

# Minimum and Maximum Land Size Assessment: *A Systematic Literature Review of Emerging Thematic Issues in Kenya*

\*Silas Mwiti Muketha

<https://orcid.org/0009-0003-4022-7381>

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## Abstract

*Despite decades of policy interventions and constitutional mandates in several countries, limited global consensus exists on appropriate minimum and maximum landholding thresholds to sustain agricultural productivity and household livelihoods. This study reviews the literature on minimum and maximum land sizes to identify emerging thematic patterns in rural agricultural landholding policy. The study uses a systematic literature review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and synthesizes evidence from 28 studies that met the inclusion criteria. The review identifies four major themes: minimum viable farm size and living income thresholds, land fragmentation measurement, land consolidation as a policy instrument, and agricultural zoning with maximum landholding ceilings. The findings show that fixed quantitative standards are unsuitable across diverse contexts, highlighting the need for land optimization strategies based on income viability, voluntary consolidation, cooperative farming, and context-specific agricultural zoning. These findings provide evidence to inform Kenya's constitutional land reforms and land policy in other developing countries.*

**Keywords:** Minimum landholding size, maximum landholding size, land fragmentation, land consolidation, agricultural zoning, land policy, Kenya

## INTRODUCTION

Landholding sizes differ substantially around the world, with resulting divergent issues for policymakers. In developed countries such as Australia, Canada, and the United States, the average farm size exceeds 178 hectares, and production is primarily carried out by very large commercial farms (Mayele et al., 2024; Sikk & Maasikame, 2015). On the other hand, in much of South Asia and sub-Saharan Africa, farming is mostly undertaken on small, scattered plots. The average landholding in Bangladesh is 0.35 hectares, in Rwanda 0.7 hectares, and in Ethiopia 0.83 hectares (Ali et al., 2019; Amsalu, 2024).

Partible inheritance (the division of land equally among all heirs) has led to extreme fragmentation in many developing countries, whereas primogeniture and concentrated land ownership have helped preserve large holdings in other countries (Paudel et al., 2013; Travnicek et al., 2002).

Governments have tried to address this problem by setting minimum landholding sizes (to prevent unviable fragmentation) and maximum landholding sizes (to redistribute excess land) through land ceiling acts, agricultural zoning, and subsidy thresholds (Akkaya Aslan et al., 2007; Duangbootsee, 2024; Oregon Administrative Rules, 2025; UK Statutory Instrument, 2009). Nevertheless, there is no global agreement on appropriate thresholds, which range from 0.1 hectares for United Kingdom subsidies to 160 acres for Oregon rangeland, illustrating that appropriate landholding sizes are highly context-dependent (Marinus et al., 2021; Minnesota Legislature, 2025).

Landholding thresholds are particularly important in sub-Saharan Africa, where rapid population growth and limited land availability have reduced average farm sizes. Kenya's per capita arable land declined from 0.462 hectares in the 1960s

\*Corresponding author:

Silas Mwiti Muketha University of Nairobi (UoN), Faculty of the Built Environment and Design (FABED, Department of Urban and Regional Planning, Nairobi, Kenya  
Email: [smmuketha@gmail.com](mailto:smmuketha@gmail.com)

to approximately 0.11 hectares in recent years. Similarly, Rwanda and Ethiopia have experienced substantial declines, with 34% of Ethiopian farmers cultivating less than 0.5 hectares (Ali et al., 2019; Amsalu, 2024; National Land Commission, 2022).

According to research, East African highland farms smaller than 2.1–3.6 hectares cannot support a living income, while most farms currently measure only 0.8–1.8 hectares (Marinus et al., 2021). Traditional inheritance practices requiring land to be divided equally among heirs, together with poorly functioning land markets and weak enforcement of land-use regulations, have accelerated land fragmentation despite attempts to establish minimum landholding sizes (Belay, 2024; Duangbootsee, 2024; Paudel et al., 2013). Consequently, few African countries have enacted effective legislation establishing explicit minimum or maximum agricultural landholding sizes, creating a policy vacuum in which land continues to be subdivided into economically unviable units.

Kenya provides a good example of the conflicts arising from the absence of evidence-based landholding size policies. Only 16% of Kenya's land is classified as high-potential agricultural land, yet this small proportion supports nearly 80% of the country's population, creating enormous pressure on agricultural land (National Land Commission, 2022). Smallholder farms (under five hectares) increased from 2.22 million to 7.64 million between 1994 and 2016, while farms larger than 10 hectares declined from 92,498 to 6,714 (NLC, 2022). In Vihiga County, where population density reaches 1,045 persons per square kilometre, land parcels are as small as 0.01 hectares and 84% of farmers own less than one acre (Mwendwa et al., 2024).

In Embu County, the minimum farm size required to achieve household food security was two hectares in the Sunflower Zone but only 0.5 hectares in the Tea Zone, demonstrating that even within Kenya, context-specific and agro-ecological landholding thresholds are necessary (Ndirangu, 2020). Kenya's Constitution (2010), under Article 68, assigns Parliament the responsibility of enacting legislation prescribing minimum and maximum landholding sizes for private land, while the National Land Policy (2009) calls for the identification of economically viable minimum landholding sizes. However, as of 2025, no such

legislation has been enacted (National Land Commission, 2022).

Previous legislative proposals have failed because of inadequate empirical evidence for determining appropriate thresholds, resistance from landowners, and concerns regarding implementation. Consequently, continued subdivision of agricultural land into environmentally and economically unviable units has contributed to declining agricultural productivity and increasing rural food insecurity, with approximately 2.1 million Kenyans remaining chronically food insecure (National Land Commission, 2022).

This article addresses this gap by conducting a systematic literature review based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) of empirical and policy literature published between 2000 and 2025. It synthesizes evidence on minimum and maximum landholding size regulations and provides a comprehensive evidence base to inform landholding policies appropriate for Kenya and other developing countries.

### Problem Statement

Ideally, agricultural landholdings should be sufficiently large to enable farmers to achieve economies of scale, adopt modern technologies, generate surpluses, and sustain household livelihoods above poverty thresholds, as observed by Blarel et al. (1992) and Marinus et al. (2021). However, land fragmentation continues to subdivide farms into economically unviable units in many developing countries, while land concentration persists elsewhere, creating a dual challenge of fragmentation and inequitable land distribution (Mayele et al., 2024).

Despite decades of policy interventions, including consolidation programmes, agricultural zoning, and land ceiling legislation, there remains no global consensus on appropriate minimum and maximum landholding thresholds, and fixed quantitative standards have proved ineffective across diverse contexts (Duangbootsee, 2024). Moreover, maximum landholding ceilings remain severely under-researched, fragmentation measurement approaches remain inadequate, and the outcomes of land consolidation continue to be contested (Demetriou et al., 2013; Ali et al.,

2019). This systematic literature review addresses these gaps by synthesising evidence from 28 studies published between 2000 and 2025 to identify emerging thematic patterns, areas of agreement and disagreement, and knowledge gaps, thereby providing a comprehensive evidence base to inform landholding policy in developing countries.

### Specific Objectives

- i. To systematically review the literature on minimum and maximum landholding sizes in rural areas.
- ii. To identify the major themes emerging from the literature on minimum and maximum landholding sizes.
- iii. To propose strategies for promoting viable rural landholding sizes.

## THEORY

This section presents four complementary theoretical perspectives that inform the analysis of minimum and maximum landholding sizes in rural agricultural areas. Collectively, these theories provide analytical lenses for understanding land fragmentation, spatial organisation, agricultural productivity, and planning interventions. Each theory explains a different dimension of landholding policy and together provides the theoretical foundation for this systematic review.

### Theory of Economic Viability and Farm Size

Economic Viability Theory holds that farms must achieve a minimum scale to sustain household income above the poverty line (Blarel et al., 1992). The theory argues that farm size is directly associated with household welfare because larger farms enable economies of scale, mechanisation, and surplus production for markets. It is applied in this study to evaluate minimum landholding thresholds required to achieve a living income under different agro-ecological conditions. Its principal strength lies in linking landholding size with household welfare outcomes. However, it gives limited consideration to off-farm income opportunities and agricultural intensification strategies that may compensate for smaller landholdings (Aslam & Fazal, 2025).

