GENDERED ENERGY CULTURES AND CLEAN COOKING IN KIGALI: STATUS, TASTE, AND FUEL STACKING

CULTURAS ENERGÉTICAS COM PERSPECTIVAS DE GÊNERO E COZINHA LIMPA EM KIGALI: STATUS, SABOR E ACÚMULO DE COMBUSTÍVEIS

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Abstract

Clean cooking is often framed as a diffusion or pricing problem, yet households adopt and use stoves within gendered energy cultures that organise labour, risk, taste, and status. Drawing on ten focus-group discussions, 100 observed cooking sessions, and 20 semi-structured interviews with urban residents of Kigali, Rwanda, we combine anthropological narrative inquiry with the Energy Cultures framework to examine how material arrangements, shared meanings, and everyday practices co-produce household fuel portfolios. We identify three mechanisms. First, status-mediated switching: households rotate among LPG, electricity, charcoal, and episodic firewood to perform urban modernity while safeguarding dish-specific flavour, with women's culinary authority and men's liquidity control shaping sequences of use. Second, a double bind of transition: price volatility and supply reliability intersect with safety talk and taste standards to stabilise stacking as a low-regret strategy under uncertainty. Third, policy choreography, sequenced community-level interventions, culinary stewardship (taste-equivalence protocols), safety dramaturgy (neighbour-led demonstrations), and budget-fit infrastructure align technologies with culturally legible routines. We report transparent qualitative procedures (reflexive memoing, shared codebook, and intercoder checks) and propose portfolio-quality metrics, exposure reduction, time efficiency, and sensory satisfaction as outcomes that better capture progress than primary-fuel displacement alone. Designing with gendered culture, rather than around it, offers a more durable and just pathway to clean-cooking transitions in rapidly urbanising African cities.

Resumo

A culinária limpa é frequentemente enquadrada como um problema de difusão ou de preços, mas as famílias adotam e utilizam fogões dentro de culturas energéticas com perspectiva de gênero, que organizam o trabalho, o risco, o gosto e o status. Com base em dez discussões em grupo focal, 100 sessões de culinária observadas e 20 entrevistas semiestruturadas com moradores urbanos de Kigali, Ruanda, combinamos a investigação narrativa antropológica com a estrutura das Culturas Energéticas para examinar como os arranjos materiais, os significados compartilhados e as práticas cotidianas coproduzem os portfólios de combustíveis das famílias. Identificamos três mecanismos. Primeiro, a alternância mediada pelo status: as famílias alternam entre GLP, eletricidade, carvão e lenha ocasional para representar a modernidade urbana, ao mesmo tempo que preservam o sabor específico de cada prato, com a autoridade culinária das mulheres e o controle da liquidez pelos homens moldando as sequências de uso. Segundo, um dilema da transição: a volatilidade dos preços e a confiabilidade do fornecimento se cruzam com discursos de segurança e padrões de sabor para estabilizar o uso combinado como uma estratégia de baixo arrependimento em situações de incerteza. Em terceiro lugar, a coreografia de políticas, intervenções sequenciais ao nível da comunidade, gestão culinária (protocolos de equivalência de sabor), dramaturgia de segurança (demonstrações lideradas por vizinhos) e infraestruturas adequadas ao orçamento alinham as tecnologias com rotinas culturalmente compreensíveis. Apresentamos procedimentos qualitativos transparentes (anotações reflexivas, livro de códigos partilhado e verificações entre codificadores) e propomos métricas de qualidade de portfólio,

redução da exposição, eficiência de tempo e satisfação sensorial como resultados que melhor captam o progresso do que a substituição de combustíveis primários por si só. Conceber com a cultura de género, em vez de a contornar, oferece um caminho mais duradouro e justo para as transições para uma cozinha limpa em cidades africanas em rápida urbanização.

Palavras-chave: *Cozinha Limpa. Género. Culturas Energéticas. Utilização de Combustíveis Alternativos. Normas Sociais.*

1 INTRODUCTION

The global clean-cooking challenge is often framed as technology diffusion and price signals, yet households do not simply adopt devices; they domesticate them within gendered webs of meaning, authority, and taste (Listo, 2018). Systematic reviews confirm that affordability and fuel availability are necessary conditions but rarely sufficient without attention to place-specific norms, sensory expectations, and the division of domestic labour (Vigolo, Sallaku, & Testa, 2018). Behaviour-change campaigns can raise awareness, but their effects hinge on who speaks to whom, with what symbols, and at what moment in the daily round; message fit and social positioning often determine whether new stoves become central, supplementary, or merely ornamental within the household repertoire (Evans et al., 2018; Wolf et al., 2017). Because cooking, cleaning, and fuel procurement are unequally distributed, women and girls typically shoulder time costs, smoke exposure, and safety risks, while men frequently act as financial gatekeepers whose risk tolerance and status aspirations shape what gets purchased and maintained (Bonjour et al., 2013). To put it succinctly, clean cooking is not merely an engineering or economic problem; it is a question of gendered culture in practice.

Recent South Asian work using the Energy Cultures framework shows how material arrangements (appliances, fuels, kitchen spaces), motivators (status, safety, health, aspiration), and activities (routines, time pressure, commensality) intersect to shape transitions (Kok et al., 2025). This lens clarifies a persistent paradox: infrastructure expands and devices arrive, yet everyday use remains partial or cyclical, the "double transition" in which access and appropriation diverge. A gendered reading helps explain why. Taste standards are often policed within women's culinary authority; safety narratives circulate through women's experiential knowledge of leaks and smoke; and

decisions about up-front costs or cylinder refills can be delayed by men's control over liquidity. Gender thus mediates both the meanings attached to fuels and the capacity to enact change.

