

Impact of Cashew Plantation on Land Tenure in Jaman South Municipality, Ghana

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Key words: Cashew, Land tenure, Jaman South

SUMMARY

The rapid increase in cashew plantation in Jaman South of Ghana has generally presented certain challenges within the land space. The Jaman South Municipal is a major contributor to the Ghana's cashew boom. This paper assessed the impact of increased cashew plantation on the land tenure in the Jaman South municipality. The rise in cashew was quantitatively assessed by conducting a Land Use Land Cover assessment over the municipality using Landsat images for the years 1989, 2007 and 2023. Currently, about 70% of the land is used for cashew plantation compared to an initial 19% before 1990. The land tenure evolution is then investigated by conducting interviews and open forum sessions in sampled locations within the municipality. This study adopted focus group discussions, interviews of key informants and questionnaire interviews to investigate the land tenure evolution within Jaman South. It was revealed that customary land tenure prevailed prior to the cashew boom. However, the most predominant system now is attempt to individualize the land rights (transition of land rights). Abunu sharecropping was found to be a major choice of land tenure arrangements among respondents (between land owners and tenants). From the results, the rise in cashew inadvertently serves as a conflict resolution mechanism since recognition of land owners and users is easy. The study's conclusions also support the claim that the expansion of cashew plantations is raising land demand and dividing society while limiting access to land for growing other food crops.

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1. INTRODUCTION

Cashew farming has grown dramatically in the world in the last decade. Cashew which originated from northern South America is today found in tropical locations all over the world. Africa has taken over to be the world's leading producer of RCN. Over the past three years, Côte d'Ivoire and Tanzania have been the leading producers in Africa (African Cashew Alliance, 2018). The cashew industry including its entire value chain is, without doubt, a profitable sector. This is supported by the total figures reported annually. The raw cashew market is predicted to grow at a rate of 4.27 per cent per Anum between 2020 and 2025. It is expected to be worth \$7 billion by 2025 (African Cashew Alliance, 2018; Boafo and Lyons, 2019). Cashew is the second most valuable export crop in West Africa, after cocoa (Ricaud, 2019).

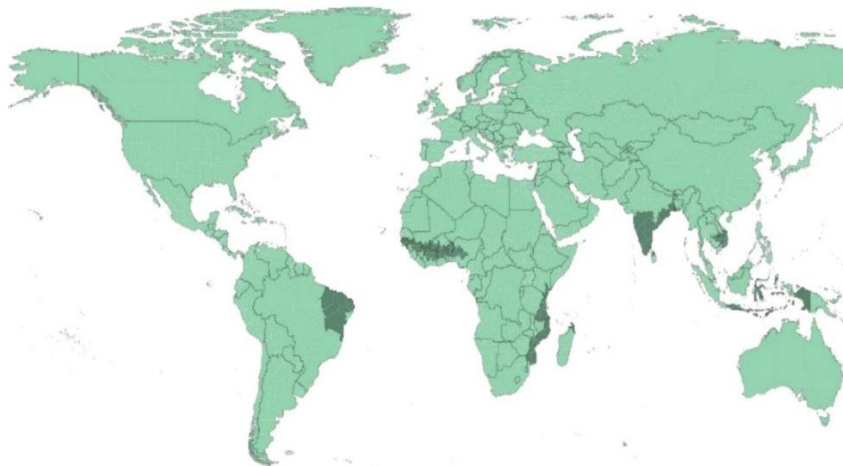


Figure 1 Main Cashew Production Areas in the world dark green (Source: Nitidæ, 2019)

Remote sensing and Geographical Information Systems (GIS) are effective techniques for obtaining valuable, accurate and prompt data on the spatial dispersion of land covers. This is particularly useful as studies on land use/land cover changes can occur across large areas (Carlson and Sanchez-Azofeifa, 1999; Rogan and Chen, 2004; Alqurashi and Kumar, 2013). Geospatial technology gives several advantages because Ground-based data, atmospheric imaging platforms, and satellite-based imaging platforms may all be gathered and evaluated with today's remote sensing technologies. GPS data, GIS data layers and functions, and expanding modelling capabilities are all included (Franklin, 2001).

