

Research Article

Sequenced Appropriation: Gendered Cooking Practice and Clean-Cooking Transitions in Urban Kigali

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Abstract

While electrification and access to liquefied petroleum gas (LPG) are increasing in Kigali, daily meals continue to rely on charcoal and wood. This study investigates why the adoption of new connections and appliance ownership does not necessarily result in appropriation, defined as the enduring and legitimate integration of equipment into valued culinary routines. Employing narrative ethnography in Gasabo, Kicukiro, and Nyarugenge from January to July 2025, we integrated semi-structured interviews, participant observation in over 100 cooking sessions, small focus groups, and transect walks. We analysed job timing, fuel sequencing, metering protocols, artefact custody, and vendor-trust practices that influence regular decision-making. Research reveals "sequenced appropriation": a rapid initiation followed by completion in which high-temperature methods (LPG/electricity) transition to charcoal for enhanced flavour, texture, and reputational security, locally referred to as *ibishyimbo zibuka amakara* ("beans remember charcoal"). Access to modern heating is governed by gatekeeping mechanisms (prepaid meters, top-up SIM cards, regulator keys) and trust frameworks (visible weighing, seal inspections, regulator-date logs). It is additionally influenced by hospitality risk and seasonal fluctuations in reliability. Prepayment visibility creates a "metered morality" that increases the social cost of mid-cook failures and restricts experimentation with unfamiliar equipment; space compatibility and delicate gadget ecologies further hinder domestication. The investigation elucidates the adoption of charcoal finishes without substitution and delineates gendered legitimacy dynamics that categorise charcoal finishes as "guest-facing" precautions, while designating swift transitions to LPG/electricity. We offer indicators at the appropriation level, detailing who utilises resources, for which tasks, at what times, and under whose authority, alongside ownership counts, to ensure that transitions are auditable at the practical level. The findings inform design and policy alternatives that normalise hybrids, establish vendor transparency, enhance repair routes, and regulate usage (e.g., hosting modes, co-registered SIMs), thereby transitioning high-heat phases away from biomass without compromising sensory legitimacy.

Keywords

Gender, Clean Cooking, Sequenced Appropriation, Gatekeeping Artefacts, Innovation Uptake

1. Introduction

Kigali's electricity connections, prepaid metering, and LPG availability have expanded rapidly, yet these infrastructures settle unevenly into everyday cooking. Minimal,

low-load uses, such as lighting, phone charging, and television, stabilise quickly. At the same time, core meal techniques remain anchored to charcoal and wood, unless new

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devices are domesticated within valued practice ecologies of timing, space, authority, and taste [16, 22]. Ethnographically, women describe a weekday choreography of “start fast, finish flavour”: high-heat starts on LPG/electricity to hurry time, followed by charcoal to restore texture, aroma, and reputational safety, summarised in the refrain *ibishyimbo zibuka amakara* (“beans remember charcoal”). This hybrid logic is evident across districts and venues, from shared compounds to small eateries, and is taught as a practical craft (“full flame to start; small flame to hold”), rather than as a reluctance toward modernity.

These observations foreground the research problem: why does electrification lead to adoption without substitution in Kigali kitchens, and which social-material mechanisms stabilise hybrid fuel routines as legitimate practices? Rather than measuring transition by the number of connections sold or devices owned, we ask who uses what. For this task, at what time, under whose authority—shifting evaluation to appropriation: the durable embedding of techniques within everyday life [7, 21]. In Kigali, the answer turns on two proximate mechanisms. First, gatekeeping artefacts (prepaid meters, top-up SIMs, regulator purchases, and cylinder-cage keys) allocate permission and define “prudent use.” For example, caretakers classify weekday boiling on communal meters as “waste units” while reserving “guest electricity” for front-stage needs. Second, trust infrastructures, auditable rituals of visible weighing, seal checks, and regulator-log dates, alongside reputational routes, convert risky transactions into verifiable ones and authorise cooks to mobilise “modern heat.”

This practice-centric lens aligns with wider clean-cooking evidence that households persistently stack fuels and techniques, optimising across price, reliability, and taste rather than linearly “switching” from biomass [14, 18, 24]. In Kigali specifically, domestication hinges on place-aware fit, safe outlet locations, cable management, pot stability, meter audibility, cylinder storage, and courtyard geographies that make safety rules durable in space; without these, “affordable” appliances remain impractical or morally suspect [15, 27].

This research contribution is twofold. Conceptually, it theorises sequenced appropriation, division of culinary labour across fuels as a rational reconciliation of temporal efficiency with sensory legitimacy and hospitality risk, and specifies metered morality, whereby prepaid visibility elevates the social cost of mid-cook failure, constraining experimentation. Empirically, it shows that what program logics label “fuel stacking” is, in practice, a collectively taught repertoire stabilised by artefact custody, meter etiquette, and public trust rituals [3, 28]. We therefore propose appropriation-level indicators, gender-disaggregated, task-timing-authority logs, and ownership counts for assessing transition.

