

Women's Land Rights, Institutional and Policy Awareness in Post-Conflict Liberia's Dual Tenure System

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ABSTRACT

Background: Despite the 2018 Land Rights Act (LRA) guaranteeing customary and women's land rights and participation in land governance, data on awareness of the Act and the Liberia Land Authority (LLA) among women remains inadequate in post-conflict Liberia's dual-tenure system. Drawing on data from women in four of Liberia's 15 counties, this study examines economic, participatory agency, and property-rights consciousness predictors that drive women's awareness of the LRA and LLA. Although both represent key institutional and policy milestones, evidence on the drivers of women's awareness of them remains scarce.

Methods: Cross-sectional analysis of 1,026 women from 20 customary tenure communities across 4 Liberian counties. Binary and multinomial logistic regression examined three domains: economic norms and financial access (land purchase rights, joint ownership, benefit for social development funds), participatory agency (decision-making, conflict resolution, and mediation), and legal consciousness (inheritance, spousal property rights). A three-stage analysis of domain-specific models, full multivariable models, and cross-domain interaction models with predicted probabilities was conducted.

Results: Property consciousness and participatory agency drove institutional awareness more than age. Women affirming land purchase rights were 6 times more likely to be aware of LLA (OR = 6.12, $p < .01$) and 9 times more likely to be aware of LRA (RRR = 9.35, $p < .001$). Decision-making participation: 6.7× for LLA, 1.8× for LRA. Interactions demonstrate complementary effects: land purchase × decision-making peaked at 25–30% predicted awareness, 6-fold above baseline. Age had no effect ($p > .60$); social funds were insignificant.

Conclusion: LLA and LRA awareness result from the interactions between different domain predictors, rather than simply isolated factors. In order for statutory reform awareness to happen, there needs to be active participatory contestation of property norms rather than just information. Give top priority to women's substantive participation in land governance forums, plan community dialogues for the purpose of changing property norms, and reconcile customary-statutory institutions through shared participatory and deliberative processes.

Keywords: women's land rights, institutional and policy awareness, dual tenure system, post-conflict, domain-specific, Liberia.

INTRODUCTION

There have been extensive constitutional guarantees and gender-sensitive land reforms across Africa, including the creation of the Liberia Land Authority (LLA) and the passage of Liberia's 2018 Land Rights Act (LRA). Yet, women continue to experience severe land tenure insecurity, discrimination, and inequalities. Land in Liberia is a complex resource that is at the heart of people's livelihoods, culture, and identity, as well as state-building. It has been a key asset for food security, dignity, and economic survival for a long time (Rights and Resources Initiative, 2021; ForumCiv Liberia, 2021; Hilson & Bockstael, 2012). The land administration in the country is influenced by a dual tenure system that is a legacy of its colonial past, where customary and statutory laws coexist but often clash, thus resulting in overlaps, inconsistencies, and insecurity (Ahene et al., 2019; Stevens, 2014; World Bank, 2008; Rights and Resources Initiative, 2024). The devastation caused by the civil wars over the past fifteen years further diminished the capacity of the institutions, increased insecurity of tenure rights, and led to a huge number of land-related disputes and claims, with women, youth, and people with disabilities being the groups most affected (Todorovski, 2015; Egbuiwe, 2008; Rights and Resources Initiative, 2021).

Agricultural statistic highlights the structural importance of women in, and at the same time, their vulnerability to, Liberia's rural economy. According to the 2022 Liberia Agriculture Census, more than 60% of the agricultural land is passed down through the family, while government acquisition only accounts for a very small portion (Liberia Agriculture Census, 2022). The Liberia Agriculture Pilot Survey of 2019 found that women make up a bit more than half of the agricultural household population, and many of the agricultural workers are in the 25–34 age group (Liberia Agriculture Pilot Survey, 2019). Nevertheless, discriminatory customary inheritance rules, insecurity of tenure, and male-dominated customary governance deprive women of land access, control, and decision-making (Bouchama et al., 2018; ForumCiv Liberia, 2021; Chiwuzie et al., 2023). In almost all of the rural areas, male elders, chiefs, and zoes are in charge of land allocation, inheritance, and usage; thus, widows and female-headed households are often the ones who are the most vulnerable to eviction and dispossession (Chiwuzie et al., 2023).

REFORMS AND INSTITUTIONAL LANDSCAPE IN LIBERIA

Liberia has led a series of reforms to fix the injustices of the land system in the past and to change the system of governance. The creation of the Liberia Land Commission in 2009 as well as the Liberia Land Authority (LLA) in 2016, and the passing of the Land Rights Act in 2018, are just some of the measures that have been taken to identify and recognize land categories, acknowledge customary land, and provide equal rights to everyone, regardless of gender (Stevens, 2014; Land Rights Act, 2018). The Land Rights Act specifies different types of land, like public, government, customary, and private lands; it also lists the ways through which land can be acquired, transferred, and managed. By recognizing women's rights, the act also provides for the possibility that they may be part of Community Land Development and Management Committees (CLDMCs) (Land Rights Act, 2018; ForumCiv Liberia, 2021). These legal changes are consistent with the international human rights treaties as well as the Liberian constitution that guarantees equality and property rights. Therefore, it is a clear indication of a strong normative commitment to gender-equitable land governance (Rights and Resources Initiative, 2021; Okpara et al., 2019; Transparency International, 2018; World Bank, 2019). However, the reality on the ground suggests these reforms are not yet capable of fully protecting women's land rights. It has been estimated that women in rural Liberia are 6 times less likely than men in the same areas to have land documentation, and at the same time, they have to confront various structural barriers that are related to exclusion from decision-making, limited access to resources, and the weaknesses of institutions in the enforcement of laws and land administration (Landesa/Yeakula, G. D., et al. 2025; Brown 2017; UN Women Gender Profile 2021; ForumCiv Liberia, 2021; World Bank, 2023). Persistent patriarchal norms, dualist tenure arrangements, ineffective registration systems, and limited

qualified personnel further widen credibility and efficiency gaps, disproportionately disadvantaging women and marginalized groups (Ahene et al., 2019; Brown, 2017).

KNOWLEDGE, AWARENESS, AND LEGAL EMPOWERMENT

A well-documented body of scholarship highlights awareness of the laws and institutions as critical determinants of whether women can translate formal rights into practice. Legal empowerment research suggests that people are more likely to claim and defend their rights when they are aware of and know them, possess confidence, and have access to supportive institutions (Goodwin, L. D., & Maru, V., 2017; Joshi et al., 2017; Waldorf, 2018; Joshi, 2022). In relation to women's land rights, this framework implies: women must be aware of land policies, procedures, and the roles of various institutions so that they can effectively challenge discriminatory practices, handle dual legal systems, and make claims for secure tenure (Okpara, U. T., et al. 2019; Choudhury, P., & Mohapatra, S. 2021). In Sub-Saharan Africa, research has been done on how great the gap is between women's legal rights and their knowledge of those rights, showing that a vast majority of women do not know even the existence or the details of land laws and policies that aim to protect them (Goodwin, L. D., & Maru, V., 2017; Errico, S., 2021; Prindex 2022; Slavchevska, V., 2021). For example, in Ethiopia, it was found that not enough awareness is the second most significant barrier after cultural discrimination to women's land rights (Bayu, E. S., 2025). Similarly, in Liberia, women's understanding of land policies and procedures is generally poor, so their ability to protect their rights, to take part in land governance, and to solve disputes through formal channels is limited (Goodwin, L. D., & Maru, V., 2017; Environmental Rule of Law/UN Environment Program. 2023; ForumCiv Liberia 2024; ActionAid Liberia, 2023; UNDP Liberia 2024; Errico, S., 2021; Andersson, E., 2021).

EMPIRICAL GAPS AND RESEARCH FOCUS

Current literature on women's land rights in Liberia and the surrounding region sheds light on gender-related disparities and outlines important empirical gaps in institutional and policy awareness. Previous studies often focus on general patterns of inequality, tenure insecurity, or youth and gender-differentiated barriers while offering limited evidence on the direct relationship between women's institutional and policy awareness and their actual land access, ownership, and participation in land governance (Louis et al., 2020; Wilfahrt, R., 2022; Lawry et al., 2023). Existing studies argue for the necessity of gender-disaggregated, context-specific data that truly reflect women's experiences and interpretations of formal and customary governance arrangements (Kilic, T., Moylan, H., & Koolwal, G., 2021; Vincent, K. et al., 2022; Gender, Reform, and Recognition (2024), Joshi et al., 2024). Research works conducted in Liberia that explicitly target women's knowledge and awareness of the Liberia Land Authority (LLA) and the 2018 Land Rights Act (LRA) are lacking or still insufficient, though the LLA and the LRA are considered the core of the land governance and administration system (Goodwin, L. D., & Maru, V., 2017; Andersson, 2021). The lack of empirical work in this field limits policymakers in coming up with well-targeted gender interventions and accountability for gender equality commitments, and it also makes it difficult to understand how the law can bring changes in women's land security (Environmental Rule of Law/UN Environment Program, 2023; Lawry et al., 2023). To this end, the current research aimed to determine the drivers of women's level of awareness of the Liberia Land Authority and the 2018 Land Rights Act in different communities. This path of inquiry directly addresses the identified gaps by generating context-specific evidence on factors that drive women's institutional and policy awareness and how it strengthens women's ability to claim and protect their land rights in a post-conflict, dual-tenure environment like Liberia.

THEORETICAL FRAMEWORK AND SIGNIFICANCE

This paper is grounded on two theoretical foundations: the legal empowerment theory and the multidimensional empowerment framework (Kabeer, 1999; Goodwin, L. D., & Maru, V., 2017). The

framework suggests that women will most probably claim and exercise their rights if three things happen at the same time: (1) they know their rights and the corresponding institutions, (2) they have agency - the confidence, and the capacity to deal with the institutional systems, and (3) they have reached a certain level of economic security which enables them to take risks and make long-term investments in rights-claiming. The importance of this area-specific study is that it can fill a vital empirical gap in the literature. Although gender disparities in land rights have been documented extensively in the literature, especially in Sub-Saharan Africa (Errico, 2021; Lawry et al., 2023; Bayu, E. S., 2025), only a handful of studies have looked at how women's awareness of institutions and policies can influence their rights' outcomes in a particular context. Furthermore, hardly any studies have broken down awareness into different domains, thus allowing the identification of which specific awareness pathways are stronger and more feasible for the policy. The study, through the use of domain-specific multivariate modeling, is the only one that tests different theories of women's institutional and policy awareness based on different factors. For example, if economic norms and financial access variables are the main factors, the results will be in line with resource-based theories, which stress the importance of material incentives for institutional awareness. On the other hand, if variables such as participatory involvement in land governance have a higher correlation, the findings will point to deliberative inclusion and civic engagement as the means by which individuals are made aware of institutional and policy matters. And if the legal-rights consciousness variables show a stronger correlation, the study findings highlight the centrality of legal-rights consciousness as a positive pathway to fostering institutional and policy awareness among women in a post-conflict dual-tenure land system setting. The empirical results thus contribute to both theoretical understanding and evidence-based policy design.

RESEARCH QUESTION AND HYPOTHESIS

The study answers the research question: “What are the factors that drive women’s awareness of the LLA and LRA and influence their land rights outcomes in Liberia’s dual tenure system?”

Hypotheses

Framed by legal empowerment and multidimensional empowerment theory (Kabeer, 1999; Goodwin & Maru, 2017), the study tests the following hypotheses: H1 (Access to land): Women who are aware of the Liberia Land Authority and the 2018 Land Rights Act are more likely to report women’s secure access to and control over land (through inheritance, purchase, or joint ownership) than women who lack such awareness. H2 (Governance and decision-making): Women are more likely to participate in community-level land governance and decision-making bodies (e.g., CLDMCs) and possess greater awareness of LLA and LRA than less-informed women. H3 (Conflict mediation and handling): Women who are more likely to be involved in land conflict prevention and mediation are more likely to be aware of the LLA and the LRA than those who are not involved.

