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Research Article

Resettlement and land rights: Implication on land use and land cover change in Ethiopia

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Abstract: *In Ethiopia, resettlement schemes have been widely implemented in response to famine and food insecurity. Since 2003, planned resettlement initiatives have been carried out, considering farm households' willingness as a pivotal factor. To enhance the attractiveness of the resettlement program, the Amhara regional state attempted to offer resettlers dual landholding rights. These rights encompassed perpetual landholding in the new settlement and a three-year guarantee against losing their landholdings in the old settlement if they chose to leave due to discomfort. This study aimed to address conceptual and empirical gaps in understanding the relationship between the resettlement process, land rights/tenure, and changes in land use and land cover (LULC) within this new approach. The goal was to provide policy directions. Employing a socio-spatial research methodology, data was generated using GIS techniques, questionnaires, and focus group discussions. The study found that unrestricted encroachment into woodlands and grazing lands has led to severe LULC changes in the study area. The land use land cover change analysis between 2003 and 2016 indicated that the forest cover and bushland decreased by 3,879.18 ha and 2,810.16 ha respectively, and conversely farmland has increased by 5,814.09 ha. Furthermore, due to the absence of clear property rights definitions and the provision of dual land rights, many resettlers opted to maximize benefits from both land possessions rather than establishing a settled life in the new settlement area. Despite the innovative nature of the resettlement program with its focus on providing dual land rights to relieve pressure in degraded highlands and transform livelihoods in more productive lowland areas, the initiative faced challenges in controlling land rights and management issues in both the old and new resettlement areas. Observations in these areas contradicted the presumption of the new resettlement policy, aiming to bolster farmers' livelihood security and environmental protection. This study underscores the intricate and multi-dimensional nature of the relationship between resettlement, land rights/tenure, and LULC changes in Ethiopia. To ensure the success of innovative resettlement programs, robust institutions supported by policy frameworks that comprehensively consider social, economic, political, and technical elements impacting resettlement are imperative. The study also recommends the implementation of a consolidated land governance system from the outset, complemented by a strong monitoring and evaluation system, to effectively address resettlers' land rights and obligations, thereby improved livelihoods and efficient land use and management could be advanced in the settlement areas.*

Keywords: Dual land rights, Forest cover, GIS, Land administration, Resettlement

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1. Introduction

The relationship between people and land is crucial, and imbalances in this relationship often lead to societal problems. The significant impact of people-to-land relationships on current environmental, livelihood, and food security issues is highlighted by the Food and Agriculture Organization (FAO, 2008). Scholars like Dibaba *et al*. (2020) have argued that human pressure on the environment, coupled with gaps in policy frameworks, has exacerbated Land Use and Land Cover (LULC) dynamics and land degradation risks, resulting in declining soil fertility and crop production (Jokinen, 2018).

Resettlement, which entails organized and planned relocation of people, is considered a durable solution to assist and safeguard people during environmental crises, redevelopment, conflicts, food insecurity, and land scarcity (Arnall, 2019; Yang *et al*., 2020; Nikuze, 2022). It offers displaced individuals an opportunity to regain access and security over their land, improve the environment, and enhance infrastructure beneficial to both resettlers and host communities. However, it is important to note that resettlement is not always a robust solution, as experiences have shown that only a few relocation histories have been successful (Tabucanon, 2012). The challenges often arise from inadequate initial planning that overlooks social, psychological, and land tenure issues, particularly land rights defining secured ownership and sustainable land management (Guye, 2019).

Literature highlights that tenure security is fundamental in unlocking the economic and ecological potential of natural resources, including agricultural and forest land (Dahal *et al*., 2017), while also creating conditions for social and economic development, including addressing climate change challenges (Kusters and de Graaf, 2019). Historical evidence indicates that formalizing property rights has led to increased economic prosperity, security, societal resilience, and environmental protection (Kelley and Graglia, 2017). Formal property right often encourages individuals and communities to care for their land and make improvements, and its contribution to the success of resettlement interventions are high (Gebre, 2019).

Poorly planned resettlements, lacking integration among stakeholders and defined land rights, can result in conflicts leading to additional displacement (Heslin *et al*., 2018). In such scenarios, the resettled population might engage in unfair resource competition (Wayessa and Nygren, 2016), that causes dynamic LULC change (Pelorosso *et al*., 2009), and resource depletion (Dibaba et al., 2020), ultimately harming both the environment and people. This negative relationship between resettlement and the environment is extensively documented in various research reports (Abera, 2023; Hunde *et al*., 2021; Abera *et al.*, 2020; Getahun 2017; Lemenih *et al*., 2012; Mulugeta and Woldesemait; 2011). Therefore, considering the implications of resettlement on land rights, tenure issues, and LULC changes is crucial for implementing effective and sustainable resettlement programs.

The evaluation of policies and programs, particularly resettlement initiatives, is heavily influenced by their location (Lebel *et al*., 2007). Positive or negative policy implementation outcomes are often associated with specific spatial contexts. Remote sensing technologies aid in collecting location-based information on natural and man-made features (de by and Georgiadou, 2014), which are influenced by institutional strength, policies, and land tenure characteristics (Alemie *et al*., 2015). However, remote sensing alone cannot provide a comprehensive understanding of these features. A socio-spatial study is recommended to bridge these gaps (Geoghegan *et al*., 1998), as it can furnish locational data on LULC changes and social insights into how human actions affect the land. Spatial tools are increasingly recognized as valuable for policy evaluation and understanding the impacts of social systems on specific locations (Goodchild *et al*., 2000). Therefore, assessing LULC changes in resettlement areas is vital for comprehending the socioeconomic causes and effects of resettlement programs.

In the national strategic development plan of Ethiopia a voluntary resettlement program has been introduced to ensure food security, alleviate pressure on densely populated highlands and drought-prone lowlands and pastoral areas (Gebre, 2009). Unlike the resettlement programs that were carried out in the 1980s, 1990s

without the consent of resettlers, voluntary resettlement program has been introduced since 2003 and its implementations has continued for many years. To make the resettlement program attractive the Amhara region of Ethiopia has provided dual landholding rights to resettlers in both the old and new settlement areas. This approach grants resettlers the right to maintain their landholding rights for three years in the old settlement areas in case of discomfort in the new settlement, and opt to return to their original places; and a perpetual landholding right in the new resettlement site for establishing permanent livelihoods. Aligned with the Ethiopia's famine management policy, the resettlement aims to relocate people to less populous and moisture-sufficient areas conducive for agricultural activities (Kassa, 2009).

Resettlements are integral component of rural development programs in many countries and require empirical evidence for successful implementation. Numerous studies in Ethiopia and elsewhere focus on analyzing LULC, food security, or livelihood aspects of resettlement but overlook land tenure and property rights issues in the context of resettlement, as evident in the works of many researchers (e.g., Mulugeta and Woldesemait, 2011; Guye, 2019; Hunde, *et al.*, 2021; Abera, 2023). Despite the government's initiation of dual land rights to enhance the success of the resettlement program, there is no any research work verifying the outcomes of this approach. The current study, recognizing the importance of interdisciplinary approaches in understanding people-to-land relationships (Pahl-Wostl, 2009), aims to generate both conceptual and empirical knowledge on the nexus between resettlement, land rights, and LULC change. Given resettlement is one of the development strategies in Ethiopia, the findings will be vital for policymakers and experts to consider a multitude of issues when planning and implementing resettlement, and the academia to initiate further research on resettlement issues and generate additional policy and technical feedback to decision makers.

The subsequent sections provide a theoretical underpinning of the nexus between resettlement, land rights, and land use/land cover aspects, alongside a historical perspective on resettlement in Ethiopia. Additionally, a concise description of the case study area and the applied methodology are presented, followed by research results, discussions, conclusions, and policy implications.

1.1. Theoretical underpinning

1.1.1. The resettlement, land right and LULC change nexus

In developing countries like Ethiopia, land holds paramount importance for economic development, food security, poverty reduction, and the overall livelihood of citizens. It stands as a critical asset and a vital source of sustenance, particularly for the majority of the impoverished (Crewett *et al*., 2008). However, land scarcity has become increasingly prevalent for several reasons: rapid population growth, high density in productive areas, agricultural land degradation, urban expansion, and conflicting demands for various uses, including investment. This scarcity, coupled with land degradation and erratic rainfall, impelled governments to initiate resettlement programs to empower affected communities economically and facilitate sustainable livelihoods (Gebre, 2009; Hunde *et al*., 2021).

