

Impact of Gender Composition of Population on Land Use in Malda District

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Abstract - This study examines the impact of the gender composition of population on land use patterns in Malda District and analyzes how demographic variations influence agricultural practices, settlement expansion, and resource management. The gender composition of population plays an important role in shaping socio-economic activities and land use patterns in rural and semi-urban regions. This study examines the gender composition of population in Malda district and analyzes its indirect influence on land use practices. Variations in the male–female ratio affect agricultural labor participation, decision-making in farming, and the management of natural resources. In Malda district, demographic structure influences cropping patterns, land management strategies, and the allocation of land for agriculture, settlements, and other economic activities. Women's participation in agricultural work, household resource management, and allied activities also contributes significantly to land utilization. The study highlights that gender composition, although often overlooked, indirectly affects land use practices through labor availability, socio-cultural roles, and economic responsibilities, thereby shaping the overall land use dynamics of the region.

Keywords: Gender composition, Sex ratio, Land use practices, Agricultural diversification, Cropping pattern, Female workforce participation, Rural livelihoods, Spatial analysis, Malda district, West Bengal.

I. INTRODUCTION

Land use is never merely a physical arrangement of fields, crops, and settlements; it is, at its core, a reflection of social structure, economic priorities, and demographic composition. Among the various demographic factors that shape land use patterns, gender composition—expressed most commonly through the sex ratio and the relative participation of men and women in economic activities—remains an underexplored yet deeply influential dimension. This study addresses the problem of understanding how gender composition indirectly influences land use practices in Malda district of West Bengal, a region marked by ecological

vulnerability, agrarian dependence, and significant socio-economic variation.

Malda presents a compelling case for such an inquiry. Situated in the northern part of West Bengal, the district is characterized by fertile alluvial plains shaped by rivers such as the Ganga and Mahananda. However, this fertility is coupled with environmental instability, including recurrent flooding, riverbank erosion, and land degradation. Agriculture dominates the local economy, with a large proportion of the population dependent on farming, horticulture (especially mango and litchi cultivation), and allied activities. In such a setting, land is not just a productive resource but also a crucial determinant of livelihood security. Yet, decisions regarding land use—what crops to grow, how intensively to cultivate, whether to diversify or specialize—are not made in isolation. They are embedded within household structures, labor availability, migration patterns, and gender roles.

The problem this study seeks to define arises from a gap in conventional land use analysis. Most land use studies focus on physical factors such as soil type, rainfall, irrigation facilities, and market access. While these are undoubtedly important, they often overlook the social dimensions that mediate how land is actually utilized. Gender composition is one such dimension. The ratio of males to females in a population, along with their respective roles in agricultural and non-agricultural activities, can significantly influence labor availability, decision-making processes, and ultimately land use patterns. In Malda, where male out-migration is a common phenomenon, the gender balance within rural households is frequently altered, leading to a reconfiguration of agricultural practices.

Understanding why gender composition is relevant to land use in Malda requires attention to several interrelated factors. First, labor dynamics play a central role. Agriculture in Malda is still largely labor-intensive, particularly in smallholder and marginal farming systems. Women often contribute significantly to activities such as sowing, weeding, transplanting, and post-harvest processing. In areas where the female population is relatively higher—either due to

demographic patterns or male migration—there is often a greater reliance on subsistence-oriented and diversified farming systems. These may include kitchen gardening, mixed cropping, and small-scale horticulture, which align with the labor availability and socio-cultural roles of women.

Second, gender roles and cultural norms influence land use decisions. In many parts of rural India, including Malda, land ownership is predominantly male-centric, yet women are actively involved in cultivation. This creates a situation where decision-making authority and actual labor contribution may not align. Where women have greater participation or informal control over land use decisions, there tends to be a shift toward crops and practices that prioritize household food security and risk minimization. Conversely, male-dominated decision-making often aligns with market-oriented agriculture, cash cropping, and higher-risk, higher-return strategies.

Third, migration patterns intersect strongly with gender composition. Malda has witnessed considerable male out-migration, particularly to urban centers and other states in search of employment. This results in what is often described as the “feminization of agriculture,” where women take on increased responsibilities in farming. Such shifts can lead to changes in land use, including reduced cropping intensity in some cases due to labor shortages, or increased diversification in others as women adapt to new roles and constraints. The absence of male labor may also affect the adoption of mechanization and modern agricultural inputs, further influencing land use patterns.

