



## Land tenure security, household income and distribution, lesson from southern highlands in Iringa District Council

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### ABSTRACT

Land distribution is a key factor in income inequality in rural areas of developing countries. This study examines the impact of land tenure security on household income and its distribution in Iringa district, Tanzania, focusing on the Certificate of Customary Right of Occupation (CCRO). Using a quasi-experimental design and Propensity Score Matching, 404 respondents were randomly selected and divided into groups with and without CCROs. Both quantitative and qualitative data were collected through surveys and in-depth interviews. Analysis using SPSS/STATA revealed that households with CCROs had higher agricultural yields, sales, and lower production costs. They also invested more in modern farming techniques and soil conservation, leading to higher incomes and reduced income inequality. Despite over 50,000 CCROs issued, credit access remains limited due to a lack of awareness and additional collateral requirements. The study concludes that secure land rights are vital for economic growth and poverty alleviation. Recommendations include increasing awareness about CCROs, facilitating their use as collateral, and exploring barriers to credit access for CCRO holders. Further research is needed to address these challenges.

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## Introduction

Land tenure security has become focal point for development strategies in developing countries in achieving their development schemes like reducing income inequality among rural population and vulnerable ethnic group, control and eradicate poverty rate, and improving utilization of natural resources exposed to the country (Indufor, 2014). Most of land in the world are operating in informal ownership as over more than six billion parcels of land globally only 25% are registered and have land tenure security, effect of informally administered of land can be witnessed mostly at developing country where almost 75% of population are living in rural areas and depend on agriculture activities. The rural population have experienced low-income distribution due to low agriculture productivities that caused by operating in undocumented parcel of land (Byamugisha, 2013).

Data from World Bank, (2011) indicated that 2.6 billion people are living below 1 USD per day. This burgeoning global population has intensified land accessibility issues, particularly in rural areas, pushing many into poverty; most of those people are living in rural area where more than 55% of world population are located (IFAD, 2010; MoF et al., 2013). Many of those rural dwellers are investing on smallholder agricultural activities or in other activities that indirectly depending on agriculture as source of income. Land tenure security is increasingly becoming central to development strategies in developing countries, focusing on reducing income inequality, alleviating poverty, and optimizing natural resource utilization (Indufor, 2014). Globally, a significant portion of land remains informally owned, with only about 25% of over six billion land parcels formally registered, impacting income distribution due to lower agricultural productivity associated with unregistered land (Byamugisha, 2013).

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For the rural people in developing countries access to land means income generation opportunities to the household as it opens the door for other social-economic benefits as well as control and reduce poverty level of the community and country in general (Barbanente & Chakrabati, 2020). This necessity prompted African nations, including Tanzania, to realign development strategies towards poverty reduction (Sanga, 2009). Subsequent legal reforms led to the enactment of the Land Act No.4 and Village Land Act No.5, aiming to enhance land tenure security among rural populations through the issuance of CCROs (Global Hunger Index, 2012).

Additionally, research in Indonesia by Bou Dib et al., (2018) indicates that rural populations are impacted by land use changes, whether by government action or investor initiatives, leading to income flow disruptions and exacerbating income inequality (Krishna et al., 2017). Land tenure, defined as the ownership rights sanctioned by customary laws and possession regulations by Thompson and Freudenberg, (2018), is increasingly becoming vital for rural communities. This security extends beyond agricultural use, offering diverse income-generating prospects (IFAD, 2015).

Land tenure security enables individuals to capitalize on the economic value of land through enhanced productivity, commercial farming investments, and broader income-generating activities (Bonabana et al., 2020). Yang et al (2020) observed that in China, household income disparities are linked to natural capital ownership, like agricultural and commercial land. Those with secure land tenure generally report higher incomes compared to those lacking cultivation land. In developing nations like Tanzania, land access ensures not only income generation but also for food security and socio-economic benefits, contributing to community and national poverty alleviation (Barbanente & Chakrabati, 2020). The Tanzanian government, recognizing land's significance for rural livelihoods, hence revised its land policy to facilitate rural poverty reduction.

Land tenure security significantly impacts the availability of income generation opportunities. As demonstrated by Kauzeni et al (2022), secure land tenure, particularly under the framework of the Certificate of Customary Right of Occupation (CCRO), facilitates various income-generating activities. These include production of commercial crops, land rental, and leveraging land as collateral for credit access. However, in rural areas, less than 10% of land is formally documented with CCROs. Consequently, many individuals in Tanzania operate on informal and undocumented land, which limits capacity to benefit economically from activities conducted in these areas. This limitation affects investments in commercial crops, accessing credit from financial institutions, and generating income through the rental process (Rubeena, 2022).

Despite the advantages of land tenure security, Roth and McCarthy (2014) presents a nuanced perspective. Pointing out contradictions regarding the economic benefits attributed to land tenure security and the actual economic gains rural people might realize upon obtaining a CCRO. Some studies (Lawry et al., 2017; Waterworth, 2023; Yang et al., 2020) indicate that while CCROs can offer economic benefits to rural communities, the extent and nature of these advantages remain subject to debate. Sanga (2009) notes that acquiring a CCRO does not necessarily guarantee rural households access to financial benefits, such as credit, primarily due to the low production value of the land they own. Some studies have predominantly concentrated on the relationship between land tenure security and broader development strategies or general economic growth, particularly in non-agricultural activities, thus failing to distinctly establish how land tenure security influences household income formation.