Resettlement programs manifest in different forms, such as voluntary and compulsory approaches. Voluntary resettlement occurs when migrants willingly and informedly choose to relocate, while involuntary resettlement involves the forced displacement of individuals with diminished decision-making power (Gebre, 2009; Abera, 2023; Nugusa and Nasir, 2021; Ahmed, 2023). Whether resettlement programs follow voluntary or compulsory approaches effective planning and active stakeholder involvement are essential to make the programs successful (Guye, 2019; Yonas *et al*., 2013; Lemenih *et al*., 2012).

The analysis of resettlement programs can be approached from both social and geographical perspectives. The social dimension involves mechanisms enabling resettlers to interact with the resettlement land. This includes the development and implementation of resettlement policies and plans, and the establishment of administrative structures like land rights governing people-to-land relationships (Ahmed, 2023). The spatial dimension refers to the physical space where these social processes operate and where decisions regarding land

use and rights are made. Understanding the interplay between these dimensions is crucial for comprehending the economic, livelihood, and environmental implications of resettlement initiatives (Abera, 2023; Geoghegan *et al*., 1998). Thus, critically examining resettlement initiatives from both geographical (LULC) and social (land rights) perspectives helps to comprehend conceptual and empirical elements impacting the resettlement.

The prevailing land tenure system in any country can take various forms: freehold/private, state/public, customary, or open access tenure (Kasimbazi, 2017; ECA, 2004; FAO, 2002). In broad terms however, land tenure is classified as statutory or customary. Customary tenure bases land access on tribal or community membership, managed by traditional leaders, and governed by unwritten traditional rules (ECA, 2004) whereas statutory tenure is governed by modern law and supported by documented evidence like title deeds or lease certificates, and administered by the government. In Ethiopia's constitution (FDRE, 1995), "the right to ownership of rural and urban land, as well as all natural resources, is exclusively vested in the state and in the peoples of Ethiopia." Under this premise, the state considers unoccupied lowland areas, used seasonally for grazing and economic activities, as vacant lands (Rahmato, 2004), available for resettlement and development activities. The land holders in the country are given user right only and the rural land law stipulates registration and certification of land holdings of farmers including pastoralists (FDRE Proclamation No. 456/2005). In practice the land registration is widely carried out in the highlands and much of the land in the lowlands is under customary tenure system. The settlers in the lowlands in most circumstance lack formal land-holding documentation and the land right question remains unanswered.

Land rights and LULC changes are dynamic and evolve over time. The continuum of land rights operates at different levels, leading to varying rates and magnitudes of LULC changes (UN-Habitat, 2008). As many resettlement practices, especially government-sponsored ones like those in the study area, are short-term initiatives, people-to-land relationships become dynamic, resulting in spontaneous transformations of the natural environment into various LULC patterns.

Numerous research works on resettlement and LULC change have observed significant alterations in many resettlement areas. For instance, a study in Benshangul-Gumuz by Hunde *et al*. (2021) revealed a substantial increase in agricultural and settlement areas over four decades, accompanied by severe reductions in dense forests, open forests, and shrublands. Similarly, research by Abera *et al*. (2020) in the Chewaka district and Alemu *et al*. (2015) in the northwestern lowlands of Ethiopia indicated comparable trends in LULC changes in resettlement areas. These studies illustrate the growing demand for agricultural lands, firewood and charcoal production, construction materials, and expanded settlement areas, resulting in alterations in land use/cover in resettlement areas. Such incidents underscore that without clear tenure rights accompanying resettlement programs; grazing lands and woody vegetation are vulnerable to illegal encroachment and destruction.

1.1.2. Towards a resettlement responsive land tenure for better land use

Resettlement is often triggered by various contemporary challenges faced by the original communities, such as prolonged drought, conflict, or a shortage of farmlands to sustain livelihoods. These challenges often stem from complex relationships between people and land. For instance, if resettlement aims to address food insecurity, the new location must offer better prospects in land productivity, climate suitability, and land size to sustain livelihoods. When supported by necessary institutional structures, like a responsive land tenure system, these attributes can lead to improved livelihoods, food security, and environmental preservation. Conversely, experiences indicate that without these crucial elements, people often end up worse off after resettlement (Vanclay and Kemp, 2017).

Tenure security, as outlined by Tutu *et al*. (2016), is a crucial requirement for maintaining livelihoods in human settlements. It provides settler farmers confidence to invest in their land (e.g. soil and water conservation, tree planting) to enhance agricultural

production, environmental sustainability, and socioeconomic welfare. Encouraging land rights promotes equitable resource distribution and sustainable natural resource utilization. Conversely, lacking land rights can lead to unwise resource exploitation, causing depletion and unsustainability.

In various countries, efforts are underway to formalize land tenure security through demarcation, clarification, and rights registration (Aggarwal *et al*., 2021). These interventions are thought to be successful when complemented by strong institutional support (Valkonen, 2021). Overlooking land tenure security in resettlement areas has led resettling communities to encroach illegally on communal grazing and woodlands, inducing land use and land cover changes. Owing to this the issue of land rights in resettlement areas has remained a concern, as land tenure regulates people's interactions with land in development and planning activities (Enemark, 2004). Chigbu *et al*. (2017) advocate for tenure-responsive land use planning during food security interventions. Similarly, resettlement planning and implementation should prioritize tenure-responsive approaches, acknowledging equal and inalienable rights of all resettlers in land allocation, resource access, and service provision in the resettlement area. This is critical for ensuring sustainable land management and resource utilization.

Historically, the formalization of property rights has correlated with increased economic prosperity, security, and societal resilience (Kelley and Graglia, 2017). Transparent and enforceable property ownership or land tenure security are vital incentives for effective natural resource management, encompassing land, forests, grazing land, and water (Adhikari *et al*., 2015; Robinson *et al.*, 2014). Where this is lacking, people face a higher risk of land rights violations, impairing their ability to secure sufficient food, protect the environment, and maintain sustainable rural livelihoods (Deininger *et al*., 2009; FAO, 2002). Therefore, property rights formalization and tenure security are crucial goals leading to prosperous societies, significantly impacting community-based natural resources development (Cronkleton and Larson, 2015; Kusters and de Graaf, 2019). These assertions imply that access to land for resettlers should adhere to a legally constructed land tenure system (FAO, 2002), governing the link between resettled people and the resettlement land by institutionalizing access to rights to use, control, and transfer land, alongside associated responsibilities and restrictions.

In summary, within the context of resettlement, tenure security assures resettler landholders in the resettlement area to invest and enhance their plots. This includes activities like tree planting, application of organic fertilizers, and construction of soil and water conservation structures such as terraces and check dams. Implementing these practices safeguards the environment, enhances farmland productivity, and ultimately leads to improved livelihoods.

1.2. Resettlement in Ethiopia

More than 80% of Ethiopia's population resides in rural areas, characterizing it as primarily agrarian. The country has grappled with persistent drought since 1959, with severe seasons affecting approximately 54.5 million people and causing nearly 1.2 million deaths from 1964 onward (Mulugeta and Woldesemait, 2011). In the context of resettlement within Ethiopia, it is imperative to consider the three different governmental regimes: the Imperial, the Military, and the Ethiopian People's Revolutionary Democratic Front (EPRDF) administration. Literature indicates that relocation initiatives in Ethiopia commenced during the late 1950s under the imperial administration, relocating about 20,000 households to southern Ethiopia as part of a state-sponsored effort. The objective was to redistribute resources to northern peasants, but inadequate planning, suboptimal settler selection, insufficient budgetary support, and inexperienced planners hindered the desired outcomes (Mulugeta and Woldesemait, 2011).

During the military regime, an extensive resettlement program ran from 1974 to 1991, aiming to improve the socioeconomic situation, rehabilitate the declining natural resources of the central highlands, and preserve the nation's remaining forested areas. However, due to the authoritarian nature of the regime, the resettlement was executed forcibly and without settlers' consent, lacking a land use plan, ultimately resulting in its failure.

Under the current EPRDF regime, planned and voluntary resettlement programs were implemented after assuming power in 1991, utilizing underutilized lands primarily in the lowlands suitable for agriculture. Despite the rationale behind the voluntary resettlement program aiming to address severe food insecurity due to various factors like land degradation, recurrent droughts, population pressure, limited technological advancements, small landholdings, and increasing rural landlessness, its success remains questionable (Vanclay and Kemp, 2017; Guye, 2019). Therefore, these resettlement programs, intended to enhance livelihoods and food security by granting access to farmland, require thorough scrutiny to ensure productive utilization of the nation's scarce resources.