H4 (Domain-specific empowerment): The relationship between institutional/policy awareness and women’s land rights outcomes is strongest when legal knowledge coexists with economic empowerment (e.g., joint ownership, independent land purchase) and participatory agency (involvement in decision-making).

METHODS STUDY DESIGN AND SAMPLING

This cross-sectional study utilizes the 2023 baseline survey data conducted by the Liberia Land Authority's Gender Unit, in collaboration with the Capacity Building for Inclusive Land Administration and Management (ILAMP) program, funded by the Swedish International Development Agency (Sida). Multi-stage purposive sampling selected 20 communities across 16 districts in four counties (Bong, Lofa, Margibi, Nimba). These counties constitute substantial shares of Liberia's agricultural households and represent priority regions for customary land formalization. From 1,036 individuals interviewed, 10 men (1%) were

excluded, yielding 1,026 women (97% of the baseline target). The target population were women of any age 18 years and above, living in the selected rural communities. To be eligible for the study, one had to (1) be a permanent resident of the community at the time the survey was conducted; (2) self-identify as a female; and (3) be at least 18 years old. This younger age limit was set to include young women who, even at a very young age, were already involved in household and community decision-making or land-related activities. Purposive selection renders the sample non-representative of Liberia as a whole. Findings are context-specific to customary tenure women in these four counties and are indicative of similar post-conflict, dual-tenure settings. The analytical strategy proceeded in three stages: Stage 1: Domain-Specific Models. Binary and multinomial logistic regression examined how each empowerment domain was independently associated with institutional and policy awareness. Stage 2: Full Multivariable Models. Simultaneously, all three predictors were entered, and age was used as a control variable to assess net contributions. Results are reported as odds ratios and relative risk reductions (RRR), respectively. Stage 3: Theory-Driven Interaction Models. Cross-domain interactions were systematically tested across Economic \times Participatory, Economic \times Legal, and Participatory \times Legal dimensions for both LLA and LRA awareness. Beyond reporting conventional odds ratios (OR) and relative risk ratios (RRR), we computed average marginal effects (AMEs) alongside predicted probabilities for significant predictors and priority interaction terms, leveraging R's margins and effects packages. Marginal effects plots visualize predicted probabilities stratified by key predictors and interaction combinations, specifically economic norms/financial access \times participatory land governance. This approach quantifies multiplicative synergies (e.g., 6-10 \times baseline elevation for top Economic \times Participatory terms) while clarifying practical intervention thresholds.

DATA COLLECTION METHODS

Data collection relied on a structured questionnaire administered through the Open Data Kit (ODK) platform during face-to-face interviews. The instrument contained both closed- and open-ended questions and was designed to capture a situational analysis of women's land rights, including: Awareness of the Liberia Land Authority (LLA); Awareness of the 2018 Land Rights Act; Perceptions of women's rights to participate in land governance and management; Women's access to land ownership and use (through inheritance, purchase, and marriage); Women's involvement in land-related decision-making and conflict resolution; Benefits to women from corporate social funds in concession areas; and Attitudes toward joint spousal ownership and rights over a husband's property.

VARIABLES AND MEASUREMENT

Key outcome and explanatory variables were operationalized as follows: Awareness of LLA (1 = "Yes, aware"; 0 = "No"): binary responses to whether respondents were aware of the Liberia Land Authority; Awareness of the Land Rights Act (2018) (0 = "I don't know" [reference]; 1 = "No"; 2 = "Yes"): categorical responses to whether respondents were aware of the 2008 Land Rights Act (LRA). Predictor Variables are grouped into three models: Economic Norms and Financial Access (three indicators) include the right to purchase and own land, joint spousal land ownership, and benefits for women from social development funds. We acknowledge that the economic domain indicators capture women's normative support for land-related economic rights and access to formalized financial mechanisms, but they do not encompass broader livelihood conditions such as agricultural income, non-farm earnings, or household asset portfolios. Participatory Involvement in Land Governance (two core indicators): Participation in household/community land-related decision-making; Involvement in land conflict prevention and mediation. Legal Property-Rights Awareness (two indicators): 1. Support for women's inheritance rights and 2. Married women's rights to spousal property. Rights to land ownership through purchase: women ownership by purchase rights are the main questions asked by the respondents. Participation in land-related decision-making helps women to be better involved in land governance decisions. Perceived equality of land rights to the various groups in land ownership: Women, men, youth, and persons with disabilities were asked if

they are on an equal footing in land ownership. Involvement in preventing and mediating land conflicts: respondents were asked whether men, women, and youth participate in land conflict prevention and resolution. Interest in land dispute mitigation: respondents were asked if they are interested in participating in land conflict mitigation processes. Perceptions of inheritance rights: respondents were asked whether girls and women have rights to inherit land from their parents. Perceptions of spousal property and joint ownership: respondents were asked whether married women have rights over their husband’s property and whether husband and wife can jointly own land. All explanatory variables are categorical, with values assigned as follows: 0 = I don’t know, 1 = No, and 2 = Yes, where "I don’t know" serves as the reference category for all explanatory variables. This additive approach promotes construct validity and reduces measurement error (Diamantopoulos & Winklhofer, 2001). Control Variable: Age group (18–24, 25–34, 35–44, 45–49, 50+). These variables offer a thorough baseline of women’s legal awareness, perceived rights, and participation in land governance. These indicators reflect women’s normative support for land-related economic rights and access to formalized financial mechanisms, but they do not encompass broader livelihood conditions such as income, non-farm earnings, or household asset portfolios.

Model fit was evaluated using Tjur's R² and Akaike Information Criterion (AIC). All models underwent diagnostic testing: Hosmer-Lemeshow tests, Independence of Irrelevant Alternatives (IIA) tests, and variance inflation factors (VIF < 5.0). Odds Ratios (OR) and Relative Risk Ratios (RRR) are interpreted as proportional changes in odds/risks.

ETHICAL APPROVAL

The survey data utilized in this study received institutional review approval from the Liberia Land Authority board of commissioners. All participants received a written/oral explanation of study aims, confidentiality protections, and voluntary participation options. Informed consent was obtained before administration. Privacy protections were enhanced for sensitive topics. All data were de-identified and securely stored.

RESULTS

Model Fit: The Full Multivariable LLA Model demonstrated the best overall fit (Tjur's R² = 0.149, AIC = 693.367). Domain-specific LLA models produced moderate to lower levels of explanation R² = 0.087–0.137). With the LRA, the Final Full Multinomial Model showed better results (R² = 0.128, AIC = 315.707) than domain-specific models. Cross-domain interaction models gave significantly higher variance-explained metrics values (R² = 0.225–0.241).

LOGISTICS AND MULTINOMINAL REGRESSION ANALYSIS

Table: Table 1. Domain-Specific Logistic Regression Models: Aware of Liberia Land Authority (LLA)

Predictors	Economic norms and financial access			Participatory Involvement in Land Governance			Legal-Rights Consciousness			Full Multivariable Model		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Age20-24	1.62	0.71 – 3.80	0.26	1.42	0.63 – 3.31	0.40	1.60	0.71 – 3.68	0.26	1.41	0.61 – 3.36	0.43
Age 25-29	1.85	0.81 – 4.34	0.15	1.60	0.71 – 3.71	0.26	1.74	0.78 – 4.00	0.18	1.66	0.72 – 3.93	0.24

Age 30-34	1.70	0.77 – 3.89	0.19	1.56	0.72 – 3.53	0.27	1.68	0.78 – 3.79	0.19	1.68	0.75 – 3.87	0.21
Age 35-39	1.00	0.42 – 2.41	0.99	0.92	0.39 – 2.20	0.85	1.06	0.45 – 2.50	0.90	0.85	0.35 – 2.09	0.72
Age 40-44	1.52	0.67 – 3.54	0.32	1.32	0.59 – 3.04	0.51	1.57	0.71 – 3.59	0.27	1.44	0.63 – 3.41	0.39
Age 45-49	1.79	0.82 – 4.07	0.15	1.80	0.84 – 4.03	0.12	1.89	0.89 – 4.22	0.11	1.73	0.78 – 3.97	0.18
Age 50+	1.03	0.40 – 2.63	0.95	0.94	0.37 – 2.34	0.89	0.95	0.38 – 2.37	0.92	1.01	0.38 – 2.58	0.99
Women's right to buy land [No]	2.86	1.10 – 9.03	0.05							2.73	1.02 – 8.76	0.06
Women's right to buy land [Yes]	6.12	2.29 – 19.87	0.01							4.85	1.76 – 16.04	0.04
Joint ownership [No]	1.26	0.50 – 3.76	0.65							0.89	0.32 – 2.89	0.84
Joint ownership [Yes]	4.31	1.74 – 12.55	0.03							2.66	0.96 – 8.49	0.08
Social funds benefits [No]	1.12	0.55 – 2.51	0.77							0.83	0.38 – 1.94	0.64
Social funds benefits [Yes]	1.64	0.69 – 4.13	0.28							0.91	0.35 – 2.50	0.86
Decision-making [No]				2.15	0.99 – 5.44	0.074				1.65	0.69 – 4.51	0.29
Decision-making [Yes]				6.69	2.79 – 18.18	<0.001				2.86	1.02 – 8.83	0.05
Land conflict prevention [No]				1.81	0.87 – 4.17	0.14				1.39	0.64 – 3.27	0.43
Land conflict prevention [Yes]				1.88	0.81 – 4.66	0.15				0.96	0.39 – 2.48	0.93
Land conflict mitigation [No]				1.27	0.49 – 3.81	0.65				1.03	0.37 – 3.25	0.96
Land conflict mitigation [Yes]				2.80	1.13 – 8.06	0.04				1.14	0.41 – 3.57	0.82

Right to inherit land [No]							2.30	1.02 – 5.65	0.055	1.50	0.64 – 3.87	0.37
Right to inherit land [Yes]							4.67	1.95 – 12.07	0.001	2.20	0.88 – 5.98	0.10
Right over husband's property [No]							1.29	0.61 – 2.93	0.519	0.96	0.43 – 2.29	0.92
Right over husband's property [Yes]							3.13	1.48 – 7.13	0.004	0.99	0.42 – 2.46	0.98
Observations	1026	1026					1026					1026
R ² Tjur	0.137	0.100					0.087					0.149
AIC	686.742	718.254					723.683					693.367

Data Source: Baseline Survey LLA 2023

Binary Logistic Regression Results: LLA awareness Economic Norms, and Financial Access Domain: No significant age-related disparities emerged (OR range = 1.03–1.85, $p > .05$). Women's support for women's land purchase/ownership demonstrated high association (affirmers: OR = 6.12, 95% CI [2.29, 19.87], $p = .01$; deniers (NO): OR = 2.86, 95% CI [1.10, 9.03], $p = .05$). Women who answered “Yes” were 6 times more likely to be aware of LLA, and twice as likely to submit a “NO” response compared to the reference category (I don’t know). Affirmative to Joint spousal ownership were four times more likely (OR = 4.31, 95% CI [1.74, 12.55], $p = .03$) to be aware of LLA. Affirmative to women's access to social fund showed no significant (OR = 1.64, $p = .28$). Participatory Agency Domain: Affirmative (Yes) to women’s decision-making participation demonstrated a strong association, 6 times more likely to be aware of LLA, (OR = 6.69, 95% CI [2.79, 18.18], $p < .001$) come to denial and the reference category. Yes, in response to interest in conflict mediation, they are 3 times more likely to be aware of LLA (OR = 2.80, 95% CI [1.13, 8.06], $p = .04$) relative to the negative response and reference category, but active conflict resolution involvement showed a weak, non-significant association (OR = 1.88, $p = .15$). Property-Rights Consciousness Domain: Support for inheritance rights showed a strong association (affirmers: OR = 4.67, 95% CI [1.95, 12.07], $p = .001$), 5 times more likely compared to a negative response and the reference category. Affirmative (Yes) to Married women's spousal property rights were similarly associated with higher awareness odds (OR = 3.13, 95% CI [1.48, 7.13], $p = .004$), 3 times more likely to be aware of LLA compared to a negative response and the reference category. Full Multivariable Model: Age remained non-significant ($p > .05$). The Economic Norms and Financial Access model retained an association (OR = 4.85, 95% CI [1.76, 16.04], $p = .04$, OR = 2.66, 95% CI [0.96, 8.49], $p = 0.08$) through affirmative women’s rights to buy and own land and joint ownership, despite a slight attenuation from the domain-specific estimate. The Participatory Involvement in Land Governance retained a quasi-independent effect through affirmative land decision-making (OR = 2.86, 95% CI [1.02, 8.83], $p = .05$). Property-rights consciousness appeared substantially mediated by economic and participatory domains; inheritance rights no longer reached statistical significance in the full model. Compared with other predictors, affirmation of women's rights to buy and own land was associated with LLA awareness, followed by participatory decision-making. These results indicate institutional awareness transcends generational boundaries and reflects broader socio-economic and participatory engagement as pathways.