To address this knowledge gap, the study was conducted in the Iringa district, Tanzania. To assess the impact of land tenure security on household income and income distribution. The study specifically focused on measuring how land tenure security affects agricultural productivity, examining the impact of land tenure on farm investment, and determining the influence of land tenure security on access to credit facilities.

## **Literature Review**

This section presents the review of several researches and academic publication that have studied the topic related with the objective of this study. Literature reviewed to find the concept that enable understanding of the current problem that is investigated by this study, the section arranged to present empirical review of different previous studies and reviews of theories that provide assumption to the existing topic, and conceptual framework that show the relation of different variables.

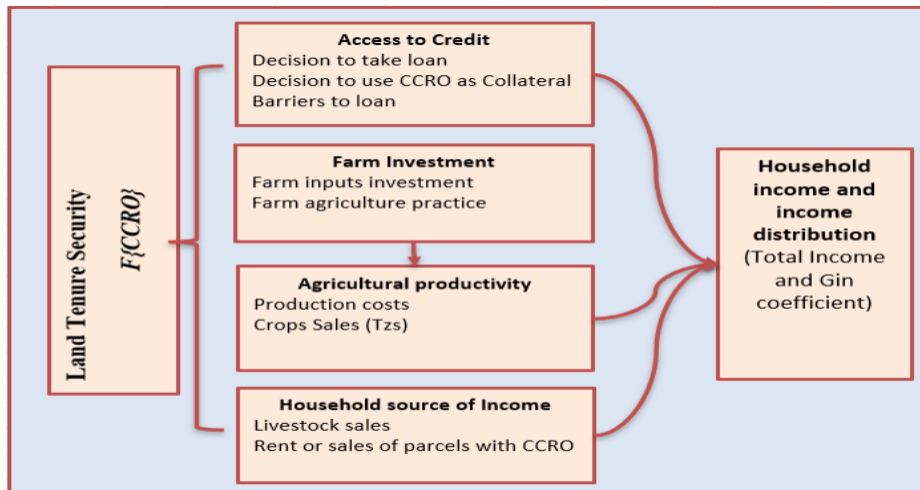
### **Theoretical and Conceptual Framework**

The study employs the Theory of Access (TA) as conceptualized by Ribot and Peluso (2003) to elucidate the link between land tenure security and household income distribution. Given that agriculture is a primary source of income in rural areas of developing countries, access to production equipment is crucial. (Po & Hickey, 2018) argue that limited accessibility to such equipment challenges governments in addressing income disparity and poverty reduction in rural areas. This necessitates government intervention to ensure the availability of these materials. The TA underscores the significance of rural households having access to essential resources, such as land, for agricultural purposes, in managing income distribution. Furthermore, legal possession of property, safeguarded under statutory or customary laws, is central to accessing production resources (Kraft and Furlong (2017). However, Tenaw et al (2009) argue that mere access and possession of productive resources does not automatically lead to increased income and distribution; therefore, the capability to effectively utilize these resources is imperative. The TA thus focuses on both the legal possession provided by land tenure security and the practical utility of these resources in generating financial benefits (Bacchetti et al., 2019).

The TA's application in this study mirrors its use by Aguirre (2019) in the Gendered Land Use and Land Cover Change (GLUCC) study among Afro-descendant communities in Colombia. Aguirre employed the TA to explore the interplay between property rights, environmental entitlements, and land utilization. Similarly, Dercon and Gollin (2014) and Tenaw et al (2009) have used the TA to investigate the relationship of land tenure security. While the TA is influential in rural research, critics such as (Kogachi & Shaw, 2023; Morse & McNamara, 2013; Serrat, 2017) have highlighted its shortcomings, particularly its insufficient emphasis on household income sources in determining income outcomes. Despite these criticisms, the TA remains a valuable framework in rural studies. In this study, the TA is applied by treating household sources of income as an independent variable to assess their impact on income generation and distribution.

### Conceptual Framework

The conceptual framework of this study was developed from an analysis of various empirical evidence and theoretical assumptions relevant to the research. Utilizing the framework illustrated in Figure 2, this study aims to understand the impact of land tenure and the issuance of CCRO on household income and its distribution.



**Figure 1:** Land Tenure Security and Household's Income and Income Distribution; *Source:* Conceptualization from theory and empirical studies (2022).

The study overall objective was to determine the impacts of land tenure security on households' income and income distribution at Iringa district council Tanzania by establishing the relationship that CCRO had to the variable of the study that are Agricultural productivity, Farm Investment, Access to credit, and household source of income.

The function of CCRO and its variables was key independent factors of the study as it was used to measure the income distribution in household, in that sense the independent variable of paper was agriculture productivities indicated by amount of harvest per land cultivated input invested in cultivation activities, farm investment factors such as household awareness, adaptation of technologies and new farming techniques, improvement of household land productivity is considered proxy to investment, access to credit measured by factors such as effectiveness of collateral as proxy of credit access, and sources of income to household indicated by consumption expenditure as proxy of income sources. Thus the reason behind the conceptual framework that established the relationship and interaction between land tenure security and household income distribution as the study focused on three specific factors that are to measure the impact of CCRO as function of lend tenure security to the agricultural productivities of the household in relation to income of household, to measure the impact of CCRO into farm investment in relation to household income distribution, and to measure the impact of CCRO on household sources of income.

