

Land tenure dynamics among smallholder maize farmers: A typological analysis revealing the multifactorial nature of gender inequalities.

Auteur 1 : Ouimpabo Toumoudagou.

Auteur 2 : Rodrigue Ogoulonou Balagueman.

Auteur 3 : Afouda Jacob Yabi.

Ouimpabo Toumoudagou 1, (<https://orcid.org/0009-0007-3296-097X>*, MSc)

1 Laboratoire d'Analyses et de Recherches sur les Dynamiques Economiques et Sociales (LARDES),
Université de Parakou, Parakou, Benin, email: lardes.up@gmail.com, PO Box: BP 123 Parakou (Bénin)

Rodrigue Ogoulonou Balagueman 2, (<https://orcid.org/0000-0003-0097-8044>, PhD)

2 Laboratoire d'Ecologie, de Botanique et de Biologie Végétale (LEB), Université de Parakou, Parakou,
Benin, PO Box: 03 BP 315 Parakou (Bénin)

Afouda Jacob, Yabi 1, (<https://orcid.org/0000-0001-9340-0342>, full Professor)

1 Laboratoire d'Analyses et de Recherches sur les Dynamiques Economiques et Sociales (LARDES),
Université de Parakou, Parakou, Benin, email: lardes.up@gmail.com, PO Box: BP 123 Parakou (Bénin)

Déclaration de divulgation : L'auteur n'a pas connaissance de quelconque financement qui pourrait affecter l'objectivité de cette étude.

Conflit d'intérêts : L'auteur ne signale aucun conflit d'intérêts.

Pour citer cet article : Ouimpabo Toumoudagou, Rodrigue Ogoulonou Balagueman & Afouda Jacob Yabi (2026) « Land tenure dynamics among smallholder maize farmers: A typological analysis revealing the multifactorial nature of gender inequalities », African Scientific Journal « Volume 03, Num 38 » pp: 001 – 027.



DOI : 10.5281/zenodo.22964769

Copyright © 2026 – ASJ



Abstract

Smallholder farmers across sub-Saharan Africa are highly exposed to land insecurity, which limits their capacity to invest in agriculture. Understanding the factors shaping land tenure dynamics among these farmers is essential for designing inclusive and sustainable land policies. This study analyzed the socioeconomic and institutional factors influencing land tenure among smallholder maize farmers in northwestern Benin. Factorial Analysis of Mixed Data (FAMD) and analysis of variance (ANOVA) were applied to data collected from 338 farmers randomly selected. The results identified three distinct land tenure profiles: (1) predominantly female farmers relying on rental, characterized by informal and insecure tenure; (2) predominantly male farmers accessing land mainly through inheritance and benefiting from relatively secure and formal tenure; and (3) a more inclusive profile with equitable land access, greater participation of women in decision-making, and weaker customary constraints. Higher agricultural experience significantly ($P = 0.02$, ANOVA) enhanced tenure security whereas limited financial resources (52.52%; $p < 0.05$), restrictive customary norms, and non-inclusive land reforms (97.01%; $p < 0.05$) drove tenure inequalities. These findings reveal persistent structural gender inequalities in land access and highlight the need for locally adapted governance mechanisms that promote equitable land tenure and strengthen sustainable smallholder farming systems.

Keywords : Land tenure security; Smallholder farmers; Maize; Typology; Northwestern Benin

Introduction

Land tenure security, defined as the assurance that individuals or groups hold legally or socially recognized long-term rights to land without fear of arbitrary dispossession (FAO, 2020), is essential for agricultural production. It also plays a fundamental role in promoting sustainable development across sub-Saharan Africa. Moreover, secured tenure is widely acknowledged to stimulate agricultural investment, enhance productivity, and reinforce the sustainability of rural farming systems (Deininger, 2003). In West Africa, however, land governance continues to be marked by the coexistence of customary systems and modern state mechanisms, two frameworks that often prove difficult to reconcile (Delville, 2018). Despite numerous regulatory reforms initiated since the early 2000s, tenure security remains a persistent challenge in Benin. The adoption of the Land and Property Code through Law No. 2013-01 of August 14, 2013 (Republic of Benin, 2013, 2018) represented a significant milestone in the State's commitment to transparent and equitable land management. While this legal framework seeks to unify tenure systems and guarantee farmers' legal security, recent studies reveal that its implementation is hindered by administrative delays, high registration costs, limited public awareness, and resistance from entrenched customary practices (Akpo et al., 2024; Adéchian & Baco, 2025). As a result, a considerable proportion of land transactions continue to occur under traditional norms, without official registration, thereby exposing small-scale producers to persistent legal insecurity. This challenge is particularly acute in northwestern Benin, where rural livelihoods rely heavily on rain-fed agriculture and where land pressure is steadily intensifying. The majority of farmers continue to operate under customary land use rights, which, although socially recognized, fail to provide the legal guarantees necessary for tenure stability and long-term investment planning. Such precarious conditions undermine the rights of small-scale farmers, especially those without formal land titles, who consequently face significant constraints in agricultural investment. In theory, producers with secure rights are more inclined to invest in soil fertilization, mechanization, and the adoption of innovative practices (Lawin, 2019). Conversely, those experiencing insecurity tend to prioritize extensive, short-term strategies, thereby limiting the sustainability of production systems. Furthermore, empirical evidence demonstrates that men are generally more inclined than women to invest in tenure security, both in theory and practice (Lastarria-Cornhiel et al., 2014; Addaney et al., 2022). This structural inequality not only shapes investment choices but also restricts female producers' ability

to sustainably secure their holdings. Hence, tenure security extends beyond formal title ownership; it also encompasses perceptual and institutional dimensions rooted in social and community recognition of rights (Adéchian & Baco, 2025). To address these challenges, several initiatives have been introduced to strengthen local land governance. Among them, Rural Land Plans (RLPs), supported by INRAB (2019), aim to reconcile customary recognition with the gradual formalization of rights. Although these mechanisms have reduced certain conflicts and fostered more rational land management, their outcomes remain uneven across municipalities. Their effectiveness depends largely on the capacity of local actors to integrate social realities, customary hierarchies, and institutional constraints (Ekpodessi & Nakamura, 2022). This precarious tenure environment directly affects the profitability of maize which accounts for approximately 78% of national cereal production (MAEP, 2017 ; Amegnaglo & Soglo, 2019).

The objective of this study is to explore the patterns of land tenure security among smallholder maize farmers in Benin. We addressed the following research question: Which socioeconomic, cultural, and institutional factors are correlated with land tenure security among smallholder maize farmers?

To address this question, we first provided a general overview of the socioeconomic, cultural, and institutional factors influencing land tenure security. We then presented the methodology and results, discussed the findings, and concluded with recommendations.

1. Literature review

Recent literature underscores that land tenure security is a multidimensional concept shaped not solely by the possession of formal land titles but also by a complex interplay of individual, household, institutional, socio-cultural, economic, and political factors (Ayamga et al., 2015; Asaaga, 2017). In this regard, tenure security is increasingly conceptualized as extending beyond legal documentation to encompass perceptions of legitimacy, community recognition, and institutional enforcement. This review therefore synthesizes the principal determinants of land tenure security identified in the literature, highlighting how diverse social, economic, and institutional dynamics interact to influence farmers' capacity to secure and sustain their land rights.