2. Research Methodology

2.1. Description of the study area and resettlers

This study was conducted in the West-Aremachiho district of the North Gondar zone in the Amhara National Regional State (ANRS) of Ethiopia. Geographically, the study area spans between 12059'23" - 13053'17"N and 36006'03" - 36050'05"E (Figure 1), with altitudes ranging from 620 to 850 meters above sea level (Azanaw *et al*., 2018). The district was selected due to its status as one of the significant areas for large-scale resettlement initiatives since mid-2003. Specifically, it is notable as a resettlement site where dual land rights were granted to resettlers in the new settlement area and in their original villages. Covering an area of 269,026 hectares, the district houses an estimated population of 45,583, with a population density of around 17 people per square kilometer. The primary means of livelihood for the community revolves around crop production and livestock husbandry, complemented by off-farm activities such as petty trade and wage labor. The resettlement program was implemented across ten rural Kebele Administrations (the lowest level political administrative units), and this research focuses on two specific kebeles: Dermaga and Zemen Merik 01 Kebele. The topography of the study area is predominantly plain, fostering favorable conditions for agricultural activities (Azanaw *et al*., 2018).

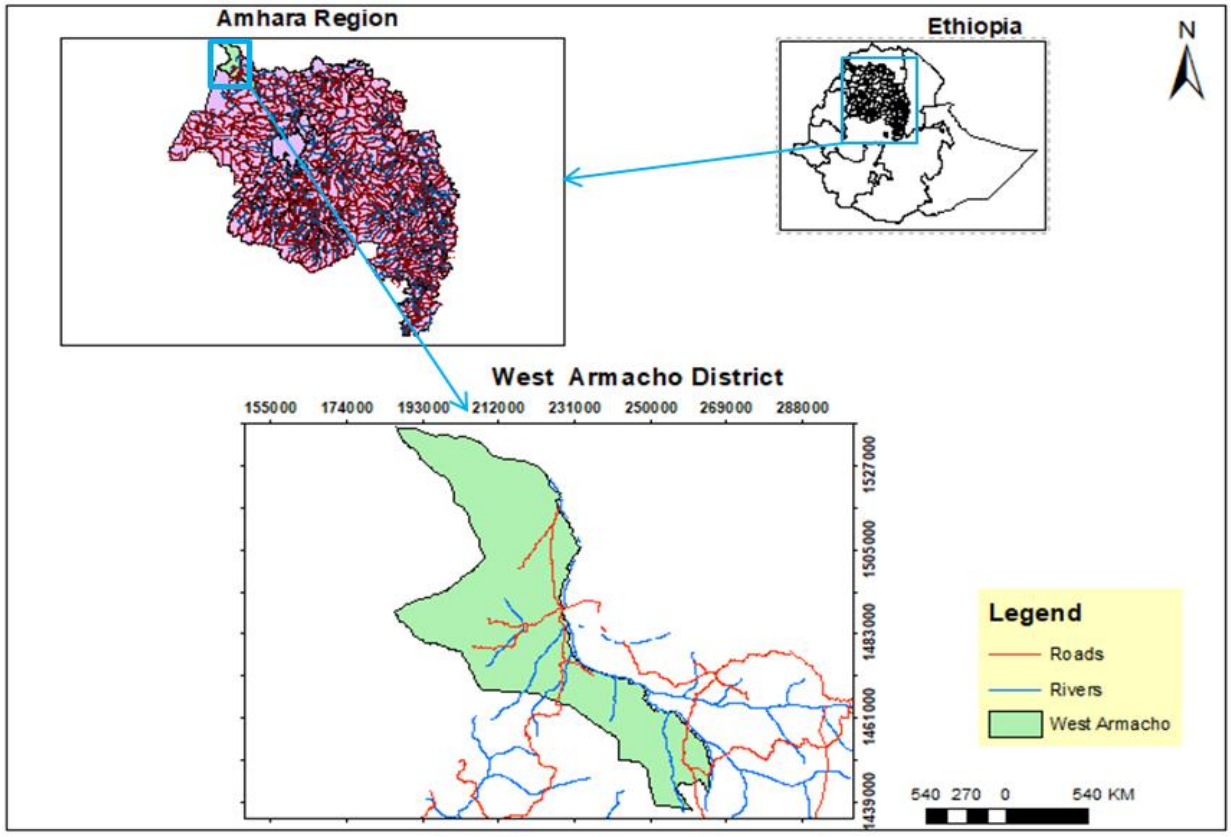

Figure 1: Map of the study areas: Source: Prepared by authors using Geographic Information System

The resettled households in this study originated from the northern highlands of the country, which are known for frequent droughts, small household land holdings, low soil fertility, and extreme food insecurity. The resettlement program aimed to achieve two primary objectives: firstly, to assist settlers in achieving food security, and secondly, to restore degraded and infertile soil while preserving ecological stability in the old settlements. The resettlement agreement granted resettled farmers the right to retain their landholding in their original settlements for three consecutive years. The success of the program relied entirely on the willingness of households to participate, as the provision of dual land rights was designed to encourage farmers to embrace the resettlement with confidence. The assumption underlying this approach was that resettlers would decide whether to permanently reside in the resettlement area if their livelihoods improved or to return to their original location if they faced economic and social disadvantages (West Armahiho Agricultural Office, 2016).

2.2. Research design

Resettlement, as a multifaceted process, intertwines both social and spatial dimensions. Therefore, to scrutinize the social impact on spatial systems observable during resettlement, an integrated social and spatial analysis technique is essential (Yeager and Steiger, 2013). The spatial approach offers promising tools for gathering spatial data and analyzing temporal changes, which are crucial in understanding the social impact on spatial systems in resettlement areas. Conversely, the social approach delves into the underlying causes of ongoing changes in land use and land cover. While the socio-spatial approach is not novel in a general context, its application in resettlement domains remains largely theoretical and unexplored in analyzing the interplay between resettlement, land rights, and land use and cover changes (Aleme *et al*., 2015).

Qualitative research methodology was employed to gather data from resettlers, local leaders, and government personnel, focusing on the effects of resettlement on community livelihoods and land rights, environmental impacts, and the institutional frameworks governing resettlement, notably land administration. Figure 2 illustrates the overall research design. This approach is deemed vital, particularly in comprehensively synthesizing contemporary global challenges like climate change analysis (Christmann and Ibert, 2012), land policy and governance analysis (Alemie *et al*., 2015), environmental analysis (Raven *et al*., 2012), and urbanization analysis (Yao and Zhang, 2014). Alemie *et al*. (2015) lucidly articulate the necessity of the socio-spatial approach in understanding the dynamic relationship between people and land. Similarly, Ahammad *et al*. (2019) examined how changes in forest cover affected livelihoods in eastern highland regions of Bangladesh and discovered a strong correlation between livelihood outcomes and changes in forest cover. These studies underscore the significance of the socio-spatial approach in comprehensively grasping the interaction between people and land, a vital perspective in analyzing resettlement initiatives. In essence, the socio-spatial research approach addresses the "where," "how," and "why" questions simultaneously, contrasting with non-mixed research methodologies.

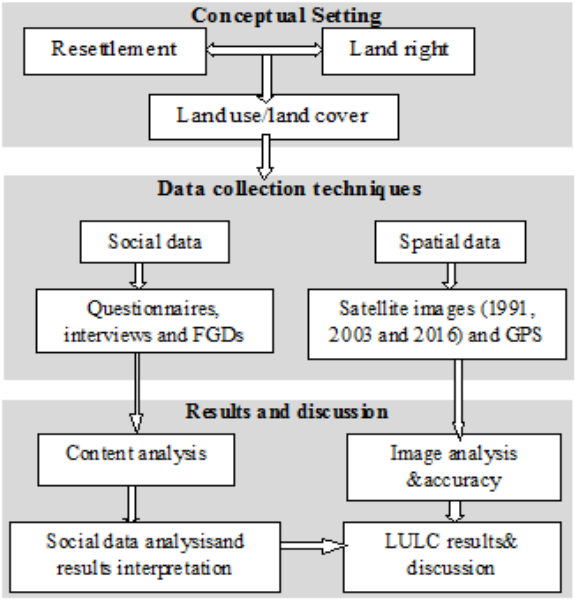

Figure 2: Overall research design

2.3 Data collection and analysis methods

Three time series satellite images were collected from the United States Geological Survey, namely OLI 2016, ETM+ 2003, and Landsat TM 1991. These series were utilized to compare land use and land cover changes before and after the resettlement. The resettlement boundary was determined using shape

files of the study area, while ground truth data was gathered using portable GPS devices. During field surveys, four primary land cover classes namely farmland, forestland, bushland, and grassland were identified with the aid of the OLI 2016 image. A minimum of 40 ground truth points were collected from each land cover class to enable geometric adjustment and supervised image classification, following the recommendation by Lillesand et al. (2004) that a minimum of 40 to 50 ground truth points are necessary for image classification with fewer than 12 classes. In practical terms before post processing of the raw satellite data, pre-processing techniques such as geometric corrections were carried out. Then a supervised classification with maximum likelihood algorithm was used to create the LULC maps for the various years, which can evaluate the spectral patterns belonging to a specific LULC class, unlike other algorithms.

