

# Evaluating The Performance Of The National Rural Land Administration Information System: The Case Of Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia

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**Abstract:** Land administration in the modern context encompasses properties, constructions, and the natural environment, extending to everything attached to, above, and below the surface. This study was conducted to evaluate the performance of the National Rural Land Administration Information System (NRLAIS), focusing on Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia. It aimed to fill methodological and research gaps by analyzing how legal frameworks, infrastructure, digital transaction services, data quality, capacity building, and customer satisfaction influence NRLAIS performance. The study employed a mixed-methods research design. From a total population of 4,315 households, 189 rural land holders selected using systematic random sampling. Both primary and secondary data were utilized, collected through questionnaires, interviews, focus group discussions, observations, and document reviews. Descriptive and inferential statistical methods were applied for quantitative analysis. Findings revealed that the effectiveness of NRLAIS is significantly affected by the legal framework, quality of land data, network and infrastructure capacity, database management, adequacy of hardware and software, efficiency of service delivery, and institutional capacity building. The research underscores the importance of developing clear and harmonized legislation, applying advanced technologies to technical activities, enhancing service delivery mechanisms, and providing regular awareness and training programs. The study was limited to evaluating the system's efficiency and did not comprehensively explore socio-economic or environmental outcomes. Future research is recommended to address these dimensions, thereby providing a more holistic understanding of NRLAIS's role in sustainable land governance.

**Keywords:** Land, NRLAIS, Ethiopia, Performance, Legal Framework, Land Information Systems, GIS



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By: Habtamu Demelash Beyene

August 2025

Bahir Dar, ETHIOPIA

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# APPROVAL SHEET

## BAHIR DAR UNIVERSITY

### INSTITUTE OF LAND ADMINISTRATION GRADUATE PROGRAM IN LAND ADMINISTRATION AND MANAGEMENT

As a member of the examining board for this thesis, we certify that we have read and evaluated the thesis prepared by **Habtamu Demelash Beyene** entitled: **Evaluating the Performance of the National Rural Land Administration Information system: The case of Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia.** It is accepted as fulfilling the thesis requirement for the degree of Master of Science in Land Administration and Management. The final approval and acceptance of the thesis are contingent upon the candidate's successful defense of the thesis and submission of the final copy of the thesis to the research and community service coordinator of the Institute of Land Administration (ILA).

#### Approved by Board of Examiners

Name of Advisor -----Signature -----Date -----

Name of Internal Examiner -----Signature -----Date -----

Name of External Examiner -----Signature -----Date -----

## DECLARATION

I hereby declare that this research paper entitled “[**Evaluating the Performance of the National Rural Land Administration Information system: The case of Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia**]” is my original work and has not been submitted elsewhere for any other degree or publication. All sources of information used in this study have been duly acknowledged through proper citations and references.

I also confirm that any data, ideas, or words borrowed from other sources (including books, articles, websites, and other references) have been appropriately credited. Any form of plagiarism, if found, was be my sole responsibility.

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## ABSTRACT

Land administration in the modern context encompasses properties, constructions, and the natural environment, extending to everything attached to, above, and below the surface. This study was conducted to evaluate the performance of the National Rural Land Administration Information System (NRLAIS), focusing on Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia. It aimed to fill methodological and research gaps by analyzing how legal frameworks, infrastructure, digital transaction services, data quality, capacity building, and customer satisfaction influence NRLAIS performance. The study employed a mixed-methods research design. From a total population of 4,315 households, 189 rural land holders selected using systematic random sampling. Both primary and secondary data were utilized, collected through questionnaires, interviews, focus group discussions, observations, and document reviews. Descriptive and inferential statistical methods were applied for quantitative analysis. Findings revealed that the effectiveness of NRLAIS is significantly affected by the legal framework, quality of land data, network and infrastructure capacity, database management, adequacy of hardware and software, efficiency of service delivery, and institutional capacity building. The research underscores the importance of developing clear and harmonized legislation, applying advanced technologies to technical activities, enhancing service delivery mechanisms, and providing regular awareness and training programs. The study was limited to evaluating the system's efficiency and did not comprehensively explore socio-economic or environmental outcomes. Future research is recommended to address these dimensions, thereby providing a more holistic understanding of NRLAIS's role in sustainable land governance.

**Keywords:** Land, NRLAIS, Ethiopia, Performance, Legal Framework, Land Information Systems, GIS

## ACRONYMS AND ABBREVIATIONS

- LIS Land information systems
- NRLAIS National Rural Land Administration Information System
- IT Information Technology
- QGIS Quantum Geographical Information System
- REILA Responsible and Innovative Land Administration
- SLLC Second Level Land Certification
- SNNRP Southern Nations, Nationalities and Peoples Region
- UNCEF United Economic Commission for Europe
- FDRE Federal Democratic Republic of Ethiopia
- GIS Geographical Information Systems
- LAS Land Administration System
- CENLAIS Central Land Administration Information System
- REGLAIS Regional Land Administration Information System
- ZONLAIS Zonal Land Administration Information System
- WORLAIS Woreda Land Administration Information System
- WIPSS Information Provision Sub-System
- PRSS Property Registration Sub-System
- CMSS Cadaster Maintenance Sub-System
- PSS Process Sub-System
- DMSS Document Management Sub-System
- CSA Central Statistical Agency
- SL Service Level
- DB Database
- RBAC Role-Based Access Control

- LAN Local Area Network
- WAN Wide Area Network
- HHH House Hold Headed
- DBMS Database Management Systems
- LADM Land Administration Domain Model
- GIS Geographic Information Systems
- IDS Intrusion Detection Systems
- LPI Land Property Information
- FGD Focus Group Discussion
- PDF Portable Document Format
- JPG Joint Photographic Group
- MOE Ministry of Agriculture
- ANRS Amhara National Regional State

## Table of Contents

APROVAL SHEET .....	i
DECLARATION .....	ii
ABSTRACT.....	iv
ACRONYMS AND ABBREVIATIONS .....	v
LISTS OF TABLES.....	xiii
LISTS OF FIGURES .....	xiv
1.CHAPTER ONE: INTRODUCTION.....	1
1.1.Background of the Study .....	1
1.2.Statement of the problem.....	2
1.3.Objectives.....	3
1.4.Research questions.....	4
1.5.Significant of the study .....	4
1.6.Scope of the study .....	5
1.7.Limitation of the study .....	5
1.8.Definition of Terms.....	5

2.1.The Concept of Land Information System .....	8
2.1.1.Land Registration.....	8
2.1.2.Different land registration system.....	8
2.2.1.Sporadic Land Registration Methods .....	10
2.3.Cadaster system.....	11
2.4.Land administration system .....	11
2.5.Modern land administration global perspectives .....	12
2.6.Legal Framework about Rural Land information system.....	13
2.7.Land Information System .....	14
2.8.NRLAIS Database Management System.....	16
2.8.1.NRLAIS Description and Components .....	16
2.8.2.NRLAIS Database Schemas .....	18
2.8.3.NRLAIS Database Sub – System .....	18
2.8.5.Key Aspects of NRLAIS Network Infrastructures in Globally:.....	20
2.8.5.1.Data Centres.....	20
2.8.5.2.Network Connectivity .....	21
2.8.5.3.Hardware Components.....	21

2.8.5.4. Software .....	21
2.8.5.5. Security Measures .....	21
2.8.5.6. User Training and Support.....	22
2.8.5.7. Data Management .....	22
2.8.5.8. Infrastructure Development .....	22
2.8.5.9. Integration and Interoperability .....	22
2.8.5.10. Public Access and Services.....	23
2.8.5.11. Cloud Computing.....	23
 CHAPTER THREE: Description of the study area and RESERFCH	
METHODS .....	24
3.1. Description of the Study Area .....	24
3.2. Research Method .....	25
3.2.1. Study area selection and sampling design .....	26
3.2.1.1. Target Population and sampling frame.....	26
3.2.1.2. Sampling Techniques.....	27
3.2.1.3. Sample Size.....	27
3.3. Data Sources and Methods of Data Collection.....	28

3.3.1. Quantitative Instrument .....	29
3.3.2. Qualitative Instrument .....	29
3.4.1. Qualitative Data Analysis .....	31
3.4.2. Quantitative Data Analysis .....	31
3.6. Description of Dependent and Independent Variables .....	34
3.6.1. Dependent Variable .....	34
3.6.2. Independent Variables .....	34
CHAPTER FOUR: RESULTS AND DISCUSSION .....	35
4. Introduction .....	35
4.1. Demographic and Socio-Economic Characteristics .....	35
4.1.2. Demographic Characteristics of House Hold Headed .....	35
4.2. Attributes of Land information experts .....	37
4.3. Assessing the Current Practice of NRLAIS .....	44
4.4. Network infrastructures and database management system on NRLAIS .....	46
4.5. The contribution of legal framework on NRLAIS .....	51
4.6. Technical strengths, weaknesses, and challenges of the NRLAIS .....	55
4.6. Challenges Facing NRLAIS Implementation .....	56

4.7. Evaluation of system user satisfaction.....	59
4.7.1. System Usability and Functionality .....	59
4.7.2. Accessibility and Digital Inclusion.....	59
4.7.3. Training and Support .....	59
4.7.4. Transparency and Trust.....	60
4.7.5. Government & Policy Alignment .....	60
4.8. Potential Challenges Affecting NRLAIS user Satisfactions .....	60
CHAPTER FIVE.....	84
5. SUMMARY OF FINDING, CONCLUSION, AND RECOMMENDATION .....	84
5.1. Summary of Finding .....	84
5.2. Conclusion .....	85
5.3. Recommendations.....	86
REFERENCE.....	88
Appendix I: Questionnaire for House Hold Headed.....	95
Appendix II: Questionnaire for Experts.....	98
Appendix III: SPSS Analysis Results of House Hold Headed .....	102

Appendix B: The contribution of legal framework on NRLAIS respondents of House Hold Headed .....	105
Appendix C: Technical strengths, weaknesses, and challenges of the NRLAIS respondents of House Hold Headed.....	106
Appendix D: Evaluate System User Satisfaction respondents of House Hold Headed.....	107
Appendix IV. SPSS Analysis Results of Experts .....	109
Appendix A: Network infrastructures and Database management expert respondents.....	109
Appendix B: Legal framework aspects on NRLAIS expert respondents.....	110
Appendix C: Strength, weakness and challenges of NRLAIS expert respondents.....	111
Appendix D: Evaluate System user satisfaction expert respondents.....	112

## LISTS OF TABLES

Table 3.1: Sample size determination table.....	28
Table3.2: Operation of Variables and Analysis Tools: .....	32
Table 4.1: Respondent Background Information of House Hold Headed (HHH) .....	35
Table 4.2: Assessing the network infrastructures and database management system on NRLAIS respondents of House Hold Headed .....	49
Table 4.3: The contributions of legal framework on NRLAIS .....	52
Table 4.4: The contribution of legal framework on NRLAIS respondents of House Hold Headed.....	52
Table 4.5: Technical Strengths of NRLAIS for service deliveries.....	55
Table 4.6: Technical Weaknesses of NRLAIS for customer services .....	56
Table 4.7: Technical strengths, weaknesses, and challenges of the NRLAIS respondents of House Hold Headed .....	57
Table 4.8: Evaluate System User Satisfaction respondents of House Hold Headed.....	61
Table 4.9: Network infrastructures and Database management expert respondents.....	63
Table 4.10: Legal framework aspects on NRLAIS expert respondents.....	68
Table 4.11: Strength, weakness and challenges of NRLAIS expert respondents .....	72
Table 4.12: Evaluate System user satisfaction expert respondents .....	76
Table 4.13: Binary logistic Regression model evaluation.....	80

## LISTS OF FIGURES

Figure 2.1. A global land administration perspective .....	13
Figure 2.2. Transactions implemented in WORLAIS of NRLAIS.....	18
Figure 2.3. A Sub-Systems of NRLAIS.....	20
Figure 3.1. The Study Area map.....	25
Figure 4.1. Age of respondents.....	38
Figure 4.2. The gender of respondents.....	39
Figure 4.3. The marital status of respondents .....	40
Figure 4.4. Education background of respondents.....	40
Figure 4.5. Education level of respondents.....	41
Figure 4.6. Job title of respondents.....	42
Figure 4.7. Work experience of respondents .....	43
Figure 4.8. Cross-tabulation of the network infrastructure and database management system on NRLAIS by using a Bar chart.....	67
Figure 4.9. Cross-tabulation of the legal framework contribution on NRLAIS by using a Bar chart .....	70
Figure 4.10. Cross-tabulation of the strength, weakness and challenges on NRLAIS by using a Bar chart.....	75
Figure 4.11. Cross-tabulation of system user satisfaction of NRLAIS by using a Bar chart .....	78



# 1. CHAPTER ONE: INTRODUCTION

## 1.1. Background of the Study

Land is a fundamental resource for economic development, social stability, and environmental sustainability, particularly in rural areas where agriculture and natural resources play a central role (Zdruli et al., 2016). From a performance evaluation perspective, Land Information Systems (LIS) are understood as an integrated framework comprising land-related technologies (including hardware, software, infrastructure, and equipment), human resources, data, rule-based procedures, and institutional structures (Ayele, 2015).

The National Rural Land Administration Information System (NRLAIS) has emerged as a critical tool for enhancing land governance and administration. However, the current system continues to face challenges associated with inefficient land administration practices. These issues largely stem from the continued reliance on traditional, paper-based record-keeping methods, which are susceptible to loss, inaccuracies, and mismanagement (Mengesha et al., 2023).

The NRLAIS was designed to address these challenges by digitizing land records and integrating various data sources into a centralized rural land information system platform. The effectiveness of the system largely depends on the design of its programs and the procedures implemented to operationalize them, which are critical determinants of its success or failure. To build a more robust and effective system, it is essential to resolve persistent issues such as unclear land tenure, land disputes, inequitable access to land resources, inadequate service delivery, and weak tenure security (Singirankabo & Ertsen, 2020).

Modernizing land administration systems is essential to address pressing challenges such as the need for centralized databases and robust IT infrastructure, a clear legal framework, improved land tenure security, efficient service delivery, and adequate hardware and software resources. In this context, studying the National Rural Land Administration Information System (NRLAIS) becomes increasingly relevant as argued by (Kanji et al., 2005).

The development of the National Rural Land Administration Information System (NRLAIS) has been undertaken by the Responsible and Innovative Land Administration (REILA) project, funded jointly by the governments of Finland and Ethiopia (2011–2021). During the project's implementation period, NRLAIS was piloted and implemented in the Ethiopian regions of Oromiya, SNNPR, Tigray, and Amhara (REILA, 2015).

In the Amhara region, NRLAIS provides a comprehensive platform for land administration that encompasses land registration, land use planning, land dispute resolution, and land valuation. This research is designed to evaluate key components of NRLAIS specifically the legal framework, infrastructure, and service delivery in order to support a dynamic and sustainable digitalization of land administration processes.

## **1.2. Statement of the problem**

The National Rural Land Administration Information System (NRLAIS) faces multiple challenges, particularly in rural areas where inadequate infrastructure such as limited internet connectivity and unreliable electricity significantly impede its implementation and effectiveness (Caron & Markusen, 2016). For NRLAIS to succeed, it must be aligned with both national and local legal frameworks governing land rights, ownership, and administration. Addressing the system's challenges requires a holistic approach that integrates technology, policy reform, governance improvements, and community engagement to fully realize the benefits of NRLAIS within the rural land administration system nationwide (Kebede, 2022).

In the Ethiopian context, these challenges are intensified by the widespread lack of basic infrastructure essential for NRLAIS operation, including consistent electricity and internet access. Moreover, aligning NRLAIS with ongoing land reforms and legal frameworks particularly concerning land registration and certification remains a complex and demanding task (Zein et al., 2019).

While NRLAIS has been implemented in the Amhara region to support the Second Level Land Certification (SLLC) and digital land services, many districts continue to struggle with limited

internet connectivity, inconsistent power supply, insufficient technical capacity, and restricted access to modern technology. The system was designed to accommodate an increasing volume of land records, users, and digital services. Therefore, the IT infrastructure must be scalable to accommodate the growing demand for digital information systems in land administration, as an inefficient infrastructure can significantly slows down the performance of the Land Information System (LIS) (Ruiz-Martínez & Esparcia, 2020). Furthermore, the successful operation of NRLAIS depends on comprehensive, well-defined regulatory frameworks that encompass all aspects of land transactions and reinforce the capacity of law enforcement agencies. Clear institutional arrangements, including defined roles and responsibilities, are critical. The overarching objective of NRLAIS is to establish a decentralized database management system capable of accessing a centralized database with robust security protocols to ensure data integrity and accessibility. Significant investment in reliable network infrastructure is also essential (Ayele, 2015).

A well-functioning NRLAIS has the potential to serve as a powerful instrument for enhancing land governance, fostering equitable land distribution, strengthening IT infrastructure, expediting service delivery, and stimulating economic growth in rural Ethiopia by addressing the critical issues highlighted in this study. This study therefore aims to identify the opportunities and challenges within the current implementation of NRLAIS to improve land service delivery. By engaging policymakers, government officials, and practitioners, the research seeks to contribute to overcoming existing system barriers and to promote a more equitable and sustainable land administration framework.

### **1.3. Objectives**

#### **1.3.1. General objective**

The overall objective of the study is to evaluating the performance of the National Rural Land Administration Information System: The case of Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia.

#### **1.3.2. Specific objectives**

To address the general objective, the following specific objectives are forwarded:

- To assess network infrastructures and database management on the NRLAIS in Bahir Dar Zuriya Woreda.
- To identify the contribution of legal framework on NRLAIS.
- To identify the technical strengths, weaknesses, and challenges of the NRLAIS.
- To evaluate system user satisfaction.

#### **1.4. Research questions**

- How are management of the network infrastructures and database management on the NRLAIS handled in Bahir Dar Zuriya Woreda?
- To what extent does the legal framework contribute to the performance the NRLAIS?
- What are the strengths, weaknesses, and challenges of the NRLAIS technical in the study area?
- How to evaluate system service user satisfactions?

#### **1.5. Significant of the study**

Given the problems outlined earlier, it is essential to assess the performance and functionality of the NRLAIS. This study aims to identify both good practices and existing performance gaps within the system. As a result, it can provide valuable insights to relevant stakeholders on how to improve the system's efficiency, reliability, and adaptability to evolving needs.

Furthermore, this research serves as a foundation for those interested in conducting more detailed and comprehensive studies in this area. It lays the groundwork for informing policies, guiding investments, and shaping strategies to better leverage information technology and services for economic growth, social inclusion, and technological advancement.

By adopting a data-driven approach, the study addresses key challenges while highlighting opportunities in the digital age. It also contributes to closing the knowledge gap in this field and provides essential system documentation, particularly relevant within the context of the study area.

## **1.6. Scope of the study**

This study is limited to evaluating the implementation and performance of the Land Information System (LIS) application in the Bahir Dar Zuriya Woreda Land Office. In addition, it takes an in-depth look at the National Rural Land Administration Information System (NRLAIS). The study specifically aims to assess the current status of the system in terms of customer satisfaction, network and IT infrastructure, and the supporting legal framework within the study area. A mixed-method research approach is employed, complemented by descriptive analysis, to ensure a comprehensive evaluation that combines both qualitative and quantitative data for a holistic understanding of the system's performance and challenges.

## **1.7. Limitation of the study**

This study encountered some challenges and limitations during the research process. The primary and most significant issue was the difficulty in reaching all selected respondents. In some cases, respondents were unwilling to complete the questionnaires, and a few participants were reluctant to provide essential information within the planned timeframe. However, the researcher made efforts to address these challenges by identifying replacement households with similar backgrounds and by assuring participants that the research was conducted purely for academic purposes and that their responses would remain strictly confidential.

## **1.8. Definition of Terms**

**Land registration:** Land registration is a methodical and systematic documentation of all real estates located in an area, which is regarded as a single organizational area. Such registration is open to inspection and usually anxieties legal facts and/or legal significances and data relating to the nature of the real estate, including size, location, land use. Land registration, as an official systematic process of managing information about land tenure (Shange, 2010).

**Land Administration:** Land administration is the “progressions of decisive, recording and distributing information about the tenure, value and use of land when applying land management policies”. The land administration system is a basic foundation for the spatial enablement of a

people and is careful to comprise land registration, cadastral surveying and mapping, fiscal, legal and multi-purpose cadasters and land information systems (UNECE, 1996; Blake, et al 2015).

**Land Management:** Land Management is the art or science of creation knowledgeable decisions about the distribution, use and growth of the earth's natural and built resources. It is "the process of handling the use and expansion of land resources are put to good effect (UNECE, 1996; Wasiamson, Blake, et al 2015).

**Land Information System (LIS):** It is a **computerized** system used to capture, store, manage, analyze, and present data related to land ownership, land use, and land value. It integrates spatial (geographic) data with legal, administrative, and property-related information to support land administration, planning, and decision-making (Hallett et al., 2017).

**Geographical Information System (GIS):** it is a computer-based tool that allows for the collection, storage, analysis, visualization, and interpretation of spatial (geographic) data. It integrates hardware, software, and data to capture, manage, and display information related to positions on the Earth's surface.

**Information Technology:** The term Information Technology is any activity that involves information processing and integrated communication through electronic equipment. These resources contain hardware, software, communications (voice, data, and video) and associated personnel. Information Technology is the competences obtainable by computers, applications - software - and telecommunications(Franklin, 2019).

A **Database:** is a well-ordered collection of related data that is constructed for a specific purpose. A database might be organized as a collection of numerous tables, where a table characterizes a real world component or entity. Each table has numerous different fields that represent the typical features of the entity.

A **Database Management System** is a collection of packages that enables creation and maintenance of a database. DBMS is available as a software package that enables definition, construction, manipulation and sharing of data in a database. A Definition of database includes

explanation of the structure of a database. Construction of a database involves real storing of the data in any storage medium. Manipulation mentions to the retrieving information from the database, updating the database and generating reports (Miller, 2018).

**Network:** Refers to two or more connected computers that can share resources such as data, a printer, an Internet connection, applications, or a combination of these resources(*Networking Fundamentals* © 2006, 2006).

**Network Infrastructure:** Network infrastructure is the hardware and software resources of an entire network that enable network connectivity, communication, processes and management of an enterprise network. It delivers the communication path and facilities between users, processes, applications, services and external networks/the internet (Materials, n.d.).

