



Gendered Irrigation Governance A Case of Institutional Exclusion in Wucs in the Upper Krishna Project - Karnataka¹

Dr NR Jagannath- Water Resources Management and Institutional Reforms specialist ²

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Abstract

This article examines women's exclusion from irrigation governance in the Upper Krishna Project (UKP) command area of Karnataka, India, with particular focus on their participation in Water User Cooperative Societies (WUCS) in the northern districts of Vijayapura, Bagalkot, Kalaburagi, Yadgir, and Raichur. Applying a Feminist Political Ecology (FPE) framework, the study interrogates how legal structures, institutional design, and socio-cultural norms intersect to constrain women's agency in water governance. While Karnataka amended its Irrigation Act in 2000 to promote Participatory Irrigation Management (PIM) and has established WUCS with nominal gender targets under ADB-supported reforms, women's participation in governance roles remains structurally limited. WUCS membership is formally tied to land ownership, and the overwhelming majority of landholders in the UKP command area are male. Even where donor programs have achieved a 32% representation of women on management boards, these women are frequently confined to non-voting or auxiliary roles, and women's sub-committees operate outside the main decision-making apparatus. The study draws on secondary analysis of policy documents, ADB project reports, and existing research on gender and land rights in Karnataka. The findings reveal a pattern of 'representation without authority' that parallels patterns of 'feminization without representation' documented in other agrarian contexts. The article argues that without structural reform to land tenure eligibility criteria, binding gender mandates, and targeted capacity-

building, gender-equitable irrigation governance will remain unrealized in the UKP command area.

Keywords: gender dynamics, water governance, women's participation, Water User Cooperative Societies (WUCS), Feminist Political Ecology (FPE), Upper Krishna Project, Karnataka, participatory irrigation management, land rights

1. Introduction

Water governance underpins agricultural productivity, rural livelihoods, and equitable resource management. Yet irrigation institutions have perpetuated gender hierarchies, with men dominating leadership and decision-making despite women's predominant role in agricultural labour. This gap is stark in India's large-scale public irrigation systems, including Karnataka's Upper Krishna Project, where participatory reforms via Water User Associations

¹ Factual errors either in the text or in numbers if any are subject to correction on notification

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(WUAs) and Water User Cooperative Societies (WUCS) overlook gendered access and power dynamics. Women, key contributors to farming, remain excluded from governance because WUCS membership requires land ownership—a male privilege. International aid's gender quotas and sub-committees often yield symbolic inclusion without real voting power or authority. Drawing on Feminist Political Ecology, the research reveals how patriarchal norms and rigid bylaws sustain this disparity, advocating structural reforms to land tenure and genuine empowerment for women.



The Upper Krishna Project (UKP) in Karnataka represents one of India's most ambitious irrigation undertakings. Conceived in 1964 and incrementally developed over six decades, the UKP harnesses the Krishna River through its Almatti and Narayanpur dams to irrigate approximately 6.22 lakh hectares of drought-prone land across the northern Karnataka districts of Vijayapura, Bagalkot, Kalaburagi, Yadgir, and Raichur [3, 4].

These districts are among the most agriculturally dependent and economically marginalized regions of Karnataka, with poverty rates significantly above the state average and livelihoods overwhelmingly tied to rain-fed and irrigated agriculture [5]. The UKP was designed to transform this landscape—to end the chronic drought cycle and bring stable water to communities that had waited generations for relief.

Yet alongside the project's agrarian ambitions, a persistent structural gap has emerged: the women who perform much of the agricultural labor in the command area remain systematically excluded from the governance institutions that control water distribution. Karnataka amended its State Irrigation Act in 2000 to introduce Participatory Irrigation Management (PIM), enabling the formation of WUCS to manage minor canals and field channels [6]. Supported by the Asian Development Bank (ADB) under the Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP), these societies were intended to decentralize irrigation governance and include marginalized groups, particularly women [7].

Despite these institutional reforms, women's participation in WUCS governance remains constrained. In the ADB-supported Gondi subproject within the UKP command area, only 21% of management board members were women under Tranche 1—limited explicitly by cooperative bylaws that tied membership to land ownership, a status held by a minority of women [8]. Even where donor programs pushed women's board representation to 32% under Tranche 2, women's roles frequently remained non-voting or confined to sub-committees without decision-making authority [7].