The accuracy of the LULC maps was assessed to determine their quality, and ground truth data and geographical features on the classified LULC maps were utilized in the accuracy assessment process. A confusion matrix was developed to record the outcomes, with the 85% classification accuracy target frequently considered a standard for thematic mapping from remotely sensed imagery for LULC and natural resource mapping goals, as noted in the literature (Ge *et al*., 2007).

Primary socio-economic data on land rights, livelihood, land governance, status of land registration, and drivers of LULC change were obtained through carefully designed data collection tools such as surveys, key informant interviews, and focus group discussions (FGDs). The questionnaires, interviews, and FGD checklists were prepared and conducted in Amharic, the native tongue of the case study area, later translated into English for analysis and writing. The recall method (Kura *et al*., 2017) was used to track respondents' perceptions in the questionnaire, FGD, and interview questions, capturing their reflections on the before and after resettlement scenario. Targeted respondents were requested to evaluate the conditions of the LULC by comparing the present with the circumstances during the beginning of the relocation.

In this study, purposive sampling was employed for the selection of respondents in the focus group discussions (FGDs) and key informant interviews, targeting individuals with substantial knowledge and experience concerning the resettlement. To choose sample respondent households a list of the resettles in the study kebeles was first compiled. Accordingly 348 resettlers in Dermaga kebele and 300 resettles Zemen Merik 01 Kebele were recorded. The list of resettler households in each kebele was used as a sampling frame and systematic random sampling was employed to select sample respondents for the questionnaire. The sample size was purposely fixed to be 90 (proportionally divided: 42 in Zemen Merik and 48 in Dermaga) in line the suggestion of Lykken *et al*. (1988) who claim that 10% or more sample is adequate for a study community homogenous in terms of social and economic level. In this research the sample accounted nearly 14% of the population and was deemed sufficient to accurately represent the study population.

For key informant interviews, 12 individuals were carefully chosen (6 from each Kebele), including two resettlers, two Kebele leaders, and two government employees with extensive experience in the settlement program. Selection criteria for government workers were based on their position and length of service in the program, while settlers were selected based on their years of residency (i.e., those resettled from 2003 to 2006) in the Kebeles and who have already decided to permanently live in the resettlement area. Similarly, FGD participants were selected based on their familiarity with the resettlement process, involvement in local development activities, and permanent residency in the study area

A total of three FGDs were conducted, each with ten participants. The first FGD involved settlers, the second involved Kebele leaders, and the third included district land administration and agricultural development experts. To ensure that important concerns were effectively addressed, contentious issues raised during the first and second FGDs were filtered and discussed in the subsequent sessions. The FGD process was recorded using both a video recorder and note-taking and focused on issues related to resettlement planning, perceptions of land

use and land cover transformation, livelihood enhancements, and land rights.

Data collected from questionnaires, interviews, and FGDs were systematically organized into four thematic categories: pre-resettlement awareness activities, support during resettlement, perceptions of the resettlement program, and opinions from settlers and government personnel. The study has also covered various aspects, including land rights and tenure arrangements, farmland allocation, infrastructure provision, resettlement planning and implementation processes, post-resettlement outcomes like LULC changes, societal perceptions of the program, land tenure security, natural resource management, and livelihood activities. Quantitative data from the household survey were summarized and analyzed using descriptive statistics, mainly percentages, to elucidate the diverse socio-economic characteristics of the sample respondents and their perspectives on the research variables. Qualitative data collected from farm households, key informants, and FGD participants underwent thematic analysis. This analysis takes bodies of data and groups them according to similarities, mainly in themes. These themes help us make sense of the content and derive meaning from it (Belotto, 2018). Accordingly, views on specific issues were identified, coded, and used for analysis in the context of the research objective. Bryman (2012) argues that triangulation is a powerful solution to the problem of relying too much on any single data source or method as it tends to affect the validity and credibility of findings Thus, the responses gathered from varied data sources were triangulated to evaluate convergence and divergence of views among different sources.

3. Results and Discussion

3.1. Perception of the settlers about the resettlement

The federal government's resettlement program, launched in 2003, has placed significant emphasis on comprehensive planning and effective awareness creation for resettlers. The findings from this study suggest a departure from earlier resettlement initiatives undertaken in the country before 2003, wherein the government has actively utilized various channels to raise awareness of the resettlers about the resettlement program. The settlers who participated in the FGDs affirmed that they received adequate information regarding the resettlement program's process, organizational aspects, incentive packages, and notably, the retention of their landholding rights in their original possessions for a three-year period. They were also assured of receiving temporary landholding certificates upon arrival at the new location. This arrangement has allowed resettlers to choose permanently settle in the new location or opt otherwise.

However, concerns surfaced among FGD participants regarding the maintenance of their landholdings in their original villages during their absence. Despite government assurances on the management of land left by resettlers by local authorities and the implementation of rehabilitation measures such as area closure and tree planting the study's findings show that no such measures were implemented. Field visits by researchers to the old villages confirmed the communal land remained open and was utilized by households refusing to join the resettlement program and residing nearby. It was also noted that much of the farmland belonging to the resettled farmers is rented out and, and the land that was deemed to be naturally rehabilitated has remained under cultivation without any conservation measure.

During the awareness creation phase, FGD participants expressed that they have developed trust in the prospects of better livelihoods in the resettlement area, primarily due to the information provided by the government. However, subsequent discussions highlighted discrepancies between the promised provisions and the actual implementation. Challenges such as small land holdings and low soil fertility hampered farmers' efforts to increase production, aligning with observations from a study on voluntary resettlement programs elsewhere in Ethiopia, which also highlighted small landholding as a severe challenge affecting such programs (Ahmed, 2023). Moreover, essential services like medical care, access roads, water points, and schools were described as underdeveloped by FGD participants and Key Informants. Furthermore, it was realized that some settler farmers, particularly those in older age groups, found it challenging to adapt to the harsh environment and chose to return to their original

villages. Although resettlers going back to their original places are required to hand over their land holdings to the Kebele land administration office the resellers either passed on or rented out the farmland to their children or kinships. These and others concerns expressed by resettlers and experts are elaborated in Table 1.

During the FGD sessions, it became evident that the younger age group of resettlers displayed greater optimism and a strong inclination to acquire more assets in the new settlement area. This positive outlook was attributed to a scarcity of land and other resources in their previous settlement areas. An analysis of survey questionnaire responses, detailing reasons for the departure of numerous settlers from the resettlement area, highlighted several factors. These factors encompassed insufficient farmland, a high sense of land tenure insecurity (owing to the absence of a landholding certificate provided to resettlers in the new settlement), undefined arrangements regarding communal land use rights, conflicts with indigenous inhabitants, and challenging climatic conditions (as outlined in Table 2). Notably, many resettled farmers cited the provision of dual landholding rights and the absence of restrictions on renting out their land in the previous living places as significant deterrents to permanently settling in the new resettlement area.