1.1. Socio-demographic traits

The literature consistently identifies socio-demographic characteristics as critical determinants of land tenure security. According to Doss and Meinzen-Dick (2020), variables such as age, gender,

marital status, ethnicity, religion, household position, and socioeconomic status significantly shape individuals' capacity to acquire, maintain, and defend land rights. These traits influence both formal and informal mechanisms of land access and ultimately determine the extent to which individuals can benefit from legal protections. Among these factors, gender emerges as one of the most influential. Women frequently access land through male relatives and, as a result, hold weaker and more conditional rights compared to men (Balas et al., 2022). In many African societies, land inheritance is predominantly patrilineal, thereby restricting women's direct ownership and inheritance rights (Santpoort et al., 2021). Consequently, women face heightened tenure insecurity, which reduces their participation in land-related decision-making processes (Feyertag, 2022). Their limited economic resources further constrain their ability to undertake costly land formalization procedures or defend their rights in legal and administrative settings (Masuku et al., 2023). Age also plays a decisive role in shaping tenure security. Older farmers often enjoy stronger claims to land, supported by their accumulated experience and greater social recognition within communities (Mbudzya et al., 2023). This generational authority reinforces their capacity to secure and defend land rights, in contrast to younger farmers who may lack similar legitimacy. Education constitutes another critical determinant. Educated individuals are generally more aware of their legal rights, have greater access to information, and are better equipped to navigate administrative procedures associated with land registration. Higher levels of education are therefore expected to increase the likelihood of securing land rights (Miheretu & Yimer, 2017). Nevertheless, empirical evidence suggests that highly educated individuals may display a lower propensity to formalize their tenure rights, possibly due to alternative livelihood opportunities or reduced reliance on agriculture (Wankogere & Alananga, 2020). Taken together, these socio-demographic traits illustrate the complex ways in which personal and household characteristics intersect with institutional and cultural contexts to shape land tenure security. They underscore the importance of analyzing tenure not only through legal frameworks but also through the lived realities of farmers whose access to land is mediated by social identity and status.

1.2. Socioeconomic factors and access to resources

Beyond socio-demographic characteristics, socioeconomic conditions exert a profound influence on land tenure security. Agarwal (2018) observes that inequalities in access to secure tenure frequently constrain investment opportunities, particularly for women and smallholder farmers.

Consequently, tenure security is closely intertwined with access to productive resources and broader economic opportunities. Household income emerges as a particularly critical determinant. Farmers with higher incomes are generally better positioned to bear the financial costs associated with land registration, documentation, and dispute resolution. Moreover, they are more likely to perceive land formalization as a profitable investment that safeguards assets and enhances access to agricultural finance (Oladehinde, 2025). Access to credit constitutes another pivotal factor highlighted in the literature. While tenure security is often regarded as a prerequisite for obtaining formal credit, the relationship is reciprocal. Access to credit can stimulate investments in land acquisition, registration, and improvement, thereby reinforcing tenure security. Several studies confirm a positive correlation between tenure security and credit access (Miheretu & Yimer, 2017; Subramanian & Kumar, 2024). Nevertheless, persistent gender inequalities in financial resource acquisition continue to restrict women's capacity to invest in agriculture and secure their land rights. Taken together, these socioeconomic determinants underscore the interdependence between tenure security and access to resources. They reveal how economic capacity not only facilitates formalization but also shapes the extent to which farmers—particularly marginalized groups—can defend and sustain their land rights within evolving institutional frameworks.

1.3. Access to information, training, and awareness

Access to information and knowledge has emerged as a significant determinant of land tenure security. Producers with greater exposure to information are generally more aware of the advantages associated with land formalization and are thus better positioned to engage with institutional mechanisms (Asegie & Ayele, 2024). In parallel, participation in capacity-building initiatives enhances producers' awareness of land rights and strengthens their ability to interact effectively with land governance institutions. Empirical studies further suggest that training programs contribute to the development of positive attitudes toward formal tenure systems and increase farmers' willingness to adopt land registration practices (Kansanga et al., 2021; Miheretu & Yimer, 2017). Such interventions not only improve technical knowledge but also foster behavioral change, thereby reinforcing the perceived legitimacy and utility of formalized land rights. Taken together, access to information, training, and awareness initiatives play a pivotal role in bridging the gap between customary practices and formal tenure systems. They empower farmers

to make informed decisions, reduce vulnerability to dispossession, and enhance the overall effectiveness of land governance frameworks.

1.4. Legal and institutional determinants

The legal and institutional environment constitutes one of the most critical determinants of land tenure security. Balas et al. (2022) identify discriminatory legal frameworks, weak institutional capacity, and inadequate law enforcement as major obstacles to securing land rights in Sub-Saharan Africa. Land policies, in particular, play a decisive role in shaping tenure outcomes. Their effectiveness depends not only on the legal provisions they contain but also on farmers' perceptions of whether such policies are inclusive or exclusive in practice. Rojas Herrera (2025) argues that transparent legal frameworks, when combined with inclusive governance mechanisms, strengthen trust in land administration systems and thereby improve tenure security. The literature further emphasizes that inclusive land reforms are more likely to succeed when they explicitly address the needs of vulnerable groups, ensuring equitable access and protection (Balas et al., 2022). Effective institutions are assumed to facilitate land registration, conflict resolution, and the enforcement of property rights. In this regard, institutional capacity and accountability are indispensable for translating legal provisions into tangible security for farmers. Without strong institutions, even well-designed policies risk remaining ineffective, leaving smallholder producers exposed to persistent insecurity. Taken together, the legal and institutional environment underscores the importance of both structural reforms and functional governance. Secure tenure depends not only on the existence of laws but also on their fair application, inclusivity, and the ability of institutions to enforce them consistently across diverse social and cultural contexts.

1.5. Customary institutions and social norms

Social norms and customary institutions remain pivotal determinants of land tenure security in Sub-Saharan Africa. Although customary systems are often perceived as insecure, empirical studies demonstrate that they can provide strong tenure guarantees when supported by community legitimacy and effective customary institutions (Asaaga, 2017). Nevertheless, these systems are increasingly challenged by factors such as land scarcity, commercialization, population growth, and urbanization, all of which contribute to growing inequalities in land access (Asaaga, 2017). Customary norms frequently prioritize male inheritance and ownership, thereby reducing women's opportunities to claim land rights and reinforcing gendered disparities in tenure security (Balas et

al., 2022). The balance between state tenure systems and customary practices thus emerges as a critical determinant of overall security. Secure land rights are more likely to be achieved when statutory recognition is complemented by social legitimacy within local communities, ensuring that legal frameworks resonate with established cultural norms (Doss & Meinzen-Dick, 2020). Taken together, the literature underscores that tenure security cannot be understood solely through statutory provisions. Instead, it requires an appreciation of the dynamic interplay between formal legal systems and customary institutions, both of which shape access, legitimacy, and enforcement of land rights across diverse social contexts.

