Effectiveness of Digital Land Administration in Land Tenure Security in Nasarawa State, Nigeria

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https://doi.org/10.56201/ijgem.vol.12.no10.2026.pg424.442

Abstract
Land tenure security is an important component of effective land administration and sustainable development. This study examined the relationships between deed-record efficiency, access to land administration services among rural and vulnerable groups, and land tenure security in Nasarawa State, Nigeria. A survey research design was adopted, involving 520 respondents selected purposively from Nasarawa Geographic Information Service (NAGIS) clients, land administration professionals and other stakeholders. Data were collected using structured questionnaires and analysed using descriptive statistics and Pearson's Product Moment Correlation. The findings revealed a strong, positive and statistically significant relationship between deed-record efficiency and land tenure security ($r = 0.721$, $p < 0.001$). Similarly, access to land administration services among rural and vulnerable groups had a strong, positive and significant relationship with land tenure security ($r = 0.681$, $p < 0.001$). However, respondents identified concerns regarding possible record manipulation, registration support, government policy effectiveness and equitable access to land services. The study concludes that reliable deed-record management and inclusive access to land administration services are important priorities for strengthening land tenure security in Nasarawa State. It recommends improving the accuracy and security of deed records while simplifying registration procedures and addressing barriers faced by rural and vulnerable groups.

Keywords: *Deed records, digital land administration, land tenure security, NAGIS, rural and vulnerable groups, Nasarawa State.*

1. Introduction

Insecurity of tenure arises from uncertainty, often caused by land rights conflicts. Sen (2000) uses a powerful metaphor, comparing someone without land tenure security to being "without a limb." This lack of security can lead to significant economic and social hardship. The definition of land tenure security in sub-Saharan Africa emphasizes its dynamic nature. It's seen as an evolving characteristic of a land tenure system, shaped by ongoing processes and interactions (United Nation, 2015) Land is the most prominent assets in most nations of the world. Land administration is fundamentally meaning of managing the relationship between individuals and land, hence, can be centred on the bases of people centric. The major reason of perfect land administration system is to form open showcase economies which can in turn transform land into a financial product. It

too offer assistance to control method, strategies and benchmarks related to the generation, administration and dispersal of land data framework that are made within the prepare executing the operations of land administration (Bennett et al.,2021). The centres capacities of land administration are based on the accurate boundary study of the land allocate and the enlistment of rights over that allocate. It is for this reason that need ought to be given to making strides the information quality, productivity of administrations, and exactness of the geometry of the divide and arrive enlist (Abdulghani et al., 2022).

Land organization system gives a nation fundamental the foundation for execution of land approaches and land administration procedures which was in turn back maintainable advancement. The capacity of a country to open its economy for international ventures is evaluated as on how commerce is encouraged. A cardinal degree of ease of doing commerce for any present day economy relates among others on how property based exchanges and land utilize and improvement forms are conducted Al-ossmi, (2024). Data especially on arrive titling, and property rights as executed is key to intending financial specialists and it is for this reason that the land organization system requires spatial system to function. A digitalization of the land administration system is critical to supply dependable information on lands counting its residency and other measurements to conclusion clients (Rodima-Taylor, 2021).

Halim and Ifediora (2023) noted that obliged by operational hiccups that emerge with manual land organization forms, numerous states in Nigeria have as of late grasped a digitalisation of the arrive organization frameworks utilizing a geographical information design that have irrelevantly progressed their pre-GIS execution levels. Spearheaded by the Service of the Federal Capital Region in the late 80s as implies to oversee the multi-faceted issues of overseeing land titling and transaction related infractions, Topographical Data Frameworks has gotten to be the foremost sought-after hone for Nigerian states (Oruonye et al., 2021). The method of securing and setting up GIS based land organization in Nigeria is exceptionally expensive and is ordinarily defended on the requirement to establish a straightforward utilitarian land administration framework (Pilevar et al., 2020). Underneath the objective of accomplishing straightforwardness in land organizations, recipients have come to be burdened with exceptionally tall benefit conveyance charges and it is basic to investigate the challenges going up against the foundation of GIS based arrive organization.

2. Materials and Methods

2.1 Study Area

Nasarawa State is located in the North-Central geopolitical zone of Nigeria, within the Middle Belt region. It lies approximately between latitudes 7°45′N and 9°25′N and longitudes 7°00′E and 9°37′E. The state shares boundaries with Kaduna State to the north, Plateau State to the northeast, Taraba State to the east, Benue State to the south, Kogi State to the southwest, and the Federal Capital Territory (FCT), Abuja, to the west. Its capital is Lafia, and the state comprises 13 Local Government Areas: Akwanga, Awe, Doma, Karu, Keana, Keffi, Kokona, Lafia, Nasarawa, Nasarawa Eggon, Obi, Toto, and Wamba (Nasarawa State Government, Ministry for Local Government, Community Development and Chieftaincy Affairs, n.d.).

The landscape comprises undulating plains, lowlands, hills, and rocky outcrops. Elevated terrain is prominent in parts of Nasarawa, Nasarawa Eggon, Wamba, Keffi, and Akwanga, while relatively extensive plains occur around Lafia, Doma, Awe, and Keana. The Benue River and its tributaries form important components of the state's drainage network, supporting agricultural activities and other land-based livelihoods (Federal Ministry of Environment, n.d.).

Nasarawa State experiences a tropical climate characterised by distinct wet and dry seasons. The rainy season generally begins around April or May and extends to October, while the dry season occurs approximately from November to April. Annual rainfall varies across the state, with estimates ranging from about 1,100 mm to 1,600 mm. These climatic conditions influence agricultural production, vegetation distribution, surface runoff, and seasonal water availability (Mecon Geology and Engineering Services Ltd., n.d.).

Agriculture is a major livelihood activity in the state, alongside trading, mining, public service, and other commercial activities. The state's proximity to Abuja has also encouraged urban expansion, population movement, land-market growth, and increasing demand for residential, commercial, and institutional land. These changes have increased the importance of effective land administration, reliable land records, transparent property transactions, and secure land tenure.

The Nasarawa Geographic Information Service (NAGIS) supports land administration through the application of geographic information systems and related geospatial technologies. Its activities include the management of spatial land information and support for land documentation and related administrative processes. The state's combination of expanding urban settlements, peri-urban development, and rural landholding systems provides a relevant setting for examining how digital land administration influences land tenure security.