Land use and land cover system is the information and relations of the activities on the land. Demand for land use and land cover data is on the rise as they have become very vital in decision-making for planning and solving problems such as hazard control, uncontrolled

developments, a decline in environmental qualities, and loss of agricultural lands and wetlands (Anderson *et al.*, 1976). (Cisse *et al.*, 2021) assessed the impact of increased cashew plantations on the natural landscape in the North of Cote D'Ivoire. The study evaluated the LULC using satellite images for the following years; 1989, 2000 and 2017. A maximum likelihood classification algorithm was used for the classification. The study suggests that there are still undiscovered consequences of expanded cashew culture. A study by (Hurni *et al.*, 2017) focused on the expansion of boom tree crops such as cashew and rubber in Mainland Southeast Asia. Support Vector Machine is a classifier used on Landsat images to come up with a LULC map of the study area. Results showed a good overall performance of the classifier in classifying the various tree crop classes and forest types.

A critical examination was carried out by (Boafo and Lyons, 2019) to ascertain the implications of how farmers in the Bono region of Ghana are shifting to cashew production, which is increasing land accumulation, social division, and decreased access to land for cultivation of other food crops. The use of various qualitative approaches such as interviews, focus group discussions, observation, and policy document analysis, the study found in-depth data acquired from cashew growers and local agricultural actors in the Bono and Ahafo regions. The findings suggested that Cashew production is modifying land tenure relations through individualization, as well as the acquisition of communal land for cashew cultivation. Land purchasing by the indigenous elites, along with the increased conversion of family land to cashew cultivation, is transforming existing land tenure arrangements. This has significant implications for migrant farmers and local food supplies. (Boafo and Lyons, 2019) suggested that agricultural policy must take into account the effects of cashew production on land tenure and local food security.

2. MATERIALS AND METHODS

2.1 Study area

The study location is Jaman South Municipal in the Bono region of Ghana. It is situated between longitudes 2°40' W and 2°56' W and latitudes 7°25' N and 7°58' N. Jaman North District lies to the north of study area, while Berekum and Dormaa Municipalities are to the east and south, respectively. According to Ghana's 2021 Population and Housing Census, 108,388 people are living in the municipality. The area comprises roughly 150 settlement sites with a population density of 145.3/km². It has huge arable territory for agricultural activities, The overall land area is approximately 755.4 km² (Kosoe, Darko and Osumanu, 2019). Its proximity to Cote d'Ivoire to the west has an impact on the presence of cashew in the study area. The area boasts of fertile grounds and a suitable climate for agrarian activities. In addition to the current dominance of cashew growing, Jaman South is also well-known for its food crops, including yam, cassava, maize, and groundnuts (Peprah *et al.*, 2018). The production of cashew nuts for export has increased significantly in the Jaman South municipality. Instead of growing food for the local market, farmers in the area are increasingly devoting their time and lands to the cultivation of raw cashew nuts for the export market (Boafo, Appiah and Tindan, 2019). Evidence from (Peprah *et al.*, 2018) suggests the municipal is a primary cashew hub in the country.

