# Assessing Stakeholder's Willingness to Adopt Agroforestry for Land Reclamation in Gold Mining-Affected Areas

## A Case Study of Chunya District, Tanzania

Luciana Raphael Chappa

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Luciana Raphael Chappa

**Swedish University of Agricultural Sciences**

Faculty of Natural Resources and Agricultural Sciences

Department of Economics

# Abstract

This study investigates the willingness of stakeholders in Chunya District, Tanzania, to adopt agroforestry as a land reclamation strategy in gold mining-affected areas. Mining activities in Chunya District have led to severe environmental degradation, including soil erosion, water contamination, and deforestation, which not only disrupt agriculture but also harm local biodiversity. Agroforestry, which integrates trees with crops or livestock, has been identified as a promising solution to restore soil fertility, mitigate erosion, enhance food security, and provide materials such as timber and fuelwood for the mining industry. By incorporating trees into agricultural landscapes, agroforestry can also reduce the pressure on natural forests, helping to avoid further deforestation and providing sustainable alternatives for timber, firewood and building materials used in mining industries. Despite its potential, agroforestry remains underutilized in Chunya District. The research employs a case study design and uses qualitative methods including in-depth interviews, focus group discussions, and participant observation. These methods were used to assess the attitudes of local farmers, community leaders, mining company representatives, and environmental experts toward adopting agroforestry for land reclamation. The findings reveal that 85% of stakeholders recognize the benefits of agroforestry, such as improved soil quality, enhanced water retention, increased agricultural productivity, diversified income sources, and the restoration of degraded land. However, several barriers hinder the widespread adoption of agroforestry in the area. The most significant obstacles are financial constraints, lack of technical knowledge, and limited institutional support. While agroforestry is seen as a long-term solution, many stakeholders are hesitant to invest due to high initial costs and insufficient funds and training. Furthermore, legal challenges related to land tenure and competing interests between farmers and mining companies complicate the implementation of agroforestry practices. Despite these challenges, the study highlights the potential of agroforestry to address both environmental and socio-economic issues. By integrating trees with agricultural practices, agroforestry can mitigate the adverse effects of mining, such as soil erosion and water pollution, while simultaneously providing local communities with food, timber, and other materials. For the mining industry, agroforestry can offer sustainable sources of timber and fuelwood, reducing the pressure on natural forests and promoting a more environmentally responsible approach to land use. Furthermore, agroforestry can enhance food security and improve livelihoods by diversifying income streams for local farmers. The study concludes that agroforestry offers a viable and multifaceted solution to the challenges posed by mining in Chunya District. To overcome the barriers to adoption, the research suggests the need for targeted policy frameworks, financial incentives, and capacity-building programs. By fostering collaboration between stakeholders, including mining companies, government agencies, and local communities, agroforestry can play a critical role in land reclamation, environmental restoration, and the long-term sustainability of Chunya District. This research contributes to the growing body of knowledge on agroforestry as an effective strategy for mitigating the environmental and social impacts of mining activities in Tanzania.

*Keywords:* Agroforestry, Sustainable Solutions, Stakeholder willingness, Public-Private Partnerships, financial incentives, Mining Impact, Land Reclamation and Mining.

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## Abbreviations

| | |
|---|---|
| SLU | Swedish University of Agricultural Sciences |
| ICRAF | World Agroforestry Centre |
| TFCG | Tanzania Forest Conservation Group |
| MCDI | Mpingo Conservation & Development Initiative |
| URT | United Republic of Tanzania |
| NGO´s | Non-Governmental Organizations |
| CSR | Corporate Social Responsibility |

# 1. Introduction

*The background of the study of Agroforestry and Mining is presented in this section, along with a general introduction to agroforestry in Tanzania. Additionally, the problem statement, the aim and research question, the delimitation of the study, and the outline have been provided.*

## 1.1 Background

Tanzania, situated in East Africa, boasts a population projected to reach approximately 67.76 million by 2024, spanning an expansive land area of 947,303 square kilometers. The nation's economy, diverse in its activities including agriculture, mining, manufacturing, and tourism, faces vulnerabilities exacerbated by climate change and other environmental concerns (Coulson, 2013; Wetengere, 2021; Omambia & Gu, 2010). Sectors like agriculture, manufacturing, and energy stand particularly susceptible to the impacts of climate change, with projections indicating a significant reduction in GDP by 2050 and beyond if temperatures are not kept in check (Watkiss et al., 2011: Agrawala et al., 2003; Omambia & Gu, 2010).

Chunya District, nestled in the Southern highlands of Tanzania, epitomizes this economic diversity with its blend of agriculture, mining (predominantly gold), and trade. The district is divided into three distinct Agro-Economic Zones, each characterized by unique landscapes and economic activities: the Gold Mine Zone, the Miombo Woodland Zone, and the Rukwa Basin Zone. Mining activities refer to the process of extracting valuable minerals or other geological materials from the earth's surface or beneath it (Jønsson et al., 2009; Kumah, 2006; Betancur-Corredor et al., 2018). These activities involve various stages, including exploration, extraction, processing, and transportation of minerals such as coal, metals, gemstones, and industrial minerals (Betancur-Corredor et al., 2018; Jumabayeva et al., 2023 ). Mining can occur through surface mining, where minerals are extracted from the earth's surface, or underground mining, where tunnels and shafts are constructed to access deposits located beneath the surface. Betancur-Corredor et al. (2018) and Mbare et al. (2023) reported that Mining plays a crucial role in providing raw materials for various industries and fulfilling global demands for resources essential for economic development. However, it also poses several environmental challenges including soil erosion, water pollution, air pollution, and loss of biodiversity.

In line with the environmental impacts, Betancur-Corredor et al. (2018) and Mbare et al. (2023) have identified significant social hurdles within the gold mining sector, including illegality, widespread poverty, informal mining practices, and community violence in mining areas, loss of jobs, health problems, and land conflicts. To address the environmental impact of waste deposits stemming from mining activities, numerous researchers have advocated various technologies for land reclamation. For instance, Betancur-Corredor et al. (2018) and Gitari et al. (2024) highlighted silviculture, reforestation, and agriculture as promising methods to mitigate this challenge. To address social challenges effectively. Betancur-Corredor et al. (2018) advocate for active community engagement and participation in the reclamation efforts spearheaded by gold mining companies and other stakeholders. By actively involving themselves, communities aim to restore their livelihoods and enhance their well-being. Moreover, Betancur-Corredor et al. (2018) stressed the importance of integrating corporate social responsibility initiatives to offset the health repercussions, livelihood losses, and other adverse social impacts stemming from gold mining activities.

Further, study by Leah et al. (2014), Golar et al. (2021), Adu-Baffour et al. (2023), Samsudin et al. (2020), and Buxton et al. (2013) suggested that Land affected by mining activities can be restored through various methods, including the refilling of open pits, revegetation, reforestation, agroforestry, and bioremediation. Among all the mentioned technological methods, agroforestry emerges as particularly advantageous, offering a multitude of benefits simultaneously. Agroforestry, as explained by Leakey (1996) and Gitari et al. (2024) combines trees with crops or livestock, offering multifaceted benefits. It enhances agricultural productivity, besides diversifying income sources (Nair, 1989; Soratto et al., 2022), and bolsters food security (Nair, 1993; Chappa et al., 2024). These systems aid climate change mitigation by sequestering carbon (Leakey, 1996; Alkharabsheh et al., 2023), restoring soil fertility, preventing soil erosion, fostering biodiversity conservation, and sustainably yielding timber products (Nair, 1993; Maitra et al., 2024).

The growing mining activities in Chunya pose serious dangers to several sectors including the agriculture and environment. Digest Tanzania (2023) reported that mining operations harm the environment, causing soil erosion and water pollution that directly affects arable lands, potentially reducing crop yields. The use of chemicals and changes in land use patterns can disrupt farming practices, impacting the cultivation of important food and cash crops.

Furthermore, the expansion of mining into agricultural areas also increases the likelihood of land conflicts, creating challenges for sustainable farming and putting the livelihoods of local farmers at risk (Digest Tanzania 2023). Moreover, Digest Tanzania (2023) reported that the forest is often cleared regularly in preparation for mineral extraction, this harms habitats, endangers biodiversity, disrupts ecosystems, and contributes to climate change. Mining activities harm agriculture, degrade the environment, and spark land conflicts, exacerbating scarcity, and posing challenges to sustainable land use.

To counter this, we need a solution that restores the damaged land, maximizes sustainable land use, provides food for the community, and obtains timber materials within mining areas without clearing natural vegetation. Several scholars have highlighted the positive impacts of Agroforestry in addressing both environmental and social challenges linked to degraded land (Kisaka et al., 2023; Nungula et al., 2024; Chaturvedi et al., 2014). While Agroforestry presents a promising approach, there is a paucity of research exploring its potential in mitigating the serious issues stemming from mining activities. This lack of investigation is particularly evident in the Chunya district, where Agroforestry remains underutilized. Consequently, this study seeks to evaluate the willingness of stakeholders to embrace Agroforestry as a solution to these pressing concerns.
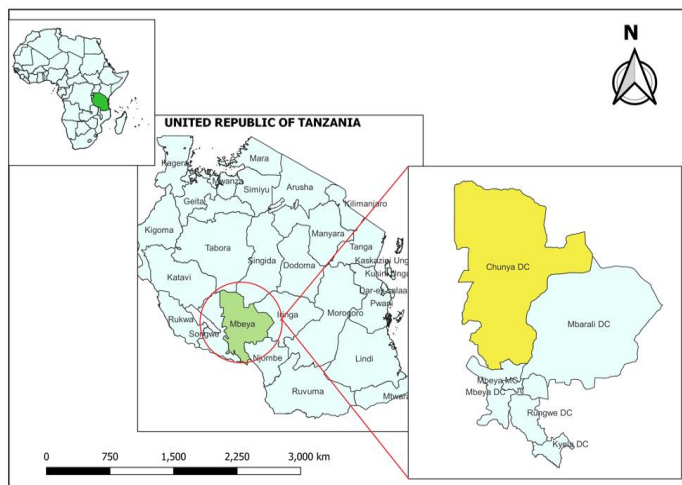


*Figure 1: Location of study area (Chunya district)*

## 1.2 Agroforestry in Tanzania

The adoption of agroforestry in Tanzania has been driven by a combination of factors that address both environmental and socio-economic needs. One key factor is the recognition of the benefits that agroforestry offers in terms of sustainable land management and climate resilience. Tanzania, like many other countries in sub-Saharan Africa, faces challenges such as soil degradation, deforestation, and climate variability, which threaten agricultural productivity and livelihoods. Agroforestry presents a holistic approach to addressing these challenges by integrating trees into agricultural landscapes, thereby improving soil fertility, conserving water resources, and enhancing ecosystem resilience (Sunderland et al., 2013; Nair, 1993; Chappa et al., 2024; Gitari et al., 2024).

Furthermore, the promotion of agroforestry in Tanzania has been supported by various governmental and non-governmental organizations, as well as international development agencies (Kitalyi et al., 2010; Vi Agroforestry, 2019; Trees for the Future, 2024). Government policies and programs aimed at sustainable land management and environmental conservation have encouraged the adoption of agroforestry practices among smallholder farmers. For example, the National Forestry Policy of 1998 and the National Forest Program of 2001 emphasize the importance of integrating trees into agricultural systems to enhance biodiversity, mitigate climate change, and improve rural livelihoods (URT, 1998; URT, 2001; Tanzania Agricultural Research Institute, 2025).

