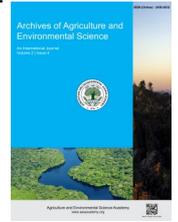This content is available online at AESA

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ORIGINAL RESEARCH ARTICLE

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Adoption of circular economy practices in agricultural SMEs: A comparative study of Nepal and the UK

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ABSTRACT

Agricultural small and medium-sized enterprises (SMEs) face mounting pressure to adopt sustainable business models, yet their ability to transition to circular economy (CE) practices differs across institutional and resource contexts. This study addresses the limited understanding of how CE adoption unfolds in agriculture within contrasting national settings by comparing agricultural SMEs in Nepal and the United Kingdom. The purpose is to investigate the processes of establishing CE practices in these firms and determine their effects on sustainability and business performance. A mixed-methods approach was employed, combining survey data with quantitative analysis. The results show significantly higher CE awareness in the UK (61%) than in Nepal (19.4%). The outcome shows marked differences in support systems of the countries (32.7% UK vs 47.2% Nepal). Yet, technical advice was reported to be 47.2% in Nepal and 22.4% in the UK which suggests that support in Nepal is largely advisory in nature and often led by NGOs. The results of this investigation indicate that adoption patterns are determined by institutional frameworks and resource abilities: in Nepal, low levels of awareness and capacity limitations are dominant, whereas in the UK, cynicism and scale issues are predominant. Environmental outcomes are realized earlier and more regularly than the economic or social benefits. This study advances CE diffusion theory by demonstrating that early environmental gains pave the way for weighted outcomes in resource-constrained settings.

INTRODUCTION

Circular Economy (CE) is accepted to be a sustainable development framework that addresses economic, environmental, and, more recently, social systems (Walker *et al.*, 2022; Figge *et al.*, 2023; Badran *et al.*, 2025). Within this global sustainability agenda, CE has emerged as a framework designed to reduce resource consumption, minimize waste, and maintain the value of products, materials, and resources for as long as possible (Kirchherr *et al.*, 2023; Rada, 2023; Upadhayay *et al.*, 2024). The role of small and medium enterprise (SME) to transition to a CE is essential, especially in agriculture, where it dominates supply chains in both developed and developing economies (Losa, 2025). The 3R model (Reduce, Reuse, Recycle), central to CE

policy and practice, is especially relevant when assessing how agricultural SMEs implement circular principles across different national settings. The 3R concept is still key in discussions on CE, influencing its theory and ways it is used in real-world situations (Uvarova *et al.*, 2023; Meshram, 2024). While the R scope is expanding, the 3Rs are still the main focus of guidance, policy, and strategies (Uvarova *et al.*, 2023). SMEs in Nepal and the UK encounter some significant barriers: the access to finance, technical knowledge, and the availability of qualified staff are often mentioned as constraints to growth (Bhattarai *et al.*, 2021; Dey *et al.*, 2022). The high investment requirements of circular solutions in the beginning and the enduring information gaps, especially regarding novel business models or the life cycle management of products, are a barrier that hinders the process,

particularly among SMEs (Rizos *et al.*, 2016; Gómez-Garza *et al.*, 2024). Furthermore, these are compounded by poor integration into research provider and insufficient, usually generic, training (Bhattarai *et al.*, 2021; Gómez-Garza *et al.*, 2024). Nevertheless, institutions and infrastructure are in much better shape in the UK than in most countries. Small and Medium-sized Agricultural Enterprises (SMEs) benefit from suitable public policies, a well-developed system to manage waste, and assistance from the government (Dey *et al.*, 2022; Cherrington *et al.*, 2024). The substantial number of pilots are a reflection of the UK's networked public-private partnerships across the system in CE, for example through multi-actor industry councils and knowledge transfer networks (Hina *et al.*, 2023). The UK benefits from incentives to innovate, as well as clear environmental certification rules, which help SMEs sell their eco-friendly products as exclusive offerings, generating ongoing demand and investing in current ideas (Cherrington *et al.*, 2024; Hina *et al.*, 2023). In contrast, Nepalese SMEs function in 'destructured' policy structures and ad hoc implementation (Melles *et al.*, 2025). Though resource efficient and low waste practices exist, formal CE is still largely an aspiration. Action typically halts at recycling or basic composting with little engagement in higher-order circular approaches such as bio-based value chains, or closed-loop nutrient circulation (Bhattarai *et al.*, 2021). The absence of powerful incentives, a shortage of demonstration projects, and poor connectivity between different economic groups prevent meaningful change (Melles *et al.*, 2025). Yet SMEs are on their own, scrounging for finance and given no clear direction by government or industry bodies. Existing literature on CE adoption in SMEs are predominantly focused on single countries or in developed countries, with limited comparative insights between contrasting contexts. There are insufficient studies exploring how CE practices are established and operated within SMEs across nations, explicitly between high income and low-income nations. Lack of comparative evidence limits opportunities for development of context specific CE policies and support systems. This study aims to investigate the key drivers and barriers of CE adoption, compare the efficacy of institutional efforts across nations, and derive policy relevant implications for transition in agricultural SMEs.