2. Literature: Practice, Hybridisation, and Gendered Legitimacy

Over the past three decades, scholarship on household energy transitions has shifted from linear “energy ladder” assumptions to explanations that foreground fuel stacking, practice ecologies, and gendered governance [18]. The energy ladder’s core claim—that rising income and urbanisation drive a monotonic shift from biomass to modern fuels—has been repeatedly qualified by evidence that households layer fuels and techniques to hedge against price, reliability, and sensory risk [14, 24]. In African and Latin American cities, LPG and electricity often augment rather than displace charcoal/wood, a pattern better captured by stacking and hybridisation frameworks than by unidirectional substitution [21, 26]. Kigali’s kitchens exemplify this critique, as lighting and charging stabilise immediately after connection. However, cooking devices domesticate selectively and remain contingent on permissions, spatial affordances, and taste benchmarks—an empirical pattern detailed in findings that frame “transition as practice” rather than provision [16, 22].

A practice-centric lens asks whether devices “fit” the triad of materials, meanings, and competences [16], and whether they can be appropriated into the rhythms and reputational stakes of everyday life. Appropriation, distinct from uptake, requires stabilisation within valued practice ecologies: weekday/ceremonial tempos, gendered divisions of attention, and sensory outcomes recognised as “proper food.” This approach aligns with calls in energy social science to ask “what is energy for?” [23] and to treat diffusion indicators (connections, sales) as insufficient proxies of cultural change [8]. Kigali evidence demonstrates why, sequenced use—“start fast, finish flavour”—allocates high-heat starts to LPG/electricity and flavour finishes to charcoal, with legitimacy accruing to the sequence itself, not to any one fuel. Some works of literature show how such sequencing is taught, audited, and made durable by artefacts and spaces, thereby reframing stacking as a deliberate choreography rather than a “failed transition” [23].

Device-centric literature on improved cookstoves (ICS) has clarified thermal and emissions performance, but often under-specifies non-appropriation mechanisms and under-analyses appliances such as rice cookers, hot plates, and kettles [15, 27]. Kigali vignettes broaden the explanatory frame; rice cookers and hotplates often assume niche roles (steaming, reheating) or are sidelined after minor failures, as prepaid metering, socket geographies, bench heights, and steam dispersion problems render routine use impractical or morally suspect (“wasting units”) [17, 25]. Other studies have documented how micro-reconfigurations, bench moves, chalked “hot zones”, cylinder placement, and keeping appliances within audible range of meter beeps translate safety guidance into durable spatial rules [15, 27]. Without such a place-aware fit, “affordable” devices do not domesticate, even where connection and tariffs are favourable.

At the heart of hybridisation are trust infrastructures and

gatekeeping artefacts. A growing stream in energy/social-infrastructure studies shows that everyday provisioning is organised by auditable rituals (on-the-spot weighing, seal checks, regulator logs) that convert risky transactions into verifiable ones [5, 10]. Kigali materials specify these mechanisms and embed them in route reputations and compound governance; caretakers managing communal prepaid meters classify weekday boiling as “waste”, reserve “guest electricity” for front-stage uses, and thereby shift boiling to LPG/charcoal despite available sockets [14]. Such metered morality makes kilowatt-hours publicly legible and elevates the social cost of mid-cook failure, constraining experimentation and stabilising the “fast-then-finish” choreography. These nuanced understandings of standard supply- and price-led explanations show how permission to use “modern heat” is socially allocated via tokens, SIMs, regulator purchases, and cage keys, rather than simply being technically available.

Gendered legitimacy is a second central axis. Clean-cooking studies consistently show intra-household asymmetries; men disproportionately use entertainment and income-generating appliances, while devices aimed at reducing women’s labour face ownership-use gaps [4, 9, 28]. Kigali evidence echoes this: rice cookers require authorisations (access to meters/SIMs and socket time) that women do not fully control; their success depends on satisfying flavour benchmarks under hospitality risk [2, 14]. Thus, the reputational economy around taste and hosting is not an “irrational barrier” but a normative infrastructure, beans that “remember charcoal,” brochettes that “carry smoke,” and rice with proper grain separation constitute sensory legitimacy. Devices that threaten these anchors are peripheralized (e.g., for fast boils), while charcoal finishes protect identity claims and social safety, again observable in Kigali accounts.

The literature on leapfrogging, direct adoption of advanced fuels and devices, has tempered early optimism with attention to organisational and institutional frictions [21]. Kigali’s case clarifies which frictions matter most for kitchens, prepaid governance, vendor transparency, repair ecologies, and space. The study’s broader review traces Rwanda’s dramatic electrification trajectory while showing why, in kitchens, transformation depends on measurement and design that foreground appropriation, gender-disaggregated task-timing-authority logs, codified trust at points of sale, and place-aware retrofits that make hybrid sequences safe, auditable, and legitimate [1, 13, 29]. Cutting-edge clean-cooking research now converges on the claim that decarbonising kitchens is a cultural-infrastructure problem; technologies endure when they preserve sensory legitimacy, redistribute permission visibly, and align with the micropolitics of meter rules, vendor routes, and courtyard geometries —exactly the dynamics detailed for Kigali.