Moreover, initiatives led by NGOs and research institutions have played a crucial role in promoting agroforestry awareness and providing technical assistance to farmers (Tanzania Agricultural Research Institute, 2025; Vi Agroforestry, 2019; Kitalyi et al., 2010; reNature, 2023; Food and Agriculture Organization. 2025). Organizations such as the Mpingo Conservation & Development Initiative (MCDI), the Tanzania Forest Conservation Group (TFCG), reNature and the World Agroforestry Centre (ICRAF) have implemented projects aimed at training farmers in agroforestry techniques, supplying tree seedlings, and facilitating market linkages for agroforestry products (ICRAF, n.d.; TFCG, n.d.; MCDI, n.d.; reNature, 2023). These efforts have been complemented by the involvement of international organizations like Vi Agroforestry and Trees for the Future, which have contributed significantly to the implementation of agroforestry projects. Vi Agroforestry, for instance, has launched campaigns advocating for a National Agroforestry Policy and organized annual

symposiums to raise awareness and share best practices (Vi Agroforestry, 2019). Similarly, Trees for the Future has partnered with local institutions to address pressing issues such as soil erosion, deforestation, and rural poverty through the adoption of agroforestry practices (Trees for the Future, 2024).

The potential of agroforestry to improve household food security and generate additional income for rural communities has also been a significant driver of its adoption (Chappa et al., 2024; Gitari et al., 2024; Nungula et al., 2024). By diversifying agricultural production and incorporating trees that produce fruits, nuts, and timber, agroforestry systems provide farmers with a more resilient and sustainable livelihood strategy. Additionally, the integration of agroforestry with livestock farming can further enhance the productivity and sustainability of agricultural systems, as trees offer fodder, shade, and shelter for animals (Pender et al., 2006; Chappa et al., 2024). These diverse benefits have made agroforestry an attractive option for smallholder farmers seeking to improve their livelihoods while conserving the environment.

The adoption of agroforestry in Tanzania has been influenced by a combination of environmental, institutional, and socio-economic factors. The collaborative efforts of government policies, NGO initiatives, and farmer-driven innovations have significantly contributed to the promotion of agroforestry practices, thereby enhancing agricultural sustainability, resilience, and livelihoods across the country. As a proven solution for addressing environmental degradation, enhancing agricultural resilience, and improving rural livelihoods, agroforestry holds great promise for transforming the agricultural landscape and building a more sustainable future for the country. Continued support and investment in agroforestry extension services, research, and policy implementation are essential to further promote the adoption and scaling up of agroforestry in Tanzania and other similar contexts.

## 1.3 Problem Statement

Gold mining activities in Chunya District pose a significant threat to agricultural lands, biodiversity, and ultimately, the socio-economic fabric of the region. The indiscriminate extraction of gold not only degrades agricultural lands through chemical use and deforestation but also exacerbates climate change and biodiversity loss. These interconnected challenges necessitate sustainable solutions to mitigate the adverse impacts of mining on the ecosystem and ensure the well-being of local communities. To address these pressing issues, this study aims to assess stakeholders' willingness to adopt agroforestry practices for land reclamation in gold mining-affected areas. Agroforestry presents a promising approach by integrating trees with crops and livestock, offering multifaceted benefits such as improved soil fertility, biodiversity conservation, jobs creation, land restoration, and food security. By understanding stakeholders' perspectives, this research seeks to contribute valuable insights towards developing holistic strategies for sustainable land use practices in Chunya District, Tanzania.

## 1.4 Study Aim

This research aims to assess stakeholders' willingness to adopt agroforestry practices for land reclamation in gold mining-affected areas in Chunya district to promote sustainable land use and community resilience. To achieve this objective, the following research questions have been formulated focusing on Chunya District, Tanzania:

- How do stakeholders perceive the impact of agroforestry on land reclamation in gold mining-affected areas?

- What is the level of stakeholders' willingness to adopt agroforestry practices for land reclamation?

- What social and environmental factors influence stakeholders' willingness to adopt agroforestry practices?

## 1.5 Delimitations

This research specifically examined stakeholders' willingness to adopt agroforestry practices for land reclamation in gold mining-affected areas within Chunya District, located in Mbeya-Tanzania. The focus was confined to this single district due to its active gold mining operations and the associated environmental and socio-economic challenges. By narrowing the study to Chunya District, the research aims to provide targeted insights into local stakeholder perspectives and readiness for agroforestry as a reclamation strategy. The findings from this study may offer valuable lessons and potential applications for other districts in Tanzania that also experience gold mining activities, such as Mpanda, Geita, Shinyanga, and Iringa. However, the specific conditions and stakeholder dynamics in these regions may differ from those in Chunya District. Thus, while the insights gained could be relevant for broader contexts, further research would be necessary to explore the applicability and effectiveness of agroforestry in these other areas. The study's delimitation to Chunya District allows for a detailed exploration of the local context, setting a foundation for future comparative studies and broader applications of agroforestry in mining-affected regions.

# 2. Literature review and theoretical framework

*In this chapter, the literature review on the use of Agroforestry for land reclamation in mining-affected areas is presented. The chapter also highlights the theories that help to explain the title well.*

## 2. 1 Literature review

Gold mining, while economically significant, often results in severe environmental degradation and social disruption. Mining activities have several environmental effects, including loss of biodiversity, deforestation, and soil erosion, (Betancur-Corredor et al., 2018; Jønsson et al., 2009). The impact extends beyond the environment to affect local communities by causing land disputes, health issues, and disruptions to traditional livelihoods (Mbare et al., 2023). In Chunya District, these impacts are particularly acute as mining activities encroach upon fertile agricultural land, resulting in conflicts over land tenure and resource rights (Buxton et al., 2013, Asaaga, 2017). The loss of agricultural land and disruption of traditional practices exacerbate tensions between mining companies and local communities, complicating efforts to restore and manage degraded lands effectively.

Restoring land affected by mining involves addressing both environmental degradation and social conflicts. A critical barrier to effective land reclamation is the social conflict arising from competing interests in land use. These conflicts often stem from the loss of land used for traditional agricultural practices, which are integral to the local economy and community identity (Betancur-Corredor et al., 2018; Golar et al., 2021). Efforts to restore these lands must therefore navigate these entrenched conflicts to be successful. Agroforestry, which integrates trees into agricultural landscapes, has emerged as a viable approach for land reclamation (Theodoro et al., 2021; Cardoso et al., 2001; Laudares et al.,2017; Gupta et al., 2020). This method provides numerous ecological and socio-economic benefits, including improved soil fertility, enhanced biodiversity, Improved livelihood, and increased carbon sequestration (Nair, 1989; Leakey, 1996; Chappa et al., 2024; Espinosa-Alzate & Rios-Osorio, 2024). Agroforestry can address environmental degradation by stabilizing soil, improving water retention, and restoring vegetation cover (Jose, 2009; Nyawade et al., 2019; Gitari et al., 2024; Nungula et al., 2024). In mining-affected areas like Chunya, agroforestry offers a sustainable solution by blending land restoration with productive agricultural practices (Wireko, 2011; Lestari et al., 2018; Theodoro et al., 2021; Cardoso et al., 2001; Laudares et al.,2017 ).

Furthermore, A complementary approach to addressing the environmental and socio-economic impacts of mining involves linking mining activities to carbon markets through forest-based initiatives (Hirons et al., 2014). This strategy would see degraded mining lands rehabilitated into forests, which could then be transferred back to local communities to derive economic benefits from carbon sequestration programs ( Hirons et al., 2014). These benefits could be realized through voluntary carbon markets, the Clean Development Mechanism (CDM), or potentially through the REDD+ initiatives' additional components if negotiation frameworks permit (Hirons et al., 2014). Such schemes could also enhance corporate social responsibility (CSR) efforts by contributing to climate change mitigation and fostering local development (Hirons et al., 2014). For example, Sperow (2006) illustrates the potential for carbon sequestration on mined lands by estimating that rehabilitating these sites in the United States could account for up to 12.5% of a 7% total emissions reduction target. Despite these promising outcomes, the role of carbon-based payment-for-ecosystem-services (PES) initiatives within the context of mining rehabilitation remains underexplored in developing regions (Hirons et al., 2014).

Despite its potential benefits, agroforestry faces several adoption challenges for stakeholders, including a lack of knowledge, land tenure conflicts (Ruheza et al., 2012), financial constraints, and perceived trade-offs in land use (Current et al., 1995; Ruheza et al., 2012). Many farmers are unfamiliar with agroforestry practices and their advantages, which hampers effective implementation (Johnson & Delgado, 2003; Jha et al., 2021). Financial barriers are significant, as the initial costs for planting and maintaining trees, coupled with potential short-term losses in crop income, can be prohibitive, particularly for smallholder farmers (Islam et al., 2021; Johnson & Delgado, 2003). Several researchers, including Workman et al. (2003), Trozzo et al. (2014), Mattia et al. (2018),  Ford et al. (2021), and Stubblefield et al. (2025) have emphasized that a lack of knowledge and skills significantly limits producers' ability and willingness to adopt agroforestry practices. Similar challenges have been observed with the implementation of conservation agriculture methods, as noted by Prokopy et al. (2019). Furthermore, the critical role of technical information and support has been highlighted, particularly among new farmers attempting to establish various forms of agricultural systems. For example, Iles et al. (2023) investigated the barriers and motivators faced by new and beginning farmers in the Midwest United States, revealing that 88% of respondents identified access to relevant technical information as a pressing need (Stubblefield et al., 2025).

Similarly, other researchers Mbow et al. (2014), McGinty et al. (2008), ISKANDAR et al. (2016), and Mukhlis et al. (2022) have identified several obstacles contributing to the low adoption of agroforestry practices in developing countries. These challenges include a lack of farmer knowledge about agroforestry techniques, inadequate policy frameworks, and limited access to financial resources (Beyene et al., 2019; Mukhlis et al., 2022; Meijer et al., 2015). The exclusion of agroforestry from public policies results in insufficient acknowledgment of its potential to improve rural livelihoodsand address climate change (Bishaw et al., 2013; Beddington et al., 2012; Mukhlis et al., 2022). This oversight may partly stem from a scarcity of comprehensive evidence that simultaneously addresses the socio-economic and environmental impacts of agroforestry on rural communities (Kiptot et al., 2007; Mukhlis et al., 2022; Espinosa-Alzate & Rios-Osorio, 2024).

Additionally, the need to allocate land for trees, which could otherwise be used for immediate crop production, often deters farmers because the perceived short-term trade-offs can outweigh the long-term benefits (García de Jalón et al., 2018; Johnson & Delgado, 2003; Garrity et al., 2010). Furthermore, the long-term investment required for agroforestry, along with high management costs and labor demands, adds to the complexity of adoption. The benefits of agroforestry, such as improved soil health and increased biodiversity, emerge over several years, making it less attractive to those focused on immediate returns (Mathur & Bhattacharya, 2024; Johnson & Delgado, 2003; Chappa et al., 2024). Gender disparities also impact adoption rates, as differences in access to resources and decision-making authority can affect the engagement of men and women in agroforestry practices (Islam et al., 2021). Regulatory constraints and administrative burdens further complicate the process, with complex regulations and bureaucratic hurdles discouraging potential adopters (García de Jalón et al., 2018; Johnson and Delgado, 2003).

Nikoi (2024) underscores the significance of policymakers establishing and enforcing robust regulatory systems that address governance challenges while promoting sustainable development. In this context, the author emphasizes the necessity of collaboration among practitioners and stakeholders to design initiatives that support agricultural communities affected by mining activities, helping them build resilience and recover from adversity. To this

end, governments or NGOs can play a pivotal role by reclaiming degraded lands and allocating them to individuals interested in adopting agroforestry systems (Mukhlis et al., 2022).

In addition, financial and public partnership mechanisms serve as indispensable tools for fostering the adoption of agroforestry systems, particularly in resource-constrained settings. Besacier et al. (2021) highlight local financing mechanisms, such as community savings groups, revolving funds, and blended finance approaches, as pivotal tools for promoting forest and landscape restoration. These mechanisms mobilize local-level investments and ensure that financial resources reach grassroots stakeholders effectively. Similarly, Thukral (2012) emphasizes the role of Public-Private Partnerships (PPPs) in agroforestry ventures, where governments and private entities collaborate to provide technical expertise, infrastructure support, and market access. Such partnerships not only reduce financial risks but also enhance community participation and long-term sustainability by aligning the interests of multiple stakeholders.