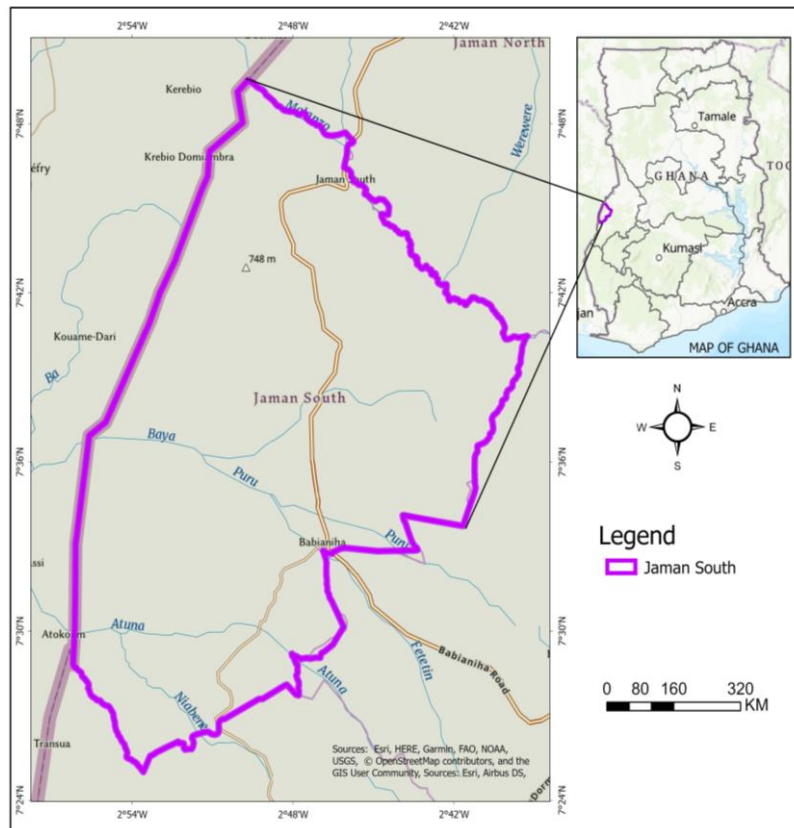


Figure 2 Map of Study Area (Jaman South)

2.2 Data

For this research, both current and historical Landsat data were obtained from United States Geological Survey (USGS) archives. The years of interest for this research were 1989, 2007 and 2022. Availability of cloud-free images and a reasonable span of years for changes in land cover to be appreciated are among the factors considered for selecting those years. As required by the classification process, the study area was visited and a number of samples of all classes were recorded and used as training dataset. This was done by a handheld GPS enabled device. After a careful sampling of representative towns for the study area, interviews, questionnaires and group discussions were employed to gather information on the land tenure system which exists in the municipality. With the aim of this research discussed with the respondents, they were able to refer me to more respondents. Thus respondents were targeted by snowball and random sampling techniques.

2.3 Methods

The methods used in this research are outlined in the sub-sections below. There are three major stages to the methodology. They are as follows: 1) Analysing the Land Use Land Cover Changes (LULCC). 2) Assessing the land tenure system 3) Assessing the impact of Cashew

Plantation on the Land tenure. The flowchart of procedures used in this research are shown in Figure below.