### Land Sparing and Sharing Theory

Land Sparing and Sharing Theory, originating from conservation biology and agricultural

land-use planning, distinguishes between two approaches to managing agricultural landscapes (Fischer et al., 2008). Land sparing advocates intensive agricultural production on relatively small areas while conserving other land for biodiversity, whereas land sharing promotes wildlife-friendly farming practices across entire agricultural landscapes (Ntihinyurwa & de Vries, 2021). In this study, the theory is applied to evaluate whether minimum and maximum landholding policies should promote agricultural intensification on smaller parcels or encourage consolidation for more extensive farming systems. Unlike Economic Viability Theory, which focuses primarily on household welfare, this theory emphasizes balancing agricultural productivity with environmental sustainability. Its strength is providing a framework for reconciling production and conservation objectives, although it may oversimplify the complexity of rural livelihood strategies (Aslam & Fazal, 2025).

### Anti-commons Theory

Anti-commons Theory, developed by Heller (1998), explains how multiple owners holding exclusion rights over a shared resource can lead to its underutilisation. In the context of land fragmentation, when numerous individuals hold rights to separate parcels, they may restrict one another's effective use of land, resulting in what Museleku (2023) describes as a "spatial anti-commons." This theory is applied in this study to explain how excessive land subdivision and, in some cases, rigid landholding restrictions may create conditions in which land is underutilised rather than optimally managed. In contrast to Economic Viability Theory, which focuses on farm size, Anti-commons Theory explains the institutional and ownership barriers that reduce land-use efficiency. Its strength lies in explaining suboptimal land-use outcomes, while its limitation is that fragmentation is not always detrimental, as some fragmented landholding arrangements may be economically rational and socially beneficial (Negash, 2014).

### Spatial Planning and Zoning Theory

Spatial Planning and Zoning Theory, rooted in land-use planning and regional science, provides the conceptual basis for allocating land according to its suitability for different functions (FAO, 1993). The theory emphasises the systematic allocation of land uses based on biophysical

characteristics, socio-economic conditions, and policy objectives (Carsjens & Van der Knaap, 2002). Agro-ecological zoning identifies areas with similar combinations of soil, landform, and climatic characteristics to guide appropriate land-use planning (FAO, 1996). This theory is applied in the present study to evaluate agricultural zoning as a policy instrument for establishing minimum parcel sizes and reducing excessive fragmentation. Unlike Anti-commons Theory, which explains why fragmentation occurs, Spatial Planning and Zoning Theory provides practical planning mechanisms for addressing fragmentation through land-use regulation. Its principal strength is providing a systematic framework for land allocation decisions, although static zoning approaches may not adequately accommodate changing socio-economic conditions and evolving land market pressures (Hidding & Teunissen, 2002).

### Synthesis of the Theoretical Perspectives

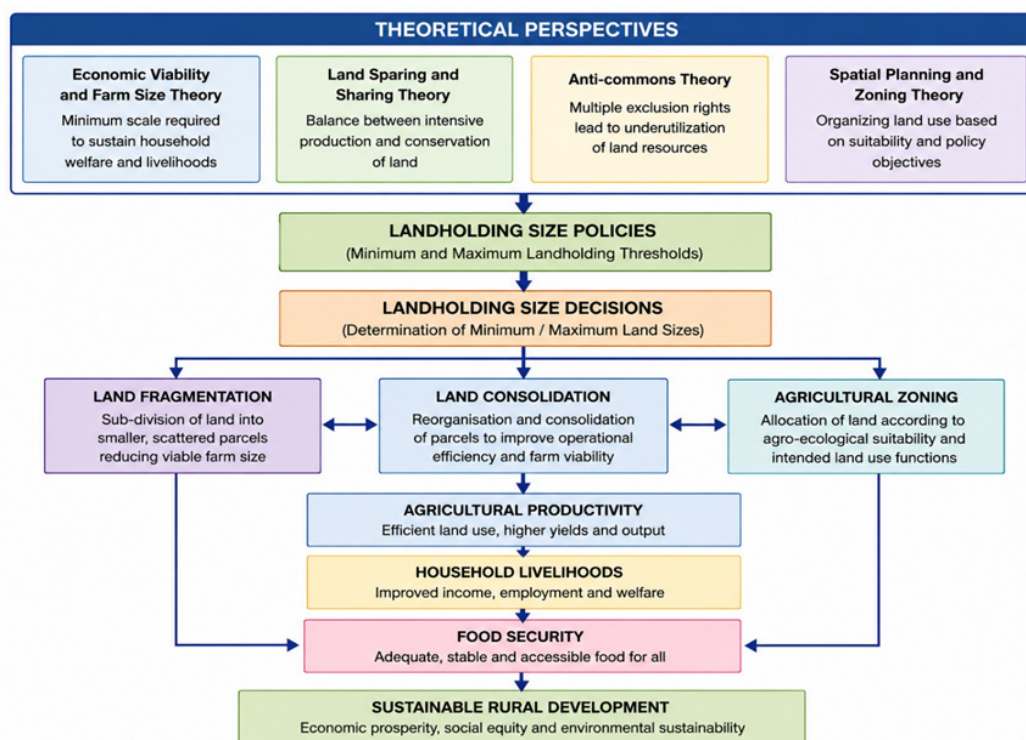
Collectively, these four theories provide complementary rather than competing perspectives for analysing minimum and maximum landholding sizes. Economic Viability Theory explains the minimum landholding thresholds

required to sustain household livelihoods, while Anti-commons Theory explains how excessive subdivision can reduce productive land use. Land Sparing and Sharing Theory addresses the trade-offs between agricultural productivity and environmental conservation, whereas Spatial Planning and Zoning Theory provides planning instruments for implementing context-specific landholding policies. Together, these theories offer an integrated analytical framework for interpreting the evidence synthesised in this review and evaluating policy options for sustainable rural landholding management.

### Conceptual Framework

**Figure 1** presents the conceptual framework that guides this study by illustrating the relationships among the theoretical perspectives, landholding size policies, and the expected outcomes for sustainable rural development.

The conceptual framework presented in **Figure 1** illustrates the relationships among the theoretical perspectives, landholding policies, and the anticipated outcomes of minimum and maximum landholding size decisions. It demonstrates how the four complementary theories jointly



**FIGURE 1**

Conceptual framework linking landholding policies, livelihoods, and sustainability

**Source:** Author's conceptualisation based on reviewed literature and theories, 2026

inform the formulation and implementation of landholding policies aimed at addressing fragmentation, promoting efficient land use, and improving rural livelihoods. Rather than relying on a single theoretical perspective, the framework integrates economic, institutional, environmental, and spatial planning considerations to provide a comprehensive analytical lens for examining landholding challenges.

The framework further shows that minimum and maximum landholding policies influence decisions regarding appropriate landholding sizes, which subsequently shape three interrelated land management processes: land fragmentation, land consolidation, and agricultural zoning. These processes affect agricultural productivity through their influence on farm structure, operational efficiency, and the suitability of land for agricultural production. Improved productivity contributes to enhanced household livelihoods and food security, ultimately supporting sustainable rural development. The framework therefore provides a logical pathway for interpreting the evidence synthesised in this review and for evaluating policy options that promote economically viable, socially equitable, and environmentally sustainable landholding systems.

## RESEARCH METHODS

This systematic literature review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency, reproducibility, and methodological rigor (Page et al., 2021). The review addressed five research questions concerning minimum and maximum rural landholding sizes: (1) methods used to identify landholding thresholds; (2) policy instruments adopted; (3) impacts on agricultural productivity, land fragmentation, equity, and food security; (4) unintended consequences; and (5) the influence of contextual factors on these outcomes. Electronic database searches were conducted between January 5 and January 15, 2026.