Furthermore, governments could provide provisional support, including enhanced market access, post-harvest tools, or mechanisms for price stability, which would bolster the economic resilience of these communities (Mukhlis et al., 2022). Research has consistently shown that community involvement, in collaboration with private or governmental organizations, is vital for the success of agroforestry objectives (Meinzen-Dick, 2007; Nagendra, 2007; Mukhlis et al., 2022; Jinger et al., 2024; Thukral (2012), Katsvanga & Mudyiwa, (2019). This approach is particularly effective in mitigating the risks associated with the overexploitation of common-pool resources (Western et al., 1995; Mukhlis et al., 2022), with the establishment of institutions to regulate and organize farming activities proving beneficial. Evidence from various studies indicates that local communities possess the capacity to create institutions that effectively govern and manage their resources (Barton Bray & Klepeis, 2005; Mukhlis et al., 2022). Additionally, there has been growing scholarly interest in the role of institutions in managing ecological systems, as highlighted by Aoki (2001), Ostrom (1990), and Mukhlis et al. (2022). In this context, stakeholder engagement becomes crucial for the successful adoption of agroforestry in land reclamation efforts in gold mining-affected areas. Yesigomwe (2008) emphasizes that the involvement of stakeholders in the selection of appropriate crops, trees, and animals tailored to specific socio-economic conditions and soil types is essential. This participatory approach ensures that agroforestry practices can effectively address land

degradation while simultaneously enhancing crop production. Furthermore, Rosendahl (2018) stresses the importance of conducting a thorough stakeholder analysis to identify both opportunities and challenges that may arise in efforts to enhance sustainable land management. Moreover, the role of government officials and mining companies is equally significant. Tuokuu (2019) points out that their commitment is vital to the successful implementation of effective policies and guidelines. In addition, Mbewe (2017) underscores the government's role in raising environmental awareness and collaborating with organizational leaders to foster sustainability. Active participation from all these stakeholders is indispensable for prioritizing social and environmental responsibility, ultimately contributing to successful environmental restoration and sustainable land management.Thus, the intersection of strong regulatory systems, community involvement, and the active engagement of stakeholders forms the foundation for sustainable land reclamation and agroforestry adoption, particularly in areas affected by mining.

 Effective land reclamation in mining-affected areas can be greatly enhanced through a nuanced understanding of socio-economic factors and stakeholder dynamics. Conde and Le Billon (2017) emphasize that community resistance to mining projects often stems from unresolved historical grievances and inequities in compensation, which can be mitigated by inclusive stakeholder engagement. In a similar vein, Raizada and Dhyani (2020) argue that successful reclamation requires addressing both environmental and social dimensions, which agroforestry can facilitate by promoting sustainable land use practices and fostering community involvement. Furthermore, Quinkenstein et al. (2012) highlight that integrating agroforestry into reclamation efforts not only restores ecological balance but also contributes to socio-economic resilience by enhancing local livelihoods and carbon sequestration. Hermawan (2016) supports this view by presenting agroforestry models that effectively address post-mining land use challenges, demonstrating the approach's potential for sustainable land management. Additionally, Lestari et al. (2018) provide insights into the socio-economic strategies necessary for integrating agroforestry in post-mining landscapes, stressing the importance of aligning practices with local needs and capacities. Chaturvedi et al. (2014) further reinforces that addressing socio-economic factors, such as land tenure and community engagement, is critical for the successful adoption of agroforestry in reclamation projects.

## 2.2 Theoretical Framework

To have a clear picture of the study, this study considered three theories as follows,

## 2.2.1 Stakeholder Theory

In the quest to address the pressing social and environmental challenges posed by gold mining activities in the Chunya District of Tanzania, stakeholders play a crucial role in shaping the trajectory of land reclamation efforts. Stakeholder theory, as elucidated by Freeman (2010), posits that organizations should consider the interests and concerns of all individuals or groups impacted by their actions, beyond just shareholders or investors. In the context of land reclamation in gold mining-affected areas, stakeholders encompass a diverse array of entities, including local communities, governmental bodies, mining companies, environmental organizations, and other key actors with vested interests in the outcomes of land restoration efforts. One of the fundamental principles of stakeholder theory is the importance of stakeholder engagement throughout the research process. This principle emphasizes the need to actively involve stakeholders in project design, data collection, analysis, and decision-making, thereby fostering collaboration, building trust, and ensuring the relevance and impact of research findings (Freeman, 2010).

In the case of assessing stakeholders' willingness to adopt agroforestry for land reclamation in the Chunya District, stakeholder engagement takes center stage. Through stakeholder analysis and engagement activities such as interviews and focus group discussions the study seeks to elicit the perspectives, interests, and concerns of various stakeholders regarding the adoption of agroforestry practices for land restoration. Moreover, stakeholder theory underscores the dynamic nature of stakeholder relationships and the need for continuous adaptation and responsiveness to stakeholders' evolving needs and expectations. This necessitates an iterative approach to stakeholder engagement, characterized by ongoing dialogue, feedback loops, and collaborative decision-making processes (Freeman, 2010).

By applying stakeholder theory within the research framework, the study aims to facilitate meaningful engagement and collaboration among stakeholders in the Chunya District. Through inclusive and participatory approaches to research, the study seeks to empower stakeholders, amplify their voices, and co-create knowledge, ultimately enhancing the effectiveness and sustainability of land reclamation efforts. Furthermore, stakeholder theory highlights the concept of stakeholder salience, which suggests that not all stakeholders hold equal importance

or influence in organizational decision-making (Mitchell et al., 1997). In the context of land reclamation, organizations must prioritize stakeholders based on their power, legitimacy, and urgency, directing resources toward those stakeholders with the greatest impact on land restoration outcomes.

## 2.2.2 Corporate Social Responsibility

In the context of land reclamation efforts in gold mining-affected areas like the Chunya District of Tanzania, Corporate Social Responsibility (CSR) emerges as a critical aspect in addressing environmental degradation, fostering community development, and promoting sustainable practices.

CSR refers to the ethical and philanthropic responsibilities of corporations to contribute positively to society while balancing economic, legal, and ethical considerations (Carroll, 1991). In the case of gold mining activities, CSR entails mining companies taking proactive measures to minimize their environmental footprint, support local communities, and promote sustainable land use practices. Gold mining operations often result in significant environmental degradation, including deforestation, soil erosion, water pollution, and habitat destruction. Through CSR initiatives, mining companies can invest in technologies and practices to mitigate these environmental impacts.

CSR initiatives can promote the adoption of sustainable land use practices, such as agroforestry, for land reclamation purposes. By partnering with local farmers and environmental organizations, mining companies can support the restoration of degraded land through the planting of trees, crops, and other vegetation. Agroforestry, in particular, offers a multifaceted approach to land reclamation by improving soil fertility, preventing erosion, enhancing biodiversity, and providing sustainable livelihood opportunities for local communities. In addition to environmental and social benefits, CSR can also yield long-term economic advantages for mining companies. By investing in sustainable practices and community development, mining companies can enhance their reputation, reduce operational risks, and gain access to new markets and opportunities. This not only creates value for shareholders but also contributes to the overall sustainability and resilience of the company's business operations.

## 2.2.3 Institutional Theory

Institutional theory provides a lens through which we can understand the behavior and decisions of organizations within their broader social and institutional context. In the case of land reclamation efforts in gold mining-affected areas such as the Chunya District of Tanzania, institutional theory offers valuable insights into how organizations are influenced by external pressures, norms, and expectations.

At its core, institutional theory posits that organizations are embedded within institutional environments that shape their behavior and practices (DiMaggio & Powell, 1983). These institutions encompass regulatory bodies, governmental agencies, professional associations, and societal norms that establish rules, norms, and expectations for organizational conduct. In the context of gold mining operations in the Chunya District, organizations are subject to various institutional pressures related to environmental regulation, community engagement, and sustainable development. Governmental agencies enforce environmental laws and regulations that govern mining activities, prescribing standards for waste management, land reclamation, and environmental conservation. Furthermore, societal expectations and norms regarding corporate responsibility, transparency, and accountability exert significant influence on mining companies operating in the region. As concerns over environmental degradation and social injustice associated with mining activities mount, there is increasing pressure on companies to adopt responsible practices, engage with local communities, and mitigate their environmental footprint (Suchman, 1995).

Institutional theory also highlights the concept of isomorphism, which refers to the tendency of organizations to conform to institutional norms and practices to gain legitimacy and social acceptance (DiMaggio & Powell, 1983). In the context of gold mining operations, companies may adopt certain practices, such as community development programs or environmental management systems, not only to comply with regulatory requirements but also to signal their commitment to responsible business practices and enhance their legitimacy in the eyes of stakeholders. Moreover, institutional theory underscores the role of institutional entrepreneurs in driving institutional change and innovation (DiMaggio & Powell, 1983). These actors may champion new approaches to land reclamation, advocate for policy reforms, or mobilize support for sustainable development initiatives, thereby shaping the institutional environment within which organizations operate.

# 3. Research Methodology

*The chapter presents the techniques, methods, and procedures used to gather the data. Research design, the study area, method selection, sampling technique, sample size, data collection method, and data analysis are all described in detail. Information on ethical considerations, quality assurance, and data presentation is also provided in this chapter.*

## 3.1 Research Design and Approach

This study employs a case study design, focusing on the adoption of agroforestry practices for land reclamation in gold mining-affected areas in Chunya District, Tanzania. As Saunders et al. (2019) suggest, a research design provides the framework that guides the study toward its objectives. A case study, defined by Rowley (2002) as a detailed exploration of a single phenomenon within its real-world context, was selected because it allows for an in-depth understanding of the complex social, economic, and environmental interactions influencing agroforestry adoption. While the research utilizes multiple qualitative data collection methods including in-depth interviews, focus group discussions, participant observation, and documentary analysis these are integrated within the overarching case study framework. This approach enables the triangulation of findings, enhancing the reliability and validity of the results (Creswell & Poth, 2016). By focusing on the central actors local farmers the study examines their willingness, challenges, and opportunities in adopting agroforestry practices. Other stakeholders, such as environmental experts, mining industry representatives, and community leaders, are included as supporting actors to provide contextual and institutional insights.

## 3.2 Data Collection Methods

The study utilized multiple qualitative data collection methods, including in-depth interviews, focus group discussions, participant observation, and documentary analysis. This combination allowed for triangulation, enhancing the reliability and depth of the findings.

### 3.2.1 In-Depth Interviews

In-depth interviews were conducted with a diverse range of stakeholders, including farmers, community leaders, local gold miners, and environmental experts. These interviews were structured to elicit detailed insights into participants' experiences, perceptions, and opinions regarding the effects of gold mining on the environment and the potential role of agroforestry

in land restoration efforts. According to Creswell and Poth (2016), in-depth interviews are particularly valuable for exploring complex phenomena and capturing the nuanced perspectives of participants. By engaging in one-on-one conversations with stakeholders, researchers can delve deeply into their individual experiences and viewpoints, uncovering rich qualitative data that may not be accessible through other methods. Moreover, the use of In-Depth interview protocols allowed for flexibility in probing participants' responses, enabling the exploration of emergent themes and ideas (Rubin & Rubin, 2011). This approach ensured that the interviews remained focused on the research objectives while also allowing participants the freedom to express themselves in their own words.

## 3.2.2 Focus Group Discussions

Focus group discussions were organized to complement the insights gained from individual interviews by capturing collective opinions and shared experiences within the community. Community members were invited to participate in group discussions where they could engage in open dialogue about the integration of agroforestry practices in land restoration efforts.