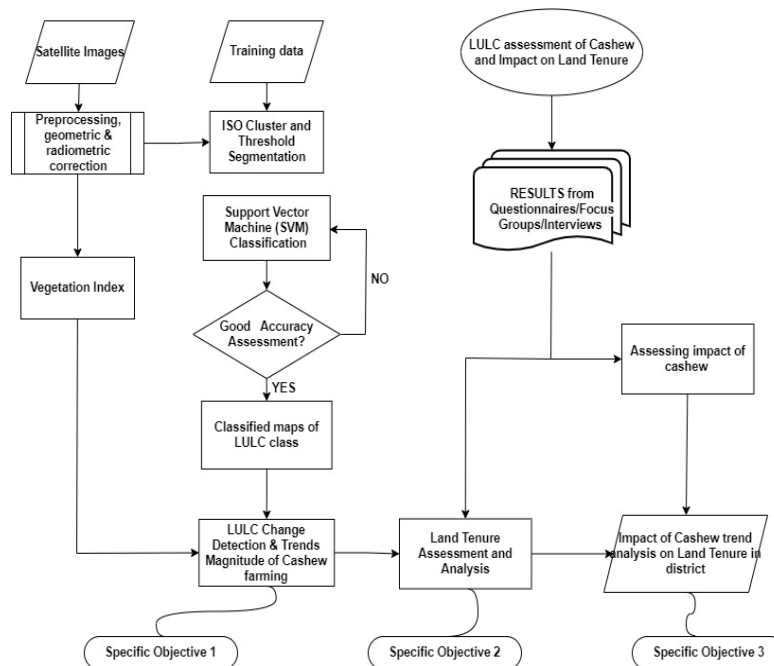


Figure 3 Flowchart of methods

2.3.1 Land Use Land Cover Analysis

The Landsat images were subjected to pre-processing to clean up any defects and prepare them for segmentation and subsequently classification. Segmented images and training data samples were utilized by Support Vector Machine (SVM) to train and develop the new models that were employed for the classification.

In the study area, the three major classes which were identified are Cashew Plantation (CP), Other Vegetation (Other Veg) and Settlement/Bareland (SB).

2.3.2 Land Tenure System

Interview questions were posed to respondents to ascertain the evolution of land tenure system in the Jaman South Municipality. In the study location, a broad purposive sample of community members of various generations, occupations, genders and social statuses was identified to provide insights into the development of the tenure system. Jaman South Municipality's land tenure system and tenurial practices were examined using a quantitative approach. Methods used included focus groups discussions (FGDs), key informant interviews (KIIs), and questionnaire surveys. All focus group discussions, recorded interviews, and audio recordings were translated into English. An interpretive summary of every transcript was made, and a separate topic analysis was done, to make understanding the dataset easier. Structured questionnaires that were given to the respondents helped collect the necessary primary data for the study. On the surveys, there both were open-ended and closed-ended questions. Using purposive and snowball sampling techniques, key informants were chosen. An undersized study can be a waste of

resources for not having the capability to produce useful results, while an oversized one uses more resources than are necessary (Lenth, 2001). Simple random procedure was employed in the initial step to choose the specific research communities.

The study purposefully targeted cashew farmer who subsequently assisted in finding the other respondents using the snowball sampling approach since it is challenging to identify a cashew farmer among groups of farmers in the general populace (Peprah *et al.*, 2018).

2.3.3 Impact of Cashew Plantation on land tenure

The statistical Package for Social Sciences (SPSS) was used to analyse responses from questionnaire and interviews. The responses were categorized firstly according to the questions targeted at the demographic details of the interviewees. Secondly, the effect of cashew plantation on the society's land tenure system.

2.4 Limitations of methodology

The potential for paranoia to influence interviewee responses was a challenge in the collection of data. However, the likelihood of getting inaccurate responses from respondents and key informants was minimised because of the familiar faces by enlisting prominent and influential members of the municipality to go along with. Also, the challenge of locating cashew farmers was overcome by incorporating snowball sampling by engaging the respondents to help identify the next. The methods outlined performed well towards achieving the objectives of the research. The results obtained were satisfactory and acceptable.

3. RESULTS

All findings from the study are presented in this section. Results from questionnaire surveys and interviews conducted in the study location as well as the results of a Land Use/Land Cover classification maps from Landsat imagery.

3.1 Spatial Distribution from LULC

The figure below shows the spatial distribution of the Cashew Plantation, Other Vegetation and Settlement/Barelands in the study location for the years 1989, 2007 and 2022 (left to right respectively).