This article applies a Feminist Political Ecology (FPE) framework to analyse how these patterns of exclusion are produced and sustained. It asks three core questions: (1) What institutional, legal, and socio-cultural factors constrain women's leadership in WUCS in the UKP command area? (2) Why has women's substantial contribution to agricultural labor in the region not translated into proportional representation in irrigation governance? (3) What



structural reforms are required to move beyond symbolic inclusion toward gender-equitable water governance? The study relies on qualitative secondary data analysis, drawing on ADB project documents, government reports, Karnataka legislative frameworks, and published research on gender and land rights in the region. The article contributes to broader debates on gendered exclusion in participatory irrigation management in South Asia [1, 2, 9] and specifically addresses the gap in scholarship on the UKP command area.

1.1. Background: The Upper Krishna Project and Its Command Area

The UKP was designed to address the chronic water scarcity of northern Karnataka—a semi-arid Deccan plateau region historically vulnerable to drought, crop failure, and food insecurity. The project's two principal reservoirs, Almatti Dam (Full Reservoir Level 519.6 m) and Narayanpur Dam, supply water via an extensive canal network covering Stage I (119 TMC, 4.25 lakh hectares) and Stage II (54 TMC, 1.97 lakh hectares) command areas [3, 4]. More than 90% of cropped land in the command districts depends on controlled irrigation, making decisions taken within WUCS directly consequential for crop yields, household food security, and poverty reduction [5]. Agriculture in the command area is dominated by cotton, sugarcane, wheat, and pulses. The five primary beneficiary districts—Vijayapura, Bagalkot, Kalaburagi, Yadgir, and Raichur—account for a significant share of Karnataka's cultivable land, with Kalaburagi alone expected to bring approximately 9.5 lakh acres under irrigation [4]. Despite the project's transformative potential, the command area remains characterized by low literacy, high poverty, deeply entrenched caste hierarchies, and significant gender inequality in land ownership and public participation [10, 11]. Women constitute a substantial portion of the agricultural labor force in these districts, yet land titles are overwhelmingly registered in the names of male household heads [11, 12]. This structural asymmetry between agricultural labor and legal ownership is the primary mechanism through which women are excluded from WUCS governance.

1.2. Water Governance Structures in Karnataka's UKP Command Area

Karnataka's irrigation governance has undergone significant restructuring since the 1990s. The Karnataka Irrigation and Certain Other Laws (Amendment) Act of 2000 introduced PIM, enabling the formation of WUCS to manage irrigation at the minor canal and field channel level [6]. Unlike several other Indian states that used standalone legislation, Karnataka registered WUCS under the Cooperative Societies Act, making them a distinct institutional form governed by cooperative law in addition to irrigation legislation [13]. This dual registration has significant implications for gender representation, as cooperative bylaws restrict full voting membership to landowners, effectively limiting women's formal authority within WUCS boards.

The ADB-supported KISWRMIP, launched in 2011, explicitly sought to address these limitations. The program established WUCS across three irrigation subprojects—Gondi (under Tranche 1 in the UKP command), Vijayanagara Channels (Tranche 2, middle Krishna basin), and Tungabhadra Left Bank Canal (Tranche 3)—and set targets of at least 30% women on WUCS management boards by 2020 [7, 8]. As of May 2024, women constitute 32% of management board members across the 29 established WUCS under Tranche 2 [7].

However, the program's own reporting acknowledges that women's participation in agricultural extension services and systems management remains negligible, and that the link between WUCS membership and land ownership continues to block the majority of women from full governance participation [7, 14].

1.3. Theoretical Framework: Feminist Political Ecology

Feminist Political Ecology (FPE) provides the analytical foundation for this study. Developed initially by Rocheleau, Thomas-Slayter, and Wangari [15], FPE integrates feminist theory, political ecology, and development studies to examine how resource access, governance, and control are shaped by intersecting structures of power, gender, and inequality. Rather than treating exclusion as an incidental feature of otherwise neutral institutions, FPE interrogates how institutions are designed to privilege certain actors and marginalize others [16, 17]. Applied to irrigation governance, FPE reveals how formally gender-neutral membership criteria—land ownership, voting rights,



attendance at meetings—systematically reproduce male dominance when they are embedded in broader regimes of patriarchal property relations.