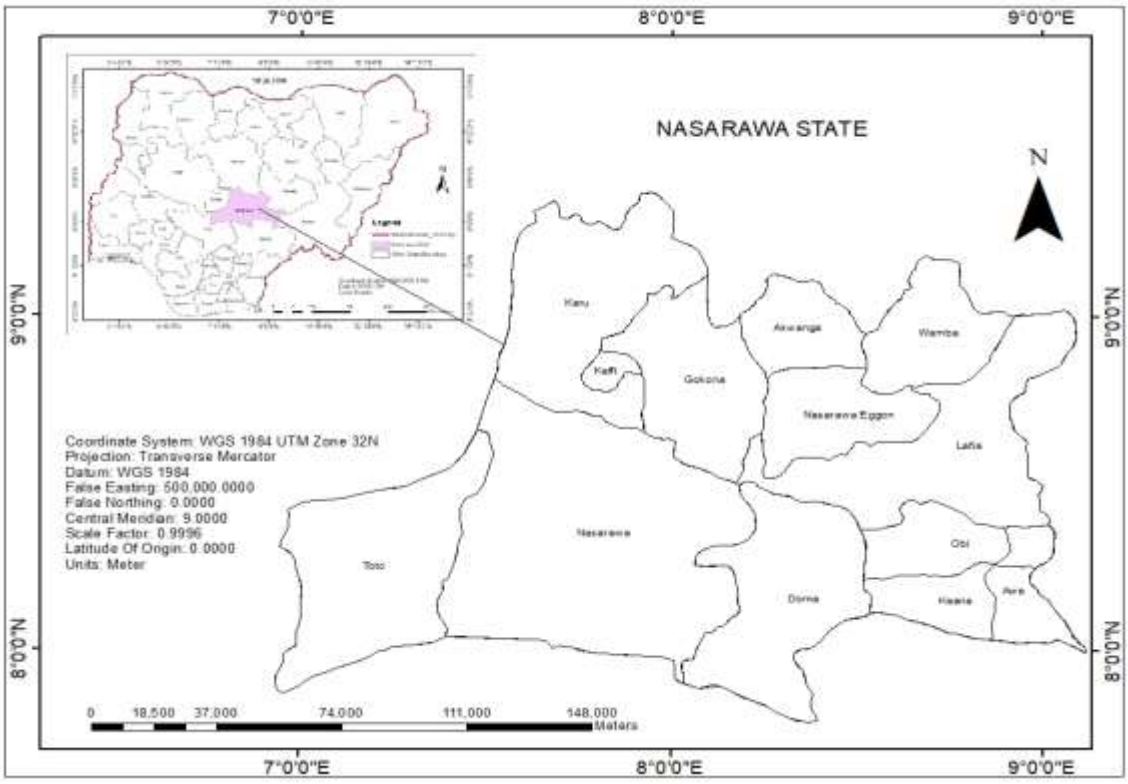


Figure 1: Nasarawa State, Nigeria, showing its Local Government Areas

Research Design

The study adopted a survey research design to examine the impact of digital land administration on land tenure security in Nasarawa State, Nigeria. The design facilitated the collection of data

from clients of the Nasarawa Geographic Information Service (NAGIS) and relevant stakeholders regarding land documentation, service delivery, transparency, accessibility, and tenure security.
A total of 520 respondents were selected through purposive sampling from NAGIS clients and key stakeholders. The sampling frame was based on approximately 25,000 Certificates of Occupancy generated between 2012 and 2025. Questionnaires were administered to respondents at the NAGIS offices in Lafia and Karu. Participants were selected based on their experience with or knowledge of land administration processes relevant to the study.
Eligible participants included NAGIS clients aged 18 years and above who had accessed land administration services, landowners or applicants involved in land documentation and registration, and relevant stakeholders with professional or administrative knowledge of land administration. Participation was voluntary, and respondents were expected to provide information relevant to the study objectives.

Sampling Technique and Sample Size

The study employed purposive sampling to select 520 respondents from NAGIS clients, land administration professionals, and other key stakeholders in Nasarawa State. The sampling frame was based on approximately 25,000 Certificates of Occupancy generated between 2012 and 2025. Questionnaires were administered at the NAGIS offices in Lafia and Karu.
The sample comprised 400 NAGIS clients and 120 land administration professionals and other key stakeholders, with 260 respondents allocated to each office. The distribution is presented in Table 1.

Table 1: Distribution of Respondents by Category and NAGIS Office

Respondent category	Lafia office	Karu office	Total
NAGIS clients	200	200	400
Land administration professionals and other key stakeholders	60	60	120
Total	**260**	**260**	**520**

The distribution provided equal representation of the two NAGIS offices within the study sample. NAGIS clients constituted 76.9% of the respondents, while land administration professionals and other key stakeholders accounted for 23.1%. The resulting sample of 520 respondents provided the basis for assessing perceptions of digital land administration and its relationship with land tenure security in Nasarawa State.

Sources and Methods of Data Collection

Primary data were collected through a structured questionnaire designed to obtain respondents' views on land-administration accessibility, efficiency, transparency, service reliability, and perceived land tenure security. The questionnaire used a five-point Likert response scale ranging from Strongly Agree to Strongly Disagree. The draft also describes focus group discussions with stakeholders, potentially including representatives of agricultural development agencies, market associations, and the Nasarawa Urban Development Board
Secondary information was reportedly obtained from official land-administration records and NAGIS, including deed-register information, mortgage registrations, and Certificates of

Occupancy. Other materials included an administrative map and relevant books, journal articles, reports, and government documents.

Method of Data Analysis

Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to summarise respondents' assessments of NAGIS efficiency and land tenure security. Pearson Product Moment Correlation (PPMC) was used to examine the relationships between NAGIS efficiency and perceived land tenure security, deed-record efficiency, and access to land administration services among rural and vulnerable groups. Statistical significance was assessed at the 0.05 level, with probability values displayed as 0.000 reported as $p < 0.001$.

