	Married	1	C

an informed consent form and a photo release form, both in Kinyarwanda. These explained that their pictures were their property, with "user rights for noncommercial use" granted to the first author. The co-researchers were asked if they wanted to have their full names mentioned or not and if they wanted their faces to be blurred for academic/outreach purposes. All co-researchers wanted to be named and have their faces shown for any use of their pictures. Although publishing real names in academic journals can raise ethical questions, we decided to mention their first names in accordance with the situatedness of this research, which is linked to the guidance of Fricas (2022, 13): "From an anticolonial perspective, the use of pseudonyms and anonymisation is ahistorical and acontextual—precisely what we are trying to avoid". Once all ethical dimensions were clarified, we gave the co-researchers the following photo assignment: Please take two pictures representing positive experiences of your work in the biowaste company and two pictures representing negative experiences of your work. From a methodological viewpoint, it is important to note that the assignment must remain as open as possible to avoid thematic guidance, as co-researchers should be free to take pictures of what they believe is important.

We revisited each site three times during December 2021 and January 2022. First, we confirmed with each co-researcher their final selection of pictures. Second, once all the pictures were printed, the second author conducted in-depth interviews in Kinyarwanda with the seventeen co-researchers individually. Every interview was audio-recorded to be able to transcribe and translate them later into English. During the first two interviews, we followed the "SHOWED[1]" acronym to explain the content of the pictures (Hergenrather, Bardhoshi, and Pula 2009). We rapidly realised that the set of questions in "SHOWED" was too complex for the co-researchers. As others have done (Wilson et al. 2007), we switched to the "PHOTO" acronym[2], which was better adapted to the co-researchers. To ease co-researchers into the conversation, we started by asking general questions about their access to the job, previous working experience, education, family, and partnership status. Finally, the first and second authors returned in December 2022 to conduct three group participatory data analyses. This took place a year later to give the lead researcher time to access all interview transcripts and reflect on the meaning of the data collected. In June 2023, the first author returned to Rwanda for three photovoice exhibitions, during which co-researchers were able to present their pictures and share their stories with the general public (two exhibitions) and with RUNRES related audience (one exhibition).

To account for the ethical dimensions of conducting participatory research with fragile communities (Hammett and Sporton 2012), we financially compensated co-researchers at the end of the individual interviews (December 2021) and at the end of the group participatory data analysis (December 2022). This accounted for the time co-researchers spent in workshops and taking pictures. The co-researchers were also allowed to take four pictures for themselves that were printed

for them. This research was approved ethically by ETH Zürich (EK 2021-N-53) and received a research permit from the Rwandan National Council for Science and Technology (NCST/482/232/2021).

2.4. Data analysis

First, the lead researcher conducted a reflexive thematic analysis (TA) according to Braun and Clarke (2022) with NVivo software (version 12, release 1.71) (QSR International, Ltd. 2023) to elicit the main positive and negative experiences from the seventeen transcripts. By reading the textual data, the researcher identified codes that were, in a second phase, clustered into themes considered "patterns of meaning anchored by a shared idea" (Braun and Clarke 2022, 16). The themes and codes identified are shown on the left side of Table 2.

Second, we conducted three participatory data analysis (PDA) workshops (one per company site) with the co-researchers in December 2022 to complement and cross-validate the thematic analysis. We brought each co-researcher's four pictures and asked them to present the meaning of their pictures to their colleagues. After the first round of sharing, they were asked to find similarities between their pictures, cluster them, and name each cluster. To guide this exercise and take notes on the discussion, two Rwandan facilitators were hired. The workshop ended once everybody agreed on a way to cluster the groups' pictures and an appropriate theme was found to name each cluster. Table 2

Table 2. Combined approach to data analysis.

Thematic analysis (TA)		Participatory data analysis (PDA)		
Themes	Codes	Company A	Company B	Company C
Life improvement	Savings in Ibimina (local saving groups) Investment in livestock, land (or any physical asset) Savings with momo (mobile banking system)	Outputs from salary (5 pictures)		
Work satisfaction	Productive at work Work as the essence of everything Easy tasks at work Compost as the essence of farming Responsibility for a task		Productivity and teamwork (2 pictures) Knowledge (4 pictures) Pride and memory (3 pictures)	Having a responsibility for a task (5 pictures)
Community empowerment	Social interactions Mental well-being	Social interactions (3 pictures)	Productivity and teamwork (2 pictures)	Teamwork and interactions (4 pictures)
Occupational safety	Lack of protective materials Work is bad for health Dangerous machinery Hazardous handling of materials		Health issues (3 pictures)	Health issues and risks (7 pictures)
Working conditions	Work is physically difficult No health insurance No clean water access on site No access to a clean toilet on site Low wage		Difficult working conditions (3 pictures) Gender roles (2 pictures)	Physical job does not match the salary (3 pictures)
Productivity bottlenecks	Weather dependency No electricity Not enough work External dependency	Climate change reduces production (4 pictures) Lack of cassava (3 pictures)		

(right side) shows the thematic clusters on each company site. The themes highlighted in grey in Table 2 are those that were mentioned only in the PDA or the TA.