**Legal Framework:** The legal framework for land administration refers to the set of laws, regulations, and policies that govern the management, use, and transfer of land within a particular jurisdiction. This framework provides the rules and guidelines for how land is allocated, owned, used, and transferred between individuals, organizations, and the government (UNECE, 1996).

**NRLAIS** is a combination of an attribute and special information about rural land information system for transaction processes. NRLAIS system is functional for after the cadaster system was accomplished and migrate both data source of attribute and special land information system make a service delivery for a beneficiary (Abab et al., 2021).

## **CHAPTER TWO: LITERATURE REVIEWS**

This chapter presents a comprehensive review of existing literature and outlines the conceptual framework that underpins the study. It examines previous scholarly work and empirical studies related to land registration, Land Information Systems (LIS), and the National Rural Land Administration Information System (NRLAIS). The review also explores the benefits and limitations of LIS and NRLAIS, with particular attention to the legal and institutional frameworks,

network and IT infrastructure, and database management systems required for integration and functionality. Special emphasis is placed on the role of land registration systems in supporting effective, transparent, and sustainable rural land governance. The chapter also highlights how well-designed LIS processes can enhance purposeful rural land development, improve land tenure security, and contribute to informed policymaking.

## **2.1. The Concept of Land Information System**

### **2.1.1. Land Registration**

Land registration can be defined as "the process of recording officially recognized interests (ownership and/or use) in land." The term 'registration' refers to a dynamic process, the outcome of which is known as a *'register'* and the institution responsible for managing this process is called a *'registry'*. Land registration is primarily a legal procedure that provides clear and official information about who owns or holds rights to a particular piece of real property. The term is widely used in the Anglo-Saxon legal tradition, although similar systems exist elsewhere for example, the Grundbuch system in Central Europe, which serves a comparable purpose (The Cambodian Experience, 2017).

### **2.1.2. Different land registration system**

There are many types of land registration systems. Each system has evolved over the years in response to changing social needs as described below.

#### **2.1.2.1. Title registration system**

Title registration is a land registration method in which the government maintains an authoritative and legally guaranteed record of land ownership, interests, and rights. Unlike a deed registration system, which simply records documents related to land transactions, a title registration system

provides conclusive evidence of ownership backed by the state. This system significantly reduces the risk of ownership disputes and enhances security of tenure.

The Land Title Registration System operates in areas designated as compulsory land registration districts. In these areas, ownership rights and interests in land are officially recorded and guaranteed by the government. In contrast, the Deed Registry System functions in areas that have not been declared as compulsory title registration districts. Under the deed system, only the documents evidencing transactions are recorded, without state verification or guarantee of ownership (Jing et al., 2014). Title registration is considered more secure and reliable than deed registration, as it provides legal certainty and simplifies land transactions by reducing the need for extensive historical investigations into past ownership.

#### **2.1.2.2. Deed Registration system**

A deed is defined as a written legal instrument, signed and delivered, through which one individual referred to as the grantor conveys title to real property to another individual, known as the grantee. A deed is sometimes referred to as a conveyance of land or a tenement. There are two primary types of deeds: the warranty deed and the quitclaim deed. A warranty deed includes a guarantee that the grantor holds valid title to the property and has the legal right to transfer it. In contrast, a quitclaim deed transfers only the interest the grantor actually possesses in the property, without any warranties or guarantees of title.

In a deed registration system, the deed representing a specific, isolated transaction is registered as evidence that a transaction has occurred. However, the registration of the deed does not, in itself, provide legal proof of ownership or the legal rights of the involved parties. As such, the deed is not definitive evidence of title or the legality of the transaction (Zevenbergen, 2002).

### **2.2.1. Sporadic Land Registration Methods**

The sporadic method of land titling and registration is typically initiated at the Office of the Surveyor-General of the State, where the authenticity of the submitted survey plan is verified. Supporting documents such as proof of tax payment and evidence of ownership are reviewed and vetted at the office of the Director of Deemed Rights. This approach is case-by-case and often initiated by individual landowners seeking to formalize their land rights, rather than as part of a coordinated government program.

### **2.2.2. Systematic Land Registration Method**

The systematic method involves a coordinated, area-wide approach, usually led by land administration authorities in collaboration with Geographic Information System (GIS) experts and registration officers. The process begins with the charting of existing land records in GIS and the establishment of a Dispute Register. An initial public awareness campaign (sensitization) is conducted before the commencement of field activities.

### **2.2.3. Sporadic Land Registration Method**

The systematic method involves a coordinated, area-wide approach, usually led by land administration authorities in collaboration with Geographic Information System (GIS) experts and registration officers. The process begins with the charting of existing land records in GIS and the establishment of a *Dispute Register*. An initial public awareness campaign (sensitization) is conducted before the commencement of field activities.

Demarcation and data recording activities are then carried out concurrently. The Demarcation Officer enters the field with a prepared map and marks the boundaries of land parcels in the presence of landowners and neighbors to resolve any boundary disputes. Meanwhile, the Recording Officer collects and verifies necessary information to authenticate ownership and other relevant land rights (Systematic, 2023).

### **2.3. Cadaster system**

A cadaster is defined as “an official record of information about land parcels, including details of their boundaries, tenure, use, and value” (McLaughlin, 2015). The term cadaster has been primarily used in continental Europe, where its meaning has evolved over time. In contrast, the term has been less commonly used in the Anglo-Saxon world, although the phrase cadastral survey referring to the surveying of property boundaries has been widely applied.

According to (Zevenbergen, 2002), “a cadaster is normally a parcel-based and up-to-date land information system containing records of legal rights, restrictions, and responsibilities associated with land.” It typically includes a geometric (spatial) representation of land parcels, which is linked to textual records describing the nature of interests, ownership or control of those interests, and, in many cases, the value of the land and any developments on it.

### **2.4. Land administration system**

The term “land administration” refers to the processes involved in recording, managing, and disseminating information related to the ownership, value, use, and associated rights of land and its related resources. It encompasses a wide range of activities, including the adjudication of land rights i.e., the legal determination of ownership and other land-related claims as well as the surveying and description of land parcels, which involves capturing spatial and textual data about the land.

#### **2.4.1. The benefits of a good land administration system**

A well-functioning land administration system provides numerous benefits that are critical for social stability, economic development, and environmental sustainability. One of its fundamental advantages is the guarantee of possession and security of tenure, which offers landholders legal

certainty and reduces the risk of arbitrary eviction. This legal security not only protects individual rights but also encourages investment in land and property.

In addition, effective land administration enhances the efficiency and transparency of land markets, facilitates accurate land valuation, and simplifies transactions. It also plays a key role in protecting state-owned lands, reducing land-related disputes by clearly defining ownership and boundaries, and supporting land taxation systems. On a broader scale, it contributes to national development by facilitating rural land reform, improving urban planning and infrastructure, and supporting environmental management through better land use control. The system also generates reliable statistical data that informs evidence-based policymaking((Enemark et al., 2005).

Despite these advantages, establishing and maintaining such systems is resource-intensive. Land records are costly to compile and require continuous updates to remain accurate and relevant. Moreover, many of the benefits such as social equity, reduced conflict and improved governance—are not easily measured in financial terms. Nevertheless, the long-term value of a robust land administration system is profound and enduring(UNECE, 1996).

## **2.5. Modern land administration global perspectives**

Land management is a phenomenon present in all human societies. It involves the dissemination and management of a society's primary asset: land. In Western democracies with highly developed economies, land management with land administration as a central element is a major function of both the government and the private sector, forming the basis of sophisticated land markets and land delivery systems.

The land management paradigm presented below helps to clarify the role of land administration within land management, illustrating how land administration system (LAS) institutions respond to a country's historical context and policy decisions. This paradigm also provides a stable framework for comparing and sharing national, regional, and international efforts to achieve effective land management. More importantly, it offers a structure that facilitates the integration

of new needs into traditionally organized systems without undermining the fundamental security these systems provide (I Wasiamson & Wallace, 2007). Modern land administration paradigms focus on five interrelated components: land tenure, land use, land value, land development, and land information systems. These components are mutually supportive, and all rely heavily on comprehensive land information systems to function effectively (Figure 2.1).

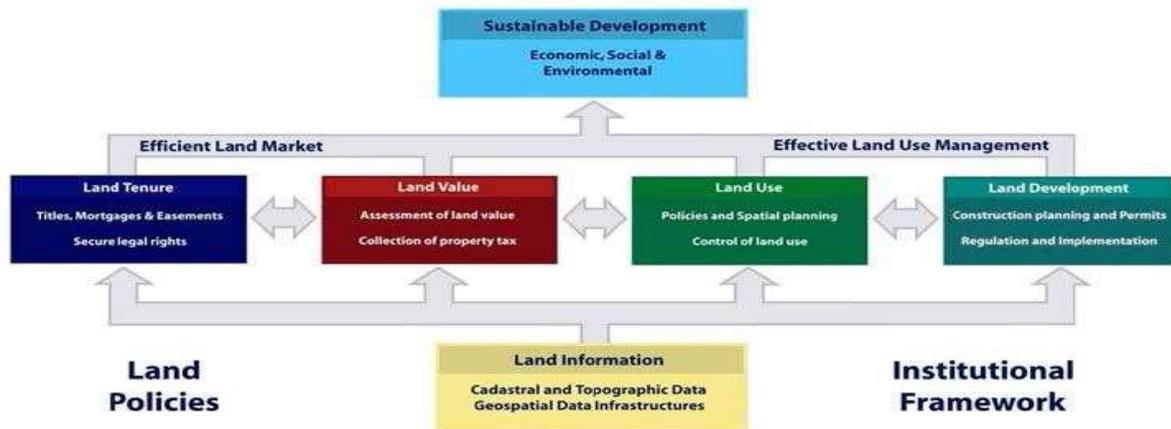


Figure 2.1. Global land administration perspective (Enemark et al., 2005)

## 2.6. Legal Framework about Rural Land information system

The legal framework for rural land information systems in globally often involves a combination of constitutional provisions, statutory laws, and policies aimed at ensuring effective land administration and governance (K. H. Babalola et al., 2022). Here are some key aspects:

1. **Constitutional Provisions:** Many countries' constitutions provide the legal basis for land administration systems (LAS). These provisions often emphasize human rights, the rule of law, and legal pluralism to support pro-poor land administration reforms.
2. **Statutory Laws and Policies:** Specific laws and policies are enacted to regulate land administration. For example, in Ethiopia, the NRLAIS has been implemented to digitalize rural land registration, aiming to improve service delivery and tenure security (Governance et al., 2016).
3. **Institutional Frameworks:** Various institutions, such as ministries of agriculture or land administration authorities, are responsible for implementing and overseeing land information

systems. These institutions often work to establish national databases and support local land administration offices (Durán-Díaz, 2023).

4. **Technological Integration:** Modern land information systems increasingly rely on digital tools and geospatial technologies to manage land records, facilitate data integration, and support informed decision-making. These frameworks are crucial for ensuring transparent, efficient, and equitable land administration, particularly in rural areas where land rights are often less formalized.

The Ethiopia's legal framework on rural land administration involves the constitution and other successive land laws enacted by the federal and regional states. The Federal Democratic Republic of Ethiopia (FDRE) Constitution has recognized a non-flexible land policy in the country. This constitution states that, federal government shall enact laws for the operation and preservation of land and other natural resources (Article 51 (5) of FDRE Constitution, 1995). Land is a shared property of the Nations, Nationalities and Peoples of Ethiopia and was not be subject to sale or to additional means of exchange (Article 40 (3) of FDRE Constitution, 1995).

In Amhara Region land administration and use Proclamation 252/2009 E.C Land holder means an individual, group of people or community, government body, social institution or other body with the genuine personality having ownership right over a rural land. The Right to Acquire Land Any Person, who is 18 years and above, residing in the region and in need of engaging in agricultural activity shall have a right to freely acquire holding land (CANRS, 2017).

In general Ethiopian federal government proclamations provide about rural land some land rights guarantees and some requirements for regional councils, but there is no land policy and administration unit that might work as a managing body at the countrywide level of government for policy discussion and coordination of land administration (USAID, 2004).

## **2.7. Land Information System**

Land Information Systems (LIS) provide a foundation for supportive decision-making across a broad spectrum of natural resource applications: agronomic, environmental, engineering and public good. Typically, LIS constitute a computerized database warehouse holding geospatial

components, 'mapping unit' geometry and related geo-referenced materials such as satellite imagery, meteorological interpretations and forecasts and scanned legacy mapping. Coupled with the geospatial data are related property, semantic and metadata, representing a range of thematic properties and characteristics of the land and environment (Hallett et al., 2017).

A Land Information System (LIS) is a specialized system designed to collect, manage, analyze, and present data related to land and property. It's a comprehensive framework that integrates various data sources to support land administration, urban planning, property management, and related activities (Paradzayi et al., 2008). Here are some key components and functions of an LIS:

1. **Data Collection and Integration:** LIS typically integrates data from various sources, including cadastral surveys, satellite imagery, land records, and property databases. This data may include information on land ownership, boundaries, land use, zoning, and infrastructure.
2. **Database Management:** Central to an LIS is a spatial database that stores and manages geospatial and attributes data. This database allows for the efficient retrieval and updating of land-related information.
3. **Geographic Information System (GIS):** An LIS often incorporates GIS technology to visualize and analyze spatial data. GIS allows users to create maps, overlay different datasets, and perform spatial analysis.
4. **Data Analysis and Reporting:** LIS provides tools for analyzing land-related data, such as assessing land use patterns, evaluating property values, and identifying zoning compliance. Reports and visualizations can help in decision-making processes.
5. **Decision Support:** By providing accurate and up-to-date information, an LIS supports various decision-making processes related to land management, urban planning, and policy development.
6. **Public Access and Transparency:** Many LIS platforms offer public access to certain types of data, improving transparency and allowing stakeholders, such as property owners and developers, to access relevant information.

7. **Legal and Regulatory Compliance:** An LIS helps ensure that land management practices comply with legal and regulatory requirements, including property rights, zoning laws, and environmental regulations.
8. **Maintenance and Updates:** Regular updates are crucial for maintaining the accuracy of an LIS. This involves updating land records, mapping changes, and integrating new data sources as they become available (Governance et al., 2016). Overall, an LIS is a powerful tool for managing land resources efficiently, supporting sustainable development, and enhancing administrative functions related to land and property.

## **2.8. NRLAIS Database Management System**

Ethiopia's land regulation gives important powers to its regional states. Each of the nine regional states is responsible for the operation of the land administration facilities within its region on the basis of the state laws and regional regulations. This situation has resulted in different regions implementing land administration systems in somewhat different ways and some regions became more progressive than others in terms of numbers of parcels registered and the level of facility being provided (Governance et al., 2016).

NRLAIS is a basic strategic development within the land administration sector in Ethiopia and provides the necessary functionalities to manage the land administration datasets and administration services of the rural land.

### **2.8.1. NRLAIS Description and Components**

The necessary functionality is different at each level, and NRLAIS has successfully the following components (Abab et al., 2021).

- **Central level- CENLAIS** - the Central Land Administration Information System for data aggregation of all regional states of Ethiopia, and for assistance of the decision making and national policy development.

- **Regional level- REGLAIS** - the Regional Land Administration Information System with progressive data processing experiences and cadastral parcel data management containing the management of zones and Woreda within the concerned region.
- **Zonal level- ZONLAIS** – the Zonal Land Administration Information System with capabilities to observation and transmit out administrative operations at the zonal level.
- **Woreda level- WORLAIS** – the Woreda Land Administration Information System placed at the Woreda level on which all land administration transactions are implemented, i.e. it achieves and updates holding/land rights and cadastral parcel data.
- **MASSREG** - the Mass Registration System containing of auxiliary technical tools for systematic (mass) land registration (The Ethiopian second level land certification program) and for data migration. The latter tool agrees the migration of existing land administration data which follow to a set of clear standards. CENLAIS, REGLAIS (ZONLAIS) and WORLAIS are internal components integrated in NRLAIS while MASSREG is an external separate component (Zein et al., 2019).
- The NRLAIS levels of services are (WORLAIS, REGLAIS, ZONLAIS and CENLAIS) and WORALIS of NRLAIS transaction applications over view (figure 2.2 Transactions implemented in WORLAIS of NRLAIS).



**Figure 2.2. Transactions implemented in WORLAIS of NRLAIS (source: Hansa Luftbild AG, 2019)**

### **2.8.2. NRLAIS Database Schemas**

NRLAIS applies three database schemas namely (Cullingworth, 2015):

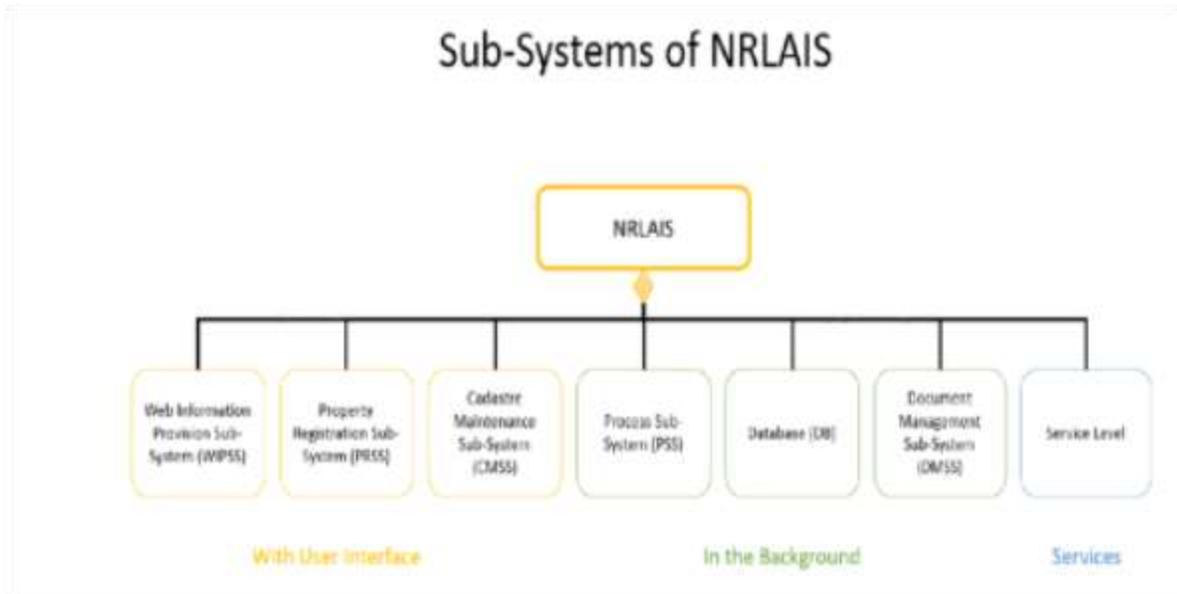
1. **NRLAIS-Inventory database:** schema which comprehends actually valid state of NRLAIS and officially valid present information
2. **NRLAIS-History database:** schema that comprehends previously valid states of NRLAIS and legitimately valid past information
3. **NRLAIS-Transaction database:** schema that comprehends information about the state of valid a transaction. This state is only temporarily available during a transaction and contains legally valid information in the present (Caron & Markusen, 2016).

### **2.8.3. NRLAIS Database Sub – System**

The following are components of the NRLAIS database sub– system:

- **Web Information Provision Sub-System (WIPSS):** provides read only access to both land register and cadastral information (Zein et al., 2019).

- **Property Registration Sub-System (PRSS):** maintains the land register and manages the transactions through a web application. Transactions are controlled by a transaction manager, a tool which manages the full transaction process. The full transaction process in PRSS is based on the overall communication model.
- **Cadaster Maintenance Sub-System (CMSS):** handles and manages the spatial data through a desktop application, built on QGIS.
- **Process Sub-System (PSS):** manages processes (each process combines several tasks on the land register and the cadaster) and works in the background, has no user interface and is a web application. It also manages the communication between other system components and the database.
- **Document Management Sub-System (DMSS):** provides services for storing and retrieving supporting documents needed for the transactions, it is integrated in other system components of NRLAIS and has no user interface of its possess.
- **Service Level:** provides web services (OGC compliant) for accessing the land register and the cadaster data within NRLAIS; it is retrieved by components of NRLAIS in instruction to share data and can be used by external software, if required.
- **Database (DB):** central database detached into three different types of databases: inventory database contains the existing valid legal data; the transaction database deals with the transaction data from the initialization of a new transaction until its finished prominence (accepted or rejected); and the history database contains data of conducted transactions and data prior to its change in the inventory database (Mengistu et al., 2018)(figure 2.3).



**Figure 2.3. Sub-Systems of NRLAIS (Zein et al., 2019)**

#### **2.8.4. NRLAIS Network Infrastructures**

NRLAIS typically refers to a specialized network infrastructure designed to support land administration and management in rural areas. These systems are crucial for the effective governance of land resources, especially in developing countries where rural land management can be complex and challenging.

#### **2.8.5. Key Aspects of NRLAIS Network Infrastructures in Globally:**

NRLAIS and similar land administration systems globally rely on a robust network infrastructure to effectively manage land records, transactions, and services. The infrastructure typically includes a range of components and technologies designed to ensure data accuracy, security, and accessibility. Here’s a comprehensive overview of the network infrastructures commonly found in global land administration systems (Alamgir et al., 2019).

##### **2.8.5.1. Data Centres**

- **Function:** Centralize the hosting of applications, databases, and backup systems.

- **Components:** Include servers (application and database), storage solutions, and backup facilities. Data centers ensure the reliable and secure storage of land records.

#### **2.8.5.2. Network Connectivity**

- **Local Area Networks (LANs):** Connect offices within a local area, such as municipal or district land administration offices, to facilitate internal communication and data sharing.
- **Wide Area Networks (WANs):** Extend connectivity across regions and countries, linking different administrative levels and enabling centralized access to land information.
- **Internet Connectivity:** Provides access to land administration systems from remote locations and for public services.

#### **2.8.5.3. Hardware Components**

- **Servers:** Handle the processing of land data and host applications.
- **Workstations and Terminals:** Used by field officers and administrative staff for data entry and access.
- **Network Devices:** Routers, switches, and firewalls manage and secure network traffic.

#### **2.8.5.4. Software**

- **Land Information System Software:** Core application used for managing land records, transactions, and applications.
- **Database Management Systems (DBMS):** Store and manage land-related data, including property ownership and land use.
- **Geographic Information Systems (GIS):** Integrate spatial data with land records, enabling visualization, mapping, and spatial analysis of land use and ownership.