### Search Strategy and Databases

Relevant literature was identified through six electronic databases: Scopus, Web of Science, Google Scholar, AgEcon Search, PubMed, and the FAO Land Tenure Database. Searches included peer-reviewed journal articles, government

reports, legal documents, institutional reports, and working papers published between January 2000 and December 2025. Boolean operators combined keywords relating to landholding size, policy instruments, and agricultural outcomes. Additional studies were identified through backward and forward citation tracking using Google Scholar and by searching grey literature from the Food and Agriculture Organization (FAO), World Bank, International Food Policy Research Institute (IFPRI), and national land commissions. The Boolean search strategy was adapted to suit the indexing requirements of individual databases.

### Inclusion and Exclusion Criteria

Study selection followed the PICOS framework (Population, Intervention, Comparator, Outcomes, and Study Design). Eligible studies focused on rural agricultural landholders, policies establishing minimum or maximum landholding sizes, or empirical analyses of viable farm sizes. Studies addressing agricultural productivity, land fragmentation, household income, food security, land access, or unintended policy outcomes were included. Quantitative, qualitative, mixed-methods studies, systematic reviews, policy evaluations, legal analyses, and government reports published in English between 2000 and 2025 were considered. Studies unrelated to agriculture, lacking explicit landholding thresholds, or published before 2000 were excluded.

The inclusion and exclusion criteria used to select studies for this systematic review are presented in **Table 1** following the PICOS framework.

### Search Results and Study Selection

The PRISMA screening process identified 28 studies that satisfied all inclusion criteria and were included in the final synthesis. No additional eligible studies were identified through hand-searching (**Figure 2**).

### Data Extraction

A standardized extraction form was developed and piloted using five randomly selected studies. Two independent reviewers extracted data, with disagreements resolved through discussion or consultation with a third reviewer. Inter-reviewer reliability was assessed using Cohen's kappa coefficient ( $\kappa = 0.82$ ), indicating almost perfect agreement (Landis & Koch, 1977). Methodological

**TABLE 1**  
PICOS framework guiding study inclusion and exclusion criteria

| Criterion                 | Inclusion                                                                                                                                                                                                                                                  | Exclusion                                                                                           |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Population</b>         | Rural smallholders, commercial farmers, agricultural households, and landholders                                                                                                                                                                           | Urban land, industrial non-agricultural land, and forestry-only operations                          |
| <b>Intervention</b>       | Policies, laws, regulations, or programs establishing minimum or maximum landholding sizes; studies calculating optimal or minimum viable farm sizes                                                                                                       | Studies on land fragmentation without explicit size thresholds                                      |
| <b>Comparator</b>         | Unregulated areas, different size thresholds, pre-post policy implementation, or across agro-ecological zones                                                                                                                                              | No comparator or control                                                                            |
| <b>Outcomes</b>           | Agricultural productivity (yield, technical efficiency), land fragmentation indices, household income or living income, food security, equity (land access by marginalized groups), unintended consequences (eviction, informal tenancy, land abandonment) | Outcomes not related to land use or agriculture                                                     |
| <b>Study Design</b>       | Empirical (quantitative, qualitative, mixed methods), systematic reviews, meta-analyses, policy evaluations, legal analyses, government reports                                                                                                            | Editorials, opinion pieces, purely theoretical without data, conference abstracts without full text |
| <b>Geography</b>          | Global (no restriction)                                                                                                                                                                                                                                    | None                                                                                                |
| <b>Language</b>           | English                                                                                                                                                                                                                                                    | Non-English                                                                                         |
| <b>Publication Period</b> | January 2000 – December 2025                                                                                                                                                                                                                               | Pre-2000                                                                                            |

**Source:** Author's compilation based on PRISMA and PICOS framework, 2026

quality was assessed using the Mixed Methods Appraisal Tool (MMAT) for empirical studies and Joanna Briggs Institute (JBI) checklists for reviews and policy documents. Quality assessment informed interpretation of findings but was not used to exclude studies. Extracted information included study identification, geographical context, policy type, legal instruments, methodology, sample characteristics, contextual factors, key findings, outcomes, and reported limitations.

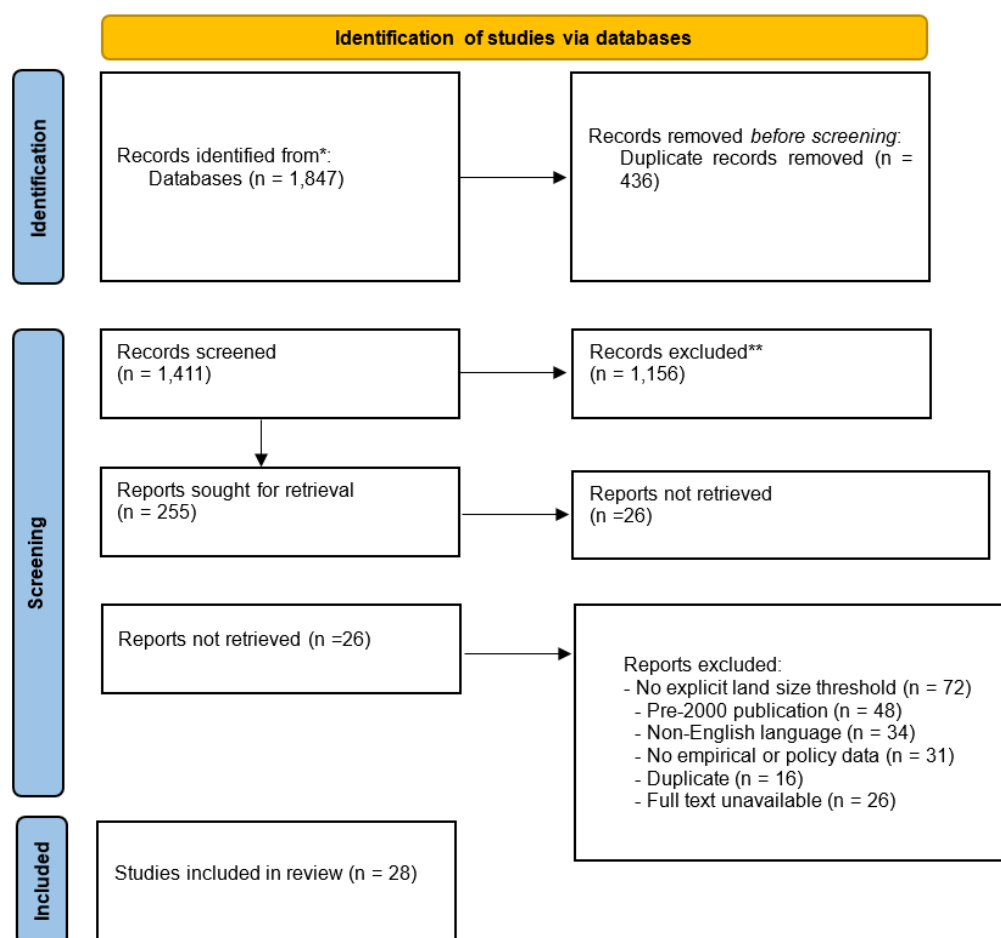
### Data Synthesis

Because of substantial variation in study designs, policy instruments, geographical settings, and outcome measures, a narrative synthesis was undertaken following the Economic and Social Research Council (ESRC) guidance (Popay et al., 2006). Findings were synthesised according to the study objectives and organised by geographical region (global, Africa, and Kenya) and policy instrument. Where quantitative evidence was comparable, descriptive statistics, including ranges, medians, and means, were used to

summarise findings. Variability was explored according to agro-ecological zones, population density, and policy type, while publication bias was assessed qualitatively through comparison of peer-reviewed and grey literature as shown in **Table 2**.

### Limitations of the Review

This review has several limitations. The predominance of cross-sectional studies limited causal inference, while restricting the review to English-language publications may have excluded relevant studies from non-English-speaking countries. Inclusion of grey literature introduced variability in publication quality, although formal quality appraisal was undertaken. Furthermore, considerable heterogeneity in study designs and outcome measures prevented meta-analysis, making the findings context-specific. Despite these limitations, the review provides a robust evidence base for informing landholding policy in Kenya and other developing countries.