3. Results

This section is structured into three parts. First, we present the combined results from the thematic analysis (TA) and the participatory data analysis (PDA) shown in Table 2. In the description, we refer to the TA or PDA to highlight some of the differences (themes in grey in Table 2) between the two data analysis approaches. This will allow a response to the first research question: What are the experiences of workers employed in biowaste recycling? Second, we present thematic differences across study sites (companies) raised by the co-researchers, mostly during the PDA. Third, we present gendered experiences in terms of marital status differences between female and male workers and gendered access to job opportunities. This allowed us to respond to the second research question: To what extent do the female workers' experiences differ from the males? All citations presented below were extracted from the interview transcripts and translated into English.

3.1. Co-researchers' experiences as workers in biowaste recycling

3.1.1. Life improvements (TA) / outputs from salary (PDA)

Many pictures taken by the co-researchers showed assets they purchased thanks to their income: a goat (Figure 3), new clothes, or land (Figure 4). During TA, we called these "life improvements",

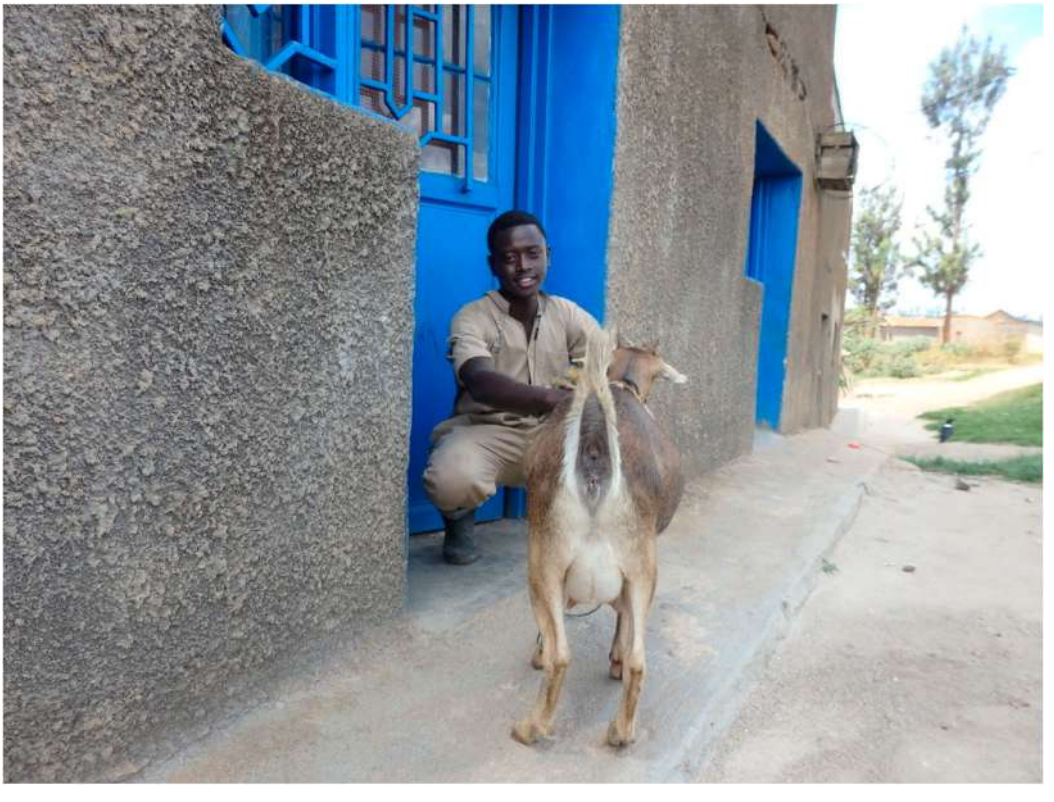

Figure 3. Paul proudly presents the goat that he bought with his savings and which will soon give birth, bringing returns to his investment (Date: 7 December 2021 to 13 December 2021). Photo credit: Paul N.

Figure 4. Liberata stands on the land she owns, where she grows cassava, a subsistence crop in Rwanda. (Date: 7 December 2021 to 13 December 2021). Photo credit: Liberata N.

and during PDA, co-researchers from Company A called these "outputs from salary". Even though wages were low, co-researchers were able to save money monthly in local saving groups, called "ibimina" in Kinyarwanda or with mobile services (momo). Being part of saving groups helped the co-researchers set aside small amounts daily to receive a larger saved amount monthly, thereby enabling investments in larger assets. Having a monthly wage, even small, improved the lives of the co-researchers, who were able to access assets. Anecdotally, one worker from Company C took his work gum boots to his hometown over the weekend to show his community that he had economic revenue. In that sense, the gum boots symbolised his improved societal status from *having* a job.