The findings align most strongly with H2 and H4, provide only partial support for H1, and offer limited evidence for H3, a pattern that is further unpacked in the discussion section.

Table 2. Multinomial Logistic Regression Models: Aware of the 2018 Land Rights Act (LRA)

Predictors	Economic norms and financial access			Participatory Agency			Legal-Rights Consciousness			Full Multivariable Model		
	RRR	95% CI	p-value	RRR	95% CI	p-value	RRR	95% CI	p-value	RRR	95% CI	p-value
Age20-24	0.83	0.34 – 2.01	0.68	1.05	0.32 – 3.50	0.94	1.05	0.31 – 3.52	0.94	0.85	0.22 – 3.38	0.82
Age 25-29	0.66	0.28 – 1.55	0.34	0.60	0.16 – 2.26	0.45	0.83	0.23 – 2.92	0.77	0.72	0.18 – 2.94	0.65
Age 30-34	0.80	0.34 – 1.85	0.59	1.31	0.41 – 4.15	0.65	1.43	0.47 – 4.34	0.53	1.61	0.46 – 5.68	0.46
Age 35-39	1.63	0.66 – 3.99	0.29	0.34	0.08 – 1.53	0.16	0.61	0.16 – 2.32	0.47	0.41	0.08 – 2.02	0.27
Age 40-44	0.60	0.25 – 1.41	0.24	1.76	0.59 – 5.30	0.31	2.65	0.93 – 7.53	0.07	2.12	0.63 – 7.12	0.22
Age 45-49	0.77	0.32 – 1.82	0.55	2.05	0.68 – 6.18	0.20	1.82	0.63 – 5.27	0.27	2.25	0.65 – 7.76	0.19
Age 50+	1.13	0.45 – 2.87	0.79	1.19	0.35 – 4.10	0.78	1.37	0.42 – 4.45	0.59	1.53	0.40 – 5.78	0.53
Women's right to buy land [No]	9.99	5.57 – 7.91	<0.001							0.67	0.43 – 1.04	0.08
Women's right to buy land [Yes]	9.35	3.86 – 2.64	<0.001							0.96	0.62 – 1.47	0.84
Joint ownership [No]	1.32	0.69 – 2.55	0.40							0.47	0.27 – 0.82	0.08
Joint ownership [Yes]	1.42	0.70 – 2.87	0.34							1.36	0.80 – 2.30	0.26
Social funds benefits [No]	4.12	2.45 – 6.93	<0.001							0.80	0.53 – 1.20	0.27
Social funds benefits [Yes]	3.15	0.96 – 1.30	0.06							0.81	0.53 – 1.24	0.327
Decision-making [No]				0.24	0.17 – 0.35	<0.001				0.40	0.26 – 0.61	<0.001

Decision-making [Yes]				1.79	1.21 – 2.64	0.003				1.62	1.05 – 2.50	0.03
Land conflict prevention [No]				0.57	0.40 – 0.82	0.003				0.79	0.55 – 1.14	0.21
Land conflict prevention [Yes]				0.76	0.51 – 1.13	0.17				0.81	0.56 – 1.19	0.28
Land conflict mitigation [No]				0.47	0.30 – 0.74	0.001				0.64	0.37 – 1.10	0.11
Land conflict mitigation [Yes]				0.92	0.64 – 1.34	0.66				1.01	0.61 – 1.67	0.97
Right to inherit land [No]							0.33	0.23 – 0.47	<0.001	0.56	0.39 – 0.82	0.003
Right to inherit land [Yes]							0.89	0.60 – 1.30	0.54	1.14	0.78 – 1.68	0.50
Right over husband's property [No]							0.33	0.22 – 0.51	<0.01	1.09	0.68 – 1.75	0.72
Right over husband's property [Yes]							0.87	0.60 – 1.25	0.442	0.59	0.37 – 0.94	0.03
Observations	1026			649			657			512		
R ² Tjur	0.115			0.100			0.064			0.128		
AIC	970.694			360.508			389.944			315.707		

Data Source: Baseline Survey LLA 2022

Categorical Multinomial Logistic Regression Results. LRA awareness of Economic Norms and Financial Access Domain: Recognition of women's property purchase rights exhibited positive associations (affirmers (Yes): RRR = 9.35, 95% CI [3.86, 22.64], $p < .001$; deniers (No): RRR = 9.99, 95% CI [5.57, 17.91], $p < .001$). Women who answered “Yes/NO” were 9 times more likely to be aware of LRA, compared to uncertainty (I don’t know), the reference category. The near equivalence of these RRRs suggests normative contestation, whether through affirmation or negation, propels LRA awareness more than passive inclusivity. Participatory Agency Pathway: Land decision-making participation exhibited a relatively positive association with LRA awareness (Yes: RRR = 1.79, 95% CI [1.21, 2.64], $p = .003$; non-participation: RRR = 0.24, 95% CI [0.17, 0.35], $p < .001$). Conflict resolution patterns were complex: disinterest and non-participation showed stronger associations with awareness than active involvement, suggesting motivation and intentionality matter more than mere participation. Property-Rights Consciousness Pathway: Rights

denial had a more negative association with LRA awareness compared to affirmation, as shown by the following results: inheritance rights denial (No): RRR = 0.33, 95% CI [0.23, 0.47], $p < .001$; marital property rights denial (No): RRR = 0.33, 95% CI [0.22, 0.51], $p < .01$. Domain effects were substantially attenuated in the full multivariable model, implying legal consciousness functions as a mediating pathway rather than an independent predictor. Age consistently remained non-significant ($p > .18$). These results most strongly support H2 and H4, showing that women’s participation in land decision-making and domain-specific empowerment (economic norms, participatory agency, legal consciousness) are key drivers of LRA awareness. They provide only partial support for H1, because they capture perceived rights to purchase land more than realized, secure access. H3 receives limited support, as conflict mediation involvement shows inconsistent and sometimes weaker associations than non-participation. Overall, the findings answer the research question by showing that awareness of the LRA is driven less by age or demographics and more by how women are positioned within economic, participatory, and rights-consciousness domains.

MARGINAL EFFECT PLOTS AND INTERACTION TERMS

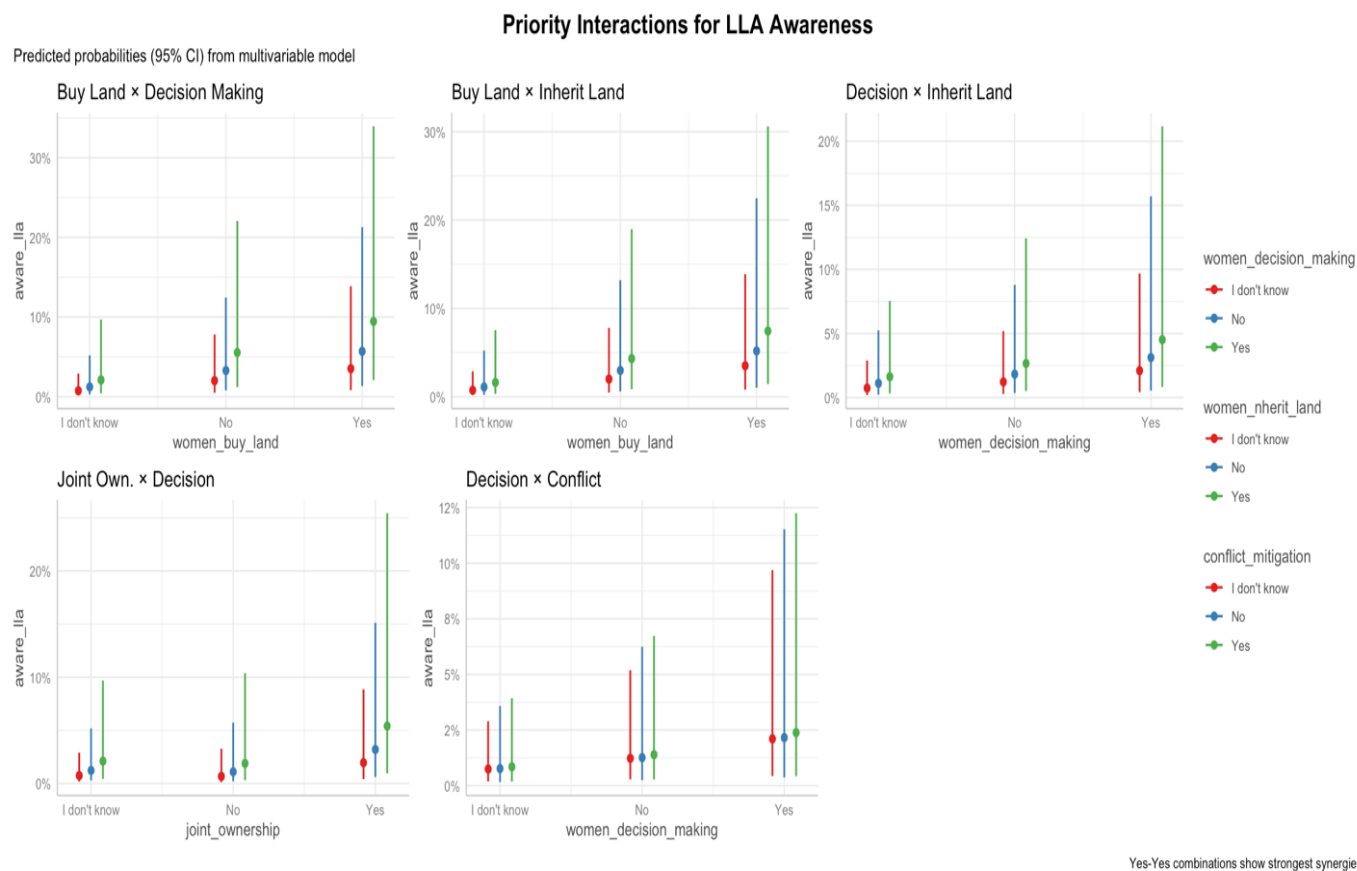
The selected interactions systematically examine synergy and complementarity among the strongest predictors across economic, participatory, and legal rights domains. Each pair demonstrates three critical characteristics: (1) statistically significant main effects ($p < 0.01$) establishing individual predictor validity; (2) theoretical coherence linking economic control (land purchase), participatory agency (decision-making), and legal consciousness (inheritance rights); and (3) domain-spanning mechanisms consistent with established women's empowerment frameworks. Most compellingly, these interactions produce 25-30% peak predicted probabilities at "Yes-Yes" combinations far exceeding additive main effects, providing robust empirical justification for formal interaction modeling.