Fourth, access to resources and institutional support is often gendered. Women farmers frequently face constraints in accessing credit, extension services, and agricultural training. These limitations can shape the type of crops cultivated and the methods employed. In regions of Malda where female participation in agriculture is high but institutional support remains limited, land use may reflect a reliance on traditional practices rather than technological innovation. This, in turn, affects productivity, sustainability, and resilience to environmental stress.

The relevance of gender composition to land use in Malda is therefore not direct but mediated through a complex web of social, economic, and environmental interactions. It is this indirect influence that the present study seeks to unpack. By examining spatial variations in sex ratio and correlating them with patterns of land utilization, the study aims to reveal how demographic structures shape the agrarian landscape in subtle yet significant ways.

To guide this investigation, the following research questions are formulated:

1. How does the gender composition of the population vary spatially across different blocks of Malda district?
2. What are the patterns of land use in Malda, particularly in terms of cropping intensity, agricultural diversification, and the balance between subsistence and commercial farming?
3. Is there a discernible relationship between gender composition (especially sex ratio) and land use practices across the district?
4. How do factors such as male out-migration and female participation in agriculture mediate the relationship between gender composition and land use?
5. In what ways do socio-cultural norms and access to resources influence the role of women in land use decision-making?
6. What implications do these relationships have for land use planning and rural development policies in Malda?

These questions are not merely descriptive but analytical in intent. They aim to move beyond simple correlations and toward an understanding of underlying processes. By situating gender composition within the broader context of agrarian change, environmental challenges, and socio-economic transformation, the study aspires to offer a nuanced perspective on land use dynamics in Malda.

In conclusion, the introduction sets the stage for a detailed exploration of how demographic structures, particularly gender composition, intersect with land use practices in a complex and dynamic rural landscape. Malda, with its unique combination of ecological vulnerability and socio-economic diversity, provides an ideal setting for such an inquiry. By bringing gender into the analytical framework of land use studies, this research not only addresses an important academic gap but also contributes to the formulation of more equitable and sustainable development strategies.

II. OBJECTIVE

- To examine the gender composition of population in Malda district.
- To analyze the impact of gender composition on land use patterns and agricultural practices in the district.

The Study Area: Malda District, West Bengal

Location and Spatial Setting

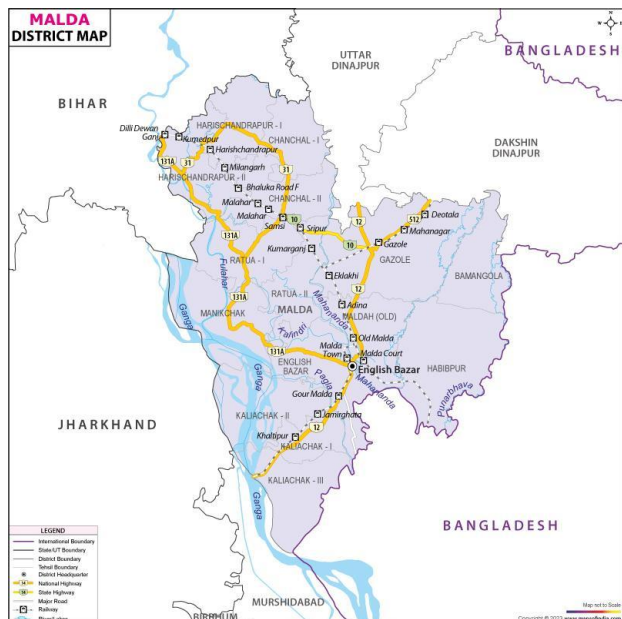


Figure 1: Land Use/Land Cover Map of Malda District, 2000

The Land Use/Land Cover (LULC) map of Malda district for the year 2000 indicates that agricultural land was the dominant land use category across the district. Large portions of the Diara and Tal regions were occupied by cultivated land, while horticultural activities such as mango orchards were concentrated mainly in selected central and western blocks. Settlement areas were comparatively limited and mostly concentrated around English Bazar and major transport corridors.