3. Results and Discussion

3.1 Efficiency of Nasarawa Geographic Information System in Land Tenure Security

As shown in Table 2, the findings reveal that 93.7% of respondents agreed that land ownership documentation has become more efficient under NAGIS (Mean = 4.09, SD = 0.739). This indicates that respondents generally perceived an improvement in the efficiency of land documentation following the adoption of NAGIS. The finding suggests that digital land administration has enhanced the organisation, storage and retrieval of land records. This is consistent with Sullivan et al (2019), who observed that digital land information systems can improve documentation efficiency by reducing dependence on manual record-keeping and limiting the risks associated with misplaced, duplicated or inaccessible records. Digital platforms can therefore improve the reliability and accessibility of land information and contribute to more efficient land administration.

Similarly, 78.9% of respondents agreed that NAGIS has reduced land disputes and overlapping claims (Mean = 3.83, SD = 1.213). Although the mean indicates general agreement, the relatively higher standard deviation suggests some variation in respondents' experiences. This finding is consistent with Abdullah et al (2020), who reported that digital land administration systems can contribute to the reduction of boundary conflicts and overlapping claims through the provision of more accurate spatial information and land ownership records. Improved cadastral databases and geospatial technologies can facilitate clearer identification of property boundaries and ownership information, thereby supporting the management of land-related disputes.

Furthermore, 79.8% of respondents agreed that NAGIS provides adequate security for land tenure (Mean = 3.79, SD = 1.101). This indicates that a substantial proportion of respondents perceived the system as contributing to the protection and security of land rights. The finding corresponds with Sullivan et al (2019), who noted that digital land administration systems can strengthen tenure security by improving the credibility, accessibility and permanence of land records. Reliable land documentation provides documentary evidence of ownership and interests in land and can therefore contribute to greater confidence in tenure arrangements.

The analysis also shows that 89.8% of respondents agreed that NAGIS is accessible and easy to use (Mean = 4.16, SD = 0.927). This suggests that respondents generally regarded the system as reasonably accessible and user-friendly. Accessibility is an important component of effective digital land administration because landowners and other users need to obtain information and access administrative services without unnecessary difficulties. This observation agrees with Abdullah et al (2020), who noted that user-friendly digital land administration platforms can improve public interaction with land services and encourage greater utilisation of digital administrative systems.

Transparency in land administration recorded the highest mean score of 4.23, with 92.7% of respondents agreeing that NAGIS has increased transparency in land administration. This indicates a strong perception that digitalisation has enhanced openness in land management processes. Greater transparency can facilitate the verification of land information, improve accountability and reduce opportunities for discretionary manipulation of records. The finding is consistent with Sullivan et al. (2019), who emphasised the potential of digital land records to improve transparency by making land information more accessible and reducing excessive dependence on discretionary manual processes.

In addition, respondents expressed a high level of confidence in NAGIS, with 92.5% agreeing that landowners feel more confident under the system (Mean = 4.05, SD = 0.741). Similarly, 94.6% agreed that NAGIS services are timely and reliable (Mean = 4.11, SD = 0.604). These findings suggest that respondents generally perceived improvements in confidence, service delivery and reliability. The relatively low standard deviation for service timeliness and reliability further indicates a comparatively high degree of consistency in respondents' assessments. Similar observations were reported by Abdullah et al (2020), who found that digital land administration can streamline administrative procedures and improve the efficiency and reliability of land-related services.

Moreover, 92.7% of respondents agreed that NAGIS has reduced corruption in land dealings (Mean = 4.13, SD = 0.751), while 95.6% expressed satisfaction with the handling of land information (Mean = 4.12, SD = 0.594). These findings demonstrate strong positive perceptions of the system's contribution to accountability and information management. The high satisfaction score, together with the relatively low standard deviation, indicates considerable consistency in respondents' assessments of NAGIS land information handling. Sullivan et al (2019) similarly observed that digital land administration can reduce opportunities for corrupt practices by creating more traceable records and reducing excessive human intervention in land information management.

Despite the generally positive assessment, 85.2% of respondents agreed that major challenges still limit the efficiency of NAGIS (Mean = 4.09, SD = 1.012). This finding is important because it indicates that positive perceptions of NAGIS coexist with recognition of continuing operational constraints. Such challenges may include bureaucratic procedures, inadequate technological infrastructure, limited technical capacity, system maintenance problems and institutional coordination difficulties. Abdullah et al (2020) similarly emphasised that the effectiveness of digital land administration reforms depends on adequate institutional capacity, technological infrastructure and sustained system maintenance.

In summary, the results presented in Table 4.2 indicate that respondents generally perceived NAGIS as effective in improving land documentation, accessibility, transparency, service reliability, corruption reduction, information handling and land tenure security. The highest mean score was recorded for increased transparency in land administration (Mean = 4.23), while the lowest mean was recorded for adequate security for land tenure (Mean = 3.79). Nevertheless, the high level of agreement that major challenges continue to limit NAGIS efficiency demonstrates that the positive assessment does not imply the absence of institutional and operational constraints. The PPMC analysis further provides an inferential basis for examining the relationship between NAGIS efficiency and land tenure security.

Table 2: Efficiency of NAGIS in Land Tenure Security

S/N	Variables	SA	A	UD	D	SD	Mean	STD
i.	Land ownership documentation more efficient	118 (22.7)	369 (71.0)	9 (1.7)	11 (2.1)	13 (2.5)	4.09	0.739
ii.	Reduced land disputes and overlapping claims	161 (31.0)	249 (47.9)	14 (2.7)	52 (10.0)	44 (8.5)	3.83	1.213
iii.	Adequate security for land tenure	116 (22.3)	299 (57.5)	23 (4.4)	45 (8.7)	37 (7.1)	3.79	1.101
iv.	Accessible and easy to use	192 (36.9)	275 (52.9)	15 (2.9)	18 (3.5)	20 (3.8)	4.16	0.927
v.	Increased transparency in land administration	204 (39.2)	278 (53.5)	10 (1.9)	11 (2.1)	17 (3.3)	4.23	0.859
vi.	Landowners feel more confident	103 (19.8)	378 (72.7)	16 (3.1)	8 (1.5)	15 (2.9)	4.05	0.741
vii.	Services are timely and reliable	104 (20.0)	388 (74.6)	15 (2.9)	8 (1.5)	5 (1.0)	4.11	0.604
viii.	Reduced corruption in land dealings	139 (26.7)	343 (66.0)	15 (2.9)	12 (2.3)	11 (2.1)	4.13	0.751
ix.	Satisfied with NAGIS land information handling	104 (20.0)	393 (75.6)	10 (1.9)	8 (1.5)	5 (1.0)	4.12	0.594
x.	There are still major challenges limiting NAGIS efficiency	198 (38.1)	245 (47.1)	25 (4.8)	31 (6.0)	21 (4.0)	4.09	1.012

Note: *N = 520; SA = Strongly Agree, A = Agree, UD = Undecided, D = Disagree, SD = Strongly Disagree.*

Correlation Analysis on Efficiency of NAGIS in Land Tenure Security Variables

The Pearson Product Moment Correlation (PPMC) was used to examine the relationship between the efficiency of NAGIS and land tenure security. The analysis was based on the responses of 520 respondents, with the level of significance set at 0.05.