Building on these insights, we present an ethnographically informed study of urban Kigali, Rwanda, where charcoal, liquefied petroleum gas (LPG), electricity, and, at times, firewood compose a dynamic fuel ecology. We ask:

1. How do women and men in Kigali households narrate and negotiate fuel choice across charcoal, LPG, electricity, and firewood within specific kitchens and neighbourhoods?
2. How do gendered divisions of labour, authority, and risk, along with status, taste, cost, access, and reliability, stabilise fuel stacking or prompt switching episodes?
3. What programs and policy designs can engage local energy cultures and address gendered constraints without erasing culinary heritage?

Our contribution is twofold. Empirically, we center household voices, women's routine work and men's purchasing authority to show how cooking technologies become social artefacts that carry prestige, danger, convenience, and flavour. Analytically, we braid anthropology with the Energy Cultures approach to specify mechanisms, status-mediated switching, taste-equivalence thresholds, gendered time and safety burdens, and intra-household bargaining that render transitions durable or fragile (Evans et al., 2018; Kok et al., 2025; Vigolo et al., 2018). By treating kitchens as sites where modernity is performed, memory curated, and gender negotiated, we move beyond technology adoption count toward gender-responsive, culturally legible levers for policy and design for an effective clean cooking energy transition.

2 THEORETICAL FRAMING

We approach clean cooking not as a linear "adoption" event but as the ongoing production of energy cultures, configurations in which material arrangements, shared meanings, and everyday practices are mutually constitutive. The Energy Cultures framework formalises this triad by linking appliances, fuels, and kitchen spaces to norms, aspirations, and routines, emphasising feedback rather than one-way causality (Stephenson, 2015; Stephenson, 2018; Oksman et al., 2021). In this view, a stove is not a neutral device: it reconfigures time (what can be cooked before school or in the morning

before work), space (what can be cooked indoors), and social relations (who is authorised to light gas or tend coals). Crucially, energy-culture insights are domain-specific. Studies in industrial settings caution that lessons do not travel intact across sectors; method and inference must be rebuilt around the concrete practices and meanings at stake in each context (Oksman et al., 2021). Our Kigali study extends this logic to domestic kitchens where culinary heritage, gendered labour, and risk narratives saturate decision-making. Treating kitchens as ethnographic sites, we trace how households calibrate devices and fuels to ritualised meals, neighbourhood air, and reputation, an approach that renders culture actionable for policy without reducing it to attitudes or "awareness".

This framing converges with and sharpens the quantitative and programmatic evidence on clean cooking. Consumer-focused syntheses show that seven interlocking drivers, cost, fuel availability, technology attitudes, risk/benefit awareness, location, and social/cultural influence, shape uptake, and that affordability alone rarely dissolves entrenched practice (Vigolo, Sallaku, & Testa, 2018; Lee, 2013; Brooks et al., 2016). Behaviour-change communication (BCC) evaluations underline the value of mixed-method designs that combine population surveys with focus groups, stove-use monitoring, and exposure measures to capture both intention and enactment (Evans et al., 2018). Yet this literature typically treats culture as a contextual modifier; our energy-cultures lens treats it as the proximate mechanism through which price signals, safety claims, and supply reliability are translated into routine action or resisted. Finally, macro-comparative reviews remind us that household practices are nested within enabling conditions, developing contexts often face thin technical workforces and supply-chain fragility, and regulatory ambiguity and high investment costs cut across settings (Pereira, Silva, & Ferreira, 2025). We integrate these scales by theorising status-mediated switching and taste-equivalence thresholds as household-level mechanisms that interact with structural constraints (prices, outages, after-sales service) to stabilise fuel stacking. Our theoretical wager is that the success of clean-cooking transitions hinges on aligning infrastructures with culturally legible routines and identities, an alignment that can be diagnosed and designed using the energy-cultures apparatus (Walekhwa et al., 2009).

3 METHODS, DESIGN AND EPISTEMOLOGY

Guided by an interpretivist epistemology, we treated clean-cooking "adoption" as a culturally situated accomplishment rather than a discrete event, privileging meaning, context, and negotiated practice (Charmaz, 2006; Lincoln & Guba, 1985; Patton, 2015). We employed a multi-sited qualitative design built around focus group discussions (FGDs), transect walks, cooking-session observations, and semi-structured interviews. FGDs are well-suited to eliciting shared norms, social comparison, and the public reasoning through which households justify, contest, and revise fuel practices (Kitzinger, 1995; Krueger & Casey, 2015; Patton, 2015). Transect walks followed participatory rural appraisal traditions to surface spatially embedded practices and supply constraints (Chambers, 1994), while observation and ethnographic interviewing captured routine action, paralinguistic cues, and material arrangements in situ (Emerson et al., 2011; Spradley, 1980).

Reporting adheres to established qualitative standards (COREQ; Tong et al., 2007) and broader guidance on transparency in qualitative reporting (SRQR; O'Brien et al., 2014), including researcher reflexivity, sampling logic, settings, instruments, and analytic procedures. In line with our theoretical framing, kitchens and neighbourhoods were approached as social fields in which material arrangements, meanings, and routines are negotiated, not mere backdrops for device use (Patton, 2015).

Fieldwork took place from January to July 2025 in urban Kigali (Gasabo and Kicukiro). We conducted 15 transect walks, 100 focused cooking-session observations, 10 FGDs, and 20 semi-structured interviews. Sessions were scheduled around mealtimes and held in familiar community spaces to minimise power distance and maximise ecological validity (Krueger & Casey, 2015; Patton, 2015). Field notes systematically captured gesture, laughter, turns-at-talk, and dissent as essential cues for interpreting consensus claims (Emerson et al., 2011). Interviews and FGDs were conducted in participants' preferred languages and recorded as verbatim narratives; moderators probed for concrete recent episodes (e.g., last charcoal-versus-gas choice) rather than abstract preferences to reduce recall and social-desirability bias (Patton, 2015).