**FIGURE 2**

PRISMA flow diagram illustrating systematic study selection process

Source: Adapted from Page et al. (2021) PRISMA Statement

**TABLE 2**

Data extraction fields used for systematic literature review

| Data Field                 | Description                                                                                                                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Study identification       | Author(s), year, title, journal/source                                                                                                                                                                         |
| Geographic context         | Country, region, agro-ecological zone (if specified)                                                                                                                                                           |
| Policy/threshold type      | Minimum size, maximum size, or both; specific threshold value (hectares/acres)                                                                                                                                 |
| Legal or policy instrument | Land ceiling act, agricultural zoning, subsidy threshold, inheritance restriction, land consolidation program                                                                                                  |
| Methodology                | Quantitative (production function, DEA, regression, simulation), qualitative (case study, FGD, legal analysis), mixed methods                                                                                  |
| Sample characteristics     | Sample size (households, farms, plots, or jurisdictions)                                                                                                                                                       |
| Key outcomes               | Productivity (yield, technical efficiency, profitability), fragmentation (number of parcels, Simpson index, average parcel size), equity (land access, gender effects), food security, unintended consequences |
| Contextual mediators       | Agro-ecological zone, population density, off-farm employment, land market functioning, mechanization, tenure security                                                                                         |
| Key findings               | Main results relevant to minimum/maximum size research questions                                                                                                                                               |
| Limitations                | Author-reported limitations                                                                                                                                                                                    |

Source: Author's compilation based on PRISMA extraction reporting guidelines, 2026

## RESULTS

### Overview of Included Studies

This review included 28 studies comprising peer-reviewed journal articles, government reports, legal documents, working papers, and institutional publications. The literature spans the period 2000–2025, with a notable increase in publications after 2020, reflecting growing policy attention to land fragmentation, food security, and landholding regulations following the promulgation of the Constitution of Kenya, 2010, together with increasing concerns over climate-induced agricultural stressors.

Qualitative synthesis of the 28 studies identified four major themes relating to minimum and maximum rural landholding sizes. These themes emerged through iterative reading, coding, and cross-referencing of findings across the reviewed literature. They represent the most frequently recurring policy and practical issues regardless of methodology, geographical coverage, or study design.

### Geographic Distribution

The geographical distribution of the reviewed studies is presented in **Figure 3**.

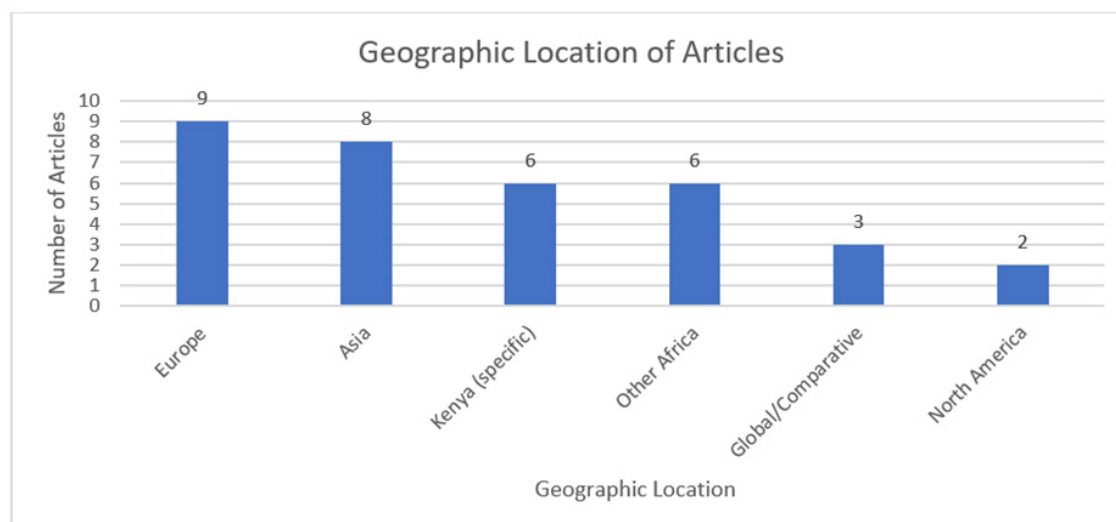
**Note:** Articles covering multiple regions are counted in each applicable category; therefore, the total exceeds 28.

Europe accounted for the largest share of the reviewed studies (9 studies), reflecting its long history of land consolidation policies and institutional reforms. Asia followed with 8 studies, illustrating increasing interest in landholding regulations and agricultural restructuring. Kenya-specific studies totalled six, demonstrating growing national research interest in landholding policies. Similarly, studies from other African countries—including Ethiopia, Rwanda, Uganda, South Africa, and Ghana—also totalled six. In contrast, global comparative studies and North American research were relatively few, suggesting that most existing studies remain regionally focused rather than internationally comparative.

### Temporal Distribution

The distribution of publications over time is presented in **Figure 4**.

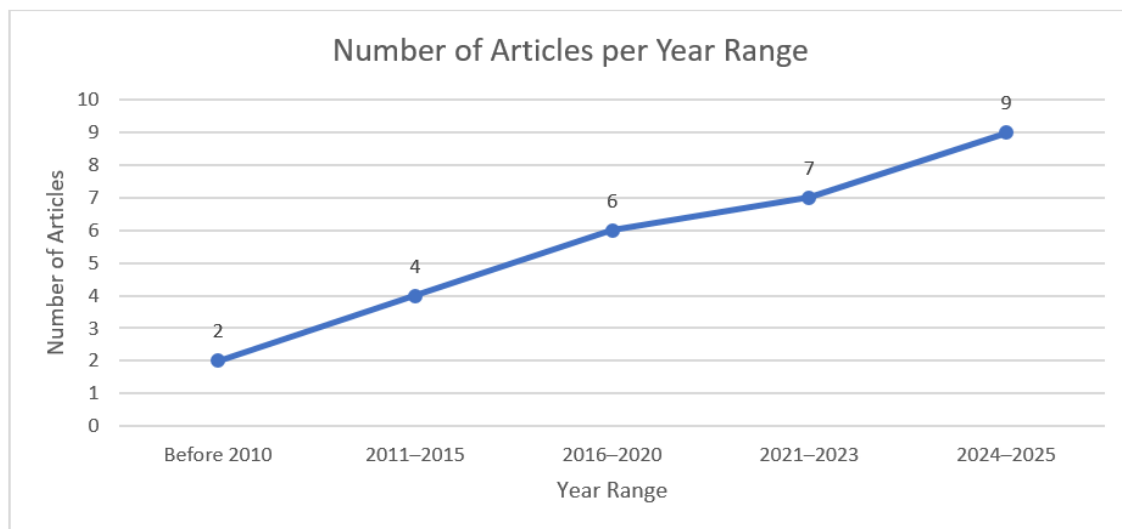
Scholarly interest in minimum and maximum rural landholding sizes has increased steadily over time. Before 2010, only two studies were identified, indicating that the subject received relatively limited attention during this period. Between 2011 and 2015, publications increased to four studies, followed by six studies during 2016–2020. The greatest growth occurred between 2021 and 2025, accounting for 57% of all studies included in this review. This trend reflects increasing global concern regarding land fragmentation, agricultural productivity, food security, climate change, and sustainable rural development.



**FIGURE 3**

Geographic distribution of reviewed landholding size literature studies

**Source:** Author's compilation from reviewed literature by geographical regions, 2026



**FIGURE 4**

Publication trends of reviewed studies between 2000 and 2025

**Source:** Author's compilation from publication years of reviewed studies, 2026

### Methodological Distribution

The methodological approaches adopted by the reviewed studies are presented in **Figure 5**.

Quantitative methods dominated the reviewed literature (48.1%), primarily employing regression analysis, stochastic frontier analysis, and simulation modelling. Qualitative approaches, including case studies, legal analyses, and conceptual studies, accounted for 21% of the reviewed literature and provided important insights into policy implementation and local institutional contexts.