MATERIALS AND METHODS

The research is embedded in a comparative, mixed method research design, and aims to provide both wide and deep understanding of how agricultural SMEs in different social- economic and institutional settings comprehend, adopt and benefit from CE practices. This study employs a combined deductive and inductive research approach, in line with its sequential mixed-methods design (QUAN → qual) and pragmatic philosophical stance. According to Naeem *et al.* (2023), a research strategy guides the researcher in delivering valuable and valid outcomes. The instruments of the study are structured questionnaires containing open-ended questions as the fundamentals of the research strategy employed at both quantitative and qualitative

stages. This pattern helps to integrate QUAN to qual step-by-step so that comprehensible patterns could be identified and then examined in more detail (Sandelowski, 2014). In the case of Nepal and the UK, questionnaires may be specifically appropriate in the context of SMEs in the agricultural sector, where geographic distribution, uneven access to the internet, and time are the limitations that complicate the interviews. Questionnaires provide a broad scope, availability, and adjustability, and yet the depth of information obtained remains intact due to open-ended feedback (Naeem *et al.*, 2023).

Research design

This study adopts comparative, explanatory, and sequential mixed-methods research design (QUAN → qual). This approach is particularly suited to investigating the adoption of CE practices in agricultural SMEs across two national contexts Nepal and the UK as it facilitates the analysis of both shared and context-specific influences (Claasen *et al.*, 2015). The design aligns with the pragmatic philosophical orientation of the study by integrating both breadth and depth of understanding, and it directly supports the research objectives and questions by enabling triangulated, cross-contextual analysis (Glogowska, 2011). The study used non-probability purposive sampling method, which fits the comparative mixed-method research design, as well as the targeted population of agricultural SMEs involved in the practices of CE. The method of purposive sampling is where the study participants are chosen due to their knowledge, relevance, or experience with respect to the research target (Campbell *et al.*, 2020). The study was conducted based on data obtained through an open-ended online questionnaire created with the help of Microsoft forms. As a Computer-Assisted Qualitative Data Analysis Software (CAQDAS), NVivo supports the researcher by organizing data for thematic coding and interpretation, but it does not perform the analysis itself (Zamawe, 2015). To facilitate systematic coding and generation of themes with the capabilities of NVivo, it was critical to prepare the textual data accurately to allow documenting rigour and transparency in qualitative research (Allsop *et al.*, 2022). SPSS was chosen for analyzing structured, closed-ended survey questions about CE practices, motivations, and outcomes among agricultural SMEs in Nepal and the UK because it is specifically designed for quantitative data management and offers user-friendly, robust statistical features tailored to social science research (Rahman & Muktadir, 2021; Antonius, 2013). The mixed-methods comparative design will be applied to answer the research questions about the circular-economy adoption in agricultural SMEs in Nepal and the UK. Mixed-methods research offers a possibility to combine the quantitative and qualitative strand: quantitative data.