The study used purposive sampling to maximise variation in kitchen type (indoor/outdoor), dwelling tenure, and fuel mix (charcoal, LPG, electricity, episodic firewood), targeting primary cooks and household decision-makers (Palinkas et al., 2015;

Patton, 2015). To reflect locally patterned roles, we prioritised recruiting primary cooks (predominantly women) and, where feasible, male household decision-makers encountered during transect walks (contextualising gender roles rather than essentialising them). Recruitment continued until topical sufficiency/information power was reached on core themes (taste–safety–speed trade-offs; price and reliability talk; status signalling), evidenced by diminishing conceptual returns in successive events (Guest et al., 2006; Malterud et al., 2016; Guest et al., 2020).

All participants provided informed consent after a plain-language explanation of aims, data handling, and the voluntary nature of participation. To protect privacy, we report coarsened sociodemographic descriptors and district-level locations. We attended to positionality (researcher gender, educational status, affiliations) and its effects on disclosure around domestic authority, accidents, and money, inviting quieter voices, often younger women and unmarried men, through targeted prompts and small-group moments (Lincoln & Guba, 1985; O'Brien et al., 2014; Tong et al., 2007).

We applied a three-stage analytic pipeline. First, open coding on transcripts and field notes surfaced patterned concepts (e.g., "performing modernity," "taste-heritage," "safety calculus," "budget choreography") (Corbin & Strauss, 2015; Saldaña, 2016). Second, axial coding mapped inductive codes onto the Energy Cultures triad (materiality, meanings/motivators, activities) and onto drivers from the clean-cooking literature (cost, availability, technology attitudes, risk awareness, location, socio-cultural influence), linking talk about burners, cylinders, and ventilation to gendered routines and status/safety narratives (Corbin & Strauss, 2015; Miles et al., 2014). Third, pattern/thematic analysis traced how narratives clustered around switching episodes and stabilised or unsettled stacking over time, supported by reflexive memoing (Braun & Clarke, 2006, 2019; Charmaz, 2006; Miles et al., 2014). Discrepancies were resolved through memo exchange and joint rereading; we calculated simple intercoder agreement (> .80) on major codes and documented procedures for reliability and analytic integrity (Campbell et al., 2013; Lombard et al., 2002; Miles et al., 2014). Triangulation across methods (FGDs, observations, interviews) and sources strengthened credibility and confirmability (Denzin, 1978; Lincoln & Guba, 1985).

4 FINDINGS

4.1 Performing modernity, preserving identity

Across all focus groups, fuel choice operated as a social semaphore, an everyday code through which households communicated competence, aspiration, and belonging. Participants did not describe charcoal, LPG, electricity, or occasional firewood as fungible heat sources. Rather, each fuel condensed a repertoire of meanings legible to neighbours and kin, consistent with "energy cultures" accounts in which material arrangements, shared meanings, and practices are mutually constitutive (Oksman et al., 2021; Stephenson et al., 2010). LPG and electric hotplates, for example, indexed urban modernity; they suggested punctuality, cleanliness, and the ability to keep pace with work and school schedules. Several women observed that a gleaming cylinder or a two-burner hotplate near a tiled sink "makes the kitchen feel like town", suturing appliance aesthetics to the moral geography of the city and to locally gendered respectability politics (Listo, 2018; Vigolo et al., 2018). Men, for their part, often framed LPG as a rational purchase that spared "unnecessary small expenses", positioning themselves as prudent managers who anticipate monthly fuel needs and avoid the embarrassment of smoke drifting into shared courtyards, an optic aligned with status- and cost-sensitive adoption dynamics reported elsewhere (Brooks et al., 2016; Wolf et al., 2017).

Yet the same households defended charcoal as integral to culinary identity (Vermeulen et al., 2020). Charcoal was not framed as backward but as a keeper of taste, a medium that coaxes a particular smokiness and mouthfeel from dishes such as isombe, beans, and maize porridge. Women referenced sensory cues, the smell, the colour of steam, and the way oil behaves on the pan, which help judge doneness and flavour, forms of embodied culinary authority that many felt were muted on gas. These were not only nostalgic claims but also accountability claims, as elders and respected neighbours evaluate a cook's expertise through those cues. Accordingly, households often "save" charcoal for meals that "carry memory" and reserve LPG for weekday breakfasts and school-night dinners where speed and cleanliness are valued, an example of portfolio logic shaped by taste, time discipline, and social surveillance (Jeuland et al., 2015; Vigolo et al., 2018).

This dual commitment, to perform modernity while preserving taste, produced what we term status-mediated switching. Households curate a sequence of fuels across the day and week: LPG or electricity signals punctuality and urban capability in the morning; charcoal anchors identity and hospitality on weekends and on dishes tied to home place. Firewood, while stigmatised in dense neighbourhoods, resurfaces episodically during visits to rural kin, for outdoor compound cooking at large gatherings, or when shortages and price spikes make cylinders temporarily inaccessible, patterns consistent with "fuel stacking" under mixed constraints (Walekhwa et al., 2009; Wolf et al., 2017). The shock one participant described when her husband encountered firewood used for maize at home ("He worried what people would think") is best read as a reputational calculus, not merely a response to cost or risk.