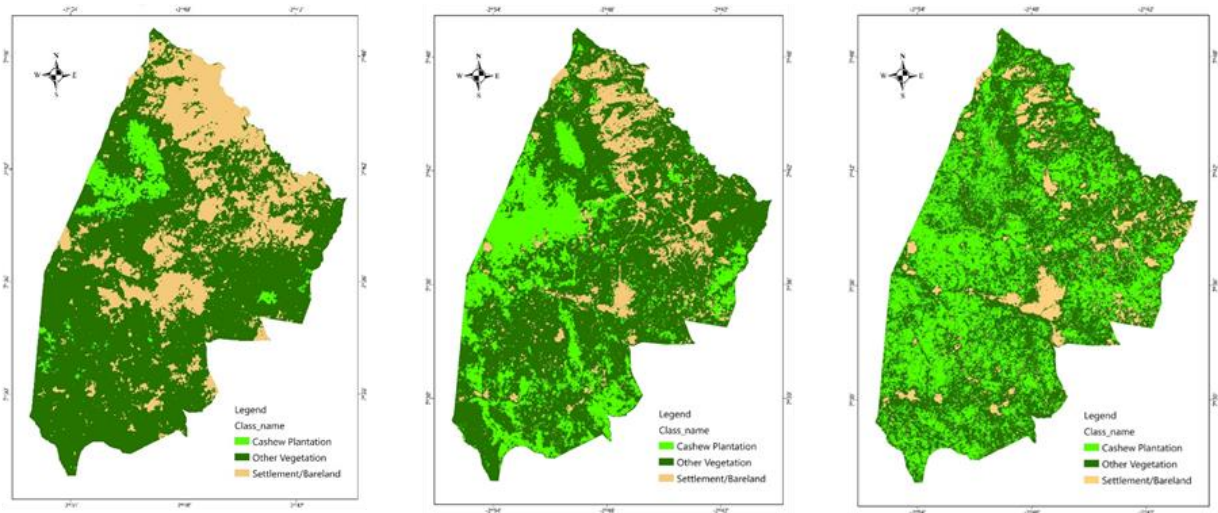


Figure 4 Land Use Land Cover Maps (1989, 2007 and 2022)

The figure below shows results for the quantitative assessment of land use land cover of the study area.