3. Materials and Methods: Narrative Inquiry Across Temporality, Sociality, and Place

We used a narrative ethnography to surface how women in Kigali domesticate, contest, and stabilise clean-cooking techniques in everyday life. Narrative inquiry treats participants’ stories as process data that unfold across time (life course and daily rhythms), sociality (relations, roles, and authority), and place (the material geographies of kitchens, compounds, markets) [6, 20]. Concretely, the design combined four strands: semi-structured life-history interviews, participant cooking observations (including observant participation), small, food-centred focus groups (“story circles”), and transect walks through kitchens, compounds, and supply nodes, supplemented by a document/grey-literature review to situate household practices within governance and supply-chain logics. Fieldwork took place from January to July 2025 across Gasabo, Kicukiro, and Nyarugenge, with a prolonged engagement to capture weekday/ceremonial cycles, as well as weather/reliability contingencies.

We applied purposive, saturation-driven sampling to recruit information-rich cases across income strata, dwelling types, household size, and fuel-stacking patterns, iteratively refining the sample as themes stabilised [11, 19]. The corpus comprises 50 households (primary cooks predominantly women), 100 cooking-session observations (60-150 minutes), 20 semi-structured interviews (with repeat contacts for depth), 10 focus groups (5-7 participants), and 15 transect walks, complemented by key-actor conversations (vendors, caretakers, community leaders) to triangulate provisioning and rule-setting. Sampling and routing were adjusted in response to emergent patterns (e.g., “hosting” days; storm-season reliability dips).

Each strand was instrumented to render task, timing, and authority observable. Interview guides elicited fuel biographies, decision thresholds, and “hosting risk” scenarios; focus groups staged peer narration around shared food to surface collective norms and diffusion pathways; transect walks documented route reputations, pricing, deposit/expiry checks, and last-metre risks; observations tracked ignition, first boil, simmer/finish, plating, noting who initiated transfers, who held tokens/SIMs/keys, meter beeps, cylinder icing, and spatial fixes (bench moves, hot-zone chalking, cable management). We combined time-sampling (routine peaks: mid-morning tea, midday, early-evening meals) with event-sampling (rain bursts, price shocks, outages) as “stress tests” that reveal sequencing logics under constraint. Visual field sketches, selective audio/video (with consent), and immediate analytic memos formed a synchronised audit trail.

Analysis proceeded concurrently with collection in iterative cycles of open, focused coding, producing district-level thematic maps that were then consolidated. Abductive moves linked thick description to mid-range constructs (e.g., se-

quenced appropriation, metered morality, gatekeeping artefacts, trust infrastructures). Cross-strand triangulation tested rival explanations (price/reliability vs. hospitality risk vs. spatial fit), while member checks (interview summaries, group feedback) stabilised interpretations. Reflexive journals documented positionality, interactional dynamics, and instrument drift; codebooks and versioned memos provide an audit trail [12].

Ethical clearance was obtained from Thammasat University HREC and Rwanda NCST. All participants gave informed consent; identifiers were removed at transcription; recordings and notes were stored on encrypted media. We addressed credibility through prolonged engagement, triangulation, member checks, and peer debriefs; dependability/confirmability through protocol transparency, reflexive journaling, and a maintained codebook; and transferability through a thick description of the context and practice ecologies [11]. Translation/interpretation choices, as well as code merges, were logged. Ambiguous cases (e.g., conflicting accounts of “waste units”) were retained as negative cases to test thematic boundaries.

As a single-city, deep case, statistical generalisation is not claimed; instead, we aim for analytical transferability to comparable developing urban contexts. To mitigate reactivity and recall bias, we prioritised in-situ observation and participatory observation; to mitigate gatekeeper effects, we varied settings (private kitchens, shared courtyards, markets, and post-Umuganda gatherings) and scheduling (avoiding times when senior household members could suppress talk). Seasonal/weather variability was partially addressed through event sampling; longer panels would further strengthen temporal claims.