### Empirical Review and Hypothesis Development

The study was hypothesized that households with CCRO are more likely to access credit, enhance productivity through good agricultural practices, and feel more confident to invest in land. This hypothesis was backed by previous study such as a study of Steven et al (2017) shows that farmers with tenure security experience higher agricultural productivity and farm income compared to those without. The World Bank (2018) suggests that secure land rights can boost productivity and income by 24% more than households lacking secure tenure rights.

The study conducted by Yang et al (2020) with the objective to understand livelihood capitals on income inequality among rural household, the capital referred to natural capital which is land for cultivation and forest land. The outcome of the study by focusing on natural capital of land for cultivation and forest land for harvesting forest output show that, there is income inequality for individual that have access to the natural capital compared to those without access. The different applied on the investment as those that have land tenure security can innovate their natural capital to increase productivities and have ability to diversify the cultivation process which lead to more income generation compared to those that lack access to natural capital ownership which led to inequality in

income distribution among peoples in rural area. Another study that provides knowledge overview on the land tenure security and household income distribution was conducted by Lawry et al (2016) focused their study on the impact of land property right interventions on investment and agricultural productivity in developing countries adopted a systematic review.

Petracco and Pender (2009) study in Uganda revealed that households' perception of tenure security is crucial for long-term land-related investments and sustainable income. This is supported by a study conducted in Rwanda by Ali et al (2014) where it was found that households with tenure security were 10% more likely to invest in their farms for future income security. Additionally, a study in Cameroon Tchinda and Kamdem (2020) demonstrated that households leverage land tenure security to enhance income through credit access using title deeds. This credit access facilitates additional income for meeting daily needs.

Ymeri et al (2020) define the source of income as the financial gain accumulated from various activities. In rural areas, household income sources are categorized into three aspects: on-farm income from agricultural activities, off-farm income such as casual employment salaries and wages, and unearned off-farm income, including social security pensions and other investments (Ndhleve et al., 2011)

## **Research Methodology**

### **Study Area and Context**

The research was carried out in the Iringa district one of the four districts of Iringa region: the others are Kilolo, Mafinga and Mufundi. The district was chosen due to the significant reliance on agriculture by its population, with about 82% engaged in agricultural activities as their primary income source (URT, 2021). Additionally, Iringa District was selected because of the collaborative efforts between the government and international organizations to implement strategies aimed at encouraging households to obtain CCRO for their land. In this initiative, approximately more than 50,000 CCROs have been issued across 36 villages within the Iringa District Council (LTA, 2021). With the population in Iringa estimated to be above 941,238, large part of population in Iringa region are presented in rural areas as it counts 64% of total regional population (URT, 2021).

Iringa District Council has 20,576 Kilometer square area, 52% (making 10,718.5 Kilometer square) of which has been reserved as the Ruaha National Park, The Lunda Mkwambi forest and ponds reserve, and 9857.5 Kilometer square are remaining for human users including forest and wildlife reserve (WMA) equivalent to 48% of the entire council area. The district is located between Latitude 7 00 and 8 00 South and Longitude 34 and 37 East. In general, the district is located at an altitude between 900 and 2000 meters above the 4sea level. In additional, the district receives between 500 and 1000 mm of rain and temperature between 10 and 30 C. Iringa District council is one of the districts that makes up the Iringa region, with 6 divisions, 28 wards and 134 villages (URT, 2021).

### **Research Design, Sampling and Data Collection Methods**

The study employed the quasi-experimental research design whereby villages that received Certificates of Customary Right of Occupation (CCROs) were categorized as the treatment group and those without CCROs were designated as the control group. The quasi-experimental design is chosen because of pre-existing groups, villagers with and without CCRO, where the researcher cannot randomly assign participants to different conditions. The design is also suitable in assessing the effectiveness of interventions by comparing groups that have been exposed to the intervention with those that have not.

The study's population consisted of all households in the two selected villages of Iringa district. The study employed a probability sampling technique, which ensured equal chances for participants to be randomly selected for the sample size. Additionally, non-probability sampling methods were used for the purposive selection of key informants (KIs) for the study.

To determine the sample size, a formula adopted from Adam (2020) was utilized, mathematically represented as:  $n = N / (1 + N(e^2))$ . In this formula, 'n' represents the sample size, 'e' is the level of precision (0.05), under the assumption of a 95% confidence level, and 'N' denotes the total population in two selected villages, one with and one without CCRO. Using this formula, the study used stratified random selection of 400 respondents and categorized into two groups.

The study used mixed methods to collect both quantitative and qualitative data to triangulate the study results. The questionnaire collected data on variables such as background information, independent variables, dependent variables, and intermediate variables that pertain to the research objectives. An in-depth interview guide was used to collect qualitative data in relation to land tenure security and households' income.

### **Data Analysis**

The study used the Propensity Score Matching (PSM) to contain bias emanating from the use of the quasi-experimental research design. The PSM created artificial control group based on demographic factors and objectives that was used in regression model with similarity with other group used by the study.