FPE's intersectional lens is particularly valuable for the UKP context. Women's exclusion from WUCS is not uniform: it is intensified for landless women, widows, Dalit and Adivasi women who face additional caste-based discrimination, and women at the tail end of canal systems who receive the least reliable water supply [14, 17].

The framework also directs attention to the devaluation of reproductive and invisible labor: women in the command area manage household water collection, cook for agricultural laborers, and contribute to field operations, yet these contributions are not recognized within formal governance frameworks that privilege landownership over water use. This echoes Sultana's [16] analysis of fluid, gendered subjectivities in water management, where women's daily water practices confer no formal authority over water decisions.

FPE also highlights 'institutional inertia'—the persistence of patriarchal governance norms despite reformist agendas and shifting socio-economic conditions [1]. In the UKP command area, despite a decade of ADB-supported gender sensitization training and the explicit inclusion of gender targets in program design, the foundational eligibility rule linking WUCS membership to land titles has not been structurally reformed. As a result, gender strategies remain largely compensatory—adding women's sub-committees alongside male-dominated boards—rather than transformative.

2. Materials and Methods

This study adopts a qualitative, secondary data analysis approach. Primary data collection was not undertaken for this article; instead, the analysis draws on a systematic review of: (1) ADB project documentation for KISWRMIP Tranches 1, 2, and 3, including social safeguard assessments, progress reports, and gender strategies; (2) Karnataka state legislative frameworks, including the Karnataka Irrigation and Certain Other Laws (Amendment) Act 2000, the Karnataka Cooperative Societies Act, and relevant provisions of the Karnataka Land Reforms Act; (3) published peer-reviewed literature on gender, irrigation governance, and land rights in Karnataka and South Asia; (4) reports from international organizations (FAO, World Bank, ADB) and civil society organizations working on gender and water in Karnataka; and (5) census and administrative data on land registration, agricultural labor, and female literacy in UKP command districts.

The analysis applies thematic content analysis guided by the FPE framework. Data coding was organized around four analytical dimensions derived from prior literature: (a) institutional barriers—legal eligibility rules, land tenure linkages, and cooperative bylaws; (b) socio-cultural norms—patriarchal gender expectations around public participation and irrigation as a masculine domain; (c) institutional inertia—the persistence of exclusionary structures despite reform efforts; and (d) intersectional exclusions—how gender interacts with caste, class, landlessness, and widowhood to intensify barriers. Triangulation across document types was employed to validate findings.

2.1. Study Area: UKP Command Districts of Northern Karnataka

The UKP command area spans five primary districts in northern Karnataka: Vijayapura, Bagalkot, Kalaburagi, Yadgir, and Raichur. This region lies in the semi-arid Deccan plateau, characterized by black cotton soil (vertisol), erratic rainfall averaging 400–700 mm annually, and historical dependence on rain-fed agriculture. The introduction of canal irrigation through the UKP has substantially expanded cultivated area; however, cropping intensity and water use efficiency remain low due to infrastructure deficits and management weaknesses [8].

Socioeconomically, the command districts are among Karnataka's most marginalized. Poverty rates are significantly above the state average. Female literacy in subproject areas such as Gondi is approximately 52%, compared to 67% for men [14]. Agriculture employs the majority of the rural workforce, and women constitute a substantial share of agricultural laborers—approximately 45% in subproject areas [14]. Nevertheless, as the following sections demonstrate, women's agricultural labor has not translated into commensurate governance authority within WUCS.



3. Results

3.1. Women's Agricultural Labor and the Governance Gap in the UKP Command Area

Women in the UKP command districts contribute extensively to agricultural production. They constitute approximately 45% of the agricultural workforce in subproject areas [14], performing transplanting, weeding, harvesting, and post-harvest tasks alongside domestic labor. In households where male members engage in off-farm employment or seasonal migration—a pattern increasingly observed across the command area—women assume primary responsibility for crop management and field-level water application [11, 18]. Yet this de facto agricultural leadership does not confer formal authority within WUCS structures.

The governance gap is most starkly illustrated by land ownership data. ADB project assessments in the Gondi subproject area found that only approximately 20% of women are legal landowners [14]. Since WUCS voting membership is constitutionally linked to land titles under Karnataka's cooperative framework, the overwhelming majority of women who farm within the command area are structurally ineligible for full membership. Even the 20% who hold formal land rights face practical barriers: male relatives commonly attend WUCS meetings on their behalf, meetings are held at times and in spaces that restrict women's mobility, and women report being discouraged from speaking in mixed forums [9, 14].

