

Managing Agricultural Expansion and Grazing Systems: Land-Use Conflicts in the SOFIA Region of Madagascar

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ABSTRACT

This study aims to examine the drivers of land struggles in the SOFIA region of Madagascar by analyzing how agricultural expansion, grazing practices, and governance dynamics shape conflicts between farmers and herders within rural land-use systems. The study adopts a qualitative research design. Primary data were collected through semi-structured interviews with 35 participants, including farmers, herders, and local authorities. Data were analyzed using inductive thematic analysis to identify recurring patterns in land use, governance, and livelihood management. The findings reveal competition over fertile land, the expansion of cash-crop agriculture, restricted grazing mobility, ambiguous land-tenure arrangements, and limited governance capacity, collectively intensifying land-related disputes. These challenges are further exacerbated by socioeconomic vulnerability and demographic pressures in communities that depend heavily on land-based agricultural and livestock livelihoods. This study contributes original insights by integrating agricultural and grazing practices with governance and livelihood management perspectives in an understudied region of Madagascar. It advances understanding of land-use conflicts by highlighting the interaction between rural enterprise activities, tenure insecurity, and local governance, offering context-specific implications for sustainable land management and conflict mitigation.

Keywords: Management, grazing, land conflicts, SOFIA region.

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INTRODUCTION

Land remains a central resource for livelihoods and economic development in Madagascar, particularly in rural regions such as SOFIA. Agricultural activities, including both crop cultivation and livestock grazing, dominate land use, providing food, income, and cultural identity for communities (Andriarimalala et al., 2013; Andriatsitohaina et al., 2024). The intensification of land use to meet population demands, however, has contributed to competition over land and emerging conflicts between farmers and herders. These conflicts are not only influenced by the physical scarcity of fertile land but also by evolving farming systems, market pressures, and governance dynamics (Land pressures et al., 2014; Huff & Orengo, 2020).

Agricultural expansion in Madagascar, particularly the conversion of forests and marginal lands to cropland, has been documented as a primary driver of land degradation and environmental change (Casse et al., 2004; Tiandraza et al., 2023). Eucalyptus plantations, cash crops, and subsistence farming practices alter land-cover patterns and exacerbate competition for arable land (Alemayehu & Melaku, 2025; Mtsetfwa et al., 2025). Grazing, traditionally an integral component of rural livelihoods, often overlaps with agricultural zones, increasing the potential for disputes between crop farmers and herders (Solofondranohatra et al., 2020; Usman & Nichol, 2022). The complex interplay between land-use

intensification and grazing practices creates a socio-ecological context in which land struggles are frequent and multifaceted.

Previous studies in Madagascar highlight the challenges of integrating agricultural development with conservation goals. For example, Andriarimalala et al. (2013) explored synergies between agricultural conservation and cattle production in the Alaotra region, demonstrating that conflicting land-use objectives can hinder sustainable resource management. Similarly, Andriatsitohaina et al. (2024) illustrate the potential of agroforestry to reconcile agricultural production with environmental conservation. Despite these insights, few studies have specifically addressed the SOFIA region, where distinct land tenure arrangements, population pressures, and agro-ecological conditions shape the nature of land disputes.

Research gaps persist regarding how localized governance, traditional land management, and community-level practices shape land-related conflicts. While decentralization in Madagascar has introduced mechanisms for local decision-making, studies suggest that these governance structures often fail to prevent disputes or mediate competing interests effectively (Emynorane et al., 2025; Kioko & Changwony, 2025). Moreover, the interactions between grazing systems and crop agriculture are context-dependent and require detailed qualitative assessments to understand stakeholders' perspectives and practices (Mai et al., 2025; Leal Filho et al., 2025).