The results in Table 4.2 show that the efficiency indicators of NAGIS generally have positive and statistically significant relationships with land tenure security. Land ownership documentation efficiency recorded a positive relationship with land tenure security ($r = 0.309$, $p = 0.000$). Similarly, reduction in land disputes and overlapping claims was positively related to land tenure security ($r = 0.294$, $p = 0.000$).

Accessibility and ease of use also had a positive significant relationship with land tenure security ($r = 0.246$, $p = 0.000$). Increased transparency in land administration was positively associated with land tenure security ($r = 0.266$, $p = 0.000$), while landowners' confidence showed a positive

significant relationship (r = 0.218, p = 0.000). Timely and reliable services recorded a positive relationship (r = 0.309, p = 0.000), while reduced corruption in land dealings recorded the strongest positive relationship among the indicators (r = 0.379, p = 0.000). Satisfaction with NAGIS land information handling was also positively related to land tenure security (r = 0.291, p = 0.000).
In contrast, the perception that major challenges still limit NAGIS efficiency had a negative but statistically significant relationship with land tenure security (r = -0.143, p = 0.001). This suggests that the persistence of challenges in NAGIS was associated with lower perceptions of land tenure security.

Test of Hypothesis
H_1: There is a significant relationship between NAGIS efficiency and land tenure security.
For the overall hypothesis, the positively worded NAGIS efficiency indicators were combined to obtain a composite measure of NAGIS efficiency. The PPMC result produced a correlation coefficient of r = 0.445, with p = 0.000 at N = 520.
Since the obtained significance value (p = 0.000) is less than the adopted significance level of 0.05, the null hypothesis is rejected. The alternative hypothesis is therefore accepted. This indicates that there is a significant positive relationship between NAGIS efficiency and land tenure security in the study area.

Decision: Reject H_0 at $\alpha = 0.05$.
The result indicates that greater efficiency in NAGIS land documentation, accessibility, transparency, service delivery, corruption reduction and information handling is associated with improved land tenure security among respondents (see Table 3)

Table 3: Correlation between NAGIS Efficiency Indicators and Land Tenure Security

S/N	NAGIS Efficiency Indicator	Pearson's r	Sig. (2-tailed)	Decision
i.	Land ownership documentation more efficient	0.309**	0.000	Significant
ii.	Reduced land disputes and overlapping claims	0.294**	0.000	Significant
iii.	Adequate security for land tenure	1.000**	0.000	—
iv.	Accessible and easy to use	0.246**	0.000	Significant
v.	Increased transparency in land administration	0.266**	0.000	Significant
vi.	Landowners feel more confident	0.218**	0.000	Significant
vii.	Services are timely and reliable	0.309**	0.000	Significant
viii.	Reduced corruption in land dealings	0.379**	0.000	Significant
ix.	Satisfaction with NAGIS land information handling	0.291**	0.000	Significant
x.	Major challenges limiting NAGIS efficiency	-0.143**	0.001	Significant

Source: Author's Fieldwork (2025)
Note: Correlation is significant at the 0.01 level (2-tailed). N = 520

Implications
The rejection of the null hypothesis, with r = 0.445 and p = < 0.001, implies that improvements in the efficiency of NAGIS are associated with stronger land tenure security. The practical implication is that continued investment in digital land administration, particularly land documentation, accessibility, transparency, timely service delivery, corruption reduction and effective information management, can contribute to strengthening the security of land rights. It

also implies that the identified operational challenges affecting NAGIS efficiency should be addressed through improved infrastructure, technical capacity, system maintenance and institutional coordination. Thus, NAGIS should be continuously strengthened as an important instrument for improving land administration and tenure security in Nasarawa State.

3.2 Efficiency of Deeds Records in the Current Land Administration System

The assessment of deed record efficiency under the Nasarawa Geographic Information Service (NAGIS) reveals a generally positive perception among respondents, as reflected in the overall mean score of 3.94. High mean values recorded for timely updates (Mean = 4.40) and ease of registration (Mean = 4.33), alongside relatively lower standard deviations, indicate strong agreement and consistency in user experiences regarding operational efficiency. This suggests that the system has significantly improved the speed and convenience of land record management. Such findings are consistent with the position of Raihan et al (2020), who emphasized that the integration of digital and geospatial technologies enhances efficiency, reduces procedural delays, and improves accessibility in land administration systems (see Table 4).

In addition, the relatively high mean for accuracy and authenticity of deed records (Mean = 4.07) further supports the perception of reliability within the system. This aligns with the findings of Chehrehbargh et al (2023), who noted that modern cadastral systems contribute to improved data integrity and strengthen trust in land tenure documentation. However, the moderate standard deviations associated with these variables indicate that, despite overall agreement, user experiences are not entirely homogeneous. This variation may be attributed to differences in user exposure, technical capacity, or administrative practices across different service points.

Despite these strengths, notable concerns emerge in areas such as system manipulation (Mean = 3.54; STD = 1.444), user-friendliness of digital platforms (Mean = 3.77; STD = 1.337), and satisfaction with registration support (Mean = 3.59; STD = 1.388). The relatively lower mean scores and higher variability in these indicators suggest inconsistencies in service delivery and a degree of skepticism among users. In line with Raihan et al (2020), these findings highlight that technological advancement alone is insufficient without corresponding improvements in institutional transparency, user support, and effective communication. Their study underscored that user confidence in land administration systems is strongly influenced by service quality and accessibility.