According to Morgan (1996), focus group discussions are well-suited for exploring social dynamics and generating a diversity of perspectives on a given topic. By bringing together individuals with different backgrounds and viewpoints, researchers can facilitate interactive discussions that yield valuable insights into community attitudes, beliefs, and concerns. The structured nature of focus group discussions allowed researchers to guide the conversation towards specific topics of interest, such as the challenges and opportunities associated with agroforestry adoption (Krueger, 2014). Additionally, the group setting provided a supportive environment for participants to express their opinions openly and engage in collaborative sense-making processes (Stewart and Shamdasani, 2014).

## 3.2.3 Participant Observation

Participant observation involved immersing oneself in the daily lives of community members and directly observing their interactions with the land. Researchers spent time in the field, observing existing agroforestry practices and their impact on the environment, as well as visiting mineral mining sites to assess their effects on the surrounding landscape. According to Kawulich (2005), participant observation allows researchers to gain firsthand experience of social phenomena and understand the context in which they occur. By engaging in direct observation, researchers can capture rich, contextual data that may not be accessible through interviews or focus group discussions alone. Moreover, participant observation enables researchers to identify subtle nuances and patterns in behavior that may not be apparent through

other methods (Baker, 2006; Barker, 1980). By immersing oneself in the community, researchers can gain a deeper understanding of the social and cultural factors that influence stakeholders' attitudes towards agroforestry adoption.

### 3.2.4 Documentary Analysis

Documentary analysis involved the systematic review and interpretation of relevant documents, reports, and community records related to gold mining and agroforestry. Researchers examined historical documents, community narratives, and indigenous knowledge to provide additional context and insight into the research topic. According to Bowen (2009), documentary analysis is a valuable method for corroborating and triangulating qualitative data obtained through interviews and observations. By analyzing existing documents, researchers can identify recurring themes and patterns that may inform their interpretation of primary data sources. Moreover, documentary analysis allows researchers to access information that may not be readily available through other methods, such as archival records or official reports (Tracy, 2010). By drawing on a diverse range of documentary sources, researchers can enrich their understanding of the research topic and provide a more comprehensive analysis.

## 3.3 Study Area and Justification

Chunya District, situated in the southwestern part of Tanzania, is the designated study area for this research. Geographically positioned between latitudes 8° 36' 0.01" S and 33° 24' 0.00" E, the district experiences a semi-arid climate characterized by irregular rainfall patterns, with an average annual rainfall ranging from 500 mm to 800 mm. Temperature fluctuations are observed between 18°C and 30°C throughout the year. The district's altitude ranges from 900 meters to 1800 meters above sea level, contributing to its diverse ecological features, while the soil composition predominantly consists of sandy loam and clay soils. Farming, mining, and business are the primary economic drivers in Chunya District. Agriculture, predominantly characterized by subsistence farming, sustains the local populace. Crops such as maize, beans, cassava, bananas, Millets, sunflowers, and sorghum, are cultivated alongside livestock rearing and Beekeeping, forming the cornerstone of the district's economy. However, the rapid expansion of gold mining activities has introduced significant challenges to both agriculture and the environment. Chunya District has been selected as the focal area for this study due to its prominence in gold mining activities, which have significantly impacted the region's socio-economic and environmental landscape. Within Chunya District, specific attention was directed towards assessing stakeholders' willingness to adopt agroforestry practices for land reclamation in areas affected by gold mining.
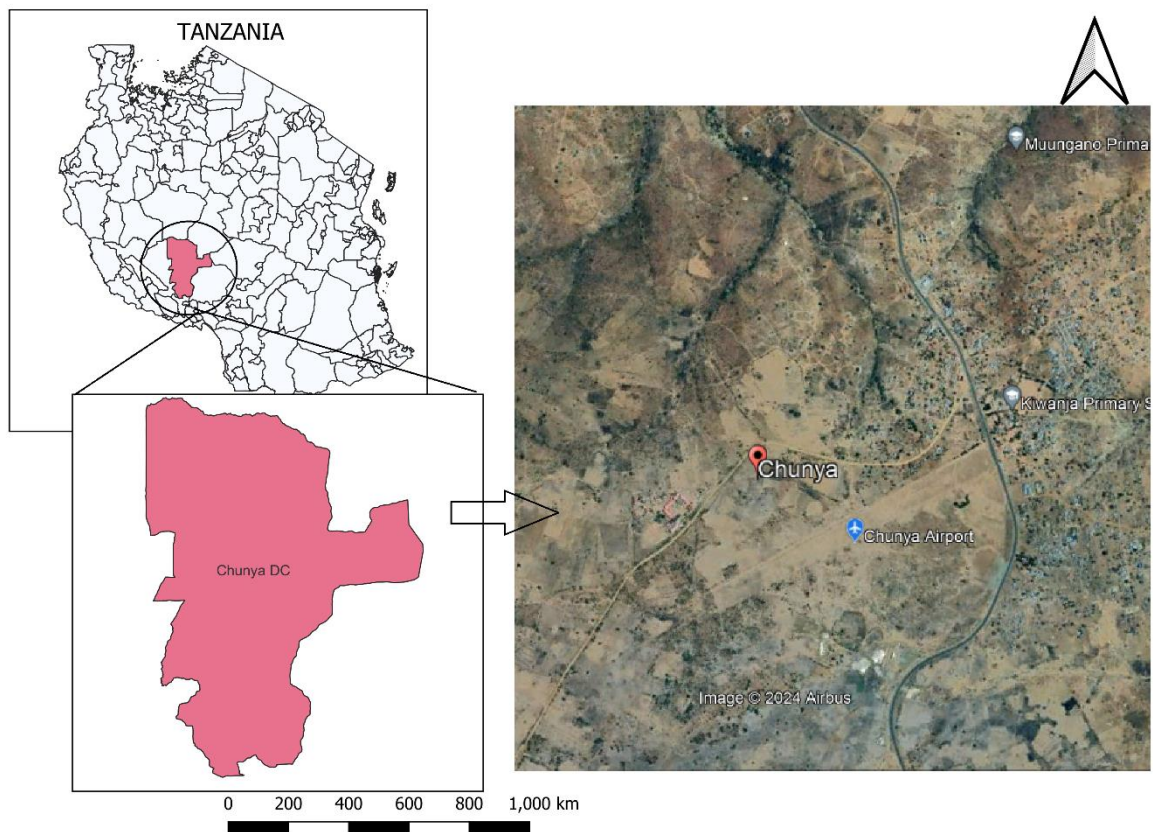
*Figure 2: Chunya district map; Source of Image - Satellite Image (Google Earth Pro)*

## 3.4 Sampling Techniques

Sampling is a fundamental component of research design, as it defines how participants or data sources are chosen to represent a larger population (Singh & Masuku, 2014). Sampling techniques are generally divided into two main categories: probability sampling and non-probability sampling (Singh & Masuku, 2014). Probability sampling involves selecting participants randomly, ensuring each member of the population has an equal and known chance of being included in the sample, which helps in generalizing about the larger population (Taherdoost, 2016). In contrast, non-probability sampling does not guarantee that every member of the population has a chance of being selected (Taherdoost, 2016). Each sampling method has its own set of benefits and limitations, with the choice depending on the research goals, available resources, and specific constraints (Taherdoost, 2016; Singh & Masuku, 2014). For the case study conducted in Chunya District, Tanzania, both purposive and convenience sampling techniques were used to collect qualitative data.

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Purposive sampling is a non-probability technique where participants are selected based on specific characteristics or expertise that are relevant to the research objectives (Tongco, 2007). This method allows researchers to focus on individuals who have particular knowledge or experience pertinent to the study's focus areas (Tongco, 2007). For the in-depth interviews, The participants were chosen for their direct involvement and expertise in areas critical to the study, including environmental management, agricultural extension, farming, mining industries, and local community leadership. The selection criteria ensured that each participant could offer valuable insights into the issues being studied. The purposive sampling approach allowed for a comprehensive exploration of diverse perspectives from, Environmental Experts, Individuals with specialized knowledge in environmental issues, crucial for understanding the ecological impacts of agriculture and mining in the region. Agricultural Extension Officers, Professionals who provide support and guidance to local farmers, offering insights into agricultural practices and challenges. Local Farmers are primary stakeholders in agriculture, whose experiences and practices provide ground-level perspectives on farming conditions and issues. CEOs from Gold Mining Industries, Key figures in the mining sector, essential for discussing the industry's Initiatives to solve the negative impacts brought by mining activities on the environment and local communities. Community Leaders, Influential individuals who can offer perspectives on local governance and community issues related to mining and agriculture. Local Gold Miners, Workers in the mining sector who provide insights into the operational and socio-economic aspects of gold mining.

Convenience sampling, another non-probability technique, involves selecting participants based on their ease of access and availability (Emerson, 2015; Sedgwick, 2013). This method is particularly useful when logistical constraints, such as time, cost, or geographic limitations, are significant factors (Emerson, 2015; Sedgwick, 2013). While convenience sampling does not guarantee that every subgroup of the population is represented, it allows for practical and efficient data collection (Emerson, 2015; Sedgwick, 2013). In this study, convenience sampling was utilized for the focus group discussions conducted across five villages in Chunya District. The villages chosen included Chalangwa, Itumbi, Sangambi, Ifumbo, and Kibaoni were selected based on their accessibility and the willingness of local participants to engage in discussions.

## 3.5 Data Collection process and sample size

The study utilized both in-depth interviews and focus group discussions (FGDs) to collect primary data. The in-depth interviews involved 20 participants, comprising environmental experts, agricultural extension officers, local farmers, CEOs from gold mining industries, community leaders, and local gold miners. The interviews were conducted between March 1st, 2024, and April 3rd, 2024, with each session lasting approximately 35 minutes. The gender distribution among participants was diverse, and specific details regarding the participants and timelines are summarized in Table 1 below.

Table 1: Listing participants with time ranked of interviews.

| S/N | Participant | Date | Time | Gender |
|-----|-------------|------|------|--------|
| 1 | Environmental expertise | 2024/03/01-2024/03/04 | 35 minutes per each | 3 Females, 2 Male |
| 2 | Extension officer | 2024/03/06-2024/03/11 | 35 minutes per each | 1 Female, 2 Males |
| 3 | Local farmer | 2024/03/13-2024/03/15 | 35 minutes per each | 1 Female, 3 Males |
| 4 | CEO (gold mining industry) | 2024/03/17-2024/03/20 | 35 minutes per each | 3 Males |
| 5 | Community leaders | 2024/03/24-2024/03/27 | 35 minutes per each | 1 Female, 1 Male |
| 6 | Local gold miners | 2024/03/31-2024/04/03 | 35 minutes per each | 3 Males |

Focus group discussions were held in five villages: Chalangwa, Itumbi, Sangambi, Ifumbo, and Kibaoni, between February 28th, 2024, and April 20th, 2024. A total of 108 participants were involved, with each group comprising between 17 and 28 members with a mix of male and female participants. The variation in participant numbers across different villages helped capture a comprehensive view of the local context and issues. The detailed breakdown of participant numbers, gender distribution, and discussion dates is presented in Table 2 below.

