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Women-Led Grassroots Innovations in Contemporary India: Between Informal Knowledge and Institutional Recognition

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Abstract

Innovation discourse in contemporary India remains dominated by formal R&D systems, start-up ecosystems, and patent-driven entrepreneurship, often marginalising women's informal knowledge practices. However, women across rural and semi-urban contexts generate context-specific innovations rooted in embodied labour, ecological adaptation, and livelihood necessity. These innovations enhance productivity and sustainability but frequently encounter structural barriers to institutional legitimacy.

This paper examines how women-led grassroots innovations transition from informal problem-solving to institutional recognition through intermediary networks such as the National Innovation Foundation (NIF), GIAN, and SRISTI. Drawing on qualitative document analysis of institutional award compendiums, databases, and published case studies, the study develops a five-stage relational framework that integrates innovation systems theory, feminist political economy, recognition theory, and the sociology of expectations.

The analysis demonstrates that institutional recognition operates as a structured and uneven process of mediation. While validation confers visibility, symbolic capital, and network access, it simultaneously filters and reframes grassroots knowledge according to dominant logics of scalability, regulatory compliance, and market alignment. Recognition thus redistributes authority within gendered innovation fields rather than functioning as a neutral endorsement mechanism.

By conceptualising recognition as a power-embedded process, the paper advances a gendered innovation systems perspective and highlights the need for reflexive validation protocols that can decentralise knowledge hierarchies. The findings contribute to debates on inclusive innovation by foregrounding the

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politics of legitimacy that shape which knowledge becomes visible, valued, and sustained within contemporary innovation ecosystems.

Keywords: Grassroots innovation; women innovators; institutional recognition; symbolic capital; gendered innovation systems.

1. Introduction

Over the past three decades, innovation has become a central idiom of development policy and economic transformation in India. National policy frameworks increasingly position innovation as synonymous with technological advancement, startup acceleration, patent production, and high-growth entrepreneurship. Metrics of success are commonly derived from intellectual property filings, venture capital mobilisation, incubation outputs, and digital transformation indices. Within this dominant narrative, innovation is imagined as laboratory-based, capital-intensive, and embedded within formal research and development ecosystems (Lundvall, 2010; OECD, 2018). The prototypical innovator emerging from this discourse is technologically trained, institutionally networked, and disproportionately male.

Such a framing, while influential in shaping policy imagination, narrows the epistemic boundaries of what is recognised as innovation. It privileges codified, scalable, and market-oriented solutions while marginalising context-bound, experiential, and necessity-driven forms of problem-solving. In doing so, it inadvertently reproduces gendered hierarchies within innovation systems. Women's contributions, particularly those located in rural, informal, and community-based contexts, often remain analytically peripheral. Feminist scholarship has long demonstrated that innovation ecosystems reflect broader patterns of the gendered division of labour, in which women's knowledge is frequently situated within domestic, agricultural, and care economies and is therefore coded as non-technical or supplementary rather than inventive (Ahl & Nelson, 2015; Harding, 1986).

However, the empirical reality complicates this dominant account. Across diverse regions of India, women engage in sustained, iterative problem-solving that addresses agricultural constraints, water management, food processing, energy efficiency, local health practices, and environmental sustainability. These innovations emerge not from formal laboratories but from embodied familiarity with ecological cycles, household resource management, and livelihood precarity. They are often driven by necessity, shaped by resource scarcity, and refined through collective experimentation. Although such innovations frequently

enhance productivity, reduce drudgery, and strengthen local resilience, they remain underdocumented and undervalued in mainstream innovation metrics.

The invisibility of women-led grassroots innovations is not merely a matter of statistical underrepresentation; it reflects deeper epistemological hierarchies. Innovation systems theory has historically emphasised formal institutional linkages, research intensity, and technological transfer mechanisms (Freeman, 1987; Lundvall, 2010). Informal knowledge systems, particularly those rooted in gendered labour spaces, rarely fit comfortably within these analytical models. As a result, women innovators operating outside formal entrepreneurial circuits encounter structural barriers to recognition, including limited access to technical validation, financial capital, intellectual property protection, and market networks.

In the Indian context, intermediary organisations such as the National Innovation Foundation (NIF), the Grassroots Innovation Augmentation Network (GIAN), and the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) have sought to bridge this divide. These institutions serve as platforms that identify grassroots innovations, facilitate technical validation, support incubation, and connect innovators to broader policy and market ecosystems. By documenting and awarding local innovations, they contribute to the translation of tacit knowledge into publicly recognised innovation narratives. For women innovators in particular, such institutional mediation can provide access to visibility, credibility, and new socio-economic networks.

However, institutional recognition is neither automatic nor neutral. Validation processes involve codification, standardisation, and alignment with regulatory, scientific, and market criteria. In transitioning from community-based experimentation to formal recognition, innovations are often reframed to fit dominant innovation logics. This raises critical questions about whose knowledge counts, how it is reconfigured, and under what conditions it acquires legitimacy. Women innovators must navigate a complex terrain in which community legitimacy intersects with institutional gatekeeping and where symbolic recognition may coexist with persistent structural constraints.

Against this backdrop, the present study asks: *How do women-led grassroots innovations negotiate the space between informal knowledge production and institutional recognition?* By foregrounding negotiation rather than celebration, the paper seeks to move beyond inclusionary rhetoric and interrogate the structural dynamics that shape recognition within contemporary innovation systems.

The study makes three interrelated contributions. First, it extends gendered innovation scholarship by repositioning grassroots epistemologies as analytically central rather than peripheral to innovation discourse. Second, it develops a conceptual framework that integrates gendered institutional gatekeeping with the sociology of expectations, demonstrating how recognition processes both enable and reshape women's innovative agency. Third, it offers policy-relevant insights for strengthening inclusive innovation architectures, arguing for validation frameworks that move beyond patent-centric and episodic award models toward sustained, context-sensitive mentorship ecosystems.