#### **2.8.5.5. Security Measures**

- **Firewalls and Intrusion Detection Systems (IDS):** Protect the network from external threats and unauthorized access.

- **Data Encryption:** Ensures secure data transmission and storage.
- **Access Controls:** Regulate who can access and modify data within the system.

#### **2.8.5.6. User Training and Support**

- **Training Programs:** Training users on how to effectively use the NRLAIS, including data entry, management, and retrieval.
- **Technical Support:** Provides assistance for troubleshooting technical issues and maintaining system functionality.

#### **2.8.5.7. Data Management**

- **Backup Systems:** Regularly back up data to prevent loss due to system failures, force measures or disasters.
- **Data Integrity:** Measures to ensure data is accurate, up-to-date, accessible, and reliable.

#### **2.8.5.8. Infrastructure Development**

- **Upgrades:** Regular updates to a software and hardware to accommodate technological advancements and evolving requirements and standards.
- **Maintenance:** Ongoing checks and repairs the equipment to ensure system reliability and performance.

#### **2.8.5.9. Integration and Interoperability**

- **System Integration:** Interfaces with other governmental and private institutions information systems for integrated data sharing and services.
- **Interoperability:** Ensures that different systems and platforms can work together seamlessly, facilitating data exchange and coordinated land management.

#### 2.8.5.10. Public Access and Services

- **Online Portals:** Allow citizens and businesses to access land information, apply for permits, and view property records without charge.
- **Mobile Applications:** Provide access to land information and services via smartphones and tablets.

#### 2.8.5.11. Cloud Computing

- **Adoption of Cloud Services:** Some countries use cloud-based solutions for scalability, flexibility, and cost-efficiency in managing land administration systems. Examples of Global Implementations. For example;
  1. **United States:** they used Land records are managed through systems like the Geographic Information Systems (GIS) and various county-level systems integrated with national databases.
  2. **European Union:** Several countries in European Union use advanced land registration and management systems integrated with GIS and cadastral databases.
  3. **Australia:** In this country, Land administration is supported by systems like the Land and Property Information (LPI) and various state-based systems (Computing, 2024).

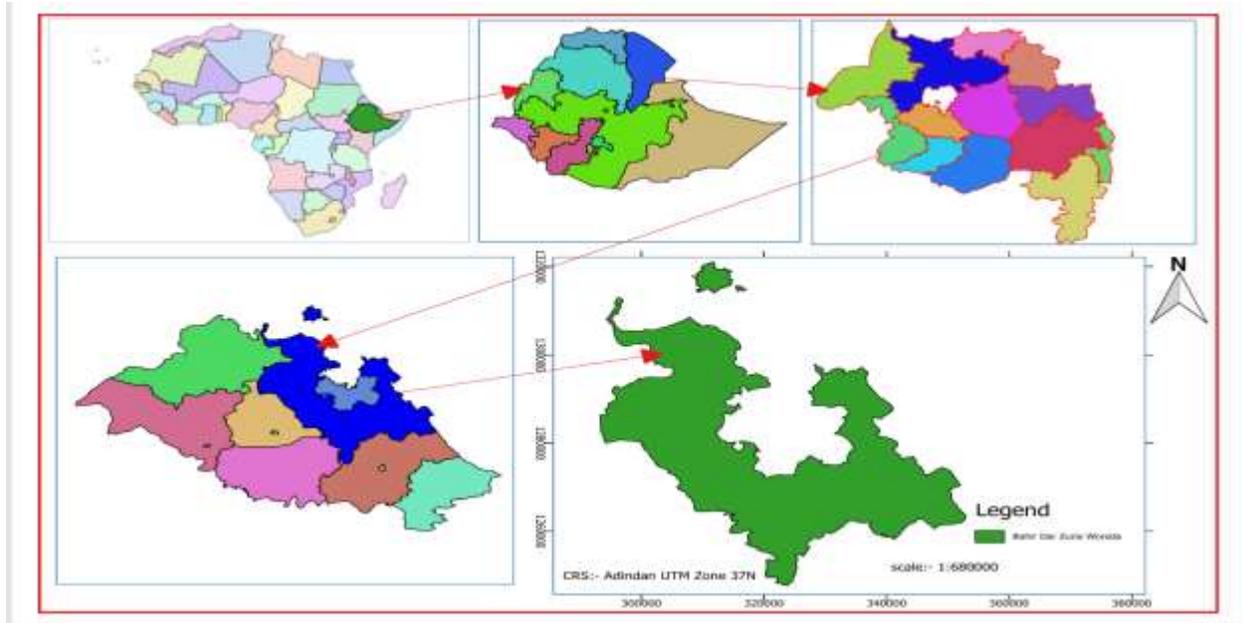
In summary, the infrastructure that supports land administration systems worldwide combines advanced technology with strategic planning to manage land records effectively. This infrastructure ensures that land administration systems are reliable, secure, and capable of meeting the needs of both administrative bodies and the public.

## **CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND RESEARCH METHODS**

### **3.1. Description of the Study Area**

This research was conducted in Bahir Dar Zuriya Woreda, located in the North Gojjam Zone of the Amhara National Regional State. The Woreda is situated approximately 465 km from Addis Ababa. Bahir Dar Zuriya is bordered to the south by Yilmana Densa, to the southwest by Mecha, to the northwest by the Gilgel Abay River, which separates it from North Achefer to the north by Lake Tana and the Special Zone of Bahir Dar, and to the east by the Abay River (Figure 3.1).

According to the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), Bahir Dar Zuriya Woreda has a total population of 182,730, of whom 93,642 are men and 89,088 are women. Covering an area of 1,443.37 square kilometers, the Woreda has a population density of 126.60 persons per square kilometer, which is lower than the zone average of 158.25 persons per square kilometer. A total of 40,893 households were recorded, with an average household size of 4.47 persons, and there are 40,097 housing units. The majority of the population, approximately 99.7%, adhere to Ethiopian Orthodox Christianity (Muluneh et al., 2016).



**Figure3.1.The Study Area map**

### **3.2. Research Method**

This research employed a mixed-methods approach, integrating both qualitative and quantitative methods. Descriptive qualitative research focuses on portraying the characteristics of a specific individual or group (Aghnides, 2019). Meanwhile, the study utilized a quantitative descriptive method to examine whether, and to what extent, relationships exist between two or more measurable (numerical) variables. Mixed-methods research combines the collection and analysis of both quantitative and qualitative data, integrates these data forms, and employs various designs that may include logical frameworks and theoretical perspectives.

This study focused on assessing the performance of the National Rural Land Administration Information System (NRLAIS) using a mixed research method to achieve a comprehensive understanding by concurrently analyzing both quantitative and qualitative data. This mixed approach is appropriate when neither a purely quantitative nor qualitative method alone is sufficient to fully address the research problem (Orkaido & Youna, 2020). Specifically, the study employed an exploratory sequential mixed-methods design, which involves initially collecting and

analyzing qualitative data to explore the issue, followed by a second phase of quantitative data collection and analysis based on the initial findings (Stadtländer, 2009). Additionally, the study examined the perceptions of households and customers, as well as the performance of the institution, using descriptive analysis.

### **3.2.1. Study area selection and sampling design**

The study area Bahir Dar Zuriya Woreda was selected purposely considering that NRLAIS has been operation for the last 2012 E.C years Of the total Thirty-five (35) rural kebeles in the woreda and 2(two) kebeles were again selected purposely because the performance of NRLAIS transaction services are active and in actively participations.

The sample design serves as a guiding framework for selecting an appropriate and representative sample of respondents to achieve the research objectives. In this study, the sample design includes key components such as the target population, sampling frame, sampling units, sampling techniques and the sample size. Each element was carefully considered to ensure that the selected respondents accurately reflect the characteristics of the larger population, thereby enhancing the reliability and validity of the research findings.

#### **3.2.1.1. Target Population and sampling frame**

The target population of this study included rural landholding households (customers), as well as experts, department heads, and managers from the Bahir Dar Zuriya Woreda Land Office and selected kebele offices.

The household sample was drawn from two selected kebeles, using household lists obtained from the National Rural Land Administration Information System (NRLAIS). In total, the study considered 4,315 households and experts as the overall population. Key informants from the Woreda Land Office included 1 Office Head, 4 Department Team Leaders, 20 Experts, and 14 kebele-level experts. These groups were selected to provide both user and institutional perspectives on the performance of the NRLAIS.

A sampling frame contains information about the research population and a list of names or an address that includes all of the members of the population from which the sample is to be selected (M. Denscombe, 2014). In this study, the sampling frame included the list of rural households in the study kebeles having their land registered in the National Rural Land Administration Information System (NRLAIS). In addition office heads and experts in Bahir Dar Woreda were part of the sampling frame. From the sampling frame representative samples that are sought having some knowledge on NRLIS performance were drawn for data collection.

### **3.2.1.2. Sampling Techniques**

This study employed both probability and non-probability sampling techniques to select participants based on the nature and objectives of the research. For the probability sampling, a systematic random sampling method was used to select rural landholders. This approach was appropriate due to the large number of landholders involved, particularly for assessing customer satisfaction and the legal framework related to the NRLAIS.

On the other hand, purposive sampling, a form of non-probability sampling, was used to select knowledgeable informants to evaluate the technical performance and database management aspects of NRLAIS. This method was selected to allow the researcher to focus on specific cases that were most relevant and informative particularly in assessing IT infrastructure and service delivery performance. According to (Dolores & Tongco, 2007), purposive sampling is effectively exemplified through the key informant technique, which involves selecting individuals based on their knowledge and involvement in the subject matter.

### **3.2.1.3. Sample Size**

The appropriate sample size of (**n**), considering a margin of error (**e**) of 0.05 and a 95% confidence level. Given the total population of 4,315 households, the calculated sample size was approximately **189 respondents**.

Where:

- **N** = Target population (4,315 households)

- **n** = Sample size (189)
- **e** = Margin of error (0.05 for 95% confidence level)
- **p** = Estimated proportion of an attribute present in the population (assumed 0.02 )
- **q** = 1 - p (0.98)
- **z** = Z-score corresponding to the confidence level (approximately 2.005 for 95%)

This approach ensured a representative sample with an acceptable level of precision for the study’s objectives.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2(N-1) + z^2 \cdot p \cdot q}$$

$$n = \frac{4.020025 * (0.02) * (1-0.02) * (4315)}{[0.0004(4314)] + 0.0788} = 189$$

By using proportional formula the study achieved the required samples,  
 2385\*189/4315=104, 1930\*189/4315=85(Table 3.1)

**Table 3.1: Table 3.1. Sampling frame and sample size**

Kebele name	Male Headed Land Holder	Female Headed Land Holder	Male and Female Headed Land Holder in Common	Total Land Holder	Sample size in number
Yesal Gulagulema	428	869	1088	2385	104
Yigodina Tentela	464	636	830	1930	85
Total	892	1505	1918	4315	189

Sources: own survey, Bahir Dar Zuriya Woreda 2025

### 3.3. Data Sources and Methods of Data Collection

This study gathered data from both **primary** and **secondary** sources. **Primary data** were collected from Woreda land officials, including kebele experts, customers, and rural households. **Secondary**

**data** were obtained from various sources, including formal literature, unpublished documents, office registers, government and non-government reports, and other relevant records. These secondary sources provided background information and supported the analysis of NRLAIS's service efficiency and effectiveness in the selected kebeles.

Multiple methods were employed to ensure comprehensive data collection, such as survey questionnaires, participant observation, Key informant interviews, and focus group discussions with kebele committees and rural land administration officials and experts

### **3.3.1. Quantitative Instrument**

**Questionnaire:** The survey questionnaire was developed to gain insights into the relationships among various variables including social, economic, political, organizational, and environmental within the study area. The questionnaire, designed using an ordinal scale of measurement, was employed to assess correlations between dependent, independent, and intervening variables relevant to the research. To ensure effective communication and accurate responses, the questionnaire was translated into the local language, Amharic.

### **3.3.2. Qualitative Instrument**

**1. Key Informant Interview:** Key informants were selected through purposive sampling, a non-probability sampling technique commonly used in qualitative research. This method involved deliberately choosing individuals who possess specialized knowledge, experience, or involvement in the subject matter under investigation. In the context of this study, key informants were selected based on their direct roles and responsibilities (e.g., office heads, department team leaders, experts, and kebele officials) and Length of service and level of involvement in land administration activities within the National Rural Land Administration Information System (NRLAIS) and their insight into land administration processes at the Woreda and kebele levels. Key informants from the Woreda Land Office included 1 Office Head, 4 Department Team Leaders, 15 Experts, and 10 kebele-level experts. These groups

were selected to provide both user and institutional perspectives on the performance of the NRLAIS.

2. **Participant Observation:** Participant observation is a research method in which the observer becomes involved in the daily activities of the individuals or groups being studied either openly as a researcher or covertly in a disguised role—while observing behaviors, listening to conversations, and asking questions over an extended period (Kawulich, 2005).

In this study, participant observation was employed as a supplementary data collection tool to assess several key aspects of institutional performance. Specifically, it was used to evaluate time management practices of managers, the quality and efficiency of service delivery to customers, and the effectiveness of data management processes within the land administration offices. This method provided firsthand insights that enriched and validated the findings obtained through other instruments such as surveys and interviews.

3. **Focus group discussion:** The study employed focus group discussions (FGDs) as a qualitative data collection method to gather in-depth insights from key community stakeholders. FGDs were conducted with selected members of kebele committees and local elders, who possess firsthand knowledge and experience regarding rural land administration practices and the implementation of the NRLAIS.

A total of five focus groups were organized, with each group comprising five participants, making up a total of 25 individuals. The participants were purposefully selected based on their leadership roles, community influence, and familiarity with land-related issues in their respective kebeles. These discussions provided valuable qualitative data on community perceptions, challenges, and recommendations related to the land information system, helping to triangulate the findings obtained from surveys and interviews.

### 3.4. **Methods of Data Analysis**

Data analysis involves the systematic examination of responses in any form of communication. It is described as a technique that bridges qualitative and quantitative methods, allowing for qualitative interpretation of data that may appear quantitative (Islam, 2020).

### **3.4.1. Qualitative Data Analysis**

Qualitative data were examined using qualitative methods. The purpose of this analysis was to describe data gathered from structured interviews, participant observation, and document analysis. Furthermore, the qualitative analysis was conducted using open coding techniques, which involve representing the data or texts by applying labels or codes that appropriately capture and support the description of the information gathered (Sarmiento & Costa, 2017).

### **3.4.2. Quantitative Data Analysis**

Quantitative data were gathered through the distribution of both closed- and open-ended questionnaires. After collection, the data were analyzed, summarized, and presented using appropriate techniques. The latest version of SPSS (version 27) was employed to analyze numerical data using descriptive and inferential statistics.

Descriptive analysis is one of the analysis techniques that would be employed to summarize the data collected from the sample representing a given population (Gomm, 2008). This descriptive analysis includes the frequency, percentage, mode, and median of data analysis. To these effects, depending on the nature of basic research questions and data collected, the descriptive analysis was used to analyze the frequencies and percentages of the demographic characteristics of the respondents. Consequently, the categorized data were analyzed, interpreted, concluded, and presented qualitatively through summarizing and narrative discussion of the participant responses.

Inferential analysis was applied to address the research hypotheses, and the appropriate model, binary logistic regression, was employed. A binary logistic regression model was used because the dependent variable is definite and dichotomous, representing two possible outcomes: efficient or not efficient.

Additionally, the Spearman rho correlation coefficient was used to determine the relationship between the dependent variable and the independent variables. Furthermore, the inferential analysis emphasized significance testing and hypothesis testing to answer the research hypotheses, in alignment with the research problem and objectives of the study (McIntyre et al., 1988).

### 3.4.2.3. Model Specification

Binary logistic regression is one of multivariable statistical analysis which is used to calculate the probability of two outcomes (Pituch & Stevens, 2020). In this study, the two possible outcomes are whether the performance of NRLAIS would be efficient or not efficient. The point here the appropriate form for the dependent variable would be limitation variable taking the values yes and no since two possible outcomes are probable of yes-NRLAIS is efficient and No is not efficient. The independent variables that change of NRLAIS Performance as indicators are hardware & software system requirement, infrastructure, customer service satisfaction, data quality, expert, transactions and legal framework. Thus, the researcher had predicted the probability of NRLAIS Performance based on these explanatory variables (table 3.2).

**Table3.2: Sample size determination table**

Research objectives	Explanatory Variables	Dependent variable	Analysis tools
To assess network infrastructures and database management on NRLAIS in Bahir Dar Zuriya Woreda.	-Hardware& software -Infrastructure	NRLAIS Performance	Mixed method analysis
To identify the contribution of legal framework on National Rural Land Administration Information System.	-Legal framework -Expert	NRLAIS Performance	Descriptive, Inferential statistics  A binary logistic regression

To identify strength, weakness and challenges of National Rural Land Administration Information System to deliver services to the clients.	<ul style="list-style-type: none"> <li>-Infrastructure</li> <li>-Customer satisfaction</li> <li>-Data quality</li> <li>-Transaction</li> </ul>	NRLAIS Performance	Descriptive, Inferential statistics  Binarylogistic regression
To evaluate System user satisfaction	<ul style="list-style-type: none"> <li>-Infrastructure</li> <li>-Legal framework</li> <li>-Expert</li> <li>- Hardware&amp; software</li> </ul>	NRLAIS performance	Descriptive, Inferential statistics  Binarylogistic regression

### 3.5. Descriptive and inferential statics

#### 3.5.1. Descriptive statistics

Descriptive statistics summarize and describe the features of a dataset. They provide simple summaries about the sample and the measures. Key components include: **Measures of Central Tendency, Measures of Dispersion, Frequency Distributions, and Graphs** (Yellapu, 2019).

#### 3.5.2. Inferential Statistics

Inferential statistics go beyond merely describing the data and it allow to make predictions or generalizations about a population based on a sample. Key concepts inferential statistics are include -**Sampling, Hypothesis Testing, Confidence Intervals, Regression Analysis, ANOVA (Analysis of Variance)** (Amaral, 2018).

## **3.6. Description of Dependent and Independent Variables**

### **3.6.1. Dependent Variable**

The main indicators for assessing the performance of the rural land information system (NRLAIS) include increased customer satisfaction, improved transaction and data quality in land offices, enhanced system performance speed, and reduced customer dissatisfaction in service delivery(Matthew, et al., 2008). Consequently, it can be argued that the rural land information system is efficient when these standards are met.

### **3.6.2. Independent Variables**

In this study, several dimensions of independent variables were considered, including legal framework, expertise, financial resources, infrastructure, and hardware and software requirements. These dimensions represent different factors influencing the performance of NRLAIS. In the analysis, all explanatory variables were examined using both ordinal and nominal scale measures of association(Lewis-Beck, 1974).

## CHAPTER FOUR: RESULTS AND DISCUSSION

### 4. Introduction

This chapter presents the results and discussion of the study, which aimed to evaluate the performance of the National Rural Land Administration Information System (NRLAIS) in Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia. The chapter begins with the response rate and demographic characteristics of the respondents, followed by the results of descriptive analyses aligned with the study objectives. These include assessing the practices of the current rural land administration system, evaluating the network infrastructure and technical capacity of the office, and examining system satisfaction levels and data quality. Furthermore, the chapter employs binary logistic regression and other inferential statistical techniques to analyze the effects of explanatory variables on the dependent variable, providing a comprehensive understanding of NRLAIS performance in the study area.

### 4.1. Demographic and Socio-Economic Characteristics

#### 4.1.2. Demographic Characteristics of House Hold Headed

The quantitative data collected provided insights into the demographic and socioeconomic characteristics of the survey respondents. Information was gathered on respondents' experiences with NRLAIS service delivery, age, household headship, marital status, and educational background. These variables were analyzed to understand the profile of the participants and how these characteristics might influence their interaction with the rural land administration system. The results are presented in (Table 4.1).

**Table 3.1: Respondent Background Information of House Hold Headed (HHH)**

Description of statements	Participants response	Frequency	Percent
Respondent Age	18-30	66	34.9
	31-40	99	52.4

	42-50	19	10.1
	50 and above	5	2.6
	Total	189	100.0
Respondent of House Hold Headed	Male Headed Land Holder	18	9.5
	Female Headed Land Holder	46	24.3
	Male and Female Headed Land Holder	125	66.1
	Total	189	100.0
Respondent of Marital Status	Married	128	67.7
	Unmarried	53	28.0
	Divorced	8	4.2
	Total	189	100.0
Respondent of Education background	Illiterate	117	61.9
	Read and Write	51	27.0
	Elementary Grade(9)	14	7.4
	Grade 9-12	4	2.1
	Other	3	1.6
	Total	189	100.0

**Sources: Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025**

- The analysis of the survey respondents indicates that 34.9% of household heads properly utilize the land inherited from their parents through various transaction activities. Additionally, 52.4% of household heads are familiar with the functionalities of the NRLAIS and recognize that the system provides relatively fast and efficient transaction services. The SPSS 27 analysis further

shows that 10.1% of respondents demonstrate proper resource utilization, while 2.6% have applied digital land transaction services for land transfers through gift or inheritance.

- Regarding marital status and household headship, the analysis shows that the majority of respondents, 125 (66.1%), were from coupled households (male and female-headed landholders). In contrast, 18 respondents (9.6%) were male-headed households, and 46 respondents (24.3%) were female-headed households.
- The analysis of respondents' educational background shows that the majority of household heads (HHHs) were illiterate, accounting for 62.7% of the 150 respondents. Additionally, 26% of respondents could read and write, 7.3% had completed elementary education, 2% had completed secondary education, and another 2% had attained higher-level academic education. These findings indicate a high illiteracy rate among household heads in the study area, which may contribute to tenure insecurity. On the other hand, the educational status of land administration institution staff members was not reported in detail, but it is implied that their education level could influence the effectiveness of service delivery.

## **4.2. Attributes of Land information experts**

In addition to the above demographic characteristics of customers, a relevant 39 questionnaire survey was provided for Bahir Dar Zuriya Woreda & kebele land experts all of the respondents were replied appropriately. This was to address the perception of officials on technical capacity, institutional capacity, and current practice of NRLAIS implementation. Of this mainly included demographic characteristics of Experts were such as age, gender, marital status, education background, education level, and job title and work experiences.