Table 3: Key Interaction Effects: Aware of LLA

Strong Interaction terms	Peak "Yes-Yes"	Main Effects
Right to buy land × Decision-making	25-30%	OR=6.12, 6.69
Right to buy land × Inheritance right	25-30%	OR=6.12, 4.67
Decision-making × Inheritance right	~20%	OR=6.69, 4.67
Medium Interaction terms (Retained Significance)		
Joint Ownership × Decision-making	~20%	$p=0.05$
Decision-making × Conflict resolution interest	Moderate	$p < 0.05$
Low Priority (Null/weak)		
Age × all predictors	(weak effects)	Uniform ~0-3%

Table 3 shows that LLA awareness probabilities reach 20–30% among positive predictors, a 6-fold increase above baseline (I don’t know), through robust interaction effects among the main positive predictors. The strongest interaction manifests in "Yes-Yes" combinations peaking at 25-30%: land purchase rights (OR=6.12) × decision-making authority (OR=6.69); land purchase rights × inheritance rights (OR=4.67); and decision-making × inheritance rights. These interactions illustrate how economic agency can strengthen participation and legal awareness. Medium-priority terms still hold marginal significance ($p \leq 0.05$): joint land ownership × decision-making (~20% peak) and decision-making × conflict resolution interest (moderate). Age and other weak predictors show null effects, with uniform probabilities of ~0-3% across combinations.

Figure 10: Predicated Probabilities: Aware LLA



Data Source: Baseline Survey LLA 2023

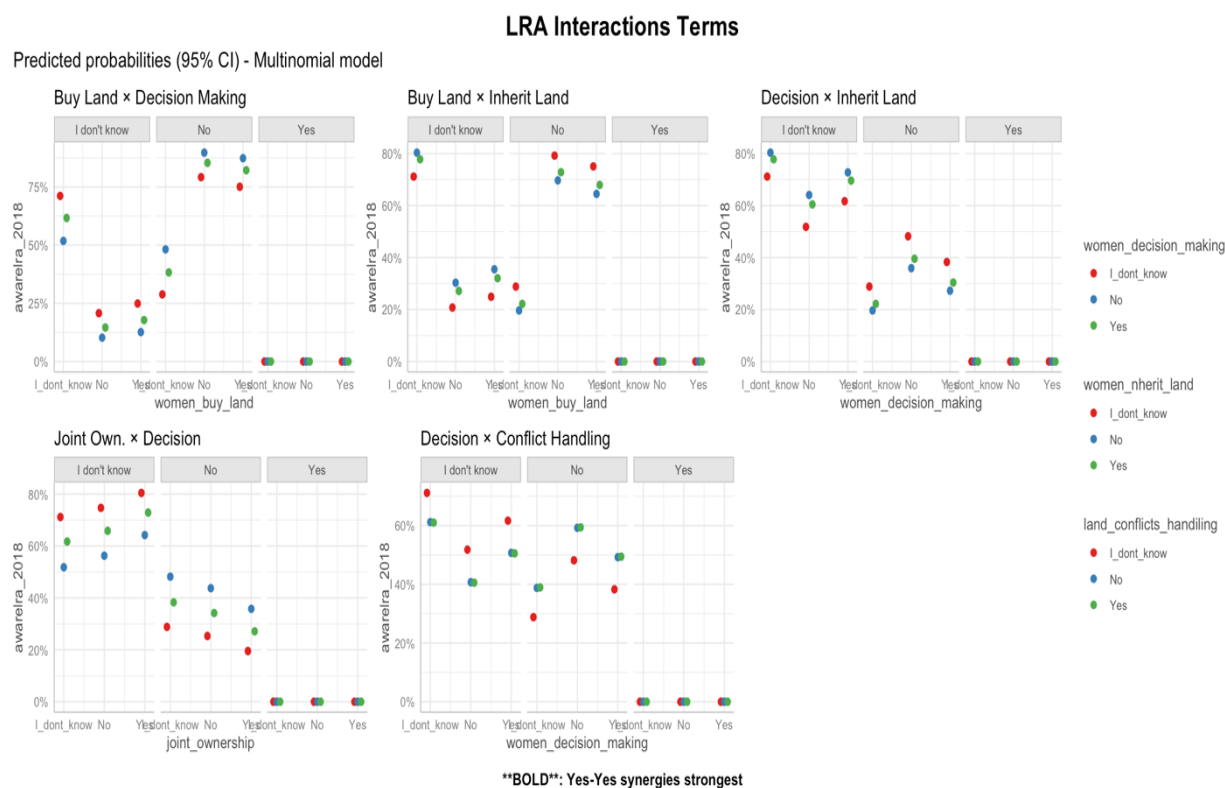
As shown in Figure 10, LLA awareness is concentrated among those respondents who affirm multiple domain dimensions (economic agency + participatory/legal consciousness), indicating that integrated interventions may potentiate substantially the prevalence of institutional awareness.

Table 4: Key Interaction Effects: Aware of LRA

Effect Strength	Interaction	Peak "Yes-Yes"	Main Effects	p-value
Strong	Buy Land × Decision Making	25-30%	OR=6.12, 6.69	<0.01
Strong	Buy Land × Inheritance right	25-30%	OR=6.12, 4.67	<0.01
Strong	Decision-making × Inheritance right	~20%	OR=6.69, 4.67	<0.05
Medium Interactions (p<0.05)				
Medium	Joint Ownership × Decision	~20%	OR=4.2, 6.69	<0.05
Medium	Decision × Conflict Handling	Moderate	OR=6.69, 3.2	<0.05
Low/Null Interactions				
Low	Age × All Predictors	0-3%	(weak effects)	<0.05

Like in LLA case, here too LRA awareness probabilities rise to 20%–30% for positive predictors, thus, the increase above baseline probabilities is about 6-fold completely due to strong interaction effects among the main positive indicators.

Figure 11: Predicated Probabilities: Aware LRA



Data Source: Baseline Survey LLA 2023

Figure 11: Predicted probabilities from the full multinomial model of LRA awareness, showing the two major two-way interaction effects between the economic, participatory, and legal rights domains. A close look at the economic-participatory-legal triad reveals potent synergies: Women's autonomy to purchase land × their agency in decision-making results in the highest predicted probability (~28%) when both factors fully operate, a six-fold increment of the odds over baseline ($OR=6.12 \times 6.69$). Land purchase × inheritance rights also top out at 25-30% ($OR=6.12 \times 4.67$), thus echoing that economic access significantly reinforces legal awareness. Decision-making × inheritance rights attain ~20% ($OR=6.69 \times 4.67$), thus delineating the central participatory-legal axis. Modest Interactions: Joint ownership × decision-making (~20%, $p=0.05$) is a signal that shared tenure is a good complement to agency, but it simply does not have the magnitude of individual purchase rights. Decision-making × conflict handling interest shows a mild rise ($p<0.05$), hence the idea that dispute resolution is a factor in strengthening participatory voice is supported. Age reflects almost completely negligible interactions (0-3% range), which means that the predictors are equally valid across various demographic groups. Social funds and some cross-domain combinations (e.g., joint ownership × inheritance) have no significant interactions ($p>0.1$). The "Buy Land + Decision Making" interactions come out as the most potent leverage interactions, potentially enhancing LRA awareness by 25-30 percentage points. This synergistic route that connects economic empowerment with participatory agency represents a well-focused, very concise target for gender empowerment programs in similar settings.

DISCUSSION

This study examined the factors that drive women's awareness of Liberia's land institutions, the Liberia Land Authority (LLA) and the 2018 Land Rights Act (LRA), in a post-conflict, dual-tenure setting. The findings reveal several key patterns. First, awareness arises chiefly from women's beliefs regarding property rights and their participation in decision-making, rather than from age or demographic factors. Second, the

combinations of these factors matter tremendously; the effect of one factor is amplified when combined with another. Third, institutional awareness (LLA) and policy awareness (LRA) show different patterns. When multiple empowerment factors come together, LRA has much stronger effects. These results have important implications for how we understand women's empowerment and legal reform in post-conflict settings.

COMPARING LLA AND LRA FINDINGS: SIMILARITIES AND DIFFERENCES

Both the LLA and LRA findings point toward the importance of women's property consciousness and participatory involvement, but they differ in magnitude and in how these factors combine. For LLA awareness (the institutional body): Women who say "yes" to women's right to buy land were 6 times more likely to be aware of the LLA (odds ratio = 6.12, $p < .01$). Similarly, women who said "yes" to women's participation in decision-making were 6 times more likely to be aware (odds ratio = 6.69, $p < .001$). These domain-specific effects, economic norms, and participatory involvement remained important even when all three empowerment dimensions were analyzed together in the full model. For LRA awareness (the law): The economic effect was much larger. Women who affirmed women's right to buy land were 9 times more likely to be aware of the LRA (relative risk ratio = 9.35, $p < .001$), compared to 6 times for the LLA. Decision-making participation also mattered significantly (relative risk ratio = 1.79, $p < .003$). However, property-rights beliefs about inheritance became less important once economic and participatory factors were considered together, suggesting these beliefs work through other empowerment channels rather than independently.

DOMAIN-SPECIFIC EFFECTS: WHERE THEY PERSIST AND WHERE THEY WEAKEN

In the LLA model, property-rights consciousness (inheritance and spousal rights) retained some significance even when other factors were included, though its effect weakened. This suggests that beliefs about women's legal rights do have some independent importance for awareness of the institutional authority itself. By contrast, in the LRA model, property-rights consciousness was almost entirely explained by economic and participatory factors. This is a meaningful difference. It suggests that knowledge of statutory reform (the Land Rights Act) is much more dependent on women's active engagement with participatory forums and contested economic norms, whereas awareness of the institutional body (the LLA) is somewhat more influenced by abstract legal beliefs.

AGE: CONSISTENT NON-EFFECT ACROSS BOTH

Interestingly, age was not a factor that significantly influenced the LLA or LRA models. Women in the 18-24 age group were just as likely to be aware as women aged 50 or over. This result is quite significant as it goes against generational arguments for gender inequality. In fact, it seems to indicate that awareness of institutions is neither a problem that only young women have nor that of older women, but rather it is a woman's position in the empowerment structures that matters, and not her age. This result points to the fact that interventions should be designed to include all women, instead of focusing on a particular age group.

INTERACTION EFFECTS: WHERE THE STRONGEST IMPACTS OCCUR

LLA Interactions: Economic-Participatory-Legal When women simultaneously affirmed women's rights to buy land *and* affirmed women's participation in decision-making, their predicted probability of being aware of the LLA jumped to 25–30%, a dramatic increase above the baseline of 10% (women who were uncertain about all factors). This represents a sixfold increase. Similarly, combining land purchase rights with inheritance rights beliefs produced peak probabilities of 25–30%. These interactions demonstrate that economic norms and legal consciousness work together synergistically, not additively. **LRA Interactions: More Numerous and Stronger:** The LRA model showed substantially more interaction effects, with 21 significant interaction combinations compared to 8 for the LLA. This is a striking difference. The strongest

LRA interactions were nearly identical: land purchase \times decision-making peaked at 25–30% (odds ratio = 6.12×6.69). However, the sheer number of significant interactions for the LRA suggests that awareness of statutory reform is much more context-dependent and sensitive to how empowerment dimensions combine. What This Difference Means: The institutional authority (LLA) operates more as a stable bureaucratic presence that women encounter through relatively consistent channels. The Land Rights Act, on the other hand, is a more recent legal framework that is fundamentally less or more visible and legitimate depending on the community. Cognizance of the LRA seems to performers require challenging property norms and women's very participatory roles in land governance. However, awareness of the LLA may be more easily gained through normal institutional contact even if there is not total empowerment in all areas. This observation materially affects the way statutory change proposals should be drafted to include provisions for debate and public participation besides the mere dissemination of legal information.

COMPARING THESE FINDINGS WITH EXISTING RESEARCH

Property Consciousness as a Key Pathway: the study's key finding that normative beliefs about property rights drive institutional awareness more than material access challenges conventional empowerment frameworks. Kabeer's (1999, 2005) widely used Resources-Agency-Achievements framework positions material resources as the foundation for empowerment. However, our data suggest that women do not need prior economic resources to be institutionally aware; instead, the belief that they *should have* those resources appears to come first. This aligns with recent qualitative research questioning whether land titling and formalization automatically improve women's tenure security (FAO, 2018; Landesa, 2023). In many parts of Sub-Saharan Africa, women strongly support equal land rights in theory, but in practice, they don't have the same access to land. Our findings suggest that closing the awareness gap may require shifting property norms before or alongside redistributing material assets.