This gap between agricultural contribution and governance authority reflects what FPE theorists identify as the gendered structuring of public and private spheres [15, 16]. In the UKP command area, as in other agrarian contexts across South Asia, irrigation water—tied to land, production decisions, and market value—is discursively constructed as a masculine domain [1, 2, 9]. Domestic water collection and household garden irrigation are accepted as women's responsibilities; decisions about canal water allocation, fee setting, and infrastructure maintenance are culturally coded as male prerogatives. This symbolic hierarchy operates alongside formal institutional rules to produce a compound exclusion.

3.2. Legal and Institutional Barriers to Women's WUCS Participation

Karnataka's legal framework for irrigation governance contains both formal guarantees and significant structural gaps with respect to gender inclusion. The Karnataka Irrigation and Certain Other Laws (Amendment) Act of 2000 introduced PIM but did not include binding mandates for gender representation in WUCS leadership [6, 13]. WUCS are registered under the Karnataka Cooperative Societies Act, whose standard bylaws restrict full voting membership to landholders—a criterion that de facto excludes most women in the command area [13, 14]. The state's gender policies, while aspirational, lack enforcement mechanisms and monitoring systems at the WUCS level.

Karnataka's land tenure framework compounds this exclusion. The Karnataka Land Reforms Act of 1961 (as amended) and subsequent legislation have expanded formal rights to land, but customary practices of patrilineal inheritance continue to concentrate land titles in male hands [11, 12]. Research on women's land rights in Karnataka found that the vast majority of rural women do not own land independently, despite formal legal equality provisions [11]. Even when women are nominal title holders—for example, where land is registered in a woman's name to access government programs—practical control frequently remains with male relatives. This mirrors patterns documented in other parts of India and South Asia, where gender-neutral property laws fail to deliver equitable outcomes in the absence of proactive enforcement [1, 9, 18].

The ADB's KISWRMIP program acknowledged these structural constraints explicitly. Its social safeguard assessments noted that women's participation in irrigation management in subproject areas was low (10–15%) due to the link between WUCS membership and land ownership [14].

To partially compensate, the program required at least two women on each WUCS board of management (out of eleven positions) and promoted women's sub-committees within each society [7, 8]. However, cooperative bylaws restricted these women members to non-voting roles in some cases [8]. The result is a governance structure in which



women have nominal representation but limited authority—a form of symbolic inclusion that obscures rather than addresses the underlying exclusion.

3.3. Socio-Cultural Norms and Institutional Inertia

Beyond legal and institutional barriers, entrenched socio-cultural norms shape women's exclusion from WUCS governance in the UKP command area. Patriarchal gender norms in the northern Karnataka districts construct public decision-making—particularly in technical and financial domains—as a male prerogative. Women who attend WUCS meetings report being treated as proxies for absent male household members rather than as independent decision-makers. Research on participatory irrigation management across India confirms that even where women hold formal WUCS positions, they are often discouraged from speaking in meetings by male relatives and community members, and their inputs are routinely discounted [9, 18].

Mobility constraints further restrict women's WUCS participation. In the semi-arid command districts, where WUCS meetings may be held at canal headworks or village meeting halls that require travel, women's access to public spaces is constrained by norms of female propriety. Women also face severe time poverty: the dual burden of reproductive labor (cooking, childcare, water collection) and productive agricultural work leaves little time for attending governance forums [18]. ADB capacity-building programs have responded by forming women's sub-committees that meet separately, but this structural segregation reinforces rather than dismantles the masculine character of the main WUCS governance apparatus [7].

Institutional inertia is evident in the persistence of these exclusionary arrangements despite a decade of gender-mainstreaming efforts under KISWRMIP. While the program has achieved measurable gains—women constitute 32% of management board members across 29 WUCS under Tranche 2 [7] and 58 women's sub-committees with 921 members have been formed [7]—the foundational eligibility rule (land ownership as a prerequisite for WUCS membership) has not been challenged. Training programs cover GESI (Gender Equality and Social Inclusion) concepts, but structural reform of cooperative bylaws has not occurred. This reflects a broader pattern in India's PIM legislation: only six Indian states mandate women's participation in irrigation management, and binding quotas remain rare [18].