4. Results

4.1. Adoption Without Substitution

Across Kigali, electrification “settled” quickly for low-load services, lighting courtyards and rooms, charging phones, and running radios/TVs, often within months of connection. By contrast, kitchen transformations were selective and gendered: kettles became ubiquitous, but rice cookers and hotplates drifted into peripheral niches (porridge, steaming, reheating) or were retired after a single failure (e.g., tripped meters, flimsy switches, missing cups), producing adoption without substitution [9, 26]. The Kigali narratives underscore why uptake does not equal appropriation; devices must stabilise inside valued practice ecologies, weekday/ceremonial tempos, household rules and authorities, spatial affordances, and, crucially, sensory legitimacy. In the study’s observations, rice cookers were found in roughly a tenth of homes, with habitual use in fewer still. At the same time, LPG cylinders were present but mobilised episodically, especially for cooking or throughput in small eateries. Women routinely described “putting the cooker away after it burnt once” or “keeping it for

steaming”, even when they praised electricity for everything else. As one woman explained:

“The kettle is every day, fast, simple. The cooker? ... If the guests are coming, I go back to the pot.” (Woman 42, Gasabo, 2025; Participant INT-5, Semi-Structured Household Interview)

This pattern aligns with comparative evidence that lighting stabilises early. At the same time, biomass persists for cooking, reframing the “paradox” not as resistance but as selective domestication under risk and reputation [14, 18, 24]. Programmatically, the implication is that counts of connections or devices overestimate transformation, without task-level, gender-disaggregated logs that show who uses what, when, and under whose authority. As a result, electrified kitchens will appear more “modern” on paper than in practice. Kigali materials repeatedly demonstrate that meter etiquette, artefact custody (token, SIM, cage key), and bench/socket geographies determine whether a device is considered “reasonable”, especially on stormy evenings or when “units are running”.

4.2. Sequenced Appropriation (“Start Fast, Finish Flavour”)

The dominant choreography across households and eateries is fast-then-finish; cooks initiate high-heat starts on LPG/electricity to “hurry time” (soften beans, bring stews to a first boil, parboil rice), then transfer to charcoal for protracted simmering, smoke contact, and texture control. Women gloss this as *gukurikiza uburyohe*, “following flavour”, captured in the refrain that *ibishyimbo zibuka amakara* (“beans remember charcoal”). In commercial settings, the logic is identical: steady gas is used to reach safe/consistent internal temperatures, and charcoal is used to finish with a recognisable crust, aroma, and colour. Importantly, legitimacy flows from the sequence, not from substitution; LPG/electricity gains social permission when it performs the fast phase; charcoal retains the “guest-facing” finish that anchors reputations. This division of labour across fuels lowers social risk; if a cylinder empties or units dip mid-cook, continuity can be recovered on the brazier without reputational loss. Sequencing also exploits each fuel’s comparative advantages: controllable, clean high heat for rapid phases; stable, unattended simmering; and multi-pot management on charcoal. The result is a durable hybrid rather than a waystation on a linear “ladder”. Far from a “failed transition”, sequencing is a rational reconciliation of temporal efficiency with sensory legitimacy under hospitality risk. Kigali evidence shows the sequence is taught as a practical craft, “full flame to start; small flame to hold”, and audited in action: who initiates the transfer, who monitors the meter beep, who controls the regulator, and whether the finish meets the family’s benchmark for “proper food”. For policy and design, the takeaway is that complements beat substitutes, dual-fuel benches, safe transfer ergonomics, and devices that protect the finish (e.g., low-smoke char-finishers) will embed more reliably than devices marketed as total replacements.

Sequencing is the unit of analysis; measure tasks within meals, not devices in homes.

4.3. Metered Morality & Hospitality Risk

Prepayment systems make kilowatt-hours visible and morally legible. In many compounds, caretakers manage communal meters and classify heavy weekday cooking as “wasting units,” reserving electricity for front-stage needs (“guest electricity”). Primary cooks internalise these rules; they pre-emptively revert to charcoal when meals are long, guests are expected, or storm-season reliability dips threaten mid-cook failure. The risk is not only technical but reputational:

“If the units finish, they say I wasted them. With charcoal, no one blames you.” (Woman 27, Nyarugenge, 2025; Participant OBS-42, Observations)

Thus, metering acts as governance by display: the audible beep, the dwindling numeric readout, the public top-up ritual, all produce a metered morality in which “prudence” is performative and auditable. This constrains experimentation with “uncertain” appliances (e.g., hotplates, rice cookers with unfamiliar cycles) and time-shifts high-draw tasks to when units are safely topped up or to fuels deemed safe by reputation. These patterns align with studies on prepayment and household welfare that identify anxiety and rationing behaviours around visible balances [25], as well as clean-cooking literature on fuel stacking as a hedge against reliability and social risk [14, 18]. In Kigali, the moralization is sharpened by compound rules and artefact custody (SIMs, tokens), which allocate permission to mobilise “modern heat.” Women narrated meter etiquette alongside hospitality scripts: during “big meals,” they move the finishing point to charcoal to avoid conspicuous, blame-worthy unit draw; on weeknights, they may use LPG for a fast start if a top-up is imminent. Policy designs that ignore this moral economy of metering, for instance, by assuming that tariff reductions alone drive substitution, will underperform. Interventions that tame the meter (e.g., a “hosting mode” with audible pre-alerts and temporary caps, dish-level watt-hour labels, and co-registered SIMs to reduce gatekeeping) directly target the social calculus that currently assigns high-stakes phases away from electricity. The analytic lesson is simple: in prepay systems, visibility creates accountability, and accountability shapes culinary permission.