The study employed a multiple linear regression model to assess the relationship between holding a CCRO and a household's total income. Before running the regression, the study computed Propensity Score Matching to create artificial comparison group to minimize selection bias. The regression model used is presented mathematically as.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \epsilon$$

Y is total household income,  $\beta_1, \dots, \beta_n$  is a slope,  $\beta_0$  constant term,  $X_1, \dots, X_n$  functions of holding CCRO (tenure security), such as agriculture productivity, farm investment, household source of income, and access to credit, and  $\epsilon$  is an error term.

In the study, the Gini coefficient was employed to examine the hypothesis that land tenure security influences income levels among households. Following this, the researchers utilized Gini decomposition to analyze the sources of income, differentiating between groups of households with Certificate of Customary Right of Occupancy (CCROs) and those without. The Gini coefficient was decomposed by income sources to see the effect of each source on income distribution. The decomposition was also done between groups to see the effect of land tenure security on income distribution. The decomposition corresponding to the *coefficient of variation* is expressed as:

$$\sum w_i c_i = 1; w_i = \mu_i / \mu; c_i = \rho_i [\delta_i / \mu_i] / [\delta / \mu]$$

Whereby,  $w_i c_i$  = factor inequality weight of the  $i^{th}$  source in overall inequality,  $\mu_i$  and  $\mu$  = the mean income from  $i^{th}$  source and from all sources respectively,  $c_i$  = the relative concentration coefficient of  $i^{th}$  source in overall inequality,  $\rho_i$  = the correlation coefficient between the  $i^{th}$  source and total income, and  $\delta_i$  = the covariance involving the  $i^{th}$  income source.

The decomposition corresponding to *Gini coefficient* is expressed as follows: -

$$\sum w_i g_i = 1; w_i = \mu_i / \mu; g_i = R_i (G_i / G), R_i = \text{cov}(y_i, r) / \text{cov}(y_i, r_i)$$

Whereby,  $w_i g_i$  = the factor inequality weight of  $i^{th}$  source in overall inequality,  $g_i$  = the relative concentration coefficient of the  $i^{th}$  source in overall inequality,  $G_i$  = the Gini coefficient of the  $i^{th}$  source of income,  $Y_i$  = series of income from the  $i^{th}$  source,  $R_i$  = Series corresponding ranks,  $G$  = total income *Gini* coefficient, and  $R$  = Correlation ratio.

An income source is inequality-increasing or inequality-decreasing if  $c_i$  (or  $g_i$ ) is greater than or less than unity. The study computed the difference in total income as well as Gini coefficients between households with CCROs and those without. The T-test was used to determine the statistical significance of the difference in total income and Gini coefficients between the two groups.

**Validity and Reliability Tests**

The study employed the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity to measure the accuracy of data collected in terms of sampling adequacy for further analysis. The study used interpretation rules for KMO based on intervals of 0-1 with values above 0.5, being ideal for interpretation and analysis. The KMO is valued at 0.620 with significance values of 0.000 that is less than alpha P- values interval of 0.05 and less. Hence, the sampled data have significant statistical relationship paving way for further analysis. The KMO value of 0.620 means that there are sufficient variables that can be measured for each objective for more than 62% and present strong partial correlation of the variables that support interpretation of data sampled. Bartlett's Test of Sphericity have significance values of 0.000 less than 0.05, indicated that sampling was statistically significant without identical variable matrix and thus good for analysis as there is strong relationship of the variables.

The study further used Cronbach's Alpha to measure the reliability of data collected using a Likert sale. The results of Cronbach's Alpha based on Standardized Item values were 0.523 meaning that internal consistence of sampled statistics was 52.3% reliable for further interpretation. The study employed Analysis of Variance (ANOVA) through use of Tukey's Test for non-additivity to analyze the statistical relationship of variables collected from sampled population. The results of the Tukey's Test for non-additivity significance level of 0.000 meaning that there is statistical significance for households having CCRO and household income.

Additionally, the ANOVA results showed F-values of 133.108 with a significance value (p-value) of 0.000, which is lower than the commonly accepted significance level of 0.05. This indicates that the variables in the study were appropriately incorporated into the Multivariate Regression Analysis Model. This model was used to evaluate the relationship between the possession of a CCRO) and household income in the Iringa district. Furthermore, the study reported outcome residual non-additivity values of 504.000 with a significance value of 0.000. This suggests that there is a statistically significant relationship between the variables studied and the income of households.

To determine the study's reliability the Intraclass Correlation Coefficient (ICC) was used to determine consistency and reliability. The outcome showed that the two-way mixed effect mode of ICC had a statistical significance value of 0.000 with confident intervals above 95%. Also, the outcome shows that ICC correlation of single measure was 0.103 and the average ICC correlation was 0.408, suggesting that 40.8% of the variables in the group which is productivity, source of income, credit access, and farm investment have strong relationship to household income distribution.

**Table 1:** Validity and reliability tests

Validity		Reliability					
KMO		Cronbach's Alpha		hoteling's T-squire Test		ICC	ANOVA
.620	Sig.	.523	N	2261.109	Sig.	F	Sig.
	.000		6		.000	447.733	.000
							.000

## Findings and Discussion

### Respondents Socio-demographic Characteristics

The study shows that most of the respondents were female (61.9%), reflecting their central role in household income distribution and management. Male participants accounted for 38.1% of the sample. The majority (77.5%) of the respondents were primary school leavers, the rest had secondary or higher levels of education.