Similarly, the observations correspond with Chehrehbargh et al (2023), who identified that limitations in user interface design and concerns about data security can undermine the effectiveness of digital land systems. The high standard deviations recorded in this study reflect divergent user experiences, suggesting that some users encounter difficulties in navigating the system or accessing adequate support services. This indicates that while NAGIS has achieved a functional level of efficiency, it still faces challenges in ensuring uniform service quality.

Furthermore, perceptions regarding long-term data security (Mean = 4.01; STD = 1.412) and the occurrence of errors (Mean = 3.87; STD = 1.297) reveal a mix of confidence and uncertainty among respondents. Although the mean values suggest general agreement, the high variability indicates that trust in the system is not uniformly established. This supports the argument of Chehrehbargh et al (2023) that sustained trust in land information systems depends on consistent performance, transparency, and effective error management mechanisms.

This finding demonstrates that NAGIS has made considerable progress in enhancing deed record management, particularly in efficiency and reliability. However, the presence of significant variation in responses points to the need for improvements in system transparency, user interface

design, and support services. Addressing these gaps will be critical to achieving a more robust, inclusive, and fully trusted land administration system, in line with global best practices identified by Raihan et al (2020) and Chehrehbargh et al (2023).

Table 4: Efficiency of Deed Records

S/N	variables	Rating (%)					Mean	STD
		SA	A	UD	D	SD		
i.	Deed records are well-organized and easy to retrieve	210(40.2)	214(40.9)	13(2.5)	55(10.5)	31(5.9)	3.99	1.176
ii.	Registering deeds is straightforward	342(65.4)	102(19.5)	12(2.3)	41(7.8)	26(5.0)	4.33	1.155
iii.	Updates to deed records are timely	299(57.2)	180(34.4)	15(2.9)	10(1.9)	19(3.6)	4.40	.921
iv.	Deed records are accurate and authentic	189(36.1)	263(50.3)	17(3.3)	29(5.5)	25(4.8)	4.07	1.021
v.	Errors in records are rare and corrected quickly	212(40.5)	182(34.8)	20(3.8)	65(12.4)	44(8.4)	3.87	1.297
vi.	Digital deed records are user-friendly	196(37.5)	187(35.8)	17(3.3)	72(13.8)	51(9.8)	3.77	1.337
vii.	Records are securely stored long-term	292(55.8)	113(21.6)	11(2.1)	45(8.6)	62(11.9)	4.01	1.412
viii.	The system is free from manipulation	160(30.8)	198(37.9)	10(1.9)	73(14.0)	82(15.7)	3.54	1.444
ix.	I am satisfied with deed registration support	161(30.8)	198(37.9)	23(4.4)	72(13.8)	69(13.2)	3.59	1.388
x.	Deed records support secure land ownership	189(36.1)	201(38.4)	15(2.9)	63(12.0)	55(10.5)	3.78	1.331

Correlation Analysis on Efficiency of Deed Records Variables

The Pearson Product Moment Correlation (PPMC) was used to examine the relationship between the efficiency of deed records and land tenure security among the 520 respondents. The analysis considered the ten indicators of deed-record efficiency presented in Table 5. The results are presented in Table 5.

As shown in Table 5, all the indicators of deed-record efficiency have positive relationships with land tenure security. The strongest relationship was recorded between deed records supporting secure land ownership and land tenure security ($r = 0.746$, $p = 0.000$). This was followed by accuracy and authenticity of deed records ($r = 0.703$, $p = 0.000$), secure long-term storage of records ($r = 0.689$, $p = 0.000$) and timeliness of updates to deed records ($r = 0.674$, $p = 0.000$). These results indicate that the reliability, security and currency of deed records are closely associated with respondents' perceptions of secure land ownership.

A positive relationship was also observed between straightforward deed registration and land tenure security ($r = 0.641$, $p = 0.000$), while freedom from manipulation recorded $r = 0.628$ ($p = 0.000$). The organization and ease of retrieval of deed records ($r = 0.612$, $p = 0.000$) and the prompt correction of errors ($r = 0.587$, $p = 0.000$) also demonstrated significant positive relationships. Digital deed records being user-friendly ($r = 0.565$, $p = 0.000$) and satisfaction with deed

registration support (r = 0.554, p = 0.000) recorded positive relationships, although they were comparatively lower.

The overall correlation coefficient of r = 0.721 (p = 0.000) indicates a strong positive relationship between the efficiency of deed records and land tenure security. This suggests that improvements in the organization, accuracy, accessibility, security, updating and management of deed records are associated with stronger land tenure security among respondents.

Test of Hypothesis

H_2: There is no significant effect between the efficiency of deed records and land tenure security.

The hypothesis was tested using the Pearson Product Moment Correlation at the 0.05 level of significance. The result shows a positive and statistically significant relationship between the efficiency of deed records and land tenure security (r = 0.721, p = 0.000, N = 520). The positive coefficient indicates that higher efficiency in the management and maintenance of deed records is associated with higher levels of land tenure security.

Since the significance value of 0.000 is less than 0.05, the null hypothesis is rejected. Therefore, there is a statistically significant relationship between the efficiency of deed records and land tenure security in the study area.

Decision: Reject H_0 at $\alpha = 0.05$.

Table 5: Correlation between Efficiency of Deed Records and Land Tenure Security

S/N	Variables	N	Correlation (r)	Sig. (2-tailed)	Decision
i.	Deed records are well-organized and easy to retrieve	520	0.612**	0.000	Significant
ii.	Registering deeds is straightforward	520	0.641**	0.000	Significant
iii.	Updates to deed records are timely	520	0.674**	0.000	Significant
iv.	Deed records are accurate and authentic	520	0.703**	0.000	Significant
v.	Errors in records are rare and corrected quickly	520	0.587**	0.000	Significant
vi.	Digital deed records are user-friendly	520	0.565**	0.000	Significant
vii.	Records are securely stored long-term	520	0.689**	0.000	Significant
viii.	The system is free from manipulation	520	0.628**	0.000	Significant
ix.	I am satisfied with deed registration support	520	0.554**	0.000	Significant
x.	Deed records support secure land ownership	520	0.746**	0.000	Significant

Note: Correlation is significant at the 0.01 level (2-tailed)

Implications

The null hypothesis was rejected because the analysis produced a strong positive correlation of r = 0.721, p = < 0.001. This implies that efficient management of deed records is an important component of land tenure security. Accurate, authentic, well-organised, accessible and securely stored deed records provide stronger documentary evidence of land ownership and reduce

uncertainty concerning land rights. The finding therefore implies that land administration authorities should prioritise the digitisation, regular updating, secure storage and accurate management of deed records. Particular attention should also be given to preventing manipulation, correcting errors promptly and improving registration support, since weaknesses in these areas can undermine confidence in land ownership and tenure security.