4.4. Device Fragilities & Unfriendly Spaces

Even when prices and access are favourable, devices stall at the point of a spatial fit and repair ecosystem. Kigali kitchens and courtyards are often organised around low, stable charcoal stoves and heavy-bottomed pots; by contrast, rice cookers/hotplates require bench space, clean/dry outlets, and cord management away from child paths. Participants reported missing or fragile parts (inner pots, switches), unclear war-

ranty pathways, and scarce local repairs; a single failure can permanently sideline a cooker. Where outlets are few, appliances must compete with fridges, routers, and multi-plugs; relocating them increases wear and perceived risk. Women, therefore, perform micro-retrofits to translate abstract safety into durable spatial rules, moving benches to create clearances, chalking “hot zones” to signal child boundaries, placing cylinders in shaded, ventilated positions, and keeping appliances within audible range of meter beeps for prudent control. Without such modifications, electrified cooking is judged impractical or morally suspect (“don’t waste units near the socket”). These frictions are not idiosyncratic; they systematise the “ownership-use gap”, which is already documented for ICS and appliances [15, 27]. They also expose why space-aware design matters more than incremental price tweaks. In our corpus, the most successful appropriations bundled devices with place-aware aids, surge-protected splitters, short-throw shelves that safely lift cookers off the floor, simple pictorial guides for local rice varieties, and ergonomic safe transfer between LPG and charcoal. In effect, domestication requires a choreography of sockets, surfaces, and safety literacies, not merely a device. Policies oriented towards substitution should therefore include micro-grants for socket and cable management, standard regulator certification, and expiry logs at the point of sale, as well as neighbourhood repair kiosks/micro-warranties to keep cookers “alive” after the first failure. Appropriation hinges on whether devices can live safely and audibly in the places where meals are actually made.

4.5. Trust Infrastructures & Route Geographies

Kigali cooks narrate provisioning as a performance of trust, on-the-spot weighing, seal checks, regulator-date logs, and “preferred routes” to reputable vendors. Neighbourhood chat groups act as distributed warning systems. Broadcasting “don’t wet the sack” cautions for charcoal and highlighting LPG sellers who weigh in public. These auditable rituals convert risky transactions into verifiable ones, mitigating the impact of hurried vendors or reluctance to weigh the risks. In shared compounds, a parallel regime governs electricity. Caretakers steward communal prepaid meters and reserve “front-stage” loads for guests, reclassifying electricity as a status resource rather than a cooking fuel, and consequently shifting boiling back to LPG/charcoal, despite available sockets. The net effect is a trust-permission complex, on the street, vendor proofs stabilise procurement; at home, meter norms and token custody stabilise (or forbid) deployment. This resonates with broader work on trust infrastructures in energy transitions, moving beyond attitudes to the procedural [5, 10]. In our transect walks, route geographies mattered; women favoured well-lit paths, verified seals at kiosks that allowed public cutting, and coordinated top-ups at times when caretaker scrutiny was lower. Where trust infrastructures were codified (e.g., regulator replacement schedules;

visible certification cues), we observed more confident use of LPG/electricity for time-sensitive phases, while flavour finishes remained on charcoal for legitimacy. Design implications follow: bundle devices with vendor transparency standards; make regulators and hoses visibly certifiable with an expiry date; and align refill hours with safe routes. Doing so lowers the moral hazard that attaches to “modern heat” and shifts household calculus from fear management to practice optimisation. In this, without auditable trust, the fast phase remains risky and the finish retreats to what neighbours and kin recognise as credible.

4.6. Learning & Domestic Governance

Sequencing is taught in action. Women train daughters/nieces and negotiate with husbands, sons, and caretakers using procedural scripts: “full flame to start; small flame to hold”, “check the regulator date”, “don’t waste units on a long boil”, “keep the cylinder shaded”, and “listen for the meter beep”. Household artefacts, prepaid tokens, top-up SIMs, regulator keys, and cylinder cage locks materialise authority; whoever holds them sets thresholds for risk and timing (e.g., “no boiling on communal meters” or “buy only from Vendor X, who weighs in public”). Men often acquire units intermittently; women, on the other hand, manage daily use and, consequently, the reputational stakes associated with running out of units. When inventory is low, cooks adjust menus and serving times, replace beans with greens or ugali, finish cooking outdoors, and pace the audible meter to avoid embarrassment during the cooking process. These patterns echo gendered ownership-use gaps reported elsewhere; male-preferred, front-stage appliances diffuse faster than backstage labour-saving tools [4, 28]. However, the Kigali materials specify the governance mechanisms, who owns the SIM, who controls the key, and who defines prudence. Focus groups and observations also documented peer pedagogy—neighbours demonstrating “bubble tests” for leaks, chanting “seal-check” routines at LPG kiosks, and sharing watt-hour heuristics for cooker cycles, converting tacit safety into performative competence that legitimises weekday use. The study shows domestic governance allocates permission to mobilise modern heat, and learning stabilises practice through collective scripts that are repeatable, auditable, and compatible with sensory benchmarks. Programs that deliver devices without reshaping these scripts, co-registering SIMs, installing audible pre-alerts, standardising regulator logs, or funding safe placements will struggle to move beyond episodic trials. Kigali demonstrates that to change cooking, one must change who can say yes, when they can say it, and what constitutes a safe and respectable use.