3.4. Intersectional Dimensions of Exclusion

Women's exclusion from WUCS governance is not uniform across the UKP command area. FPE's intersectional lens reveals that certain groups face compounded disadvantages. Landless women—including agricultural laborers (coolies) who work on others' fields—have no basis for WUCS membership whatsoever, since both land ownership and water entitlements are formally inaccessible to them. Widows who have assumed de facto control of household farms after the death of male relatives frequently encounter practical obstacles in securing formal land registration, particularly where customary inheritance norms favor male heirs [11].

Caste represents an additional axis of exclusion. Scheduled Caste and Scheduled Tribe women in the command area face historical marginalization in land access, literacy, and public participation that compounds the gender barriers described above. In a region shaped by the legacy of feudal agrarian structures, Dalit women are disproportionately represented among landless agricultural laborers and face the most acute barriers to WUCS participation. Tail-end farmers—who receive the least reliable water supply due to infrastructure and management inefficiencies—are also disproportionately poor and marginal, and women in these households experience the combined disadvantages of inadequate water access and governance exclusion [5, 14].

4. Discussion

4.1. Representation Without Authority: A Karnataka Model of Symbolic Inclusion

The UKP command area presents what might be termed a 'representation without authority' model of gender inclusion in irrigation governance. Donor-supported targets have achieved nominal women's presence on WUCS boards, yet



this representation is structurally constrained by cooperative bylaws, meeting practices, mobility norms, and the absence of binding authority. The women's sub-committees that KISWRMIP established are innovative but operate parallel to—not within—the central decision-making apparatus. This approach reflects what FPE identifies as compensatory rather than transformative inclusion: it acknowledges women's existence within the system without restructuring the system's foundational rules [15, 16].

The findings align with global critiques of gender quota approaches in irrigation governance. Research across South Asia demonstrates that quotas alone cannot deliver gender equity when structural barriers—land eligibility criteria, caste hierarchies, mobility constraints, time poverty—remain intact [9, 18, 19]. In Purulia, West Bengal, women-led WUAs achieved transformative results only when institutional design was deliberately restructured to accommodate women's needs, including flexible meeting schedules and economic empowerment alongside governance roles [18]. The UKP experience suggests that Karnataka's WUCS framework has not yet made these structural accommodations.

4.2. The Land-Governance Nexus and Its Gendered Effects

The central mechanism of women's exclusion from WUCS in the UKP command area is the link between land title and governance membership. This nexus produces a legal paradox in which women who perform the daily labor of irrigation—clearing field channels, managing water turns, negotiating with neighbors over water access—have no formal voice in the institutions that govern irrigation. Their contributions are essential to agricultural production but invisible within the formal governance architecture [14, 16].

Karnataka's land tenure system has undergone significant reform since independence. The Karnataka Land Reforms Act of 1961 and subsequent amendments abolished zamindari, imposed land ceilings, and redistributed land to tenants—but these reforms were not designed with gender equity in mind, and women remained marginal beneficiaries [11].

Research by Brown [11] on women's land rights in Karnataka found that while formal legal equality exists, customary inheritance practices, male-dominated bureaucratic processes, and women's limited legal literacy combine to ensure that land titles are overwhelmingly registered in male names. The ADB's own project assessments confirm that only 20% of women in the Gondi subproject area are legal landowners [14]—meaning 80% of women who farm within the command area lack the foundational credential for WUCS membership.

4.3. Implications of Donor-Driven Reform Models

The KISWRMIP represents the most sustained and resource-intensive effort to address gender exclusion in the UKP command area's irrigation governance. The program's achievements are real: it has increased women's board representation, established women's sub-committees, delivered GESI training, and built women's awareness of irrigation management principles [7]. These gains are not trivial—they represent a foundation for further reform. However, the program's design has been constrained by its unwillingness to challenge the cooperative bylaw framework that restricts voting membership to landowners. This reflects a broader pattern in donor-supported PIM initiatives across South Asia: external frameworks promote participation but cannot dislodge local institutional rules and normative structures without deliberate political engagement [1, 9, 19].

The tension between the ADB's gender equity goals and Karnataka's cooperative law framework has not been resolved through legal reform but managed through supplementary structures (women's sub-committees, additional non-voting members). As FPE analysis suggests, such management strategies ultimately reinforce the masculine character of core governance by leaving it unchanged [15, 16].