### **4.2.1. Age of Respondents**

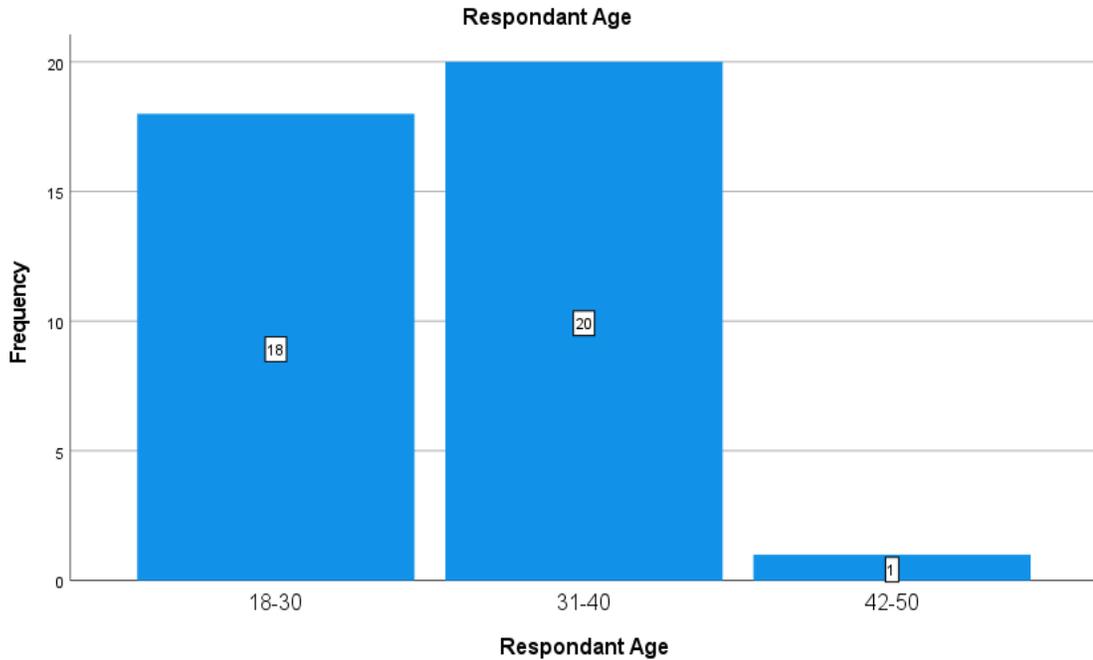


Figure 4.1. The age of respondents

**Source:** SPSS 27 output (2025)

- The demonstration of the respondent above figure statements of the description of Age 18(46.2%) of 18-30 age experts are more a progressive stage for service delivery of land administration information system and 20(51.3%) 31-40 ages are more experienced about land administration information system of NRLAIS functionalities and fast transaction services are much matured stages and more valued for NRLAIS implementations. The respondent of 1(2.6%) form 42-50 ages more advanced both technical and logical aspects of land administration information system for advice and share best experiences for others.

#### 4.2.2. Gender of Respondents

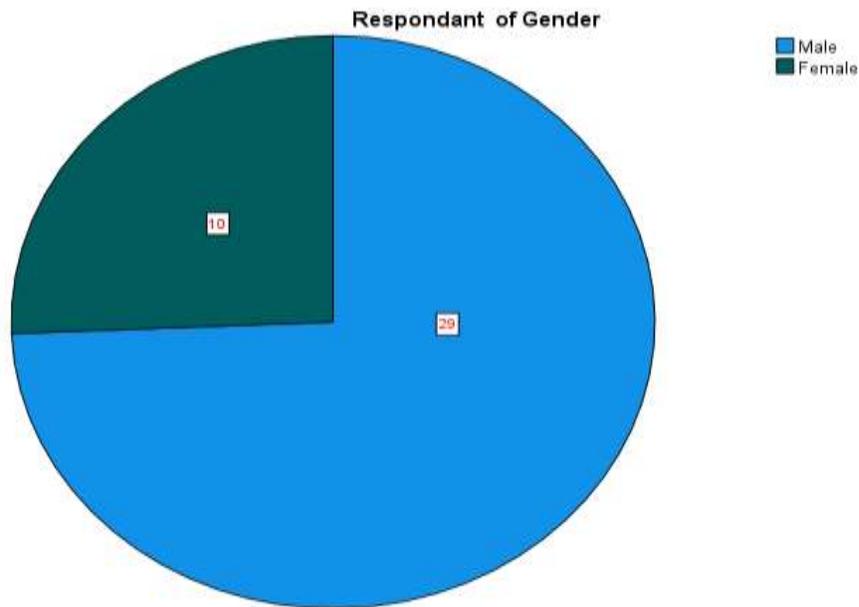


Figure 4.2. The gender of respondents

Source: SPSS 27 output (2025)

- The analysis of gender among the land administration expert respondents shows that 74.4% are male, while the remaining 25.6% are female, out of a total of 39 experts. Gender composition is an important consideration for NRLAIS service delivery, as it can influence how effectively services are provided to both male and female customers.

#### 4.2.3. Marital status of respondents

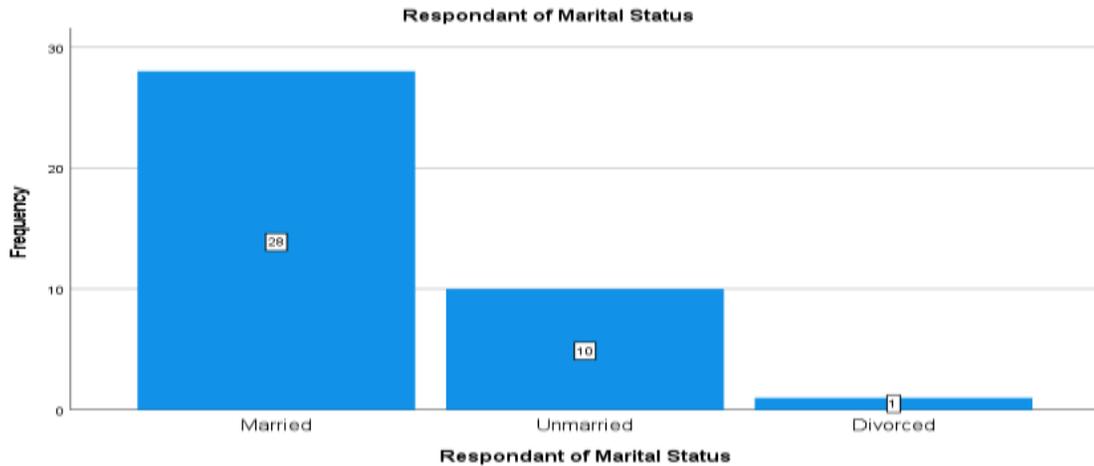


Figure 4.3. The marital status of respondents

Source: SPSS 27 output (2025)

- The researcher pursued the marital status of officials shown in the above figure that 28 respondents are married, 10 respondents are unmarried and the remaining respondent of 1 is divorced. This designates that in the study for married, unmarried and divorced were appropriately participated to provide intended data.

#### 4.2.4. Education background of respondents

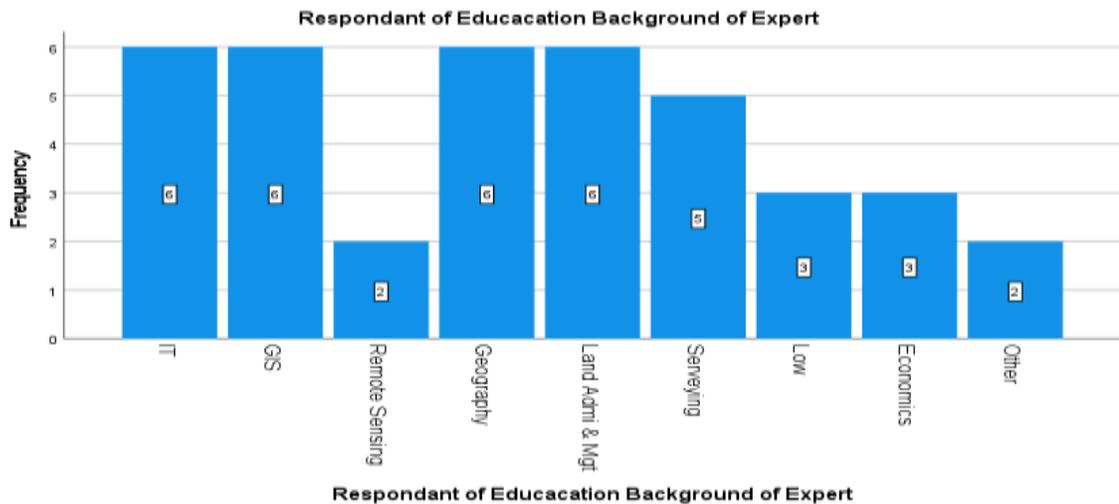


Figure 4.4. Education background of respondents

Source: SPSS 27 output (2025)

The educational backgrounds of experts working in the land office, particularly for NRLAIS transaction service delivery, are diverse and cover multiple fields. According to SPSS 27 analysis, the distribution of expertise is as follows: Information Technology (15.4%), GIS (15.4%), Remote Sensing (5.1%), Geography (15.4%), Land Administration and Management (15.4%), Surveying (12.8%), Law (7.7%), Economics (7.7%), and other fields (5.1%).

This variety of technical expertise supports the development and performance improvement of the National Rural Land Administration Information System. Notably, Information Technology experts play a crucial role in enhancing customer satisfaction by maintaining the system, addressing hardware and software issues, and ensuring ease of access to the system’s resources.

#### 4.2.5. Education level of Respondents

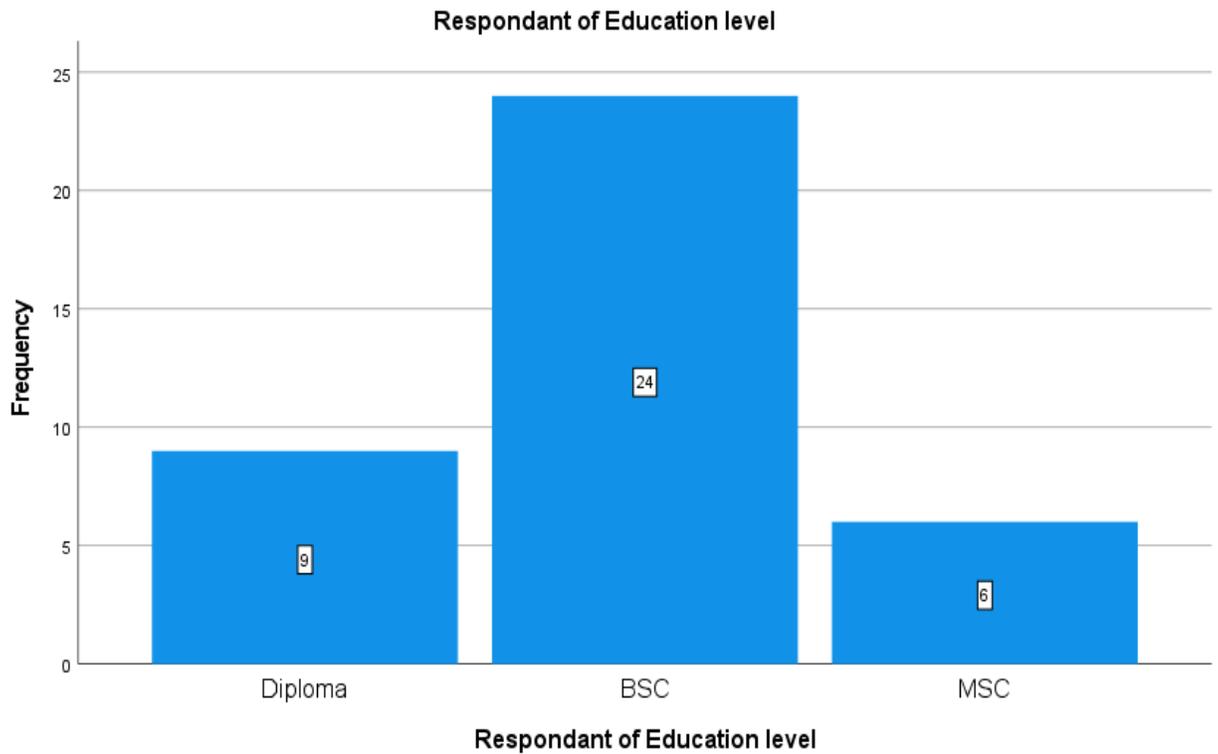


Figure 4.5. Education level of respondents

Source: SPSS 27 output (2025)

- The analysis of respondents' education levels shows that 23.1% hold a Diploma, 61.5% has a BSc, 15.4% have an MSc, and none hold a PhD or other advanced degrees. Education level plays a crucial role in understanding the land administration information system and enhancing service delivery. The evaluation of NRLAIS performance highlights that customer satisfaction is often affected by a lack of understanding of land administration guidelines and NRLAIS business processes.
- Therefore, it is important for land administration institutions to update and improve the education levels of their staff to support system development. According to SPSS 27 results, 84.6% of the 39 experts hold either a BSc or Diploma, indicating that most of the workforce has intermediate-level qualifications. To further strengthen the system, efforts should be made to upgrade diploma-level staff and increase the number of MSc-qualified experts through long-term training programs. Although PhD-level experts are currently absent, incorporating highly qualified personnel could enhance the sustainability and capacity of NRLAIS services.

#### 4.2.6. Job title of respondents

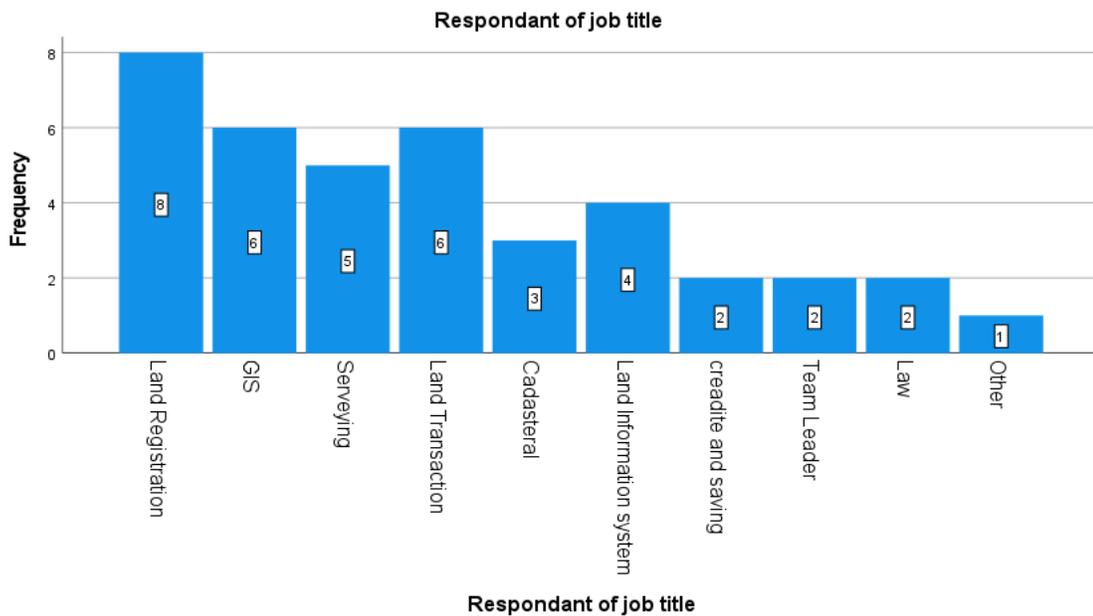


Figure 4.6. Job title of respondents

Source: SPSS 27 output (2025)

- The analysis of respondents' job titles shows the following distribution: Land Registration (15.4%), Law (5.1%), GIS (15.4%), Surveying (15.4%), Land Transaction (15.4%), Cadastral (7.7%), Land Information System (10.3%), Credit and Savings (5.1%), Team Leader (5.1%), and Other (5.1%). This indicates that NRLAIS service delivery is carried out across a variety of job roles. However, the table also highlights that technical positions, particularly in Information Technology and GIS, are underrepresented.
- The limited participation of staff with technical expertise suggests that the assignment of experts is not fully aligned with the sustainable development needs of the National Rural Land Administration Information System (NRLAIS). Consequently, the institution may not be effectively leveraging technical skills for the improvement and long-term sustainability of NRLAIS services.

#### 4.2.7. work experience of respondents

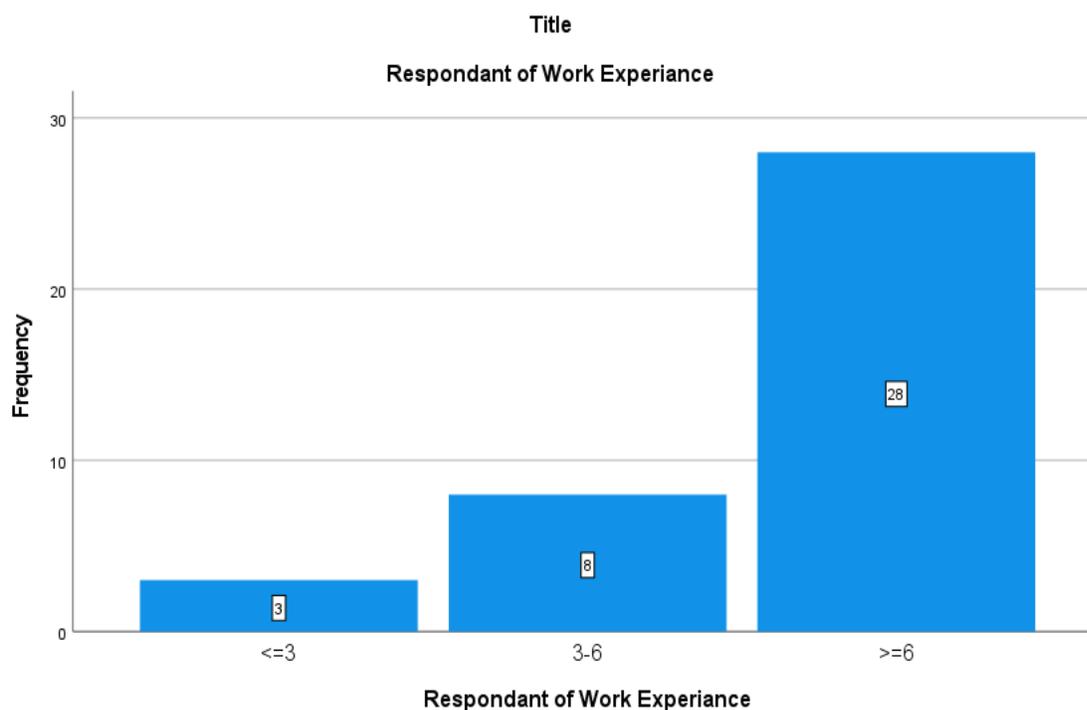


Figure4.7. Work experience of respondents

Source: SPSS 27 output (2025)

- The analysis of respondents' work experience shows that 7.7% have  $\leq 3$  years, 20.5% have 3–6 years, and 71.8% have  $\geq 6$  years of experience. Among the 39 experts surveyed, 28 (71.8%) have more than six years of work experience. The SPSS 27 results indicate that the majority of these experienced experts have a solid understanding of the land administration information system guidelines and business processes, which supports effective NRLAIS service delivery.

### **4.3. Assessing the Current Practice of NRLAIS**

The study revealed that the current performance of the rural land administration information system (NRLAIS) in Bahir Dar Zuriya Woreda faces several challenges that hinder effective service delivery. While the system is generally clear and incorporates its main functions, significant obstacles compromise its implementation. These include a shortage of qualified experts to handle technical land administration tasks, limited capacity-building initiatives, inadequate computers and printers, insufficient vehicles for fieldwork, poor office management, lack of sufficient office space, and a shortage of surveying instruments. Consequently, the performance of the land office is constrained, making it difficult to achieve the expected objectives and provide efficient services to landholders.

The interview responses reveal insights into the implementation of NRLAIS transaction services for landholders. While the system shows successful progress in land tenure registration, several challenges were identified. The customer transaction application procedures, particularly for court-related issues, lack clear guidelines and are often complicated.

NRLAIS primarily focuses on land tenure, with limited attention given to other core functions such as land valuation, land use, and land development. Land development control, in particular, is not well implemented in the Bahir Dar Zuriya Woreda land office, contributing to an increase in illegal settlements and unauthorized construction on kebele lands planned for rural development programs. Overall, the findings indicate that while land tenure implementation is progressing satisfactorily, land valuation, land use, and land development functions remain underemphasized.

The focus group discussion with selected kebele committees highlighted key issues regarding the rights and restrictions of rural landholders. For private landholdings, landholders have rights to use, possess, transfer, and rent or sharecrop their land for a specified period, but they do not have the right to sell. For communal landholdings, the rights include collective use with members, restricting use outside designated boundaries, and the duty to protect and improve communal property.

The discussion further explored the major causes of land-related conflicts in the study area. The participants identified boundary disputes, easement conflicts (right of way), and overlapping land possession on a single parcel, often resulting from unlawful issuance of holding books during cadastral demarcation, as the primary sources of conflict.

The next issue addressed during the focus group discussion was whether the kebele committees had their own office and archive for document management. The participants indicated that there was no dedicated office to carry out these tasks. They also highlighted a lack of awareness creation and capacity-building initiatives. Moreover, the discussion revealed poor coordination between kebele experts and committees, which hindered the establishment of an effective land administration system.

Participant observation further evaluated office time management, service delivery by officials, and the quality of data management and inputs in NRLAIS. The observations indicated the absence of clear time management strategies, limited understanding among both landholders and office staff regarding committee roles, and partial customer satisfaction with service delivery. Customers were frequently disappointed by the inability to resolve land dispute cases effectively. Additionally, vital documents were not organized safely or securely.

Despite these challenges, NRLAIS was acknowledged as a useful system that facilitates task completion at both kebele and Woreda levels. Overall, findings from key informant interviews, focus group discussions, and participant observation indicate that the current implementation of NRLAIS at the Bahir Dar Zuriya Woreda land office is inefficient and faces several operational challenges.

#### **4.4. Network infrastructures and database management system on NRLAIS**

The National Rural Land Administration Information System is a digital platform developed to modernize and streamline land administration services in rural areas of Ethiopia. It plays a critical role in supporting the documentation, registration, and management of landholding rights, which are essential for tenure security, land-related investments, and agricultural productivity.