A significant majority (86.1%) of the respondents were engaged in agricultural activities as their primary source of income and livelihood. Other forms of occupation were less common: 0.7% were involved in livestock keeping, 0.5% worked as unpaid family helpers, 2.2% were formal sector employees, 5.4% were engaged in business activities, and 5% were self-employed.

Regarding land ownership, over two-fifths (44.7%) of the CCRO owners were joint owners (husband and wife), while one-third were either solely owned by the self/husband (34.1%) or listed under wife/spouse (12.2%). Land with CCROs owned by other family members constituted 8.6%, and a small fraction (0.4%) did not know the ownership status. Most respondents either inherited their land or purchased it, with each category accounting for 47.8% of the cases. A minimal portion obtained land by clearing forests or unused land (0.2%), through village distribution (3.7%), or as a gift (0.5%).

**Table 2:** Socio-demographic Data

Socio-demographic Characteristics	Categories	Percentage
<b>Gender</b>	Male	38%
	Female	62%
<b>Economic Activities</b>	Agriculture activities	86.1%
	Livestock keeping	0.7%
	Unpaid family helper	0.5%
	Paid employee	2.2%
	Business	5.4%
	Self-employed	5%
<b>Land Ownership</b>	Self/Husband	34.1%
	Wife/Spouse	12.2%
	Jointly listed	44.7%
	Other	8.6%
	Do not know	0.4%
<b>Education Level</b>	Primary	77.5%
	Secondary	15.6%
	Certificate	2.2%
	Diploma	.5%
	University	1.5%
	No education	2.7%

### Households' Income and Income Distribution

The study's findings (Figure 2) show that households possessing a CCRO tend to have higher income levels compared to those without. As illustrated in Figure 2, the average income for households without CCRO is estimated at around 976,396 TZS per respondent. In contrast, households that have effectively utilized land resources through obtaining a CCRO demonstrate the capability to generate a higher mean income of approximately 1,873,659 TZS.

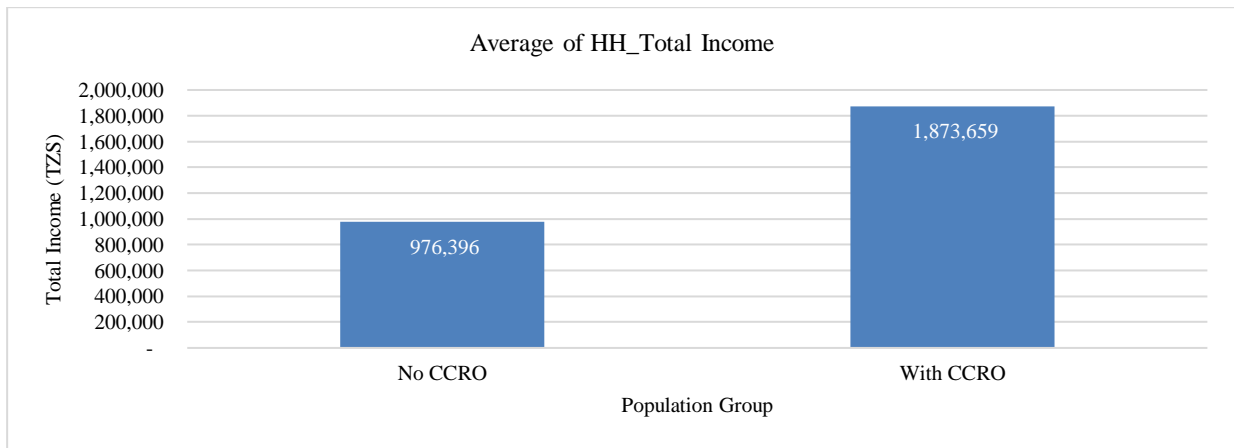


Figure 2: Households' Income

The study employed Lorenz Curve & Gin Coefficients to determine income distribution among household in Iringa district for those with CCROs and those without as shown in Figure 3. The Lorenz Curve for households without a CCRO shows a significant deviation from the line of perfect income equality, indicating higher income inequality among the households (as shown in area B). This is evident as 60% of households without CCRO are expected to garner only 16.47% of the cumulative income. In contrast, the Lorenz Curve for households with CCROs is closer to the line of equality, suggesting lower income inequality thus, suggesting households with CCROs potentially benefit more from land utilization as a source of income, with 60% of such households accounting for 31.59% of the cumulative income. Generally, the possession of a CCRO among household members appears to reduce income inequality compared to households that use land without having a CCRO, Kauzen, et al, (2022) reported that income making opportunities like producing commercial crops, renting lands as well as using land as a collateral for credit access, these opportunities are created by land tenure security under CCRO. The study's finding aligns with what has been reported by Yang, et al., (2020) that income disparities between individuals with and without access to natural capital compared to those without a formal access. The distinction lies in the ability to leverage land tenure security to enhance natural capital productivity and diversify cultivation processes, leading to greater income generation. In contrast, those lacking access to natural capital ownership experience heightened income distribution inequality.