Table 2: Focus group discussion.

| S/N | Village/Location | Number of participants | Gender | Date |
|-----|------------------|------------------------|--------|------|
| 1 | Chalangwa | 22 | 12 Females 10 males | 2/28/2024 |
| 2 | Itumbi | 17 | 10 Females 7 males | 3/12/2024 |
| 3 | Sangambi | 28 | 8 Females 20 Males | 3/25/2024 |
| 4 | Ifumbo | 22 | 11 Females 11 Males | 4/7/2024 |
| 5 | Kibaoni | 19 | 10 Females 9 Males | 4/20/2024 |

## 3.6 Quality assurance and ethical consideration

The local government of Chunya District authorized the research, ensuring that the study adhered to ethical standards and good research practices throughout its duration. To maintain data quality, several measures were implemented, including pre-testing of research instruments and rigorous adherence to ethical considerations (Bryman & Bell, 2015). Participation in the study was voluntary, and respondents had the option to decline answering any questions or to withdraw from the study at any time without facing any consequences. During interviews, care was taken to ensure that all respondents had equal opportunities to contribute, preventing any individual from dominating the discussion. Additionally, to overcome potential language barriers, data collection was conducted in Swahili, the national language, facilitating clear communication between the researcher and participants (Cope, 2014). Personal or biometric information that could identify participants was not collected. Confidentiality was strictly upheld, with all data being kept secure and used exclusively for academic purposes as outlined in this thesis (Cope, 2014). According to Cope (2014), credibility in qualitative research involves the alignment of respondents' perspectives, the researcher's expertise, and the thoroughness of descriptions. In this study, credibility was reinforced through transparent documentation of the research process, consistent observation techniques, and careful validation of results with participants.

## 3.7 Data Analysis

The unit of analysis for this study was the individual stakeholders, including farmers, community leaders, CEOs in Mining industries, local gold miners, environmental experts, and agricultural extension officers, involved in or affected by gold mining activities in Chunya District, Tanzania. The data collected through in-depth interviews and focus group discussions were recorded with participants' consent, translated into English, transcribed, and coded for final analysis. The data were analyzed using thematic analysis to address the research questions concerning stakeholders' willingness to adopt agroforestry for land reclamation. Thematic analysis was chosen for its capacity to identify and interpret patterns within qualitative data and provide a comprehensive understanding of the participants' perspectives (Braun & Clarke, 2013). This approach involved a systematic, inductive process, often referred to as reflexive thematic analysis. The analysis began with familiarization with the data through repeated reading of the transcribed interviews and discussions. Following this, the data were systematically coded, with key concepts and recurring issues being tagged to facilitate the identification of patterns. Initial themes were developed by grouping related codes, which were then reviewed and refined for accuracy and coherence. Themes were clearly defined and named to capture their essence and relevance to the research questions. The final write-up integrated these themes into a coherent narrative, supported by direct quotations from participants to provide evidence and context. This process was complemented by the review of secondary data to enrich the analysis and validate findings.

# 4. Results and Analysis

*This chapter presents the empirical data collected through in-depth interviews and focus group discussions conducted in Chunya District, Tanzania. The analysis provides insights into stakeholders' perceptions, challenges, and opportunities related to adopting agroforestry for land reclamation in gold mining-affected areas. The findings are organized around several key themes: business-related challenges, understanding of agroforestry, financial mechanisms and support, stakeholder roles, successful collaborations, and policy recommendations.*

## 4.1. Business-related Challenges, Risks, and Opportunities in Agroforestry Adoption

The adoption of agroforestry as a land reclamation strategy in gold mining-affected areas of Chunya District presents a complex interplay of challenges, risks, and opportunities. The challenges stem from financial, technical, and institutional barriers, while the opportunities lie in promoting environmental restoration, market diversification, and long-term community benefits. Insights from local stakeholders, particularly four representative farmers, reveal overlapping concerns yet distinct perspectives on how agroforestry could transform their livelihoods and the degraded landscape.

One of the foremost challenges identified by all four farmers is financial constraints. Farmer 1 highlighted this issue, saying, *"I know agroforestry, but I don't have money to start this."* This sentiment reflects a widespread lack of access to capital, which hinders farmers from investing in agroforestry systems. Farmer 3 echoed this, emphasizing the cost-intensive nature of initial agroforestry investments: *"Without support, it's hard to afford seedlings, tools, and everything else needed to make agroforestry work."* Stakeholders such as local extension officers and NGO representatives also acknowledged this issue during focus group discussions, with one officer stating, *"Financial barriers are the main reason farmers hesitate to adopt agroforestry, especially when mining offers quick returns."*

Compounding financial challenges is resistance to change, particularly among farmers who balance mining with agriculture. Farmer 2, who engages in both farming and gold mining, expressed skepticism about the profitability of agroforestry: *"If I do agroforestry and mining, I see that agroforestry will waste my time and give me less profit."* This view underscores the allure of mining's immediate financial returns compared to agroforestry's long-term benefits,

a common deterrent among smallholder farmers. Stakeholders noted that addressing this mindset requires demonstrating the tangible benefits of agroforestry, such as improved soil fertility and diversified income streams, through targeted education and capacity-building programs.

Beyond financial and attitudinal barriers, a significant technical challenge is the lack of knowledge and skills required to implement agroforestry effectively. Farmer 4, who had no prior exposure to agroforestry, expressed a desire for training: *"I would do it if I had more knowledge and resources to support it."* Local extension officers reiterated this point, with one officer explaining, *"Farmers need practical guidance on how agroforestry works, especially in degraded mining areas. Without proper training, adoption will remain low."* Collaborative efforts between government agencies, NGOs, and educational institutions could bridge this knowledge gap by offering hands-on training tailored to the region's specific ecological conditions.

Institutional challenges, particularly around land tenure and regulatory frameworks, further complicate agroforestry adoption. Farmer 2 voiced concerns about land security, stating, *"I am afraid that after I invest in agroforestry, someone doing mining activities may come and claim my land."* This lack of clear land ownership discourages farmers from committing to long-term projects like agroforestry. Community leaders supported this concern, with one leader noting, *"Secure land tenure is crucial if we want farmers to invest in sustainable practices."*

Despite these challenges, stakeholders identified significant opportunities that could make agroforestry a viable solution for land reclamation. Farmer 3 offered an optimistic perspective, saying, *"It's true it takes time, but agroforestry is sustainable. I believe it will bring better returns in the future."* This belief aligns with views expressed by an environmental expertise who see agroforestry as a pathway to environmental restoration and job creation. A community leader stated, *"Agroforestry can transform mining-affected lands into productive ecosystems while providing long-term economic benefits to the community."* Businesses operating in the region, including mining companies, also see agroforestry as an opportunity to enhance corporate social responsibility. One mining company representative remarked, *"Supporting agroforestry aligns with our environmental commitments and offers a way to build stronger relationships with local communities."*

Financial incentives, such as subsidies and low-interest loans, were identified as critical enablers for agroforestry adoption. During focus group discussions, community leaders emphasized the importance of such support, with one leader stating, *"If farmers receive subsidies or tax incentives, they will be more willing to take the risk of adopting agroforestry."* Public-private partnerships (PPPs) could play a pivotal role in providing these financial mechanisms. Another representative from mining industry highlighted the potential of PPPs, saying, *"Collaboration between financial institutions, businesses, and government agencies could reduce the financial risks for farmers and encourage sustainable practices."*

Additionally, agroforestry offers opportunities for market diversification and value chain development. Stakeholders pointed out that agroforestry products, such as fruits, timber, and medicinal plants, could access new markets, providing farmers with alternative income streams. Farmer 3 emphasized this potential, saying, *"Agroforestry can open doors to markets we've never accessed before, like selling fruits or trees for timber."* This market-oriented approach could make agroforestry more attractive to farmers by linking them to buyers and processors through cooperative models.

The adoption of agroforestry in Chunya District faces significant financial, technical, and institutional challenges. However, these barriers are not insurmountable. By addressing financial constraints through subsidies and PPPs, providing targeted training programs, and clarifying land tenure policies, stakeholders can unlock the opportunities agroforestry presents. These opportunities include environmental restoration, income diversification, and community development, making agroforestry a promising strategy for reclaiming gold mining-affected lands while supporting local livelihoods.

## 4.2 Understanding of Agroforestry and Perception of Agroforestry as a Business Opportunity

The concept of agroforestry as a potential solution for land reclamation in gold mining-affected areas has been embraced by many stakeholders in Chunya District, but the understanding and perception of agroforestry differ significantly among local farmers. While there is broad awareness of agroforestry as a land management system that integrates trees with crops or livestock, the depth of this understanding, coupled with the perception of agroforestry as a business opportunity, varies significantly between the four local farmers interviewed for this study. This section provides a detailed comparative analysis of these farmers' perspectives on

agroforestry, drawing insights from their responses and integrating input from other key stakeholders, including environmental experts, agricultural extension officers, and representatives from mining companies. In doing so, this analysis highlights the potential for agroforestry to be both an ecological and economic solution, as well as the challenges that must be overcome to transform it into a viable business opportunity for local farmers.

Farmer 1, a well-experienced agriculturalist, demonstrates a solid understanding of agroforestry principles, noting, "*Agroforestry is not just about planting trees. It's about creating systems that work together to enhance soil fertility and protect the environment*." This statement reflects a strong theoretical understanding of agroforestry, which is supported by the fact that 85% of stakeholders in the study, including farmers, environmental experts, and extension officers, similarly recognized agroforestry as an effective land management practice. However, while Farmer 1 understands agroforestry's ecological benefits, he is less convinced about its potential as a business opportunity. During the interview, he expressed skepticism, stating, "*I don't see it as a business. It's more of a solution for environmental problems, but it doesn't bring in immediate profit*." This view contrasts with the perceptions of other stakeholders, who see agroforestry as a business opportunity that aligns with market demands for sustainable products and offers long-term financial returns.

Farmer 2, who is also a local gold miner, holds a more transactional view of agriculture. His perspective on agroforestry is influenced by his focus on maximizing short-term financial returns from mining. When asked about agroforestry as a business, Farmer 2 stated, "*Agroforestry would only be worth it if it provides instant profit. Otherwise, it's just another way of wasting time*." This sentiment reflects the dominant preference for immediate returns from mining, which presents a significant challenge to shifting farmers' perspectives toward more sustainable and long-term practices like agroforestry. As mining continues to dominate the local economy, it becomes increasingly difficult for local farmers like Farmer 2 to see agroforestry as an economically viable alternative. However, this is where the role of other stakeholders becomes critical. For instance, extension officers, who are actively engaged with farmers to provide technical knowledge and support, stress the importance of demonstrating the economic benefits of agroforestry. One extension officer commented, "*The challenge is changing the perception of farmers, especially those involved in mining. Agroforestry needs to be seen as a business, not just a tool for land restoration*."

Farmer 3, however, shows a more optimistic view of agroforestry as both an ecological solution and a business opportunity. While he acknowledges the time and investment required for agroforestry to pay off, he also sees its potential for providing long-term, sustainable income. "*Agroforestry is a good investment for the future*," Farmer 3 remarked. "*It may not give quick returns, but it will be profitable in the long run, especially if we can get access to better markets for the products*." This perspective is in line with the broader understanding among stakeholders in the focus group discussions, where agroforestry was consistently seen as a viable business opportunity if the market for sustainable products could be developed. During a focus group discussion, a local agricultural expert highlighted that "*Agroforestry can diversify income sources, making it attractive for farmers if they have access to value-added markets and processing incentives.*"

The emphasis on market access as a critical factor in transforming agroforestry into a business opportunity is underscored by Farmer 4, who although new to agroforestry, is open to learning about its potential as an economic activity. "*If I can sell the products from agroforestry, I would be willing to try it*," Farmer 4 stated. This openness to agroforestry as a business opportunity reveals an area of potential for introducing agroforestry to the broader farmer community. In focus group discussions, other stakeholders, particularly those from community leaders, emphasized the importance of market linkages and the need to help farmers access profitable markets for agroforestry products. One community leader noted that, "*There is significant market potential for agroforestry products, but farmers must be supported in accessing these markets to make agroforestry a profitable venture*."

The role of external stakeholders such as government agencies and NGOs in creating market linkages cannot be overstated. Both Farmer 3 and Farmer 4 expressed a need for external support in connecting them to these markets. Farmer 3 stated, "*If there were programs that could connect us to buyers for agroforestry products, I would invest more in it*." This was echoed by an agricultural extension officer, who noted, "*Market access and value chains are key to making agroforestry profitable. Without them, even the best agroforestry systems won't succeed.*" Moreover, a representative from a mining company in Chunya suggested that "*collaborations between agroforestry producers and mining companies could create new avenues for market development, benefiting both the environment and local economies*."