By situating women-led grassroots innovation at the intersection of informal knowledge systems and institutional mediation, the paper contributes to a more expansive understanding of innovation in contemporary India, one that is attentive not only to technological advancement but also to the politics of recognition that determine whose creativity is seen, legitimised, and supported.

3. Literature Review

This section situates the study within three interrelated strands of scholarship: grassroots and informal sector innovation, gender and innovation systems, and institutional mediation. Rather than treating these literatures as discrete domains, the review examines how their intersection reveals an under-theorised space concerning women-led grassroots innovation and recognition dynamics.

A. Grassroots Innovation and Informal Knowledge Systems

The dominant architecture of innovation scholarship has historically centred on formal research and development (R&D) systems, industrial laboratories, and technologically intensive sectors (Freeman, 1987; Lundvall, 2010). National innovation systems theory conceptualises innovation as an outcome of structured interactions among firms, universities, and the state. While analytically influential, this framework privileges institutionalised knowledge production and codified scientific outputs. As a result, innovation occurring outside formal R&D environments, particularly within informal, rural, or resource-constrained contexts, has remained under-theorised.

In response, alternative strands of scholarship have foregrounded grassroots and informal sector innovation. Gupta (2016) and colleagues have emphasised the creative capacities embedded within local knowledge systems, arguing that innovation is not the exclusive domain of laboratories but also emerges from everyday problem-solving among farmers, artisans, and informal workers. Similarly, Seyfang and Smith (2007) conceptualise grassroots innovations as networks of activists and community actors that generate bottom-

up solutions oriented toward sustainability and social needs rather than profit maximisation. These perspectives challenge the technological determinism of mainstream innovation discourse and expand the definitional boundaries of innovation.

Parallel debates around "bottom-of-the-pyramid" (BoP) markets have further complicated the innovation-development nexus. Prahalad (2005) reframed low-income populations as consumers and entrepreneurs within emerging markets, prompting corporate engagement with inclusive innovation strategies. However, critics have cautioned that BoP narratives risk commodifying poverty and overlooking structural inequalities (Arora & Romijn, 2012). Importantly, much of the BoP literature remains firm-centric, focusing on corporate adaptation rather than endogenous community innovation. The distinction between market-led inclusion and community-originated innovation remains analytically significant.

Recent scholarship on frugal innovation and inclusive innovation has also sought to move beyond capital-intensive models (Pansera & Owen, 2018). Frugal innovation highlights cost-efficient, locally adapted solutions developed under constraints. However, even here, analytical attention tends to prioritise scalability and market diffusion, often sidelining questions of power, gender, and recognition. While the literature increasingly acknowledges informal innovation ecosystems, systematic interrogation of how such innovations transition into formal recognition remains limited.

B. Gender, Knowledge, and Innovation

Innovation systems are not gender-neutral. Feminist scholarship has long demonstrated that knowledge production is shaped by power relations embedded within social, economic, and institutional structures (Harding, 1986). Women's exclusion from formal scientific and technological domains has been widely documented, particularly within STEM education, patent authorship, and high-technology entrepreneurship (Ahl & Nelson, 2015). Structural barriers include limited access to capital, network exclusion, mobility constraints, and entrenched norms regarding appropriate domains of female labour.

However, focusing solely on women's underrepresentation within formal innovation spaces risks reproducing the same narrow definitional boundaries. Feminist political economy broadens the lens by interrogating how unpaid care work, subsistence labour, and informal sector activities generate knowledge and innovation that remain unrecognised within market metrics (Elson, 1999). Women's labour in agriculture, water management, health practices, and household economies frequently produces adaptive

technologies and process innovations, yet these contributions are rarely codified as intellectual property or entrepreneurial achievement.

The invisibility of women-led innovation is thus both institutional and epistemic. Tacit knowledge embedded in lived experience often lacks formal documentation or technical validation, leading to its marginalisation within mainstream innovation frameworks; moreover, gendered expectations shape which ideas are perceived as legitimate. Research on entrepreneurial ecosystems indicates that evaluative biases influence funding, recognition, and mentorship pathways (Brush et al., 2019). These dynamics suggest that recognition is not simply a matter of output quality but of institutional perception.

Despite growing scholarship on women entrepreneurs and gender gaps in innovation metrics, comparatively little attention has been devoted to women innovators operating within grassroots and informal contexts. The analytical focus remains disproportionately on high-growth, venture-backed enterprises rather than community-embedded problem-solving. This gap underscores the need to reposition grassroots women innovators within innovation studies, not as peripheral actors but as central knowledge producers navigating structurally uneven systems of recognition.

C. Institutional Mediation and the Politics of Recognition

Innovation does not occur in isolation; it is embedded within institutional ecosystems that shape validation, diffusion, and legitimacy. DiMaggio and Powell's (1983) theory of institutional isomorphism underscores how organisational fields impose norms and standards that actors must align with to gain legitimacy. Within innovation systems, validation processes, including technical testing, patenting, incubation, and award recognition, serve as mechanisms of institutional mediation. These processes confer symbolic capital while simultaneously filtering innovations through established criteria of novelty, scalability, and commercial viability.

Intellectual property regimes further structure the politics of recognition. Patent systems privilege codified, individualised invention over collective and tacit knowledge traditions (Drahos, 2010). For grassroots innovators, particularly women with limited access to legal expertise, navigating intellectual property frameworks can be prohibitively complex. Incubation ecosystems, while designed to support innovation, may inadvertently reproduce gatekeeping logics through eligibility criteria and evaluation norms aligned with formal entrepreneurship.

Innovation networks and intermediary institutions, therefore, occupy a pivotal position. They function as translators between informal knowledge and formal recognition structures, facilitating documentation, validation, and market access. Nevertheless, mediation is not a neutral bridge; it is a site of negotiation. Recognition can transform social identity, redistribute symbolic capital, and alter local power relations. At the same time, institutional alignment may reshape the meaning of innovation itself.