4.7. Optimising Under Constraint (Not “Failing” to Transition)

According to this study, the evidence suggests a relational

equilibrium rather than a stalled ladder. Households allocate brief, high-heat tasks (such as rapid boils, preheats, and blanching) to LPG/electricity, and prolonged simmering/finishing to charcoal. This hybrid allocation reduces biomass use without displacing it, which is consistent with multiple-fuel strategies documented across various regions [18, 24]. The driver is not simply price minimisation but the triangulation of (1) cost visibility and prepay risk, (2) sensory legitimacy and hospitality norms, and (3) spatial fit and repairability. When reliability dips or balances shrink, charcoal absorbs risk; when schedules compress, LPG/electricity “hurries time” while leaving flavour work intact. The concept is not indecision; it is optimisation under constraint. Moreover, the equilibrium is teachable and auditable—a repertoire of rules (“no boiling on communal meters”, “public weighing only”) and placements (benches, hot zones, cylinder shade) that make hybridisation legible to caretakers, spouses, neighbours, and, crucially, to the cooks themselves. In this frame, labelling Kigali as a “failed transition” misreads the object. The relevant question is whether interventions improve the hybrid by codifying trust at the point of sale, adding hosting modes to meters, offering kettle-plus-insulated simmerer bundles, designing dual-fuel benches that stabilise quick transfers, and producing watt-hour recipe labels so that more of the fast phase moves cleanly off biomass without compromising finish-phase legitimacy. Monitoring must keep pace: report fuel-task-timing by daypart and authority mapping (token/SIM/regulator holders), not only ownership counts. In our corpus, households that could see vendor proofs and hear meter pre-alerts took bolder steps toward weekday electrified starts, while retaining charcoal finishes for guest-facing dishes. The cultural logic is coherent, electrons hurry time; charcoal finishes taste. A city-level clean-cooking strategy that normalises hybrids, codifies trust, and tames the meter will outperform one that pushes substitution regardless of practice ecologies. Kigali’s kitchens are already optimised for this future; policy must meet them where they cook.

5. Discussion

This study shows that Kigali’s clean-cooking transition does not hinge on simple device replacement but on sequenced appropriation, the deliberate division of culinary labour across fuels, whereby LPG/electricity “hurries time” and charcoal “finishes taste”. Read as flavour work, this choreography converts new devices from imagined substitutes into complements, lowering the social cost of experimentation and rendering saved time publicly diligent rather than derelict. That is to say, electrified starts become respectable because charcoal finishes remain recognisable to diners and kin. This resolves the so-called “uptake paradox” without pathologising users: households are not “failing” to modernise; they are rationally reconciling temporal efficiency with sensory legitimacy, hospitality risk, and compound governance.

Situated in the broader literature, our findings qualify linear

“ladder” or leapfrogging narratives by specifying the mechanisms that make stacking durable [18, 24]. A practice lens asks whether devices align with the triad of materials, meanings, and competences [16]. In Kigali, fit is co-produced by gatekeeping artefacts (prepaid meters, SIMs, and regulator keys) and trust infrastructures (public weighing, seal checks, and regulator logs) that socially allocate permission to mobilise “modern heat”. Prepayment visibility produces a metered morality—kWh balances become auditable performances of prudence—raising the reputational cost of mid-cook failure and constraining experimentation with unfamiliar cooking programmes [14, 25]. Our data, therefore, transform an abstract “stacking” descriptor into a governance account of who holds the token, who approves the purchase, which vendor is legitimate, and when electricity is permitted for which task.

The discussion also extends cultural studies of infrastructure by foregrounding taste and hospitality as constitutive of energy practices rather than residual “preferences”. Following Bourdieu’s account of distinction, sensory benchmarks (smoke, crust, grain separation) are not private whims but moral orders that anchor reputations [2]. Kigali cooks keep their “guest-facing” finishes on charcoal to safeguard identity claims, while appropriating electric speed where it does not threaten legitimacy. Programs that focus solely on substitution, therefore conflict with the teleo-affective orders of the kitchen regarding what is considered “proper food,” who is responsible if it is late or flat, and how thrift is demonstrated through prepaid display. Our contribution is to name this settlement—sequenced appropriation—and to explain how it is transmitted across households and eateries as a collectively learned repertoire.