2. Material and methods

2.1. Study area

The study area, covering approximately 7,600 km², is located within agroecological zone VI (West Atacora) in northwestern Benin and encompasses the municipalities of Tanguiéta, Matéri, and Coby (Figure N°1). Geographically, it is bordered to the south by the municipality of Boukombé and the Republic of Togo, to the east by Toucountouna, Kouandé, and Kérou, and to the north and west by Burkina Faso. The region is characterized by a tropical climate with two distinct seasons: a rainy season extending from May to October, and a dry season from November to April, dominated by the harmattan wind and elevated temperatures. Topographically, the area features the Atacora mountain range and extensive peneplains, while the Pendjari River and its tributaries constitute the principal hydraulic network. Vegetation is dominated by wooded and grassy savannas, sustained by shallow stony soils in mountainous zones and clay-sand soils in the plains. The socioeconomic context is predominantly agrarian, with approximately 80% of the population engaged in subsistence and commercial farming. Agricultural practices are largely extensive, relying on slash-and-burn techniques and intercropping. Yams, sorghum, millet, cassava, and maize represent the main staple crops, while cotton serves as the principal cash crop. Livestock farming—including cattle, small ruminants, and poultry—provides a secondary livelihood, supplemented by regulated fishing, hunting, crafts, trade, and tourism. The population, estimated at roughly 256,000 inhabitants (INSAE, 2016), is characterized by significant ethnic diversity, which shapes both the cultural landscape and the dynamics of land use and resource management in the region.

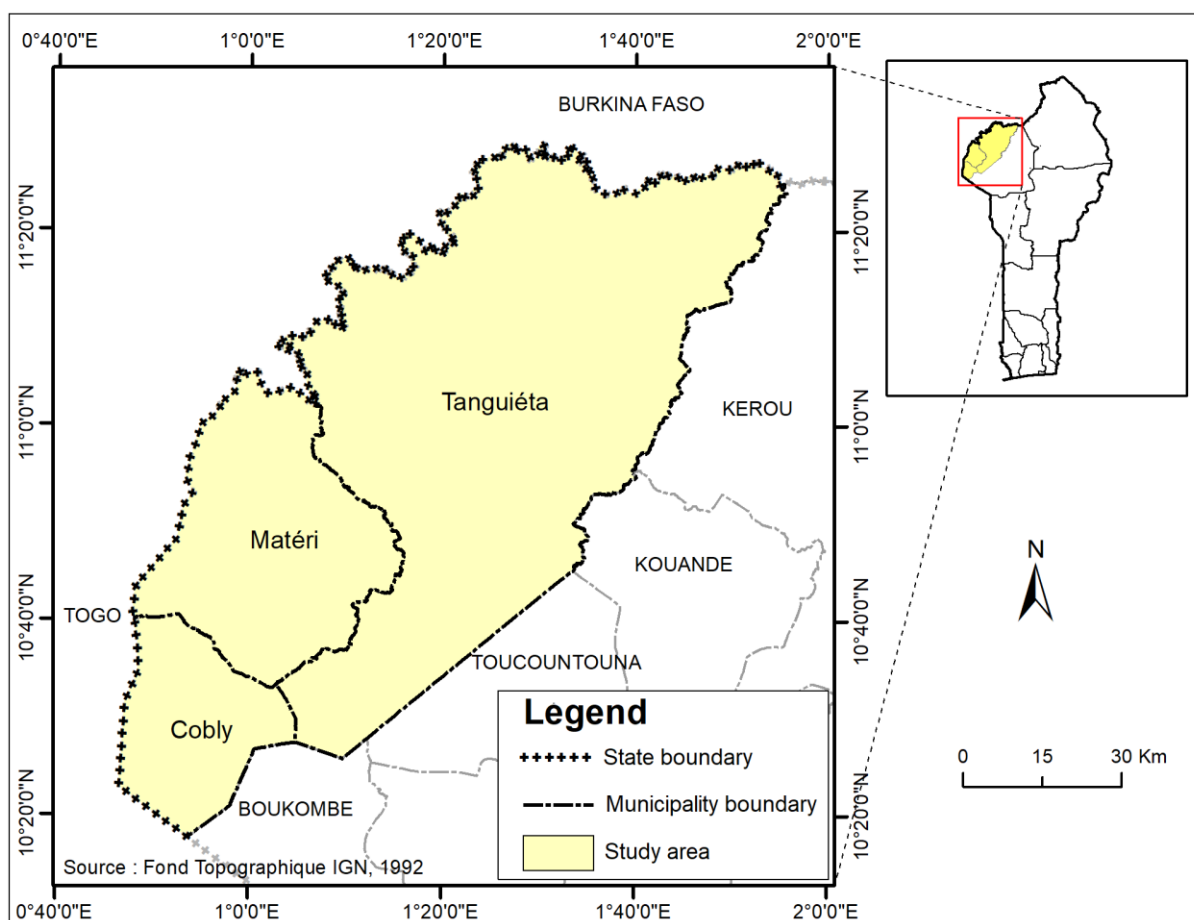


Figure N°1 : Geographic location of the study area

Source: IGN (2018) data; CRS: WGS 84 / UTM Zone 31N.

2.2. Sampling and data collection

2.2.1. Study crop selected and reasons

Maize constitutes the primary cereal crop cultivated across Benin, with production distributed throughout all ecological regions despite variable growing conditions. In 2015, maize accounted for 78.3% of total national cereal production and occupied 52.6% of cultivated land (MAEP, 2017). As a dietary staple, it is consumed daily by more than 70% of inhabitants in the southern and central regions and represents over 60% of intensive poultry feed requirements (MAEP, 2017). Consequently, the maize sector is of paramount importance for national food security and serves as the second largest source of income for rural households (Yabi et al., 2016). Within the study area, maize remains the dominant crop, with a total production of 45,643 tonnes recorded in 2017 (MAEP, 2017).

2.2.2. Sampling design

The study employed a stratified two-stage sampling design, focusing on small-scale maize farmers (those cultivating less than 2 hectares) across the municipalities of Matéri, Tanguiéta, and Cobly, with the household head serving as the sampling unit.

This sampling design is appropriate because maize producers are geographically dispersed and may differ according to the production potential of their villages. Stratification guarantees that villages with low, medium, and high production capacity are represented in the sample. Multi-stage sampling method is commonly advised in agricultural surveys because it concentrates fieldwork in selected locations and avoids the need to construct a complete list of all agricultural holdings across the entire study area (FAO, 2018).

First stage : selection of villages

The Participatory Accelerated Research Method (PARM) was applied to classify villages according to production capacity (low, medium, high). Subsequently, 10% of villages were randomly selected from each category, in line with the minimum recommendation for representativeness in social science research (Hasan & Kumar, 2024). PARM entailed active collaboration with ATDA agents, technical partners, and cooperative leaders (Niwah et al., 2020). In this study, the stakeholders engaged in PARM included ATDA agents, technical and financial partners, and producers represented by their cooperative leaders.

Second stage : selection of producers

The sample size (N) for household heads was determined using an approximation of the normal distribution, based on the formula proposed by Dagnelie (1998):

$$N = \frac{P(1 - P)U_{1-\alpha/2}^2}{d^2}$$

Where P represents the proportion of household heads specializing in maize production and cultivating 2 hectares or less, derived from an exploratory survey of a 90-household subsample of the surveyed villages. The proportion P was estimated at 68.5%, with $U_{1-\alpha/2} = 1,96$, representing the value of the normal random variable for a risk α equal to 0.05. $d=5\%$, corresponds to the margin of error in estimation.

Following the estimation of N, a proportional sampling rule was applied to allocate the sample by village and by municipality based on the RGPH 4 data on household size.

This method enabled the selection of 14 villages and 338 small-scale producers across the three Municipalities (Table 1).

Table N°1 : Spatial distribution of sampled famers across villages in each surveyed municipality

Villages/Towns	Number of administrative villages	Number of sampled villages	Sampled number of household heads
Cobly	26	3	115
Datori			52
Okpintouhoun			8
Tapoga			55
Matéri	56	7	148
Bahoun			13
Bogodori			12
Boutouhoun-Pingou			10
Dassari			71
Fekerou			5
Kotari			12
Nodi			25
Tanguiéta	39	4	75
Cotiakou			22
N' dahonta			27
Tanongou			11
Tcheta			15
Total	121	14	338

Source : Authors' calculations from the 2026 producer survey.