While existing scholarship addresses grassroots innovation, gender disparities in innovation systems, and institutional validation processes as distinct domains, there is limited integrative analysis of how these dimensions intersect. In particular, very little scholarship interrogates how women innovators move from informal community recognition to institutional legitimacy within structured innovation ecosystems. The transition from tacit, locally embedded problem-solving to formal recognition involves negotiation across gendered, epistemic, and institutional boundaries, an analytical terrain that remains insufficiently theorised.

This gap provides the foundation for the present study. By examining women-led grassroots innovations at the interface between informal knowledge production and institutional mediation, the paper seeks to illuminate the structural dynamics that shape recognition, legitimacy, and transformative potential within contemporary innovation architectures.

4. Conceptual Framework

The analytical challenge of this study lies in situating women-led grassroots innovation within the broader architecture of innovation systems while simultaneously interrogating the gendered and institutional dynamics that shape recognition. Mainstream innovation systems theory, as articulated by Freeman (1987) and further developed by Lundvall (2010), conceptualises innovation as emerging from structured interactions among firms, research institutions, and the state. While this framework powerfully explains technological development in industrial contexts, it implicitly privileges formal R&D infrastructures and codified knowledge flows. Grassroots innovations, particularly those emerging from informal and gendered labour spaces, remain analytically peripheral within this paradigm.

To address this limitation, the present study constructs a relational conceptual framework that integrates five theoretical domains: informal knowledge systems; feminist political economy and epistemology; the sociology of expectations; symbolic capital and recognition theory; and institutional dynamics, including entrepreneurship and gatekeeping. Together, these perspectives enable a multi-layered understanding of how women innovators traverse recognition systems.

Informal Knowledge Systems within Innovation Architectures

Grassroots innovation is embedded in tacit, experiential, and context-specific knowledge. Unlike laboratory-based innovation, which follows codified procedures, informal innovation evolves through iterative adaptation shaped by ecological familiarity and livelihood constraints (Gupta, 2016; Seyfang & Smith, 2007). Women innovators frequently operate within domains socially coded as reproductive or subsistence labour, agriculture, food processing, water management, and health practices, where innovation is not institutionally recognised as technological production.

From the standpoint of feminist epistemology, such marginalisation reflects not an absence of innovation but a hierarchy of knowledge (Harding, 1986). Informal knowledge is rendered epistemically subordinate because it emerges outside dominant scientific institutions. Feminist political economy further underscores how labour markets and innovation systems are gendered institutions that distribute recognition unevenly (Elson, 1999). Women's problem-solving activities, though economically consequential, are often naturalised as routine labour rather than inventive contribution.

Accordingly, the first stage of the model, *Stage 1: Informal Problem-Solving,* positions innovation before institutional visibility, grounded in lived experience rather than formal validation.

Sociology of Expectations and the Translation of Promise

Innovation is inherently future-oriented. The sociology of expectations demonstrates how anticipatory narratives mobilise resources, shape legitimacy, and influence investment flows (Borup et al., 2006). Within structured innovation systems, value is attached not only to present utility but to projected scalability, technological novelty, and market potential.

For women-led grassroots innovation, this introduces a translation dynamic. At the community level, innovations gain legitimacy through immediate practical impact, reducing labour intensity or enhancing sustainability. However, institutional recognition requires reframing such utility into a future-oriented "innovation promise." This reframing marks the transition to Stage 3: Institutional Mediation, in which local knowledge must be rendered legible within dominant evaluative frameworks.

Crucially, expectations are structured by power. Certain forms of innovation, digitally oriented, patentable, and scalable, align more readily with institutional imaginaries than context-specific adaptations. The negotiation of expectations, therefore, becomes a central site of inclusion and exclusion.

Symbolic Capital, Recognition, and the Matthew Effect

Institutional validation confers symbolic capital (Bourdieu, 1986). Awards, certifications, patents, and public recognition reclassify grassroots women from informal problem-solvers to legitimate innovators. Recognition is transformative; it reshapes identity, expands networks, and can alter intra-community power relations.

Recognition theory deepens this dimension. Honneth (1995) conceptualises recognition as foundational to social agency; its denial constitutes injustice. For women historically excluded from technological domains, institutional acknowledgement carries moral and symbolic weight beyond economic benefit.

Nevertheless, recognition operates within stratified fields. Merton's (1968) Matthew effect illustrates how established actors accumulate disproportionate credit, while marginal actors struggle for acknowledgement. Innovation ecosystems often exhibit cumulative advantage dynamics, in which visibility and credibility reinforce existing hierarchies. Women innovators entering institutional arenas, therefore, confront asymmetrical recognition regimes.

In *Stage 4: Market/Policy Validation*, symbolic capital becomes convertible into access to funding, market networks, and policy engagement. However, conversion requires compliance with institutional logics, embedding innovators within structured hierarchies of legitimacy.

Institutional Gatekeeping and Institutional Entrepreneurship

Institutional theory emphasises that organisational fields impose normative and evaluative constraints (DiMaggio & Powell, 1983). Gendered gatekeeping operates subtly through funding criteria, mentorship networks, intellectual property regimes, and informal biases that shape which innovations are perceived as credible.

Intermediary institutions, such as NIF, GIAN, and SRISTI, mediate between informal knowledge and formal systems. Their role corresponds to *Stage 3: Institutional Mediation*, where documentation, technical validation, and codification occur. However, mediation is selective. Innovations are filtered through standards of novelty, market viability, and regulatory compatibility. Recognition thus involves translation, standardisation, and sometimes transformation of original knowledge.