As land administration becomes increasingly data-driven, network infrastructure and database management have emerged as foundational components of the system's success. Network infrastructure refers to the hardware and software resources that enable data transmission, connectivity, and communication across various administrative levels from federal ministries to local land offices.

A robust and reliable network is vital to ensure real-time data sharing, remote access, and efficient service delivery. Database management, on the other hand, involves the structured storage, retrieval, updating, and security of land-related data. It ensures that land records, cadastral maps, and transaction histories are consistently maintained, securely stored, and readily accessible for administrative and legal purposes. Proper database management supports transparency, reduces land disputes, and fosters trust among land users and institutions.

However, despite its potential, NRLAIS faces several challenges linked to limited ICT infrastructure, inconsistent data standards, and fragmented institutional coordination. Addressing these issues through improved digital infrastructure and integrated database systems is essential to unlocking the full benefits of rural land administration reform and the key findings and implications of network infrastructure and database management on the performance and sustainability of NRLAIS in Ethiopia.

The effectiveness of the National Rural Land Administration Information System is closely tied to the quality and reliability of its network infrastructure. However, several key challenges have hindered optimal performance and full-scale implementation of the system across Ethiopia. These problems affect the ability of land offices to process, share, and secure land information efficiently.

Many rural land offices lack stable internet connections, which are essential for syncing data with central servers and accessing the NRLAIS platform. In areas with poor connectivity, data often has to be collected offline and uploaded later, leading to delays and errors.

Low bandwidth and network congestion slow down data transmission between federal, regional, and local offices and Real-time access to land data, especially spatial (GIS) data, becomes difficult in areas with insufficient network capacity. Many offices are under-equipped with modern hardware and networking tools, including routers, servers, and firewalls. This limits their ability to host, back up, or secure land data locally and remotely.

Frequent electricity outages in rural areas disrupt the functioning of network devices and data servers. This causes data loss, system downtime, and limited user access, reducing public trust in the system. There is a shortage of skilled IT personnel to maintain and troubleshoot networking issues, especially at the Woreda (district) level(Architecture, 2012).

As a result, minor network issues can escalate and cause extended service interruptions and Weak or absent network linkages between federal, regional, and local databases result in poor data flow and duplicate records. This fragmentation undermines efforts to create a unified national land information system. Due to outdated or minimal cyber security measures, network systems are exposed to risks such as data breaches, unauthorized access, or hacking. The absence of secure network protocols and encryption can compromise sensitive land tenure data.

The National Rural Land Administration Information System (NRLAIS) is a vital digital platform developed by the Ethiopian government to support secure, transparent, and efficient rural land administration. At the heart of this system lies an essential component: the Database Management System (DBMS).

The DBMS plays a critical role in organizing, storing, processing, and retrieving vast amounts of land-related data in a structured and accessible manner. In a country where land tenure security is key to economic development, especially in agriculture-dominated rural areas, managing land information accurately and efficiently is crucial. NRLAIS captures various types of data, including

landholder details, parcel boundaries, ownership history, and transaction records. The DBMS ensures that this information is safely stored, consistently updated, and easily retrievable by authorized users across different administrative levels (S. O. Babalola & Uyi, 2019).

A well-designed database management system enables data integrity, consistency, security, and scalability all of which are essential for long-term sustainability of land administration services. Moreover, it supports integration with other government systems and helps in decision-making, policy planning, and conflict resolution. Despite its significance, the implementation of database management within NRLAIS has encountered several challenges, such as inconsistent data entry practices, limited technical expertise, and inadequate backup systems.

Addressing these challenges is essential to ensure the reliability and functionality of the system and understanding how database management underpins the success of NRLAIS and why its optimization is critical to delivering effective land services across rural Ethiopia. The Database Management System (DBMS) is a core component of the National Rural Land Administration Information System (NRLAIS), enabling the systematic handling of land-related data. Through implementation studies and operational reviews of NRLAIS in my study area, several key findings have emerged regarding its database management:

NRLAIS utilizes a centralized database architecture, which allows authorized users at federal, regional, and local levels to access and manage land information more easily. This structure reduces redundancy and supports uniformity of records across administrative tiers. While efforts have been made to align with international standards like the Land Administration Domain Model (LADM), inconsistency in data formats and attribute definitions still exists across regions and Lack of standardization results in data compatibility issues when integrating or comparing records. The system lacks robust automated data validation tools, which has led to issues such as data quality problems, missing information, or inconsistent entries.

This undermines the accuracy and trustworthiness of land data, especially when resolving disputes or processing transactions. Many local land offices lack effective data backup and disaster recovery protocols. In cases of system failure or power outages, there is a risk of data loss, which

can delay services and reduce land holder trusts. The DBMS has limited implementation of role-based access control (RBAC) and encryption protocols. This raises concerns about unauthorized access, data tampering, and the privacy of landholder information. NRLAIS is not yet fully integrated with related systems (e.g., tax, agriculture, or environmental systems), limiting the ability to conduct multi-sectorial analysis or streamline government services.

The results indicated that the network infrastructure of the National Rural Land Administration Information System (NRLAIS) is inadequate for delivering efficient land transaction services. Among 189 respondents, all survey questions highlighted significant challenges related to the system’s database and network infrastructure at the Bahir Dar Zuriya Woreda land office. These deficiencies were identified as the primary barriers to timely service delivery for customers. The findings from all eight questions clearly illustrate the existing gaps in the system (Table 4.2).

**Table 4.2: Assessing the network infrastructures and database management system on NRLAIS respondents of House Hold Headed**

Description of statements	Participants response		
	Frequency	Percent	
A system networking infrastructures are very poor to deliver fast service related to land transactions.	Strongly Disagree	7	3.7
	Disagree	21	11.1
	Neutral	20	10.6
	Agree	65	34.4
	Strongly Agree	75	39.7
	Total	189	100.0
NRLAIS infrastructures power problem distributes across digital services	Strongly Disagree	4	2.1
	Disagree	20	10.6

	Neutral	11	5.8
	Agree	75	39.7
	Strongly Agree	79	41.8
	Total	189	100.0
Database users that designed and assigned to Read only Write and Approval activities are poor to secured land right transactions.	Strongly Disagree	5	2.6
	Disagree	29	15.3
	Neutral	17	9.0
	Agree	71	37.6
	Strongly Agree	67	35.4
	Total	189	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

The responses regarding the functionality of NRLAIS for land transaction activities indicate varying perceptions among respondents. Only 8.5% of respondents strongly agreed that NRLAIS is fully functional for land transactions, while 10.1% also strongly agreed with this statement. About 11.6% of respondents were neutral, indicating they were unsure about NRLAIS services. Meanwhile, 29.1% agreed that the system functions effectively, whereas 40.7% disagreed.

The SPSS 27 results suggest that, although some respondents perceive NRLAIS as functional, the majority recognize gaps in its ability to deliver fast services. Key challenges include network problems, a decentralized database, unreliable utilities (internet and power), dependence on manual backup systems, inefficient data security mechanisms, and delayed system upgrades. These factors collectively limit the effectiveness of transaction service delivery to customers. The results also highlight that a significant proportion of respondents remain neutral or unaware of NRLAIS functionalities.

#### **4.5. The contribution of legal framework on NRLAIS**

Ethiopia has been implementing a National Rural Land Administration Information System (NRLAIS) to digitize land records, improve tenure security, and enhance rural land governance. Both the federal legal framework and the Amhara Region's land laws play a critical role in shaping this system.

Federal Legal Framework Constitution of Ethiopia (1995) Article 40: Recognizes state ownership of land but guarantees usufruct rights (right to use, lease, and inherit) and provides the constitutional basis for land administration, ensuring that land cannot be sold but can be leased and the Proclamation of Rural Land Administration and Land Use (No. 456/2005 & No. 133/2006) Mandates land certification (first level and second-level landholding certificates). Establishes land administration institutions (e.g., Rural Land Administration & Use Committees) and Supports digitization by requiring systematic land registration.

Data Protection & Cyber security Laws in Amhara regions Computer Crime Proclamation (No. 958/2016): Protects digital land records from fraud and cyber threats. Amhara Region Legal Framework Contributions for Amhara National Regional State Rural Land Administration & Use Proclamation (No. 252/2017) Strengthens land tenure security through second-level land certification (GPS-based, digital mapping). Establishes a Rural Land Administration Information System (RLAIS) to manage land records digitally and Allows land leasing and transfer with proper documentation, reducing informal transactions.

Amhara Land Administration & Use System Regulation (No. 283/2020) and Mandates digital land registration and electronic record-keeping. Links land records with other government services (taxation, credit access) and Provides dispute resolution mechanisms using digital evidence. The federal Proclamation No. 1324/2024 plays a crucial role in the development and implementation of the National Rural Land Administration Information System (NRLAIS) in Ethiopia (Fikadu & Office, 2024). By establishing a legal framework that recognizes digital land records, promotes decentralized land governance, and enhances landholder rights, the proclamation provides the foundation for a modern and efficient land administration system. The integration of regional legal

frameworks further strengthens the implementation of NRLAIS, ensuring that land administration is responsive to local needs and contributes to sustainable land management practices across the country (Tuladhar, 2002).

The legal framework contributes to the development of NRLAIS by providing integrated proclamations, regulations, and guidelines that support and guide the system’s implementation and functionality. Table 4.3 shows federal and regional context contributions.

**Table 4.3: The contributions of legal framework on NRLAIS**

Area	Federal Contribution	Amhara Region Contribution
<b>Legal Basis</b>	Constitutional land ownership & usufruct rights	Regional land laws for digital certification
<b>Land Certification</b>	First & second-level certification mandate	GPS-based digital land mapping
<b>Digitization</b>	Encourages national land database	Implements RLAIS with GIS integration
Tenure Security	Protects against arbitrary eviction	Strengthens with e-registration & dispute resolution
Land Market	Allows leasing, restricts sales	Facilitates e-lease transactions
Data Security	Cybercrime & data protection laws	Secure digital land record management
Interoperability	National policy for integration	Links land data with tax & credit systems

Sources: (Belay, 2010)

**Table 4.4: The contribution of legal framework on NRLAIS respondents of House Hold Headed**

Description of statements	Participants response		
		Frequency	Percent
NRLAIS transaction service working procedures are not clearly stated	Strongly Disagree	17	9.0
	Disagree	19	10.1

	Neutral	12	6.3
	Agree	76	40.2
	Strongly Agree	65	34.4
	Total	189	100.0
A system transaction application formats are not developed based on legal provisions	Strongly Disagree	7	3.7
	Disagree	20	10.6
	Neutral	17	9.0
	Agree	83	43.9
	Strongly Agree	62	32.8
	Total	189	100.0
NRLAIS service activities are long path to land transactions	Strongly Disagree	5	2.7
	Disagree	23	12.2
	Neutral	19	10.1
	Agree	73	38.8
	Strongly Agree	68	36.2
	Total	188	100.0
A system transaction service application document is not specified by procedures	Strongly Disagree	6	3.2
	Disagree	20	10.6
	Neutral	31	16.4
	Agree	60	31.7
	Strongly Agree	72	38.1
	Total	189	100.0

**Sources: Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025**

A legal framework contribution of NRLAIS supported to develop systems with integrated proclamation, regulations, guide lines and others are meeting with the system. The above table demonstrated of NRLAIS transaction service working procedures are not clearly defined and the respondents result of SPSS 27 show that 10.1% disagree the statement is does not how that. But the other respondents of the statement 9.0% strongly disagree and 6.3% neutral for unknown about the statement of NRLAIS application format are not develop based on legal provisions. But 34.4% respondents are strongly agreed by the statements.

A system transaction service working procedures are not clearly stated can be acceptable by the respondents of 40.2% are agrees from participates of 189. NRLAIS is done the proclamation and regulations functional for pervious manual services are strongly attached. But NRLAIS legal framework does not clearly sated the part of spatial. The gape of Woreda land office for understand legal framework about NRLAIS how data updating from manually and systematically registered land office. There is no remaining hard copy transaction certificate file in the office and updated Registration and green book.

Land holder transaction application format is not clearly stated by land office. Demonstrates respondents' perceptions regarding whether the NRLAIS transaction application formats were developed based on legal provisions. According to SPSS 27 results, 10.6% of respondents disagreed with the statement, while 3.2% strongly disagreed. Additionally, 16.4% were neutral or unsure about the statement. In contrast, 38.1% of respondents strongly agreed that the NRLAIS application formats were not developed in accordance with legal provisions. The uploaded document amount size does not determine and any applicant document is needed to use evidences there must be experts are uploaded the documents.

From the transaction certificate, who has a responsibility persons put the signatures is one of undefined by legal framework of land office and a bureaucracy way the land holders. NRLAIS uses the previous manual legal frameworks not only spatial legal framework. So that the land office

clearly stated a system fully functional service to the customer supported by legal frameworks. All statements are indicated to that affected by the legal framework system service deliveries.

#### 4.6. Technical strengths, weaknesses, and challenges of the NRLAIS

The National Rural Land Administration Information System (NRLAIS) in Ethiopia is a digital platform developed to manage and administer rural land information nationwide. It aims to enhance land tenure security, facilitate land certification, reduce conflicts, and support sustainable land use planning. While the system has demonstrated notable technical strengths (Table 4.5) it continues to face significant technical and institutional challenges (Dawidowicz et al., 2015).

**Table 4.5: Technical Strengths of NRLAIS for service deliveries**

Strength	Description
1. GIS-Based Parcel Mapping	Supports accurate, geo-referenced parcel-level land registration (second-level certification).
2. Centralized Database	Maintains a unified national land record system, promoting data consistency and standardization.
3. Interoperability	Designed to interface with regional systems and other national data platforms (e.g., agriculture, environment).
4. Digital Records and Legal Validity	Legally recognized digital land records reduce reliance on paper-based systems and enhance data integrity.
5. Customization and Local Adaptation	System allows region-specific configurations, aligning with federal and regional laws.
6. Access Control & Security	Includes user authentication and role-based access to protect sensitive land information.
7. Transaction Support	Facilitates tracking of land transfers, leases, inheritance, and disputes through a traceable digital history.

**Source:** (Mehta & Koranga, 2020)

**Table 4.6.: Technical Weaknesses of NRLAIS for customer services**

Weakness	Description
1. Infrastructure Dependence	Requires stable internet, power, and hardware—often lacking in rural Woreda.
2. Incomplete Coverage	Not yet fully rolled out across all Woreda or regions; some areas still use paper-based systems.
3. Limited Real-Time Updating	In many areas, land transactions are updated manually or with delays.
4. Usability & Interface Limitations	The user interface can be complex for low-skilled operators; limited localization in local languages.
5. Data Quality Issues	Inconsistencies in data entry and parcel boundary errors due to lack of technical capacity during fieldwork.
6. Integration Gaps	Limited integration with land use, taxation, or environmental management systems.

**Source:** (Dethier & Moore, 2012)

## **4.6. Challenges Facing NRLAIS Implementation**

### **4.6.1. Institutional and Human Capacity**

Shortage of skilled **personnel** at the Woreda and kebele levels to manage and update the system frequent staff turnover undermines system continuity and data integrity.

### **4.6.2. Legal and Policy Fragmentation**

Variation in regional laws and procedures leads to inconsistent application of NRLAIS Coordination between federal and regional institutions is still evolving.

### 4.6.3. Finance Constraints

High initial and operational costs of equipment, training, and data maintenance and Donor dependency can affect system sustainability.

### 4.6.4. Connectivity and Technological Access

Many rural offices lack adequate ICT infrastructure, including internet access, computers, and backup power and Limited access to real-time updates in remote areas.

### 4.6.5. Community Awareness and Participation

Low public awareness of NRLAIS and its benefits can lead to mistrust or underutilization limited participation of women and pastoral communities in land registration processes.

### 4.6.6. Data Security and Privacy

Risks related to unauthorized access, data loss, or system hacking if digital safeguards are not properly implemented.

**Table 4.7: Technical strengths, weaknesses, and challenges of the NRLAIS respondents of House Hold Headed**

Description of statements	Participants response		
	Frequency	Percent	
NRLAIS and analogy service is gone side by side for transactions	Strongly Disagree	24	12.7
	Disagree	25	13.2
	Neutral	5	2.6
	Agree	75	39.7
	Strongly Agree	60	31.7
	Total	189	100.0
	Strongly Disagree	23	12.2

NRLAIS data has quality problems for transactions services.	Disagree	34	18.0
	Neutral	14	7.4
	Agree	66	34.9
	Strongly Agree	52	27.5
	Total	189	100.0
A Landholder service application format processes have long paths.	Strongly Disagree	4	2.1
	Disagree	10	5.3
	Neutral	17	9.0
	Agree	88	46.6
	Strongly Agree	70	37.0
	Total	189	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

NRLAIS exhibits both strengths and weaknesses in delivering land transaction services, and customers often face difficulties accessing services due to a shortage of experts, technical skill gaps, and system slowdowns. The survey results indicate that 47.1% of respondents agreed and 40.2% strongly agreed that system service levels are affected, while 6.3% disagreed, 4.2% strongly disagreed, and 2.1% were neutral. These findings highlight that the time required to upload customer application documents significantly slows system performance, as icons and initiation tasks are often unresponsive.

Moreover, the system does not specify limits on the number of documents a customer can upload, and it only accepts PDF and JPG file formats. System slowdowns are primarily caused by database performance issues, insufficient technical expertise, and inadequate hardware and software resources. Consequently, customers experience delays, consuming additional time and effort to access the services.

## **4.7. Evaluation of respondents' satisfaction on the system**

User satisfaction with the National Rural Land Administration Information System (NRLAIS) depends on multiple factors, including system functionality, ease of use, accessibility, and the quality of support services. Additionally, the level of expert qualifications and the extent to which services are fully delivered at the office level are key factors that influence overall user satisfaction.

### **4.7.1. System Usability and Functionality**

A user-friendly interface with clear navigation enhances system usability and helps experts easily understand its business rules. Key functions—such as land registration, dispute resolution, mapping (GIS), transactions, and document management—should operate smoothly. Fast processing and minimal downtime are essential to ensure high satisfaction among landholders accessing the services.

### **4.7.2. Accessibility and Digital Inclusion**

In rural areas where internet connectivity is often poor, offline capabilities or mobile access can significantly improve user satisfaction. Currently, NRLAIS functions primarily as a desktop application, limiting its accessibility. Expanding the system to support multiple platforms—including smartphones, tablets, and desktops would enhance usability and ensure wider access for all users.

### **4.7.3. Training and Support**

Proper training is essential for all NRLAIS users, including land tenure team leaders, farmers, local officials, surveyors, and other stakeholders, to ensure effective system use. The land office provides training from the Woreda to kebele levels, targeting both experts and rural landholders. Additionally, a robust helpdesk and support mechanism for the quick resolution of technical issues further enhances user satisfaction.

#### **4.7.4. Transparency and Trust**

Reliable land records are essential for reducing disputes and building trust in the system. Public access to land records allows farmers to verify their holdings, which improves user satisfaction with NRLAIS services. However, the system currently faces challenges, including the lack of centralized online access, insufficient backup mechanisms, and data security risks, particularly at the Woreda land office level.

#### **4.7.5. Government & Policy Alignment**

Integration with other systems, such as courts, tax authorities, agricultural, or financial institutions, enhances the overall usefulness of NRLAIS. Additionally, strict adherence to national land laws ensures policy compliance and reinforces the system's legitimacy.

### **4.8. Potential Challenges Affecting NRLAIS user Satisfactions**

Digital literacy is a critical factor in the effective use of NRLAIS; however, the study found that rural users often struggle with the technology due to a lack of training on the system's service levels. Infrastructure issues further exacerbate these challenges. Poor internet connectivity and frequent power outages hinder access to services, often forcing users to postpone their appointments to the next day or even the following week.

Bureaucratic delays were also observed as a significant barrier to efficient service delivery. The process of applying for land services involves long and complex steps, and many customers lack clear information on how to access services from kebele to Woreda levels, which slows down the processing of land transactions and reduce customer satisfaction.

Data migration and digitization problems were another major challenge. The study revealed that fully digitalizing services for all kebele landholders remains difficult. Digital records often contain topology errors, preventing proper migration and integration into the WORLAIS database. Previous versions of NRLAIS lacked controls to prevent duplicate or unwanted data, resulting in time-consuming tasks for cleaning and migrating remaining parcels. These issues collectively limit

the efficiency, accuracy, and accessibility of NRLAIS, undermining its ability to deliver timely and reliable services to landholders.

**Table 4.8: Evaluation of respondents' satisfaction on the system of House Hold Headed**

Description of statements	Frequency	Percent	
NRLAIS has a gap of knowledge and skills of information technology experts.	Strongly Disagree	4	2.1
	Disagree	5	2.6
	Neutral	11	5.8
	Agree	95	50.3
	Strongly Agree	74	39.2
	Total	189	100.0
A system has given a fast service delivery in transaction processes.	Strongly Disagree	3	1.6
	Disagree	7	3.7
	Neutral	9	4.8
	Agree	86	45.5
	Strongly Agree	84	44.4
	Total	189	100.0
NRLAIS transaction application process is highly bureaucracy ways.	Strongly Disagree	26	13.8
	Disagree	25	13.2
	Neutral	11	5.8
	Agree	65	34.4
	Strongly Agree	62	32.8
	Total	189	100.0
	Strongly Disagree	1	0.5

A land user does not access NRLAIS service due to shortage of power.	Disagree	14	7.4
	Neutral	13	6.9
	Agree	94	49.7
	Strongly Agree	67	35.4
	Total	189	100.0
NRLAIS digital land services save time, energy and money for landholders.	Strongly Disagree	0	0.0
	Disagree	2	1.1
	Neutral	5	2.6
	Agree	97	51.3
	Strongly Agree	85	45.0
Total	189	100.0	

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

The land office does not assign experts based on NRLAIS services and the existing experts almost all has agape of technical skills for fast service delivery to the land holders. From the results of SPSS 25 output data 2.6 % disagree, 2.1% strongly disagree, 5.8% neutral, 50.3% agree and 39.2% strongly agree result indicates that NRLAIS has a gap of knowledge and skills of information technology experts. So that land office NRLAIS activities it might be down for fast service delivery to the users and system sustainability issues are questionable for NRLAIS buildup. The land office expert assigns are not based on digital service delivery.