3.3 Trend at Which Rural and Vulnerable Groups Secure Their Landed Properties

The evaluation of inclusivity within the land administration system under the Nasarawa Geographic Information Service (NAGIS) reveals a pattern of moderate agreement across most indicators, with mean scores ranging from 3.25 to 3.79. This suggests that while the system is perceived as somewhat supportive of rural populations and vulnerable groups, it has not yet achieved full inclusiveness. For instance, the accessibility of land registration for rural dwellers (Mean = 3.79; STD = 1.376) indicates general acceptance that registration processes are reachable; however, the relatively high standard deviation highlights uneven experiences. This variability may reflect spatial inequalities in service delivery, a concern similarly emphasized by Abdullah et al (2020), who found that rural accessibility to land services often depends on infrastructural development and administrative decentralization (see Table 6).

Perceptions regarding the treatment of vulnerable groups (Mean = 3.54; STD = 1.264) and the dissemination of land rights information to rural areas (Mean = 3.72; STD = 1.351) further reinforce this trend of moderate acceptance with notable divergence in experiences. While respondents generally agree that fairness and information flow exist, the observed variability suggests that such benefits are not uniformly distributed. This aligns with the findings of Ansah (2022), who argued that institutional frameworks in developing countries often exhibit gaps in outreach and equitable service provision, particularly in marginalized communities where awareness and engagement remain limited.

Affordability of land documents for low-income earners (Mean = 3.72; STD = 1.351) and gender inclusivity in land access (Mean = 3.63; STD = 1.370) also recorded moderate agreement, indicating that the system is perceived as relatively equitable in principle. However, the high standard deviations suggest that economic and socio-cultural barriers persist in certain contexts. This observation corroborates Abdullah et al (2020), who highlighted that affordability and gender equity in land systems are often constrained by localized socio-economic dynamics, thereby limiting the effectiveness of formal land administration reforms.

Similarly, the provision of support for illiterate individuals in land transactions (Mean = 3.75; STD = 1.332) and the role of traditional leaders in enhancing land security (Mean = 3.68; STD = 1.348) suggest moderately positive perceptions of institutional and customary support structures. Nonetheless, the significant variability indicates inconsistency in implementation and effectiveness. This finding resonates with Ansah (2022), who emphasized the importance of integrating customary institutions with formal systems to achieve broader inclusivity, while also noting that such integration is often uneven across regions.

The perception that dispossession of vulnerable groups has reduced (Mean = 3.78; STD = 1.239) reflects a degree of confidence in the system's protective capacity. However, responses regarding government policy effectiveness (Mean = 3.25; STD = 1.538) reveal the lowest level of agreement and the highest variability among all indicators. This suggests limited confidence in policy frameworks and highlights significant disparities in how such policies are experienced by different groups. In line with Chehrehbargh et al (2023), weak policy implementation and lack of

transparency can undermine the inclusivity of land administration systems, even where formal provisions exist.

Furthermore, the perception that rural and vulnerable groups are protected under the current land system (Mean = 3.75; STD = 1.347) indicates moderate agreement but again reflects inconsistent experiences. This pattern of moderate means coupled with high standard deviations across most variables underscores a critical issue: while institutional frameworks and mechanisms for inclusivity are present, their implementation is uneven and context-dependent. Chehrehbargh et al (2023) similarly concluded that achieving effective land governance requires not only system design but also consistent enforcement, transparency, and user-oriented service delivery.

Generally, the findings suggest that the NAGIS land administration system demonstrates partial inclusivity, with measurable progress in accessibility, affordability, and support mechanisms. However, significant gaps remain in policy effectiveness, service consistency, and equitable outreach. These results are consistent with the broader conclusions of Abdullah et al. (2020), Ansah (2022), and Chehrehbargh et al (2023), all of whom emphasized that inclusivity in land administration is not solely a function of system availability but also of equitable access, effective policy implementation, and context-sensitive institutional practices.

Table 6: Access by Rural and Vulnerable Groups

S/N		Rating (%)					Mean	STD
		SA	A	UD	D	SD		
i.	It is easy for rural people to register land	207 (39.6)	180 (34.4)	18 (3.4)	55 (10.5)	63 (12.0)	3.79	1.376
ii.	Vulnerable groups are treated fairly	105 (20.1)	265 (50.7)	12 (2.3)	88 (16.8)	53 (10.1)	3.54	1.264
iii.	Land rights information reaches rural areas	181 (34.6)	199 (38.0)	18 (3.4)	66 (12.6)	59 (11.3)	3.72	1.351
iv.	Land documents are affordable for low-income earners	111 (21.2)	280 (53.5)	18 (3.4)	82 (15.7)	32 (6.1)	3.68	1.151
v.	Men and women have equal land access	167 (31.9)	199 (38.0)	15 (2.9)	82 (15.7)	60 (11.5)	3.63	1.370
vi.	Illiterate people get support with land transactions	184 (35.2)	202 (38.6)	11 (2.1)	74 (14.1)	52 (9.9)	3.75	1.332
vii.	Traditional leaders support land security for rural groups	173 (33.1)	198 (37.9)	16 (3.1)	82 (15.7)	54 (10.3)	3.68	1.348
viii.	Dispossession of vulnerable groups has reduced	162 (31.0)	234 (44.7)	21 (4.0)	62 (11.9)	44 (8.4)	3.78	1.239
ix.	Government policies help rural/vulnerable groups secure land	178 (34.0)	91 (17.4)	14 (2.7)	165 (31.)	75 (114.3)	3.25	1.538
x.	These groups are protected under current land systems	192 (36.7)	188 (35.9)	18 (3.4)	71 (13.6)	54 (10.3)	3.75	1.347

Correlation Analysis on Access by Rural and Vulnerable Groups Variables

The Pearson Product Moment Correlation (PPMC) was used to examine the relationship between access to land administration services by rural and vulnerable groups and land tenure security

among the 520 respondents. The ten indicators presented in Table 4.6 were subjected to correlation analysis. The results are presented in Table 7.