At the same time, institutional change remains possible. Battilana, Leca, and Boxenbaum (2009) theorise institutional entrepreneurship as the capacity of actors to mobilise resources and reshape institutional

arrangements. Women innovators who successfully navigate validation processes may act as institutional entrepreneurs, redefining local gender norms and expanding the boundaries of legitimate technological agency.

This dynamic culminates in *Stage 5: Social Repositioning*, in which institutional recognition may alter symbolic capital, decision-making authority, and community status. However, repositioning is contingent; without sustained support, recognition risks remaining episodic.

Integrated Five-Stage Relational Model

The conceptual framework, therefore, proposes a dynamic, process-oriented model:

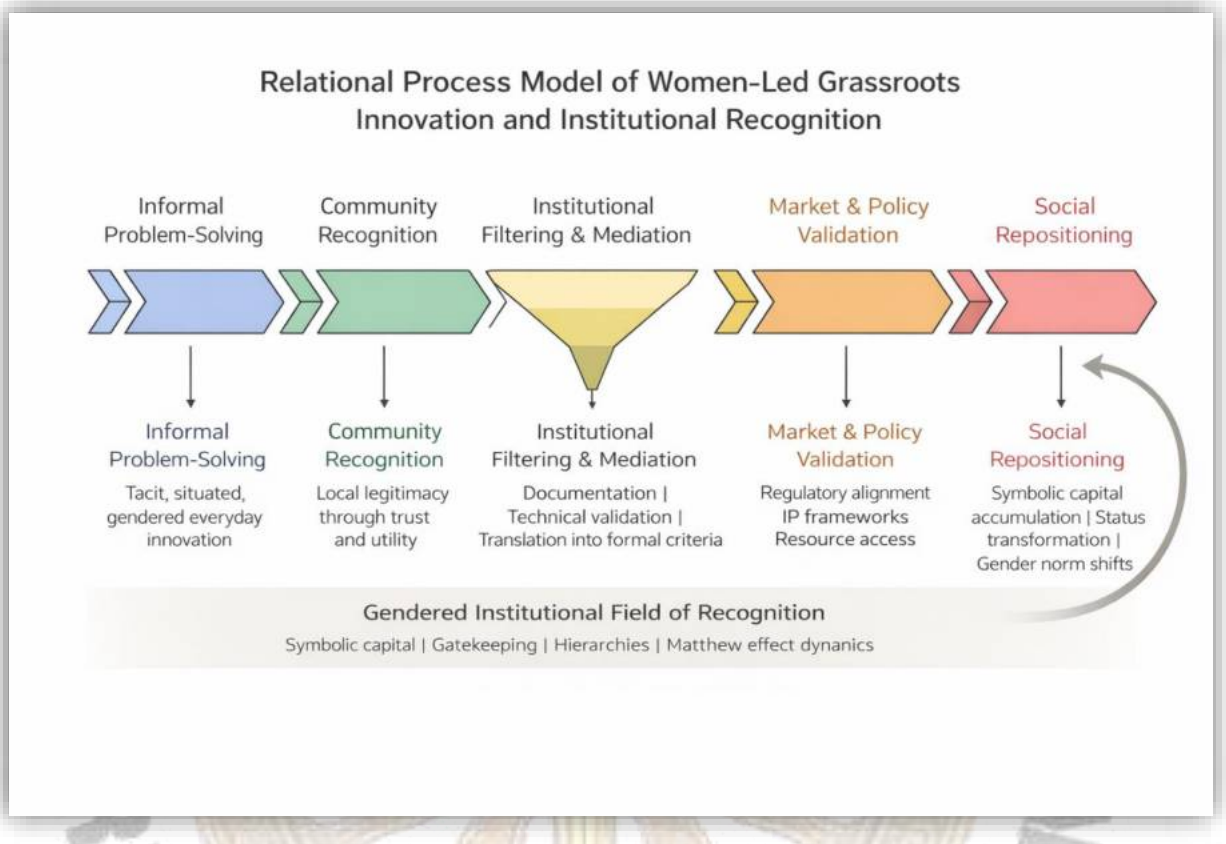
1. **Informal Problem-Solving** – Tacit, gendered, context-specific innovation.
2. **Community Recognition** – Local legitimacy grounded in utility and trust.
3. **Institutional Mediation** – Documentation, validation, and codification by intermediary organisations.
4. **Market/Policy Validation** – Entry into regulatory and intellectual property regimes; accumulation of symbolic capital.
5. **Social Repositioning** – Transformation of social identity and potential institutional entrepreneurship.

Movement across stages is neither linear nor guaranteed. Each transition involves negotiation across epistemic hierarchies, gendered power structures, and institutional expectations. Institutional recognition is therefore not a neutral bridge; it is a reconfiguration of power that redistributes legitimacy while embedding innovation within formal structures.

By integrating innovation systems theory with feminist political economy, recognition theory, and institutional analysis, this framework moves beyond descriptive accounts of women innovators. It foregrounds the politics of legitimacy and the structural conditions under which informal knowledge becomes institutionally validated. This analytical architecture guides the empirical analysis that follows, enabling systematic examination of how women-led grassroots innovations navigate and reshape the terrain of recognition within contemporary innovation ecosystems.

Figure 1

Relational Process Model of Women-Led Grassroots Innovation and Institutional Recognition



Source: Author's conceptualisation.

As illustrated in Figure 1, the transition from informal innovation to institutional recognition is structured by selective mediation and embedded within a gendered field of power.

5. Methodology

This study employs a qualitative research design grounded in systematic document analysis to investigate how women-led grassroots innovations move from informal problem-solving into institutional recognition regimes. Because the central research question concerns mediation, validation, and symbolic repositioning, rather than diffusion rates or performance outcomes, an interpretive qualitative approach is methodologically appropriate. Document analysis enables examination not merely of innovation outcomes, but of how institutions narratively construct legitimacy, codify knowledge, and formalise recognition (Bowen, 2009).