Methodological limitations in prior studies also constrain comprehensive understanding. Quantitative analyses often capture land-cover changes using remote sensing or cadastral data but ignore the social, cultural, and economic dimensions that drive conflicts (Debay et al., 2025; Mechiche-Alami et al., 2021). Conversely, studies emphasizing local perceptions tend to be limited in spatial scope or fail to systematically integrate insights from multiple stakeholder groups. The combination of environmental, social, and economic pressures suggests the need for an in-depth qualitative approach that considers the experiences of farmers, herders, and local authorities in the SOFIA region.

Additionally, studies on land struggles in Madagascar frequently underrepresent the role of livestock in shaping land conflicts. Herder practices, including transhumance and communal grazing, have been identified as key factors influencing resource competition in other sub-Saharan contexts (Usman & Nichol, 2022; Solofondranohatra et al., 2020). Applying these insights to Madagascar offers opportunities to understand how traditional grazing norms intersect with agricultural expansion, population growth, and climate variability to generate land conflicts. This knowledge is particularly relevant for developing locally tailored strategies to promote equitable land access and sustainable resource management.

Despite recognition of these challenges, studies that integrate multidimensional drivers of land struggles remain limited. Studies often address agricultural intensification, grazing practices, or governance in isolation, failing to capture the complex interactions shaping land use and social tensions (Huff & Orengo, 2020; Tiandraza et al., 2023). Furthermore, most studies in Madagascar emphasize other regions, leaving the SOFIA region underexplored. This geographic gap underscores the importance of examining localized land-use dynamics to inform context-specific policies and interventions.

Finally, the SOFIA region represents a unique case study for understanding land struggles due to its combination of ecological sensitivity, high agricultural dependence, and diverse land-use practices. The region's vulnerability to soil degradation, deforestation, and grazing pressures creates a critical need to explore the drivers of land conflicts, identify stakeholder perspectives, and inform sustainable land management strategies (Gardner et al., 2018; Rodríguez-Rodríguez et al., 2024). Addressing these gaps will contribute to broader debates on sustainable development, rural livelihoods, and conflict mitigation in Madagascar and other comparable sub-Saharan contexts.

LITERATURE REVIEW

The literature on land use, agricultural expansion, and grazing dynamics in Madagascar and broader sub-Saharan Africa provides essential context for understanding the tensions observed in the SOFIA region.

Scholars have long emphasized that rural land struggles emerge from interactions among ecological pressures, demographic change, cultural practices, and evolving economic systems. This section synthesizes existing research across four core thematic areas: (1) agricultural expansion and land-use transformation; (2) grazing systems and livestock mobility; (3) land governance, tenure, and institutional dynamics; and (4) economic pressures and livelihood vulnerability. Together, these themes form the analytical foundation for interpreting the drivers of land disputes in SOFIA.

Agricultural Expansion and Land-Use Transformation

Agricultural expansion has been a defining feature of rural development in Madagascar, driven by population growth, subsistence needs, and the increasing influence of commercial markets. Studies indicate that smallholder farmers often extend cultivation into marginal or fallow lands to meet household demands, contributing to land degradation and altering ecological systems (Casse et al., 2004; Tiandraza et al., 2023). These transformations are not only ecological in nature but also social, as shifts in land use reshape interactions among communities and influence the distribution of productive resources.

The rise of cash crops, such as vanilla and market-oriented food crops, has further intensified land-use pressures. Scholars argue that the profitability of these crops encourages farmers to convert grazing lands and communal spaces into private agricultural plots, contributing to conflicts with herders who rely on open-access grazing systems (Alemayehu & Melaku, 2025; Hending et al., 2018). As plantations expand, landscapes once managed collectively become increasingly fragmented, reducing the flexibility needed for sustainable crop–livestock coexistence.

Moreover, the study highlights that agricultural intensification often occurs without adequate consideration of environmental limits or long-term sustainability. While conservation agriculture has been proposed as a solution to maintain soil fertility and reduce land pressure, adoption rates remain low due to limited access to knowledge, inputs, and institutional support (Araya & Ochsner, 2024). This gap between recommended practices and actual adoption exacerbates competition for fertile land and contributes to land-use conflicts.