Table 1: FGD Responses from both the settlers and government employees

Issues raised during FGD with resettlers and government staff		Responses	
Thematic issues	Issues discussed in detail under each theme	Responses from settler FGDs	Responses from Government employees FGD
Awareness creation	• Land rights guarantee in the old settlement	• FGD participants raised questions how they will be assured to retain their landholding rights once they left their village and go to the new resettlement area during the awareness creation meeting. • They were informed that they will retain their land certificate and the local level land administration office will keep the record intact.	• Experts claimed that they have given awareness about the resettlement and the land right of settlers on their old possessions. • Settlers were also informed that they will be given temporary land holding certificate in the new settlement that extends for three years.
	• Management and monitoring of the land in the original settlement during their absence	• They were informed by the government authorities that the local land administration and the Kebele leadership will take care of the land not to be encroached by other farmers living in the locality.	• Government employees confirmed that the farmland left by resttlers will be rehabilitated by the Kebele land administration and the Kebele leadership monitors and controls encroachment of the uncultivated land by people who did not join the resettlement program. • The communal land will be closed and be rehabilitated through different land management schemes
	• Trust to lead better livelihoods in the	• Based on the information given to them, resettlers have	• Government officials and experts were also of the opinion

	resettlement area	developed high hope to run better livelihoods in the resettlement area	that resettlers will be better if they join the resettlement program.
Support provided in the new resettlement area	• Adequacy of farmland provided to individual households	• Land allocated to individual resettler is not adequate and soil fertility in some places is poor and the land is not irrigable. • Equal amount of land was given for each household irrespective of the soil fertility. • The size of the land given to individual households did not take into account what is stipulated in the rural land proclamation.	• The land size for distribution was not supported by evidences on soil fertility, irrigation potential and slope. • Only availability of vacant land was considered regardless of its productivity to produce enough amounts of grains. • Farmers are expected to use improved technologies to maintain soil fertility.
	• On the use of improved agricultural technologies	• Settlers responded that improved technology provision such as improved seeds, fertilizers and others was limited. • Even what was provided was not made available on time.	• For the first two years, the land was considered to be fertile enough so technological provision was limited. • Fertilizers application by the farmers was not as per the recommendation given due to scarcity of fertilizers and lack of money to buy adequate amount of fertilizers. Hence productivity remains low.
	• Questions on agricultural extension support	• There was limited extension support such as training on crop agronomy, tree planting, pest control, livestock husbandry, and soil management	• Lack of commitment of the agricultural development workers was expressed due to poor incentive packages. • Besides, experts indicated they are more pushed to involve in political matter instead of focusing on their professional service.
	On access to land by the youth above 18 years old after resettlement	• The young settlers seem to be more optimistic about their livelihoods in the new settlement as their landholding in their original settlement area is very small. • Settlers' children who became 18 years old and above after relocation and aiming to start independent life are unable to access land and they have opted to encroach grazing and communal woodlands.	• Government staff indicated policy gaps. The youth who reach 18 years soon after the resettlement were not considered during the relocation planning. • This has induced illicit encroachment to the natural woodland and brought a dynamic alteration of the ecosystem in short period of time. • There is a lack of proper definition of ownership right on

			grazing land, wood lands, and natural reserves.
	• Adequacy of Infrastructures such as health, education, etc.	• A lot has been promised during the consultation meeting. However, practically there is acute shortage of infrastructures. There is health problem and some people are dying due to malaria. • The relatively old aged settlers are not comfortable due to the harsh environment and, lack of adequate services such as health. They prefer to give or rent the farmland in the new settlement to their children and go back to their original settlement.	• The problem with infrastructures is that they are capital intensive. It is difficult to develop all the infrastructures at once. However, the government is still working to develop more and improve the existing ones.
	• Rehabilitation activities in the old settlement	• Most FGD participants were unable to respond on condition of rehabilitation in the old habitats due to lack of information.	• There is no any strategy designed to monitor and control the land management and use practices. • This has created a loophole for relocated farm households to continue generating income from the old possessions through renting or sharecropping during the dual land right period (three years).
Perception of the resettlers on the overall process	• Perception of the realization of promised benefits	• Resettlers felt that what was promised and actually done was different. • Land size and productivity did not allow many farmers to produce more. • The medical service, access to roads, water points and schools are not adequately developed.	• Experts shared the views of the settlers.
	• Perception on their landholding right in the new settlement and old possessions	• Lack of land holding certification in the resettlement has created uncertainty about their land holding rights. • Discussion on land holding rights in the resettlement are rarely done. • There is a tendency by many of the farmers to hold their old possession as well as the land	• Failures to give temporary land use certificate were attributed to lack of experts and resources to carry out the land certification. Some have commented that the land right issue was not given prime importance.

	allocated in the resettlement.	
• Perception on LULC change in the new settlement area	• FGD participants commented that there is a decline in the woodland and grazing land areas and an increase in the area of farmlands.	• Government staff also shared the views of the settlers and stressed that absence of property right definition has exposed the natural resources to more degradation.
• Integration with the host community	• There was no visible conflict over natural resources use though there are minor complaints on grazing land use	• Good awareness was created to the host community before the resettlement

Table 2: Multiple response on perception of respondents on reasons triggering settlers to leave the settlement areas (N=90)

S/N	Reasons	Yes (%)	No (%)
1	Lack of enough farmland	75	25
2	Right of farmland possession up to three years in their former living places	65	35
3	Problems associated to adapt to the harsh climatic condition	56	44
4	Lack of strong social interaction between settlers and the native people in the resettlement area	34	66
5	Exposure to infectious disease especially malaria	89	11

In principle, farmers abandoning the resettlement area are required to return their farmland to the local government. However, insights gathered from Focus Group Discussions (FGDs) with experts working in settlement villages reveal significant shortcomings in the implementation of this policy within the study area. The findings indicate that 53% of the total resettlers who departed from the resettlement area transferred their landholdings to their children or rented it out to other farmers. About 27.8% illegally sold the land against land law, 10.6% abandoned the land, and approximately 8.6% returned it to the local government. Discussions with settlers also unveiled that abandoned land has become a source of conflict among farmers vying to claim it.

Settler farmers participating in the FGDs emphasized pertinent issues concerning land, especially the adequacy of the allotted land and the security of their land tenure. Similar to sampled respondents, a majority of FGD participants highlighted the absence of official documentation ensuring their land holdings in the resettlement area. Likewise, there was no written guarantee for resettlers that they wouldn't lose their land holdings in their former villages upon returning. Concerns were also raised about the disregard for the land rights of settlers' children who were close to turning 18 years old soon after the resettlement. The restricted access to farmland and the lack of alternative off-farm employment opportunities in the resettlement area have compelled the landless youth to trespass on communal woodlands and grazing areas illegally.

Nearly all FGDs revealed a strong desire among resettlers to retain their landholding rights in their original locations, citing emotional attachment to their forefathers' birthplaces. This emotional bond with the land is referred to as the sentimental value of land (de Vries and Voß, 2018). The study unveiled that a majority of families have adopted strategies to retain land rights in both locations, resorting to tactics like false divorce or sending their wives back to their former villages. Some have transferred land in the old villages to children who turned 18 before their three-year landholding right expired.

While one of the primary aims of relocation was to enhance the rehabilitation of degraded lands in former settlement areas, the government has failed to

develop strategies for monitoring and controlling land management and use practices (Table 1). This loophole enables relocated farm households to continue generating income from their former possessions through renting out or sharecropping during the dual land right period. Discussions with experts working in resettlement areas revealed a lack of communication or information exchange between land administration offices in the settlement district and those in the districts from which settlers originated. Therefore, this study asserts that the aforementioned occurrences vividly demonstrate the government's institutional failure in properly administering and regulating land tenure rights in both the resettlement area and the original locations.

3.2. Landholding size of the settlers and its implication to land use land cover change

As per the directive on land distribution for settlers, married settler farmers who do not have children are eligible to receive one hectare of farmland and a 300 m^2 homestead for constructing a residence. On the other hand, couples with children and dependents are entitled to receive 1.5 to 2 hectares of farmland and a 300 m^2 homestead (Table 3).

The average landholding in the resettlement area stands at 1.5 hectares, and a considerable number of settlers reported inadequacy in the allotted land size (Table 1). Existing literature suggests that farmland holdings below 2 hectares per household, particularly those without irrigation, are considered small (Lowder *et al*., 2016). Despite the allocation of land based on family size, most (85%) households stated that their landholdings are insufficient to sustain adequate grain production for the family. This deficiency primarily results from poor soil fertility in many areas and the lack of access to irrigation water (Table 1). Focus Group Discussion participants echoed these concerns. Government employees underscored that the land redistribution size was not determined by evidence of soil fertility, irrigation potential, or slope but rather focused on the availability of vacant land. Although lowland farmland typically requires fallowing to maintain soil fertility (Richard *et al.*, 2006; FAO, 2005), government employees suggested compensating for yield reductions due to poor soil fertility by utilizing manure and chemical fertilizers.

Despite claims by experts that agricultural extension services are provided to resettlers, the majority of respondents (92%) and FGDs with resettlers revealed that training provided on improved agronomic practices is limited and the supply of improved seeds, chemical fertilizers, and pesticides is inadequate. Settler farmers also boldly stated that the small size of landholding, on one hand, and the desire to produce more, on the other, have tempted many of the settlers to illegally encroach communal lands and cultivate crops. Lack of registration and certification of the land resources in the name of the settled communities and absence of institutions governing the land have remained serious challenges inducing uncontrolled competition and illegal exploitation of the communal land resources.