2.3. Data collection

Data were collected using a questionnaire structured around farm characteristics. The questionnaire was administered to producers through a systematic individual survey, utilizing the highly reliable and widely recommended Kobocollect platform (Sherin et al., 2018). Only maize producers

(household heads) cultivating 2 hectares or less were included in the survey. In addition to the questionnaire, focus group interviews were conducted in each municipality using a standardized interview guide to gather qualitative data (texts and testimonies). For this purpose, a focus group composed of stakeholders—small-scale maize producers, technical and financial partners, and ATDA staff—was organized in each municipality. The data collected comprised three primary dimensions : (1) socioeconomic and sociocultural profiles of surveyed producers, including age, sex, ethnicity, education level, socio-professional status, religion, annual income, household size, access to agricultural finance, access to capacity building, media usage, and knowledge of customary and formal land tenure systems; (2) farm characteristics, namely cultivated area, production system, and labor force; and (3) tenure characteristics, specifically access modes, security deeds, protective practices, perceptions of tenure security, and the effectiveness of land policies.

2.4. Data analysis

Descriptive analyses were performed to characterize the socioeconomic and sociocultural profiles of the respondents. Subsequently, a Factorial Analysis of Mixed Data (FAMD) followed by Ascending Hierarchical Classification (AHC) was conducted to establish a typology of farmers. The resulting groups were then compared using analysis of variance (ANOVA) to assess differences in quantitative variables and validate cluster discrimination. All statistical analyses were performed using R software (R Core Team, 2024).

3. Results

3.1. Socio-demographic characterization of respondents

The surveyed population was dominated by adults (50.59%, Figure N°2.a), with a significant male predominance (84.91%, Figure N°2.b). Educational attainment was generally low, with 51.47% lacking formal schooling (Figure N°2.c). Ethnicity analysis identified the Biali as the primary cluster (37.86%), followed by the M'Bermé (20%, Figure N°2.d). The sample exhibited high homogeneity in marital status, as 95.27% of respondents were married (Figure N°2.e). Regarding occupation, agricultural activities predominated (93.78%), while secondary sectors—crafts, livestock farming, and commerce—were only marginally represented (Figure N°2.f).

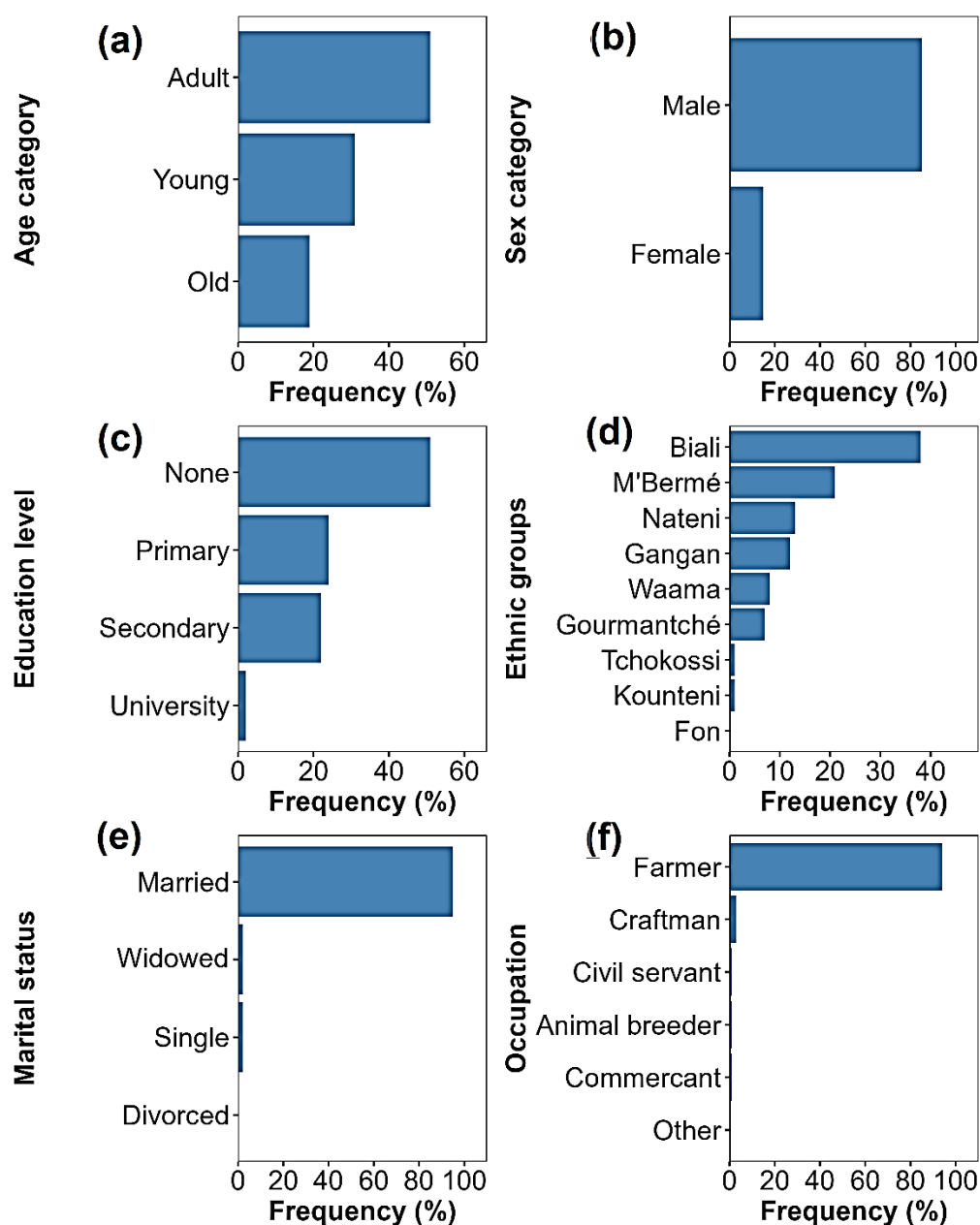


Figure N°2 : Geographic location of the study area

Source: Authors' construction based on survey data

3.2. Clusters of farmers from the FAMD and AHC

Five principal dimensions derived from the FAMD and AHC summarized the underlying structure of the dataset. Axis 1, which possessed the highest eigenvalue (0.30), accounted for 16.74% of the total variance and constituted the primary discriminating dimension. Axis 2, with an eigenvalue of 0.21, contributed 11.53% of the variance and identified a secondary independent opposition. Axis

3 explained 7.71% of the variance, while axes 4 and 5 represented 6.48% and 6%, respectively. Collectively, these five axes encompassed 48.46% of the total variance, which demonstrated a satisfactory capacity to represent the overall data structure. The first two axes, which accounted for 28.27% of the explained variance (Table 2), capture the dominant trends and were retained for interpretation.

4. Table N°2: Eigenvalues and % of explained variance of the FAMD dimensions

	Axis.1	Axis.2	Axis.3	Axis.4	Axis.5
Eigenvalue	0.30	0.21	0.14	0.12	0.11
% of variances	16.74	11.53	7.71	6.48	6.00
% of cumulative variances	16.74	28.27	35.98	42.46	48.46

Source : Authors' calculations from the 2026 producer survey.