Grazing Systems, Livestock Mobility, and Traditional Norms

Livestock herding has deep cultural and economic significance in Madagascar, with livestock serving as symbols of wealth, social status, and livelihood security. Traditional grazing systems typically rely on communal land management and seasonal mobility, enabling herders to adjust to climatic variability and pasture availability (Solofondranohatra et al., 2020). However, these systems are increasingly threatened as agricultural expansion restricts grazing corridors and reduces access to critical pasture zones.

Several studies have documented how livestock mobility is disrupted when grazing routes intersect with expanding farmlands. Livestock movements become more constrained, increasing the likelihood of accidental crop damage and subsequent disputes between herders and farmers (Usman & Nichol, 2022). As mobility decreases, herders become more vulnerable, particularly during dry seasons when flexible access to pasture is essential for herd survival.

The erosion of traditional grazing norms also intersects with broader socio-economic and ecological changes. Climate variability, recurrent droughts, and soil degradation reduce pasture quality, placing additional pressure on the remaining grazing lands. Scholars argue that integrating local grazing knowledge with modern land management approaches could support more sustainable practices; however, institutional recognition of customer systems remains limited (Mechiche-Alami et al., 2021). Consequently, the weakening of traditional norms contributes to rising tensions and competition over land use.

Land Governance, Tenure Systems, and Institutional Challenges

Land governance in Madagascar is characterized by the coexistence of statutory law and customary tenure arrangements, often creating ambiguity over land rights. Formal land titling remains limited, especially in rural areas, where most land users rely on inherited or community-recognized claims. This

dual system frequently results in disputes, as authorities struggle to reconcile customary practices with formal policies (Huff & Orengo, 2020). Such institutional overlaps complicate conflict resolution and undermine tenure security for both farmers and herders.

Decentralization reforms were introduced to strengthen local participation in land management, yet research reveals persistent challenges. Local authorities often lack the technical capacity, financial resources, and legal tools needed to mediate disputes effectively (Eymnorane et al., 2025; Kioko & Changwony, 2025). Weak enforcement of land regulations enables powerful actors to appropriate land or expand cultivation into communal grazing areas, intensifying tensions between different land users.

Furthermore, development programs promoting agricultural commercialization often fail to integrate herder needs or recognize the importance of communal grazing systems. Policies that encourage plantation agriculture or market-oriented farming sometimes inadvertently promote land conversion in areas used collectively by herders, thereby deepening potential for conflict (Debay et al., 2025; Mechiche-Alami et al., 2021). These governance gaps highlight the necessity of coordinated policy frameworks that balance agricultural development with sustainable grazing management.

Socioeconomic Pressures, Livelihood Vulnerability, and Resource Competition

Socioeconomic vulnerability plays a critical role in shaping how communities experience and respond to land struggles. Rural households rely heavily on agriculture or livestock, often face fluctuating income levels, limited market access, and exposure to environmental risks. As competition for fertile land intensifies, poorer households frequently become marginalized, losing access to land or facing reduced livelihood opportunities (Rodríguez-Rodríguez et al., 2024). These inequalities exacerbate tensions and reduce community resilience in the face of shocks.

Migration and demographic change further complicate land-use dynamics. In-migration from neighboring regions introduces new claimants to already limited land resources, while population growth within communities increases demand for arable plots and grazing areas (Huff & Orengo, 2020). Without effective land-use planning or equitable allocation mechanisms, these pressures increase the likelihood of disputes.

Livelihood diversification has been proposed as a strategy to reduce dependence on land and mitigate the risk of conflict. However, in many rural areas of Madagascar, opportunities for non-agricultural income remain limited due to inadequate infrastructure, limited education, and weak market connections (Land pressures et al., 2014). As a result, farmers and livestock herders continue to rely heavily on land-based activities, reinforcing the centrality of land in both survival and conflict.