Gendered roles traverse these semiotics; women, as routine cooks, are the custodians of flavour and of the moral order of meals; men, as periodic purchasers, police the optics of progress and the regularity of payments, an asymmetry widely observed in solid-fuel contexts (Bonjour et al., 2013; Listo, 2018). The lines are not fixed, however. Younger couples described shared decision-making in which men tolerate the charcoal pot for isombe if weekday breakfasts are reliably gas-cooked, while women accept gas for speed if authority over taste-critical dishes is recognised. In this negotiation, appliances become social artefacts that materialise who the couple is becoming, urban and efficient yet faithful to inherited flavours, echoing evidence that preferences and choices reflect reputational, sensory, and liquidity constraints rather than simple price minimisation (Jeuland et al., 2015; Vigolo et al., 2018).

4.2 The safety, taste, speed triangle

Participants repeatedly plotted choices within a triadic calculus of safety, taste, and speed, consistent with energy-cultures work that links material arrangements, shared meanings, and routine activities (Oksman et al., 2021; Stephenson et al., 2010). LPG and electricity were framed as fast and clean but potentially catastrophic if mishandled; charcoal as slower yet flavourful and familiar; and firewood as both smoky and risky, acceptable mainly outdoors or in village settings, aligning with evidence that perceived safety, sensory quality, and convenience are core uptake drivers (Jeuland et al., 2015; Vigolo et al., 2018). These appraisals were narrated through incident stories, near misses,

rumours of leaks, and the authority of slow cooking, rather than abstract preferences, echoing prior findings that lived experience and social transmission shape stove use (Evans et al., 2018; Wolf et al., 2017).

Women who cooked daily often held the greatest narrative capital about risk management in the kitchen. They described tactile and olfactory practices, checking hoses, listening for faint whistles, distinguishing ordinary heat from a worrying "gas smell", and positioning pots away from children, mirroring household safety competencies documented in improved-stove trials (Masera et al., 2007) and the broader risk context of solid fuels (Bonjour et al., 2013). Men more often referenced risk indirectly, as justification for purchases ("a new regulator") or as a reputational hazard ("people will say we were careless"), reflecting status- and provision-orientated roles noted in the adoption literature (Brooks et al., 2016; Listo, 2018).

Taste claims were equally detailed. Cooks praised charcoal's "steady heat" for beans and leafy stews and valued the smoky aroma as a marker of proper technique and patience, features that many felt were muted on gas. By contrast, LPG/electricity excelled for punctuality (eggs, porridge, tea) when schedules compressed, but some warned that gas's very speed risks scorching or unsafe imitation by children without explicit training. These trade-offs map onto documented tensions between sensory performance, hygiene, and time savings in real-world portfolios (Jeuland et al., 2015; Vigolo et al., 2018).

The triangle also structured social identity talk. Light-hearted jabs, gas users teasing charcoal cooks for "yesterday's smell", and charcoal defenders retorting that gas users "eat fast but forget flavour" functioned as local moral commentary about hazard and virtue, a dynamic consistent with socially mediated evaluation of technologies (Evans et al., 2018; Wolf et al., 2017). Importantly, "safety" narratives circulated through gendered channels, women's caregiving networks (accidents, near-misses, hose-replacement tips) and men's purchase networks (reliable vendors, counterfeit avoidance). When these circuits aligned, such as after community demonstrations of cylinder handling, participants reported greater comfort with LPG; when spectacular leak stories circulated without follow-up explanation, households reverted to charcoal for reassurance. This contingent reweighting parallels "fuel stacking" as a low-regret hedge under uncertainty (Walekhwa et al., 2009).

Also, electricity reliability bent the triangle into a pyramid in participants' accounts. Intermittent supply discouraged reliance on hotplates for anything beyond

quick tasks; an outage mid-cook was experienced as morally embarrassing when hosting. In these moments, charcoal's "forgiving" heat provided an alternative form of safety, protection against social risk, even if environmental health risks remain higher (Bonjour et al., 2013; Lewis et al., 2016). Overall, the safety–taste–speed triangle operated as a moral topology: households sought positions where children are safe, food tastes right, and time is respected, with rotation among fuels as seasons, stories, and supply conditions shift (Oksman et al., 2021; Vigolo et al., 2018).

Figure 1.

Safety, taste, speed triangle and its extension to a reliability apex, forming a pyramid of household fuel-choice trade-offs. Positions are illustrative; LPG = liquefied petroleum gas.
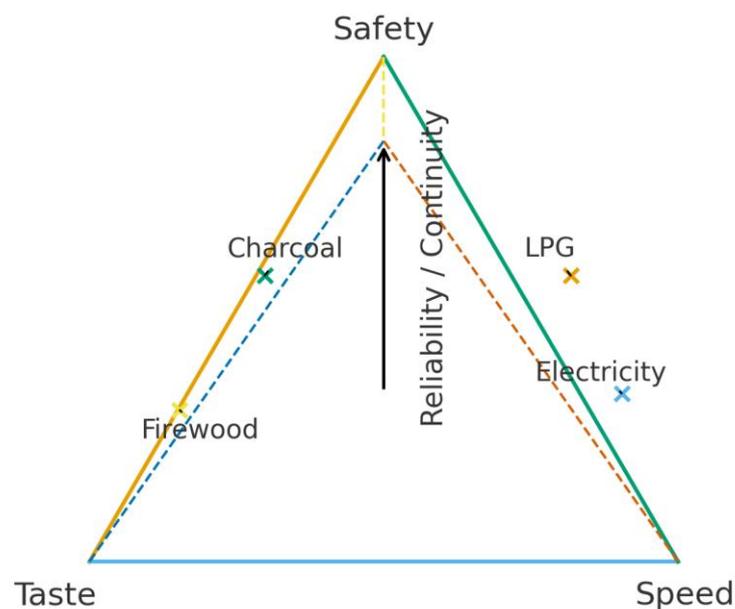
4.3 Location and life course as transition engines