RESULTS AND DISCUSSION

Circular economy outcomes in Nepalese and UK farms
The results of this study are presented in Table 1 and Figures 1-5 and indicated that the practices of the CE have been positively affecting various important facets of farm operations. Over half

of the respondents reported an improvement in soil health (52.8%) and productivity (61.1%), while the remainder observed no change, and very few experienced declines. Water use efficiency was a more temperate influence, where nearly a third improved (33.3%) and most farms (63.9%) had no change. Similarly, waste generation improved for 36.1% of farms but remained the same or increased for the rest, highlighting room for further intervention. Customer feedback was mostly stable or better with 44.4 % recording positive feedback. Generally, these results inform the idea that CE practices effectively improve soil health, productivity, and stakeholder perception, whereas water efficiency and waste management are more challenging and might need some reinforcement. The results of the study provide subtlety in the presented perspectives talking about the intervention of the CE practice on farm sustainability and receptivity towards new business strategies. Only 33.3 % of the respondents deemed adoption of CE practices to have enhanced their farm long term sustainability whereas the majority 66.7% were still undecided which an indication that although farmers understand the potential benefits and lasting effects of CE, a sizeable portion have not yet experienced it. In contrast, there was a strong interest in innovative approaches, with 72.2% of farmers expressing willingness to explore a new business model, 22.2% indicating possible interest, and only a small fraction (5.6%) showing no interest. These findings suggest that although immediate perceptions of long-term sustainability gains are modest, farmers are largely receptive to adopting new business strategies, reflecting openness to innovation and potential future adoption of CE practices (Table 1).

The comparative study disclosed demographic alignment between Nepalese and UK's samples showing no statistically significant differences in the age (U = 812.000, Z = -0.670, p = 0.503) and gender distribution (χ^2 (1) = 0.017, p = 0.896). Nevertheless, significant differences existed in farm characteristics. UK farms were significantly larger (M = 227.16 hectares) compared to Nepalese farms (M = 1.03 hectares, t = 5.645, p < 0.001, Cohen's d = 1.06). Farm management types also differed substantially (χ^2 = 38.18, p < 0.001), with individual farms dominating in the UK (83.3%), whereas family-run farms were more prevalent in Nepal (73.3%). Land ownership patterns differed significantly (χ^2 = 19.549, p < 0.001), as Nepalese farmers predominantly owned their land (66.7%), while UK farmers often

rented (91.3% of renters) or combined ownership with rental arrangements (Figure 1). These disparities indicate varying institutional and social and cultural settings. The limited resources and smallholder traditions lead to the formation of family-run structures, which are prominent in Nepal (Melles *et al.*, 2025). Awareness about circular economy concepts varied considerably between the two countries (χ^2 = 14.737, p < 0.001). Only 19.4% of Nepalese SMEs noted familiarity with CE, compared to 61.2% of UK respondents (Figure 2 and 3). This awareness disparity was reflected in qualitative findings, where Nepalese farmers explained their practices by referring to them as a form of tradition or resources reuse, but not by explicitly accepting them as CE. One participant said, "we don't just use manure and compost, that is how our fathers used to farm anyway, and not because of this circular economy concept" (Farmer_NP7). This is consistent with literature asserting that CE in Nepalese agriculture is only in its "infant stage" with little awareness (Bhattarai *et al.*, 2021). In comparison, UK farmers explained a more explicit and wider vision of CE. They typically linked it with ecological restoration, renewable energy, and biodiversity. One respondent described it as: Circular economy is not 'recycling but the farm being part of the whole ecosystem' (Farmer_UK12). That represents better awareness of CE in rural settings in the UK, but even then, it may be confined to the "3Rs" (Cherrington *et al.*, 2024).

Support systems indicated marked cross-country variation as UK SMEs reported substantially higher access to financial and training support (32.7% and 55.1%) compared to Nepal (2.8% and 27.8%), χ^2 = 11.58, p < 0.001 and χ^2 = 6.30, p = 0.012, meaning that formal means of funding and capacity building are more advanced in the UK (Figure 4). Conversely, technical advice was more common in Nepal (47.2%) than in the UK (22.4%), χ^2 = 5.77, p = 0.016, indicating that the SMEs in Nepal may tend to use the NGO-run or donor-demanded advising programs because of the insufficient financing and teaching opportunities. These trends echo the literature presenting Nepalese CE adoption as limited by limited knowledge, weak institutional frameworks, and insufficient policies (Bhattarai *et al.*, 2021; Melles *et al.*, 2025), with the practice being driven by external input more than formal, systemic support. The input and equipment support were poor amongst the two countries (UK 16.3%, Nepal 19.4%, χ^2 = 0.139, p = 0.709) indicating that there is a challenge in the