METHODOLOGY

This study employs a qualitative research design to capture the complex socio-ecological dynamics underlying land struggles in the SOFIA region. The research follows an interpretivist orientation, emphasizing how individuals perceive and interpret land access, agricultural expansion, and grazing practices within their everyday lived realities. This approach is appropriate because land conflicts are embedded in historical relationships, cultural norms, and institutional arrangements that cannot be thoroughly understood through quantitative measures alone. By centering the perspectives of local actors, the study seeks to reveal how interactions among farmers, herders, and authorities shape land-use pressures and contribute to the emergence and persistence of conflicts.

Data were collected through semi-structured interviews with 35 participants, including crop farmers, livestock herders, and local authorities, selected using purposive and snowball sampling techniques to ensure direct experience with land use and conflict processes. The interviews explored issues related to land tenure, agricultural expansion, grazing mobility, conflict experiences, and governance responses. They were conducted in local languages with the support of trained facilitators to enhance clarity and depth of responses. The data were analyzed using an inductive thematic approach, involving systematic coding,

categorization, and theme development to identify recurring patterns across participant groups. Triangulation across different livelihoods and governance actors strengthened the credibility of the findings. A summary of participant characteristics, including gender, age range, occupation, and years of involvement in land-use activities, is presented in Table 1, providing contextual grounding for the analysis.

Table 1. Profile of Informants

Informants	Total	Gender	Age	Occupation	Years in Land Use
Crop Farmers	15	9M/6F	25–60	Rice, maize, cassava	05–35
Herders	10	8M/2F	30–65	Livestock grazing	10–40
Local Authorities	10	6M/4F	35–60	Governance/Policy	05–25

RESULTS AND DISCUSSION

Competition over Fertile Land

Competition for fertile land emerged as one of the most significant and consistent themes expressed by farmers, herders, and local officials, all of whom recognized the increasing scarcity of productive soils in the SOFIA region. Participants explained that fertile land, particularly lowland rice fields and areas with high soil moisture, has become progressively contested as expanding agricultural frontiers overlap with traditional grazing zones. This overlap intensifies tension as farmers seek to increase crop yields while herders attempt to maintain mobility and livestock health. The situation echoes patterns documented in other sub-Saharan contexts where simultaneous agricultural intensification and grazing pressures lead to direct competition for land resources (Mai et al., 2025). Informants emphasized that seasonal variations exacerbate these tensions, especially during dry periods, when pasture near water sources becomes critical for herders, leading to more frequent spatial conflicts.

The pressure on fertile land is further increased by the expansion of agriculture into previously marginal or communal areas. Many participants explained that, due to population growth and increased market demand, farmland is now extending into areas historically used for dry-season grazing, eliminating natural buffer zones that once reduced the likelihood of disputes. This aligns with broader regional trends where agricultural encroachment increases land fragmentation and reduces grazing access (Alemayehu & Melaku, 2025; Mtsetfwa et al., 2025). Farmers defended the expansion as necessary for household survival, while herders argued that such encroachment violated traditional agreements over pasture access. This duality highlights how different livelihood strategies, although equally legitimate, produce conflicting interpretations of land rights and appropriate land-use practices within the same geographic space.

Overlaying these pressures is the problem of ambiguous land tenure. Many informants rely on customary systems of land recognition, which often conflict with the state's formal land policy frameworks. Herders reported that the absence of clearly demarcated grazing areas leads to constant contestation, while farmers expressed concern that informally recognized lands may be claimed or contested without warning. Such ambiguity undermines the predictability needed for sustainable agricultural or pastoral planning and is consistent with studies showing how conflicting tenure systems contribute to persistent land-related tensions in rural Madagascar (Eric et al., 2025; Jayne et al., 2014). The findings underscore the necessity of harmonizing customary and statutory land governance and establishing participatory land-use zoning to reduce uncertainty and promote coexistence.