Pervious manual service delivery expert assign levels are working now digital is influenced for customer service. When the power is off, the service of land transaction is off. That means the power problems are the main challenges of service delivery to the customer is affecting by shortage

of powers. NRLAIS digital land services help landholders save time, reduce effort, and cut costs by streamlining land management processes.

#### 4.8.1. Network infrastructures and database management aspect on NRLAIS

NRLAIS typically refers to a specialized network infrastructure designed to support land administration and management in rural areas. These systems are crucial for the effective governance of land resources, especially in developing countries where rural land management can be complex and challenging.

NRLAIS and similar land administration systems globally rely on a robust network infrastructure to effectively manage land records, transactions, and services. The infrastructure typically includes a range of components and technologies designed to ensure data accuracy, security, and accessibility. Here’s a comprehensive overview of the network infrastructures commonly found in global land administration systems (Alamgir et al., 2019).

NRLAIS is operated by Ethiopia’s Ministry of Agriculture (MOA) as part of its suite of national e-services and a digital platform designed to support land administration services at the rural level in Ethiopia. NRLAIS can be Accommodates large volumes of spatial and legal land data, requiring structured storage, indexing, and retrieval and Enables transaction processing: registrations, transfers, query handling, dispute management. A system Ensures consistency, scalability, and performance for users across rural admin offices and Facilitates reporting, statistical analysis, and structured decision support capabilities (Nyongesa, 2012).

**Table 4 Network infrastructures and Database management expert respondents**

Description of statements		Frequency	Percent
NRLAIS is ready and fully functional for Land transactions activities.	Strongly Disagree	9	23.1
	Disagree	13	33.3
	Neutral	4	10.3
	Agree	6	15.4

	Strongly Agree	7	17.9
	Total	39	100.0
Database structural layout is very clear and user friendly to use	Strongly Disagree	0	0.0
	Disagree	9	23.1
	Neutral	1	2.6
	Agree	16	41.0
	Strongly Agree	13	33.3
	Total	39	100.0
A system database decentralized approach becomes barrier for data communications	Strongly Disagree	2	5.1
	Disagree	4	10.3
	Neutral	1	2.6
	Agree	18	46.2
	Strongly Agree	14	35.9
	Total	39	100.0
A backup mechanism which is manual specially for Woreda levels is a disadvantage of NRLAIS	Strongly Disagree	2	5.1
	Disagree	2	5.1
	Neutral	3	7.7
	Agree	17	43.6
	Strongly Agree	15	38.5
	Total	39	100.0
A system test mechanisms affects existing system.	Strongly Disagree	2	5.1
	Disagree	2	5.1

Neutral	2	5.1
Agree	16	41.0
Strongly Agree	17	43.6
Total	39	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

NRLAIS is ready and fully functional for land transaction activities of the above demonstration of the respondent strongly disagree show that 23.1.5%, disagree 33.3%, neutral 10.3%, agree 15.4% and strongly agree 17.9% indicate the results of SPSS 27 indicate the respondent of NRLAIS functional service is not good. Occasional outages or slow performance can delay transactions like land transfers, split parcels, updates and Poor internet connectivity or lack of digital literacy in remote areas may hinder access to NRLAIS services.

Lack of real-time data sharing between NRLAIS and other government bodies (e.g., tax offices, courts) can slow down transactions and Sensitive land ownership data may be vulnerable to cyber threats if security measures are inadequate. Users may not have access to adequate support or training on how to use the system for transactions and the interface is not available in local languages, it could limit usability for some users. NRLAIS offers fully functional land services for efficient land management and experience the power of NRLAIS functional services reliable, efficient, and ready to use. NRLAIS functional services are designed to streamline land administration and support landholders and NRLAIS functional services, landholders can save time, reduce effort, and lower costs.

A decentralized database may hold conflicting or outdated versions of the same data and Lack of synchronization leads to unreliable information across the system. Without real-time syncing, updates made in one location may take time to reach others and slows down transactions, verifications, or decision-making. Decentralized databases may use different structures, formats, or platforms and Makes it difficult for systems to talk to each other or share data efficiently. Data

may be entered or stored multiple times across different locations and Increases storage costs and causes confusion in reporting or analysis.

A Combining data from multiple decentralized sources into one report or national system can be difficult and error-prone. Ensuring consistent data protection policies across all nodes is challenging. Different locations might have different security standards or access rights. Rural or remote areas may lack the robust internet or IT capacity to maintain smooth communication between nodes. A system decentralized database approach became barriers of data communication are the respondents of the demonstrate result that can be show that strongly disagree 5.1%, disagree 10.2%, neutral 2.5%, agree 48.1% and strongly agree 35.9% show that the lack of data security and no any data sharing and accessibilities.

There are no results for Manual NRAIS Backup System Drawbacks Manual backup systems for NRAIS have several significant drawbacks: Operational Challenges Human error prone: Manual processes are susceptible to mistakes in data selection, transfer, or storage Time-consuming: Requires significant staff time for regular backup operations Inconsistent timing: Backups may not occur at regular intervals due to human factors Data Integrity Issues Incomplete backups.

Risk of missing critical files or databases during manual selection No version control: Difficult to maintain proper versioning of backups without automated systems higher risk of corruption. Manual transfers increase chances of data corruption Security Vulnerabilities Exposure during transfer: Data may be vulnerable when being moved between systems Improper storage: Manual systems may lead to backups being stored in insecure locations (Furmston & Logan, 1987).

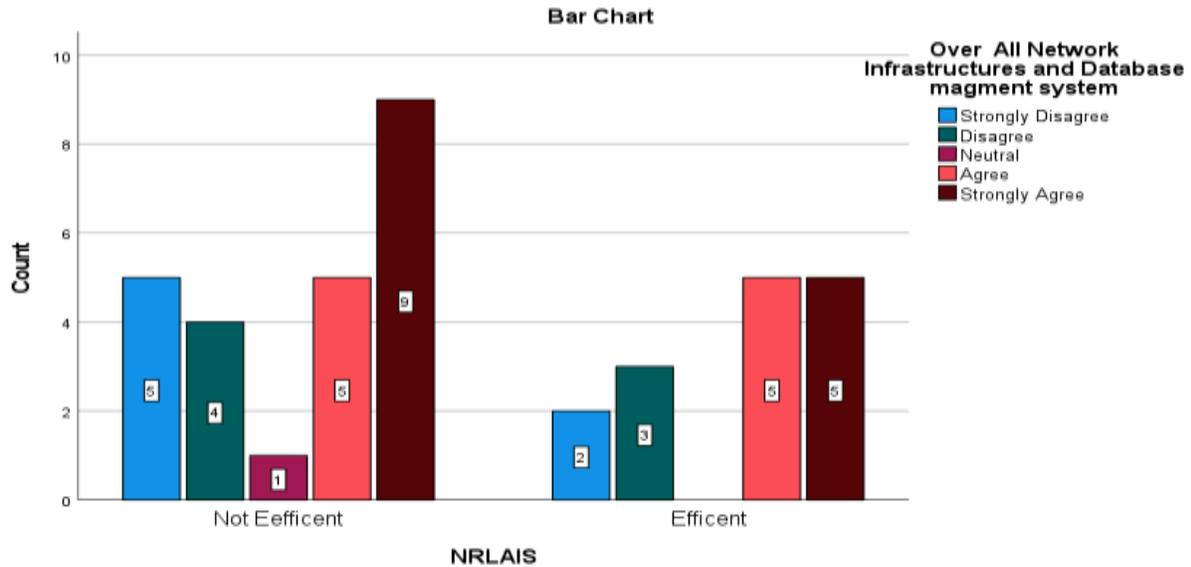


Figure4.8. Cross-tabulation of the network infrastructure and database management system of NRLAIS by using a Bar chart

**Source:** SPSS27 statistics output (2025)

As it can be understood in the chart above the majority of respondents replied strongly agreed as NRLAIS in land office was not efficient on aspects of the legal framework and also more of respondents replied strongly agreed on the efficiency of NRLAIS on aspects of the legal framework in the Bahir Dar Zuriya Woreda office. This implies the legal framework has an influence that inclines to negative effect.

Therefore, the overall analysis result depicts that a legal framework affects the efficiency of NRLAIS land office. Moreover, the results of the findings of ( Tilahun Woldezena 2014). Revealed that officials from the land office have also confirmed that land-related regulations and guidelines are lacking clarity and not fully harmonized to provide efficient NRLAIS transaction services. In a related study, indicated that increasing regulation of the land, the inclusion of all private rights, as well as public restrictions and responsibilities concerning the legal situation of the land, is becoming more and more of an issue for a fair and transparent land market and efficient land administration system (Alamgir et al., 2019).

#### 4.8.2. The contributions of legal frame work on NRLAIS

The contribution of a legal framework to land information system is foundational and multifaceted. Here's a structured overview of how the legal framework supports and enhances the NRLAIS that can be support by Provides Legal Authority and Mandate, Ensures Data Legitimacy and Legal Recognition, Supports Transparency and Accountability, Enables Interoperability and Integration, Protects Stakeholders’ Rights, Guides Conflict Resolution and Adjudication, Promotes Sustainability and Long-term Use.

Proclamation 1324/2024 Article 50 Digital Land Information System that can be Information contained in the registry book shall be migrated to the digital land information system. All land rights transfers and restrictions shall be registered in the digital land information system and Printed documents and digital land information systems may be used as evidence, as relevant (Fikadu & Office, 2024).

Some several laws and acts deal with the land, the relationship between landlord and tenants, mortgagor and mortgagee, assessment and collection of land tax, and land acquisition for a public purpose. All these are administered and maintained by land administration institutions (Alamgir et al., 2019). So the main aspects of the legislative framework of land administration incorporated in this study analyzed as follows in Table 4.10. The researcher pursued to know the respondent’s opinion on legal framework parameters. The result was measured on Likert Scale of 1-5 where 5- strongly agree, 4 - agree, 3- neutral, 2- disagree, and 1- strongly disagree. The interpretation was done based on this assumption.

**Table 4.10: Legal framework aspects on NRLAIS export respondents**

Description of statements		Frequency	Percent
NRLAIS transactions are not supported by land administration proclamations.	Strongly Disagree	0	0.0
	Disagree	2	5.1
	Neutral	3	7.7

	Agree	17	43.6
	Strongly Agree	17	43.6
	Total	39	100.0
System transaction is not supported by spatial legal frameworks.	Strongly Disagree	0	0.0
	Disagree	1	2.6
	Neutral	3	7.7
	Agree	12	30.8
	Strongly Agree	23	59.0
	Total	39	100.0
A system business processes does not control data quality tools	Strongly Disagree	0	0.0
	Disagree	1	2.6
	Neutral	2	5.1
	Agree	22	56.4
	Strongly Agree	14	35.9
	Total	39	100.0

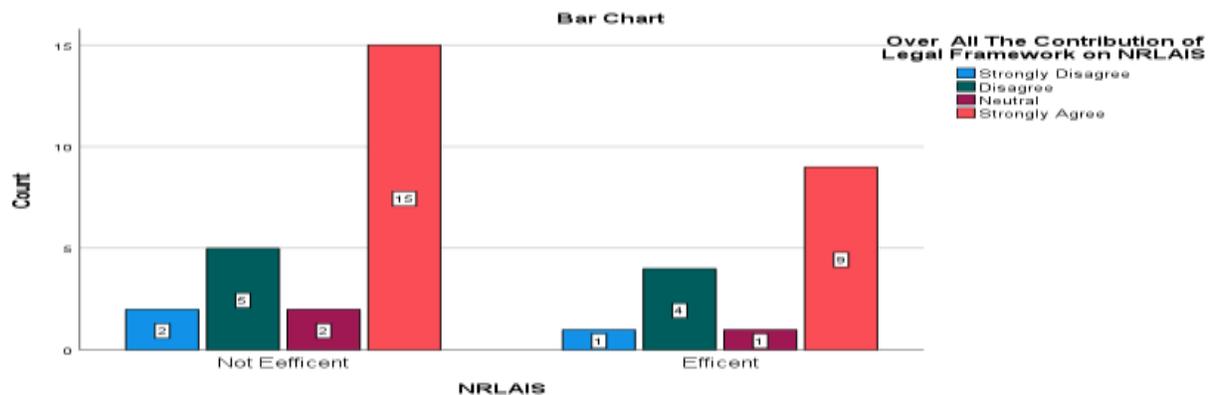
**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

As can be shown in Table 4.10 consists of three aspects that explain the legal framework impacts on the efficiency of the rural land administration. It can be seen from the respondents' reply in the first aspect 'NRLAIS transactions are not supported by land administration proclamations'. From the total of 39 respondents 0(0%) replied strongly disagree, 2(5.1%) answered disagree, 7% responded neutral, agree 17(43.6%) and 17(43.6%) replied strongly agree. According to the respondents of 39 responses, the majority (87%) was agreed and strongly agreed in which that gaps and inconsistencies in the legal system are causing a big challenge on the NRLAIS in the study area.

In the second point, 'System transaction is not supported by spatial legal frameworks'. From the above table, it shows that out of 39 respondents 0(0%) replied strongly disagree, 1(2.6%) answered disagree, 3(7.1%) reacted neutral and the remaining 12(30.8%) and 23(59%) responded agree and

strongly agree respectively. According to the above response rate, the majority (90%) respondents replied agree and strongly agree. This implies that most of the respondents expressed their opinion that the current legal framework does not completely change to improve the efficiency and effectiveness of NRLAIS.

In the last aspect of this explanatory variable, ‘A system business processes does not control data quality tools’ the response rate indicates that from the 39 respondents 0(0%) reacted strongly disagree, 1(2.6%) replied disagree, 2(5.1%) answered neutral and the remaining 22(56.4%) and 14(35.9%) responded agree and strongly agree respectively. Trusted on the response rate, the majority of the respondents ‘90% were agreed and strongly agreed. This conveys that the legal specialists do not sufficiently support in respect of legal issues. Figure 4.5 below indicates that the overall legal framework cross-tabulation analysis results by using a bar chart based on how many respondents replied strongly agreed’, neutral’, and strongly disagreed ‘on the efficiency of NRLAIS.



**Figure4.9. Cross-tabulation of the legal framework contribution on NRLAIS by using a Bar chart**

**Source:** SPSS27 statistics output (2025)

As it can be understood in the chart above the majority of respondents replied strongly agreed as NRLAIS in land office was not efficient on aspects of the legal framework and also more of

respondents replied strongly agreed on the efficiency of NRLAIS on aspects of the legal framework in the Bahir Dar Zuriya Woreda office. This implies the legal framework has an influence that inclines to negative effect. Therefore, the overall analysis result depicts that a legal framework affects the efficiency of NRLAIS land office. Moreover, the results of the findings of (Alamgir et al., 2019). Revealed that officials from the land office have also confirmed that land-related regulations and guidelines are lacking clarity and not fully harmonized to provide efficient LA services. In a related study, indicated that increasing regulation of the land, the inclusion of all private rights, as well as public restrictions and responsibilities concerning the legal situation of the land, is becoming more and more of an issue for a fair and transparent land market and efficient land administration system (Zena, 2014).

#### **4.8.3. Strength, weakness and challenges of NRLAIS**

NRLAIS is a digital platform designed to modernize rural land management by improving tenure security, reducing disputes, and enhancing service delivery. While NRLAIS has brought significant improvements in land governance, it also faces weaknesses and challenges that hinder its effectiveness. The strength of NRLAIS is a transformative digital platform designed to enhance land governance in rural areas.

By modernizing land administration processes, NRLAIS strengthens tenure security, improves efficiency, and supports sustainable rural development. NRLAIS can be offers significant benefits in modernizing land governance; it also has notable weaknesses that limit its effectiveness. These shortcomings ranging from technical gaps to institutional challenges must be addressed to ensure the system achieves its full potential. NRLAIS has the potential to revolutionize rural land

administration, challenges like technological gaps, legal hurdles, financial constraints, and social resistance must be addressed (Dawidowicz et al., 2015).

**Table 4.11: Strength, weakness and challenges of NRLAIS expert respondents**

Description of statements		Frequency	Percent
Institutional arrangements are established based on land administration functions.	Strongly Disagree	16	41.0
	Disagree	12	30.8
	Neutral	1	2.6
	Agree	6	15.4
	Strongly Agree	4	10.3
	Total	39	100.0
NRLAIS data migration has faced a problem on attribute and spatial data to Woreda land administration information system (WORLAIS)	Strongly Disagree	0	0.0
	Disagree	0	0.0
	Neutral	1	2.6
	Agree	17	43.6
	Strongly Agree	21	53.8
	Total	39	100.0
NRLAIS transaction service materials need high budget	Strongly Disagree	0	0.0
	Disagree	0	0.0
	Neutral	0	0.0
	Agree	20	51.3
	Strongly Agree	19	48.7
	Total	39	100.0
A system hardware component is affect service delivery interactions.	strongly Disagree	1	2.6
	Disagree	0	0.0
	Neutral	1	2.6
	Agree	21	53.8

	Strongly Agree	16	41.0
	Total	39	100.0
NRLAIS software slow down when upload land holder application document	Strongly Disagree	1	2.6
	Disagree	2	5.1
	Neutral	1	2.6
	Agree	19	48.7
	Strongly Agree	16	41.0
	Total	39	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

The above tables the respondents of institutional arrangements are established based on land administration functions of strongly disagree 16(41.0%), disagree 12(30.8 %), neutral 1(2.6%) the remaining 6(15.4%) and 4(10.3%) responded agree and strongly agree respectively. The respondent results show that institutions are not arranged based on land administration functions the respondent results of (79%) are opposed the arrangement of land offices. the institutional arrangements are established based on land administration functions refers to the idea that the structure and organization of institutions involved in land governance are largely shaped by the functions and objectives of land administration systems.

NRLAIS data migration has faced a problem on attribute and spatial data to Woreda land administration information system (WORLAIS) the respondents show that strongly disagree 0(0.0%), disagree 0(0.0%), neutral 1(2.6%) and the remaining 17(43.6%, ) and 21(53.8%) agree and strongly agree respectively. The respondent results show that data migration process result of the respondent indicates that (96%) migration problems are exist on data migration issue from NRLAIS to WORLAIS specifically with attribute and spatial data. This type of issue is common during system transitions, especially when there are differences in data models, formats, standards, or system architectures.

From the above table the respondents of NRLAIS transaction service materials need high budget strongly disagree 0(0.0%), disagree 0(0.0%), neutral 0(0.0%), 20(51.3%) and 19(48.7%), agree and strongly agree respectively. The agree and strongly agree results show that (100%) need of high budget to implement NRLAIS transaction services at the Woreda level requires significant budget allocation due to technical infrastructure demands, data quality assurance, licensing, training, and connectivity needs. To ensure sustainability and affordability, alternative financing models and phased implementation strategies should be explored.

A system hardware component is affect service delivery interactions NRLAIS transaction service deliveries show the above table respondents of strongly disagree 1(2.6%), disagree 0(0.0%), neutral 1(2.6%), 21(53.8) and 16(41.0%), agree and strongly agree respectively. A system hardware component is affect service delivery interactions seems to be pointing out that a hardware issue is negatively impacting system service delivery possibly within a land administration system services of NRLAIS or WORLAIS.

NRLAIS software slow down when upload land holder application document results show that the above table strongly disagree 1(2.6%), disagree 2(5.1%), neutral 1(2.6%), 19(48.7) and 16(41.0%), agree and strongly agree respectively. NRLAIS software slows down when uploading landholder application documents points to a performance bottleneck in the system during file upload operations. The problems that are not specified the application document uploaded during transaction services of the system users have large files, many concurrent users, or inefficient backend processes.

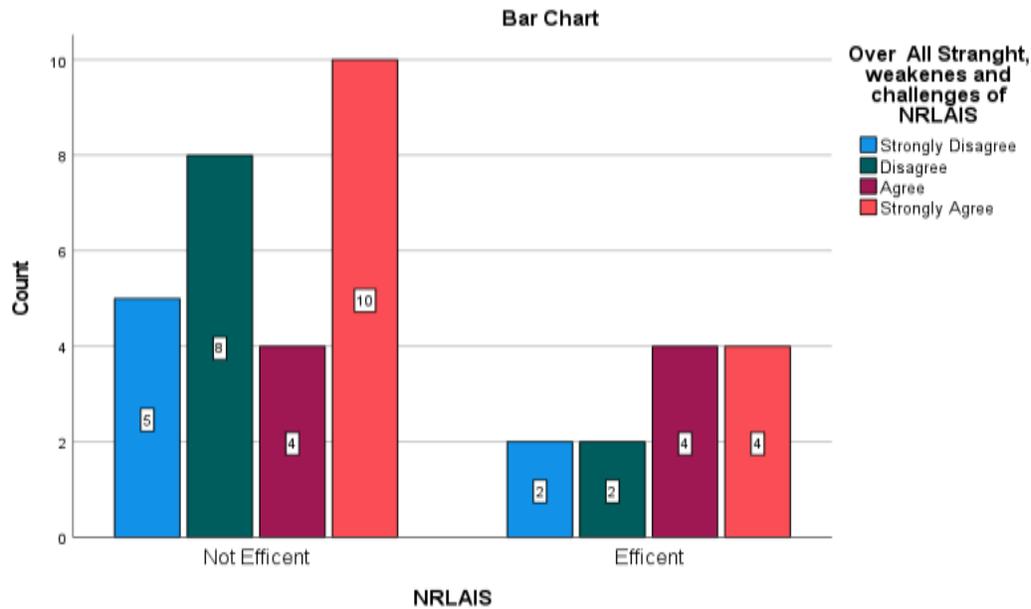


Figure 4.10. Cross-tabulation of the strength, weakness and challenges on NRLAIS by using a Bar chart

**Source:** SPSS27 statistics output (2025)

As it can be understood in the chart above the majority of respondents replied strongly agreed as NRLAIS in land office was not efficient on aspects of the strength, weakness and challenges also more of respondents replied strongly agreed on the efficiency of NRLAIS on aspects of the weakness and challenges of NRLAIS in the Bahir Dar Zuriya Woreda office. This implies the weakness and challenges has an influence that inclines to negative effect. Therefore, the overall analysis result depicts that weakness and challenges affects the efficiency of NRLAIS land office. NRLAIS has laid a strong foundation for rural land management and digital recordkeeping. The challenges of NRLAIS are Performance, scalability, and user-friendliness remains concerns and the challenges of a system Integration, infrastructure, and sustainability are major on-going issues. System (NRLAIS) is the limited technical infrastructure in rural regions. This issue undermines the system's efficiency, accessibility, and sustainability (Zena, 2014).