These insights have measurement consequences. Conventional indicators (connections, ownership) overstate transition because they cannot account for partial use, transfer points, or “absent practices” [7, 21]. We propose appropriation-level indicators, including gender-disaggregated task-timing-authority logs (who uses what, for which task, at what time, under whose permission) and place-aware constraints (socket availability/quality, ventilation, cylinder placement, meter rules, and route safety). Such indicators align with practice theory and would make program impacts auditable in the registers that actually govern use—flavour benchmarks, artefact custody, and trust rituals, rather than proxies of access alone [16, 17, 22].

For design and policy, first normalise hybrids: dual-fuel benches that stabilise quick transfers, insulated simmers paired with kettles, and low-smoke charfinishers to protect flavour without heavy emissions. Second, codify trust, visible weighing, and seal-date standards at LPG points of sale; regulator/hose certification with precise expiry; neighbourhood repair kiosks; and micro-warranties [5, 10]. Third, tame the meter: “hosting modes” with audible pre-alerts and temporary caps; dish-level watt-hour labels; co-registered SIMs to reduce gatekeeping [17, 25]. These are not cosmetic tweaks; they directly relax the moral and spatial constraints that cur-

rently assign high-stakes phases away from electricity.

As a single-city, in-depth case, Kigali offers analytical generalisation rather than statistical inference. Yet, the mechanisms we specify — prepaid visibility, artefact custody, trust rituals, and flavour benchmarks — are standard across many developing urbanising contexts with prepaid and LPG growth. Future work should pair narrative inquiry with dish-stage diaries and high-frequency energy logs to quantify sequencing, and test whether codified trust and hosting-mode meters measurably shift fast phases to cleaner fuels without eroding sensory legitimacy. If, as we argue, electrons hurry time and charcoal finishes taste, then transitions will endure only when designs respect that cultural arithmetic and make legitimacy auditable alongside kilowatt-hours.

6. Policy and Design Implications

Energy access programming should pivot from counting connections and devices to documenting appropriation, that is, who uses what, for which task, at what time, and under whose authority. A lean monitoring dashboard can capture gender-disaggregated fuel-task-timing by daypart (weekday vs. ceremonial) alongside an authority map identifying holders of the token, SIM, regulator, and cage key. Such instrumentation reframes “transition” from ownership to practice, rendering visible the transfer points that structure meals (e.g., LPG/electric starts followed by charcoal finishes) and the compound rules (e.g., “no boiling on the communal meter”) that actually govern use [7, 8, 21]. Aligning evaluation with practice ecologies is essential in Kigali, where legitimacy demonstrably flows from sequencing rather than wholesale substitution.

Design should likewise assume hybrids as the end state, not a temporary stopgap. Treating LPG/electricity and charcoal as complements informs product and spatial choices in the prevalent “fast-then-finish” choreography. Practical priorities include dual-fuel benches that stabilise heavy pots and enable safe one-hand transfers; guarded char-finishers that reduce burns and smoke during flavour finishing; and kettle-plus-insulated-simmer pairings that shift only the high-heat phase off biomass while protecting taste benchmarks. Small, inexpensive spatial aids, such as short-throw shelves and surge-protected splitters, allow appliances to “live” near prep zones without cord hazards. In Kigali kitchens, these micro-upgrades repeatedly determined whether devices were domesticated or drifted back into storage [14, 27].

Because everyday provisioning hinges on credibility, interventions must codify trust rather than rely on messaging alone. Auditable vendor standards, public on-the-spot weighing of LPG, visible seal/date checks, and regulator/hose certification with clear expiry marks convert risky transactions into verifiable ones. When coupled with micro-warranty tokens and neighbourhood repair kiosks, these standards prevent a single device failure from permanently sidelining a cooker, a recurrent cause of non-appropriation in the field.

Evidence from infrastructure governance suggests that formalising such trust structures raises confidence in using modern fuels during time-sensitive phases [5, 10].

Equally, metering needs to be tamed so that prepaid visibility does not translate into moral exposure that deters experimentation. Hosting modes on smart meters, temporary kWh caps with audible pre-alerts, can prevent mid-cook failure and public blame, while dish-level watt-hour labels (e.g., “Beans: X Wh to first boil”) convert “unit anxiety” into actionable planning. Co-registering SIMs for top-ups reduces gatekeeping over mobile money that currently restricts primary cooks’ autonomy. These adjustments target the social calculus that discourages long, uncertain cooks from using electricity despite having physical access [17, 25].