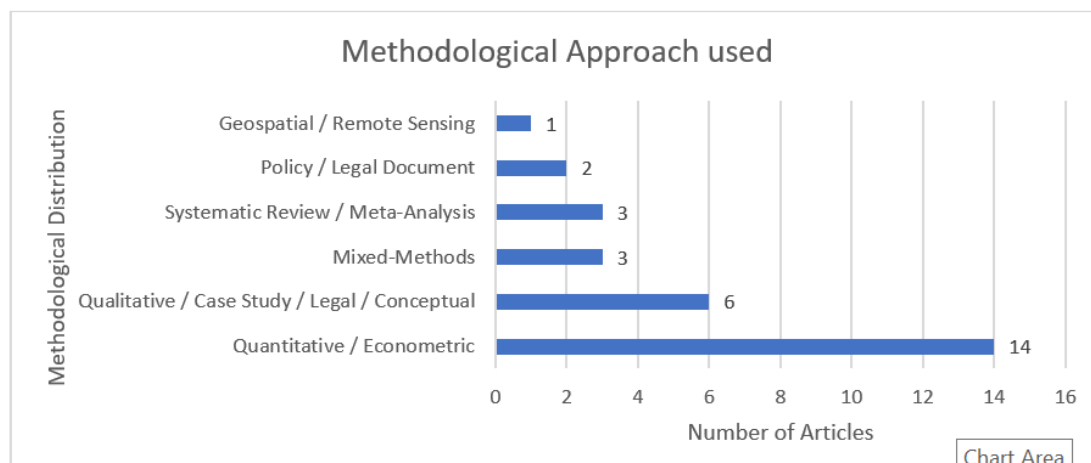
Mixed-methods studies (10%) and systematic reviews/meta-analyses (10%) were comparatively fewer but appear to be increasing. Policy and

legal document analyses (7.1%) together with geospatial methods (3.5%) were the least represented approaches, suggesting opportunities for future studies to integrate spatial analysis with legal and policy evaluation.

### Publication Type Distribution

The distribution of publication types is presented in **Figure 6**.

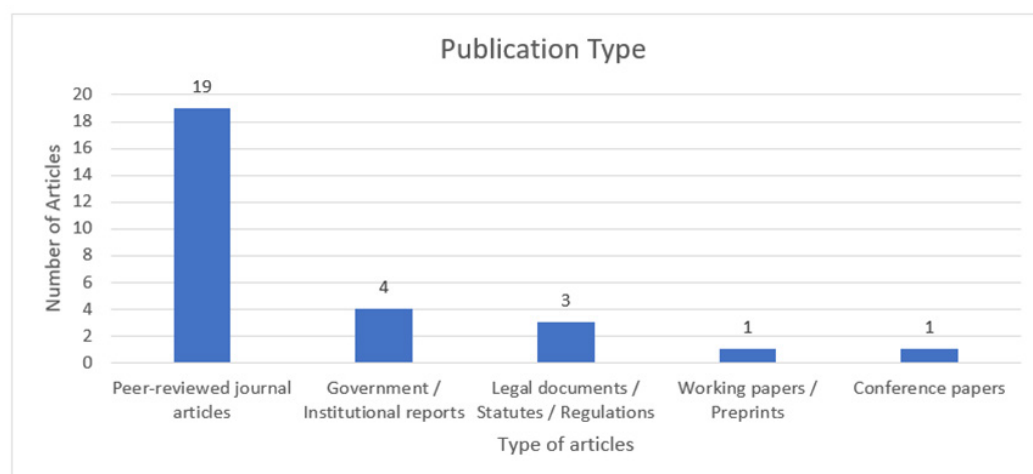
Peer-reviewed journal articles constituted the largest proportion of the reviewed literature (67%), indicating that research on minimum and maximum landholding sizes has matured sufficiently for publication in established academic journals. Government and institutional reports



**FIGURE 5**

Methodological approaches adopted across reviewed landholding size studies

**Source:** Author's compilation from methodologies reported in reviewed studies, 2026

**FIGURE 6**

Publication types represented within the reviewed literature

**Source:** Author's compilation from publication categories of reviewed studies, 2026

(14%) together with legal documents (10.7%) also contributed substantially, reflecting the policy-oriented nature of landholding regulation. Working papers and conference publications collectively represented only 7.4%, suggesting that most research findings have progressed beyond preliminary dissemination into peer-reviewed academic publications.

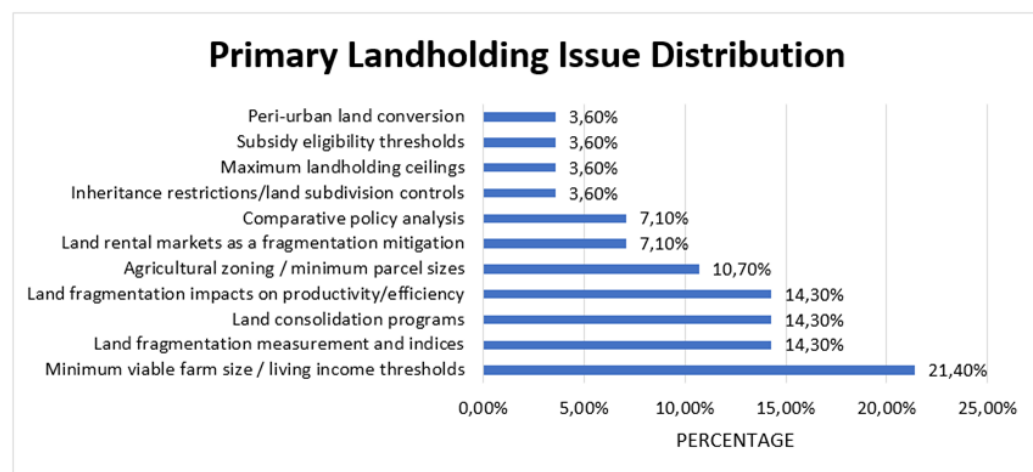
### Primary Landholding Issue Distribution

The distribution of the principal landholding issues examined in the reviewed studies is presented in **Figure 7**.

Minimum viable farm size and living income thresholds were the most frequently investigated

issues (21.4%), reflecting growing concern over the minimum land area required for farm households to achieve a decent standard of living. Land fragmentation measurement (14.3%), land consolidation programmes (14.3%), and the effects of fragmentation on agricultural productivity (14.3%) received equal attention, demonstrating the close relationship among these themes.

Agricultural zoning and minimum parcel size regulations accounted for 10.7% of the reviewed studies, while land rental markets represented 7.1%. In contrast, maximum landholding ceilings (3.6%) received the least attention despite constitutional and legislative provisions in countries such as Kenya, India, and Nepal.

**FIGURE 7**

Primary landholding issues examined across reviewed studies

**Source:** Author's compilation from thematic analysis of reviewed literature, 2026

This finding highlights an important research gap regarding policies that regulate maximum landholding sizes.

### Data Source Distribution

The distribution of data sources used in the reviewed studies is presented in **Figure 8**.

Primary survey and field data constituted the largest source of evidence (35.7%), indicating that many studies relied on direct household-level information on landholdings, agricultural production, and household livelihoods. Secondary and archival data, including cadastral records, satellite imagery, and nationally available datasets, accounted for 28.6%, reflecting increasing access to administrative and geospatial information.

Legal document analysis (14.3%) and literature reviews (10.7%) represented a smaller proportion of the reviewed studies. Mixed data sources (7.1%) and simulation-based approaches (3.6%) were the least frequently used. Overall, the predominance of primary data suggests that comprehensive and publicly accessible datasets on rural landholding sizes remain limited across many countries.

### Classification by Policy Instrument Type

The policy instruments identified in the reviewed literature are summarised in **Figure 9**.