Beyond the individual farmers, there is a consensus among stakeholders that agroforestry, if promoted effectively, could address both ecological and economic challenges in gold mining-affected areas. The perception of agroforestry as a business opportunity is increasingly supported by the recognition that it can generate sustainable income and mitigate environmental degradation caused by mining. Quotes from respondents echoed this sentiment, with one stakeholder who is an Environmental expertise expressing, *"Agroforestry seems like a practical approach to restoring degraded land while also providing economic opportunities.*" This statement was also supported by the other two respondents from the Agricultural sector as well as from the mining companies.

## 4.3. Financial Mechanisms and Support for Agroforestry Initiatives

The financial mechanisms and support structures required to foster agroforestry adoption in Chunya District have emerged as critical points of focus in discussions with local farmers, community leaders, extension officers, and representatives from mining companies. Financial constraints are consistently identified as a key barrier to the successful implementation and scaling of agroforestry projects. The farmers interviewed for this study, along with various stakeholders, highlighted the challenge of securing adequate funding to initiate and sustain agroforestry systems. Farmer 1 clearly expressed the need for financial support, saying, *"Without dedicated funding, it's challenging for us to invest in agroforestry. We need to know that the funds will be there to both start and sustain these projects."* This perspective was shared by other stakeholders, highlighting the universal understanding that both initial and ongoing financial backing are essential for the success of agroforestry initiatives.

Farmers in Chunya, especially those dependent on subsistence agriculture or mining, face significant financial pressures, making long-term investments in agroforestry less appealing. For instance, Farmer 2, whose livelihood is tied to the immediate returns from mining, expressed reluctance to invest in agroforestry, stating, *"I don't have the money to take risks on something that might not provide returns in the short term."* This attitude reflects a broader trend where short-term financial pressures often take precedence over the long-term benefits of sustainable land management practices, such as agroforestry.

To overcome these financial barriers, several mechanisms have been proposed. The need for dedicated financial support, including grants, subsidies, or low-interest loans, was commonly mentioned by both farmers and other stakeholders. Farmer 3, who views agroforestry as a business opportunity, emphasized the need for financial support, saying, *"If there were financial assistance or subsidies available for establishing agroforestry, it would make it much easier for us to start."* This was echoed by extension officers, who stressed that government funding is crucial for covering initial costs like seedlings and equipment. One extension officer noted, *"We need more funding programs from the government and NGOs to help farmers with the initial costs of agroforestry."* Value-added processing incentives were also seen as vital. A community leader suggested, *"If there were incentives for processing agroforestry products, such as tax breaks or support for building processing facilities, more farmers would be interested in adopting agroforestry."* This idea aligns with Farmer 3's belief that value-added processing can improve the profitability of agroforestry. Public-private partnerships were identified as key for providing resources and expertise. An extension officer explained, *"Partnerships between the government and private sector can provide the necessary resources and expertise for successful agroforestry projects."* This would directly help Farmer 3 by making resources more accessible. Innovative financing models, like microloans and community savings groups, were also proposed as solutions to financial barriers. A gold mining representative stated, *"Innovative financing, like microloans or community investment funds, could help overcome financial barriers and spread the risk among many stakeholders."* These models would help farmers like Farmer 3 access the capital needed for agroforestry. Lastly, local savings groups could pool resources to support agroforestry. A community leader said, *"Local savings groups could pool resources to help farmers invest in agroforestry."* This approach would also help Farmer 3 by providing an alternative source of funding.

While financial support is critical, stakeholders also emphasized the importance of technical assistance to ensure that financial resources are used effectively. As Farmer 4, a newcomer to agroforestry, noted, *"Even if I get financial support, I still need guidance on how to manage the agroforestry systems properly."* This underscores the necessity of providing farmers with the skills and knowledge to manage agroforestry systems effectively. Agricultural extension officers play a key role in this regard, offering training and ongoing support to ensure that farmers can implement agroforestry practices successfully. As one extension officer remarked, *"Technical training is just as important as financial support. Without it, farmers may not fully understand how to manage agroforestry systems, leading to poor outcomes."*

## 4.4. Examples of Successful Collaborations and Projects

In Chunya District, although the number of successful agroforestry collaborations remains limited, there is a shared recognition among stakeholders of the potential for partnerships to drive sustainable land use practices, including agroforestry. Despite the absence of large-scale success stories, many stakeholders agree that partnerships between mining companies, local communities, government agencies, and NGOs could be key to promoting agroforestry in the district. Farmers and other stakeholders acknowledge the benefits of collaboration, particularly between mining companies and local communities. For instance, Farmer 2 noted, *"If mining companies work with us, they could provide financial resources and expertise to help us set up agroforestry systems."* This sentiment is echoed by a representative from a mining company, who stated, *"We are committed to supporting the communities where we operate by investing in sustainable land reclamation projects. Agroforestry offers a viable solution that benefits both the environment and local livelihoods."* These perspectives underscore the potential role of mining companies in providing crucial resources for agroforestry initiatives, particularly in terms of financial investment and technical expertise. Furthermore, the involvement of government agencies is essential in facilitating these collaborations. Government support through regulatory frameworks, policy incentives, and direct financial aid can help create an environment where agroforestry partnerships can thrive. As one community leader emphasized, *"The government must provide regulatory support and financial backing, while businesses and NGOs can offer technical expertise and community outreach."* This highlights the essential role of government agencies in fostering successful agroforestry adoption, with a coordinated effort between government, businesses, and NGOs. Additionally, Farmer 3 expressed a desire for collaboration with NGOs, saying, *"I wish we could work with an NGO that can provide us with the seeds and training to get started with agroforestry,"* demonstrating the recognition of the vital role NGOs could play in supporting agroforestry by offering essential resources and knowledge-sharing. A particularly promising area for collaboration is the integration of agroforestry into mining reclamation projects. Mining companies, under pressure to restore disturbed lands, are increasingly exploring agroforestry as a sustainable method of land reclamation. A representative from a mining company noted, *"We are exploring ways to incorporate agroforestry into our land rehabilitation plans, as it offers a sustainable approach that aligns with both environmental goals and community development."* This opportunity offers a mutually beneficial solution, where mining companies contribute to

environmental restoration and local communities gain access to sustainable farming practices. However, despite these promising opportunities, stakeholders, including farmers, have expressed concerns about the lack of visible, successful examples of agroforestry collaborations in Chunya. Farmers 1, 2, 3, and 4 all acknowledged that they have yet to see large-scale agroforestry projects being successfully implemented in the district. Farmer 4 remarked, *"We hear about these partnerships, but we need to see more concrete results on the ground to believe they will work."* Similarly, Farmer 1 echoed this concern, stating, *"We've been told about the benefits of collaboration, but there hasn't been any real action in our area yet."* This reflects a general sentiment that while the potential for collaboration is recognized, tangible evidence of success is still absent, and stakeholders, including farmers, believe that more visible, concrete examples are needed to build trust and confidence in these collaborative efforts.

## 4.5 Policy Recommendations for Promoting Agroforestry Integration

To promote the integration of agroforestry as a viable land reclamation strategy in gold mining-affected areas of Chunya District, several policy interventions are necessary to address the financial, technical, and institutional barriers identified in the study. First and foremost, it is essential for the government to develop and implement policies that provide financial support to farmers looking to adopt agroforestry practices. This could include subsidies for the initial costs of establishing agroforestry systems, low-interest loans, and grants to cover the expenses of seedlings, tools, and training programs. Farmer 3 emphasized the importance of financial support, saying, *"If there were financial assistance or subsidies available for establishing agroforestry, it would make it much easier for us to start."* Such financial support would help alleviate the burden of upfront costs and incentivize farmers to embrace agroforestry. In addition to financial support, there is a pressing need for targeted training programs to build the technical capacity of farmers, especially those with limited knowledge of agroforestry, such as Farmer 4, who noted, *"Even if I get financial support, I still need guidance on how to manage the agroforestry systems properly."* As demonstrated by the interviews and Focus grop discusion, some stakeholder , including Farmer 4, expressed interest in agroforestry but lacked the necessary skills and knowledge to implement it effectively. Therefore, the government should collaborate with agricultural extension officers, NGOs to offer practical, hands on training that covers agroforestry systems suitable for the specific ecological conditions of

Chunya. This training should not only focus on the ecological aspects of agroforestry but also include guidance on how to manage the systems as profitable business ventures, addressing the concerns of farmers like Farmer 2, who is primarily motivated by immediate financial returns and expressed skepticism about agroforestry's profitability, saying, *"Agroforestry would only be worth it if it provides instant profit. Otherwise, it's just another way of wasting time."* Furthermore, the government should establish a clear regulatory framework for land tenure that ensures secure land ownership and protects farmers' investments in agroforestry. As highlighted by Farmer 2, concerns about land security are a significant deterrent to agroforestry adoption, stating, *"I am afraid that after I invest in agroforestry, someone doing mining activities may come and claim my land."* Strengthening land tenure rights would encourage farmers to invest in long-term, sustainable practices without fear of losing their land to mining activities. In parallel, it is vital to establish market linkages that can connect farmers to potential buyers of agroforestry products. Policies should focus on facilitating access to value-added markets for agroforestry products, such as fruits, timber, and medicinal plants, as indicated by Farmer 3, who sees agroforestry as a promising source of long-term income if market opportunities can be developed. He stated, *"Agroforestry is a good investment for the future. It may not give quick returns, but it will be profitable in the long run, especially if we can get access to better markets for the products."* The establishment of cooperatives or partnerships between farmers and local businesses could help streamline this process and provide farmers with the necessary market access. Moreover, public-private partnerships (PPPs) should be encouraged, particularly with mining companies, to support agroforestry initiatives. Mining companies, as part of their corporate social responsibility efforts, could provide financial resources and technical expertise to help farmers transition to agroforestry. These collaborations could also integrate agroforestry to mining reclamation projects, which would help restore degraded lands while benefiting both the environment and local communities. A mining company representative noted, *"We are committed to supporting the communities where we operate by investing in sustainable land reclamation projects. Agroforestry offers a viable solution that benefits both the environment and local livelihoods."* Lastly, the government should create a policy environment that incentivizes private investment in agroforestry, such as offering tax breaks for businesses involved in agroforestry or processing agroforestry products. This would stimulate private sector involvement in agroforestry, further bolstering its potential as both an ecological and economic solution. A comprehensive approach that includes financial incentives, technical training, secure land tenure, market linkages, and

public-private partnerships is crucial for promoting the successful integration of agroforestry into land reclamation efforts in Chunya District.