The methodological logic is therefore aligned with the conceptual framework developed in Section 4. If recognition is understood as a structured, filtered, and power-embedded process, then institutional documentation becomes a primary site for analytically examining such processes.

Data Sources

The empirical material is drawn from four interrelated institutional sources that collectively constitute the formal recognition infrastructure of grassroots innovation in India:

1. **National Innovation Foundation (NIF) Biennial Award Books**, which provide curated case narratives of recognised innovators, including socio-economic background, technical description, and validation pathway.
2. **Festival of Innovations documentation**, capturing publicly curated presentations of selected innovators and the symbolic framing accompanying recognition.
3. **NIF Innovation Database**, offering searchable entries detailing innovation domain, inventor profile, and institutional status.
4. **Institutional reports and publications from SRISTI and GIAN**, outlining scouting, validation, incubation, and market-linkage processes.

These sources were selected because they represent formalised sites of institutional mediation. They document the transition from tacit, community-level innovation to codified, publicly validated knowledge.

Case Selection Criteria

Cases were selected using purposive sampling (Patton, 2015), guided by theoretical relevance rather than statistical representativeness. Selection criteria included:

- Primary leadership of the innovation by a woman.
- Documented evidence of institutional recognition (award, validation, incubation, or formal documentation).
- Sectoral diversity, ensuring representation across agriculture, household technologies, and environmental sustainability.

The objective was theoretical illumination rather than empirical generalisation. Cases were chosen to demonstrate variation across stages of the relational process model, particularly in institutional mediation intensity and post-recognition repositioning outcomes.

Analytical Strategy

Institutional documents were analysed using qualitative content analysis techniques (Schreier, 2012). Coding was both deductive, guided by the five-stage relational framework, and iterative, allowing patterns to emerge across cases.

Four analytical dimensions structured the coding:

1. **Problem Context** – Socio-economic and ecological conditions generating the innovation.
2. **Innovation Characteristics** – Nature of solution, degree of modification, and contextual embeddedness.
3. **Institutional Mediation** – Processes of documentation, validation, technical translation, and narrative reframing.
4. **Recognition and Repositioning** – Evidence of symbolic capital accumulation, market or policy engagement, and shifts in intra-community status.

Particular attention was paid to how institutional language reframed informal knowledge into measurable, scalable, or policy-aligned categories. Analytical memos traced how gendered constraints and translation pressures manifested at mediation stages.

Scope and Limitations

This study relies exclusively on institutional documentation and does not incorporate primary interviews. While this limits access to innovators' subjective accounts, it is consistent with the analytical focus on recognition regimes. The aim is not to reconstruct experiential narratives but to examine how institutions codify and validate innovation. In this sense, institutional documentation is treated not as neutral reporting but as an active site of legitimacy construction.

This methodological approach operationalises the conceptual framework and prepares the ground for examining empirical trajectories across cases.

6. Empirical Analysis: Women-Led Grassroots Innovation in Practice

This section applies the relational process model developed in Section 4 to selected cases of women-led grassroots innovation documented within institutional archives. The purpose is analytical rather than celebratory. Each case is examined through a common structure, socio-economic location, innovation characteristics, structural constraints, institutional mediation, and post-recognition repositioning, to trace how informal knowledge becomes institutionally legible within gendered innovation systems.

The cases were selected to reflect sectoral diversity while demonstrating variation in mediation intensity and recognition outcomes.

Case 1: Agricultural Tool Innovation and Labour Reduction

This case illustrates how embodied agrarian labour experience generates context-specific technological adaptation, demonstrating the initial movement from informal problem-solving toward broader recognition within agricultural innovation systems.

Socio-Economic Background: The first case concerns a rural woman farmer from a semi-arid agrarian region with limited access to mechanised farming inputs. Operating within a smallholder household economy, she had agricultural responsibilities that included manual weeding and soil preparation, tasks characterised by high physical drudgery and seasonal intensity. Like many women farmers in India, she made significant contributions to labour but was under-recognised in formal agricultural extension systems.

Nature of Innovation: The innovator developed a modified hand-held agricultural implement designed to reduce bending strain and improve weeding efficiency. The innovation emerged through iterative experimentation using locally available materials. It was not initially conceptualised as a "technology" but as an adaptive response to bodily fatigue and time constraints. The solution was context-specific, tailored to soil conditions and cropping patterns prevalent in her region.

Structural Constraints: Despite demonstrable utility within the community, the innovation faced barriers typical of informal knowledge systems: the absence of technical validation, limited access to fabrication support, and restricted mobility to demonstrate the tool beyond local networks. Gendered labour norms further constrained market engagement, as women's agricultural tools are often not recognised within formal mechanisation schemes.

Institutional Intervention: Documentation by NIF intermediaries marked the transition to institutional mediation (Stage 3). The tool underwent a technical assessment of its durability and efficiency. This phase required translation of embodied experience into measurable performance criteria. Institutional endorsement conferred visibility and facilitated limited refinement of the prototype.

Post-Recognition Transformation: Recognition contributed to enhanced local credibility and participation in innovation exhibitions. While large-scale commercialisation did not occur, symbolic capital increased, altering intra-community perceptions of technical competence. However, the innovation's adaptation to formal standards introduced minor design modifications, illustrating how institutional filtering subtly reshaped original knowledge.

Case 2: Household Food Processing Innovation

The second case shifts the analytical focus from field-based labour to the domestic production sphere, highlighting how process-oriented innovations emerge within gendered household economies and subsequently negotiate institutional validation.

Socio-Economic Background: The second case involves a woman engaged in small-scale food processing to supplement her household income. Operating within a resource-constrained rural setting, she combined domestic responsibilities with informal micro-enterprise activities.

Nature of Innovation: She developed an improved, low-cost food-processing mechanism that increased preservation efficiency and reduced fuel consumption. The innovation emerged from routine experimentation in household production, reflecting tacit culinary and preservation knowledge accumulated over time.