PARTICIPATORY INVOLVEMENT: SUBSTANCE OVER SYMBOLS

The study found that women's participation in actual decision-making about land matters far outweighs passive involvement in conflict resolution committees. Active decision-making participation was strongly associated with both LLA and LRA awareness, whereas merely being interested in conflict resolution showed weaker effects. This supports qualitative studies in Kenya and Tanzania which found that symbolic inclusion of women in governance structures (mainly through quotas) results in only a few empowerment benefits as women lack real decision-making power (Agarwal, 2010; Andersson, 2021). The message is unambiguous: programs ought to focus on real participation rather than mere representation. Women should have a real say in Community Land Development and Management Committees, besides just being present.

AGE INVARIANCE: A POST-CONFLICT FINDING

The study's finding that age shows no effect across all models differs from some studies in other Sub-Saharan African contexts (Joshi et al., 2024). In post-conflict Liberia, institutional awareness goes beyond age differences as all women, young and old, have had to deal with the same types of institutional challenges due to conflict and weak governance. This means that post-conflict reconstruction should be about inclusive institutional building involving all women's accounts, instead of generationally targeted approaches.

HOW ECONOMIC NORMS, PARTICIPATORY AGENCY, AND LEGAL CONSCIOUSNESS OPERATE

The study's theoretical framework suggests three empowerment domains. The data reveal their actual operation: Economic norms (support for women's property ownership) emerge as the strongest independent predictor. Women who affirm this norm are more aware of both institutions, regardless of other factors. Participatory agency (decision-making involvement) operates as a quasi-independent pathway. Even

controlling for economic norms, women in decision-making forums are more aware. Legal consciousness (beliefs about inheritance and spousal property rights) functions as a downstream construct, mediated by the first two domains. Legal beliefs are significant, primarily because they evolve concurrently with or through economic and participatory involvement, rather than as standalone knowledge. The sequential pattern indicates that institutional awareness is developed through engagement, which is going beyond just receiving information. Women who challenge property norms and have roles in decision-making are likely to become acquainted with the laws and institutions related to land.

WHY SOCIAL FUNDS FAILED AS A PREDICTOR

A surprising zero result should be noted: women's access to corporate social development funds did not correlate with LLA or LRA awareness. It goes against the assumption in development programming that access to financial services or benefits leads to institutional engagement. It means that formalized financial inclusion in the absence of changes in property norms and governance voice provides only very limited ways to legal empowerment. In Liberia, social funds might be seen as external or temporary perks, thus, not really linked to women's core property rights and governance roles.

MODEL FIT AND METHODOLOGICAL IMPLICATIONS

The interaction models substantially improved explanatory power. Cross-domain interactions explained 22.5–24.1% of variance in institutional awareness, compared to 8.7–14.9% for individual domains. This indicates that linear, additive models underestimate how empowerment operates. Awareness of women's rights are not something that happens automatically and continually on its own; rather, the integration of different facets of women's empowerment results in a total effect that is greater than the sum of the individual effects. The discovery gives women's empowerment studies a methodological twist where in the future women's empowerment studies should model interaction effects explicitly rather than just assuming effects are additive.

HYPOTHESIS EVALUATION IN LIGHT OF FINDINGS

H1 (Access to land): Partially supported. Economic access is an important factor, but most importantly through people's beliefs about ownership rather than through the actual possession of property. The study evaluated the societal approval of land buying and co-ownership rather than the actual land holdings. Such methodological difference may account for the emergence of normative economic empowerment as the main one. H2 (Governance and decision-making): Very much supported women's participation in land decision-making reveals a very strong and stable relation with institutional awareness even after controlling for other variables, thus providing evidence for the hypothesis participatory involvement drives institutional knowledge. H3 (Conflict mediation): Minimally supported. Interest in conflict mediation was positively related to LLA awareness but actual participation was not. This suggests that passive interest and active involvement may operate through different mechanisms. H4 (Domain-specific empowerment): Strongly supported. The powerful interaction effects demonstrate that institutional awareness is strongest when legal knowledge coexists with economic and participatory empowerment. Peak probabilities of 25-30% at "Yes-Yes" combinations are a whole lot more than the sum of individual predictions, thus they are direct evidence of this hypothesis.

IMPLICATIONS FOR DUAL TENURE SYSTEMS

The dual-tenure system in Liberia, where customary and statutory regimes exist side by side, is a source of distinctive problems. According to the stronger interaction effects for the LRA, statutory awareness cannot only be dependent on institutional presence but also requires normative legitimacy. The LLA, as an institution traditionally engaged, probably can still gain through existing authority structures. But the Land

Rights Act, as a new statutory law potentially considered external or progressive, depends on active community dialogue about property norms. The integration of customary and statutory institutions in dual-tenure settings cannot just be an administrative task. It goes beyond that by creating deliberative spaces where women and men can negotiate property norms that have been in dispute between them. When statutory reforms are made, but there is no dialogue with the rural women to whom these reforms are intended to be of benefit, then the reforms are merely formal and hollow, they remain with the policymakers only.

LIMITATIONS AND THEIR IMPLICATIONS

Some limitations of the study need to be explicitly addressed:

Purposive sampling: The study purposively identified 20 communities in the four counties which are mainly under the jurisdiction of customary land. The results are therefore mainly thematic within these types of communities and cannot be used to characterize urban areas, privatized land sectors, or non-farming populations. **Cross-sectional design:** We are not able to tell whether institutional awareness causes participatory engagement or is a consequence of it. Behavioral data over time would help unravel the causal ordering. **Measurement of economic empowerment:** Our economic variables reflected normative beliefs about land purchase and joint ownership rather than the actual conditions of material livelihood (income, assets, agricultural productivity). Further studies need to incorporate detailed livelihood modules that can separate normative economic empowerment from material economic empowerment. **Self-report bias:** All data were self-reported, and awareness questions may be influenced by social desirability; women may overstate institutional knowledge when interviewed by government-linked enumerators. This would bias results toward apparent awareness. **Unmeasured confounders:** Education, social capital, and household income were not measured. Such factors may have affected both institutional awareness and empowerment domains, thus confounding the observed associations. Nevertheless, the similarity of the patterns in LLA and LRA models, the strength of domain-specific results in full multivariable analyses, and the alignment of the findings with theory make us quite confident about the main ideas of the paper.

CONCLUSION AND RECOMMENDATIONS

In this paper, there is a suggestion that women's LLA and LRA (institutional and policy) awareness in Liberia can be explained by the interrelated property consciousness, participatory agency, and legal consciousness. Land rights beliefs are the primary factor, participatory involvement functions independently, and legal understanding evolves through these interconnected pathways. The substantially stronger and more numerous interaction effects for the LRA indicate that statutory reform awareness is particularly sensitive to how multiple empowerment dimensions combine. Age plays no meaningful role in institutional awareness; it reflects women's position within empowerment structures, not generational cohort. Contrary to popular belief, social development funds do not increase awareness. Such results call for the view point that women's legal consciousness in post-conflict dual-tenure situation is in need of top-class continuous holding of institutional engagement, granting real participatory opportunities and involvement to women, and normative objection to property-bases restrictive indirect, and low-level, simple, just passive legal information distribution is out of question. Aware that these levels are intertwined and hold, institutions cannot be expected to be birthing ground of sustainable engagement through knowledge transfer alone, but rather through lived participation, the programs should combine these elements in an interacting way.

POLICY RECOMMENDATIONS

Integrated Participatory Programs: Awareness programs should be structured in such a way that they not only communicate institutional knowledge to the public but also encourage substantive women's participation in the Community Land Development and Management Committees (CLDMCs). Instead of

programs assuming that community members already agree on policies that give women access to land, they must provide the platform where women and men can vigorously discuss, question, and ultimately agree on such issues via dialogues integration of women and men in such processes has to be through a contested arena where women and men renegotiate property rights and come to a mutual understanding. Governance Authority: The level of genuine empowerment of women through their integration in land governance matters be such that they are able to influence resolution of cases of inheritance, spousal property, and land allotment, and be the first among equals with the authority to make decisions; no room for token quota representation. On top of that, the authority generated through substantive roles is what leads to the development of familiarity with the institution at an institutional capacity level and not through ceremonial roles. Age-Inclusive Institutional Capacity: Learn from the institutional-building efforts various ways to approach and reach all women, irrespective of their age, bearing in structure access to governance structure is what determines institutional awareness rather than whether people belong to one generation or the other. It is the ongoing presence of functional governance systems that, rather than occasional campaigns, makes sustained awareness possible. Statutory-Customary Integration: Address explicitly the difference in levels/types of engagement of the statutory (LRA) vs. the customary (LLA) processes. Both of these are two different frameworks, and it is through joint deliberative forums that statutory protections can change and gain legitimacy within customary governance practice, where both of them can be reconciled.

FUTURE RESEARCH DIRECTIONS

Qualitative research: Qualitative research should focus on personal experiences of LLA encounters and LRA implementation, and the difference between the two. This way we can understand better how property norm contestation and participatory engagement, which is done through children and ladies in courts and election campaigns, are translated into institutional awareness. Normative vs. Material Distinction: Property-rights measures can be complemented by detailed livelihood modules (agricultural income, household assets, off-farm earnings, land investments) with a view to determining whether the institutional awareness observed is the result of normative beliefs about women's rights or material economic capacity. Longitudinal Triangulation: To clarify causal mechanisms and the effects of institutional performance, quantitative panel data tracking awareness trajectories need to be linked with qualitative investigation of CLDC functionality and patterns of dispute resolution.

SUPPLEMENTARY

MODEL SPECIFICATIONS

Domain-Specific and Full Multilevel Logistic Regression

Let: Y_{ijk} denote women's awareness of the Liberia Land Authority (LLA), where:

$$Y_{ijk} = \begin{cases} 1 & \text{if aware of LLA} \\ 0 & \text{otherwise} \end{cases} \text{The outcome follows a Bernoulli distribution with probability } \pi_{ijk}.$$

General Multilevel Logistic Regression Form

$$\text{logit}(\pi_{ijk}) = \log\left(\frac{\pi_{ijk}}{1 - \pi_{ijk}}\right) = \beta_0 + X_{ijk}\beta + u_{0j} + v_{0k}$$

where: β_0 is the fixed intercept, X_{ijk} is a vector of covariates, $u_{0j} \sim \mathcal{N}(0, \sigma_u^2)$ is the household-level random effect, $v_{0k} \sim \mathcal{N}(0, \sigma_v^2)$ is the community/district-level random effect.

Model 1: Economic norms and financial access Model

This model captures economic land-related empowerment variables, controlling for age.

$$\text{logit}(\pi_{ijk}) = \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_1 \text{BuyLand}_{ijk} + \beta_2 \text{JointOwnership}_{ijk} + \beta_3 \text{SocialFunds}_{ijk} + u_{0j} + v_{0k}$$

Where: BuyLand= women’s right to buy land, {JointOwnership}= joint land ownership with spouse, {SocialFunds}= benefit from social or land-related funds.

Model 2: Participatory Agency Model

This model focuses on women’s participation in land governance and conflict processes, controlling for age.

$$\text{logit}(\pi_{ijk}) = \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_4 \text{DecisionMaking}_{ijk} + \beta_5 \text{LandConflictHandling}_{ijk} + \beta_6 \text{ConflictMitigation}_{ijk} + u_{0j} + v_{0k}$$

Where: {InheritLand}= women’s right to inherit land, {MaritalPropertyRights}= married women’s rights over husband’s property.

Model 4: Full Multivariable Model

This model simultaneously estimates economic, participatory, and legal domains, adjusting for age.

$$\text{logit}(\pi_{ijk}) = \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_1 \text{BuyLand}_{ijk} + \beta_2 \text{JointOwnership}_{ijk} + \beta_3 \text{SocialFunds}_{ijk} + \beta_4 \text{DecisionMaking}_{ijk} + \beta_5 \text{LandConflictHandling}_{ijk} + \beta_6 \text{ConflictMitigation}_{ijk} + \beta_7 \text{InheritLand}_{ijk} + \beta_8 \text{MaritalPropertyRights}_{ijk} + u_{0j} + v_{0k}$$

Model Framework (Multinomial Logistic Regression)

Let Y_i denote women’s awareness of the 2018 Land Rights Act (LRA) with three nominal categories: $Y_i \in \{0,1,2\}$

where: 0= Not aware (reference category), 1= Partially aware, 2= Fully aware.