Table 1. Comparative thematic analysis of circular economy practices among Nepalese and UK farmers.

| Theme	Nepal	UK
Awareness of CE	Implicit, tradition-based, limited conceptual understanding.	More explicitly, linked to ecosystem sustainability and biodiversity.
Current practices	Composting, animal manure, rainwater harvesting, reuse of packaging.	Composting, digestates, rotational/mob grazing, renewable energy, habitat restoration.
Impact on input costs	Strong cost savings in fertilizer and seeds.	Mixed: some savings in fuel/input, but high transition and infrastructure costs.
Sustainability outcomes	Soil fertility, crop resilience; doubts due to chemical reliance.	Soil health, biodiversity, carbon capture, water retention, climate benefits.
Future intentions	Expand composting, organic waste use, bioenergy, IPM.	Diversification, renewable energy scaling, ecosystem services, market-based CE.
Support needs	Training, seeds, bio-fertilizers, subsidies, loans.	Infrastructure, land tenure security, policy stability, advanced technical training.
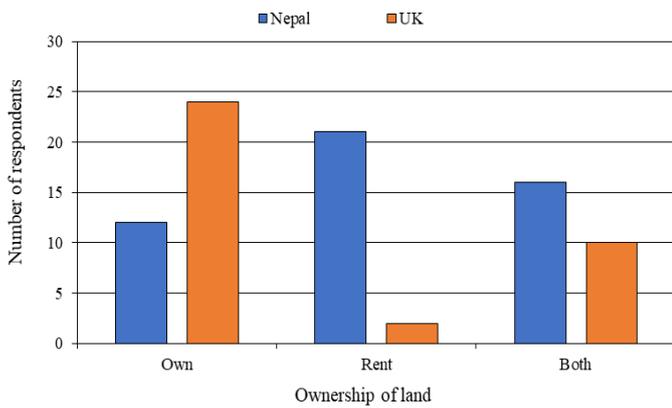
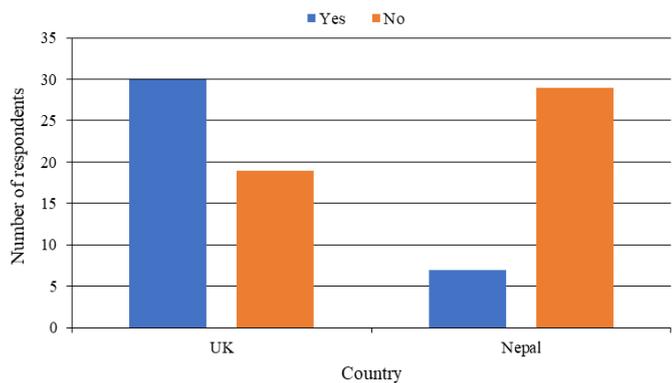**Figure 1.** *Land ownership patterns in Nepal and UK.*

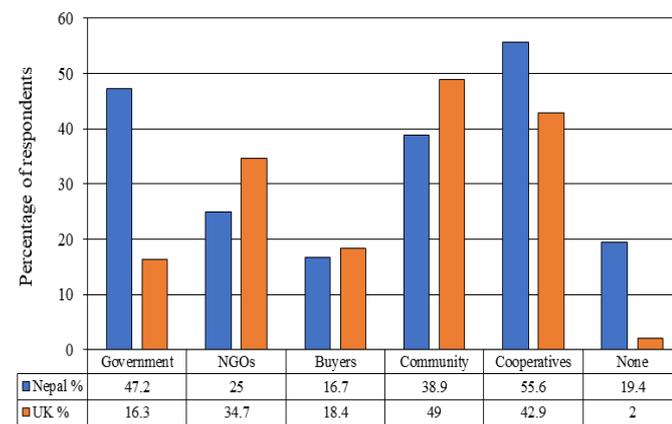**Figure 2.** *Awareness of circular economy among agricultural SMEs in Nepal and UK.*

Figure 3. *Influence of external factors on circular economy adoption in agricultural SMEs (Nepal vs UK).*