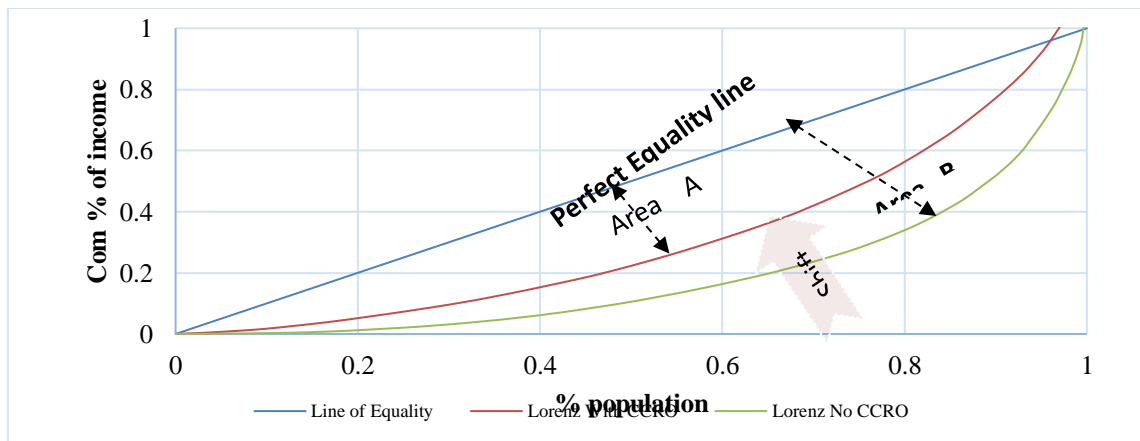


Figure 3: Lorenz Curve showing Household Income and Income Distribution

**Impact of Land Tenure Security on Household Income**

The study employed the multivariate regression analysis to examine the influence of various predictor variables (agricultural productivity, farm investments, access to credit, and sources of income) as functions of holding a CCRO on the total income of households (Dekker, 2003). The model's summary shows that the regression model was significant with the alpha P-level of 0.05 (specifically, 0.000), signifying a statistically significant relationship between the variables within the model. The model summary tables revealed an R-squared value of 0.493. This suggests that the independent variables – comprising farm investment, credit access, household sources of income, and agricultural productivity – collectively account for 49.3% of the variance in income generated by households in the Iringa district.

Table 3 shows the model had a significant value (P-value) of less than 0.001. This result points to a statistically significant relationship between the dependent variable of the study, household total income (HHTI) distribution, and the predictor variables, which include

farm investment, credit access, household income source, and agricultural productivity. This significance is demonstrated by an F-distribution value of 77.357.

The study analyzed predictor variables using multivariate regression analysis and results of the coefficients for those variables presented in Table 3,

$$Y=HHTI=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3$$

Whereby: Y –dependent variable= Household total income (HHTI), X<sub>n</sub>- independents variables, β<sub>0</sub> – is constant variable, and β<sub>n</sub> is slope coefficient that determine changes units of independents variables.

HHTI= (-274561.306+ 0.817(AP)+ 550162.233(FI)+ 653030.237(CA)+ 258730.410(IS) + 201519.090(AES) with standard Errors of 165938.378, 0.066, 65221.892, 271545.064, 72182.310, 86075.343 respectively.

**Table 3:** Coefficients of Household Total Income

Model	Unstandardized Coef. B	Std. Error	Std Coef. Beta	T	Sig.	Collinearity Statistics.1/VIF	VIF
<b>(Constant)</b>	-274561.306	165938.378		-1.655	0.099		
<b>Agriculture Productivity</b>	0.817	0.066	0.481	12.414	0	0.847	1.18
<b>Farm Investment</b>	550162.233	65221.892	0.312	8.435	0	0.933	1.072
<b>Credit Access</b>	653030.237	271545.064	0.088	2.405	0.017	0.947	1.055
<b>Income Source</b>	258730.41	72182.31	0.131	3.584	0	0.947	1.056
<b>Model Summary</b>	R= .702	R-Square = .486					
		Sig. F Change .000					
<b>ANOVA</b>	Sig. = .000						
	F= 77.357						

The results demonstrated that all predictors of household total income have a statistically significant relationship with household income, as indicated by their significance values being less than the P-value of 0.05. The finding suggests that the predictors, namely agricultural productivity, farm investment, credit access, household income sources are significant explanatory factors for household income distribution in the Iringa district.

The standardized coefficients (β) for these variables highlight their respective contributions: agricultural productivity with a coefficient of 0.481, farm investment at 0.312, credit access at 0.088, household income sources at 0.131, and agricultural extension services at 0.089. Agricultural productivity emerges as having the highest value, indicating its strong and unique contribution to household total income. Conversely, credit access, with a coefficient of 0.088, is identified as the least influential factor in determining household total income in the Iringa district. Lawry, et al, (2016) The study found out that there are recognized gain from land tenure to productivity and income gains in different household which show income distribution among population, also the study found out that land tenure security has impact on income source of population and productivity but there is no evidence for the land tenure security to the credit accessibility.

*Agricultural Productivity based on CCRO Ownership*

The study centered on examining proxy factors of agricultural productivity, which included variables such as production costs, crop sales (in Tanzanian Shillings - TZS), average farm size (measured in acres), and total seasonal harvests (quantified in kilograms). To analyze and compare these agricultural productivity parameters between households with and without CCRO, the study employed descriptive statistics and a crosstabulation triangulation method. These comparative analyses are detailed in Table 4 of the study.