Land consolidation programmes dominated the reviewed literature (21.4%), reflecting the

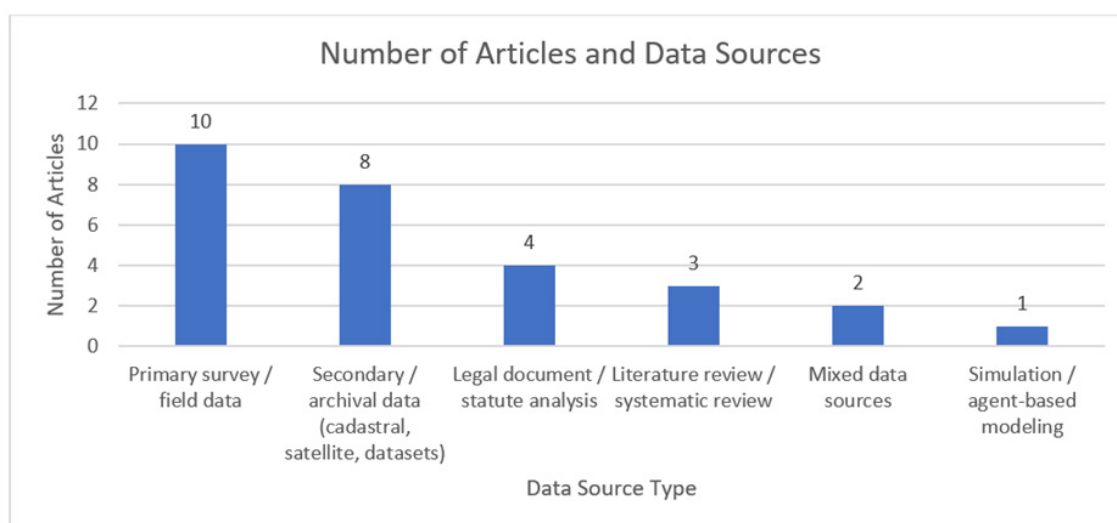
strong policy emphasis placed on reducing land fragmentation and improving agricultural productivity. Fragmentation measurement (14.3%) and comparative policy analyses (10.7%) also received considerable attention.

Agricultural zoning (7.1%), subsidy thresholds, inheritance restrictions, and land ceiling policies each appeared less frequently. Most notably, maximum landholding ceilings (3.6%) were severely under-researched despite Kenya's constitutional requirement under Article 68 to prescribe minimum and maximum landholding acreages. Only one reviewed study examined maximum landholding ceilings within the Indian context, indicating a significant gap in the existing literature.

### Detailed Thematic Analysis of Mini-Max Landholding Literature

The four major themes emerging from the systematic review are presented in **Table 3**.

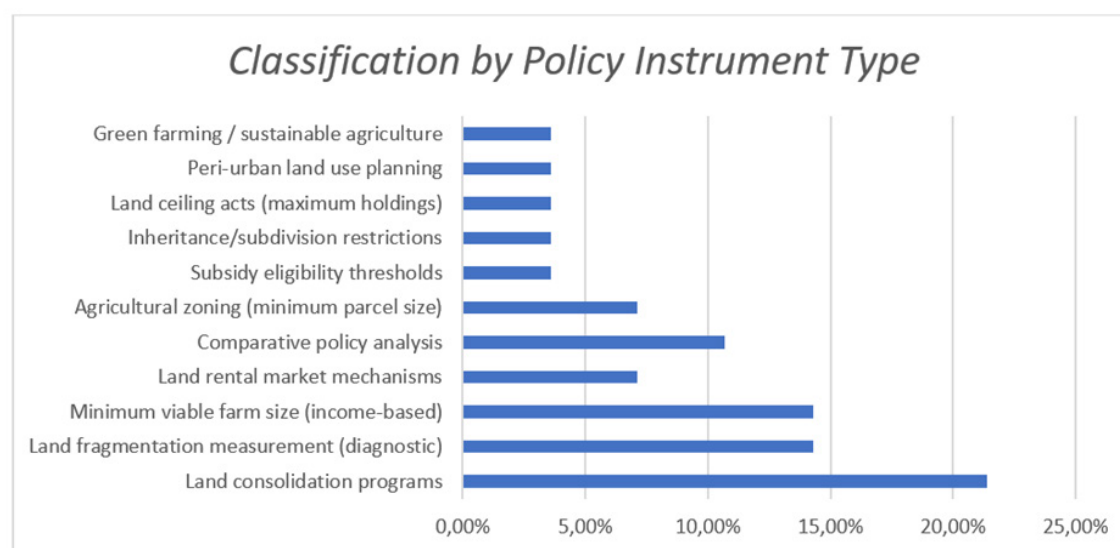
The thematic analysis identified four recurring themes across the reviewed studies: minimum viable farm size and living income thresholds; land fragmentation measurement and diagnostic tools; land consolidation as a policy instrument; and agricultural zoning together with maximum landholding ceilings. These themes collectively capture the principal policy concerns, methodological approaches, and implementation challenges associated with determining minimum



**FIGURE 8**

Data sources used across reviewed landholding size studies

**Source:** Author's compilation from reviewed studies' reported data sources, 2026

**FIGURE 9**

Policy instruments identified across reviewed landholding size literature

**Source:** Author's compilation from reviewed policy and empirical studies, 2026

**TABLE 3**

Major themes emerging from reviewed mini-max landholding literature

| Identified Theme                                               | Definition                                                                                                                                                                                                                                                                                                                                    | Illustrative Quotation from Literature (with Page Number)                                                                                                                                                                                                                                                                             | Key References                                                                                                                                                                                                                 |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1: Minimum Viable Farm Size and Living Income Thresholds | The minimum land area required for a farm household to achieve a decent standard of living varies significantly across agro-ecological zones, crop types, and off-farm income opportunities, with studies proposing income-based methodologies to determine context-specific thresholds.                                                      | "The minimum farm size required for a living income in the East African Highlands ranges from 2.1 to 3.6 hectares under baseline conditions, far above the current median farm size of 0.8 to 1.8 hectares, indicating that most smallholder farms operate below the viability threshold." (Marinus et al., 2021, p. 12)              | Amsalu (2024); Belay (2024); Das et al. (2025); Duangbootsee (2024); Eder (2024); Fikratzade et al. (2024); Marinus et al. (2021); Mayele et al. (2024); Mwendwa et al. (2024); National Land Commission (2022); Syagga (2016) |
| Theme 2: Land Fragmentation Measurement and Diagnostic Tools   | Accurate measurement of land fragmentation requires multidimensional indices that capture not only the number and size of parcels but also their shape, spatial dispersion, distance from the farmstead, and ownership complexity. Existing indices (Simpson, Januszewski) are inadequate for capturing the full complexity of fragmentation. | "The global land fragmentation index (GLFI) outperforms existing indices by integrating six core factors: dispersion of parcels, size of parcels, shape of parcels, accessibility, dual ownership, and shared ownership. The GLFI showed that existing indices underestimate fragmentation severity." (Demetriou et al., 2013, p. 78) | Amsalu (2024); Demetriou et al. (2013); Hu et al. (2024); Mayele et al. (2024); Mwendwa et al. (2024); National Land Commission (2022); Sikk & Maasikamäe (2015)                                                               |

| Identified Theme                                              | Definition                                                                                                                                                                                                                                                                                                                                                                                         | Illustrative Quotation from Literature (with Page Number)                                                                                                                                                                                                                                                                                                            | Key References                                                                                                                                                                                      |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 3: Land Consolidation as a Policy Instrument            | Land consolidation programs are the most frequently applied policy instrument to address fragmentation, but their success depends on voluntary participation, adequate legal frameworks, institutional capacity, and the provision of complementary infrastructure (roads, irrigation). Consolidation can increase productivity by 7–15% when properly implemented.                                | "Hypothetical amalgamation of all of a household's parcels into one would, based on our results, increase yield by some 7%. Programs to consolidate holdings the cost of which exceeds the net present value of this benefit can be justified economically only if additional assumptions on future benefit streams are made." (Ali et al., 2019, p. 14)             | Akkaya Aslan et al. (2007); Aleknavičius (2023); Ali et al. (2019); Belay (2024); Eder (2024); Platonova & Jankava (2013); Sikk & Maasikamäe (2015); Travnicek et al. (2002); Trovato et al. (2023) |
| Theme 4: Agricultural Zoning and Maximum Landholding Ceilings | Agricultural zoning laws (minimum parcel sizes) and land ceiling acts (maximum holding sizes) are used in various jurisdictions to prevent fragmentation and redistribute land. However, maximum ceilings are under-researched and often evaded through benami transactions, informal tenancy, and land conversion, while zoning effectiveness depends on enforcement capacity and political will. | "Despite the constitutional mandate in Kenya (Article 68) to prescribe minimum and maximum landholding acreages, no such legislation has been enacted. Where ceiling laws exist (India, Nepal), evasion through benami transactions and informal tenancy arrangements significantly undermines their redistributive intent." (National Land Commission, 2022, p. 85) | Belay (2024); Minnesota Legislature (2025); National Land Commission (2022); Oregon Administrative Rules (2025); Paudel et al. (2013); Thuo (2020); UK Statutory Instrument (2009)                  |

**Source:** Author's synthesis based on reviewed literature and thematic analysis, 2026

and maximum rural landholding sizes.