Figure 4. *SMEs receiving different types of support in Nepal and UK.*
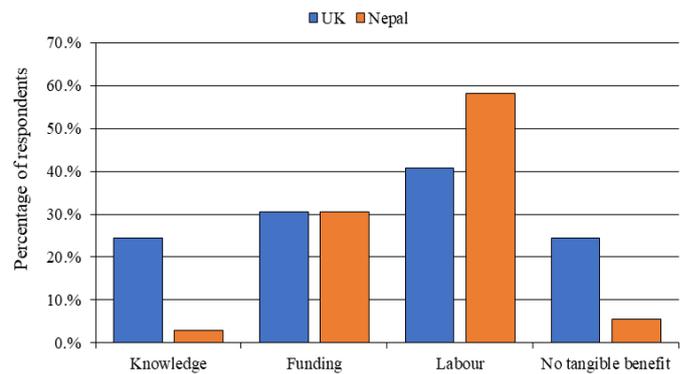
Figure 5. *Perceived challenges to CE adoption among SMEs in Nepal and UK.*

availability of material and technology resources that would enable circular practice (Figure 4). In general, these results highlight the fact that even the limited implementation of CE in Nepalese SMEs is heavily mediated by institutional and governance constraints that only external technical support can address (Bhattarai *et al.,* 2021; Melles *et al.,* 2025), and in the UK, the infrastructure provides greater access to financial and training assistance.

Barriers to the implementation of CE practices exhibited both differences and similarities. Financial limitations impacted around 31% of SMEs in both nations (χ^2 = 0.000, p = 0.996). There were more reports of labour shortages in Nepal (58.3% vs. 38.8%, χ^2 = 2.550, p = 0.110) and more reports of knowledge gaps in UK SMEs (24.5% vs. 2.8%, χ^2 = 7.552, p = 0.006). And a

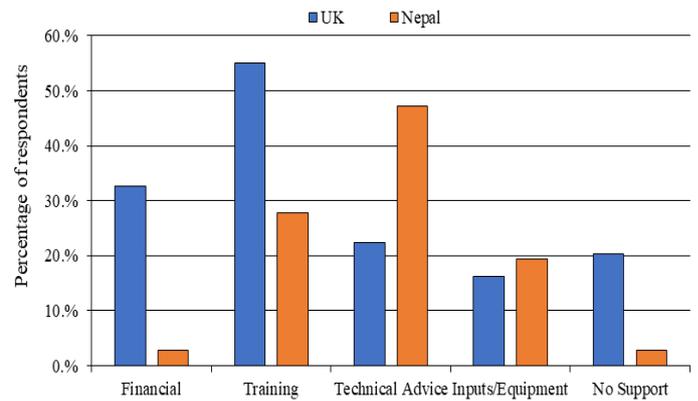lot more farmers in the UK thought that CE didn't offer any real benefits (24.5% vs. 5.6%, χ^2 = 5.408, p = 0.020). The economic analysis showed that there were marked differences in the scale of operations. UK SMEs reported higher monthly income (U = 30.000, p < 0.001) and operational costs (U = 2.000, p < 0.001) than Nepalese SMEs. Even with these differences, changes in profitability did not show a significant difference between countries (U = 713.000, p = 0.099). However, the perceived sustainability outcomes were very different: 67.3% of UK SMEs reported improved sustainability, while only 33.3% of Nepalese SMEs did and 75% of Nepalese respondents were still unsure (χ^2 = 24.382, p < 0.001). In the UK, 85.7% of people were willing to adopt noble business models, while only 72.2% of people in Nepal were willing to do so. This shows that farmers in Nepal were more hesitant (χ^2 = 9.442, p = 0.009) (Figure 5). Thematic analysis identified six principal dimensions that distinguish CE engagement. Nepalese farmers focused on traditional methods such as composting, managing manure, and saving seeds, which they saw as ways to save money and be more resilient (Table 1). Farmers in the UK said they used integrated methods like using renewable energy, mob grazing, and restoring habitats, which are all linked to ecological outcomes. There was a drop in input costs across the board, but UK farmers reported expensive transition costs. Nepal's future goals were to expand on current practices, but only if the government supported them. UK farmers, on the other hand, wanted to diversify and come up with market-oriented CE innovations that needed stable policies and investments in infrastructure.