4.1. Farmer clusters derived from the FAMD and AHC

Three distinct farmer clusters were identified based on the significant modalities ($v.test > 0$ and $P < 0.05$; Table 3).

Cluster 1: Female-dominated profile with insecure land tenure

The first cluster was predominantly composed of female farmers (88.24%). The majority of them belong to Biali ethnic group (92.19%) and are concentrated in the municipality of Matéri (83.11%). Land access was largely based on rental arrangements (89.19%). These women primarily engaged in rain-fed agriculture combined with agroforestry (60.53%) and operated within informal land tenure systems (81.82%). This profile reflected high levels of land insecurity, characterized by temporary and non-titled land access that constrained farming stability and long-term investment.

Cluster 2: Male-dominated profile with secured land tenure

The second cluster was predominantly male (56.79%), with land access mainly secured through inheritance (59.40%). All respondents (100%) belonged to the Waama ethnic group, with most residing in the municipalities of Cobly (83.48%) and Tanguiéta (65.33%). Livelihood activities were centered almost exclusively on rain-fed agriculture (56.11%), and respondents generally reported secure land rights (74.32%) within a formal legal framework (52.53%). Despite this apparent tenure security, 94.08% of respondents perceived land access as inequitable, primarily due to limited financial resources and restrictive customary norms (97.01%). Women's

participation in land-related decision-making remained limited, with 91.42% reporting non-involvement.

Cluster 3: Ideal of equity and land inclusion

The third cluster was characterized by a positive and inclusive perception of land tenure, with 100% of members reporting equitable access to land. The land tenure system was perceived as inclusive (75.00%), and women's participation in decision-making was strongly affirmed (51.72%). This profile exemplified a more egalitarian land governance model, characterized by balanced gender relations and minimal obstacles from customary rules. This cluster provided a framework for policies aimed at enhancing inclusion and promoting land justice.

Table N°3: Profiles of farmers' clusters identified

Variables	Modality	Cla /Mod	Glo bal	P	v.t est
Cluster 1					
Predominant ethnic affiliation	Biali	92.19	37.8	0. 7	14. 66
Municipality	Matéri	83.11	43.7	0. 9	13. 25
Land acquisition mode	Rental	89.19	10.9	0. 5	5.9 8
Sex of household head	Female-dominated	88.24	15.0	0. 9	7.0 5
Farming system	Rain-fed agriculture and agroforestry	60.53	22.4	0. 9	3.2 5
Land tenure regime	Informal	81.82	6.51	0. 00	3.6 6
Cluster 2					
Land acquisition mode	Inheritance	59.40	69.2	0. 3	5.2 1
Farming system	Rain-fed agriculture	56.11	77.5	0. 1	4.1 8
Tenure security status	Secure land rights	74.32	21.8	0. 9	4.7 7
Sex of household head	Male-dominated	56.79	84.9	0. 1	6.1 6
Main cause of inequality in land access for agriculture	Lack of financial resources and restrictive customary norms	97.01	19.8	0. 2	9.3 3

Municipality	Tanguiéta	22.1	0.	3.0
		65.33	9	00 0
Municipality	Cobly	34.0	0.	9.0
		83.48	2	00 7
Perceived equitable land access	No	94.0	0.	5.0
		53.14	8	00 2
Perceived inclusive land reforms	No	94.0	0.	3.7
		52.52	8	00 9
Women's participation in decision-making	No	91.4	0.	2.1
		51.78	2	03 1
Land tenure regime	Formal	93.4	0.	3.5
		52.53	9	00 9
Predominant ethnic affiliation	Waama	100.0	0.	6.0
		0	8.28	00 9
Cluster 3				
Perceived equitable land access	Yes	100.0	0.	11.
		0	5.92	00 90
Perceived inclusive land reforms	Yes		0.	8.6
		75.00	5.92	00 6
Women's participation in decision-making	Yes		0.	7.6
		51.72	8.58	00 5
Main cause of inequality in land access for agriculture	Others	86.96	6.80	0.
				00 26

Legend: Cla/Mod = Percentage of individuals with a given modality who belong to the cluster; Global = Overall frequency of the modality in the entire sample; P = Probability associated with the relationship between the modality and the cluster; v.test = Test statistic used to assess the strength and significance of the association between the modality and the cluster. Only modalities showing significant associations with clusters (v.test > 0 and P < 0.05) were printed.

Source : Authors' calculations from the 2026 producer survey.

4.2. Contribution of quantitative variables to the clusters differentiation

The results revealed a strong association between the quantitative variables and Clusters. Cluster 1 was characterized by larger household sizes, while Cluster 2 was associated with greater agricultural experience, somewhat with higher income, and moderate education (Figure N°3).

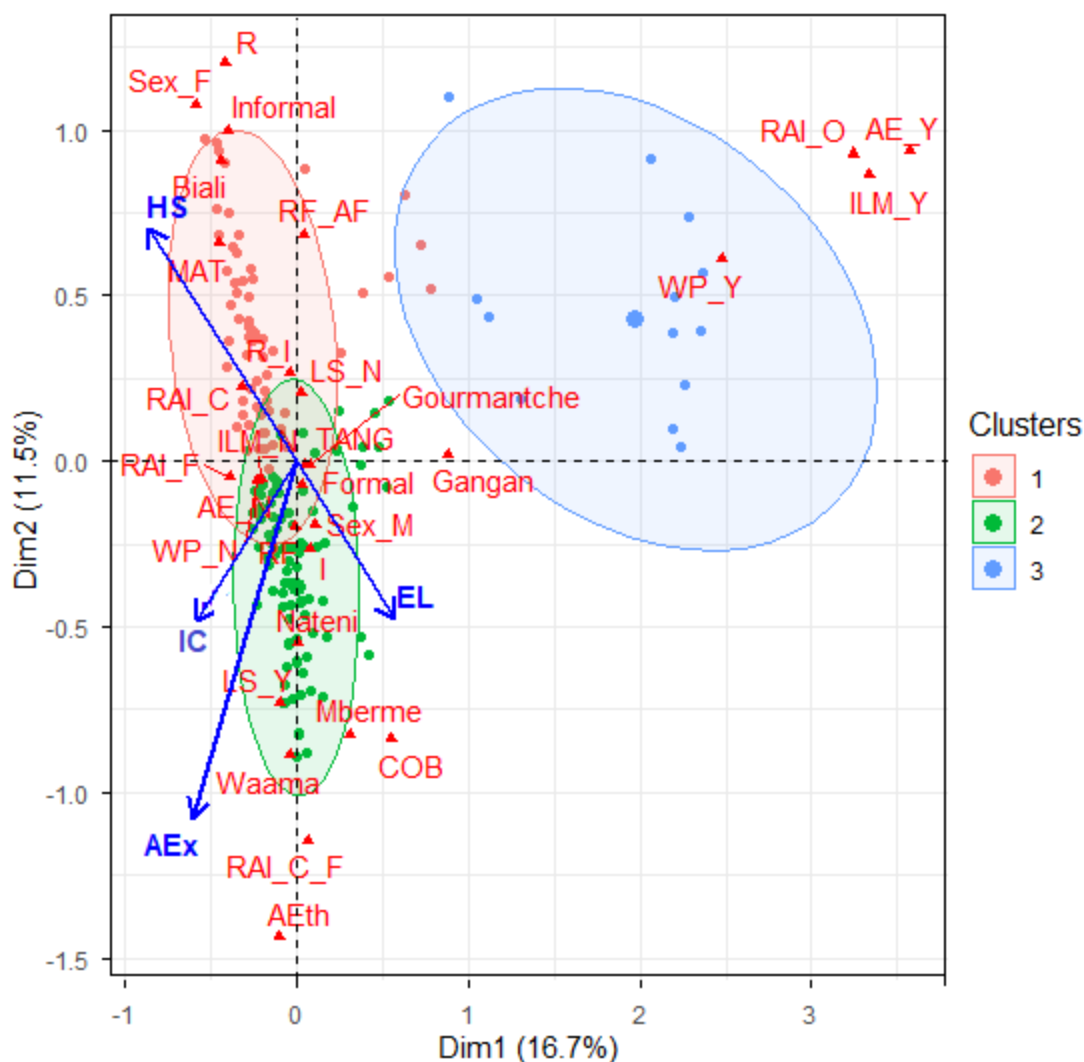


Figure N°3 : Factor map from the Factorial Analysis of Mixed Data (FAMD) showing clusters ellipses

Source: Authors' construction based on survey data.