Evolving Agricultural Practices

Shifts in agricultural practices also play a central role in shaping land struggles in the SOFIA region. Informants observed that many farmers are transitioning toward cash crops—particularly Eucalyptus, vanilla, and other market-oriented commodities which require large, continuous plots of land and often

displace traditional mixed farming or grazing systems. While these crops provide economic incentives, they tend to increase spatial competition with herders and intensify the privatization of land that was once used communally. This trend reflects what scholars have observed in other regions where profitable cash crops encourage the conversion of open or shared land into privately managed plantations, thereby heightening the potential for conflict (Alemayehu & Melaku, 2025; Hending et al., 2018). Herders expressed concern that these monocultures reduce pasture diversity and block livestock mobility, particularly during peak grazing seasons.

The adoption of agricultural conservation was frequently mentioned by local authorities and a small subset of farmers, yet overall adoption remains limited. Participants explained that challenges such as high labor requirements, limited access to training, and insufficient technical support discouraged widespread uptake of soil-conserving practices that could otherwise increase yields without expanding cultivated areas. This finding aligns with previous literature indicating that conservation agriculture, while beneficial, often faces socio-economic and logistical barriers among smallholder farmers (Araya & Ochsner, 2024; Andriarimalala et al., 2013). The limited adoption perpetuates a cycle in which declining soil fertility compels farmers to expand cultivation outward rather than increase production within existing fields, thereby intensifying competition with grazing lands.

At the same time, the study found that certain agricultural innovations, particularly agroforestry, have strong potential to reduce land-use conflicts if implemented with both farmers' and herders' needs in mind. Some participants noted that agroforestry systems incorporating fodder species could offer dual benefits: improving soil fertility for farmers while also supplying forage for livestock. This echoes findings from previous research showing that agroforestry is compatible with both agricultural productivity and sustainable grazing (Andriatsitohaina et al., 2024; Hending et al., 2018). However, such systems are not yet widely understood or adopted in the SOFIA region. Strengthening agricultural extension programs and facilitating community conversations around shared land-use planning may help create agricultural strategies that complement, rather than compete with, pastoral livelihoods.

Governance and Policy Challenges

Governance barriers emerged as a major factor that shaped the intensity and persistence of land disputes between farmers and herders. Participants consistently described local governance as fragmented and weak, with authorities lacking the necessary capacity to enforce land-use regulations or mediate conflicts effectively. Many informants stressed that, even when formal land policies exist, implementation is inconsistent due to limited technical training, financial constraints, and political interference. These challenges mirror national-level critiques of decentralization in Madagascar, where responsibility has shifted to local governments without adequate institutional support (Emynorane et al., 2025; Kioko & Changwony, 2025). As a result, disputes often escalate before any meaningful intervention occurs, deepening local frustration and mistrust in governance institutions.

Another major governance issue is the lack of coordination between agricultural development programs and pastoral land management. Farmers noted that development initiatives promoting plantation agriculture or cash crop expansion rarely consider the impacts on existing grazing systems. In some cases, such programs inadvertently encourage cultivation in areas that herders depend on for seasonal grazing, creating new points of conflict. This reflects broader patterns documented in the literature, where sector-specific policies, particularly those emphasizing agricultural modernization, frequently overlook the needs of pastoral communities (Debay et al., 2025; Mechiche-Alami et al., 2021). The absence of integrated land-use planning exacerbates tensions by reinforcing herders' perception that their livelihoods are undervalued or intentionally marginalized.

Despite these challenges, the study also revealed that customary mechanisms continue to play an important role in mediating disputes, although their authority has been weakened over time. Elders and traditional leaders traditionally facilitated negotiations between farmers and herders, but many participants noted that these systems have not been formally recognized or supported within decentralized governance

frameworks. This limits their effectiveness, particularly in cases involving land commodification or external investors. Nonetheless, several informants advocated improved collaboration between statutory authorities and customary leaders, echoing studies that highlight the potential of hybrid governance models to address land conflicts (Steen, 2026; Rodríguez-Rodríguez et al., 2024). Strengthening these hybrid mechanisms may offer a more culturally grounded and legitimate pathway for long-term conflict resolution.