Furthermore, spatial retrofits deserve parity with device subsidies. Micro-grants for safe outlets, cable management, cylinder placement/ventilation, and positioning appliances within audible range of meters address the concrete frictions that stall domestication. Normalising chalked hot zones and pot-stability fixtures suited to courtyard geographies, scheduling outreach with post-Umuganda gatherings, and aligning refills with well-lit, trusted routes reduce the social cost of procurement, instruction, and reassurance. Implementation should proceed as modular bundles—hybrid bench plus trust standard plus hosting-mode firmware plus micro-retrofits piloted in contrasting compounds and evaluated with appropriate metrics (task-level sequencing logs, daypart time-use, and incident reports on mid-cook failure) rather than ownership alone. Success, in this frame, is partial substitution, with swift phases moving cleanly off biomass while flavour legitimacy is preserved, not immediate charcoal elimination. Policy that measures practice, designs for hybrids, codifies trust, tames the meter, and retrofits space is most likely to deliver transitions that endure in the grain of everyday life, where electrons hurry time and charcoal finishes taste.

7. Conclusions

Kigali’s kitchens show that clean-cooking transitions are achieved not through simply replacing devices, but by a sequence of appropriations: starting with electrified or LPG methods that “hurry time,” followed by charcoal finishes that preserve taste, texture, and reputation. Read as flavorwork, this choreography renders modern heating legitimate within local practice ecosystems and explains persistent fuel stacking without pathologising users [18, 24, 14]. Our contribution specifies the mechanisms that make hybrids durable, gatekeeping artefacts (tokens, SIMs, regulators), trust infrastructures (weighing, seals, regulator logs), and metered morality under prepayment, thereby shifting evaluation from access to appropriation [7, 16, 25].

A policy that takes these mechanisms seriously will prioritise practice-aligned metrics (who/what/when/under whose authority), hybrid-ready design (dual-fuel benches, char-finishers, kettle-plus-simmer bundles), codified vendor standards with

micro-warranties, and hosting-mode metering that lowers visible risk [5, 10, 21]. Success should be defined as partial substitution, more rapid phases shifting off biomass without eroding sensory legitimacy, rather than immediate charcoal elimination. Future research should pair narrative inquiry with dish-stage diaries and high-frequency energy logs to quantify sequencing and to test whether trust standards and hosting-mode meters measurably reallocate tasks to cleaner fuels. When programs normalise hybrids, codify trust, tame meter anxieties, retrofit spaces, and measure appropriation directly, transitions move from access to accepted practice.

8. Ethics, Reflexivity, and Limitations

The study received ethical approval from the Thammasat University Human Research Ethics Committee and the Rwanda National Council for Science and Technology. All participants provided informed consent (written or witnessed verbal), were free to withdraw at any point, and received a brief debrief. Names and precise locations were anonymised; audio files and transcripts were stored on encrypted drives with restricted access. Where cooking sessions were recorded, separate consent was obtained; no images identifiable to individuals are reproduced. To minimise power asymmetries and gatekeeper pressure in shared compounds, interviews were scheduled at participant-selected times/places, and any third-party presence was documented in fieldnotes. Translation/interpretation decisions were logged, and emergent safety issues (e.g., proximity to hot surfaces during observations) triggered an immediate pause or rescheduling.

Reflexive journaling, member checks (return of summaries to participants), and triangulation across interviews, observations, and transects supported credibility; analytic memos and versioned codebooks provide an auditable trail. Fieldwork foregrounded women’s interpretive authority; men more often appeared as auditors of expenditure or beneficiaries of hospitality, a positionality that may shape accounts of “prudence”. Limitations include seasonality (storm-related reliability dips) and the under-representation of transient renters and highly mobile workers. Future work should incorporate dish-stage diaries and high-frequency energy-use logs to quantify sequencing and extend recruitment to transient tenancy, thereby testing transferability across different tenure forms.

Abbreviations

HREC	Human Research Ethics Committee
ICS	Improved Cookstove(s)
kWh	Kilowatt-hour
LPG	Liquefied Petroleum Gas
NCST	National Council for Science and Technology (Rwanda)
NGO	Non-Governmental Organisation
TV	Television

Wh Watt-hour

Supplementary Material

The supplementary material can be accessed at <https://doi.org/10.11648/j.ss.20251405.20>

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Author Contributions

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The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares no conflicts of interest.

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Biography



Jeremiah Thoronka is an award-winning innovator and PhD candidate in Social Innovation and Sustainability, researching energy transitions and the diffusion of innovation. He was a Commonwealth Scholar when he obtained his MSc degree in Sustainability, Energy and Development at Durham University. He founded Optim, an off-grid clean energy system that utilises solar power with innovative Global System for Mobile Communications (GSM)/Bluetooth management to provide free electricity to climate- and energy-vulnerable communities in Sierra Leone. A Forbes Africa Under 30 honouree and inaugural Global Student Prize laureate, he advises global climate and energy policy. His current work on mini-solar grids and social value frameworks advances equitable and affordable energy access for climate-vulnerable communities.

Research Field

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