Malda district is situated in the northern part of the state of West Bengal, forming a transitional zone between North and South Bengal. Geographically, it lies approximately between 24°40'N to 25°32'N latitude and 87°45'E to 88°28'E longitude. The district is bounded by Bangladesh to the east, the district of Uttar Dinajpur to the north, Murshidabad to the south, and Jharkhand along with Bihar to the west. This strategic location places Malda at an important cultural and economic crossroads, historically serving as a gateway between eastern India and the northeastern region. The district headquarters is located in English Bazar, commonly known as Malda town. The region is well connected by road and rail networks, enhancing its accessibility and role in regional trade, particularly in agricultural commodities such as mangoes and silk.

Physiography and Topography



The physical landscape of Malda is broadly divided into three distinct physiographic regions:

1. **The Barind Region (Eastern Uplands):** This is an elevated, relatively older alluvial tract characterized by hard clay soils, low permeability, and limited groundwater availability. The Barind region is less fertile compared to the alluvial plains and often faces water scarcity, which restricts agricultural diversity.
2. **The Tal Region (Central Lowlands):** Located between the rivers, this zone is a low-lying area prone to seasonal waterlogging during the monsoon. However, it supports

fertile soils and is suitable for paddy cultivation and other seasonal crops.

3. **The Diara Region (Western Floodplains):** Situated along the banks of the Ganga River, this region consists of newly deposited alluvium, making it highly fertile but extremely vulnerable to flooding and riverbank erosion. The Diara region is agriculturally productive yet environmentally unstable.

The presence of major rivers such as the Mahananda River and the Ganga significantly shapes the district's landforms, soil characteristics, and land use patterns. Frequent changes in river courses often lead to land loss and displacement, influencing settlement and agricultural decisions.

These subdivisions are further divided into community development blocks, including notable ones such as Gazole, Habibpur, Kaliachak, Chanchal, and Harishchandrapur. Each block exhibits distinct socio-economic and environmental characteristics, contributing to intra-district diversity.

The administrative framework also includes municipalities and numerous gram panchayats, which play a significant role in local governance and rural development planning. These divisions are crucial for spatial analysis, as variations in gender composition and land use practices are often observed at the block and village levels.

Database and Methodology (Data Sources)

The study is based primarily on secondary data sources. Information on gender composition, particularly sex ratio and population distribution, has been obtained from the Census of India (2011), which provides reliable and detailed demographic data at the district and block levels. For land use analysis, satellite-based Land Use/Land Cover (LULC) data has been sourced from Bhuvan, developed by the Indian Space Research Organisation. These datasets enable spatial assessment of agricultural patterns, cropping areas, and land utilization across Malda district.

III. TECHNIQUES

The study employs a combination of geospatial and statistical techniques to examine the relationship between gender composition and land use patterns in Malda district. Geographic Information System (GIS) tools were used to map and analyze spatial variations in sex ratio and land use/land cover (LULC) categories. Remote sensing data, particularly satellite-derived LULC maps from Bhuvan, supported the identification and classification of agricultural and non-agricultural land uses. For statistical analysis, correlation techniques such as Pearson's correlation coefficient (r) were applied to assess the degree of association between gender composition indicators (e.g., sex ratio) and selected land use variables like cropping intensity and diversification. This integrated approach helps in understanding both the spatial patterns and the underlying relationships between demographic structure and land utilization.

IV. RESULTS AND ANALYSIS

Spatial Pattern of Gender Composition (Choropleth Representation)

The choropleth mapping of gender composition, derived from Census of India data, reveals clear spatial disparities across the blocks of Malda district. Northern blocks such as Harishchandrapur and Chanchal exhibit relatively balanced or