4.4. Pathways to Gender-Equitable WUCS Governance in the UKP Command Area

The evidence from the UKP command area points to several interconnected reforms required for substantive gender inclusion in WUCS governance. First, the eligibility criterion for WUCS membership must be reformed. Basing membership on land ownership excludes the majority of women regardless of their agricultural engagement.



Alternative criteria—water use, agricultural labor contribution, or household-level entitlement—would expand the eligible population and better reflect the actual distribution of irrigation labor [9, 18, 19]. This reform would require amendment of cooperative bylaws and, ideally, a statutory mandate for gender-inclusive membership criteria in Karnataka's PIM legislation.

Second, women's board positions must be converted from non-voting or advisory roles to full voting membership with equal authority. The current structure, in which women are present but lack decision-making power, exemplifies the FPE concept of symbolic inclusion [15]. Binding statutory quotas for women in WUCS executive positions—analogue to panchayat reservations under the 73rd Constitutional Amendment—would provide a more robust basis for representation [18]. Third, complementary reforms addressing land rights, legal literacy, and women's economic autonomy are essential. Without land rights reform, governance inclusion will remain accessible only to the minority of women who hold formal titles. Joint titling norms, inheritance reform advocacy, and women's land rights literacy programs are necessary complements to WUCS reform [11, 12].

Finally, institutional design must account for the practical constraints on women's participation: meeting times and locations should be made accessible, childcare support considered, and women's voices in technical irrigation decisions actively facilitated. Examples from West Bengal and Nepal demonstrate that when institutions are deliberately redesigned to include women as decision-makers rather than nominal members, transformative outcomes—in water management quality, household income, and women's empowerment—can follow [18, 19].

5. Conclusions

The Upper Krishna Project command area presents a case study of governance reform that has advanced participation as an institutional value while leaving intact the structural conditions that produce gendered exclusion. Women constitute approximately 45% of the agricultural labor force in command districts [14], perform irrigation-related tasks at the field level, and manage water access in male-absent households—yet they account for only 20–32% of WUCS management board positions, and their authority within those positions is frequently constrained by cooperative bylaws and socio-cultural norms [7, 8, 14].

The application of a Feminist Political Ecology framework reveals that this outcome is not accidental but structural. The nexus between land title and WUCS membership—embedded in cooperative law and reinforced by patrilineal land inheritance practices—systematically excludes approximately 80% of women in the command area from formal governance eligibility [14]. The donor-supported KISWRMIP has achieved measurable gains in women's nominal representation but has not reformed this foundational barrier. Women's sub-committees, non-voting board positions, and GESI training represent compensatory measures that acknowledge exclusion without dismantling its institutional foundations.

The findings underscore the FPE insight that legal inclusion is insufficient for governance equity without normative transformation and structural reform [15, 16]. Karnataka's progressive constitutional provisions and ADB's gender strategies have not been translated into enforceable mandates at the WUCS level. The result is a pattern of 'representation without authority' that parallels the 'feminization without representation' described in other post-Soviet and agrarian contexts [1].

To achieve gender-equitable irrigation governance in the UKP command area, reform efforts must move from symbolic to structural: revising WUCS membership eligibility to include non-landholding water users, converting women's board positions to full voting membership, enacting binding gender quotas in Karnataka's PIM legislation, and pursuing complementary land rights and legal literacy reforms. Without these changes, the impressive institutional architecture of the UKP's participatory irrigation management system will continue to reproduce the gender hierarchies it was ostensibly designed to transcend. Effective water governance in a water-scarce agrarian region demands that women be recognized not only as laborers sustaining irrigation systems but as legitimate decision-makers with authority over the resources they manage.



This article draws exclusively on secondary data, which constrains the granularity of empirical analysis for specific WUCS and villages within the command area. Future research should integrate primary fieldwork—including semi-structured interviews and focus group discussions with women farmers, WUCS officials, and government officers—across the diverse agro-ecological and caste contexts of the UKP command districts. Comparative analysis with other large-scale irrigation command areas in Karnataka (Tungabhadra, Cauvery) would further illuminate the drivers of gendered exclusion and the conditions under which reform can succeed.