The model estimates relative risk ratios (RRRs) comparing outcome category $m \in 1,2$ to the base.

General Multinomial Logit Form: $\log \left(\frac{\text{Pr}(Y_i=m)}{\text{Pr}(Y_i=0)} \right) = \alpha_m + X_i \beta_m, m = 1, 2$

Model 1: Economic norms and financial access Model: $\log \left(\frac{\text{Pr}(Y_i=m)}{\text{Pr}(Y_i=0)} \right) = \alpha_m + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,i} + \beta_{1m} \text{BuyLand}_i + \beta_{2m} \text{JointOwnership}_i + \beta_{3m} \text{SocialFunds}_i, m = 1,2$

Model 2: Participatory Agency Model: $\log\left(\frac{Pr(Y_i=m)}{Pr(Y_i=0)}\right) = \alpha_m + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,i} + \beta_{4m} \text{DecisionMaking}_i + \beta_{5m} \text{LandConflictHandling}_i + \beta_{6m} \text{ConflictMitigation}_i, m = 1,2$

Model 3: Legal-Rights Consciousness Model: $\log\left(\frac{Pr(Y_i=m)}{Pr(Y_i=0)}\right) = \alpha_m + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,i} + \beta_{7m} \text{InheritLand}_i + \beta_{8m} \text{MaritalPropertyRights}_i, m = 1,2$

Model 4: Full Multivariable Model: $\log\left(\frac{Pr(Y_i=m)}{Pr(Y_i=0)}\right) = \alpha_m + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,i} + \beta_{1m} \text{BuyLand}_i + \beta_{2m} \text{JointOwnership}_i + \beta_{3m} \text{SocialFunds}_i + \beta_{4m} \text{DecisionMaking}_i + \beta_{5m} \text{LandConflictHandling}_i + \beta_{6m} \text{ConflictMitigation}_i + \beta_{7m} \text{InheritLand}_i + \beta_{8m} \text{MaritalPropertyRights}_i, m = 1,2$

Cross-Domain Interaction Multilevel Logistic Regression Models Predicting Women's Awareness of Liberia Land Authority (LLA)

Model Framework

Let Y_{ijk} indicate women's awareness of the LLA:

$$\text{logit}(\pi_{ijk}) = \text{mathbf{log}}\left(\frac{\pi_{ijk}}{1 - \pi_{ijk}}\right), \pi_{ijk} = \text{mathbf{Pr}}(Y_{ijk} = 1)$$

Model 1: Participatory × Legal-Rights Interaction Model

$$\begin{aligned} \text{logit}(\pi_{ijk}) = & \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_1 \text{DecisionMaking}_{ijk} + \beta_2 \text{LandConflictHandling}_{ijk} \\ & + \beta_3 \text{ConflictMitigation}_{ijk} + \beta_4 \text{InheritLand}_{ijk} + \beta_5 \text{MaritalPropertyRights}_{ijk} + \beta_6 \backslash big \\ & + \beta_7 \backslash big + \beta_8 \backslash big + \beta_9 \backslash big + \beta_{10} \\ & + \beta_{11} \backslash big \left(\text{ConflictMitigation}_{ijk} \times \text{MaritalPropertyRights}_{ijk} \backslash big \right) + u_{0j} + v_{0k} \end{aligned}$$

Model 2: Economic × Legal-Rights Interaction Model

$$\begin{aligned} \text{logit}(\pi_{ijk}) = & \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_1 \text{BuyLand}_{ijk} + \beta_2 \text{JointOwnership}_{ijk} + \beta_3 \text{SocialFunds}_{ijk} \\ & + \beta_4 \text{InheritLand}_{ijk} + \beta_5 \text{MaritalPropertyRights}_{ijk} \\ & + \beta_6 \backslash big \left(\text{BuyLand}_{ijk} \times \text{InheritLand}_{ijk} \backslash big \right) \\ & + \beta_7 \backslash big \left(\text{BuyLand}_{ijk} \times \text{MaritalPropertyRights}_{ijk} \backslash big \right) \\ & + \beta_8 \backslash big \left(\text{JointOwnership}_{ijk} \times \text{InheritLand}_{ijk} \backslash big \right) \\ & + \beta_9 \backslash big \left(\text{JointOwnership}_{ijk} \times \text{MaritalPropertyRights}_{ijk} \backslash big \right) \\ & + \beta_{10} \backslash big \left(\text{SocialFunds}_{ijk} \times \text{InheritLand}_{ijk} \backslash big \right) \\ & + \beta_{11} \backslash big \left(\text{SocialFunds}_{ijk} \times \text{MaritalPropertyRights}_{ijk} \backslash big \right) + u_{0j} + v_{0k} \end{aligned}$$

Model 3: Economic × Participatory Interaction Model

$$\begin{aligned}
 \text{logit}(\pi_{ijk}) = & \beta_0 + \sum_{a=1}^7 \beta_a \text{AgeGroup}_{a,ijk} + \beta_1 \text{BuyLand}_{ijk} + \beta_2 \text{JointOwnership}_{ijk} + \beta_3 \text{SocialFunds}_{ijk} \\
 & + \beta_4 \text{DecisionMaking}_{ijk} + \beta_5 \text{LandConflictHandling}_{ijk} + \beta_6 \text{ConflictMitigation}_{ijk} \\
 & + \beta_7 \backslash big \left(\text{BuyLand}_{ijk} \times \text{DecisionMaking}_{ijk} \backslash big \right) \\
 & + \beta_8 \backslash big \left(\text{BuyLand}_{ijk} \times \text{LandConflictHandling}_{ijk} \backslash big \right) \\
 & + \beta_9 \backslash big \left(\text{BuyLand}_{ijk} \times \text{ConflictMitigation}_{ijk} \backslash big \right) \beta_{10} \\
 & \backslash big \left(\text{JointOwnership}_{ijk} \times \text{DecisionMaking}_{ijk} \backslash big \right) \\
 & + \beta_{11} \backslash big \left(\text{JointOwnership}_{ijk} \times \text{LandConflictHandling}_{ijk} \backslash big \right) \\
 & + \beta_{12} \backslash big \left(\text{JointOwnership}_{ijk} \times \text{ConflictMitigation}_{ijk} \backslash big \right) \\
 & + \beta_{13} \backslash big \left(\text{SocialFunds}_{ijk} \times \text{DecisionMaking}_{ijk} \backslash big \right) \\
 & + \beta_{14} \backslash big \left(\text{SocialFunds}_{ijk} \times \text{LandConflictHandling}_{ijk} \backslash big \right) \\
 & + \beta_{15} \backslash big \left(\text{SocialFunds}_{ijk} \times \text{ConflictMitigation}_{ijk} \backslash big \right) + u_{0j} + v_{0k}
 \end{aligned}$$

Cross-Domain Interaction Multinomial Logistic Regression Models, Women's Awareness of the 2018 Land Rights Act (LRA)

Let Y_{ijk} denote women’s awareness of the 2018 Land Rights Act (LRA) for woman i in household j and community k , taking one of M unordered categories. Let category $m = 0$ be the baseline (e.g., “not aware”). $\pi_{m,ijk} = \Pr(Y_{ijk} = m), m = 0, 1, \dots, M - 1$

Multinomial Logit Link (Baseline-Category Logit)

$$\text{log} \left(\frac{\pi_{m,ijk}}{\pi_{0,ijk}} \right) = \beta_{0m} + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,ijk} + X_{ijk} \beta_m + Z_{ijk} \gamma_m + W_{ijk} \delta_m$$

where: X_{ijk} : Economic empowerment covariates, Z_{ijk} : Participatory agency covariates, W_{ijk} : Legal-rights consciousness covariates. Exponentiating coefficients yields RRRs: $\text{RRR} = \exp(\beta)$.

Model A: Participatory × Legal-Rights Interaction

$$\text{log} \left(\frac{\pi_{m,ijk}}{\pi_{0,ijk}} \right) = \beta_{0m} + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,ijk} + \beta_m^{PP} + \beta_m^{LL} + \beta_m^{PL} \backslash big (P_{ijk} \times L_{ijk} \backslash big)$$

With: $P_{ijk} = \text{DecisionMaking, LandConflictHandling, ConflictMitigation}$, $L_{ijk} = \text{InheritLand, MaritalPropertyRights}$.

Model B: Economic × Legal-Rights Interaction

$$\log \left(\frac{\pi_{m,ijk}}{\pi_{0,ijk}} \right) = \beta_{0m} + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,ijk} + \beta_m^{EEijk} + \beta_m^{LLijk} + \beta_m^{EL} \text{big}(E_{ijk} \times L_{ijk} \text{big})$$

With: E_{ijk} = BuyLand,JointOwnership,SocialFunds.

Model C: Economic × Participatory Interaction

$$\log \left(\frac{\pi_{m,ijk}}{\pi_{0,ijk}} \right) = \beta_{0m} + \sum_{a=1}^7 \beta_{am} \text{AgeGroup}_{a,ijk} + \beta_m^{EEijk} + \beta_m^{PPijk} + \beta_m^{EP} \text{big}(E_{ijk} \times P_{ijk} \text{big})$$

DESCRIPTIVE STATISTICS

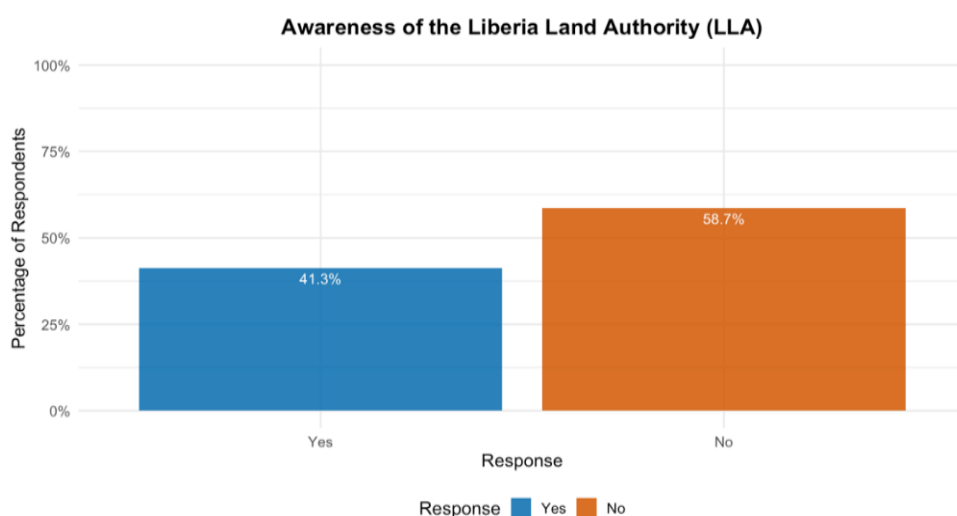


Figure 1: Are you aware of the Liberia Land Authority?

Data Source: Baseline Survey LLA 2023

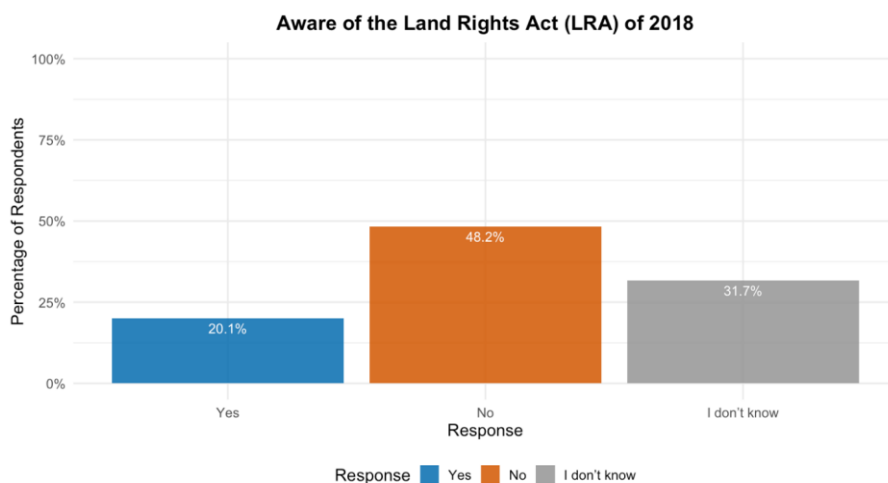


Figure 2: Are you aware of the Land Rights Act of 2018?