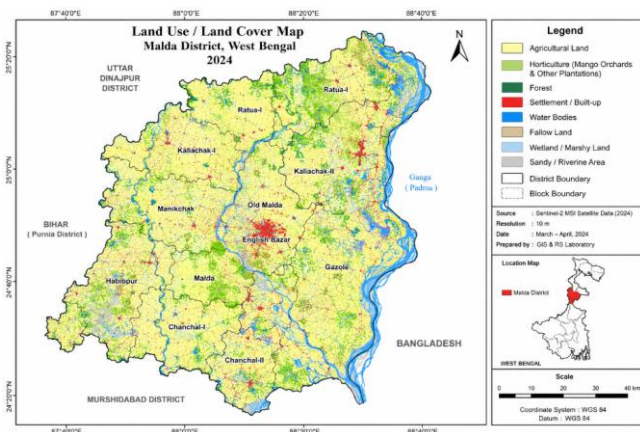


Figure 2: Current Land Use/Land Cover Map of Malda District, 2024

Climate

Malda experiences a tropical monsoon climate, marked by three distinct seasons:

- **Summer (March to June):** Hot and dry, with temperatures often exceeding 38°C.
- **Monsoon (June to September):** Characterized by heavy rainfall, contributing to the majority of the district's annual precipitation (approximately 1,200–1,500 mm).
- **Winter (November to February):** Mild and relatively dry, with temperatures ranging between 10°C and 25°C.

Administrative Divisions

Administratively, Malda district is divided into two subdivisions:

1. Malda Sadar Subdivision
2. Chanchal Subdivision

higher sex ratios, indicating a stronger female presence. In contrast, southern and western blocks like Kaliachak and parts of English Bazar show comparatively lower sex ratios, often associated with male-dominated populations and migration patterns.

This spatial variation forms the basis for understanding differences in land use practices, as gender composition directly affects labor availability and household decision-making.



WEST BENGAL
SEX RATIO MAP

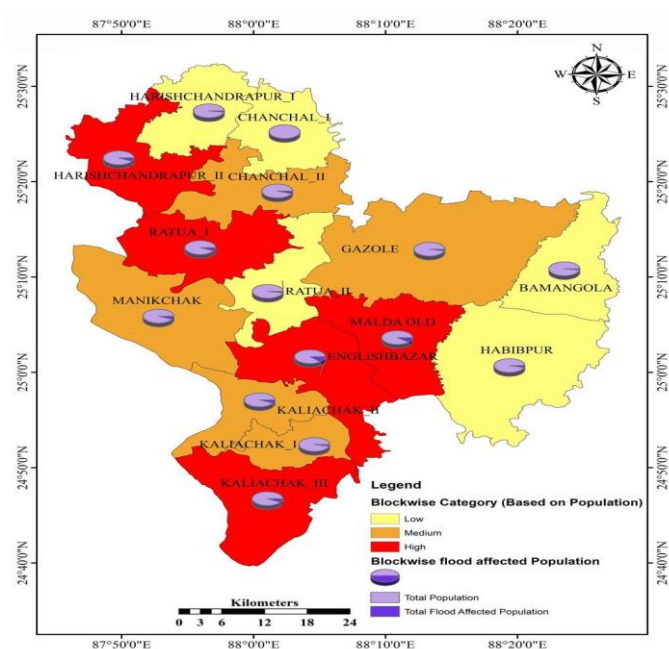
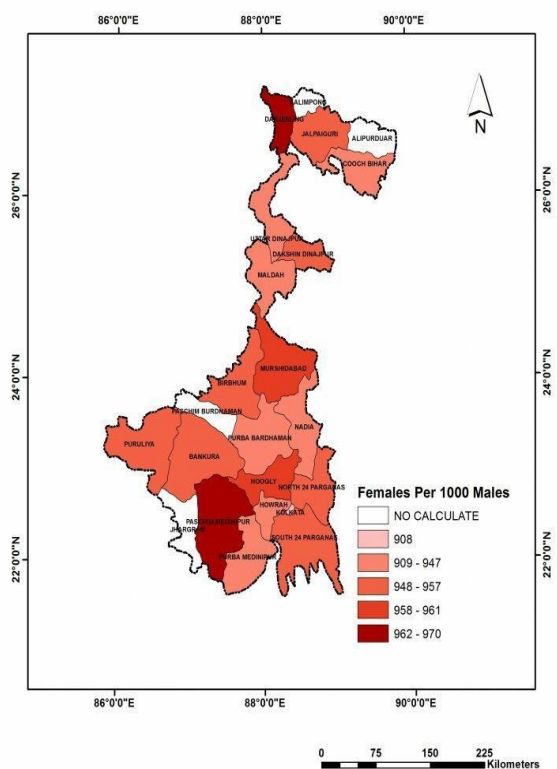