Socioeconomic Pressures and Livelihood Dependence

Dependence on land-based livelihoods magnifies the stakes of land struggles. Farmers and herders rely heavily on crop production and livestock grazing for food security and income (Land pressures et al., 2014; Usman & Nichol, 2022). Economic pressures, including market access and income variability, heighten competition for high-value land.

Socioeconomic vulnerability also affects conflict resilience. Poorer households are more likely to lose access to fertile land or grazing areas during disputes, perpetuating cycles of inequality and tension (Rodríguez-Rodríguez et al., 2024; Mai et al., 2025). Development interventions that promote income diversification, access to credit, and alternative livelihoods can reduce dependence on contested land and mitigate conflict.

Migration and population growth further amplify land pressures. New households require access to arable plots, often encroaching on traditional grazing zones (Huff & Orengo, 2020; Tiandraza et al., 2023). Managing demographic pressures through land planning and community-based resource allocation is essential to sustainable land governance.

Grazing Practices and Traditional Norms

Traditional grazing practices remain deeply embedded in the cultural and economic fabric of herding communities in the SOFIA region, yet these practices are increasingly challenged by expanding agricultural activities. Herders described long-established rotational grazing patterns that historically allowed livestock to move through communal landscapes in accordance with seasonal pasture availability. However, as cultivated land expands, mobility becomes restricted, forcing herders to concentrate livestock in smaller areas. This concentration increases the likelihood of accidental crop damage and heightens the potential for conflict, consistent with findings from similar pastoral systems across Africa (Solofondranohatra et al., 2020; Usman & Nichol, 2022). Many herders emphasized that mobility is essential not only for livestock survival but for cultural identity, making reduced access to grazing corridors particularly distressing.

Environmental variability further complicates grazing dynamics. Participants reported that changing rainfall patterns, soil degradation, and recurrent dry seasons limit pasture quality, often pushing livestock closer to agricultural zones where conflict risk is highest. These ecological pressures align with studies showing that climate variability intensifies competition for limited resources, especially in pastoral landscapes that depend on natural forage (Leal Filho et al., 2025; Mathbout et al., 2025). Some herders noted that degraded soils and invasive species have reduced natural pasture availability, requiring longer grazing movements that are increasingly obstructed by farmland expansion. This environmental degradation reduces the flexibility that pastoral systems rely on and amplifies the need for coordinated land-use planning.

Despite these challenges, participants identified local conflict-resolution strategies and collaboration mechanisms that could foster coexistence between farmers and herders. Informants described instances where communities negotiated grazing schedules, shared responsibilities for crop protection, or established informal corridors for livestock movement. These practices align with literature highlighting the value of participatory, community-led approaches to managing shared landscapes (Andriarimalala et al., 2013; Leal Filho et al., 2025). However, such agreements remain fragile without formal recognition and broader governance support. Strengthening these participatory mechanisms through training, facilitation,

and integration into official land-use planning could help sustain traditional grazing systems while reducing the frequency and severity of conflict.

CONCLUSION

This study shows that land struggles in the SOFIA region arise from the intertwined effects of agricultural expansion, shrinking spaces, weak governance, and socioeconomic dependence on land-based livelihoods, all of which intensify competition between farmers and herders. The findings highlight how evolving agricultural practices, increasing land privatization, and unclear tenure systems exacerbate tensions, especially in a context where local authorities lack the capacity to mediate disputes effectively and where poorer households face heightened vulnerability. To address these challenges, the study recommends strengthening local governance, harmonizing customary and statutory tenure rules, promoting participatory land-use planning that includes both farmers and herders, and supporting sustainable practices such as agroforestry and conservation agriculture to reduce pressure on fertile land. Reinforcing community-based conflict-resolution mechanisms, formalizing negotiated grazing corridors, and improving access to technical support can further reduce disputes and enhance coexistence. Given the dynamic nature of land use in Madagascar, future research should examine how climate variability, long-term soil degradation, and demographic change interact with local governance to shape land conflicts, and explore models for integrating traditional grazing norms into modern land-management strategies.

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