Crop productivity in the lowlands, including the study area is low due to poor soil fertility, low water-holding capacity, and diminished soil organic matter (Richard *et al.*, 2006). Owing to this about 80% of the agricultural output increase in Africa has occurred through expanded cultivated land (Yang *et al*., 2014). Consequently, settlers engaged in subsistence agriculture, constrained by small landholdings, resort to grabbing communal land to meet their demands, inadvertently leading to land use and cover change.

Acknowledging the land fertility problem, the Amhara regional state's rural land administration proclamation permits farmers in lowlands to possess up to seven hectares and up to three hectares in highlands (Proclamation No., 133/2006). Despite this, the majority of settlers have small plots insufficient for livelihoods. Hence, apart from advocating productive farming technologies, acquiring of adequate land by resettlers as stipulated in the proclamation seems imperative to enable them produce adequate grain. In response to land shortages and low crop yields, FGD participants disclosed that many settlers are engaged in fuel wood collection from communal woodlands to augment family income during slack seasons, and this contributes to land use and land cover change (LULC) and environmental degradation in the study area.

In the Amhara Region, farm households' land rights are supported by landholding certificates issued after

rigorous adjudication. However, in the resettlement area, the land allocated to each household is not supported by a landholding certificate. Instead, it is recorded in a ledger containing all settlers' names in each settlement block. Resettlers have stated that they have already been given landholding certificates in their original place. Experts have confirmed that reluctance of the rural land administration office to implement the land administration regulation that stipulates land registration and certification has created a loophole for settlers to mismanage communal lands. The resettlement program is not complemented by actions that ensure the land rights of settlers, and solid land use planning that enhances agricultural production and environmental protection is lacking. The land administration problems in general demand the establishment of local-level land administration institutions with clear rules and regulations to guide the good use of land, as well as the strengthening of agricultural extension services. These arrangements contribute to improving land management and resource governance on a sustainable basis while meeting basic societal needs, as observed in the study reports of Trombetta (2008).

3.3. Expansion of farmland

Settler farmers employ various methods to expand their landholdings. When questioned about their perceptions regarding this practice, the majority of respondents (58.9%) indicated that settlers achieve this expansion by clearing woodlands, forests, and grasslands. The remaining respondents reported that settlers illegally acquire land through informal purchase from other settlers or native farmers, or by seizing abandoned land (as illustrated in Table 4). Unfortunately, since the onset of the resettlement operation in the study region, these unlawful property acquisitions and illegal encroachments have led to rapid changes in land use and land cover (LULC) in the study area (as depicted in Figures 4A, B, and C).

Table 3: Area of farmland allocated to sample settler households in the study area (N=90)

Area of farmland allocated (ha)	Number of settlers (frequency)	Percentage
1.0	40	44.4
1.5	25	27.8
2.0	25	27.8
Total	90	100

Table 4: Means of extra farmland acquisition by settler farmers

Means of extra land acquisition	Number of respondents	Percentage
Purchased from native farmers	7	7.8
Purchased from settler farmers	17	18.8
Clearing forest and grass land area	53	58.9
Using the farm land which has no owner	13	14.4
Total	90	100

3.4. Land use land cover analysis

As detailed in the methodology, the assessment of land use and land cover (LULC) in the study area relied on three time-series satellite images: Landsat TM 1991, ETM+ 2003, and OLI 2016. This approach facilitated an examination of the evolving LULC patterns across different periods, allowing for a comparative analysis to discern changes resulting from resettlement activities. Figure 4 shows the LULC maps for the years 1991, 2003, and 2016, delineating the changes in land cover over time. This analysis provides crucial insights into the scale and nature of LULC alterations within the study area, illuminating the influence of resettlement on the region's landscape.

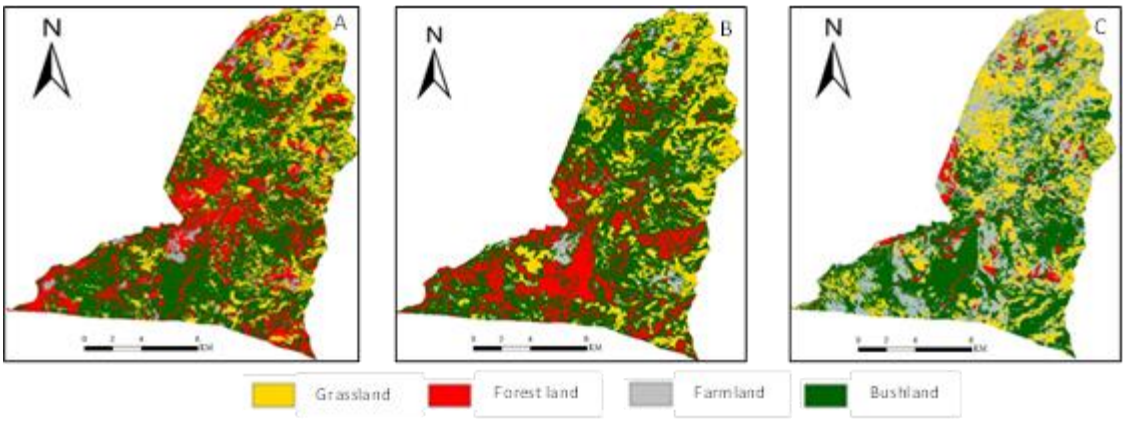

Figure 4: Land cover maps of the study area in different years: A: in 1991, B: in 2003, C: in 2016

An accuracy assessment was conducted to gauge the precision of the classified image data in comparison to the actual reference data. One common method to measure classification accuracy is through an error matrix, which displays the relationship between classes in the classified image and the reference (ground truth) data. In this study, the accuracy of the classified image was evaluated using reference data collected for each land cover class during fieldwork.

Ground truth GPS data were utilized to represent the current state of the study area. Specifically, the accuracy assessment was computed for the 2016 supervised classification map of the study area, detailed in Tables 5 and 6. An accurate assessment of classification precision is crucial to ensure the validity and reliability of the study's outcomes.

In this study, forestland is defined as an area spanning a minimum of 1 hectare with at least 10% crown cover and matured trees exceeding 2 meters in height. Bushlands are characterized by land covered with woody self-supporting single and multi-stemmed plants, branching at or near ground level, typically lacking a distinct structure. These areas exhibit a total canopy cover of more than 10% and a canopy height ranging between 2 to 5 meters. Grassland denotes areas dominated by non-woody rooted herbaceous plants, often interspersed with scattered trees and shrubs. Farmland refers to land cultivated for annual crops (FAO, 2010, 2016).

Table 5: Error matrix between classified OLI 2016 images with respect to the actual ground truth points

	Ground truth reference data				
LULC type	Bushland	Forest land	Farmland	Grassland	Total
Bushland	**29**	2	1	2	34
Forestland	0	**16**	1	0	17
Farmland	3	2	**31**	0	36
Grassland	0	0	2	**27**	29
Total	32	20	35	29	116

Table 6: Accuracy level of each land cover classes used in the image classification

LULC type	Producer's accuracy (%)	User's accuracy (%)	Kappa statistics
Bushland	90.63	85.29	0.79
Forest cover	80.00	94.12	0.93
Farmland	88.57	86.11	0.80
Grassland	93.10	93.10	0.91
Total	88.79	88.79	0.85

The supervised classification's accuracy assessment yielded results within an acceptable range for regional or rural environments, with an overall accuracy and Kappa value of 88.79% and 84.81%, respectively. The classification of bushland and grassland exhibited producer accuracy above 90%, indicating minimal incorrect exclusion of pixels from their respective categories. However, forest cover indicated an omission of 20%, implying misclassification of 20% of the pixels. Notably, forestland and grassland categories demonstrated maximum user accuracy, reaching 94.12% and 93.10%, respectively, and indicating highly accurate automated classification

Subsequent to the accuracy assessment, change detection analysis was performed using the LULC maps presented in Figures 4, 5, and 6. The findings revealed a significant increase in farmland coverage from 680 hectares in 1991 to 6,579 hectares in 2016, accompanied by a decrease in forest cover from 5,706 hectares in 1991 to 1,116 hectares in 2016, followed by reductions in bushland and grassland.