3.1.2. Work satisfaction (TA) – responsibility for a task (TA/PDA) – knowledge (PDA)

"Work satisfaction" as a theme was induced via the following codes in the TA: "responsibility for a task", "work as the essence of everything", "easy tasks at work", "compost as the essence of farming", and "productive at work". During the PDA at Company B, co-researchers chose the theme of "pride and memory" to cluster three of their pictures, in which they were posing with their best clothes and a rabbit, purchased with their savings. During the PDA, co-researchers from Company B agreed that "knowledg" was the best theme. Similarly, Yusuf from Company C also mentioned "knowledge" when explaining the meaning of one of his pictures. Yusuf is responsible for compost production, and he explained that having knowledge of compost production allowed him to become responsible for the process. This eventually allowed the company site supervisor to trust him in this work. When discussing with co-researchers from Companies A and C during the PDA, "responsibility for a task" was the theme represented in multiple pictures. Indeed,

Figure 5. Pierre emphasises his responsibility for fastening compacted plastic. (Date: 14 December 2021 to 20 December 2021). Photo credit: Pierre N.

practically all the co-researchers used one of their pictures to show the task for which they were responsible (Figures 5 and 6 below). On all company sites, it seemed that being responsible for a task gave them satisfaction and a sense of pride in "having knowledge" for something. For example, Pierre from Company C took Figure 5 and gave the following explanation:

> I took this picture, because you see that stack of compacted bottles? I am the one who knits them like that, so I like to do it as it is my job, and I have the knowledge to do it. (Pierre N., Company C)

3.1.3. Being productive at work (TA-PDA)

In both the TA and PDA, the sense of productivity was clearly thematised. Co-researchers mentioned productivity at work as a positive experience. For example, Yusuf, in Figure 7, presents his "best working team", with which he can make a productive day at Company C. Similarly, Figure 8 was taken by Ismael and Alphonsine, who rear black soldier flies (BSF) at Company B. It represents a key moment: the day when they collect the flies' eggs. It captures their hard work taking care of the BSF. Both hope to harvest many eggs (productivity), so their boss will be pleased. Alphonsine compares the BSF-rearing process to motherhood:

> You see, when a person gives birth, you have to take care of the baby until he or she has grown. So I like this job because if we get many eggs, and more larvae, we make our boss happy because that is production. (Alphonsine M., Company B)

Likewise, co-researchers referred to "being unproductive" as something demotivating. Productivity bottlenecks were mostly discussed by co-researchers from Company A, who mentioned problems

Figure 6. Vestine shows the task for which she is responsible: drying paper. (Date: 14 December 2021 to 20 December 2021). Photo credit: Vestine U.

such as "weather dependency", "power cuts", and "not enough cassava available". For example, relying on electricity to mill or the sun to dry cassava was raised multiple times as something frustrating. For this reason, the PDA co-researchers chose to put one of their picture clusters under the theme "climate change reduces production". When there is no cassava available on-site, there is no work for most co-researchers from Company A.

3.1.4. Community empowerment (TA) – social interactions and teamwork (PDA)

Social interactions appeared to be an important dimension of work during the TA and PDA. The co-researchers mentioned that relationships with their colleagues helped them cope with hard work and be productive as a team. Interestingly, some women also mentioned that social interactions helped them to be mentally strong. Women spend hours sitting together to sort waste, and this allows them to talk, as the task is not physically challenging. This is what the TA thematised as "mental well-being". In the words of Alphonsine (Figure 9):

> Because when I am alone, I think too much about negative stuff, but when I am with others, my day goes well. That is why I like this photo. (Alphonsine M., Company C)

Figure 10 was taken by Liberata in Company A to highlight, similarly to Alphonsine, that she values relationships with her colleagues on the worksite. As she works on a casual basis, she depends on the phone call from the young male workers (permanent employees), who let her know when there is cassava available to peel. This highlights a certain solidarity or "community empowerment" (TA) between workers.

Figure 7. Yusuf showing his "best team" for a good production of compost. (Date: 14 December 2021 to 20 December 2021). Photo credit: Yusuf T.

3.1.5. Lack of occupational safety (TA) – health issues and risks (PDA)

Recycling in countries where there is no waste sorting at the household level requires long hours to separate the mixed waste composed mostly of organics, plastics, paper, and glass. Sorting is time consuming and can be dangerous for workers handling waste with practically bare hands. Co-researchers from Company C were the most concerned about the risks, and many pictures witnessed the lack of occupational safety. For example, during the PDA, co-researchers highlighted their lack of protective materials or the fact that the gloves they receive are not sufficiently renewed, which does not ensure good hand protection. This is especially dangerous when medical waste – containing needles – ends up in unsorted municipal waste. This problem is highlighted by Yusuf in Figure 11. In Figure 12, Alexandre shows a waste-compacting machine whose use is dangerous, especially as his employer does not cover his health insurance and he cannot afford it on his own.