Legend: AEx = Agricultural experience; HS = Household size; IC = Income; EL = Education level, Sex_F = Female; Sex_M = Male; LS_Y = Secure land tenure; LS_N = Unsecure land tenure; I = Land acquisition through inheritance; R = Land acquisition through rental; R_I = Land acquisition through both rental and inheritance; Formal = Formal land tenure regime; Informal = Informal land tenure regime; AE_Y = Equal access to land; AE_N = Unequal access to land; RAI_C = Restricted customary norms as reasons for land access inequality; RAI_F = Financial constraints as reasons for land access inequality; RAI_O =

Other reasons for land access inequality; ILM_Y = Inclusive land management; ILM_N = Exclusive land management; RF_AF = Mixed farming system; RF = Rain-fed farming system; AF = Agroforestry system; WP_Y = Women's participation in decision-making; WP_N = Women's exclusion from decision-making; COB = Cobby municipality.

However, education level did not statistically differ among clusters ($P = 0.38$, Table N°4). This is similar to household size ($P = 0.25$) and income ($P = 0.54$). Agricultural experience was the only quantitative variable that differed significantly between clusters ($P = 0.02$). The predominantly male Cluster 2 reported the highest mean agricultural experience (17.44 ± 10.21 years), compared with Cluster 1 (14.73 ± 11.79 years) and Cluster 3 (11.65 ± 7.78 years).

Table N°4: Analysis of variance comparing quantitative variables among clusters

Clusters	Education level	Agricultural experience	Household size	Income	
1	$0.69 \pm 0.85a$	$14.73 \pm 11.79b$	$8.43 \pm 2.99a$	207,865.93 221,881.51a	±
2	$0.78 \pm 0.88a$	$17.44 \pm 10.21a$	$8.12 \pm 3.17a$	224,878.70 108,783.70a	±
3	$0.95 \pm 0.94a$	$11.65 \pm 7.78c$	$7.25 \pm 3.65a$	189,451.44 189,892.49a	±
P value (ANOVA)	0.38	0.02	0.25	0.54	

Legend: ANOVA=Analysis of Variance; P = probability value associated with the ANOVA. Mean $\pm$ SD values sharing the same letter indicate no significant difference among groups at the 5% significance threshold.

Source : Authors' calculations from the 2026 producer survey.

5. Discussion

The results underscore the complex interaction between customary tenure systems, socioeconomic characteristics, and perceived land tenure security. This complexity reflects the broader context of legal and institutional pluralism in Sub-Saharan African land governance, where state-led formal systems coexist with customary arrangements (Toulmin, 2000; Delville, 2018). Within this framework, land rights are not defined solely by statutory recognition; rather, they emerge from ongoing negotiations between formal legality, customary legitimacy, and local power relations (Doss & Meinzen-Dick, 2020).

Three contrasting producer profiles were identified: a vulnerable female cluster characterized by precarious access primarily through rental arrangements; a male-dominated cluster benefiting from inheritance-based and relatively secure tenure; and an emerging inclusive cluster reflecting hybrid governance practices. These patterns confirm that gender and land access systems constitute the primary structuring dimensions of tenure security, consistent with findings by Doss and Meinzen-Dick (2020) and Balas et al. (2022). The strong gender differentiation observed aligns with the literature emphasizing that women's land rights in Sub-Saharan Africa remain indirect, conditional, and socially mediated (Agarwal, 1994; Lastarria-Cornhiel et al., 2014; Ravnborg et al., 2016). Despite formal legal equality in Benin, women's weak participation in land-related decision-making and reliance on rental-based access reflect the persistence of customary norms prioritizing male inheritance and authority (Santpoort et al., 2021). As highlighted in the literature, these structural constraints are further reinforced by women's limited economic resources, which reduce their capacity to engage in land registration processes or defend their rights (Masuku et al., 2023). Inheritance emerges as the dominant and most secure pathway to land access, yet it remains strongly gendered and largely exclusive to men. This finding aligns with Besley (1995) and Deininger and Feder (2009), who argue that customary tenure systems often provide operational security while simultaneously reproducing social hierarchies embedded in lineage and kinship structures. In the study area, inheritance-based access strengthens tenure security for men while marginalizing women and economically constrained households, thereby perpetuating structural inequalities in land distribution (Agarwal, 1994).

The male predominance observed in the sample, combined with low levels of education and socio-spatial clustering, reflects broader rural African socio-demographic patterns (FAO, 2019; Yabi et al., 2016). However, in line with Oladehinde (2025), these characteristics also reinforce unequal access to formal land institutions, since education and awareness are key determinants of the ability to engage with administrative land procedures.

The majority of men perceive land access as fundamentally inequitable. This perception reflects the multidimensional nature of tenure security emphasized in the literature, where legal recognition does not necessarily translate into equitable or socially legitimate access (Ayamga et al., 2015; Asaaga, 2017). Consistent with Sanfo et al. (2024) and Oladehinde (2025), limited financial capacity emerges as a major constraint, restricting households' ability to formalize land rights or

resolve disputes. Similarly, the role of credit access and economic capital highlights the reinforcing relationship between asset accumulation and tenure security, as wealthier farmers are better positioned to secure and defend land rights (Miheretu & Yimer, 2017; Subramanian & Kumar, 2024). Restrictive customary norms also emerge as a major source of unequal land access. As noted by Asaaga (2017), customary systems can provide stability but often become exclusionary under conditions of population pressure, commercialization, and land scarcity. In the study area, these dynamics appear to stimulate unequal bargaining power, particularly disadvantaging women and individuals with limited capital.

This situation illustrates the tension between state-based formal rights and socially legitimate customary rights, a central issue in African land governance (Toulmin, 2000; Delville, 2018). While formal systems aim to enhance security through legal recognition, their effectiveness depends on perceived legitimacy within local communities (Rojas Herrera, 2025). The coexistence of these systems thus produces hybrid but unequal outcomes, where formal security coexists with persistent social exclusion. The identification of a more inclusive cluster suggests the emergence of transformative land governance dynamics, wherein customary and formal systems begin to converge. This finding supports the argument that land tenure security should be understood as a dynamic and evolving process rather than a fixed legal status (FAO, 2020; Delville, 2018). Participatory land governance approaches and gradual formalization strategies, as emphasized by Nadasen (2012) and Wamboye (2024), appear particularly relevant in such contexts. The emergence of this cluster may reflect increased exposure to institutional reforms such as Rural Land Plans, which aim to reconcile customary legitimacy with formal recognition (INRAB, 2019). Nevertheless, its relatively limited scale indicates that such transitions remain fragile and uneven. The role of agricultural experience in enhancing land tenure security can be interpreted as a human-capital and land-management effect. In fact, farmers with higher agricultural experience are more knowledgeable about local land norms, build stronger social ties, and manage land transactions more effectively, which can raise perceived or actual tenure security (Higgins et al., 2018; Singirankabo et al., 2022). Our findings support recent evidence that tenure security depends on context-specific social and institutional conditions, not just on legal documents (Mannepilli et al., 2026)

The structuring role of ethnicity and geographic origin further suggests that land tenure security is shaped by localized socio-cultural configurations. However, this result should be interpreted with caution due to potential sampling bias, particularly the overrepresentation of women from Matéri and members of the Biali ethnic group.