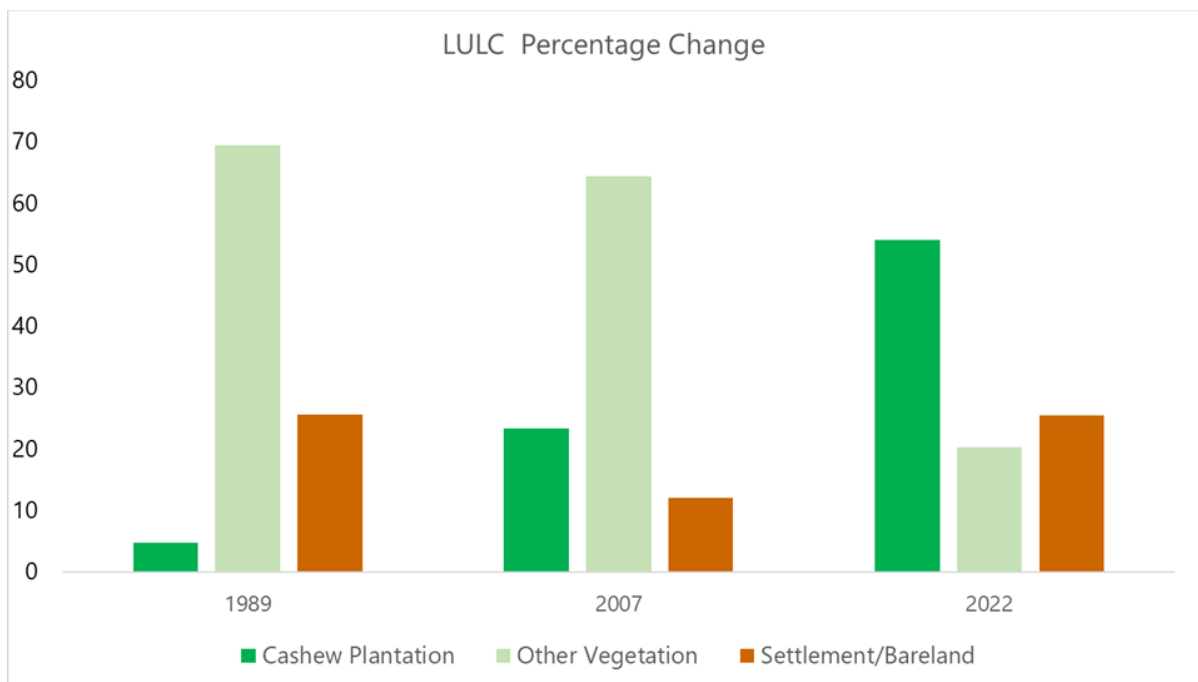


Figure 5 Graph showing Change in LULC Classes

Accuracy assessment was performed to determine the overall performance and acceptability of the classification. The overall accuracies ranged between 89% – 98%. The lack of high resolution imagery for previous years contributed to the decrease in accuracy. The harmonic mean of recall and accuracy is the F1 score. If both accuracy and recall are excellent, the score is 1, and if one is imperfect, the score is less than 1. The classification model's precision and

robustness are gauged by the F1 score (Alem and Kumar, 2021). F1 measurement for this study is shown in Table 1.

Table 1 F1 Score of Classes

Class	1989	2007	2022
CP	0.99	1.00	0.99
Other Veg	1.00	0.99	0.98
Settlement/Bareland	0.93	0.93	0.88

3.2 Land Tenure Development in Jaman South Municipality

In terms of land tenure system, a proportion of landowners only engage in "abunu" arrangements. This is the major arrangement that exists between landlords and individuals when they need land for cashew. Farmers who are without land can gain access through this system of land tenure and contractual arrangement. In the Jaman South municipality, the abunu method is frequently used. This is when a landowner and a farmer agree to split the farm into two equal portions following the rehabilitation, refurbishment, or new cashew cultivation. The farmer will have to pay the landlord a registration fee and all expenses up until the property is split once the new plantation yields fruit (usually 2–5 years in the case of cashew). In traditional societies such as the Jaman South municipality, what matters most in determining where one gets one's rights, and which rights one gets is one's status in respect to the particular right-holding group or right-holding individuals. Status is differentiated in most societies by sex and age: females are eligible to acquire certain rights and males to acquire certain others and adults can obtain some rights for which children are not eligible. Status which derives from membership in a lineage, clan, or other right-holding group may be classified into one of four categories on the basis of two major criteria: descent and residence. A person who belongs to a right-holding group by both descent and residence may be termed a primary member of it. He was born in it, lives in it, and identifies with it. This is normally where he acquires his primary rights. A person who was a primary member but has moved out (e.g. at marriage) or has not yet moved in (for example, an unmarried person in a matrilineal society in which premarital residence is patrilocal and post marital residence avunculocal, such as in the Trobriand Islands) may be termed a contingent member. Such a person has certain rights while absent, but their nature changes.

3.3 Assessment of Land Tenure, Access and Security

3.3.1 Respondents' Primary Use of Land

A large portion of the respondents have access to land. They use their lands specifically for farming (97.9%). A proportion use their lands for farming and residential purposes (2.10%). 66.3% of respondents acquired land as a result of been members of a family. The proportion of respondents that received land from Individuals was 19.5%. This refers to cashew farmers making some arrangements with individual land owners to access land. The next mode of acquisition by respondents was Chiefs (11.3%) followed by Customary Secretariat (2.8%).

3.3.2 Tenure rights held

Ownership of land by respondents was the predominant rights held. It accounted for 53.7%. 22.6% of the respondents had some form of tenancy arrangements with their land owners. Leasehold and usufruct rights accounted for 11.1% and 12.6% respectively. The municipality has experienced a significant demand for land over the past ten years, according to 97.4 percent of respondents. The potential profits derived from cashew has fuelled the demand for land.

3.3.3 Changes in Customary Tenure

The inception of cashew has introduced some changes with regards to the tenure system. The respondents alluded to the fact that Access to land (31.2%), Transfer of land rights (31.3%), Land-use practices (26.3%) and Dispute resolution (11.1%) had been altered since the inception of cashew.

3.3.4 Factors Responsible for tenure changes

Several factors according to the respondents may be underlying the changes in tenure system. The demand of land for cashew farming (100%) is the most responsible factor for the changes. 59.4% of respondents suggested that population growth had an influence on the land tenure changes in the municipality although cashew farming was the main driver. 6.4% and 0.8% of respondents added demand of land for commercial activities and building respectively were underlying factors for tenure changes (Table 2).