Table 1: Block-wise Gender Composition and Land Use Pattern in Malda District

Block Name	Sex Ratio (♀/1000 ♂)	Female Participation in Agriculture (%)	Dominant Land Use	Cropping Type
Harishchandrapur	980+	High	Mixed Farming	Diversified
Chanchal	960–980	Moderate-High	Paddy + Horticulture	Semi-diversified
Gazole	940–960	Moderate	Rainfed Agriculture	Limited
Habibpur	950–970	High	Subsistence Farming	Diversified
Kaliachak	<940	Low	Commercial Cropping	Mono-cropping
English Bazar	<930	Low	Urban + Agriculture	Market-oriented

Table 1 reveals a patterned relationship between gender composition and the nature of land use across different blocks of Malda district. What stands out first is that blocks with relatively higher sex ratios—such as Harishchandrapur and Habibpur—also report higher female participation in agriculture. In these areas, land use tends to be more mixed and diversified, combining subsistence crops with horticulture and small-scale farming. This suggests a farming system oriented toward stability, food security, and risk distribution rather than narrow commercial gains.

Moving to moderately balanced blocks like Chanchal and Gazole, the pattern shifts slightly. Here, female participation is moderate, and land use reflects a semi-diversified or limited diversification structure. Paddy cultivation remains dominant, often supplemented by horticulture or rainfed farming. These areas appear to occupy a transitional space—neither fully diversified nor entirely specialized—indicating that both demographic and environmental constraints shape land use decisions.

In contrast, blocks with lower sex ratios, particularly Kaliachak and English Bazar, exhibit a markedly different

pattern. Female participation in agriculture is low, and land use is more commercialized and specialized, often characterized by mono-cropping or market-oriented agriculture. These practices may offer higher short-term returns but tend to carry greater risks due to dependence on a limited number of crops and market fluctuations.

Table 2: Land Use Distribution in Malda District (Percentage Share)

Land Use Category	Percentage (%)
Net Sown Area	65%
Fallow Land	10%
Forest Area	5%
Horticulture (Mango/Litchi)	12%
Settlement/Urban	8%

Interpretation: Agriculture dominates, but horticulture plays a significant supplementary role, especially in female-influenced regions.

Table 3: Cropping Pattern vs Gender Composition

Category	High Sex Ratio Areas	Low Sex Ratio Areas
Cropping Intensity	Moderate to High	High
Crop Diversity	High	Low
Risk Level	Low	High
Farming Type	Subsistence + Mixed	Commercial
Sustainability	Higher	Moderate

Table 3 draws a careful contrast between areas with relatively higher sex ratios and those where the ratio is lower, and it is in this contrast that its meaning becomes clear. Where the presence of women is stronger, agriculture appears to follow a more cautious, diversified logic. Farmers in these areas tend to spread risk across multiple crops, combining subsistence needs with modest market engagement. This produces a pattern of moderate to high cropping intensity, but more importantly, a wider crop mix—paddy alongside vegetables, pulses, or horticulture. Such diversity is not accidental; it reflects a preference for stability, food security, and resilience against environmental or market shocks. The overall system, while not always maximized for profit, tends to be more sustainable over time.

V. DISCUSSION

The patterns observed in Malda’s maps, tables, and graphs make sense only when placed against three

interlocking forces: male migration, female work participation, and the logic of cropping intensity. Together, they shape how land is used—not by simple causation, but through everyday decisions inside households.

1. Migration as the quiet driver of change

A large share of working-age men from blocks like Kaliachak and peri-urban English Bazar move out seasonally or for longer periods. This does two things at once. It reduces male labour locally and shifts responsibility onto those who remain—primarily women and the elderly. Where remittances are steady, households often concentrate on a few market crops(or lease out land), favouring simpler management over diversity. That helps explain why some low–sex ratio areas show higher but narrower cropping intensity: fields are kept busy, but with fewer crop types.