In company B, where workers rear BSF, the co-researchers also complained about health issues. Compared to the risks observed at Company C, they seem minor, but they are nonetheless problematic. During the PDA, some co-researchers reported sickness linked to sieving the BSF frass (Figure 13). As there is no electricity at the site, the only available machine must be manually activated. Ismael is responsible for using this machine, and in Figure 14, he shows the unhealthy, dark smoke it produces, which worries him.

3.1.6. Difficult working conditions (TA-PDA)

On all sites, co-researchers highlighted difficult working conditions encompassing physical tasks, lack of access to clean water and/or proper toilets, and, in their opinion, a too-low salary compared to the nature of the job. In Company C, Alphonsine took Figure 15 of a water tank to show the poor

Figure 8. Alphonsine and Ismael show their motivation when collecting BSF eggs. (Date: 1 December 2021 to 6 December 2021). Photo credit: Ismael M. and Alphonsine M.

quality of the water accessible on-site, which can make workers sick because it is contaminated. Figure 16 shows the heavy bags of BSF frass that Ernest from Company B must transport with his body strength.

Another frequent complaint concerned the wage: co-researchers explained that such physical labour does not match their salaries. This criticism was mostly made by co-researchers from Company C, who manipulated mixed municipal waste. In Figure 17, Pierre shows his daily wage – the equivalent of USD 1.37. Yusuf explains that this is insufficient for his family, and hence he also must grow tomatoes. Alexandre – in Figure 18 – shows one of the most backbreaking activities happening approximately every three weeks on the site: the manual loading of stacks of compacted cartons.

> So, here, I wanted to show how bad it is to do it because it can destroy your back. If the package weighs like 300 kilograms and I weigh 65 kilograms, you can imagine that when we push it by two or three people, it is way out of our capacity. (Alexandre A., Company C)

Only the youngest and strongest can participate in such a physical task, and they are paid extra when the truck comes to collect these cartons. However, even Pierre, in his late twenties, says that this task is particularly hard and that "no woman can do this unless she wants to die".

3.2. Thematic differences across company sites

The themes raised as negative differed depending on the company site. This is not surprising, as the three biowaste companies transform different waste streams: Company A processes cassava peels, Company B rears BSF flies that feed on fruit waste and household waste, and Company C sorts

Figure 9. Alphonsine from Company C explains how being with colleagues improves her mental well-being. (Date: 14 December 2021 to 20 December 2021). Photo credit: Alphonsine M.

mixed municipal waste and transforms the organic materials into compost. In Company C, the theme most frequently represented during the PDA was: "health issues and risks" (seven pictures). This differs from Companies A and B, where more pictures represent positive themes, such as "outputs from salary" in Company A (five pictures) and "knowledge" in Company B (four pictures). Nevertheless, even if concern about health issues and risks was stronger in Company C, workers in Company B also mentioned respiratory illnesses involved in their work.

Only co-researchers rearing BSF at Company B mentioned the theme of "gender roles" during the PDA (see Table 2). Likewise, Company A was the only site to raise the theme of "climate change reduces production" during the PDA, which can be explained by their dependency on sun drying for cassava and cassava production more generally. Overall, co-researchers from the three company sites shared more similarities than differences in terms of work experiences during the PDA and the TA.

3.3. Gendered worker experiences

This photovoice study involved nine female co-researchers and eight male co-researchers, which allowed a glimpse into their gendered experiences. During the TA and the PDA, there was no major difference between the themes raised by the female or male co-researchers. Nevertheless, when asking additional questions about their access to the job and their backgrounds, we found gender differences in their profiles (marital status) and access to paid labour opportunities. This allows us to respond to our second research question that female and male experiences differ in the types of activities performed within biowaste management. The female labour preference for

Figure 10. Liberata from Company A explains that she enjoys good relationships with her colleagues. (Date: 7 December 2021 to 13 December 2021). Photo credit: Liberata N.

some tasks within biowaste management seemed to be essential for the survival of female workers (single-headed female households).

3.3.1. Female breadwinners

It is interesting to observe that – at the time of data collection – none of the female co-researchers had a partner who economically supported the household. They were either widowed or single mothers. Seven out of nine female co-researchers could be called "female breadwinners", meaning they were economically responsible for their children. According to traditional Rwandan gender-normative roles, women are responsible for the unpaid care of the household and children and men are responsible for providing economically (Kagaba 2015; McLean, Heise, and Stern 2020; Stern, Heise, and McLean 2018). In this sense, it was not surprising that the female co-researchers involved in biowaste recycling were single or widowed mothers. This was likely the reason *why* they were working on these sites, "like men". They needed to provide for their families, and working in biowaste management secured a monthly wage. However, they were carrying the double burden of being breadwinners and caregivers, as illustrated in this statement from Alphonsine:

> Yeah, we interact well [with men], and about playing cards, I do know how to play cards, and I enjoy it. But for me, at lunch hours, I go home and cook for my daughter. So, you understand that I do not have time to play cards with male workers. (Alphonsine, Company C)

Half of the men in the sample were married, with their children being taken care of by their wives. Three younger ones were single without children and living with their parents, and one was a single dad taking care of his child (Table 1). Some of the male co-researchers had migrated to access the

Figure 11. Yusuf shows the broken glass that can easily cut his hands as he wears damaged gloves. (Date: 14 December 2021 to 20 December 2021) Photo credit: Yusuf T.

biowaste job, which illustrates their higher mobility compared to women, as they are traditionally less responsible for being caregivers at home (Stern, Heise, and McLean 2018). The fact that some workers migrated from one province to another to access this job also implies that biowaste recycling is a relatively attractive job. When asking the workers how they perceived this job, it seemed to represent a "bridge to a better life" or, as Ismael from Company B expressed it, "the bad job brings the good one" (Ismael M., Company B).