Structural Constraints: The primary constraints extended beyond limited access to formal credit and market linkages. The innovation's domestic origin placed it ambiguously within institutional categories: it was simultaneously perceived as a means of livelihood supplementation and as a potential enterprise. This ambiguity limited the seriousness with which the innovation was taken in early-stage engagement. Regulatory certification requirements for food safety, labelling norms, and packaging standards introduced entry barriers that exceeded the innovator's resource capacity. Moreover, mobility constraints and care responsibilities restricted participation in extended incubation processes. These structural conditions illustrate how gendered labour arrangements intersect with formal regulatory frameworks, shaping which innovations are deemed scalable and investment-worthy.

Institutional Intervention: Through SRISTI-linked documentation and subsequent exposure in recognition platforms, the innovation entered Stage 3: Institutional Mediation. While evaluation processes acknowledged efficiency gains, validation emphasised market potential and compliance with hygiene standards. The institutional narrative reframed the innovation from "household practice" to "micro-enterprise opportunity." This reframing, while enabling access to new networks, also subtly displaced the innovation from its embedded domestic logic into a market-oriented framework. Training and packaging guidance were provided; however, the shift toward formalisation required adherence to regulatory norms that increased operational costs. Institutional mediation thus expanded visibility but simultaneously imposed standardisation pressures that altered the scale and mode of production.

Post-Recognition Transformation: Recognition expanded market visibility within regional fairs and institutional exhibitions—symbolic capital accumulation enhanced bargaining capacity within local markets. However, transformation remained uneven. Compliance costs, certification procedures, and supply-chain expectations exceeded what could be sustained without long-term financial or mentoring support. The innovation's alignment with formal market logic, therefore, introduced a paradox: institutional validation legitimised the innovation but also restructured it according to regulatory expectations that were not fully compatible with its original livelihood-oriented scale. In this instance, symbolic recognition did not seamlessly translate into structural empowerment, revealing the tension between informal adaptability and formal scalability.

Case 3: Environmental Sustainability and Waste Reuse Innovation

The third case extends the framework into the domain of environmental sustainability, illustrating how locally embedded ecological knowledge is translated into formal sustainability discourse through institutional mediation.

Socio-Economic Background: The third case concerns a woman innovator who is addressing local environmental degradation through waste-reuse practices. Situated in a peri-urban settlement, she encountered challenges related to waste accumulation and water contamination affecting community health.

Nature of Innovation: She developed a low-cost system to convert organic waste into usable compost and soil enhancers, drawing on ecological knowledge and community-level experimentation. The innovation integrated traditional composting knowledge with improvised structural modifications.

Structural Constraints: Constraints included the absence of technical endorsement, scepticism from local authorities, and limited access to dissemination platforms. Environmental innovations originating outside formal environmental engineering domains often face credibility deficits.

Institutional Intervention: Recognition through a national innovation platform facilitated technical evaluation and broader visibility. The innovation was presented within sustainability narratives aligned with national development discourse. Institutional framing emphasised environmental impact and scalability potential.

Post-Recognition Transformation: Institutional recognition reclassified the innovator as a sustainability advocate, enhancing her participation in community decision-making forums. The shift illustrates Stage 5: Social Repositioning. However, integration into formal environmental discourse also required alignment with standardised composting parameters, reflecting institutional translation dynamics.

Comparative Synthesis

Across the three cases, several patterned dynamics emerge that substantiate the relational model.

First, innovation originates in tacit, embodied problem-solving embedded within gendered labour domains. In all cases, initial legitimacy is secured at the community level through demonstrated utility rather than formal metrics. This confirms that Stage 1 and Stage 2 operate through experiential validation rather than institutional endorsement.

Second, institutional mediation operates as a selective filter rather than a neutral conduit. Technical assessment, documentation, and public presentation require translating context-specific knowledge into measurable, standardised categories. This process privileges alignment with dominant expectations of scalability, regulatory compatibility, and replicability (Borup et al., 2006). Innovations that cannot be readily translated risk marginalisation within formal systems.

Third, Symbolic capital accumulation following validation (Bourdieu, 1986) enhances visibility and local credibility but simultaneously embeds innovators within compliance regimes. Recognition, therefore, restructures opportunities unevenly within stratified fields of legitimacy, expanding visibility while simultaneously introducing regulatory and market pressures that may exceed the capacities of informal innovators (Merton, 1968). Recognition is thus not a neutral reward mechanism but a structured

redistribution of authority within gendered institutional fields. It expands networks and legitimacy while introducing formalisation pressures that may reshape the innovation's original form.

Fourth, social repositioning remains uneven and contingent. In each case, institutional recognition altered local perceptions of competence and authority. However, without sustained incubation or market integration, repositioning risks remain symbolic rather than structural. The transformation of gender hierarchies is therefore partial rather than definitive.

Collectively, the cases demonstrate that institutional recognition reconfigures power rather than merely rewarding innovation. Grassroots knowledge does not simply move upward into formal systems; it is filtered, reframed, and selectively legitimised within gendered institutional fields. These findings empirically substantiate the theoretical argument advanced in Section 4: women-led grassroots innovation navigates a negotiated, power-embedded recognition regime shaped by expectation alignment, gatekeeping, and differential access to symbolic capital.

7. Discussion

The empirical analysis demonstrates that women-led grassroots innovation in contemporary India cannot be adequately understood through celebratory narratives of inclusion. Rather, it must be situated within a structured field of recognition in which informal knowledge is selectively translated, filtered, and legitimised. The findings substantiate the central argument advanced in Section 4: institutional recognition operates simultaneously as a mechanism of empowerment and as a site of power reconfiguration.