#### **4.9. Evaluation of respondents' satisfaction on the system**

Land administration services are part of the day to day activities of public services. These are usually provided by government offices and it is a common concern in developing countries that public service delivery is sluggish and sometimes contaminated by acts of corruption. Organizations providing land administration services still need to monitor performance and quality of service provided to the public (Mahashe, et al., 2017). It may difficult to measure the satisfaction level using direct indicators .but the customers were asked to express their satisfaction with the services they received from the land office.

**Table 4.12: Evaluation of respondents’ satisfaction on the system expert respondents**

		Frequency	Percent
A system data migration processes is not control when wrongly migrated.	Strongly Disagree	6	15.4
	Disagree	5	12.8
	Neutral	3	7.7
	Agree	12	30.8
	Strongly Agree	13	33.3
	Total	39	100.0
Network infrastructures affect NRLAIS online services and maintenances.	Strongly Disagree	4	10.3
	Disagree	5	12.8
	Neutral	6	15.4
	Agree	14	35.9
	Strongly Agree	10	25.6
	Total	39	100.0
Land office assigns experts based NRLAIS structure for each specific task.	Strongly Disagree	22	56.4
	Disagree	11	28.2
	Neutral	2	5.1
	Agree	2	5.1
	Strongly Agree	2	5.1
	Total	39	100.0
A system of land transaction process on NRLAIS is protecting the land holder land right security.	Strongly Disagree	20	51.3
	Disagree	5	12.8
	Neutral	2	5.1
	Agree	8	20.5
	Strongly Agree	4	10.3
	Total	39	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

As shown in the above Table 4.12, system user satisfaction on A system data migration processes is not control when wrongly migrated; response rates of strongly disagree 6(15.4%), disagree 5(12.5%), neutral 3(7.7%) and the remaining of 12(30.8%) and 13(33.3%) respectively agree and strongly agree respondent . NRLAIS indicates that the response rate wrongly data migration processes is challenges of the service is wrongly migrated to WORLAIS database revers kebele data and land holder information show that 25(64.1%) agree and strongly agree.

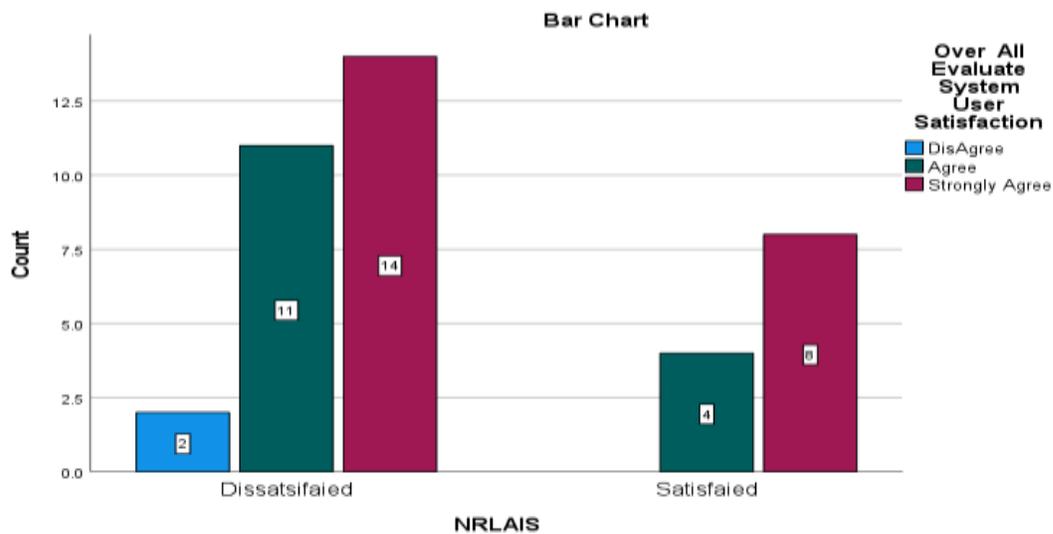
Network infrastructure plays a critical role in the performance, availability, and maintenance of NRLAIS online services. If the network is unstable, misconfigured, or poorly maintained, it can lead to service disruptions, slow response times, and security risks. Network infrastructures affect NRLAIS online services and maintenances.

From the above table respondents strongly disagree 4(10.3%), disagree 5(12.8%), neutral 6(15.4%), agree 14(35.9%) and strongly agree 10(25.6%) were NRLAIS is a barrier of user satisfactions by online service problems. From the total 39 respondents of agree and strongly agree (60%) NRLAIS online helping support service and maintenance does not accessible by a network infrastructure problems of system user satisfaction. From the above table respondents strongly disagree 22(56.4%), disagree 11(28.2%), neutral 2(5.1%), agree 2(5.1%) and strongly agree 2(5.1%)

The land office does not assign experts based on the requirements of NRLAIS services, and most of the existing experts have significant gaps in technical skills necessary for fast service delivery to landholders. According to the SPSS 27 output 22(56.4%) of respondents strongly disagreed 11(28.2%) disagreed, 2(5.1%) were neutral, 2(5.1%), agreed, and 2(5.1%) strongly agreed with the statement on expert assignment levels. This indicates that the system's civil service assignments rely more on general appointments rather than technical expertise. As a result, NRLAIS activities at the land office are hindered, leading to delays in service delivery and raising concerns about the sustainability of the system.

Moreover, the assignment of experts is not aligned with the needs of digital service delivery. Instead, the land office continues to follow assignment practices from the previous manual service delivery system, which negatively affects the efficiency of customer service under NRLAIS.

From the above table respondents strongly disagree 20(51.3%), disagree 5(12.5%), neutral 2(5.1%), agree 8(20.5%) and strongly agree 4(10.3%) were NRLAIS has a gape of data security issues are not strongly managed. from the total 39 respondents of disagree and strongly disagree (63%) A system of land transaction process on NRLAIS is protecting the land holder land right security issues has more working to be protect the land holder data. Consequently, more of the respondents were displeased with the clarity and transparency of services delivered by officials in the land office



**Figure 4.11. Cross-tabulation of system user satisfaction of NRLAIS by using a Bar chart**

**Source:** SPSS27 statistics output (2025)

As can be realized in the above chart more of the respondents 27 were dissatisfied with system user satisfaction on service delivery. Whereas, the remaining of 12 respondents were replied satisfied with the proper delivery of services in Bahir Dar Zuriya land office. This implies that system user dissatisfaction is one of the factors of NRLAI that turns to a negative effect. Therefore, the overall descriptive analysis result of representing the system user satisfaction variable

designates that dissatisfied. As a result, the efficiency and the system user satisfaction of the service delivery is poor in the Bahir Dar Zuriya land office. However, the system users have witnessed that the service provision is improving from time to time.

Moreover, based on (Alamgir et al., 2019) study revealed that the BPR has achieved remarkable results in simplifying service delivery working processes by avoiding unnecessary or non-value-adding steps. This is one justification for a better provision of services achieved after the BPR introduction in the land office. However, nowadays there is an indication of some reversal situations in the service delivery process of the land office. Moreover, the related study noted that transparency and accessibility of information is a critical component for the effective and efficient functioning of land information system (Adam & Birhanu, 2018).

As a result, the above replies of respondents indicate that the majority of respondents were dissatisfied with the inspiration of officials to provide services reliably. Furthermore, the researcher addressed in the interview reports that the system user satisfactions have asked regarding the capacity and behavior of the officials to deliver the land-related service effectively. Although the above reports have documented some outputs are achieved in this regard, however, there are still problems like not improved attitude of serving the citizens and the staff could not develop ethical standards.

As mentioned earlier, the satisfaction level of the system user of the land office is very low. The users have provided the reasons for their low rating to service satisfaction level. Most of the users have put reasons as long waiting time for the service, unavailability of qualified and ethical staff in the land office, and data quality problems for migrated and transaction service times are major challenges on Bahir Dar Zuriya rural land office.

#### **4.10. Inferential statistics**

Inferential statistics, on the other hand, involves making inferences, predictions, or generalizations about a larger population based on data collected from a sample of that population. It extends the findings from a sample to the population from which the sample was drawn.

Inferential statistics allow researchers to draw conclusions, test hypotheses, and make predictions about populations, even when it is impractical or impossible to study the entire population directly. in inferential statistics include hypothesis testing, where researchers test hypotheses about population parameters using sample data; regression analysis, where relationships between variables are examined and used to make predictions; and confidence intervals, which provide estimates of population parameters and their uncertainty levels Inferential statistics is used to draw conclusions and make inferences after analyzing data collected in surveys.

Inferential statistics include hypothesis tests and estimation to make comparisons and predictions and draw conclusions that will serve populations based on sample data.(Statistics, n.d.)

**Table 4.13: Binary logistic Regression model evaluation**

Variables Entered/Removed <sup>a</sup>

Variables Entered	Variables Removed	Method
A system data migration processes is not control when wrongly migrated. Respondent of Work Experience <sup>b</sup>		Enter

a. Dependent Variable: Respondent of Work Experience

b. All requested variables entered.

**Model Summary**

R	R Square		Change Statistics
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Model		Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	
1	1.000 <sup>a</sup>	1.000	1.000	.000	1.000	.	2	186	.

a. Predictors: (Constant), A system data migration processes is not control when wrongly migrated. Respondent of Work Experience

#### ANOVA <sup>a</sup>

Model		Sum of Squares	D f	Mean Square	F	Sig.
1	Regression	87.810	2	43.905	.	. <sup>b</sup>
	Residual	.000	186	.000		
	Total	87.810	188			

a. Dependent Variable: Respondent of Work Experience

b. Predictors: (Constant), A system data migration processes is not control when wrongly migrated. Respondent of Work Experience

#### Coefficients <sup>a</sup>

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	Correlations	Collinearity Statistics

		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero- order	Partial	Part ance	Toler ance	VIF
1	(Constant)	2.698	.000		.	.	2.698	2.698					
	Respondent of Work experience	.683	.000	1.000	.	.	.683	.683	1.000	1.000	.99 9	.997	1.003
	A system data migration processes is not control when wrongly migrated.	3.320 E-17	.000	.000	.	.	.000	.000	-.053	1.000	.00 0	.997	1.003

a. Dependent Variable: Respondent of Work experience

**Coefficient Correlations <sup>a</sup>**

Model		A system data migration processes is not control when wrongly migrated.	Respondent of Work Experience
1	Correlations	A system data migration processes is not control when wrongly migrated.	1.000 .053

	Respondent of Work experience	.053	1.000
Covariance's	A system data migration processes is not control when wrongly migrated.	.000	.000
	Respondent of Work experience	.000	.000

a. Dependent Variable: Respondent of Work Experience

**Collinearity Diagnostics <sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	(Constant)	Variance Proportions	
					Respondent of Work experience	A system data migration processes is not control when wrongly migrated.
1	1	1.053	1.000	.00	.47	.47
	2	1.000	1.026	1.00	.00	.00
	3	.947	1.055	.00	.53	.53

a. Dependent Variable: Respondent of Work Experience

## CHAPTER FIVE

### 5. SUMMARY OF FINDING, CONCLUSION, AND RECOMMENDATION

#### 5.1. SUMMARY OF FINDING

This study aimed to evaluate the performance of the National Rural Land Administration Information System (NRLAIS) at Bahir Dar Zuriya Woreda land office. The descriptive analysis indicates that the current practice of the land office is inefficient due to several challenges in the implementation of NRLAIS. These include a shortage of qualified technical experts to perform land administration activities, limited capacity-building initiatives, budget constraints, lack of vehicles for fieldwork, improper office management, inadequate office space, and insufficient surveying instruments for field tasks.

The findings reveal that institutional and technical capacity gaps are linked to explanatory variables such as the legal framework, infrastructure and database management systems, capacity-building provision, governance, and the quality of updated land data. The analysis shows that the current legal framework is not comprehensive and lacks sufficient detail to support effective NRLAIS functions. Furthermore, limited accessibility to data migration and inadequately updated records were identified as major weaknesses in the Bahir Dar Zuriya Woreda land office. Inferential analysis also demonstrates that the quality of data migration has a significant effect on NRLAIS performance.

In addition, the study found that land data archives were insecure, poorly maintained, and outdated. Descriptive analysis confirms that updated data quality significantly influences NRLAIS efficiency. Low levels of capacity building were also identified, primarily due to the lack of awareness creation and training for technical committees, experts, and employees of the institution.

Regarding governance, the findings indicate weak accountability of officials for their actions and decisions, unequal access to information, and the absence of clear and transparent services. Customer satisfaction was also assessed by examining variables that represent system-user

experiences. The results reveal low motivation among officials to deliver services, lack of transparency and clarity, poor discipline of staff in serving customers, repeated appointment delays, fragmented information provision, and unfair service fees all of which contribute to the inefficiency of the Bahir Dar Zuriya Woreda land office. Regression results further confirm that customer satisfaction has a significant effect on NRLAIS performance.

## **5.2. CONCLUSION**

The main objective of this study was to evaluate the performance of the National Rural Land Administration Information System (NRLAIS) in the Bahir Dar Zuriya Woreda Land Office, Amhara Region, Ethiopia. In doing so, the study examined the effects of several key factors, including the legal framework, data quality, capacity-building provisions, customer service delivery practices, infrastructure, database management systems, and system transaction performance. It also assessed the level of customer satisfaction with service delivery and explored the relationship between the efficiency of the rural land administration information system and its explanatory variables.

The findings of the study demonstrated that the efficiency of the NRLAIS is strongly and significantly associated with the legal framework, accessibility of the system, data quality, customer service delivery, capacity building, good governance, and customer satisfaction. Among these, the legal framework emerged as the most influential factor affecting the efficiency of the system. Furthermore, the study established that customer approval and satisfaction have a considerable effect on the overall performance of rural land administration in the study area.

Based on these insights, the study concludes that improving the efficiency of the NRLAIS in Bahir Dar Zuriya Woreda requires the development and implementation of clear and uniform legislation, the application of advanced technologies to support technical aspects of land administration, and the maintenance of updated and secure archives. In addition, the establishment of cadaster systems or second-level certification is essential for reducing land disputes, while the adoption of formal dispute resolution mechanisms, such as adjudication and geo-referencing, can enhance boundary accuracy and minimize conflicts. Equally important is the promotion of good governance to ensure

transparency and customer satisfaction, as well as the provision of regular awareness-raising and capacity-building programs for both experts and landholders.

In sum, the study highlights that addressing these factors is fundamental to achieving a more efficient, transparent, and customer-oriented rural land administration information system. Strengthening the legal framework, modernizing technical systems, improving governance, and enhancing stakeholder awareness are all crucial steps toward realizing a sustainable and effective land administration system in Bahir Dar Zuriya Woreda.

### **5.3. RECOMMENDATIONS**

Based on the findings and conclusions of this study, several recommendations are proposed to improve the efficiency of the rural land administration information system (NRLAIS) in Bahir Dar Zuriya Woreda.

First, the legal framework for rural land administration is unclear and inconsistent, creating confusion among officials and customers and undermining service delivery. The government, policymakers, and academicians should therefore collaborate to revise and simplify the framework. Establishing a uniform and easily applicable set of laws and guidelines would reduce disputes and ensure clarity in implementation.

Second, there is a shortage of skilled experts in the Woreda land office, particularly in legal and technical areas. This gap should be addressed through capacity-building initiatives:

- Short-term training to quickly fill immediate skill gaps.
- Long-term training to build sustainable expertise in administrative, technical, and managerial roles.

Third, the NRLAIS must be modernized and fully computerized. Gaps in infrastructure, database management, and file handling especially at the Woreda level pose risks to data quality and security. To address this:

- Land data should be updated regularly and safeguarded against informal alterations.
- Data migration must be validated to prevent errors.
- GIS and cadastral systems should be introduced to improve accuracy and usability.

Fourth, good governance and infrastructure must be strengthened. Weak accountability, transparency, and equity continue to undermine public trust, while frequent power and internet disruptions interrupt service delivery. To ensure continuity:

- Alternative energy sources, particularly solar systems, should be adopted.
- Strong monitoring and accountability mechanisms should be implemented to improve service quality and customer trust.

Fifth, service delivery should be streamlined. Bureaucratic procedures and weak communication between kebele and Woreda offices delay transactions. To improve efficiency:

- Tablet-based or web-based applications should be introduced to reduce unnecessary visits to the Woreda office.
- These systems would minimize costs, save time, and improve accessibility for landholders.

Sixth, information dissemination and customer engagement remain limited. Customers often lack awareness of available services and procedures. The land office should:

- Use notice boards, advertisements, and awareness campaigns to reach landholders.
- Implement simplified and transparent procedures that save time and resources.
- Ensure equal and timely access to services for all.

Finally, resource shortages pose serious challenges. Limited surveying equipment, vehicles, and technical instruments, combined with regional instability, constrain efficiency. Addressing these challenges requires:

- Adequate resource allocation to land offices.
- Stronger stakeholder coordination and government support to sustain improvements.

Looking forward, further research should not only examine technical and institutional issues of NRLAIS but also explore the broader social, economic, and environmental dimensions of rural land administration. This would provide a more holistic understanding and guide future reforms.

## **REFERENCE**

Abab, S. A., Wakjira, F. S., & Negash, T. T. (2021). Determinants of the land registration information system operational success: Empirical evidence from Ethiopia. *Land*, 10(12). <https://doi.org/10.3390/land10121394>

Access to land; Cadastre; Capacity building; Land management; Legislation; Security of tenure; land administration system (LAS); legal framework; legal pluralism; Constitution; land

- policy; customary law; social justice. (n.d.). September 2022, 11295.
- Aghnides, N. P. (2019). V. Preliminary Considerations. *Mohammedan Theories of Finance With an Introduction to Mohammedan Law and a Bibliography*, 354–376. <https://doi.org/10.7312/agh92034-017>
- Alamgir, M., Sloan, S., Campbell, M. J., Engert, J., Kiele, R., Porolak, G., Mutton, T., Brenier, A., Ibisch, P. L., & Laurance, W. F. (2019). Infrastructure expansion challenges sustainable development in Papua New Guinea. *PLoS ONE*, 14(7), 1–20. <https://doi.org/10.1371/journal.pone.0219408>
- Amaral, E. F. L. (2018). Lecture ( chapter 6 ): Introduction to inferential statistics : Sampling and the sampling distribution. 6(chapter 6), 144–159.
- Ayele, D. G. (2015). Determinants of fertility in Ethiopia. *African Health Sciences*, 15(2), 546–551. <https://doi.org/10.4314/ahs.v15i2.29>
- Baseline, C. (n.d.). *Creating the Project Schedule and Budget*.
- Blake, C. (2015). *The Application of Geospatial Information – Land Administration and Management*. Un-Ggim 3.1, July, 1–28. <http://ggim.un.org/meetings/GGIM-committee/documents/GGIM5/land admin and mngnt background paper 3.2 final.pdf>
- CANRS. (2017). *The Revised Rural Land Administration and Use Determination Proclamation Determination Proclamation of the Amhara National Regional State*. *Zikre Hig*, 14, 1–81.
- Chaurasia, A. (2018). Chapter 10 - Correlation and Regression - Part 1. 0.
- Computing, C. (2024). *Digital Notes on of Computer Science and Engineering*.
- Dawidowicz, A., Klimach, A., Sajnog, N., Lewandowicz, E., Kwiecien, J., Luczynski, R., & Banaszek, A. (2015). New challenges for land information systems in the light of European standards. *Researchgate.Net*, September 2016. [https://www.researchgate.net/profile/Kinga\\_Szopinska/publication/290429058\\_New\\_Challe](https://www.researchgate.net/profile/Kinga_Szopinska/publication/290429058_New_Challe)

nges\_for\_Land\_Information\_Systems\_in\_the\_light\_of\_European\_Standards/links/57ec3bbb08ae92a5dbd06769.pdf

Developing a Land Registration System using a Compromise between the Implementation of International Standards and Adaptation to Local Circumstances: The Cambodian Experience. (2007). May, 13–17.

Dolores, M., & Tongco, C. (2007). Definition of Purposive Sampling. *A Journal of Plants, People and Applied Research*, 5, 1–12.

Durán-Díaz, P. (2023). Sustainable Land Governance for Water–Energy–Food Systems: A Framework for Rural and Peri-Urban Revitalisation. *Land*, 12(10). <https://doi.org/10.3390/land12101828>

Enemark, S., Wasiamson, I., & Wallace, J. (2005). Building modern land administration systems in developed economies. *Journal of Spatial Science*, 50(2), 51–68. <https://doi.org/10.1080/14498596.2005.9635049>

Franklin, J. R. (2019). Information Technology. *Lecture Notes in Logistics*, February, 165–190. [https://doi.org/10.1007/978-3-319-92447-2\\_8](https://doi.org/10.1007/978-3-319-92447-2_8)

Gomm, R. (2008). Social Research Methodology. *Social Research Methodology*. <https://doi.org/10.1007/978-0-230-22911-2>

Hallett, S. H., Sakrabani, R., Keay, C. A., & Hannam, J. A. (2017). Developments in land information systems: examples demonstrating land resource management capabilities and options. *Soil Use and Management*, 33(4), 514–529. <https://doi.org/10.1111/sum.12380>

Islam, M. (2020). Data Analysis: Types, Process, Methods, Techniques and Tools. *International Journal on Data Science and Technology*, 6(1), 10. <https://doi.org/10.11648/j.ijdst.20200601.12>

Jing, Y., R Bennett, & Zevenbergen, J. (2014). Up-to-dateness in land administration: setting the

- record straight. Coordinates, November 2016.  
[https://www.fig.net/resources/articles\\_about\\_fig/coordinates/2014\\_04\\_coordinates.pdf](https://www.fig.net/resources/articles_about_fig/coordinates/2014_04_coordinates.pdf)
- Kanji, N., Cotula, L., Hilhorst, T., Kanji, N., Cotula, L., & Hilhorst, T. (2005). Can Land Registration Serve Poor and Marginalised groups? (Summary Report). Nottingham, UK: Russel Press. <https://s-sbol.com/imagebase0/imagebase/large/FC/0/3/6/4/1001004011044630.jpg>
- Kawulich, B. B. (2005). Participant observation as a data collection method. *Forum Qualitative Sozialforschung*, 6(2).
- Kebede, O. (2022). Land Administration : Securing Limited Resource with Skyrocketed Demand in. 3(1), 84–112.
- Lewis-Beck, M. S. (1974). Determining the importance of an independent variable: A path analytic solution. *Social Science Research*, 3(2), 95–107. [https://doi.org/10.1016/0049-089X\(74\)90006-4](https://doi.org/10.1016/0049-089X(74)90006-4)
- Materials, I. (n.d.). Chapter 5 : Network Infrastructure Chapter 5 : Network Infrastructure.
- McLaughlin. (2015). Rolling Easements As a Response To Sea Level Rise in Coastal. *Journal of Land Use and Environmental Law*, 26(2), 1–24.
- McIntyre, O., Graham, J., & Stump, B. (1988). *s Res ear c. I*, 554–558.
- Mengesha, A. K., Mansberger, R., Damyanovic, D., Agegnehu, S. K., & Stoeglehner, G. (2023). The Contribution of Land Registration and Certification Program to Implement SDGs: The Case of the Amhara Region, Ethiopia. *Land*, 12(1). <https://doi.org/10.3390/land12010093>
- Mengistu, E. Z., Tenno, T., Zein, T., Eversmann, B., Abza, T. G., Reda, Y., & Podolcsák, Á. (2018). Digital Cadastre With Manual Land Tenure Systems Scaling Up in Ethiopia. *Land Governance in an Interconnected World: Annual World Bank Conference on Land and Poverty*, 1–45. <https://www.oicrf.org/-/digital-cadastre-with-manual-land-tenure-systems->

scaling-up-in-ethiopia

Miller, A. W. (2018). Land Registration Process Modelling for Complex Land Tenure System in Ghana. 84. [https://library.itc.utwente.nl/papers\\_2018/msc/la/miller.pdf](https://library.itc.utwente.nl/papers_2018/msc/la/miller.pdf)

Muluneh, B., Kebede, K., & Mekasha, Y. (2016). Characterization of Indigenous Goat Breeding Practices and Production System in West Gojjam Zone, Amhara National Regional State, Ethiopia. *Journal of Natural Sciences Research* [Www.iiste.Org](http://www.iiste.org) ISSN, 6(5), 67–75. [www.iiste.org](http://www.iiste.org)

Networking Fundamentals © 2006. (2006).