3.3.2. Gendered access to paid labour opportunities

During the interviews, we asked how workers heard about their jobs, and we collected the same answers from women and men. Paid labour is extremely scarce in rural areas, with the available options being casual work on larger farms, casual work in construction, and/or subsistence agriculture for those with land. For casual workers in agriculture, a wage gap of 23% exists between women and men, which they justify by the gap in physical abilities, as investigated by Bigler et al. (2019). For casual workers in construction, men and women explained that all occupations require physical strength; hence, male labour is preferred. For women seeking employment, the options are scant, as explained by Alphonsine:

> If, for example, I ask for a job in the construction sector, they cannot hire me if I am competing with a man. In fact, they say that women don't have strength. (Alphonsine, Company B)

Interestingly, unlike the construction sector, biowaste recycling involves tasks in which female labour is preferred. The reasoning behind this, according to the co-researchers, is that "women care more", "they are more patient and delicate", and "they can do a single task during a longer period" than

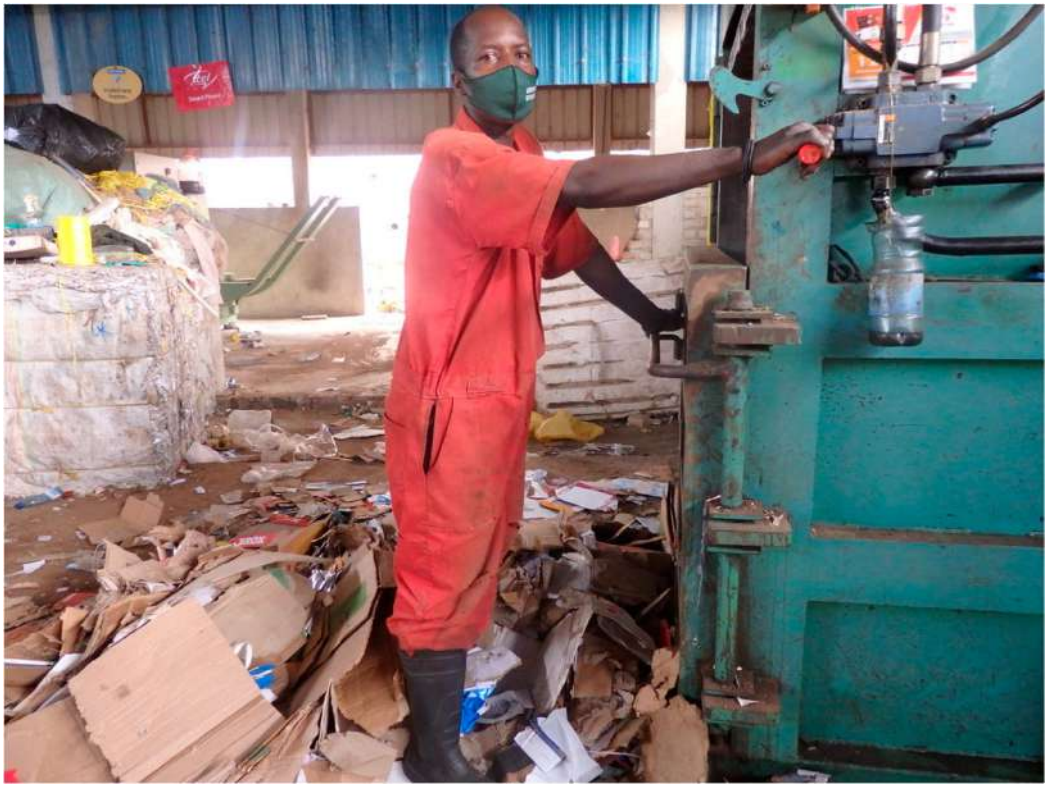

Figure 12. Alexandre highlights the risks involved with operating this compacting machine. (Date: 14 December 2021 to 20 December 2021). Photo credit: Alexandre A.

men. This was mentioned by co-researchers of Company B during the PDA under the theme "gender roles". These gender norms allow Rwandan women to access specific tasks within biowaste recycling to the disadvantage of men. Work complementarity exists at the workplace: men are responsible for most physical activities, and women are responsible for sorting, peeling, and cleaning. In this sense, the female jobs created within waste management can be considered essential to the livelihoods of rural female-headed households. The statement below from Vestine highlights these gendered tasks:

> Because of the types of jobs that are available here, people say that women are powerless. For example, we cannot work in composting, and similarly, men who work in compost cannot do the sorting. Indeed, they say that they cannot bend for a long time. (Vestine, Company C)

4. Discussion

This study presented the results of a photovoice study conducted with seventeen biowaste workers in Kamonyi District, Rwanda. Our goal was to understand how waste workers – often forgotten in CE discourses – perceive and experience their job and how it affects their personal lives. This study demonstrated that these workers value their jobs. Also, they do not have many alternatives. For women specifically, this job is precious, as there is a preference for female labour for tasks requiring patience, care, and cautiousness. For men and women, this job allows them to improve their livelihoods via savings and gain personal pride from being productive and responsible for a work task. With employment comes socialisation that is highly valued, with some women mentioning improvements in mental well-being.

Figure 13. Alphonsine shows the process of separating the BSF from the frass via sieving. This leads to dust that damages her lungs. (Date: 1 December 2021 to 6 December 2021). Photo credit: Alphonsine M.

Regarding negative experiences, workers were concerned about the health and other occupational risks involved in their jobs. However, this situation is a consequence of not having larger-scale waste sorting in Rwanda, which should not be blamed on individual companies. From the employers' perspective, solid waste management should be the responsibility of the public sector, meaning that some costs should be covered by the state (personal communication, 2022). Now, most of these costs are covered by companies that do not make a large profit on waste recycling, especially when considering compost production (personal communication, 2022). Therefore, improving working conditions by renewing protective materials and covering social security for workers cannot be a priority for employers (personal communication, 2022).

4.1. Potential for a job-intensive and gender-inclusive circular economy

Our results regarding workers' insufficient wages and occupational risks are in line with the literature, with Noel (2010) focusing on waste workers in Haiti and Dada et al. (2023) investigating waste pickers in Nigeria. More interesting are our results regarding the theme of "being responsible for a task" or "having knowledge" that – to our knowledge – has never been mentioned in the literature. What was mentioned by Wittmer (2021) when trying to understand the embodied experience of female informal waste pickers in India was their experiences of physical, mental, social, and spiritual well-being. Wittmer (2021) explains that it is necessary to adopt a "relational" conceptualisation of well-being, as theorised by White (2017). By viewing well-being as an emerging dimension of place, culture, a network of relationships, social structure, and the environment (White 2017), one can grasp why working in waste recycling can contribute to relational well-being. Indeed, White (2017) emphasises

Figure 14. Ismael is responsible for manually activating this machine, as there is no electricity on site. The machine releases a lot of black smoke. (Date: 1 December 2021 to 6 December 2021). Photo credit: Ismael M.

how relational well-being is grounded in a relational ontology that recognises its different meanings for different people across various spaces and contexts. Based on our results and considering the lack of working opportunities in Kamonyi, we argue that employment in waste management SMEs improved the well-being of the seventeen co-researchers. This does not mean we neglect the need for companies to improve workers' occupational safety and/or increase their wages. However, our results infer that recycling and transforming waste into highly valued products, such as composts and animal feeds, can be motivating and dignifying for workers, especially those in rural communities who understand the essential value of agricultural inputs, as many of them have small plots for subsistence farming. This was mentioned during some interviews under the code of "compost as the essence of farming" (Table 2).

In relation to the current literature on decent work in CE (Circular Economy 2022; ILO, CE, S4YE 2023), this study concludes that CE can contribute to the creation of "socially perceived useful jobs" (Graeber 2013; Graeber 2018). Such jobs are also referred to as "meaningful jobs" (Nikolova and Cnossen 2020), which ultimately increase the well-being of workers in LMICs. It is important to contextualise this interpretation within the very specific type of CE under consideration here. This study focuses on jobs in the organic waste recycling sector in Rwanda, where locally generated municipal, household and agricultural waste is recycled. The risk of workers being exposed to heavy metals is lower when handling organic waste than, for example, e-waste (Weghmann 2020). In addition, although the workers were informally employed in SMEs, they worked as a group, which increases their social interactions, a proven essential component of "meaningful work" (Nikolova and Cnossen 2020). Finally, the aspect of "socially perceived usefulness" and necessity (Graeber 2013; Graeber 2018; Léné 2019; Walo 2023) of agricultural input production is likely to contribute