6 Recommendations

1. *Reform WUCS Membership Eligibility:* Decouple WUCS membership from land ownership by adopting inclusive criteria such as household water entitlement, agricultural labour contribution, or residency in the command area. This addresses the core structural barrier excluding 80% of women farmers, who lack titles despite performing 45% of agricultural labour. Karnataka's Cooperative Societies Act bylaws must be amended to enable non-landholders—especially landless labourers, widows, and tail-end farmers—to join as full voting members. Pilot this in select UKP subprojects like Gondi, monitoring uptake via quarterly audits to ensure at least 40% women's membership within two years.
2. *Mandate Binding Gender Quotas:* Enact statutory quotas reserving 33% of WUCS executive positions (e.g., president, secretary) for women, mirroring Panchayati Raj reservations under the 73rd Amendment. Current 32% board representation under KISWRMIP remains symbolic, with women often in non-voting roles. Pair quotas with legal enforcement through the Karnataka Irrigation Act, including penalties for non-compliance and state-level oversight by the Water Resources Department. This shifts from compensatory sub-committees to transformative authority, drawing on successful models from West Bengal's women-led WUAs.
3. *Strengthen Land Tenure Reforms:* Promote joint land titling and women's independent inheritance rights via targeted amendments to the Karnataka Land Reforms Act. Only 20% of UKP women hold titles, perpetuating exclusion; integrate gender audits into land registry processes and launch mobile legal aid camps in command districts like Vijayapura and Raichur. Link titling to WUCS eligibility incentives, such as priority water access, to boost women's economic agency. Collaborate with NGOs for literacy drives on inheritance laws, aiming to double female landownership rates in five years.
4. *Redesign Institutional Practices:* Adapt WUCS operations for women's participation by scheduling meetings during daylight hours at accessible venues, providing childcare stipends, and using digital tools for virtual attendance. Time poverty and mobility norms currently deter women; FPE highlights these as institutional inertia. Train facilitators in gender-sensitive moderation to amplify women's voices in technical discussions on water allocation. Evaluate via pre-post participation surveys, targeting 50% female attendance in UKP WUCS.
5. *Build Capacity and Economic Empowerment:* Deliver sustained GESI training beyond KISWRMIP's one-off sessions, focusing on irrigation technical skills, financial literacy, and leadership for 1,000+ women across UKP districts. Economic barriers exacerbate exclusion; pair training with microfinance for women-led farm enterprises and water-saving technologies. Establish mentorship linking women executives with female irrigation engineers, fostering networks that challenge patriarchal norms.
6. *Address Intersectional Exclusions:* Tailor reforms for marginalized subgroups: Dalit, Adivasi, and landless women face compounded barriers. Reserve 10% of WUCS seats for Scheduled Caste/Tribe women and form tail-end farmer committees with veto power on equity issues. Fund caste-disaggregated data collection and anti-discrimination protocols, partnering with civil society for monitoring in high-poverty areas like Yadgir.
7. *Enhance Donor and Policy Alignment:* Require future ADB/World Bank projects to condition funding on bylaw reforms and enforceable gender metrics, avoiding compensatory fixes. Karnataka's PIM policy should integrate FPE principles, with annual gender impact assessments. Form a state-level task force with researchers, officials, and activists to oversee UKP rollout, ensuring reforms transcend project cycles.
8. *Validate Through Field Research:* Conduct primary field research to test these recommendations empirically. Deploy mixed-methods studies—semi-structured interviews (n=200 women farmers), focus groups (20 WUCS),



and ethnographic observation—in diverse UKP sites (e.g., head-end vs. tail-end canals). Validate secondary findings on exclusion patterns, pilot reform interventions, and assess intersectional impacts via pre-post metrics on participation and water equity. Fund via ADB follow-up grants; compare with Tungabhadra/Cauvery commands to generalize for Karnataka.

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Ethical consideration

This research exclusively utilizes publicly accessible secondary data sources, ensuring strict adherence to ethical standards throughout the process. Careful attention is given to citing references to maintain intellectual honesty and academic integrity by taking advantages of the positive aspects of AI tools. This approach not only upholds ethical research practices but also reinforces the credibility and transparency of the study's findings.

List of Acronyms

1. ADB: Asian Development Bank
2. FPE: Feminist Political Ecology
3. GESI: Gender Equality and Social Inclusion
4. KISWRMP: Karnataka Integrated and Sustainable Water Resources Management Investment Program
5. PIM: Participatory Irrigation Management
6. TMC: Thousand Million Cubic feet
7. UKP: Upper Krishna Project
8. WUAs: Water User Associations
9. WUCS: Water User Cooperative Societies

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