Quantitative and qualitative comparison between SMEs in the UK and Nepal

The comparative analysis reveals that Circular Economy (CE) adoption among agricultural SMEs is simultaneously capability-driven and institutionally contingent, with the UK and Nepal occupying distinct stages of the diffusion process. A significant awareness gap (61% UK vs. 19.4% Nepal, χ^2 = 14.737, p < 0.001) places Nepal at the early "awareness" stage where CE remains an "infant concept" characterized by little policy acknowledgement (Bhattarai *et al.*, 2021), while UK farmers are further along in 'persuasion' and 'evaluation,' enabled by exposure through cooperatives, influencers, and policy frameworks (Cherrington *et al.*, 2024). Applying Institutional Theory, UK SMEs benefit from "institutional thickness" strong normative pressures from NGOs and cooperatives alongside coercive policy support whereas Nepal's institutional field is fragmented, relying on local networks without consistent regulatory backing (Bhattarai *et al.*, 2021). From a Resource-Based View, this institutional divergence translates into capability disparities: UK farmers receive significantly higher financial (32.7% vs. 2.8%), training (55.1% vs. 27.8%), and technical support, building internal resources for implementation, while Nepalese SMEs receive technical advice (47.2%) that cannot be converted into action due to finance and labour deficits. Barriers reflect these trajectories: finance is a universal constraint (31% overall), consistent with findings that SMEs consistently struggle to fund CE (Rizos *et al.*, 2016), but Nepal faces acute labour shortages (58.3%) due to institutional and demographic issues (Melles *et al.*, 2025), whereas the UK exhibits "post-awareness" scepticism (24.5% seeing no tangible benefit), where informed farmers critically evaluate economic viability, reflecting that CE advantages tend to be skewed (Hina *et al.*, 2023). Scale differences are evident UK SMEs report significantly higher monthly revenues and costs (p < 0.001 for both), granting access to broader CE portfolios including renewables and biodiversity schemes, though profitability differences are not significant, confirming that environmental benefits are more reliable than economic or social gains (Dey *et al.*, 2022). Outcomes follow suit: two-thirds of UK respondents report sustainability improvements versus one-third in Nepal (χ^2 = 24.382, p < 0.001), with many Nepalese farmers "unsure" as their traditional practices (seed saving, nutrient cycling) are framed as resilience or cost-avoidance rather than CE (Bhattarai *et al.*, 2021; Melles *et al.*, 2025). This confirms that CE in agriculture is best characterized as a capability investment embedded in institutional systems, where Nepal's tradition-coded practices require financial reinforcement to scale, and the UK's explicit CE strategies need benefit-demonstration to overcome transition frictions together highlighting that targeted, stage-appropriate interventions from awareness-raising in Nepal to capability scaling in the UK are essential to unlock transformative potential.

Conclusion

In conclusion, three key insights that emerged in comparative analysis directly answer the research question of how agricultur-al SMEs and the UK and Nepal employ circular economy practices and their relevance to sustainable farm management and business performance. In the UK, where policy frameworks and institutional mechanisms have enhanced understanding and systematic engagement with circular economy principles, awareness and understanding of circular economy is far more advanced. In comparison, knowledge in Nepal has been fragmented and rooted into the traditional efficiency-based practices, including seed saving and nutrient cycling, rather than an articulation of CE sets of ideas. Adoption patterns within the two contexts vary considerably. Nepalese SMEs have been more focused on resource-efficient and low-cost solutions due to limitations in funding and institutional support, whereas the UK SMEs have been involved in a diversified set of practices, such as biodiversity schemes, renewable energy generation, and use of digestates, enabled by policy incentives and networks. Although both cases show superior results in environmental terms relative to economic or social results, the latter are irregular and subject to resource capabilities and institutional facilitators. These findings collectively demonstrate that CE adoption is shaped not only by internal capacities within SMEs but also by the broader institutional environment, underscoring the importance of context-specific dynamics in shaping sustainable business performance. The study shows that adoption of CE in agriculture is a staged and competency-based process, whereby environmental outcomes are the earliest to rise, whereas economic and social benefits occur more heterogeneously as a longer-term event. This study enhances the existing CE knowledge by offering comparative insights from various contexts and provides practical assistance for policymakers and SME practitioners aiming to expedite sustainable transitions in agriculture.

DECLARATIONS

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