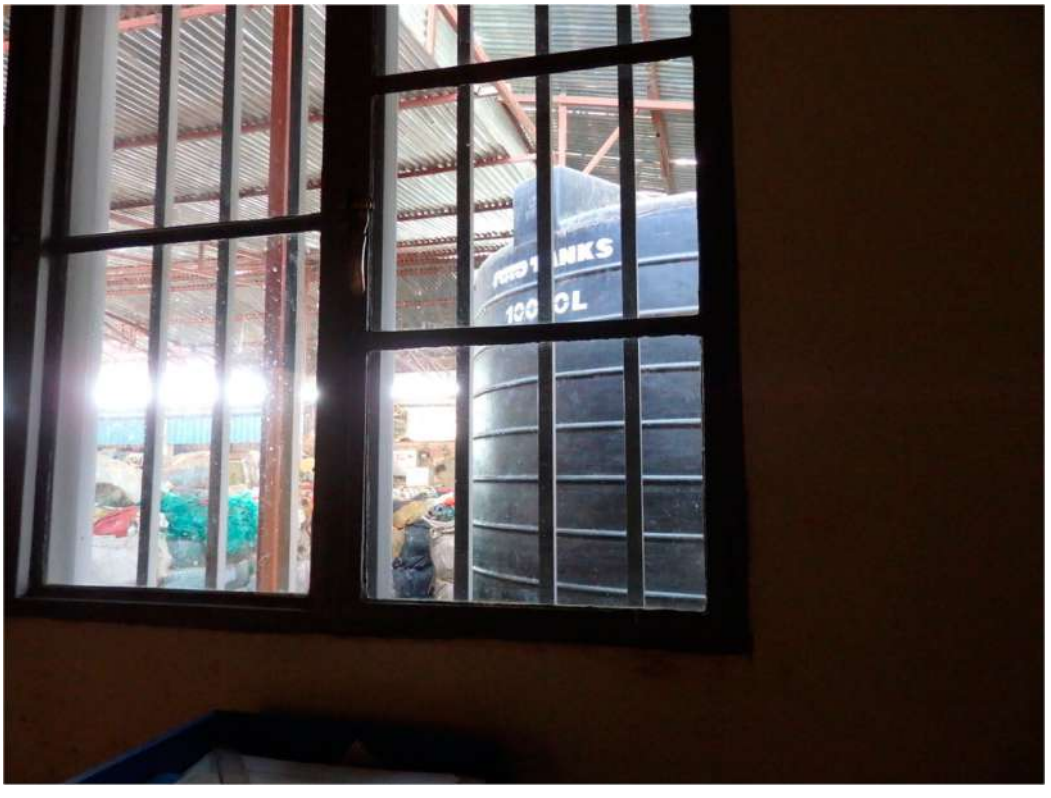

Figure 15. Alphonsine shows the contaminated water tank available at Company C for drinking purposes. (Date: 14 December 2021 to 20 December 2021). Photo credit: Alphonsine M.

to the meaningfulness of their activity. Taking all these dimensions into account, our findings highlight that this type of CE can support the creation of meaningful work, stimulate local innovation and economic growth for surrounding farmers, workers, and industries in LMICs.

Regarding the second research question, our study highlights the gender-segregated nature of most tasks in biowaste management companies. Our results are aligned with the existing literature (Dias and Ogando 2015; Muhammad and Manu 2013; OECD 2020; Scheinberg, Muller, and Tasheva 1999; World Bank Group 2021). These reports and articles describe how women and men are involved in different tasks along the waste value chain (collection, transport, sorting, picking, recycling) and in different waste streams (plastics, papers, organics). In our Rwandan study, we argue that the gender-segregated nature of waste management should be seen as an opportunity rather than a problem. In Rwanda, most people agree with the idea that "gender complementarity" is more relevant than "gender equality" (Plancke 2021), which Plancke (2021) argues is the way in which Rwanda's gender roles and norms are "modernising". The author argues that gender complementarity might be the best way in the Rwandan context to guarantee women's empowerment and that adopting Western, globalised views on gender equality might have disempowering effects (Plancke 2021). We argue that gender-segregated roles within the biowaste value chain provide empowerment opportunities for women, who are less involved in other economic sectors where there is a male labour preference, such as construction (Republic of Rwanda and National Institute of Statistics of Rwanda 2022). Hence, if female and male workers working full-time earn the same wage, which is the case in the three companies involved in this study (see Surchat et al. 2023), it would be imposing a Western gender-equality agenda to criticise this reality.

Figure 16. Ernest dislikes the physical task of carrying bags full of BSF frass for selling. (Date: 1 December 2021 to 6 December 2021). Photo credit: Ernest H.

4.2. Photovoice to challenge the "Western gaze" on waste workers

First, we want to emphasise that photovoice should be considered a transdisciplinary research approach rather than just a method. At the end of the study and during the photovoice exhibitions in Rwanda in June 2023, the co-researchers thanked us for the process, in which they felt respected and listened to. This aspect was shared by Bennett and Dearden (2013), who worked with remote fishing communities in Thailand. Learning to take pictures, deciding what to show, and analysing the meaning of the pictures facilitated reflection and community awareness. We acknowledge we have not assessed the long-term empowerment impact of photovoice, which some scholars criticise (Coemans et al. 2019). However, we argue that the seventeen workers' qualitative feedback attests that photovoice, when applied in an anticolonial way (Fricas 2022), can reach its emancipatory goals. Photovoice allows balanced power relations between researcher and "research subject" and can thereby challenge dominant epistemologies. In the African postcolonial context, such an approach is essential for "mental decolonization, liberation, and emancipation of Africans so that they do not see themselves only as objects of research, but also as producers of knowledge" (Chilisa 2017, 7). Photovoice allowed the researchers to make visible perceptions about job satisfaction from the rural Rwandan perspective, something that standardised surveys or rigid questionnaires embedded in Western epistemologies and ontologies cannot achieve.