**Table 4:** Mean Values of Productivity Parameters

Agriculture productivity Parameters	With CCRO		Without CCRO		Pearson Chi-Square	
	Mean	Std	Mean	Std	Value	Sig.
<b>Total Production Costs (TZS)</b>	579688.1	967757.8	628678.2	1030786.6	108.203	0.02
<b>Total Crops Sales (TZS)</b>	1104901.0	1600000.9	572300.0	1243283.9	149.26	0.008
<b>Average Farm Size (acres)</b>	4.2	4.0	3.8	3.5	11.704	0.764
<b>Total Seasonal Harvests (Kg)</b>	1293.4	1011.3	1079.5	930.0	2.2.813	0.000
<b>Total Annual Harvests (Kg)</b>	6472.4	23915.6	3025.8	3305.0	241.66	0.000

Table 4 shows a notable disparity between households with and without CCRO in terms of production cost, crop sales, farm size, seasonal harvests and annual harvests. It shows that households lacking CCRO tend to have lower annual harvests (averaging 3,025kg), reduced crop sales (amounting to 572,300 TZS), and incur higher production costs (reaching 628,778.22 TZS) compared to those with CCRO. This difference is statistically significant at 95% confidence interval. This outcome was also noted during focus group discussion (FGD) with participants who explained that;

*"CCRO has significantly contributed to the changing of farming techniques and procedures, having insurance on the land ownership gave peace of mind on investing in land without fear of losing it, which in turn, increased our commitment"* - FGD participant

Another participant explained that;

*"I have realized changes in the crop yield since receiving my CCRO, and the CCRO ownership has motivated most of the farmers, including myself, to invest in quality seeds and fertilizers without fear of losing my land"* FGD participant - FGD participant

It was also described by other participants that;

*"Productivity in farming has a significant relationship with the assurance of land ownership. Thus, for me, having CCRO assures me to utilize different extension services to increase land productivity."* - FGD participant

The findings are consistent with results from similar research conducted in various regions. For example, literature (Steven et al., 2017; Li et al., 2017; and Uwacu et al., 2020) shows that farmers with tenure security experience better agricultural productivity and, consequently, higher farm income than those without such security. This pattern is further corroborated by a World Bank study in 2018, which observed that in Chad, households with secure land rights experienced a 24 percent increase in productivity and income compared to those with insecure tenure rights. This body of research underscores the critical role of tenure security in enhancing agricultural efficiency and economic well-being among farming households.

*Investment*

The study aimed at assessing various investment parameters in farming, including the utilization of technology (such as fumigation and pesticides), application of chemical fertilizers, usage of tractors and machines, installation of irrigation systems, construction of buildings and fencing around farms, and conducting soil conservation activities. According to study findings (Table 12), it was observed that households possessing Certificates of Customary Right of Occupation (CCRO) invested significantly more in pesticides (50.5%), herbicides (23.3%), and agro-chemicals (80.2%) compared to households without CCRO. The latter group's investments were primarily in local fertilizers, such as animal and organic fertilizers, including farmyard manure. Place & Otsuka (2002) showed that, coffees plantation are commercial crops utilized effectively by farmers with land tenure security followed by following methods to improve land quality. The overall result that found by the study indicated that land tenure security has influence on the farm investment but had no influence on productivity of Household especial for food purpose crops.

**Table 5:** Farm Input Investments

Input Type Used		Fertilizer	Improved Seeds	Local seeds	Pesticide	Herbicide	Fungicide	Other Chemicals	Tractors
Without CCRO	Frequency	104	94	104	63	11	3	129	35
	Percentages	51.5	46.50	51.50	31.2	5.4	1.5	63.9	17.3
	Sig	0.261	0.139	0.101	0.058	0.162	0.001	0.092	0.166
With CCRO	Frequency	60	101	102	102	47	6	162	46
	Percentages	29.7	50.00	50.50	50.5	23.3	3	80.2	22.8
	Sig	0.373	0.293	0.334	0.027	0.124	0.004	0.220	0.007
Pearson Chi-Square	Value	19.872	0.486	0.04	15.582	26.09	1.023	13.379	1.868
	Sig.	0.000	0.550	0.920	0.000	0.000	0.503	0.000	0.214

*Farm Agriculture Practices*

The investigation revealed that a significant majority of households with CCRO have made substantial investments in land improvement than otherwise. This includes erecting buildings (96.2%), developing terraces (88.1%), constructing fences (91.1%), and implementing soil conservation methods (88.1%), with these farm areas being utilized for diverse socio-economic activities. However, no significant difference was observed in the investment in wells or pump irrigation between households with and without CCRO. The FGD revealed a similar outcome during the discussion with participants who described the following;

*"Since receiving our CCROs, we've realized how important it is to save our land for coming generations. To make sure that our land is fruitful for many years to come, we have begun putting soil conservation techniques like terracing and cover cropping into practice."* Participant in FGD

*"We have been inspired to adopt more sustainable farming practices by the security of land tenure that our CCROs provide." We now exercise greater caution in the utilization of our resources and land because we care about their long-term health."* Participant in FGD