Table 2 Major factors underlying the changes in tenure

Major factors underlying tenure changes	Responses	
	N	Percentage
Population growth	231	59.4%
Demand of land for cashew farming	389	100.0%
Demand of land for commercial activities	25	6.4%
Demand of land for building	3	0.8%

3.3.5 Perception of tenure security

In general respondents were secured about their tenure. Although 84.1% of respondents cumulatively were to various degrees certain about the security of their tenure, some admitted in conversation that the security of tenure had decreased due to the conflicts associated with land demand. Consequently, only 2.8% were insecure about their tenure and 13.1% were incapable of disclosing the security of their tenure (figure below).

3.3.6 Conflicts in land and resolution mechanism

The majority of respondents (57.8%) agreed to varying degrees that there have been more land disputes in the municipality as a result of the demand for land for cashew crops. 3.6% of the respondents said they "Disagree" with the idea. But 33.7% of respondents said they "Neither agree nor disagree" with the notion that there will be more conflicts as a result of the demand for land for cashew production. In terms of dispute resolution mechanisms, some respondents (41.2%) generally agree that cashew has influenced the manner in which conflicts are resolved in the municipality such that it helps establish a trace of ownership. Despite the agreement, 58.9% neither agree nor disagree that cashew has influenced mechanisms for conflict resolution (**Error! Reference source not found.**).

4. DISCUSSION

From the study, majority of the cashew farmers are in their youthful age and are energetic. By implication, cashew production in Jaman South District in particular has a great prospect of becoming one of the powerhouses of cashew production in Ghana when enabling environment is created.

4.1 Spatial Expansion of Cashew

The LULC maps Figure 4 show how cashew has progressively become the most prevalent land cover class in the municipality. Cashew Plantations (CP) made up only 4% of the area in 1989. The cashew areas from 1989 to 2007 increased significantly. When individuals started to understand its economic worth in the global market, it then climbed to 26 per cent in 2007. Cashew had taken over around 62 per cent of the region by 2022. Concerns are raised considering that less than 10% of the land is currently used for settlement, there is not much land left for other uses other than cashew. In 1989, the high percentage of Settlement/Bareland (SB) can be attributed to the ripple effect of rampant bush fires prior to that year. The area is popular for game hunting. Thus unskilled and lazy hunters rather engaged in bush burning to get their meat. As a result, the vegetation cover is usually converted to bare land in the dry seasons. In 2007, the prohibition of bush fires had an impact on the LULC such that the vegetation had been restored resulting in an increase to 246.5 km² (33% of total area). The findings complemented that of (Cisse *et al.*, 2021) where it revealed an increase in cashew plantations between 1989 and the year 2017. The rise in cashew culture resulted in the decrease in Savannah as well as other croplands and natural vegetation.

4.2 Performance Evaluation Measurements

User accuracy for the 1989 classification varied from 89 to 100 per cent, while producer accuracy ranged from 97.06 to 99.13 per cent. The narrow accuracy range suggests some degree of overlap between cashew plantations and other types of land cover. The 2007 classification also achieved user accuracy ranging from 90.91 to 100 per cent and producer correctness from 95.23 to 99.52 per cent. Between 92 and 98.76 per cent for the producer accuracy in 2022 and

85.19 to 99.67 per cent for the user accuracy, respectively. This analysis rates an overall Kappa coefficient of 0.98 for 1989, 0.97 for 2007, and 0.95 for 2022 as excellent.

From the F1 Score in Table 1, intercropping between cashew and other crops as well as bare lands and vegetation in a few instances accounted for those misclassifications. The extensive procedures used throughout the classification process are what led to the high accuracy levels for the classification. The best results were produced using the Support Vector Machine method, as shown by the kappa and total accuracy. The good quality of the classification can be attributed in part to the large number of training examples used. This also helped in the better distinction of the cashew plantations and other vegetation as given in the F1 scores.