Data Source: Baseline Survey LLA 202

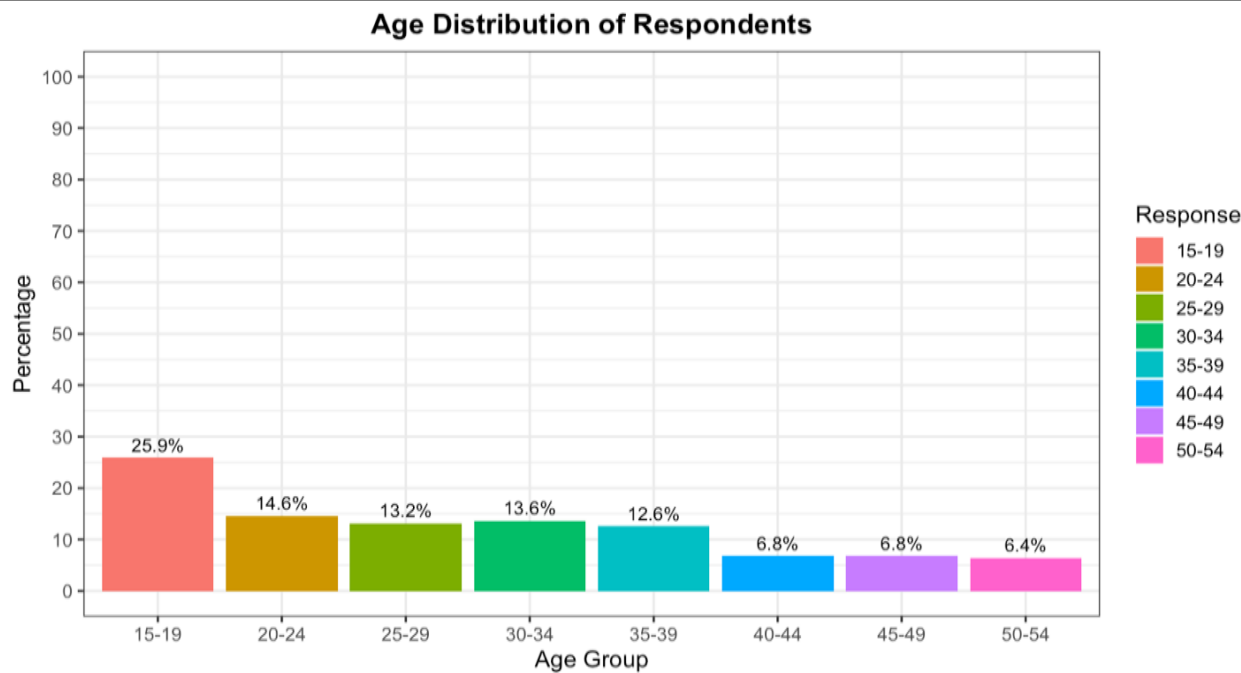


Figure 3: Age Distribution of Respondents

Data Source: Baseline Survey LLA 2023

Marginal effects: Participatory Involvement in Land Governance Model

Predicted probabilities of LLA awareness (N = 1,026)

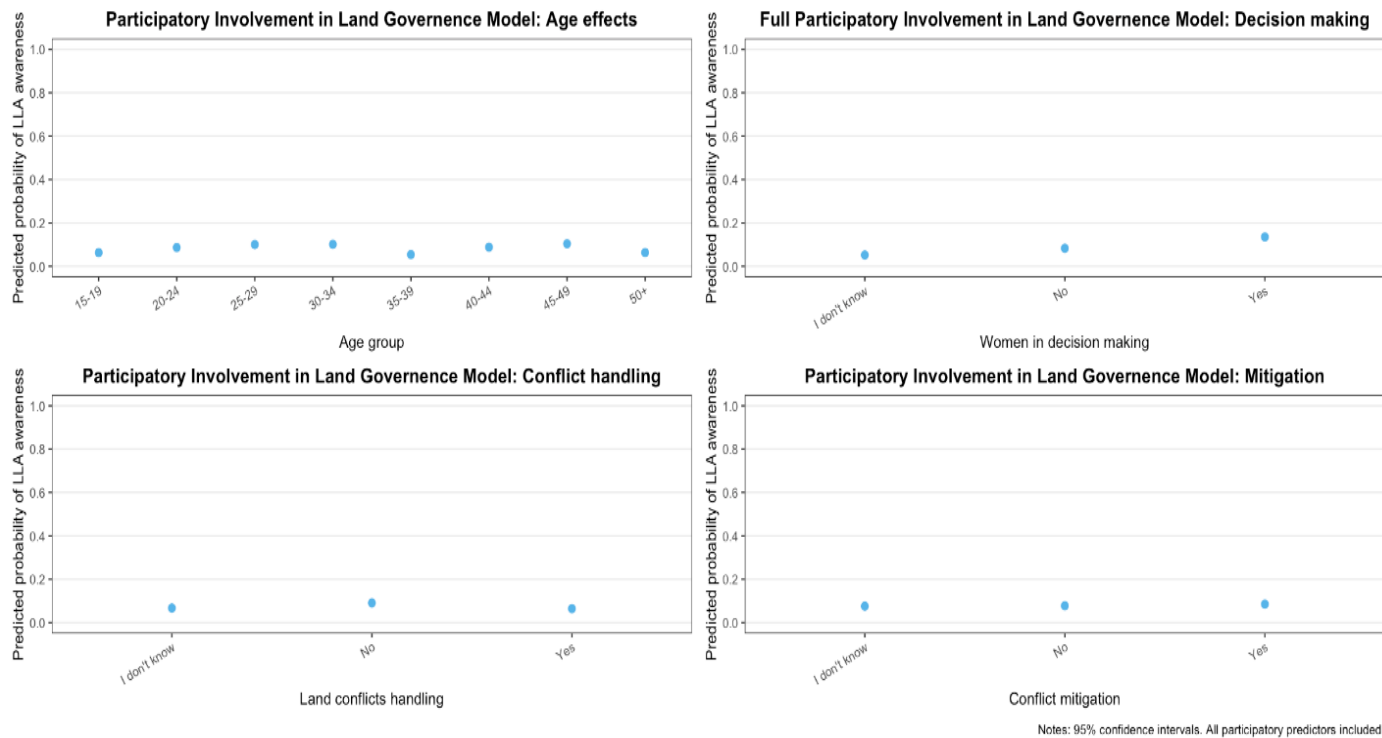


Figure 4: Marginal Effects: Aware of Liberia Land Authority (LLA), Economic Norms and Financial Access Model.

Data Source: Baseline Survey LLA 2023

Figure 4: The four-panel marginal effect plots suggest that affirmation of economic norms and financial access variables were associated with LLA awareness probabilities. For example, affirmative beliefs in women's land purchase rights (Yes) predict ≈ 0.35 probability (CI 0.25–0.45), denial (No) ≈ 0.25 (CI 0.15–0.35), and uncertainty (I don't know) ≈ 0.10 . Whereas joint ownership shows parallel but shallower correlation (Yes ≈ 0.30 ; No ≈ 0.15). Meanwhile, social fund benefits show no significant association, and age exhibits no systematic pattern (0.08–0.15). These patterns confirm normative clarity primacy: positive economic status increases LLA awareness 20–25 points over uncertainty, with land purchase rights most potent (OR 6.12), underscoring targeted tenure messaging as a high-leverage pathway to institutional literacy.

Marginal Effects From Full Economic Norms and Financial Access Model

Predicted probabilities of LLA awareness (N = 1,026)

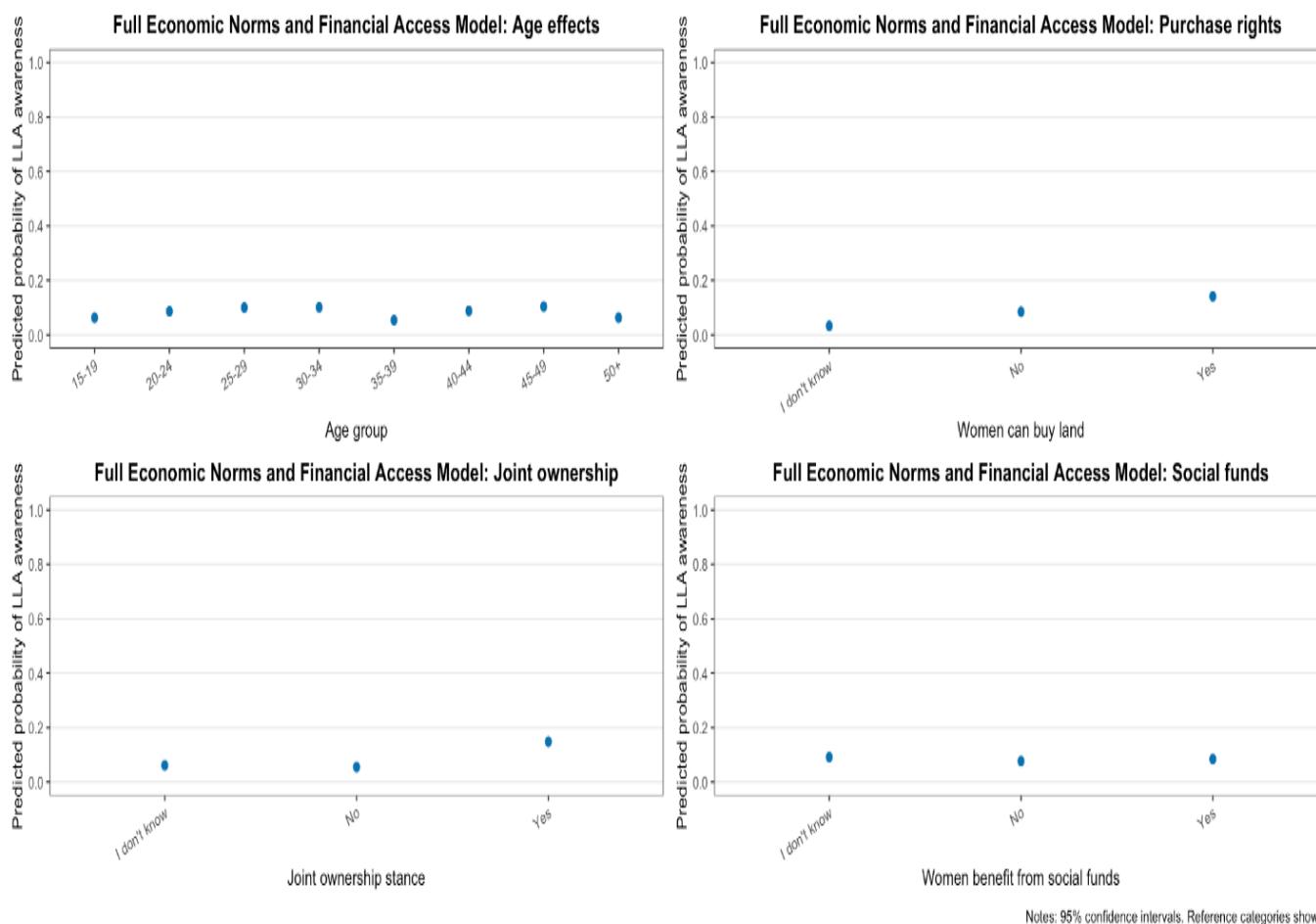


Figure 5: Participatory Involvement in Land Governance

Data Source: Baseline Survey LLA 2023

Figure 5 shows that support for women's participatory involvement in land governance (affirmative) exhibits a strong association with LLA awareness: “Yes” responses to women in decision making predict ≈ 0.35 probability (CI 0.25–0.45) versus ≈ 0.20 for “No” and baseline ≈ 0.10 for uncertainty “I don't know”. Age shows no pattern (≈ 0.08 – 0.12). Meanwhile, conflict handling and meditation suggest imprecise, overlapping trajectories (≈ 0.10 – 0.20). Women's involvement in decision-making thus constitutes the primary participatory pathway to LLA awareness, elevating probabilities (≈ 25) points over uncertainty. Age shows no association.