As shown in **Table 3**, the reviewed studies consistently demonstrate that viable farm sizes differ considerably according to agro-ecological conditions, crop enterprises, land tenure arrangements, and off-farm income opportunities. Similarly, land fragmentation is increasingly measured using multidimensional indicators that extend beyond parcel size to include parcel shape, accessibility, spatial dispersion, and ownership characteristics.

The literature further shows that land consolidation remains the most widely adopted policy instrument for addressing fragmentation. However, its effectiveness depends largely on supportive legal

frameworks, institutional capacity, voluntary participation, and complementary investments in rural infrastructure. Conversely, studies examining agricultural zoning and maximum landholding ceilings remain limited despite their policy significance in several jurisdictions.

### Strategies for Promoting Viable Rural Landholding Sizes

The reviewed studies consistently demonstrate that fixed global landholding standards are unlikely to achieve equitable or productive agricultural outcomes because viable farm sizes vary considerably across countries and agro-ecological zones. For example, viable landholdings range from approximately 0.5 hectares in intensive tea-growing areas to more than 3.6 hectares in less

productive regions (Marinus et al., 2021; National Land Commission, 2022).

Three broad strategies emerged from the literature. First, researchers recommend adopting multidimensional land fragmentation indices that incorporate parcel shape, accessibility, distance, and ownership characteristics rather than relying solely on parcel size (Demetriou et al., 2013; Ali et al., 2019). Second, the literature advocates income-based approaches that determine viable landholding sizes using minimum living-income thresholds supported by efficient land rental markets (Fikratzade et al., 2024; Marinus et al., 2021; Duangbootsee, 2024). Third, several studies recommend promoting functional land integration through cluster farming, cooperative farming, and complementary infrastructure investments as practical alternatives to compulsory physical land consolidation (Akkaya Aslan et al., 2007; Travnicsek et al., 2002; Belay, 2024; Eder, 2024).

Overall, the reviewed evidence suggests that flexible land optimisation strategies are more appropriate than rigid landholding standards because they can accommodate differences in ecological conditions, agricultural systems, and socio-economic contexts.

### Concluding synthesis of the Results

Taken together, the reviewed studies indicate that minimum and maximum landholding policies cannot be effectively implemented using universal thresholds. Instead, policy effectiveness depends on local agro-ecological conditions, land tenure systems, institutional capacity, and socio-economic contexts. The four thematic areas identified in this review provide the evidence base for the discussion that follows, where their broader implications for land policy formulation and implementation in Kenya and comparable developing countries are examined.

## DISCUSSION

### Minimum Viable Farm Size and Living-Income Thresholds

In relation to the first objective, the reviewed literature generally agrees that minimum viable farm size is context-specific, varying according to agro-ecology, crop type, and off-farm income. Marinus et al. (2021) found that minimum viable farm sizes range from 2.1 to 3.6 hectares in the

East African Highlands, far exceeding current median sizes of 0.8–1.8 hectares. The National Land Commission (2022) documented substantial variation within Kenya, requiring 2 hectares in Embu's Sunflower Zone but only 0.5 hectares in the Tea Zone. However, scholars disagree on whether agricultural intensification and off-farm income can compensate for small farm sizes and on the direction of farm size–productivity relationships (Ali et al., 2019; Eder, 2024; Hu et al., 2024). These findings partially support the Theory of Economic Viability and Farm Size (Blarel et al., 1992) while demonstrating that farm viability depends on more than land area alone.

### Land Fragmentation Measurement and Diagnostic Tools

Several reviewed studies indicate that traditional fragmentation indices inadequately capture parcel shape, distance, access, and ownership complexity. The Global Land Fragmentation Index provides a more comprehensive assessment (Demetriou et al., 2013; Amsalu, 2024). Although fragmentation generally increases production costs and reduces efficiency (Eder, 2024), disagreement remains over which fragmentation dimensions matter most and whether moderate fragmentation can reduce production risks (Ali et al., 2019; Das et al., 2025; Hu et al., 2024). These findings support Anti-commons Theory by highlighting the costs of excessive fragmentation while recognising potential adaptive benefits where households cultivate diverse ecological environments. Important gaps include limited cadastral data, inadequate validation of the Global Land Fragmentation Index, and the absence of continuous monitoring systems.

### Land Consolidation as a Policy Instrument

The literature indicates that land consolidation can improve agricultural productivity, although the reported gains remain modest (Ali et al., 2019; Eder, 2024). The reviewed studies generally favour voluntary rather than compulsory consolidation and emphasise the importance of supporting infrastructure, including roads and irrigation. Nevertheless, disagreement persists regarding cost-effectiveness, impacts on smallholders, and programme targeting. Limited long-term evaluations, inadequate cost-benefit analyses, and insufficient institutional and gender-related evidence remain important research gaps. These findings support Spatial Planning and

Zoning Theory and align with Land Sparing and Sharing Theory, although they also demonstrate that consolidation outcomes depend on local institutional and socio-economic conditions.

### Agricultural Zoning and Maximum Landholding Ceilings

The reviewed literature indicates that agricultural zoning and minimum parcel-size regulations can reduce land fragmentation where effectively enforced. However, maximum landholding ceilings remain underutilised and weakly enforced despite constitutional provisions in several countries. Considerable variation in minimum parcel thresholds across jurisdictions demonstrates that uniform landholding standards are unlikely to be effective. These findings support Spatial Planning and Zoning Theory and Anti-commons Theory while highlighting the need for context-specific implementation, improved monitoring, and stronger evidence to support Kenya's constitutional mandate under Article 68.

### Integrated Theoretical Interpretation

Collectively, the four theoretical perspectives demonstrate that appropriate landholding sizes cannot be explained solely through economic efficiency. Economic viability, property-right structures, spatial planning, institutional capacity, and ecological conditions interact to determine sustainable landholding thresholds. No single theory fully explains the complexity of minimum and maximum landholding policies.

### Comparison with Previous Systematic Reviews

Compared with previous systematic reviews focusing mainly on land fragmentation and productivity (Mayele et al., 2024; Amsalu, 2024), this review synthesises evidence on minimum and maximum landholding sizes, policy instruments, and land optimisation strategies. The inclusion of maximum landholding ceilings, despite limited empirical evidence, represents an important contribution to the literature by integrating fragmentation, consolidation, zoning, and landholding thresholds within a single analytical framework.

### International Policy Implications

The findings have implications beyond Kenya, particularly for countries experiencing rapid population growth, land fragmentation, and institutional constraints. However, policy transfer should be undertaken cautiously because successful landholding policies depend on local tenure systems, agro-ecological conditions, administrative capacity, and infrastructure. In relation to the third objective, the review supports flexible land optimisation approaches—including voluntary consolidation, land rental markets, cooperative farming, agricultural zoning, improved cadastral systems, and income-based assessments of farm viability—rather than universal acreage standards. The principal areas of agreement, disagreement, and remaining research gaps are summarised in **Table 4**.