Second, by reflecting on the workers' pictures, we see that in 80% of them (57 out of 68 pictures), the workers portrayed *themselves* in the centre. This suggests they wanted to show themselves as responsible and knowledgeable workers within waste recycling. This balances the prevailing negative colonial heritage of images taken by Western travellers "about Africa", which too often display

Figure 17. Pierre shows the wage he receives per day: RWF 1500 (USD 1.37). (Date: 14 December 2021 to 20 December 2021). Photo credit: Pierre N.

poverty, distress, and hunger and give the communities portrayed a passive, desperate tone (Eileraas 2003). In that sense, photovoice allowed for the production of new visuals and narratives from Africans themselves, which facilitates the restoration of epistemic justice, as other scholars using photovoice have argued (Cornell, Mkhize, and Kessi 2019; Fricas 2022; Seppälä, Sarantou, and Miettinen 2021).

4.3. Limitations

Our study's limitations link to the innovative design of this study: using photovoice with informal waste workers. First, co-researchers were involved as *workers* on their worksite, which in some cases restricted their photographic possibilities temporarily or spatially (migration from household assets). Some were stressed by their business leader; others worked too late and could not take pictures at home because they did not have electricity.

As other white researchers using photovoice with Black communities have discussed (Cornell, Mkhize, and Kessi 2019), it is critical to reflect on the influence of the researcher's positionality during the photovoice phases and outcomes. In this study, we ask ourselves how the positionality of the first author associated with the RUNRES project affected how the co-researchers carried out their photo assignment. The second author, for example, wonders whether the co-researchers overemphasised the positive aspects of their jobs during the in-depth interviews, as they did not want to reveal their challenges to a "muzungu" ("outsider" in Kinyarwanda). Complementary to this, it has been emotionally and cognitively challenging for the first author, to live up to the ideal-type of an anti-colonial photovoice (Fricas 2022). Indeed, approaching rural communities in Rwanda as an

Figure 18. Alexandre shows a pack of compacted cartons weighing approximately 300 kg, that male workers load manually into a truck. (Date: 14 December 2021 to 20 December 2021) Photo credit: Alexandre A.

outsider for six months rather felt like perpetuating the white privilege of the Western researcher (Schmidt and Neuburger 2017). Even when engaging at the "same-eye level" with co-researchers using participatory research methods, the research relationship is not mutual (Palaganas et al. 2017). Researchers have the privilege to construct and ask the questions, whereas co-researchers are constrained to respond to them (Law 2016). For these reasons, any white Western researcher using photovoice to restore epistemic justice should be prepared to engage in deep personal, critical, and epistemological reflexivity (Palaganas et al. 2017). They should explore their own uncomfortable feelings (Law 2016) and seek to understand them and navigate them.

Finally, photovoice is a qualitative illustrative approach that does not seek to produce representative results. Neither are these results generalisable. That said, we believe our results are transferable to the lived experiences of other waste workers in LMICs. Indeed, the power of this photovoice study is to challenge how we perceive work within the waste value chain and to see the dignifying dimension of *having a job*. We call other scholars studying work satisfaction of informal waste workers in LMICs to (1) reflect on the epistemological foundations on which they "observe and describe" a specific type of work, (2) contextualise what matters locally in defining what a "good" job is, and (3) apply photovoice to complement or triangulate a more quantitative approach to measuring worker satisfaction.

Notes

1. **SHOWED** acronym to trigger a discussion (from Hergenrather, Bardhoshi, and Pula 2009): 1. What do you **S**ee here? 2. What is really **H**appening here? 3. How does this relate to **O**ur lives? 4. **W**hy does this concern, situation, strength exist? 5. How can we become **E**mpowered through our new understanding? 6. What can we **D**o?

2. **PHOTO** acronym to trigger a discussion (from Hergenrather, Bardhoshi, and Pula 2009): 1. Describe your **P**icture. 2. What is **H**appening in your picture? 3. Why did you take a picture **O**f this? 4. What does this picture **T**ell us about your life? 5. How can this picture provide **O**pportunities for us to improve life?

Acknowledgements

First, we thank the seventeen co-researchers for their time and trust throughout the study: Felicite, Liberata, Elise, Julienne, Alphonsine, Jeanette, Alphonsine, Vestine, Groliose, Thierry, Paul, Michel, Ernest, Ismael, Yusuf, Alexandre, and Pierre. Second, we thank the three company leaders who let us interact with their staff. Finally, we thank Sandro Bösch who helped produce figures for this study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by Direktion für Entwicklung und Zusammenarbeit, Swiss Development and Cooperation Agency under the RUNRES [grant number 7F09521].

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