Table 4.8 shows that all the indicators of access by rural and vulnerable groups have positive and statistically significant relationships with land tenure security. The strongest relationship was observed between protection of rural and vulnerable groups under current land systems and land tenure security ($r = 0.669$, $p = 0.000$). This was followed by the availability of land-rights information in rural areas ($r = 0.657$, $p = 0.000$) and reduction in dispossession of vulnerable groups ($r = 0.646$, $p = 0.000$). These results indicate that greater protection, access to relevant land information and reduced exposure to dispossession are associated with stronger perceptions of land tenure security.

Ease of land registration for rural people also demonstrated a strong positive relationship with land tenure security ($r = 0.638$, $p = 0.000$). Traditional leaders' support for land security among rural groups ($r = 0.625$, $p = 0.000$), fair treatment of vulnerable groups ($r = 0.614$, $p = 0.000$) and support for illiterate people in land transactions ($r = 0.604$, $p = 0.000$) similarly showed significant positive relationships. These findings suggest that accessibility of registration procedures and institutional or community support can contribute to improved perceptions of land tenure security among rural and vulnerable populations.

Affordability of land documents for low-income earners ($r = 0.591$, $p = 0.000$) and equal land access for men and women ($r = 0.573$, $p = 0.000$) also had significant positive relationships with land tenure security. Government policies supporting rural and vulnerable groups recorded the lowest, but still significant, correlation ($r = 0.522$, $p = 0.000$). The overall correlation coefficient of $r = 0.681$ ($p = 0.000$) indicates a strong positive relationship between access by rural and vulnerable groups and land tenure security.

Test of Hypothesis

H_3: There is no significant relationship between access to land administration services by rural and vulnerable groups and land tenure security.

The hypothesis was tested using the Pearson Product Moment Correlation at the 0.05 level of significance. The result shows a positive and statistically significant relationship between access by rural and vulnerable groups and land tenure security ($r = 0.681$, $p = 0.000$, $N = 520$). The positive correlation indicates that greater accessibility of land administration services to rural and vulnerable groups is associated with stronger perceptions of land tenure security.

Since the significance value of 0.000 is less than 0.05, the null hypothesis is rejected. Therefore, there is a statistically significant relationship between access to land administration services by rural and vulnerable groups and land tenure security in the study area.

Decision: Reject H_0 at $\alpha = 0.05$.

Table 7: Correlation of Access by Rural and Vulnerable Groups and Land Tenure Security

S/N	Variables	N	Correlation (r)	Sig. (2-tailed)	Decision
i.	Ease of land registration for rural people	520	0.638**	0.000	Significant
ii.	Fair treatment of vulnerable groups	520	0.614**	0.000	Significant
iii.	Availability of land-rights information in rural areas	520	0.657**	0.000	Significant
iv.	Affordability of land documents for low-income earners	520	0.591**	0.000	Significant
v.	Equal land access for men and women	520	0.573**	0.000	Significant
vi.	Support for illiterate people in land transactions	520	0.604**	0.000	Significant
vii.	Traditional leaders' support for land security of rural groups	520	0.625**	0.000	Significant
viii.	Reduction in dispossession of vulnerable groups	520	0.646**	0.000	Significant
ix.	Government policies supporting rural/vulnerable groups	520	0.522**	0.000	Significant
x.	Protection of rural and vulnerable groups under current land systems	520	0.669**	0.000	Significant

Note: Correlation is significant at the 0.01 level (2-tailed)

Implications

The rejection of the null hypothesis, with $r = 0.681$ and $p = < 0.001$, indicates a strong positive relationship between access to land administration services by rural and vulnerable groups and land tenure security. The study therefore implies that land tenure security cannot be fully achieved without ensuring that rural residents and vulnerable groups can access land administration services. The finding specifically implies the need to improve access to land-rights information, simplify land registration procedures, provide support for illiterate users, ensure fair treatment of vulnerable groups, improve affordability of land documents and promote equitable access to land for both men and women. It also suggests that government policies and institutional arrangements should deliberately address barriers faced by disadvantaged groups. Greater inclusiveness in land administration would consequently contribute to stronger and more equitable land tenure security across the state.

4. Discussion

The findings demonstrate a strong positive and statistically significant relationship between the efficiency of deed records and land tenure security in Nasarawa State ($r = 0.721$, $p < 0.001$). This suggests that respondents who perceived deed records as efficient also tended to report stronger perceptions of land tenure security. The result highlights the importance of reliable land documentation in supporting the recognition, verification and protection of land rights. Although the correlation does not establish causation, its strength indicates that deed-record management is closely associated with tenure security in the study area.

The individual indicators further clarify this relationship. The strongest association was recorded for the perception that deed records support secure land ownership (r = 0.746), followed by the accuracy and authenticity of records (r = 0.703), secure long-term storage (r = 0.689) and timely updating of records (r = 0.674). These findings suggest that the perceived contribution of deed records to tenure security depends substantially on the credibility, accessibility and currency of recorded land information. When ownership records are accurate and regularly updated, users are better positioned to verify documented interests in land and establish evidence of their claims. This interpretation is consistent with Chehrehbargh et al. (2023), who emphasised the importance of data integrity and reliable cadastral information in strengthening confidence in land administration. The relatively strong relationships recorded for straightforward registration (r = 0.641), freedom from manipulation (r = 0.628) and the organisation and retrieval of records (r = 0.612) also demonstrate the importance of administrative procedures and information security. These results indicate that tenure security is associated not only with the existence of digital records but also with how efficiently those records are managed and accessed. Conversely, the comparatively lower correlations for satisfaction with registration support (r = 0.554) and user-friendliness of digital records (r = 0.565) suggest that improvements in administrative support and the usability of digital services remain relevant to strengthening users' confidence. This is consistent with the concerns raised by Raihan et al. (2020) regarding the importance of service quality and accessibility in digital land administration.

The descriptive findings reinforce this interpretation. The overall mean score for deed-record efficiency was 3.94, with particularly high scores for timely record updates (4.40), straightforward registration (4.33) and accuracy and authenticity (4.07). These scores indicate generally favourable perceptions of important operational aspects of deed-record management. Nevertheless, the lower mean scores for freedom from manipulation (3.54), satisfaction with registration support (3.59) and user-friendliness (3.77), together with their relatively high standard deviations, reveal areas of concern and variation in respondents' experiences. Therefore, positive perceptions of record-management efficiency should not be interpreted as evidence that all aspects of the system function uniformly well.