Mobility, in space and across the life course, operated as a powerful engine of transition, not by erasing older practices but by layering them (Stephenson, 2015; Vigolo, Sallaku, & Testa, 2018). Participants narrated movements between rural villages and urban Kigali, between rental rooms and newly built flats, and between single life, coupledom, and parenthood. Each shift reconfigured kitchen constraints and opportunities. City residence made LPG attractive by aligning with wage-labour tempo

and norms of urban cleanliness and punctuality; it also increased proximity to cylinder vendors and after-sales service (Vigolo et al., 2018). By contrast, returns to the village, especially for holidays and rituals, reactivated wood-fuel routines embedded in outdoor kitchens where smoke is socially tolerated and convivial (Lee, 2013; Walekhwa, Mugisha, & Drake, 2009). Young women described learning LPG after moving to the city, then "keeping the skill" while retaining the patience and palette cultivated around wood fires; young men framed the first cylinder as a marker of adult responsibility, tempered by anxiety about "getting it wrong" (Jeuland et al., 2015).

Life-course events intensified these dynamics. Births introduced imperatives, warming water, sterilising bottles, preparing soft foods quickly, that favoured LPG or electricity for speed and hygiene; school schedules pushed households toward fuels that guarantee breakfast on time (Brooks et al., 2016; Wolf, Mäusezahl, Verastegui, & Hartinger, 2017). Conversely, unemployment spells or income shocks renewed the appeal of charcoal's bulk-purchase logic and wood's social availability in extended family settings (Akomolafe & Ogunleye, 2017; Lee, 2013). Marriage reallocated authority and technique; brides brought taste standards and safety practices from natal homes; grooms brought purchasing routines and reputational concerns from peer networks, patterns consistent with gendered energy cultures (Listo, 2018; Stephenson, 2018).

Education and climate/air-quality awareness correlated with experimentation at the margins; trying induction plates or improved stoves after workplace or media exposure, then judging fit against dish-specific flavour, multitasking demands, and child safety (Brooks et al., 2016; Jeuland et al., 2015). Such trials often began with low-commitment devices (e.g., a single-burner or small hotplate) and diffused via peer demonstration ("come see how quickly this boils"), with knowledge retained even when the device did not become primary (Lee, 2013; Wolf et al., 2017).

Location also influenced visibility. In dense compounds, smoke created social risk, encouraging self-discipline of charcoal/wood to avoid neighbour complaints; in more dispersed settings or family compounds, wood-fired cooking could be rehabilitated as festive and appropriate for large batches (Vigolo et al., 2018; Walekhwa et al., 2009). Successful transitions, in this reading, do not eliminate older fuels so much as cultivate a portable repertoire that preserves dignity and choice while minimising harm, precisely the patterned interplay of material arrangements, meanings, and practices emphasised by

the Energy Cultures approach (Oksman, Reda, Karjalainen, ur Rehman, & Fatima, 2021; Stephenson et al., 2010, 2015).

4.4 Economies of practice: budgets, seasons, and stacking

Household budgeting narratives revealed sophisticated "economies of practice" in which money, time, and reputation were co-managed through fuel choice. Participants rarely described a monthly fuel line-item in isolation; rather, they narrated choreography: buying a sack of charcoal after harvest when prices dip; reserving LPG for mornings and emergencies; deferring electricity-heavy tasks to evening hours; and bundling cylinder refills with market trips to reduce transaction costs. Women tracked microflows, stretching residual charcoal heat for tea or warming leftovers on a small gas flame to avoid relighting coals, while men described meso-flows, such as payday refills, regulator replacement, and negotiating safe storage with landlords. These patterned moves produced strategic stacking, an intentional portfolio rather than indecisive "non-adoption", aligning closely with determinants reported in urban Africa and South Asia (Akomolafe & Ogunleye, 2017; Brooks et al., 2016; Jeuland et al., 2015; Vigolo, Sallaku, & Testa, 2018).

Seasonality further structured these economies. Rainy months dampened charcoal and wood, increasing the appeal of LPG's instant heat, while dry months legitimised outdoor cooking and socialised smoke. School calendars compressed mornings, rewarding fuels that guarantee punctuality, whereas holidays expanded convivial cooking that favours charcoal or wood for large batches (Lee, 2013; Walekhwa, Mugisha, & Drake, 2009). Price volatility, especially in LPG, often triggered temporary reversion to charcoal, narrated not as failure but prudence: "We protect gas for when it really helps." Where vendor credit existed, some households smoothed volatility, but access was uneven and gendered, consistent with evidence that cash-flow constraints and gatekeeping shape uptake (Jeuland et al., 2015; Listo, 2018; Vigolo et al., 2018).

Participants also weighed risk-adjusted costs. Unknown or counterfeit equipment was rejected for both safety and reputational reasons, while recognised brands and new regulators were framed as "peace-of-mind" purchases that signal competence to neighbours (Evans et al., 2018; Oksman, Reda, Karjalainen, ur Rehman, & Fatima, 2021). Households maintained "insurance uses" across fuels (e.g., a small bag of charcoal for

outages, a single-burner LPG even when electricity was primary), creating redundancy against outages, price spikes, illness, or equipment failure, an adaptive portfolio logic observed in prior work (Brooks et al., 2016; Stephenson et al., 2010, 2015).