# 5. Discussion

*This section delves into the empirical findings regarding agroforestry adoption for land reclamation in gold mining-affected areas, contextualizing them within existing literature on sustainable land management practices and stakeholder engagement.*

## 5.1 Business-related Challenges, Risks, and Opportunities in Agroforestry Adoption

The findings from Chunya District reveal a complex interplay of financial, technical, and institutional challenges that impede the adoption of agroforestry as a land reclamation strategy, aligning closely with barriers identified in the literature, such as financial constraints and limited technical knowledge. For instance, Farmer 1's and Farmer 3's concerns regarding the prohibitive costs of seedlings, tools, and other inputs mirror the broader issue of insufficient access to capital faced by smallholder farmers in developing regions, as highlighted by scholars like Islam et al. (2021) and Mukhlis et al. (2022). Furthermore, the reluctance expressed by Farmer 2, who viewed agroforestry as less profitable compared to the immediate financial returns of mining, underscores the perceived trade-offs between short-term gains and long-term sustainability, which have been noted as critical deterrents in previous studies, including García de Jalón et al. (2018). Such resistance demonstrates the necessity of targeted interventions, including educational programs that clearly illustrate the long-term benefits of agroforestry, such as improved soil fertility, enhanced crop yields, and diversified income streams, which have been emphasized by Raizada and Dhyani (2020). The financial challenges could be alleviated through mechanisms like subsidies, low-interest loans, and public-private partnerships (PPPs), as supported by insights from focus group discussions and studies by Mukhlis et al. (2022), Stubblefield et al. (2025), Thukral (2012), and Katsvanga & Mudyiwa (2019), which collectively advocate for such mechanisms as catalysts for sustainable practices. Additionally, land tenure insecurity, as highlighted by Farmer 2's fears of losing land to competing mining interests, reflects a significant institutional challenge that necessitates clear regulatory frameworks to incentivize long-term investments in agroforestry, a need that is consistently echoed in the literature by authors such as García de Jalón et al. (2018). Despite these barriers, stakeholders identified significant opportunities, with Farmer 3's optimism

about agroforestry's sustainability aligning with Quinkenstein et al. (2012), who argue that agroforestry not only restores ecological balance but also enhances socio-economic resilience. Market diversification opportunities, such as the potential to sell agroforestry products like fruits, timber, and medicinal plants, were similarly underscored during focus group discussions and resonate with insights from Lestari et al. (2018), who emphasize the importance of aligning agroforestry practices with local market opportunities to enhance adoption. Moreover, the engagement of mining companies through corporate social responsibility (CSR) initiatives and the promotion of PPPs, as identified in the results, illustrates agroforestry's potential to address both environmental and socio-economic challenges, an approach that is strongly supported by the literature, including Meinzen-Dick (2007) and Hirons et al. (2014), who stress the importance of collaborative efforts in fostering sustainability. Consequently, while significant barriers persist, addressing financial limitations, improving access to technical knowledge, and establishing robust policy frameworks could unlock the transformative potential of agroforestry for reclaiming mining-affected lands, offering a pathway to both environmental restoration and community development in Chunya District and beyond.

## 5.2 Understanding of Agroforestry and Perception of Agroforestry as a Business Opportunity

The understanding and perception of agroforestry as a business opportunity among farmers and stakeholders in Chunya District reveal both promising opportunities and persistent challenges, aligning closely with insights from the literature. While 85% of stakeholders including farmers, environmental experts, extension officers, and mining representatives acknowledge agroforestry as an effective land management practice, perspectives on its economic viability differ significantly. For example, Farmer 1 articulates a strong understanding of agroforestry's ecological benefits, emphasizing soil fertility and environmental protection, echoing the findings of Nair (1989) and Leakey (1996) on its role in improving ecosystem services. However, his skepticism about agroforestry's profitability highlights the challenge of delayed returns, as noted by Mathur and Bhattacharya (2024). Conversely, Farmer 2, influenced by the short-term financial benefits of mining, perceives agroforestry as viable only if it provides immediate profits, a perspective supported by García de Jalón et al. (2018), who emphasize the perceived trade-offs between immediate crop production and long-term ecological benefits. In contrast, Farmer 3 offers a more optimistic outlook, viewing agroforestry as a sustainable investment if supported by access to better markets, aligning with Lestari et al. (2018) and Theodoro et al. (2021), who stress the importance of market linkages in making agroforestry

economically viable. Farmer 4, though new to agroforestry, expresses willingness to adopt it if market access improves, which mirrors findings by Mukhlis et al. (2022) on the critical role of external support in fostering adoption. Stakeholders such as environmental experts and extension officers also stress the importance of bridging knowledge gaps and providing technical support, which aligns with findings by Workman et al. (2003) and Prokopy et al. (2019) on the necessity of capacity-building initiatives. Furthermore, mining companies and environmental experts recognize agroforestry's potential to mitigate mining-related land degradation and provide sustainable income, a dual benefit highlighted by Wireko (2011) and Gitari et al. (2024). Crucially, as Mukhlis et al. (2022) and Nikoi (2024) emphasize, the success of agroforestry depends on robust regulatory frameworks, participatory approaches, and strategic collaborations to address barriers such as financial constraints, knowledge gaps, and limited market access. Stakeholders' consensus on the ecological and socio-economic potential of agroforestry reinforces its value, but effective implementation requires integrating these perspectives with institutional support, echoing the recommendations of Ostrom (1990) and Rosendahl (2018). Thus, agroforestry represents a promising yet complex solution, requiring coordinated efforts to transform it into a sustainable business opportunity for local farmers in mining-affected areas.

## 5.3 Financial Mechanisms and Support for Agroforestry Initiatives

The financial mechanisms and support structures needed to promote agroforestry in Chunya District are pivotal, as revealed by the perspectives of farmers, community leaders, extension officers, and mining company representatives. Farmers face significant financial constraints that limit their capacity to adopt agroforestry practices, particularly those reliant on subsistence agriculture or mining, where immediate financial needs often take precedence over long-term benefits. This finding aligns with the work of Mukhlis et al. (2022), Islam et al. (2021), and García de Jalón et al. (2018), all of whom highlight financial limitations as a key challenge in agroforestry adoption. Community leaders and extension officers emphasized the necessity of government funding, grants, subsidies, and low-interest loans to cover the initial investment costs, consistent with García de Jalón et al. (2018) and Bishaw et al. (2013), who underscore the importance of financial accessibility for sustainable practices. Mining companies proposed innovative financing models such as microloans and community savings groups to address financial risks collaboratively, reflecting Mukhlis et al. (2022), who advocate for adaptive financial solutions in resource-scarce settings. Furthermore, the integration of public-private

partnerships to mobilize resources and expertise was identified as crucial, resonating with the approaches suggested by Lestari et al. (2018), Thukral (2012), Katsvanga & Mudyiwa (2019). Also, this aligns with Rosendahl's (2018) findings on the benefits of stakeholder collaboration in improving sustainable land management. Beyond financial mechanisms, stakeholders stressed the critical role of capacity-building and technical training to ensure that financial investments translate into effective agroforestry management. This perspective supports findings by Stubblefield et al. (2025) and McGinty et al. (2008), who emphasize the importance of technical knowledge in overcoming adoption barriers. These results underscore the need for a coordinated approach involving financial support, technical assistance, and stakeholder collaboration to ensure the success and sustainability of agroforestry initiatives in mining-affected regions.

## 5.4 Examples of Successful Collaborations and Projects

In Chunya District, the potential for successful agroforestry collaborations remains significant, despite the limited number of large-scale examples. Stakeholders, including farmers, mining companies, government agencies, and environmental experts, recognize the value of partnerships in promoting sustainable land use practices. This sentiment aligns with findings in the literature, where community involvement, government support, and private sector investment are repeatedly emphasized as key factors in successful agroforestry adoption (Mukhlis et al., 2022; Meinzen-Dick, 2007; Lestari et al., 2018). The positive views expressed by local farmers and mining companies about collaboration resonate with earlier studies on the benefits of integrating agroforestry into land reclamation efforts, especially in mining-affected areas (Quinkenstein et al., 2012; Hermawan, 2016). The recognition by mining companies in Chunya of agroforestry as a viable solution for both land restoration and community development mirrors the growing trend seen globally where corporations integrate environmental sustainability into their business models, often through partnerships with local communities (Hirons et al., 2014; Besacier et al., 2021; Thukral, 2012). Furthermore, the involvement of NGOs, as expressed by farmers who seek assistance with seeds and training, aligns with the role these organizations play in facilitating knowledge transfer and resource provision, which is crucial for overcoming the adoption barriers identified in the literature, such as financial constraints and lack of technical knowledge (Stubblefield et al., 2025; Johnson & Delgado, 2003). The concerns raised by farmers about the lack of tangible results reflect a gap that has been acknowledged in agroforestry research, which points to the need for more

visible, concrete examples of successful implementation to build trust and demonstrate the long-term benefits of agroforestry practices (Garrity et al., 2010; García de Jalón et al., 2018). Despite these concerns, the shared recognition of agroforestry's potential, coupled with the need for coordinated support from government, mining companies, and NGOs, is critical for addressing the environmental and socio-economic challenges posed by mining in Chunya, as highlighted in the literature (Betancur-Corredor et al., 2018; Mbewe, 2017; Lestari et al., 2018). Thus, while the absence of large-scale success stories is evident, the theoretical frameworks and previous studies suggest that fostering partnerships and overcoming adoption barriers can pave the way for effective agroforestry projects in the region.

## 5.5 Policy Recommendations for Promoting Agroforestry Integration

To promote the successful integration of agroforestry as a land reclamation strategy in Chunya District's gold mining-affected areas, the policy recommendations align closely with existing literature on the challenges and opportunities for agroforestry adoption. The study's findings emphasize the need for financial support to alleviate farmers' initial investment burdens, a point echoed by researchers like Ruheza et al. (2012), who identify financial constraints as a significant barrier to agroforestry adoption in developing regions. The literature highlights the importance of subsidies, low-interest loans, and grants, which could mitigate the financial risks perceived by farmers, similar to findings from Stubblefield et al. (2025), García de Jalón et al. (2018) and Ford et al. (2021), who stress the importance of financial incentives in encouraging sustainable agricultural practices. Additionally, the need for targeted training programs, which the study identifies as essential for building technical capacity, is supported by studies such as Iles et al. (2023), who underline that access to relevant technical information is critical for new farmers. This connects to the literature, which frequently points to the lack of knowledge and skills as a major barrier to agroforestry adoption (Johnson & Delgado, 2003; Jha et al., 2021). Furthermore, the study's recommendation to address land tenure insecurity, a major concern for farmers in Chunya, is directly linked to findings by Ruheza et al. (2012) and Golar et al. (2021), who argue that land tenure conflicts are central to the reluctance to adopt long-term land management practices like agroforestry. Strengthening land rights, therefore, is not only crucial for securing investments in agroforestry but also for reducing conflicts with mining activities, as outlined by Buxton et al. (2013). On the market front, the study's call for enhanced market linkages resonates with the work of Mbow et al. (2014) and Mukhlis et al. (2022), who stress the importance of facilitating access to value-added markets and establishing networks

that can help farmers access new revenue streams. Public-private partnerships, as suggested by the study, also align with the literature, where the role of mining companies in supporting agroforestry projects through corporate social responsibility (CSR) initiatives has been identified as a promising model for integrating agroforestry into reclamation efforts (Hirons et al., 2014; Quinkenstein et al., 2012; Besacier et al., 2021; Thukral, 2012). Finally, the study's recommendation to incentivize private sector investment through tax breaks is in line with Nikoi (2024), Chaturvedi et al. (2014) Mbewe (2017),  call for policy reforms that support sustainable development, as well as with the wider body of literature advocating for comprehensive regulatory frameworks to promote agroforestry in post-mining landscapes (Beyene et al., 2019; Mukhlis et al., 2022; Yesigomwe, 2008; Tuokuu, 2019). By addressing these interconnected policy needs, Chunya District can leverage agroforestry to mitigate environmental degradation while enhancing local livelihoods and promoting long-term ecological restoration.

# 6. Summary, Conclusion, and Recommendations and Future Research

*This final chapter encapsulates the study's key findings, draws conclusions, and offers actionable recommendations to promote agroforestry adoption and sustainable land management practices in gold mining-affected areas.*

## 6.1 Summary

This study explored the adoption of agroforestry practices for land reclamation in gold mining-affected areas in Chunya District, Tanzania. It focused on understanding the roles of various stakeholders, including farmers, community leaders, government officials, and private sector representatives, in promoting agroforestry. Additionally, the research examined the challenges faced in adopting agroforestry practices, such as financial constraints, limited technical knowledge, and inadequate policy support. The findings indicate that stakeholders recognize the potential benefits of agroforestry, including improved soil fertility, enhanced biodiversity, and economic opportunities through diversified income streams. However, financial challenges, such as high initial investment costs, limited access to credit, and market uncertainties, have significantly hindered the widespread adoption of agroforestry. The study also revealed that while collaboration among stakeholders is acknowledged as vital, successful partnerships are still limited due to inadequate coordination and conflicting interests. Furthermore, the existing policies and regulations are either insufficient or poorly enforced, making it difficult for agroforestry initiatives to gain traction. Strengthening financial support mechanisms, enhancing technical training, fostering multi-stakeholder collaboration, and improving the policy environment are recommended as ways to address these challenges.