From a methodological perspective, the factorial analysis explains a moderate proportion of variance (28.27%), which is consistent with similar socio-anthropological studies conducted in rural African contexts (Sourial et al., 2010; Costa et al., 2013; Mohammed et al., 2024). This level of variance reflects the inherently complex and multidimensional nature of tenure systems, wherein behavioral, institutional, and cultural variables interact in non-linear ways.

Conclusion

This study examined land tenure security among small-scale maize producers in the municipalities of Matéri, Coby, and Tanguéta in northwestern Benin. The findings reveal significant heterogeneity in tenure security, structured around three distinct profiles: (1) a female-dominated cluster highly vulnerable to insecurity and reliant predominantly on rental arrangements; (2) a male-dominated cluster benefiting from inheritance-based and relatively secure tenure; and (3) an emerging inclusive cluster reflecting hybrid governance practices. The results further indicate that greater agricultural experience enhance land tenure security, suggesting that experienced farmers are better able to negotiate customary institutions, and secure more stable land rights. These results confirm that gender-differentiated social norms and cultural beliefs decisively shape tenure security, operating within a context of hybrid land pluralism where social recognition frequently supersedes formal titles. Consequently, prevailing insecurity perpetuates gender inequalities and constrains long-term agricultural investment and sustainable land management. To address these challenges, there is an urgent need to adopt hybrid and inclusive land governance in Benin. Such a model must bridge the gap between customary practices and state law through participatory formalization, awareness-raising, and the strengthening of local institutional capacities.

Implications for inclusive land governance

The findings highlight the necessity of inclusive land governance in West Africa, particularly in northwestern Benin, to address persistent gender disparities. Women continue to rely on precarious leases, while men benefit from inherited and relatively secure land rights, demonstrating that the mere existence of legal frameworks is insufficient to guarantee equitable access. The emergence of a more inclusive producer cluster—characterized by equitable access to land, a reduction in traditional constraints, and women's involvement in decision-making—illustrates the potential of hybrid governance models that combine formal legal recognition with local social practices. Strengthening women's land tenure security, reconciling customary and state systems, and building local institutional capacity are therefore essential steps toward fostering equitable access to land, supporting sustainable agricultural investment, and promoting rural development.

BIBLIOGRAPHY

- Addaney, M., Akudugu, J. A., Asibey, M. O., Akaateba, M. A., & Kuusaana, E. D. (2022). Changing land tenure regimes and women's access to secure land for cocoa cultivation in rural Ghana. *Land use policy*, 120, 106292. <https://doi.org/10.1016/j.landusepol.2022.106292>
- Adéchian, S. A., & Baco, M. N. (2025). How does land tenure security contribute to the sustainable development of rural households? Evidence from Benin (West Africa). *Frontiers in Sustainable Food Systems*, 9, 1621537. <https://doi.org/10.3389/fsufs.2025.1621537>
- Agarwal, B. (1994). *A Field of One's Own: Gender and Land Rights in South Asia*. Cambridge University Press.
- Akpo, C. Y., Pocol, C. B., Moldovan, M. G., & Houensou, D. A. (2024). Land Access Modes and Agricultural Productivity in Benin. *Agriculture*, 14(10), 1744. <https://doi.org/10.3390/agriculture14101744>
- Amegnaglo, C. J., & Soglo, Y. Y. (2019). Land ownership, youth and agricultural performance among maize farmers in Republic of Benin. *Journal of land and rural studies*, 7(2), 141-151.
- Asaaga, F. (2017). *Land rights, tenure security and sustainable land use in rural Ghana* (Doctoral dissertation, University of Oxford). 414 p
- Asegie, A. M., & Ayele, W. K. (2024). Do rural women realized land tenure security rights? South Wollo, Ethiopia. *Environment, Development and Sustainability*, 26(9), 22345-22365. <https://doi.org/10.1007/s10668-023-03553-x>
- Ayamga, M., Yeboah, R. W., & Dzanku, F. M. (2015). Determinants of farmland tenure security in Ghana. *Ghana Journal of Science, Technology and Development*, 2(1), 1-21. <https://doi.org/10.47881/43.967x>
- Balas, M., Lemmen, C. H. J., & Casimiro, I. M. (2022). Factors contributing to gender inequality in land access and land tenure security in Sub-Saharan Africa: A literature review. In 27th FIG Congress 2022: Volunteering for the future-Geospatial excellence for a better living.
- Besley, T. (1995). Property Rights and Investment Incentives: Theory and Evidence from Ghana. *Journal of Political Economy*, 103 (5), 903 – 937. <https://doi.org/10.1086/262008>
- Bruce, J.W., Migot-Adholla, S., & Atherton, J. (1994). The findings and their policy implications: institutional adaptation or replacement. In Bruce, JW and Migot- Adholla, S., editors, *Searching for land tenure security in Africa*. Washington DC: World Bank, 251-265.

- Costa, P.S., Santos, N.C., Cunha, P., Cotter, J., & Sousa, N. (2013). The use of multiple correspondence analysis to explore associations between categories of qualitative variables in healthy aging. *Journal of aging research*, 2013(1), 1-12.
- Dagnelie, P. (1998). Theoretical and applied statistics. Volume 1: Descriptive statistics and bases of statistical inference. De Boeck and Larcier, Brussels.
- Deininger, K. W. (2003). Land Policies for Growth and Poverty Reduction. Washington, DC: World Bank & Oxford University Press.
- Deininger, K., & Feder, G. (2009). Land registration, governance, and development: Evidence and implications for policy. *The World Bank Research Observer*, 24(2), 233-266.
- Delville, P. L. (2018). Different strategies and procedures to formalise rural land rights. Montpellier : Pôle Foncier et Développement, 4 p. (Briefing Notes - Pôle Foncier et Développement).
- Doss, C., & Meinzen-Dick, R. (2020). Land tenure security for women: A conceptual framework. *Land Use Policy*, 99, 105080. <https://doi.org/10.1016/j.landusepol.2020.105080>
- Ekpodessi, SGN, & Nakamura, H. (2022). Impact of Insecure Land Tenure on Sustainable Agricultural Development: A Case Study of Agricultural Lands in the Republic of Benin, West Africa. *Sustainability*, 14 (21), 14041. <https://doi.org/10.3390/su142114041>
- Food and Agriculture Organization of the United Nations. (2018). *Handbook on master sampling frames for agricultural statistics: Frame development, sample design and estimation*. <https://openknowledge.fao.org/server/api/core/bitstreams/00e74c7c-5e5d-434e-87fd-43d300069617/content>
- FAO (2019). The state of food and agriculture 2019. Food and Agriculture Organization of the United Nations. <https://www.fao.org/family-farming/detail/en/c/1245425/>
- FAO (2020). Land tenure and food security in Sub-Saharan Africa. Rome: FAO.
- Feyertag, J. (2022). Gender-sensitive subjective data on land and property rights. In *The Routledge Handbook of Property, Law and Society* (pp. 414-425). Routledge.
- Hasan, M.K.H., & Kumar, L.K. (2024). Determining adequate sample size for social survey research: sample size for social survey research. *Journal of the Bangladesh Agricultural University*, 22(2), 146-157.