Care responsibilities intensified these logics. Infancy and elder care increased night-time boiling and sterilisation needs, nudging LPG/electricity for hygiene and speed; midday cooking by helpers often favoured charcoal's forgiving heat when employers were away. In dense compounds, visible smoke risked complaint or gossip, while an empty cylinder risked whispers about improvidence, underscoring that affordability alone seldom dissolves entrenched practice when social signalling is at stake (Bonjour et al., 2013; Vigolo et al., 2018; Wolf, Mäusezahl, Verastegui, & Hartinger, 2017). Policy levers that respect these economies, small-cylinder exchange and partial refills, neighbourhood safety demonstrations, and taste-preserving product design, are therefore more likely to improve portfolio quality (exposure, reliability, sensory satisfaction, time efficiency) than price instruments alone (Evans et al., 2018; Stephenson, 2015).

5 DISCUSSION

5.1 An anthropology of transition: energy cultures in the kitchen

Our findings make plain that clean cooking transitions are not discrete "adoption events" but cultural transformations in which infrastructures, social status, and culinary identity co-evolve through everyday practice; kitchens are not merely sites of heat conversion but social fields where modernity is performed, memory curated, and authority negotiated. The energy cultures lens helps formalise this entanglement by insisting that material arrangements (appliances, fuels, ventilation, storage), meanings and motivators (status, taste, safety, aspiration), and activities (routines, commensality, child care, time discipline) are mutually constitutive rather than additive (Stephenson et al., 2010; Oksman et al., 2021). In Kigali, LPG cylinders and electric plates do more than speed up cooking; they recalibrate the moral tempo of the household by promising punctuality for school and work and by rendering the kitchen legible as "urban" through its aesthetics of cleanliness and order. Yet, charcoal persists not as an irrational relic but as a "keeper of flavour", an index of technique and fidelity to place embedded in dishes like isombe, and thus in relations of recognition among elders, in-laws, and neighbours.

What appears, from a distance, as "incomplete diffusion" is, up close, an artful choreography through which households satisfy multiple audiences: employers and teachers who demand timeliness, kin who demand sensory authenticity, and neighbours who demand low smoke and visible safety (Brooks et al., 2016). Gender inflects this choreography at every turn: women, as routine cooks, carry the sensory and safety knowledge that renders meals morally adequate and children protected; men, as liquidity controllers and public risk bearers, police the optics of progress through purchase and maintenance. This is not to naturalise division but to describe how authority is enacted and bargained in kitchens, sometimes reconfigured by younger couples who distribute tasks and calibrate fuels to honour both speed and taste. Importantly, the Kigali case extends Energy Cultures applications beyond South Asia not by asserting exceptionalism but by specifying how urban African kitchens generate their own distinctive feedbacks: dense compounds translate smoke into reputational risk; intermittent electricity converts speed into social hazard (an outage while hosting); and the city–village rhythm legitimates episodic reversion to firewood as convivial rather than regressive (Kok et al., 2025; Oksman et al., 2021). In this anthropology of transition, appliances are social artefacts; risk is narrated, rehearsed, and redistributed through gendered channels; and taste is not a private preference but a public claim to competence. The analytic payoff is twofold: first, it clarifies why cost–benefit framings routinely underestimate the durability of stacking, because they treat culture as a frill rather than the very medium of action; second, it renders culture actionable for design and policy without collapsing it into attitude change, by targeting the concrete intersections where materiality, meaning, and routine bind together (e.g., the moment when a weekday breakfast must be delivered in twenty minutes and a weekend stew must "carry smoke"). Seen this way, transition succeeds when infrastructures are aligned with culturally legible routines and identities, not when one fuel displaces another in the abstract.

5.2 The double bind of transition

The Kigali narratives crystallise a double bind at the heart of clean cooking: households must optimise simultaneously across structural constraints (prices, reliability, after-sales service, safe storage) and cultural constraints (taste, safety narratives, status optics), and progress on one front can worsen vulnerabilities on the other. Price relief or

cylinder availability, for instance, can raise LPG uptake unless a salient rumour of a leak or a neighbour's vivid story of an accident tilts the household's safety calculus back toward charcoal; electrification can shorten breakfast time unless the possibility of an outage mid-meal threatens embarrassment while hosting, converting technical reliability into a reputational liability. This is not simply "heterogeneous preferences"; it is a structurally mediated, culturally saturated choice architecture in which each move has moral, temporal, and relational consequences (Pereira, Silva, & Ferreira, 2025; Vigolo, Sallaku, & Testa, 2018). The bind is sharpened by gendered labour and authority: the people who shoulder daily cooking (typically women and girls) also carry embodied risk (burns, smoke exposure) and bear accountability for taste; those who control liquidity (often men) bear public responsibility for "wise" purchases and technical upkeep and thus become the narrative targets if something goes wrong (Bonjour et al., 2013). Where technical ecosystems are thin, counterfeit regulators, inconsistent refill quality, and irregular electrical service exist, and the cost of being wrong is borne asymmetrically across this divide: women are faulted for "carelessness" if an incident occurs; men are faulted for "buying cheap" or "neglecting maintenance." Stacking is therefore not indecision but a low-regret strategy under deep uncertainty: charcoal ensures taste and continuity under multitasking; LPG ensures punctuality and hygiene under compressed routines; firewood ensures conviviality and bulk capacity in the village or outdoor compound (Jeuland et al., 2015). Education and climate awareness expand the option set but do not dissolve the bind; experiments with induction plates or improved stoves are evaluated not on abstract sustainability grounds but on fit with dish-specific technique, child safety, and the mutual gaze of neighbours. The literature's inventory of barriers, investment costs, regulatory ambiguity, and skills shortages maps cleanly onto this micro-political terrain (Pereira et al., 2025), but only an ethnographic account shows how these macro features are translated into lived constraints: a trustworthy vendor becomes a moral bulwark against rumour; an affordable small-cylinder exchange becomes a bridge through lean weeks; a landlord's rule about storing cylinders becomes a de facto veto on LPG adoption. The lesson is stark: push on prices alone and the cultural circuit reasserts itself via taste and safety; push on messaging alone and structural frictions nullify intention. Breaking the double bind requires synchronised attention to infrastructures and identities, which we term 'policy choreography' below.