## 6.2 Conclusion

The study concludes that agroforestry is a promising approach for land reclamation in gold mining-affected areas in Chunya District. The positive perceptions among stakeholders demonstrate a willingness to adopt agroforestry; however, several challenges currently constrain its adoption. Financial limitations, particularly the high initial costs and limited access to financial resources remain significant barriers. Moreover, the lack of technical expertise and inadequate policy support further complicate the adoption process. Reflecting on the findings, it is evident that the success of agroforestry initiatives relies on a supportive ecosystem that includes financial backing, stakeholder collaboration, and a favorable policy environment. The study also highlights the importance of community involvement in decision-making processes to ensure that agroforestry practices are aligned with local needs and capacities. Addressing these challenges will be crucial in unlocking the full potential of agroforestry as a sustainable land reclamation strategy in the district.

## 6.3 Recommendations

Based on the findings, several recommendations are proposed to enhance the adoption of agroforestry in land reclamation efforts. First, targeted financial programs, such as grants, microloans, and subsidies, should be established to alleviate the high initial costs associated with agroforestry. Public-private partnerships should be promoted to leverage resources and provide tailored financial solutions for agroforestry projects. Second, capacity-building initiatives must be implemented to equip farmers and other stakeholders with the necessary technical skills for successful agroforestry practices. Regular training and extension services are crucial to addressing knowledge gaps and ensuring the proper implementation of agroforestry systems. Third, fostering stakeholder collaboration is essential. The formation of multi-stakeholder platforms, where government agencies, mining companies, NGOs, and local communities can collaborate and share resources, should be encouraged. Such partnerships are necessary to align objectives and create synergies that can drive agroforestry initiatives forward. Lastly, advocacy for clear and supportive policies is needed to promote agroforestry as a key component of land reclamation strategies. Governments should streamline regulatory processes, provide tax incentives, and ensure effective enforcement of existing policies to create an enabling environment for agroforestry.

## 6.4 Further Research and Limitations of the Research

This research focused on assessing the willingness of stakeholders to adopt agroforestry in gold mining-affected areas in the Chunya District. However, several limitations exist, and additional areas remain open for future exploration. One limitation of this study is its geographical scope, which was confined to the Chunya District. Future research could expand this focus to include other mining-affected regions across Tanzania to determine if the findings from this area are consistent with broader trends. Comparative studies across different regions could provide deeper insights into the factors influencing agroforestry adoption and uncover location-specific challenges or opportunities. Moreover, this study employed a qualitative approach, relying on interviews and focus group discussions, which may limit the generalizability of the findings. A potential avenue for future research is conducting quantitative studies with larger sample sizes. This could yield statistically significant data and allow for broader generalizations, further validating or challenging the findings of this research.

Additionally, this study was cross-sectional, capturing stakeholder views at a single point in time. Longitudinal studies tracking the long-term impacts of agroforestry practices on both environmental restoration and community livelihoods would provide valuable insights into the sustainability and scalability of these interventions. Such research could highlight the dynamics of adoption over time and the lasting effects of agroforestry on land reclamation and socio-economic outcomes. This study did not extensively address financial barriers, which are often critical in the adoption of agroforestry. Future research could explore innovative financing models, such as crowdfunding, impact investing, or blended finance, to address these financial challenges. Investigating these models could lead to the development of scalable solutions that support sustainable land reclamation efforts in mining-affected areas. While this research offers valuable insights into agroforestry adoption in the Chunya District, further studies are needed to address its limitations, validate the findings across diverse contexts, and explore new avenues for promoting sustainable agroforestry practices.

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## Popular science summary

This research focuses on understanding the willingness of stakeholders to adopt agroforestry as a strategy for land reclamation in gold mining-affected areas of Chunya District, Tanzania. Gold mining in this region has led to significant environmental degradation and socio-economic challenges, necessitating sustainable land management solutions. Agroforestry, which combines crops with trees, presents a promising approach to restoring degraded land, enhancing biodiversity, and improving the livelihoods of local communities. The study utilized multiple qualitative data collection methods including in-depth interviews, focus group discussions, Documentary analysis, and participant observation. with several stakeholders, including farmers, community leaders, and representatives from mining companies. Findings revealed that 85% of stakeholders have a solid understanding of agroforestry and see it as a viable business opportunity. They recognize its potential to restore degraded land while providing diverse income sources. Despite this enthusiasm, several barriers impede the adoption of agroforestry practices. Key challenges include financial constraints, lack of technical knowledge, legal complexities, and market uncertainties. Local farmers expressed concerns about the high initial costs and the time required to see results, indicating a need for targeted financial support mechanisms and capacity-building initiatives. The research emphasized the importance of stakeholder collaboration, highlighting the potential for public-private partnerships to alleviate financial burdens and share risks associated with agroforestry initiatives. Recommendations include implementing financial incentives, such as subsidies and tax breaks, to encourage adoption, as well as creating supportive policy frameworks that facilitate stakeholder engagement and streamline the process of integrating agroforestry into reclamation efforts. Ultimately, this study underscores the critical role of stakeholder involvement and innovative financing in fostering an enabling environment for agroforestry adoption, which could lead to sustainable land management and improved socio-economic conditions in Chunya District. Further research is encouraged to assess the long-term impacts of agroforestry on community resilience and ecological health.

# Acknowledgments

Luciana Raphael Chappa

Uppsala - Sweden, 2024

# Appendix

## Appendix I: Cover letter

**SLU** Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences
Department of Economics

Dear Participants,

I am Luciana Raphael Chappa, a student at the Swedish University of Agricultural Sciences, Uppsala, Sweden, specializing in the field of Agricultural Economics and Management. Currently, I am engaged in a research endeavor focused on Assessing Stakeholders' Willingness to Adopt Agroforestry for Land Reclamation in Gold Mining-Affected Areas. Specifically, my study is centered on the Chunya District in Tanzania.

Your input is invaluable to this investigation. Therefore, I kindly request your participation in focus group discussions and in-depth interviews. Your insights will greatly contribute to the depth and accuracy of the research findings.

Please be assured that all information shared will be treated with utmost confidentiality and utilized solely for academic purposes.

Thank you sincerely for your cooperation in advance.

Best regards,

Luciana Raphael Chappa

# Appendix II: Interview guide - Questions for in-depth interviews with Extension officers and environmental expertise).

1. What are the key business challenges and opportunities associated with land reclamation and environmental restoration in gold mining-affected areas, from your observations and expertise?

2. What do you understand about Agroforestry? How would you define Agroforestry? Have you heard about Agroforestry?

3. How do you perceive agroforestry as a potential business opportunity for stakeholders involved in land reclamation efforts, considering factors such as cost-effectiveness, market demand for sustainable products, and long-term profitability?

4. What are the main drivers influencing stakeholder's willingness to invest in and adopt agroforestry practices for land reclamation?

5. Can you provide insights into the business models or financial mechanisms that have been utilized to support agroforestry initiatives in Chunya District or similar contexts, and how successful they have been in achieving both environmental and economic goals?

6. What are some of the business-related barriers or risks that stakeholders may face when considering the adoption of agroforestry in gold mining-affected areas, and how can these be mitigated or addressed?

7. In your opinion, what role should business leaders, government agencies, and NGOs play in fostering a supportive ecosystem for agroforestry entrepreneurship and investment in gold mining-affected areas?

8.  Can you provide examples of successful collaborations between different stakeholders in Chunya District that have resulted in sustainable business ventures related to environmental restoration and land reclamation?

9. Can you provide an example of a specific area in Chunya District or a similar region where agroforestry has been successfully implemented for land reclamation, and describe its impact and success?

10. What are the potential business impacts of adopting agroforestry practices on the local economy, including aspects such as job creation, value chain development, and market diversification?

11. From a policy perspective, what regulatory frameworks or incentives would you recommend promoting the integration of agroforestry into business strategies for land reclamation in Tanzania and beyond?

## Appendix II: Interview guide - Questions for in-depth interviews with local Farmers, community leaders

1. How does the land affected by gold mining activities affect your daily activities (socially and economically)

2. Have you thought about rejuvenating the land impacted by gold mining activities? What methods do you think can be used to rejuvenate the land affected by gold mining activities?

3. What do you understand about Agroforestry? How would you define Agroforestry? Have you heard about Agroforestry?

4. What are the opportunities you see in Agroforestry? Have you seen agroforestry practices in your area?

5. What are the main drivers influencing stakeholders' willingness to invest in and adopt agroforestry practices for land reclamation? (Including you)

6. What are the risks that stakeholders may face when considering the adoption of agroforestry in gold mining-affected areas, and how can these be mitigated or addressed?

7. In your opinion, what role should business leaders, government agencies, and NGOs play in fostering a supportive ecosystem for agroforestry entrepreneurship and investment in gold mining-affected areas?

## Appendix IV: Interview guide - Questions for in-depth interviews with the owners of mining industries

1. What strategies does your mining company currently employ for land reclamation and environmental restoration in areas affected by gold mining activities?

2. What do you understand about Agroforestry? How would you define Agroforestry? Have you heard about Agroforestry?

3. Have you considered integrating agroforestry practices into your land reclamation efforts? If so, what are the perceived benefits and challenges?

4. What potential economic opportunities do you see in implementing agroforestry alongside mining operations for land reclamation and environmental restoration?

5. Can you provide examples of successful collaborations or partnerships between your mining company and local communities, government agencies, NGOs, or other stakeholders to promote sustainable land use practices, including agroforestry?

6. From a business perspective, what regulatory frameworks or incentives would you recommend to support the integration of agroforestry into mining industry practices for land reclamation and environmental restoration?

## Appendix V: Questions for Focus group discussion (Including Farmers, Extension Officers, Environmental Experts, Community leaders, local gold miners, and Business Representatives)

1. What are the key business challenges and opportunities associated with land reclamation and environmental restoration in gold mining-affected areas, from your observations and expertise?

2. What do you understand about Agroforestry? How would you define Agroforestry? Have you heard about Agroforestry?

3. Do you see any opportunity in Agroforestry?

4. From a business perspective, what challenges do you foresee in implementing agroforestry initiatives for land reclamation, and how might they be addressed?

5. How can agroforestry projects in gold mining-affected areas be structured to attract investment and financing from both private and public sectors?

6. What strategies can be employed to ensure that agroforestry initiatives for land reclamation are financially sustainable in the long term?

7. How do you envision partnerships between local businesses, government agencies, NGOs, and other stakeholders contributing to the successful adoption of agroforestry for land reclamation in Chunya District?

8. What types of incentives or support mechanisms do you believe would be most effective in encouraging businesses and individuals to invest in agroforestry projects aimed at land reclamation?

9. What are the key performance indicators that should be used to measure the success of agroforestry projects for land reclamation in gold mining-affected areas, and how can they be tracked and evaluated effectively?

10. What potential business opportunities do you see emerging from the adoption of agroforestry practices for land reclamation, and how can they be leveraged to create sustainable livelihoods for local communities?

# Appendix VI: Photos from the Field

*The area affected by surface gold mining has affected the agricultural land (see maize plants beside) – Photo credit: Luciana Chappa: Itumbi village-Chunya, Tanzania; 01 March 2024*



*Photo (a, b, c) The area affected by surface gold mining which has affected the natural vegetations and biodiversity – Photo credit: Luciana Chappa: Itumbi village-Chunya, Tanzania; 01 March 2024*

*a)*



*b)*

*c)*

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