Taken together, the results suggest that strengthening deed-record efficiency should involve more than expanding digital record storage. Attention is also required to maintain accurate and current information, prevent unauthorised alterations, correct errors promptly and provide accessible registration support. These priorities are consistent with the broader argument that effective digital land administration requires appropriate institutional procedures alongside technological systems (Raihan et al., 2020; Chehrehbargh et al., 2023).

The second major finding is a strong positive and statistically significant relationship between access to land administration services among rural and vulnerable groups and land tenure security ($r = 0.681$, $p < 0.001$). This indicates that more favourable perceptions of access to land administration services are associated with stronger perceptions of tenure security. The result underscores the importance of making formal land administration accessible to different population groups rather than concentrating exclusively on the technical efficiency of record-management systems.

The strongest individual relationship was recorded for the protection of rural and vulnerable groups under existing land systems (r = 0.669), followed by the availability of land-rights information in rural areas (r = 0.657) and the perceived reduction in dispossession of vulnerable groups (r = 0.646). These relationships suggest that protection, information and reduced exposure to dispossession are particularly important dimensions of inclusive land administration. Access to

reliable information can help landholders understand documentation requirements and available administrative procedures, while appropriate protection mechanisms can strengthen confidence in the recognition and preservation of land rights. These findings are consistent with Abdullah et al. (2020), who highlighted the relevance of accessible land information and administrative arrangements to the protection of land rights.

Ease of land registration for rural residents also recorded a substantial positive relationship with tenure security ($r = 0.638$). Similarly, traditional leaders' support ($r = 0.625$), fair treatment of vulnerable groups ($r = 0.614$) and assistance for people with limited literacy ($r = 0.604$) were positively associated with tenure security. These findings demonstrate the relevance of both formal administrative procedures and community-level support. They suggest that access to land services involves not only the physical or digital availability of administrative facilities but also the ability of different users to understand, navigate and benefit from the system. This interpretation aligns with Ansah (2022), whose work, as cited in the study, highlights the importance of institutional outreach and the relationship between customary institutions and formal land administration.

Affordability of land documents ($r = 0.591$) and equal land access for men and women ($r = 0.573$) also showed statistically significant positive relationships with tenure security. These findings indicate that the financial and social dimensions of land administration should be considered alongside administrative efficiency. Where documentation costs or unequal treatment restrict access, some landholders may face greater difficulty obtaining formal recognition of their land interests. Improving affordability and equitable treatment may therefore help broaden participation in formal land administration. However, because the study relied on respondents' perceptions and correlation analysis, these results should be understood as evidence of association rather than proof that particular interventions will independently produce stronger tenure security.

Government policies supporting rural and vulnerable groups recorded the lowest individual correlation ($r = 0.522$), although the relationship remained positive and statistically significant. This result is particularly relevant when considered alongside the descriptive mean of 3.25 for perceived government-policy effectiveness, the lowest among the ten access indicators. Together, these findings suggest that respondents were less positive about policy support than about several other dimensions of access and protection. The comparatively high standard deviation of 1.538 further indicates substantial variation in respondents' assessments. The result points to a possible gap between the existence of policies intended to protect land rights and respondents' experiences of their implementation. It is consistent with the concerns raised by Chehrehbargh et al (2023) regarding the importance of institutional implementation and transparency in effective land governance.

The descriptive results provide additional evidence of partial rather than uniform inclusivity. Mean scores ranged from 3.25 to 3.79, indicating generally moderate to favourable assessments across the indicators, but the variation in responses suggests that access and protection are not experienced equally by all respondents. Consequently, the positive overall correlation of 0.681 should not obscure continuing concerns relating to policy effectiveness, affordability, fair treatment, gender equality and access to information.

Generally, the findings indicate that land tenure security is closely associated with the extent to which rural and vulnerable groups can access land administration services and obtain meaningful protection under the system. The results support an approach to land administration that combines reliable documentation with accessible information, fair procedures and attention to the needs of disadvantaged users. In this respect, inclusivity is an important complement to technical efficiency in strengthening confidence in land tenure arrangements.

5. Conclusion

This study examined the relationships between deed-record efficiency, access to land administration services among rural and vulnerable groups, and land tenure security in Nasarawa State, Nigeria. The findings establish two principal conclusions.

First, deed-record efficiency had a strong positive and statistically significant relationship with land tenure security ($r = 0.721$, $p < 0.001$). Accuracy and authenticity, secure storage, timely updates and the contribution of deed records to secure ownership recorded particularly strong individual relationships with tenure security. However, concerns about possible manipulation, user-friendliness and registration support indicate that improvements in record management should be accompanied by stronger safeguards and better service delivery.

Second, access to land administration services among rural and vulnerable groups also had a strong positive and statistically significant relationship with land tenure security ($r = 0.681$, $p < 0.001$). Protection under existing land systems, access to land-rights information and the perceived reduction in dispossession were among the strongest individual correlates. Nevertheless, the comparatively low assessment of government-policy effectiveness and the variation in responses across access indicators suggest that inclusive land administration remains an area requiring further attention.

The study concludes that effective land tenure administration in Nasarawa State requires both reliable deed-record management and equitable access to land administration services. Digital systems can support the documentation and protection of land rights, but their contribution to tenure security must be considered alongside the accessibility, fairness and consistency of the services they provide. Since the study used questionnaire-based perceptions and correlation analysis, the findings demonstrate statistically significant associations rather than causal effects. Within this limitation, the results provide evidence that improving record-management practices and addressing barriers faced by rural and vulnerable groups are important priorities for strengthening land tenure security.

6. Recommendations

Based on the two principal findings, the study makes the following recommendations:

i. **Improve deed-record efficiency:** NAGIS should ensure accurate, regularly updated and secure deed records, prevent unauthorised manipulation, correct errors promptly and improve registration support.

ii. **Promote inclusive land administration:** NAGIS and relevant government authorities should simplify registration procedures, improve rural land-rights information, make documentation more affordable and ensure fair access for rural and vulnerable groups.

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