5.3 Program design: from messaging to choreography

If behaviour-change communication (BCC) has taught us anything, it is that information and motivation can shift when messages are audience-segmented, delivered through trusted messengers, and embedded in local norms, and that durable change is most likely when measurement follows practice, not just intention (Evans et al., 2018; Wolf et al., 2017). Our evidence suggests moving beyond messaging to choreography, a sequenced bundle of interventions that act where households actually decide. First, pair targeted economic instruments with culinary stewardship: subsidies or vouchers should be accompanied by co-designed recipe protocols that preserve the sensory signatures of emblematic dishes (e.g., isombe), along with neighbourhood tasting events where cooks can test LPG/induction outcomes against charcoal benchmarks. Such "taste-equivalence" work treats flavour as a design spec rather than an afterthought, lowering the cultural cost of switching. Second, institutionalise safety dramaturgy: regular, neighbour-led, visibly rigorous demonstrations of cylinder handling, hose inspection, and regulator replacement, ideally with opportunities for hands-on rehearsal; convert rumour into skill and shift safety narratives from catastrophic imagery to actionable practice. Dramaturgy matters: stress-testing in public and tagging equipment with tamper-evident labels creates a staged assurance that travels through both women's caregiving networks and men's purchase networks. Third, adopt status reframing that recognises and rewards "clean-culinary mastery"; public recognition for households or blocks that meet low-smoke standards while producing taste-authentic dishes reframes modernity as compatible with heritage rather than opposed to it. Fourth, engineer budget-fit infrastructure: small-cylinder exchange programmes and partial-refill options align with the economies of practice households already run; vendor accreditation and transparent pricing stabilise trust; after-sales service and safe-storage solutions reduce the reputational cost of adopting gas in dense compounds. Monitoring must match this choreography: combine rapid KAP surveys with qualitative follow-ups, micro-ethnography of kitchen routines, and, where feasible, stove-use monitors to track stacking over time, recognising that rotation among fuels can be a healthy response to seasonal and social rhythms rather than a failure to commit. Program logics should therefore define success not as immediate displacement of charcoal but as movement toward risk-competent, taste-authentic, time-efficient portfolios with declining exposure and improved safety competence. Finally, invest in

gender-responsive facilitation: ensure that training times, languages, and spaces are accessible to primary cooks and that men, as liquidity gatekeepers, are not addressed only as payers but as co-stewards of safety and taste. In short, the choreography aligns incentives, skills, and status so that households can satisfy the triangle of safety–taste–speed without reputational penalty.

5.4 Implications beyond households

Household practices are nested within meso- and macro-systems whose failures can strand even the best cultural design; to avoid placing culture in a structural vacuum, city- and system-level actions must be advanced in parallel (Pereira et al., 2025; Vanegas Cantarero, 2020). At the city scale, reliable cylinder distribution networks, verified regulator supply chains, and transparent pricing reduce the informational fog in which rumour thrives; standardised product testing and visible certification marks convert safety from a private worry into a public good. Time-of-use electricity information, communicated in formats usable by busy households, allows cooks to plan around likely outages, converting electricity from a reputational risk into a reliable option for quick tasks. Municipal air-quality campaigns can be linked to neighbourhood recognition for low-smoke blocks, turning collective externalities into shared pride rather than unilateral shame. At the market and regulatory scale, small-cylinder exchange and micro-insurance for appliances align with the cash-flow realities of low- and lower-middle-income households; vendor accreditation and grievance redress mechanisms make trust portable, so that safe practice is not tied to a single charismatic supplier. At the workforce scale, investments in technician training for installation, inspection, and repair build the human infrastructure that sustains safety dramaturgy after pilots end. At the national policy scale, stabilising import duties and simplifying compliance for certified equipment can reduce counterfeit leakage, while data-sharing protocols between regulators, utilities, and municipalities enable early warning of supply or reliability shocks that would otherwise cascade into stacking reversals. Importantly, these actions should be evaluated with metrics that respect the cultural logic of transition: rather than a single "primary fuel" target, track portfolio quality (exposure, incident competence, sensory satisfaction, time savings) and practice adaptability (the household's ability to maintain safety and taste across seasons and life-course events) (Stephenson, 2015; Stephenson, 2018; Oksman et

al., 2021). Methodologically, this implies mixed systems of surveillance, routine administrative data, market price series, and community ethnography, so that policy remains responsive to the ways in which households actually live with technology. Finally, because migration, education, and media continually recompose the cultural field, cities should treat clean cooking as an ongoing governance task, not a one-off campaign: periodic refreshers in safety, rotating tasting competitions for new devices, and iterative redesign of subsidies as price and reliability shift. The broader implication for energy transition policy is clear. When infrastructures, markets, and regulations are tuned to the economies of practice that households already run, and when programmes honour the performative work of taste, safety, and status, stacking can evolve from a defensive hedge into a stepping-stone toward lower exposure and higher competence. Culture, in this register, is neither obstacle nor soft add-on; it is the operating system through which households translate system change into daily life, and it must therefore be designed for, measured, and governed alongside pipes, wires, and cylinders.