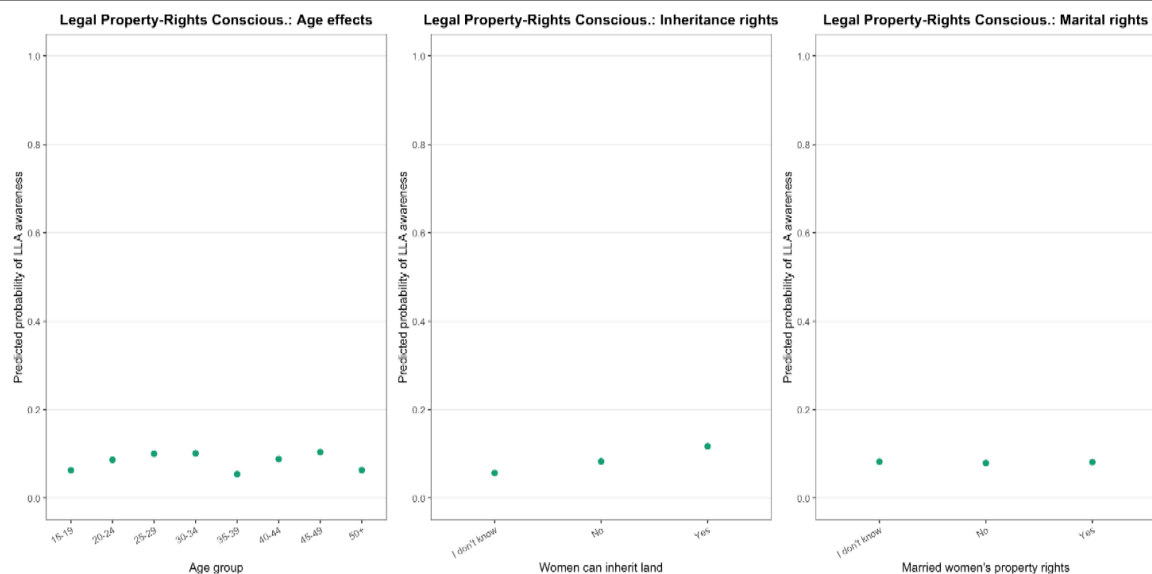


Figure 6: Legal Property-Rights Consciousness

Data Source: Baseline Survey LLA 2023

Figure 6 shows that the support for women's right to inherit property (affirmation) is significantly positively associated with LLA awareness: "Yes" answers correspond to a predicted 0.30-0.35 (CI 0.20-0.45), "No" responses (≈ 0.20 , CI 0.12-0.30), and uncertainty baselines at about 0.10. Spousal property rights demonstrate similar patterning (Yes ≈ 0.25). The legal consciousness has stable normative effects, with the affirmation most strongly linked to institutional awareness.

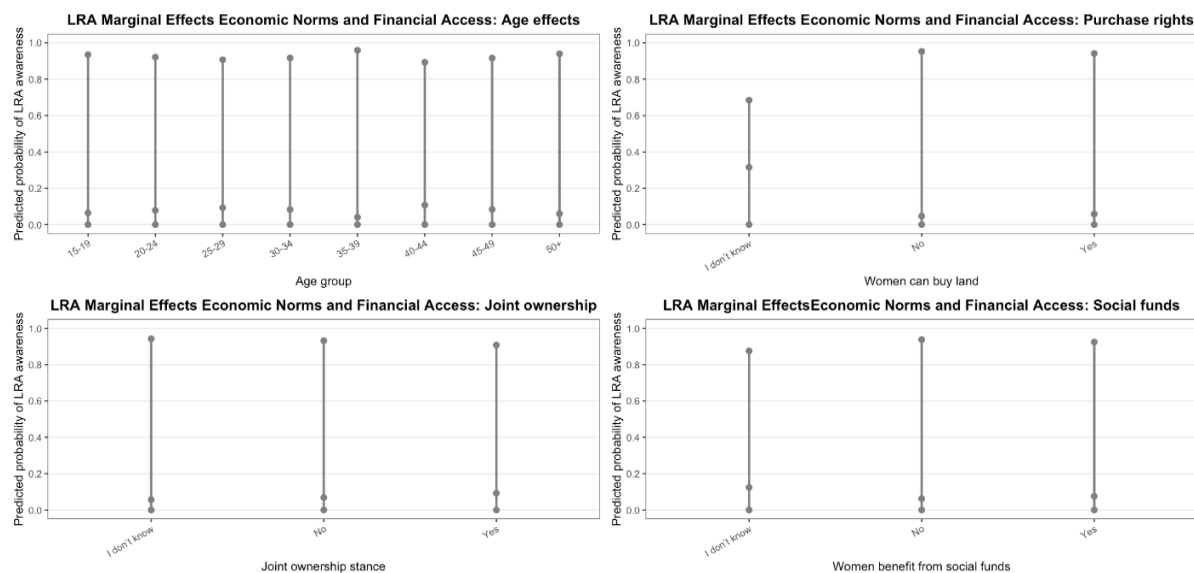


Figure 7: Economic Norms and Financial Access Model: Marginal Effects, Aware of the 2018 Land Rights Act (LRA)

Data Source: Baseline Survey LLA 2023

Figure 7 shows that economic norms and financial access predictors has positive correlations with outcomes across the board. Women's rights to purchase land confirmation ("Yes") is correlated with LRA awareness

to a degree that it predicts about 0.30-0.35, in comparison to about 0.20 for denial ("No") and less than 0.10 for uncertainty. Joint ownership basically shows the same pattern. On the other hand, social fund benefits hardly show any association. To sum up, purchase rights seem to be the main economic driver, which results in significant probability changes towards positive LRA awareness.

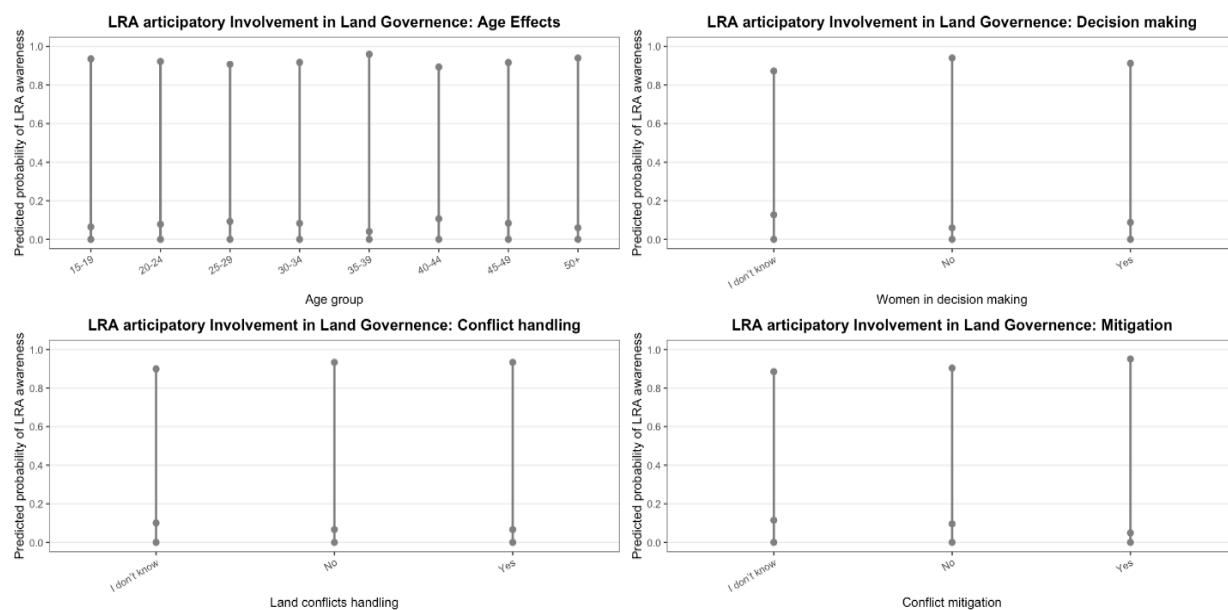


Figure 8: Participatory Involvement in Land Governance

Data Source: Baseline Survey LLA 2023

Figure 8 shows that the greatest positive association is decision-making participation affirmation; those who responded "Yes" had an LRA awareness probability of around 0.35, while those who answered "No" had a probability of about 0.20, and it was less than 0.10 for those who were unsure. No influence of age was found, whereas conflict handling and mitigation activities have intersecting paths ($\approx 0.12-0.22$). Decision forums are the main channels of participatory interaction leading to LRA awareness.

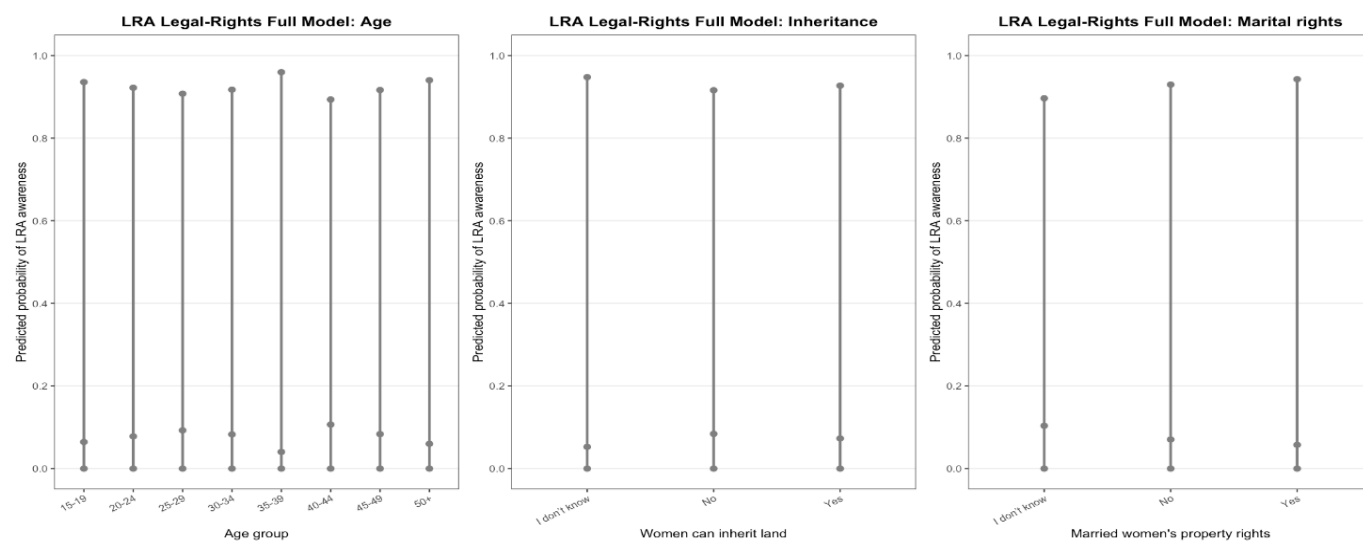


Figure 9: Legal Property-Rights Consciousness

Data Source: Baseline Survey LLA 2023

Figure 9 inheritance rights affirmation shows the tightest valence hierarchy: “Yes” elevates “Yes” LRA awareness to ≈ 0.30 (CI 0.20–0.40), “No” to ≈ 0.20 , and uncertainty baselines < 0.10 ; marital rights exhibit parallel patterning. Age exhibits no effect. Inheritance affirmation constitutes the strongest legal pathway to LRA awareness.

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