4.3 Land Tenure System Evolution

The land tenure system was predominantly customary until the recent commercialisation of land due to the effect of increased demand for land.

Evidence from this research shows that most land owners have been engaged in some form of sharecropping arrangements with migrants/settlers. The most commonly practiced agreement between land owners and the settlers was abunu.

Some land owners have carried out the cashew farming on their own. These are mostly indigenes who have acquired the land through usufructuary rights. Until the advent of cashew, the land was usually cultivated for feeding with food crops such as cassava, yam, plantain, vegetables. However, cashew is now the major drive for land acquisition.

4.4 Impact of cashew on Land Tenure and Security

The youth make up an energetic population and are probably going to work well to boost yields, according to the age group that is most active in cashew plantations. In order to maintain the cashew farming industry, there needs to be a deliberate push to recruit more people in this age range. Less youth working in cashew plantations may be due to lack of access to land. It should be noted that although the responses seemed to suggest that there might be farmland for sale, less than one-fifth of the farmers actually bought or leased their land. The cost of land is expensive, limiting potential farmers' access to land, especially the young.

The community's access to land may be impacted by the increased cashew farming in the municipality. This is due to the possibility of less space being accessible for other uses, such as housing, agriculture, and community activities, as more area is devoted to cashew production. The proliferation of cashew plantations may also result in the eviction of locals as their land is appropriated for commercial purposes. Additionally, the expansion of cashew plantations may alter how land is used. To make space for cashew plantations, for instance, natural forests and other ecosystems may be removed, which may lead to a loss of biodiversity and ecosystem services. Overall, the impact of increased cashew plantation on access to land in a municipality can be seen from the responses.

5. CONCLUSION AND RECOMMENDATION

The study showed that cashew plantation is the dominant land cover in the area. The LULC maps showed that cashew had become the dominant crop in the area. Acknowledging that other vegetation (such as other crops and hunting grounds) is still present, they have not yet been entirely supplanted by the cashew. The study established that growing cashew land demand has significantly altered Jaman South's customary land tenure patterns in terms of how that land is accessed, maintained and used. It can hinder or undo all efforts made to accomplish the sustainable development objectives. The study has established that the dominant relationship or arrangement which existed between land owners and settlers/migrants was 'Abusa'. Most landowners engaged in subsistence farming and a few others, cocoa farming before the inception of cashew. The constant need for cashew nuts as well as the crop's resistance to diseases and drought, which prevented loss, were the main factors in the transition toward cashew growing. Aspects of land tenure that are affected by rise in cashew production includes the availability of land for possible extension or new planting, the mode of acquisition of land, security of tenure and conflicts resolution mechanisms. The study further showed that, despite the rarity of conflicts, the municipality has noticed an increase in incidents as a result of the potential income that may be obtained from cashew plantations. On the other hand, growing cashew planting has impacted the municipality's mechanism for resolving conflicts.

This research provides a foundation and serve as an impetus upon which further research may be conducted in the study area in relation to cash crops, land tenure and sustainable land use. It will also influence investment incentives toward productivity and structural transformation in agriculture when development organisations and cashew experts.

In light of the conclusions and significant findings of this study, research can be conducted to assess the impact of increased cashew plantation on food security in the municipality. Research can be done by others to proffer some solutions to the existing challenges presented by the fast cashew culture. Also, the rise in cashew can be further investigated to assess the impact on specific subjects such as land tenure security. towards a more sustainable land tenure and cashew culture in Jaman South.

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BIOGRAPHICAL NOTES

The author is currently a practicing survey engineer in Ghana. He currently lectures at Central University. For a young professional, he has several years of experience within Ghana and West African sub-region. His research area of interest include the harnessing of geospatial technology for efficient capture and management of land and its resources. He is a DAAD Scholar from the Network on Excellence for Land Governance in Africa (NELGA). He is a professional member of the Ghana Institution of Surveyors (GhIS).

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