6 LIMITATIONS AND TRANSFERABILITY

Our evidence rests on the ethnographic work conducted from January to March 2025 across Kigali; as such, it offers analytical rather than statistical generalization. FGDs, interviews, and transect walks privilege publicly negotiated accounts and may under-surface private or conflictual practices; social-desirability pressures, especially around gendered authority, safety incidents, and money, likely temper disclosure. Purposive recruitment through local gatekeepers introduced selection bias toward compounds where multiple fuels were already visible, and the urban setting limits transferability to rural households with different resource ecologies, kinship obligations, and smoke tolerances. Language mediation (translation, code-switching) and researcher positionalities (education, gender, affiliation) shaped access and emphasis despite our reflexive protocols. Temporally, the snapshot coincided with specific price and supply conditions; seasonal cooking shifts (rainy-season dampness, school calendars, holiday gatherings) and policy shocks could reweight the safety–taste–speed calculus. Methodologically, our accounts would be strengthened by triangulation with instrumented traces, stove-use monitors, $PM_{2.5}$/CO logs, outage records, and price series, plus household ethnography to capture within-day choreography and domestic bargaining

off-stage from group talk. A larger, mixed-methods panel spanning diverse neighborhoods (landlord rules, density, and tenure), life-course transitions (marriage, childbirth, and migration), and village–city circuits would allow us to model how status-mediated switching and taste-equivalence thresholds evolve with changing infrastructures. Despite these constraints, the mechanisms we identify resonate with Energy Cultures theory and multi-country syntheses, supporting transferability by pattern to rapidly urbanising settings where affordability, reliability, gendered labour, and culinary identity collide. We therefore present our findings as credible, situated explanations and as design hypotheses to be tested and refined through longitudinal, gender-responsive, and sensor-augmented studies.

7 CONCLUSION

This study has shown that clean cooking in urban Rwanda is not a linear technological upgrade but a cultural reconfiguration in which infrastructures, identities, and routines are co-produced. By treating kitchens as ethnographic sites and fuel choices as socially meaningful acts, we illuminated how households assemble status-mediated switching to satisfy competing obligations of punctuality, safety, and culinary fidelity. Charcoal persists as a keeper of flavour and memory; LPG and electricity materialize urban discipline and cleanliness; firewood reappears as convivial capacity in village and compound life. These rotations are not residual "market failures". They are rational strategies under uncertainty, enacted within gendered divisions of labour and authority, and calibrated to neighbourhood surveillance, seasonal rhythms, and supply reliability. The analytic payoff is to reposition "culture" from backdrop to proximate mechanism: the channel through which price signals, product features, and reliability translate, or fail to translate, into daily practice.

Our contribution is threefold. Empirically, we centre household voices to specify how taste, safety narratives, and status optics are negotiated moment-to-moment in real kitchens, showing why affordability alone cannot dissolve entrenched practice. Theoretically, we extend the Energy Cultures approach with two actionable constructs, taste-equivalence thresholds and policy choreography, that explain when and why households reweight their portfolios of fuels. Methodologically, we align interpretivist inquiry with COREQ transparency and propose a mixed evidence architecture for future

work: qualitative depth to capture meaning-making; instrumented traces (stove-use monitors, $PM_{2.5}$/CO) to follow enactment; and administrative/market series to anchor structural shifts. Read together, these elements move the field beyond adoption counts toward portfolio quality, the degree to which households can achieve safety, sensory satisfaction, and time efficiency without reputational penalty.

The policy implications follow directly. First, design for culinary stewardship: treat flavour and texture as specifications, not afterthoughts, via co-designed recipes, neighbourhood tastings, and device standards that target dish-level performance. Second, institutionalise safety dramaturgy: routine, neighbour-led demonstrations with visible stress-tests and tamper-evident labelling to convert rumour into skill and shift risk talk from catastrophe to competence. Third, make budget-fit infrastructure the norm: small-cylinder exchange, partial refills, vendor accreditation, and after-sales service to stabilise trust in dense compounds (Masera et al., 2007). Fourth, embed gender-responsive facilitation: schedule and site training for primary cooks, enlist men as co-stewards of safety and taste, and measure time savings and exposure reductions by sex and life-course stage. Finally, evaluate success as movement toward risk-competent, taste-authentic, time-efficient portfolios, not merely displacement of a "primary fuel."

Multi-site, mixed-methods panels should track the evolution of status-mediated switching through births, schooling, migration, and price shocks; quasi-experimental variation (e.g., phased voucher rollouts, safety-demo saturation, small-cylinder exchange) can identify which levers bend portfolios durably. Sensor packages should be paired with ethnography to connect exposure reductions to concrete practice redesign, while sensory science can formalise taste-equivalence protocols that manufacturers and regulators can adopt. At the city and national scales, routine data on reliability, pricing, and certified equipment flows should be integrated with community ethnography to inform adaptive governance, recognizing that migration, media, and markets continually recompose the cultural field in which households decide (Lee, 2013; Akomolafe & Ogunleye, 2017).

Clean cooking transitions will succeed where pipes, wires, and cylinders are designed with, and governed alongside, the social operating system of the kitchen. When programmes acknowledge that people cook to nourish bodies, sustain memory, and perform respectability, not only to minimise emissions or save minutes, stacking can evolve from a defensive hedge into a ladder toward lower exposure and higher competence. The measure of progress is not whether charcoal disappears tomorrow, but

whether households gain the capacity to meet the triangle of safety, taste, and speed without fear or stigma. Designing for that capacity is both a cultural task and an infrastructural one, and it is where a just, durable clean-cooking transition will be won.

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Authors' Contribution

Both authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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