Gendered Barriers within Innovation Trajectories

Across cases, innovation originates within domains historically structured by gendered labour divisions. Women's innovations emerge from embodied engagement with agriculture, household production, and environmental management, spaces that are socially coded as extensions of domestic responsibility rather than sites of technological agency. This epistemic positioning shapes the initial invisibility of innovation, confirming insights from feminist political economy that labour markets and innovation systems are themselves gendered institutions (Elson, 1999).

Structural barriers manifest across multiple dimensions. First, access to credit remains constrained. Even when innovations demonstrate local utility, formal financial systems often require collateral, documentation, or mobility that disproportionately disadvantage women operating within informal

economies. Second, mobility constraints limit exposure to markets, exhibitions, and institutional platforms. Participation in validation processes frequently requires travel and public engagement, activities shaped by gendered norms. Third, technical validation frameworks privilege codified, measurable standards that may not fully capture the contextual specificity of grassroots adaptations. This creates epistemic friction between tacit knowledge and institutional assessment regimes.

Market access further intensifies these constraints. Formalisation introduces compliance requirements, packaging norms, regulatory certification, intellectual property procedures, that can exceed the resource capacities of individual innovators. Finally, social legitimacy operates unevenly. Even after institutional recognition, the transformation of intra-community gender hierarchies remains partial and contingent. Recognition enhances visibility but does not automatically dismantle entrenched norms.

These patterned barriers confirm that innovation ecosystems are not neutral terrains but stratified fields of legitimacy and credibility, echoing institutional theory's emphasis on structured evaluative environments (DiMaggio & Powell, 1983).

The Institutional Paradox: Empowerment and Filtering

The analysis reveals a central paradox: institutions both enable and constrain. Intermediary organisations such as NIF, GIAN, and SRISTI provide critical mediation functions, including documentation, technical assessment, exhibition platforms, and network access. Without such mediation, informal innovations would likely remain locally bounded. Unless critically examined, inclusive innovation frameworks risk reproducing the very hierarchies of knowledge and legitimacy they seek to dismantle.

However, mediation is inherently selective. Institutional validation requires translation into dominant categories of measurability, scalability, and regulatory compatibility. This process aligns with the sociology of expectations, wherein innovations gain legitimacy by conforming to anticipatory narratives valued within structured systems (Borup et al., 2006). Innovations that cannot be readily framed within these narratives risk marginalisation.

Symbolic capital accumulation following validation enhances visibility and legitimacy (Bourdieu, 1986). However, the distribution of symbolic capital operates within cumulative advantage dynamics (Merton, 1968). Recognition can amplify credibility, but it may also concentrate resources on innovations that are most easily translated into institutional criteria. Thus, empowerment occurs alongside filtering.

The paradox extends to identity transformation. Recognition reclassifies women from informal problem-solvers to "innovators," altering social perception and potentially expanding decision-making authority. This process resonates with recognition theory's assertion that acknowledgement reshapes moral and social standing (Honneth, 1995). However, identity transformation remains embedded within structural constraints; symbolic repositioning does not automatically translate into sustained economic empowerment.

Theoretical Coherence with the Relational Model

The empirical findings closely align with the five-stage relational model articulated in Section 4. Stage 1 (Informal Problem-Solving) consistently precedes formal visibility and is grounded in embodied knowledge. Stage 2 (Community Recognition) operates through experiential validation rather than formal metrics. Stage 3 (Institutional Mediation) functions as a filtering gateway, translating tacit knowledge into codified categories. Stage 4 (Market/Policy Validation) enables the accumulation of symbolic capital but introduces compliance pressures. Stage 5 (Social Repositioning) reflects identity shifts that are real yet uneven.

Importantly, the cases also illuminate the model's recursive dimension. Institutional recognition can enable women innovators to act as local institutional entrepreneurs (Battilana et al., 2009), subtly reshaping community expectations regarding technological competence and gender roles. However, such reshaping remains contingent upon sustained engagement rather than episodic recognition events.

The discussion therefore reinforces a core theoretical contribution: recognition is not merely an endpoint but a reconfiguration of power within gendered innovation systems. By integrating innovation systems theory (Freeman, 1987; Lundvall, 2010) with feminist political economy and recognition theory, the study demonstrates that inclusive innovation requires more than access, it requires reflexive examination of validation criteria, mediation practices, and the distribution of symbolic capital.

Implications for Inclusive Innovation Systems

If institutions genuinely aim to support women-led grassroots innovation, policy frameworks must move beyond celebratory recognition toward structural inclusion. This entails revisiting technical validation protocols to better accommodate context-specific knowledge, expanding incubation support beyond initial awards, and addressing gendered barriers to credit, mobility, and market integration.

Ultimately, the discussion underscores that women innovators do not simply enter innovation systems; they negotiate them. Institutional recognition catalyses transformation only when mediation processes confront, rather than conceal, the politics of legitimacy that determine whose knowledge is authorised within innovation systems.

8. Policy Implications

The preceding analysis demonstrates that institutional recognition is not merely a celebratory endpoint but a structured process that selectively translates, filters, and legitimises grassroots knowledge. If inclusive innovation policy is to move beyond symbolic acknowledgement, it must address the structural dynamics identified across the five-stage relational model. The following policy directions are therefore grounded directly in this study's empirical and theoretical findings.

Gender-Sensitive Validation Protocols

Current validation frameworks often privilege measurable efficiency, scalability, and formal technical specifications. While such criteria are institutionally necessary, they may inadvertently disadvantage context-specific innovations emerging from gendered labour domains. Validation protocols should therefore incorporate gender-sensitive assessment parameters that recognise embodied labour reduction, time-saving impacts, ecological adaptation, and community-level utility as legitimate indicators of innovation value.

This does not imply lowering standards; rather, it requires expanding evaluative metrics to better align with situated knowledge systems. Technical assessment committees should include gender-aware evaluators who can interpret informal knowledge without prematurely translating it into narrow, patent-centric categories. Such recalibration enhances epistemic inclusivity without compromising rigour.