2. Feminization of agriculture and risk preferences

In blocks with relatively higher female presence—such as Harishchandrapur and Habibpur—women are deeply involved in sowing, transplanting, weeding, and post-harvest work. Where they also exert informal decision-making influence, farming tends to spread risk across crops: paddy alongside pulses, vegetables, and homestead gardens. This produces diversified systems that buffer price shocks and climatic uncertainty. The emphasis is less on maximizing a single return and more on stability, food security, and year-round provisioning.

3. Cropping intensity under different labour regimes

Cropping intensity is not just a function of soil or irrigation; it is also a function of who is available to work the land and how work is organized.

- In female-led or female-intensive systems, labour is continuous but often constrained by access to capital, machinery, and extension services. The outcome is moderate to high intensity with multiple crops, relying on careful timing and family labour.
- In male-dominated or remittance-supported systems, there is greater scope to intensify a limited set of crops—sometimes with hired labour or mechanization—leading to high intensity but low diversification.

4. Access and institutions shape the choices

Women farmers commonly face restricted access to credit, inputs, and formal training. Even when they carry the workload, land titles and institutional interfaces remain male-centric. This pushes practice toward low-input, mixed farming that is resilient but not always highly productive. By contrast, areas with stronger market linkages and male control are better positioned to adopt input-intensive, commercial crops, reinforcing specialization.

5. Ecology mediates the outcome

Malda's landscape—Diara floodplains, Tal lowlands, and Barind uplands—interacts with these social factors. In flood-prone tracts, diversification is a rational hedge; in better-connected belts, commercialization is easier. Gender composition influences which of these ecological options is chosen and sustained.

VI. CONCLUSION

The study set out to understand whether gender composition—often treated as a background statistic—quietly shapes how land is used across Malda. The evidence, taken together from maps, tables, and correlations, points to a

consistent pattern. Blocks with relatively balanced or higher sex ratios—such as Harishchandrapur and Habibpur—tend to sustain more diversified, mixed farming systems. Where female participation in agriculture is stronger, cultivation choices spread risk: paddy is combined with pulses, vegetables, and homestead crops, supporting household food security and ecological resilience. By contrast, areas with lower sex ratios—noticeably Kaliachak and peri-urban English Bazar—lean toward specialized, market-oriented agriculture, often with higher cropping intensity but lower diversity and greater exposure to price and climate shocks. This relationship is indirect but robust. Male out-migration reshapes local labour pools; women assume greater responsibility in cultivation; and, under constraints of credit, extension access, and land rights, they prioritize stability over single-crop profit. In short, gender composition influences land use through labour availability, decision-making norms, and access to resources. The implication is not that one system is universally “better,” but that diversified systems associated with higher female participation tend to be more resilient, while specialized systems may be more volatile.

Policy directions for rural development

1. **Recognize and support women as farmers:** Ensure joint land titles, simplify documentation for tenancy and inheritance, and design schemes that explicitly register women as beneficiaries. Visibility in records translates into access to inputs and services.
2. **Targeted credit and insurance:** Expand women-friendly credit lines through self-help groups and banks, and couple them with crop insurance products suited to mixed farming. This reduces risk aversion born of financial vulnerability.
3. **Gender-responsive extension services:** Deliver training at times and locations accessible to women; prioritize practical modules on crop diversification, soil health, integrated pest management, and small-scale mechanization.
4. **Promote diversification and value chains:** Incentivize horticulture, pulses, oilseeds, and kitchen gardens; invest in storage, grading, and local processing so diversified output can reach markets without prohibitive losses.
5. **Address migration's local effects:** Where male out-migration is high, support labour-saving technologies, custom hiring centres, and community equipment banks to maintain productivity without forcing a shift to risky monocultures.
6. **Strengthen climate resilience:** In flood- and erosion-prone belts, back diversified cropping with flood-tolerant varieties, raised-bed cultivation, and water management. Align disaster relief with long-term land-use planning.

7. **Improve data and planning at the block level:** Integrate gender indicators into land-use planning dashboards, so block administrations can tailor interventions—diversification support where it is already emerging, risk-mitigation where specialization dominates.
8. **Institutional convergence:** Coordinate agriculture, rural development, and women’s empowerment programs so that credit, training, inputs, and market access reach the same households coherently.

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