- Higgins, D., Balint, T., Liversage, H., & Winters, P. (2018). Investigating the impacts of increased rural land tenure security: A systematic review of the evidence. *Journal of rural studies*, 61, 34-62. <https://doi.org/0.1016/j.jrurstud.2018.05.001>
- INRAB (2019). Study on land tenure security and agricultural productivity in Benin. Cotonou: INRAB.
- INSAE (2016). General Population and Housing Census (RGPH4): Booklet of villages and town districts of the Borgou department (RGPH-4, 2013).
- Kansanga, M. M., Kerr, R. B., Lupafya, E., Dakishoni, L., & Luginaah, I. (2021). Does participatory farmer-to-farmer training improve the adoption of sustainable land management practices? *Land use policy*, 108, 105477. <https://doi.org/10.1016/j.landusepol.2021.105477>
- Lastarria-Cornhiel, S., Behrman, J.A., Meinzen-Dick, R., & Quisumbing, A.R. (2014). Gender equity and land: Toward secure and effective access for rural women. In *Gender in agriculture: Closing the knowledge gap* (pp. 117-144). Dordrecht: Springer Netherlands.
- Lawin, K. G. (2019). Land tenure differences and adoption of agricultural innovations in Benin. *African Journal of Rural Development*, 4 (3), 230 - 242.
- MAEP. (2017). Statistical Yearbook of the Agricultural Sector of Benin. Cotonou: MAEP.
- Mannepalli, B. K., Kemboi, E., Rathour, S., Singh, P., Kushwaha, S., Kamalvanshi, V., & Parida, P. K. (2026). Is the relationship between agricultural performance and land tenure security uniform across the world? Evidence from meta-analysis. *Frontiers in Sustainable Food Systems*, 10, 1752236. <https://doi.org/10.3389/fsufs.2026.1752236>
- Masuku, M. M., Mthembu, Z., & Mlambo, V. H. (2023). Gendered effects of land access and ownership on food security in rural settings in South Africa. *Frontiers in sustainable food systems*, 7, 1158946. <https://doi.org/10.3389/fsufs.2023.1158946>
- Mbudzya, J. J., Gido, E. O., & Owuor, G. (2023). Determinants of land tenure security among small-holder farmers in rural Kenya: An ordered probit analysis. *Cogent Social Sciences*, 9(1), 2220232. <https://doi.org/10.1080/23311886.2023.2220232>
- Miheretu, B. A., & Yimer, A. A. (2017). Determinants of farmers' adoption of land management practices in Gelana sub-watershed of Northern highlands of Ethiopia. *Ecological Processes*, 6(1), 19. <https://doi.org/10.1186/s13717-017-0085-5>

- Mohammed, A.L. (2025). Managing Tensions in Ghanaian Healthcare Social Enterprises: An Institutional Logics Perspective. *Journal of Social Entrepreneurship*, 1-33.
- Nadasen, N. (2012). Rural women's access to land in sub-Saharan Africa and implications for meeting the Millennium Development Goals. *Agenda*, 26(1), 41-53.
- Niwah, C.B., Todou, G., Souare, K., Abdoulaye, A., Bay, S., & Atem, E. (2020). Diversity and uses of woody plants in the peripheral agro-systems of the city of Maroua (Far North, Cameroon). *International Journal of Biological and Chemical Sciences*, 14(3), 966-982.
- Oladehinde, G. J. (2025). Assessment of factors influencing access to residential land in urban border communities of Imeko/Afon Local Government Area of Ogun State, Nigeria: A gender dimension. *AUC GEOGRAPHICA*, 61(1), 126-142. <https://doi.org/10.14712/23361980.2025.16>
- Ravnborg, H. M., Spichiger, R., Broegaard, R. B., & Pedersen, R. H. (2016). Land governance, gender equality and development: Past achievements and remaining challenges. *Journal of International Development*, 28(3), 412-427. <https://doi.org/10.1002/jid.3215>
- Republic of Benin. (2013). Land and property code of the Republic of Benin (Law No. 2013-01 of August 14, 2013). Cotonou: National Printing Office.
- Rojas Herrera, I. (2025). Limits and possibilities of contemporary land struggles by Indigenous Peoples, Black Communities and Campesinxs in the Colombian Amazon. *The Journal of Peasant Studies*, 52(4), 667-696. <https://doi.org/10.1080/03066150.2024.2435557>
- R Core Team (2024). *_R: A Language and Environment for Statistical Computing_*. R Foundation for Statistical Computing, Vienna, Austria. <<https://www.R-project.org/>>.
- Santpoort, R., Steel, G., Mkandawire, A., Ntauazi, C., Faye, E. H., & Githuku, F. (2021). The land is ours: bottom-up strategies to secure rural women's access, control and rights to land in Kenya, Mozambique, Senegal and Malawi. *Frontiers in Sustainable Food Systems*, 5, 697314. <https://doi.org/10.3389/fsufs.2021.697314>
- Sherin, S., Mathew, P., Johns, F., & Abraham, J. (2018). The feasibility of using remote data collection tools in field surveys. *Int J Community Med Public Heal*, 5, 81-85.
- Singirankabo, U. A., Ertsen, M. W., & van de Giesen, N. (2022). The relations between farmers' land tenure security and agriculture production. An assessment in the perspective of smallholder farmers in Rwanda. *Land Use Policy*, 118, 106122. <https://doi.org/10.1016/j.landusepol.2022.106122>

Sourial, N., Wolfson, C., Bergman, H., Zhu, B., Karunanathan, S., Quail, J., Fletcher, J., Weiss, D., Bandeen-Roche, K. & Béland, F. (2010). A correspondence analysis revealed fragility deficits aggregate and are multidimensional. *Journal of clinical epidemiology*, 63(6), 647-654. <https://doi.org/10.1016/j.jclinepi.2009.08.007>

Subramanian, A., & Kumar, P. (2024). Property rights, factor allocation and household welfare: Experimental evidence from a land titling program in India. *Journal of Development Economics*, 167, 103238. <https://doi.org/10.1016/j.jdeveco.2023.103238>

Toulmin, C. (2000). *Evolving Land Rights, Policy and Tenure in Africa*. IIED.

Wamboye, E. F. (2024). The paradox of women ownership of land and gender equality in sub-Saharan Africa: channels and obstacles. *Journal of African Development*, 25(1), 22-45.

Wankogere, S. D., & Alananga, S. S. (2020). Factors affecting land titling during regularization of informal settlements in Dar es Salaam Tanzania. *International Journal of Real Estate Studies*, 14(2), 73-97. <https://doi.org/10.11113/intrest.v14n2.53>

Yabi, A. J., Bachabi, F. X., Labiyi, A. I., Odé, A. C., & Ayéna, L. R. (2016). Déterminants socio-économiques de l'adoption des pratiques culturelles de gestion de la fertilité des sols utilisées dans la commune de Ouaké au Nord-Ouest du Bénin. *International Journal of Biological and Chemical Sciences*, 10(2), 779-792.