The socio-economic and LULC analyses together unveiled dramatic changes in land use and cover during the resettlement period. These alterations were particularly pronounced in the change matrix result maps between 1991 and 2003, and between 2003 and 2016 (Figures 6 A and B; Tables 7 and 8).

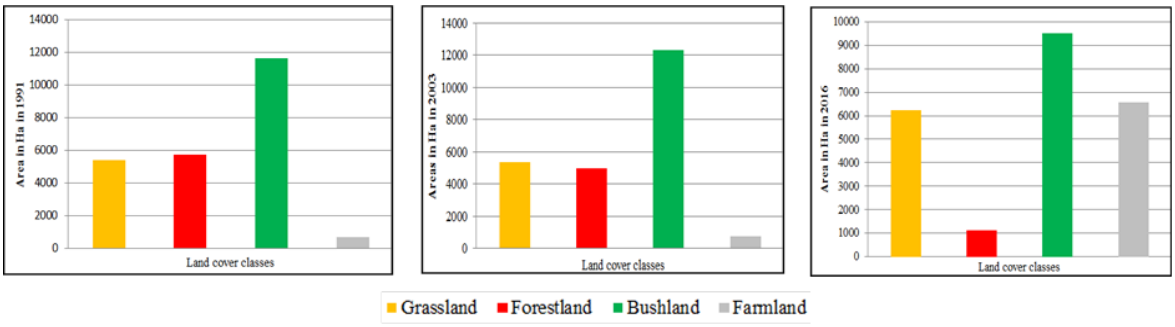

Figure 5: Area of the different land cover classes in hectare across the study time

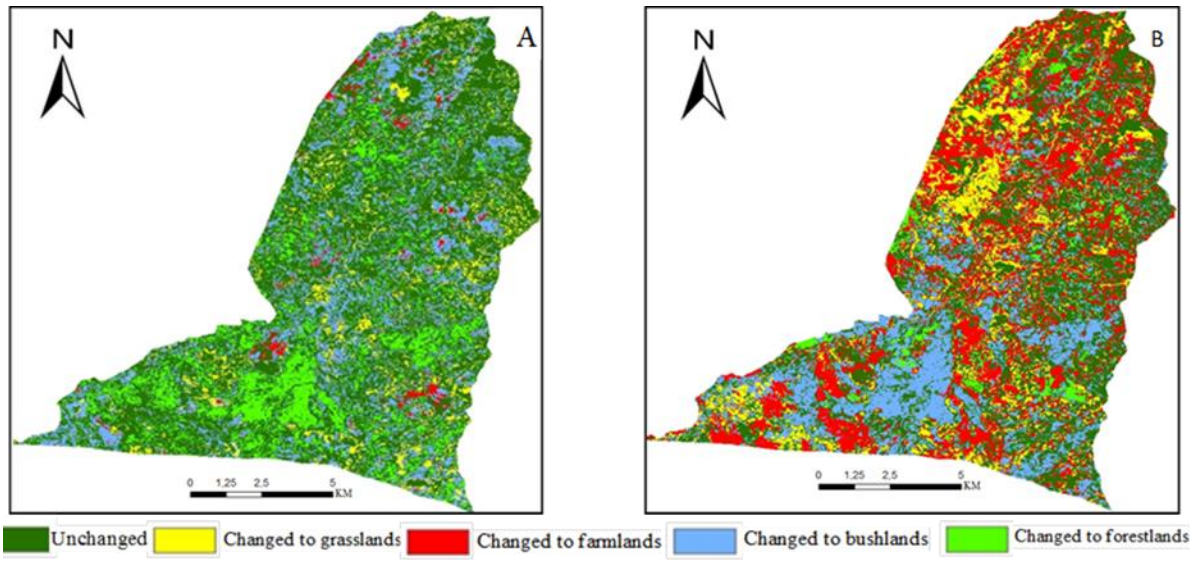

Figure 6: Land cover change map: A: 1991 to 2003; B: 2003 to 2016

Table 7: Land use land cover conversion matrix of the study area for 1991/2003

Land use land cover class:- 1991	Land use land cover class:- 2003				
	Forest cover	Grass land	Farm land	Bush land	Total
Forest cover	**1955.34**	245.52	383.58	3122.1	5706.54
Grassland	5.76	**3788.01**	8.55	1601.1	5403.42
Farmland	20.97	80.91	**369.54**	209.16	680.58
Bushland	3013.11	1254.06	3.78	**7387.74**	11658.69
Total	4995.18	5368.5	765.45	12320.1	

Table 8: Land use land cover conversion matrix of the study area for 2003/2016

Land use land cover class:- 2003	land use land cover class:- 2016				
	Forest cover	Grassland	Farmland	Bushland	Total
Forest cover	**390.87**	198.27	608.40	3797.64	4995.18
Grassland	32.76	**3275.1**	1555.38	505.26	5368.5
Farmland	195.21	56.97	**281.79**	231.48	765.45
Bushland	497.16	2713.41	4133.97	**4975.56**	12320.1
Total	1116	6243.75	6579.54	9509.94	

Figures 6A and 6B provide a comprehensive visual representation of the land use and cover change rates between 1991 and 2016. The change matrix from 2003 to 2016 highlights a decline in forest cover and bushland by 3,879.18 hectares and 2,810.16 hectares, respectively, with an annual change rate of 484.9 hectares for forest cover and 351.27 hectares for bushland. Conversely, farmland expanded by 5,814.09 hectares at an annual rate of 726.76 hectares, while grassland increased by 875.25 hectares from the 2003 classification, with an annual growth rate of 109.41 hectares.

The study has revealed significant land use and cover changes resulting from resettlement activities in the study area. Similar trends were observed in land use and cover studies conducted in the Chewaka district of Ethiopia (Abera *et al*., 2020), in the North-western lowlands of Ethiopia (Alemu *et al.*, 2015), and in the Anbessa Forest in the Benishangul-Gumuz Region (Hunde, *et al*., 2021). The substantial changes of the detected in land use and cover highlight the urgency of implementing a resettlement monitoring and evaluation system. Such a system should be established at the outset to effectively oversee the resettlement process and assess the post-settlement effects on settlers' livelihoods and the natural resource base.

3.5. Driving factors of LULC change

Survey results revealed that a significant majority (95.6%) of settler respondents perceived substantial changes in forest and bushland cover since their arrival in the study area. This perception was reinforced by feedback gathered during focus group discussions involving settlers and government staff. The absence of institutions dedicated to safeguarding communal natural reserves has exacerbated the severity of Land Use and Land Cover (LULC) change.

Despite the rural land law's provision mandating the registration and certification of land holdings for farmers, community groups, government, and non-government institutions (Proclamation No.456/2005), the lack of timely land registration and certification has led to a diminished sense of land tenure security and mismanagement of land resources. The primary drivers behind the observed changes in land use and cover, detailed in Table 9, are largely influenced by the absence of land tenure security. Government officials noted that the absence of local-level land use plans before resettlement has impeded proper land management by settlers.

The open access nature of communal resources, combined with a weak land administration system, has enabled resettlers to encroach upon communal lands. Focus Group Discussion participants highlighted that settlers' dual land tenure rights

motivated some households to encroach upon communally owned grazing and woodlands to maximize income. The influx of landless individuals and relatives of resettlers, not included in the resettlement program, has exacerbated deforestation and encroachment in to the communal grazing lands in the settlement area.

Where individual and communal landholding rights lack clear definition, and efficient systems for managing communal land resources are absent, illegal LULC changes are likely to occur. In this study, while the government's intent to grant dual landholding rights is commendable, the absence of robust institutions to enforce land rights and restrictions has contributed to the misuse of land resources. The evidence of illegal LULC changes in the study area underscores the imperative for decision-makers to identify and implement effective resettlement packages. Additionally, policy revisions are crucial to ensuring that future resettlement programs align with their intended objectives.

Table 9: Major causes for LULC changes

Major causes	Frequency	Percent
Expansion of farmland by settler farmers	61	67.8
Cutting of trees for the construction purpose	15	16.7
Expansion of farmlands by illegal settlers	9	10.0
Cutting of trees for fire wood	5	5.5
Total	90	100

The Focus Group Discussions involving both resettlers and government employees highlighted a gradual increase in competition for communal resources between resettlers and indigenous communities. This competition stemmed from the demand for farmland and fuel wood, resulting in a drastic incidence of Land Use and Land Cover (LULC) change in the study area (depicted in Figures 4A, B, and C). This finding resonates with the FAO (1993) guideline for land-use planning which underscores the importance of preparing a land use plan tailored to meet the needs of the people. However, in Ethiopia, the implementation of land use plans is weak, primarily concentrated in urban centres (Gebeyehu *et al*., 2017). The situation in rural areas, including the resettlement area in this case study, lacks guidance from land use plans, and land use practices overlook economic, social, and environmental considerations. These insights bear significant implications, urging decision-makers to prioritize effective land management practices and policy revisions to ensure that future resettlement programs achieve their intended outcomes.