Community-Level Incubation Mechanisms

The empirical findings indicate that recognition often remains episodic. Award ceremonies and documentation confer symbolic capital, yet sustained transformation requires long-term support. Institutions such as NIF, GIAN, and allied organisations could establish decentralised incubation cells at the district or cluster level, particularly in regions with high concentrations of women innovators.

Community-based incubation would reduce mobility barriers, provide iterative technical refinement support, and facilitate peer-learning networks among women innovators. By embedding incubation closer

to innovation sites, institutions can mitigate the discontinuity between Stage 3 (Institutional Mediation) and Stage 4 (Market/Policy Validation).

Recognition Beyond Patent-Centric Logic

Formal intellectual property regimes remain important; however, patentability should not become the primary criterion of recognition. Many grassroots innovations are incremental, adaptive, and locally embedded, qualities that may not easily translate into formal patent categories. Recognition frameworks should therefore expand to include alternative certification models, open-innovation acknowledgement, and community-validated documentation systems.

Such diversification prevents epistemic narrowing and reduces the risk of filtering out socially valuable innovations that lack commercial scalability but possess significant livelihood impact. Recognition must be understood as a multidimensional construct rather than a proxy for market potential.

Support for Informal and Defensive Intellectual Property Protection

Women innovators operating in informal sectors face heightened vulnerability to appropriation once their innovations become publicly visible. Institutions should strengthen mechanisms for defensive publication, simplified prior-art documentation, and accessible legal advisory services. Simplified intellectual property literacy programmes tailored for women innovators would enhance informed decision-making regarding patenting, licensing, or open dissemination.

Importantly, protective mechanisms must be accompanied by transparent benefit-sharing arrangements, particularly where innovations draw upon collective or community knowledge traditions.

Long-Term Mentorship and Network Integration

Symbolic capital alone does not guarantee structural repositioning. Sustained mentoring relationships, linking women innovators with technical experts, market advisors, and policy networks, are critical for converting recognition into durable empowerment. Institutional entrepreneurship (Battilana et al., 2009) is more likely to emerge where innovators are embedded within supportive networks rather than isolated as award recipients.

Structured mentorship programmes spanning multiple years, rather than event-based engagement, would enhance continuity across the five stages of the relational model. Such systems can gradually reshape credibility hierarchies and expand women's presence within formal innovation ecosystems.

Toward Reflexive Innovation Governance

Collectively, these policy directions suggest that inclusive innovation governance must become reflexive, attentive not only to access but to the criteria through which legitimacy is conferred. Institutions must examine how validation protocols, narrative framing, and resource allocation practices may inadvertently reproduce cumulative advantage dynamics (Merton, 1968). A reflexive approach does not weaken institutional standards; it strengthens them by aligning them with the social realities of informal knowledge production.

In sum, supporting women-led grassroots innovation requires structural recalibration rather than symbolic endorsement. Recognition systems must evolve from episodic acknowledgement to sustained, gender-responsive mediation frameworks capable of redistributing opportunity within innovation ecosystems.

9. Conclusion

This study set out to examine how women-led grassroots innovations in contemporary India negotiate the space between informal knowledge production and institutional recognition. Moving beyond celebratory narratives of inclusion, the analysis demonstrated that innovation emerges from embodied, context-specific problem-solving embedded within gendered labour domains. Women innovators are not passive beneficiaries of institutional support; they are active knowledge producers whose innovations originate in everyday engagements with agrarian, domestic, and ecological challenges.

By integrating innovation systems theory with feminist political economy, recognition theory, and institutional analysis, the paper developed a five-stage relational model that conceptualises the transition from informal problem-solving to social repositioning. The empirical cases substantiated this model. Innovation begins in tacit knowledge systems, gains local legitimacy through community validation, and then encounters institutional mediation that selectively translates and filters knowledge into formal categories. Recognition confers symbolic capital (Bourdieu, 1986), enhances visibility, and can reclassify innovators within local and national fields. However, this transformation is uneven and contingent.

The findings underscore that grassroots innovation constitutes a form of epistemic resistance. Women's adaptive practices challenge hierarchies that privilege codified, laboratory-based knowledge while marginalising embodied and experiential expertise. However, institutional recognition does not simply validate resistance; it reshapes it. As innovations are reframed to align with dominant expectations of scalability and regulatory compatibility (Borup et al., 2006), elements of contextual specificity may be reconfigured. Recognition therefore operates within cumulative advantage dynamics (Merton, 1968), where access to networks and resources influences whose knowledge achieves sustained legitimacy.

The institutional paradox identified in this study is central: intermediary organisations empower by documenting and validating grassroots knowledge, yet they also function as gateways that structure inclusion. Recognition transforms identity, redistributes symbolic capital, and may enable women innovators to act as institutional entrepreneurs (Battilana et al., 2009). At the same time, without sustained structural support, repositioning risks remaining symbolic rather than structural.

For contemporary India, where innovation discourse is increasingly oriented toward start-ups, patents, and technological entrepreneurship, these findings carry broader implications. An inclusive innovation ecosystem requires decentralising knowledge hierarchies and expanding evaluative frameworks to recognise context-specific, livelihood-oriented innovation as integral to national development. Grassroots innovation should not be positioned at the margins of innovation policy but integrated within its core architecture.

Ultimately, the study contributes theoretically by reframing recognition as a negotiated and power-embedded process rather than a neutral bridge between informal and formal domains. Empirically, it demonstrates that women-led grassroots innovation traverses structured yet mutable recognition regimes. Policy-wise, it calls for reflexive institutional practices capable of sustaining transformation beyond episodic acknowledgment.

In doing so, the paper advances a gendered innovation systems perspective that situates informal knowledge not as peripheral but as constitutive of contemporary innovation futures.

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