**TABLE 4**

Major themes, agreements, disagreements, and research gaps identified from the reviewed literature

| Theme                             | Points of Agreement                                                                                                                                                                                                                                                                                                                                                                                    | Points of Disagreement                                                                                                                                                                                                                                                                                                                                                                                                                           | Weaknesses / Gaps                                                                                                                                                                                                                                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 1: Minimum Viable Farm Size | Minimum viable farm size is context-specific and varies by agro-ecological zone (Marinus et al., 2021; National Land Commission, 2022; Syagga, 2016; Fikratzade et al., 2024). Income-based methodologies are preferred over productivity-based approaches. Current farm sizes in most developing countries fall below viability thresholds (Amsalu, 2024; Mayele et al., 2024; Mwendwa et al., 2024). | Some say intensification (improved seeds, fertilizers, livestock) can compensate for small farm size (Marinus et al., 2021). Others say land consolidation remains necessary (Amsalu, 2024; Eder, 2024). Off-farm income reduces fragmentation (Duangbootsee, 2024) vs. increases fragmentation (Das et al., 2025). Farm size-productivity relationship is positive (Ali et al., 2019) vs. negative or non-linear (Eder, 2024; Hu et al., 2024). | Predominance of cross-sectional data limits causal inference. No validation of income-based thresholds against actual welfare outcomes. Geographic gap: West Africa and Southern Africa are underrepresented. No crop-specific minimum size studies. |

| Theme                                   | Points of Agreement                                                                                                                                                                                                                                                                                                                                                                                                            | Points of Disagreement                                                                                                                                                                                                                                                                                                                                                                                               | Weaknesses / Gaps                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 2: Fragmentation Measurement      | Existing indices (Simpson, Januszewski) are inadequate because they ignore parcel shape, road access, distance, and ownership complexity (Demetriou et al., 2013; Amsalu, 2024). Multi-dimensional indices are necessary. Fragmentation increases production costs and reduces efficiency (Ali et al., 2019; Eder, 2024; Sikk & Maasikamäe, 2015).                                                                             | Disagreement on which dimension matters most: dispersion and shared ownership (Demetriou et al., 2013) vs. number of parcels and distance (Amsalu, 2024). Fragmentation has risk-reduction benefits (Ali et al., 2019; Eder, 2024) rather than only negative effects (Hu et al., 2024). Inverted U-shaped relationship: moderate fragmentation is beneficial; excessive fragmentation is harmful (Das et al., 2025). | No continuous real-time fragmentation monitoring. GLFI is not validated outside Cyprus. Limited availability of cadastral data in developing countries. No empirically determined irreversible fragmentation threshold.                                                                                                                                        |
| Theme 3: Land Consolidation             | Consolidation increases productivity, but the effect size is modest (7–15% yield increase) (Ali et al., 2019; Eder, 2024). Voluntary approaches are preferred over mandatory consolidation (Akkaya Aslan et al., 2007; Belay, 2024; Travnicek et al., 2002). Infrastructure investments (roads, irrigation, drainage) are required for success (Akkaya Aslan et al., 2007; Aleknavičius, 2023; Travnicek et al., 2002).        | Some say consolidation is cost-effective (Eder, 2024). Others say costs exceed benefits (Ali et al., 2019; Travnicek et al., 2002). Consolidation harms smallholders through labor displacement (Akkaya Aslan et al., 2007) vs. benefits them (Ali et al., 2019). Consolidation should focus on large farms (Sikk & Maasikamäe, 2015; Aleknavičius, 2023) vs. smallholders (Belay, 2024).                            | No randomized controlled trials or natural experiments. No comprehensive cost-benefit analysis, including transaction and long-term costs. No evidence on long-term persistence of benefits or re-fragmentation. Limited attention to institutional conditions (land registration, dispute resolution). Almost no gender-disaggregated analysis.               |
| Theme 4: Agricultural Zoning & Ceilings | Minimum parcel zoning effectively prevents fragmentation when enforced (Oregon Rules, 2025; Minnesota Statutes, 2025; Belay, 2024). Maximum landholding ceilings severely underutilized despite constitutional mandates (National Land Commission, 2022; Paudel et al., 2013). Policy implementation and enforcement are the weakest links across all jurisdictions (National Land Commission, 2022; Thuo, 2020; Belay, 2024). | Should maximum ceilings apply to all land or only agricultural land? Should exemptions for commercial agriculture, plantations, and industrial uses be permitted? Appropriate minimum parcel size varies enormously: 0.06 ha (Ethiopia) to 160 acres (Oregon) – no consensus on optimal threshold.                                                                                                                   | No empirical impact evaluation of existing minimum parcel regulations. No evidence base to inform Kenya's constitutional mandate (Article 68). No systematic cross-country comparison of policy effectiveness. Evasion of ceiling laws (benami transactions, informal tenancy) unquantified. No monitoring framework for evaluating policy outcomes over time. |

**Source:** Author's synthesis based on the reviewed literature, 2026

## CONCLUSION

This review achieved its main objectives. Firstly, it examined 28 peer-reviewed articles, government reports, legal documents, and institutional publications published between 2002 and 2025. The findings from these sources were synthesised to reveal global, African, and Kenyan perspectives on minimum and maximum rural landholding sizes. Secondly, the review identified four major themes within the literature: minimum viable farm size and living-income thresholds, land fragmentation measurement and diagnostic tools, land consolidation as a policy instrument, and agricultural zoning and maximum landholding ceilings. Lastly, the review proposed strategies for achieving optimal rural landholding sizes by emphasising that thresholds should not rely on fixed quantitative or institutional standards but rather on the optimal use of land while considering factors relevant to agricultural production.

The review further established that existing fragmentation indices, including the Simpson and Januszewski indices, are inadequate for capturing the multidimensional nature of land fragmentation. It also confirmed that land consolidation can improve productivity, particularly when implemented through voluntary approaches supported by complementary infrastructure investments, while maximum landholding ceilings remain under-researched and weakly enforced despite constitutional mandates in countries such as Kenya.

The findings further demonstrate that no single theoretical framework adequately explains the complex question of landholding size. Economic Viability Theory explains minimum size requirements, Anti-commons Theory explains fragmentation costs, Land Sparing and Sharing Theory explains consolidation trade-offs, and Spatial Planning and Zoning Theory explains regulatory interventions. Collectively, these perspectives demonstrate that landholding policies require multidimensional rather than single-factor approaches.

The findings of this review have relevance beyond Kenya. Developing countries across sub-Saharan Africa, South Asia, and Latin America face similar challenges of land fragmentation, declining farm sizes, and increasing pressure for land

policy reforms. The land optimisation strategies proposed, including income-based viability calculations, voluntary consolidation, and context-specific agricultural zoning, offer transferable policy pathways for these contexts. Ultimately, sustainable landholding policies should be guided by local realities, empirical evidence, and long-term agricultural resilience rather than universal numerical land size thresholds.

## RECOMMENDATIONS

### Policy

Rather than setting fixed minimum and maximum landholding sizes, policymakers should promote land optimisation strategies that prioritise productivity, efficiency, and sustainability. Given the increasing fragmentation of rural landholdings, legislation implementing Article 68 of Kenya's Constitution (2010) should provide enabling frameworks for voluntary land consolidation among landholders, complemented by investments in roads, irrigation, drainage, and other supporting infrastructure. Enforcement mechanisms should strengthen land control boards, cadastral monitoring systems, and penalties for the evasion of landholding regulations, while recognising that context-specific, flexible, and participatory approaches are more likely to succeed than uniform quantitative standards.

### Future Studies

Future studies should test the applicability of the Global Land Fragmentation Index (GLFI) and income-based minimum farm size thresholds across different African and Asian countries. Comparative evaluations of agricultural zoning in North America, land ceiling legislation in South Asia, and minimum parcel-size regulations in Europe should identify best practice examples that may inform policy in Kenya and other developing countries. Additional research should examine how landholding ceiling regulations are circumvented, evaluate the long-term effects of land consolidation over 5–10 years, assess gender-differentiated impacts of consolidation, and determine the fragmentation threshold beyond which productivity losses become irreversible.

### Planning Practice

Rather than insisting on fixed minimum or maximum parcel sizes, planners should focus on

helping landholders optimise the productive use of their land, regardless of farm size. Cadastral systems should incorporate multidimensional fragmentation indices, while voluntary land consolidation and cluster farming should be promoted through participatory approaches. Land rental markets should be strengthened as mechanisms for land optimisation, and planning authorities should coordinate with infrastructure agencies to ensure that optimisation areas are supported by adequate roads, irrigation, and drainage. Monitoring frameworks should evaluate land optimisation outcomes rather than compliance with land size standards that are often difficult or impossible to enforce.

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