Although the government claims that the voluntary resettlement program is provided with the required support, the issue of inadequate plot sizes for sustaining livelihoods has become a growing concern among the settlers. There are clear indications of illicit encroachment on natural resources, as observed in the LULC maps presented in Figures 4A, B, and C. Failure to curb continuous LULC change that is geared towards the exploitation of the fragile ecosystem is likely to lead to environmental degradation and poor ecosystem productivity, severely damaging the livelihoods of the society.

3.6. Resettles' perception on land rights

Information sourced from the Amhara Regional State indicates that since 2003, a total of 3,748 households were resettled in ten Kebeles of the West Armachiho district. However, during the field survey, it was discovered that only 1,950 households have permanently settled in these Kebeles, of which 680 are located in the two study Kebeles. Discussions with settlers revealed that those who departed the resettlement area secured land use rights in their former villages. This departure, apart from the harsh environmental conditions faced by settlers, is attributed to the dual land holding rights that is not complemented by strict land use rights.

Assessment of respondents' perceptions on their land tenure security revealed that the majority (86%) feel the land belongs to the government, and fear potential loss without adequate compensation for government development projects. Settlers expressed uncertainty about promised temporary land use certificates or the maintenance of the three-year landholding right in their former villages. More interestingly, resettlers

feel that the communal woodlands and grazing lands, which they virtually assume as state lands and used in the form of free access, will one day be designated for resettling other people. Hence, the evolving land tenure in the resettlement area, which involves the transfer of state land to resettlers, unrestricted encroachment in to communal lands, lack of land certification, have all created fear among resettlers that the land they cultivate today could be claimed by the state at any time.

Discussions with district land administration experts regarding the results in Table 10 highlighted challenges. Failure to issue land use certificates as planned and absence of a local land administration office to oversee landholding activities have hindered efforts to halt illegal land transactions and encroachments into woodlands. The local leadership was criticized by respondents for assigning experts to political matters instead of allowing them to focus on their professional services. Discussions with experts also revealed that a lack of incentive packages to retain and motivate experts working in the harsh environment has impacted their performance in the land administration. Furthermore, as observed during a field visit, unlike in the highlands, the local level administrative setup was not well-organized to handle land issues.

Lack of land use plans, registration, certification, and land management interventions are contributing factors impeding responsive land tenure security that balances livelihood improvement and environmental preservation (Table 10). As argued by Wubneh (2018) all of these factors are fundamental in the realization of responsive land tenure security that takes into consideration the improvement of livelihood in an equitable manner without compromising environmental concerns.

Table 10: Major causes of land tenure insecurity

Major causes	Frequency	Percent
Lack of land registration and certification	61	70.93
Lack of land use plan	12	13.95
Inefficient land administration systems	9	10.47
Poor political commitment	4	4.65
Total	86	100

As discussed in the theoretical underpinning section, recognizing land rights instills confidence among landholders about their land tenure security, promotes investment, and encourages better land management for improved food production and environmental conservation. These good intensions are however stifled due to absence of robust land administration institutions and effective land use planning. In the absence of proper recording and administration, as observed in the case study resettlement area, the continuum of land rights to tenure security becomes weak. This seems to have made the resettlers reluctant to manage land held by themselves and other land resources designated as community or state holdings.

The national rural land laws emphasize state and communal ownership, providing farmers with usufruct rights (Proclamation No.456/2005). Despite these provisions, implementing land registration and certification in the name of landholders to enhance their perception of tenure security is essential. The need for comprehensive land use planning is also emphasized in these laws. Although scholars (Deininger *et al.,* 2008) argue that Ethiopia has implemented one of the largest, fastest, and most cost-effective land registration and certification reforms in Africa, the resettlement programs in the country seem to have overlooked the land tenure issue. None of the resettlement programs were complemented by proper land registration and certification (EPLAUA, 2014). Even where attempts were made to register land holdings FGD participants indicated that they were given papers stating only the locations and the area of land allocated to individual settlers; and this was not given due

recognition by settlers as evidence to defend their land rights.

3.7. Implications to policy discussions

Resettlement, land rights, and Land Use and Land Cover (LULC) changes are interrelated variables that require critical analysis. However, existing literature lacks depth in illustrating the mutual influence of these systems. Empirical evidence from this research demonstrates that resettlement instigates LULC alterations and introduces new land rights and tenure complexities.

Furthermore, the nature and mechanisms of land rights and tenure determine the scope of LULC transformations. Despite the pivotal influence of land rights and LULC changes on the success of any resettlement program, the literature addressing these issues is scarce. Given the universal relevance of defining land rights/land tenure for improved livelihoods and environmental conservation this research's findings can contribute to global policy debates and theoretical discussions on aligning resettlement-induced land rights and LULC changes through policy and program refinements.

The resettlement program in this study implemented innovative policy shifts to encourage voluntary migration to the resettlement area. As part of the policy shift resettlers were granted dual landholding rights for three years in their former settlements and perpetual rights in the new settlement upon opting for permanent residence there. This governmental initiative can be considered a tangible manifestation and recognition of human rights. Despite observed irregularities, the findings suggest that the policy ideas tested in this study hold potential for adoption in future resettlement programs. The study underscores the need to complement resettlement programs with comprehensive institutional, technical, and managerial frameworks from the outset to align with the resettlers' interests and program goals, such as ensuring food security and rehabilitating original settlement areas environmentally and agriculturally.

The results of this study revealed that centralized administration, rigid policies, top-down legal frameworks, and insufficient community involvement during resettlement planning and execution contributed to unsuccessful outcomes. For instance, inadequate farmland size emerged as a significant challenge for resettlers in this study. Similarly, the dual land rights arrangement motivated resettlers to maximize family income by exploiting land in both resettlement sites and original villages. Weak institutions governing farmland and communal resources in resettlement areas have left environmental concerns unaddressed, necessitating a vigorous policy discourse. The policy implications drawn from this study could serve as valuable insights for other developing nations contemplating resettlement programs.

4. Conclusion and Recommendation

This study aims to address conceptual and empirical gaps in understanding the intricate relationship between resettlement processes, land rights, and changes in land use and land cover (LULC). It establishes a conceptual nexus among these variables, emphasizing the pivotal role of land rights in connecting resettlement areas with their inhabitants. These rights significantly influence land use decisions and management practices, ultimately shaping the LULC dynamics within the resettlement area. Employing a socio-spatial methodology, this research provides empirical evidence that elucidates the 'where, why, and how' of these variables, demonstrating their influence on resettlement outcomes.

The findings underscore the evolution of land tenure rights within the resettlement area, where state-owned land previously accessed by the indigenous community has been transferred to private ownership among resettlers. Despite the demarcation of communal grazing lands and woodlands, the absence of clearly defined rights over these resources hampers effective land resource management. Consequently, much of the forest, woodland, and communal grazing areas have been converted to other land uses, primarily for crop cultivation. Notwithstanding irregularities observed, the presence of permanently settled individuals experiencing improved livelihoods signals the initial success of the program's intention to grant dual land rights. However, failures to safeguard communal woodlands and grazing lands; and weaknesses of the local government to monitor the land abandoned by resettlers have fuelled overexploitation, resulting in drastic changes in land

use and land cover. These incidents are valid indicators to seriously evaluate the resettlement programs that give dual land tenure rights in old and new settlement areas.

Future resettlement programs should draw lessons from innovative approaches. It is imperative that any innovative resettlement initiative, aimed at achieving its noble goals, should be well supported by robust institutions and a policy framework that seriously considers diverse elements (social, economic and political elements and technical issues) that impact the resettlement program. The study also signals that priority should be accorded to implementing a comprehensive land governance system. This system must effectively address settlers' land rights and obligations together with management of communal forest and grazing lands to enhance sustainable economic and environmental development. Complementing the resettlement schemes with transparent and inclusive stakeholder discussion from the outset helps to run the program with great sense of responsibility and accountability. Additionally, establishing a robust monitoring and evaluation system is essential to ensure alignment with the intended objectives of the resettlement program.

Data availability statement

Data will be made available on request.

Conflicts of interest

The authors declared that there is no conflict of interest.

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