Orkaido, K., & Youna, B. (2020). Determinants of Women Business Growth: Evidence from Micro and Small Scale Enterprises in Hawassa City Administration, Sidama Regional State, Ethiopia. *American Journal of Theoretical and Applied Business*, 6(4), 79. <https://doi.org/10.11648/j.ajtab.20200604.15>

Paradzayi, C., Chirigo, A., Goodwin, D., & Matyukira, C. (2008). Proposed GPS Survey Method for Cadastral Surveying of A2 Model Farms in Zimbab. *Discussion and Guiding Principles for Africa. Land Management Information Systems in the Knowledge Economy*, 1–294.

Pituch, K. A., & Stevens, J. P. (2020). Binary Logistic Regression. *Applied Multivariate Statistics for the Social Sciences*, 454–490. <https://doi.org/10.4324/9781315814919-16>

Redda, Y., Tenno, T., Hailu, Z., Tadesse, M., & Schoenweger, O. (2020). Building Harmonized Private and State Land Holding Data and Information Systems in Ethiopia. 3(2), 2657–2664.

REILA. (2015). Impact Consulting Oy Ltd June 2015. June.

Review, M. I. D. T. (2020). MID TERM REVIEW RESPONSIBLE AND INNOVATIVE LAND ADMINISTRATION ( REILA ) PROJECT. December.

Ruiz-Martínez, I., & Esparcia, J. (2020). Internet access in rural areas: Brake or stimulus as post-covid-19 opportunity? *Sustainability* (Switzerland), 12(22), 1–17.

<https://doi.org/10.3390/su12229619>

Sarmiento, R., & Costa, V. (2017). Descriptive Analysis. April, 83–113.  
<https://doi.org/10.4018/978-1-68318-016-6.ch004>

Sarstedt, M., & Mooi, E. (2016). Regression Analysis (Issue March 2014).  
<https://doi.org/10.1007/978-3-642-53965-7>

Shange, M. B. (2010). A system-based approach to land registration analysis and improvements.

Singirankabo, U. A., & Ertsen, M. W. (2020). Relations between land tenure security and agricultural productivity: Exploring the effect of land registration. *Land*, 9(5).  
<https://doi.org/10.3390/LAND9050138>

Stadtländer, C. T. K.-H. (2009). Qualitative, Quantitative, and Mixed-Methods Research. *Microbe Magazine*, 4(11), 485–485. <https://doi.org/10.1128/microbe.4.485.1>

Sustainable Land Management Sourcebook. (2008). In *Sustainable Land Management Sourcebook*. <https://doi.org/10.1596/978-0-8213-7432-0>

Systematic, L. O. F. (2023). ACTIONS ( REVIEW OF LAW BEFORE AND AFTER PP NUMBER 24 OF 1997. 28(3), 110–113.

The Federal Democratic Republic of Ethiopia (FDRE). (2005). FDRE Rural Land Administration and Use Proclamation no. 456/2005. *Federal Negarit Gazeta*, 3132–3144.

UNECE. (1996). Land Administration Guidelines With Special Reference to Countries in Transition. In United Nations.  
<https://www.fig.net/resources/publications/figpub/pub60/Figpub60.pdf>

USAID. (2004). Ethiopia Land Policy and Administration Assessment. March, 64.

Wabelo, T. S. (2020). Legal and Institutional Frameworks Regulating Rural Land Governance in Ethiopia: Towards a Comparative Analysis on the Best Practices of Other African Countries.

Beijing Law Review, 11(01), 64–98. <https://doi.org/10.4236/blr.2020.111005>

Wasiyamson, I., & Wallace, J. (2007). New Roles of Land Administration Systems. Proceedings, International Workshop on Good Land Administration - Its Role in Economic Development, July, 1–15.

Yellapu, V. (2019). Full Text Introduction. September. <https://doi.org/10.4103/IJAM.IJAM>

Zdruli, P., Ziadat, F., Nerilli, E., D’Agostino, D., Lahmer, F., & Bunning, S. (2016). Sustainable development of land resources. *Mediterra 2016 - Zero Waste in the Mediterranean: Natural Resources, Food and Knowledge*, October, 91–111.

Zein, T., Tigistu, ;, Abza, G., Tenno, T., Reda, Y., & Abera, T. (2019). THE INNOVATIVE NATIONAL RURAL LAND ADMINISTRATION INFORMATION SYSTEM OF ETHIOPIA Introduction The Federal Democratic Republic of Ethiopia’s land legislation gives significant powers to its regional.

Zevenbergen, J. (2002). Systems of land registration aspects and effects. NCG Nederlandse Commissie Voor Geodesie Netherlands Geodetic Commission, May, 210. <http://resolver.tudelft.nl/uuid:44e404e9-c1e9-4c20-b1e1-977ee9c11570>

**Bahir Dar University**

**Institute of Land Administration**

**Graduate Program in Land Administration and Management**



3. Male and Female Headed Land Holder

3. **Marital status:** 1. Married  2. Unmarried  3. Divorced

4. **Educations back ground:** 1. Illiterate  2. ad and Write  3.

Elementary Grade (9)  4. Grade 9-12  Other

**II. Evaluate the performance of the National Rural Land Administration Information System.**

**DIRECTION:** For each questions below, please tick mark (√) your response that you feel in the existing reality from the alternative scales that best suit for the question; where in;

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree

<b>A. To assess network infrastructures and database management on the NRLAIS in Bahir Dar Zuriya Woreda.</b>	5	4	3	2	1
1. A system networking infrastructures are very poor to deliver fast service related to land transactions.					

2. NRLAIS infrastructures power problem distributes across digital services					
3. Database users that designed and assigned to Read only, Write and Approval activities are poor to secured land right transactions.					

<b>B. To identify the contribution of legal framework on NRLAIS</b>	5	4	3	2	1
1. NRLAIS transaction service working procedures are not clearly stated					
2. A system transaction application formats are not developed based on legal provisions					
3. NRLAIS service activities are long path to land transactions					
4. A system transaction service application document is not specified by procedures					
5. NRLAIS transaction service working procedures are not clearly stated					
<b>C: To identify the technical strengths, weaknesses, and challenges of the NRLAIS</b>					
1. NRLAIS and analogy service is gone side by side for transactions					
2. NRLAIS data has quality problems for transactions services.					
3. A Landholder service application format processes have long paths.					
<b>C. To evaluate system users satisfaction</b>	5	4	3	2	1

1. NRLAIS has a gap of knowledge and skills of information technology experts.					
2. A system has given a fast service delivery in transaction processes.					
3. NRLAIS transaction application process is highly bureaucracy ways.					
4. A land user does not access NRLAIS service due to shortage of power.					

**III. Open ended questions**

1. How do you explain the strength and weaknesses of NRLAIS for a land transaction services?

-----

2. Where and how do land holders get a transaction application formats?

-----

3. Would you please list the advantages of NRLAIS transaction services?

-----

4. What are the problems of NRLAIS?

-----

5. How much times it takes to finalize one transaction completely give to land holders?

-----

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**Appendix II: Questionnaire for Experts**

The objective of the survey is to get information n performance assessment on NRLAIS. The participation and support of the major stakeholders are the special focus.

**Dear Respondents!**

My name is Habtamu Demelash Beyene who has currently studying for masters of Land Administration and Management at Bahir Dar University institute of land Administration department of Land Administration and Surveying. Currently, I am working on my Msc research titled “Evaluating the performance of the National Rural Land Administration Information System: The case of Bahir Dar Zuriya Woreda, Amhara Region, Ethiopia”. Questionnaires are prepared to collect data related to the topic of study and achieve its objectives and will be utilized only for the purpose of this study. Please also be noted that your participation is entirely free and voluntary. With regards to the confidentiality of the data, I commit to keeping all your responses as confidential as possible. I thank you in advancer your time and contributing your input to the completion of this research.

**I. Back ground information**

**Put tick mark (√) on the box**

2. **Age** 1. 18-30  2. 31-40  3. 42-50  4. 50 and above
3. **Gender:** 1. Male  2. Female
4. **Marital status:** 1. Married  2. Unmarried  3. Divorced
5. **Educations back ground:** 1. IT  2. GIS  3. Remote sensing  4. Geography  5.   
Land administration & Mgt  Surveying  Low  8. Economics  9. Others
6. **Education level:** 1. Diploma  2. BSc  3. MSC  4. PHD  5. Others
7. **Job title:** 1. Land registration  2. GIS  3. Surveying  4. Land transaction   
5. Cadastral  6. Land information system  7. Low  8. Credit and saving   
9. Team leader  10. others

8. **Experience:** 1.  $\leq 3$   2. 3-6  3.  $\geq 6$

**5 Evaluate the performance of the National Rural Land Administration Information System.**

**DIRECTION:** For each questions below, please tick mark (√) your response that you feel in the existing reality from the alternative scales that best suit for the question; where in;

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree

<b>A. To assess network infrastructures and database management on the NRLAIS in Bahir Dar Zuriya Woreda.</b>	5	4	3	2	1
1. NRLAIS is ready and fully functional for land transactions activities.					
2. Database structural layout is very clear and user friendly to use.					
3. A system database decentralized approach becomes barrier for data communications.					
4. A backup mechanism which is manual specially for Woreda levels is a disadvantage of NRLAIS					
5. A system test mechanisms affects existing system.					

<b>B. To identify the contribution of legal framework on NRLAIS</b>	5	4	3	2	1
1. NRLAIS transactions are not supported by land administration proclamations.					
2. System transaction is not supported by spatial legal frameworks.					

3. A system business processes does not control data quality tools					
<b>C. To identify the technical strengths, weaknesses, and challenges of the NRLAIS</b>					
1. Institutional arrangements are established based on land administration functions.					
2. NRLAIS data migration has faced a problem on attribute and spatial data to Woreda land administration information system (WORLAIS)					
3. NRLAIS transaction service materials need high budget.					
4. A system hardware component is affect service delivery interactions.					
5. NRLAIS software slow down when upload land holder application document					

<b>D. To evaluate system users satisfaction</b>	5	4	3	2	1
1. A system data migration processes is not control when wrongly migrated.					

2. Network infrastructures affect NRLAIS online services and maintenances.					
3. Land office assigns experts based NRLAIS structure for each specific task.					
4. A system of land transaction process on NRLAIS is protecting the land holder land right security.					

**IV. Open ended questions**

1. How do you evaluate strength and weakness of the land administration proclamations and regulatory frameworks to meet the needs of NRLAIS functionality? -  
 -----
2. What measures would you often take when power is off or lost?  
 -----
3. What problems are affecting the customer returns without access the service?  
 -----
4. What are the challenges of NRLAIS to deliver services to the customers?  
 -----
5. What are the problems of system test control mechanisms are affects existing system?  
 -----

**Appendix III: Observation Checklist**

1. What fees do landowners or beneficiaries need to pay to obtain services once they are published?
2. Which services were previously provided using paper, and which services are now provided by the system? If you believe the system is superior, can you list the specific advantages?
3. What challenges do service seekers encounter that make it difficult for them to access services through the system?

4. How well has the system been received by service seekers?
5. When visiting the district land office for service, what issues do you find unresolved when you leave?
6. How frequently do you utilize service providers through the system?
7. What benefits has the district institution, as a community, gained from using this system?
8. The customers Where did get the transaction formats?

## Appendix IV: SPSS Analysis Results of House Hold Headed

### Appendix A: Assessing the network infrastructures and database management system on NRLAIS

Description of statements	Participants response		
	Frequency	Percent	
A system networking infrastructures are very poor to deliver fast service related to land transactions.	Strongly Disagree	7	3.7
	Disagree	21	11.1
	Neutral	20	10.6
	Agree	65	34.4
	Strongly Agree	75	39.7
	Total	189	100.0
NRLAIS infrastructures power problem distributes across digital services	Strongly Disagree	4	2.1
	Disagree	20	10.6
	Neutral	11	5.8
	Agree	75	39.7
	Strongly Agree	79	41.8
	Total	189	100.0
Database users that designed and assigned to Read only Write and Approval activities are poor to secured land right transactions.	Strongly Disagree	5	2.6
	Disagree	29	15.3
	Neutral	17	9.0
	Agree	71	37.6
	Strongly Agree	67	35.4
	Total	189	100.0

Sources: Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

**Appendix B: The contribution of legal framework on NRLAIS respondents of House Hold Headed**

Description of statements	Participants response		
		Frequency	Percent
NRLAIS transaction service working procedures are not clearly stated	Strongly Disagree	17	9.0
	Disagree	19	10.1%
	Neutral	12	6.3
	Agree	76	40.2
	Strongly Agree	65	34.4
	Total	189	100.0
A system transaction application formats are not developed based on legal provisions	Strongly Disagree	7	3.7
	Disagree	20	10.6
	Neutral	17	9.0
	Agree	83	43.9
	Strongly Agree	62	32.8
	Total	189	100.0
NRLAIS service activities are long path to land transactions	Strongly Disagree	5	2.7
	Disagree	23	12.2
	Neutral	19	10.1
	Agree	73	38.8
	Strongly Agree	68	36.2
	Total	188	100.0

A system transaction service application document is not specified by procedures	Strongly Disagree	6	3.2
	Disagree	20	10.6
	Neutral	31	16.4
	Agree	60	31.7
	Strongly Agree	72	38.1
	Total	189	100.0

Sources: Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

### Appendix C: Technical strengths, weaknesses, and challenges of the NRLAIS respondents of House Hold Headed

Description of statements	Participants response		
	Frequency	Percent	
NRLAIS and analogy service is gone side by side for transactions	Strongly Disagree	24	12.7
	Disagree	25	13.2
	Neutral	5	2.6
	Agree	75	39.7
	Strongly Agree	60	31.7
	Total	189	100.0
NRLAIS data has quality problems for transactions services.	Strongly Disagree	23	12.2
	Disagree	34	18.0
	Neutral	14	7.4
	Agree	66	34.9

	Strongly Agree	52	27.5
	Total	189	100.0
A Landholder service application format processes have long paths.	Strongly Disagree	4	2.1
	Disagree	10	5.3
	Neutral	17	9.0
	Agree	88	46.6
	Strongly Agree	70	37.0
	Total	189	100.0

Sources: **Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025**

#### **Appendix D: Evaluate System User Satisfaction respondents of House Hold Headed**

Description of statements	Frequency	Percent
NRLAIS has a gap of knowledge and skills of information technology experts.	Strongly Disagree	4 2.1
	Disagree	5 2.6
	Neutral	11 5.8
	Agree	95 50.3
	Strongly Agree	74 39.2
	Total	189 100.0
A system has given a fast service delivery in transaction processes.	Strongly Disagree	3 1.6
	Disagree	7 3.7
	Neutral	9 4.8
	Agree	86 45.5

	Strongly Agree	84	44.4
	Total	189	100.0
NRLAIS transaction application process is highly bureaucracy ways.	Strongly Disagree	26	13.8
	Disagree	25	13.2
	Neutral	11	5.8
	Agree	65	34.4
	Strongly Agree	62	32.8
	Total	189	100.0
A land user does not access NRLAIS service due to shortage of power.	Strongly Disagree	1	0.5
	Disagree	14	7.4
	Neutral	13	6.9
	Agree	94	49.7
	Strongly Agree	67	35.4
	Total	189	100.0
NRLAIS digital land services save time, energy and money for landholders.	Strongly Disagree	0	0.0
	Disagree	2	1.1
	Neutral	5	2.6
	Agree	97	51.3
	Strongly Agree	85	45.0
	Total	189	100.0

**Sources:** Bahir Dar Zuriya Woreda, Yigodina Tentela and yesala gulagulma kebele 2025

## Appendix V: SPSS Analysis Results of Experts

### Appendix A: Network infrastructures and Database management expert respondents

Description of statements		Frequency	Percent
NRLAIS is ready and fully functional for Land transactions activities.	Strongly Disagree	9	23.1
	Disagree	13	33.3
	Neutral	4	10.3
	Agree	6	15.4
	Strongly Agree	7	17.9
	Total	39	100.0
Database structural layout is very clear and user friendly to use	Strongly Disagree	0	0.0
	Disagree	9	23.1
	Neutral	1	2.6
	Agree	16	41.0
	Strongly Agree	13	33.3
	Total	39	100.0
A system database decentralized approach becomes barrier for data communications	Strongly Disagree	2	5.1
	Disagree	4	10.3
	Neutral	1	2.6
	Agree	18	46.2
	Strongly Agree	14	35.9
	Total	39	100.0

A backup mechanism which is manual specially for Woreda levels is a disadvantage of NRLAIS	Strongly Disagree	2	5.1
	Disagree	2	5.1
	Neutral	3	7.7
	Agree	17	43.6
	Strongly Agree	15	38.5
	Total	39	100.0
A system test mechanisms affects existing system.	Strongly Disagree	2	5.1
	Disagree	2	5.1
	Neutral	2	5.1
	Agree	16	41.0
	Strongly Agree	17	43.6
	Total	39	100.0

Sources: Bahir Dar Zuriya Woreda 2025

### Appendix B: Legal framework aspects on NRLAIS export respondents

Description of statements		Frequency	Percent
NRLAIS transactions are not supported by land administration proclamations.	Strongly Disagree	0	0.0
	Disagree	2	5.1
	Neutral	3	7.7
	Agree	17	43.
	Strongly Agree	17	43.6
	Total	39	100.0
System transaction is not supported by spatial legal frameworks.	Strongly Disagree	0	0.0
	Disagree	1	2.6
	Neutral	3	7.7

	Agree	12	30.8
	Strongly Agree	23	59.0
	Total	39	100.0
A system business processes does not control data quality tools	Strongly Disagree	0	0.0
	Disagree	1	2.6
	Neutral	2	5.1
	Agree	22	56.4
	Strongly Agree	14	35.9
	Total	39	100.0

Sources: Bahir Dar Zuriya Woreda 2025

### Appendix C: Strength, weakness and challenges of NRLAIS expert respondents

Description of statements		Frequency	Percent
Institutional arrangements are established based on land administration functions.	Strongly Disagree	16	41.0
	Disagree	12	30.8
	Neutral	1	2.6
	Agree	6	15.4
	Strongly Agree	4	10.3
	Total	39	100.0
NRLAIS data migration has faced a problem on attribute and spatial data to Woreda land administration information system (WORLAIS)	Strongly Disagree	0	0.0
	Disagree	0	0.0
	Neutral	1	2.6
	Agree	17	43.6
	Strongly Agree	21	53.8
	Total	39	100.0
NRLAIS transaction service materials need high budget	Strongly Disagree	0	0.0
	Disagree	0	0.0
	Neutral	0	0.0

	Agree	20	51.3
	Strongly Agree	19	48.7
	Total	39	100.0
A system hardware component is affect service delivery interactions.	strongly Disagree	1	2.6
	Disagree	0	0.0
	Neutral	1	2.6
	Agree	21	53.8
	Strongly Agree	16	41.0
	Total	39	100.0
NRLAIS software slow down when upload land holder application document	Strongly Disagree	1	2.6
	Disagree	2	5.1
	Neutral	1	2.6
	Agree	19	48.7
	Strongly Agree	16	41.0
	Total	39	100.0

Sources: Bahir Dar Zuriya Woreda 2025

#### Appendix D: Evaluate System user satisfaction expert respondents

		Count	Percent
A system data migration processes is not control when wrongly migrated.	Strongly Disagree	6	15.4
	Disagree	5	12.8
	Neutral	3	7.7
	Agree	12	30.8
	Strongly Agree	13	33.3
	Total	39	100.0
Network infrastructures affect NRLAIS online services and maintenances.	Strongly Disagree	4	10.3
	Disagree	5	12.8
	Neutral	6	15.4
	Agree	14	35.9

	Strongly Agree	10	25.6
	Total	39	100.0
Land office assigns experts based NRLAIS structure for each specific task.	Strongly Disagree	22	56.4
	Disagree	11	28.2
	Neutral	2	5.1
	Agree	2	5.1
	Strongly Agree	2	5.1
	Total	39	100.0
	A system of land transaction process on NRLAIS is protecting the land holder land right security.	Strongly Disagree	20
Disagree		5	12.8
Neutral		2	5.1
Agree		8	20.5
Strongly Agree		4	10.3
Total		39	100.0

**Sources:** Bahir Dar Zuriya Woreda 2025