*"For us Farmers who have gained ownership of CCRO, we have been empowered to have control and management of land for adopting any relevant agricultural practices that enhance food security in rural areas."* - Participant in FGD

Supporting this observation, empirical evidence from Goldstein and Udry (2008) indicates that in Ghana's Akwapim region, secure land rights encouraged individuals to innovate, leading to increased investment intensity and higher agricultural revenues. Similarly, an IFPRI (2012) study in Mozambique found that households' perceptions of tenure security were instrumental in fostering long-term, land-related investments, crucial for sustainable household income. This is further corroborated by Ali et al. (2011) in Rwanda, where households with tenure security were found to be 10% more likely to invest in their farms, enhancing their future income prospects. Moreover, a study in Cameroon by Tchinda et al. (2020) demonstrated that households leveraged land tenure security to augment income through credit access using title deeds, which in turn facilitated additional income for daily necessities.

**Table 6:** Farm Agricultural Practices

		<b>Wells or pump irrigation</b>	<b>Erect buildings</b>	<b>Develop terracing</b>	<b>Soil conservation activities</b>	<b>Erect buildings</b>
Without CORO	Frequency	192	154	101	163	156
	Percentages	95	76.2	50	80.7	77.2
With CCRO	Frequency	197	194	178	178	184
	Percentages	97.5	96	881	88.1	91.1
Pearson Chi-square	Value	1.731	33.169	68.683	4.231	14.55
	Sig.	0.293	0.000	0.000	0.040	0.000

*Credit Access*

The regression analysis results (Table 3) align with the objectives of the CCRO provision in Iringa District, which is primarily focused on addressing land tenure insecurity. The underlying assumption is that securing land rights plays a pivotal role in enhancing rural households' access to credit. Despite this, the study found that credit access in the Iringa district remains minimal, even with over 50,000 CCROs issued in the area. Only a small fraction of households (18.3%, n=202) with CCROs decided to utilize their certificates to obtain loans. The study's finding contrasts with observations from a study in Cameroon by Tchinda et al. (2020), where households effectively used land tenure security to improve their income through credit access, leveraging title deeds (CCRO). In the Cameroon context, access to credit facilitated additional income for meeting daily needs. This was supported by the results found during FGD with selected participants as noted that;

*"We still struggle to obtain financing, despite having our CCROs. Banks are frequently reluctant to lend to rural farmers because many of us do not know how to use our land as collateral. This situation irritates me."* Participant in FGD

*"We have come across ads that say that we may use our CCROs to obtain loans, but we're not sure where to begin and the procedure sounds difficult. In addition, there may be stiff repayment terms and exorbitant interest rates. The trouble isn't always worth it."* Participant in FGD

*"A few of us have attempted to obtain loans through our CCROs, but the banks have rejected our applications. They claim that smallholder farmers are unreliable or that the value of our land is insufficient for them to repay which is depressing"*. Participant in FGD

These pieces of evidence suggest that land without secure tenure is less likely to be converted into capital, thereby holding less value. Hence, obtaining a property title directly enhances income generation by fostering higher agricultural productivity, encouraging farm investment, and improving access to credit. This highlights the vital role of secure land tenure in facilitating economic growth and development in rural areas. It was argued that land tenure security provides opportunities to individuals to benefit from the economic value of a given land either through, credit access, diversity opportunities that generate income for households (Bonabana, et al., 2020).

**Table 7: Credit Access and CCRO Utilization Between Groups with and Without CCRO Ownership**

	N	Without CCRO		Sig	With CCRO		
		Mean	Std. Deviation		Mean	Std. Deviation	
<b>Decision to take Loan/Credit</b>	202	0.3465	0.47705	0.016	0.4752	0.50063	0.010
<b>Decision to use CCRO as collateral</b>	37 (18.3%)			-	0.1832	0.38777	0.006

*Key barriers*

Study findings (Table 8) show that less than half of the respondents had obtained loans from financial institutions or individual lenders.

A significant proportion of participants had not taken loans, primarily due to a lack of awareness and business ideas, despite possessing Certificates of Customary Right of Occupation (CCROs). According to the findings presented in Table 8, a substantial 61.9% of households with CCROs lacked knowledge about how and where to access credit. Additionally, 16.8% experienced limited access to financial services, as most financial institutions are centered in urban areas and have limited engagement with rural communities. The above is supported by the quote below:

*“Lack of awareness is the biggest barrier facing us in Iringa, since we do not have sufficient knowledge on how to use CCROs to access credit/loans. We have the attitude of being rejected when we go to the bank and ask for a loan (Key informant, Iringa district Council, March 2023).*

Also, it was explained that;

*"The largest obstacle we face is ignorance. We were unaware of the advantages of CCROs such as the ability to obtain credit through them. We could take advantage of these chances if we had greater knowledge and assistance." - FGD participant*

*"We have trouble accessing financial services, even if we wanted to seek loans. Our neighborhood doesn't have many banks or microfinance organizations, and the ones that do exist don't seem to be sensitive to our needs. We appear to be invisible to them." - FGD participant.*

*"A few of us have attempted to obtain loans through our CCROs, but the banks have rejected our applications. They claim that smallholder farmers are unreliable or that the value of our land is insufficient for them to repay." - FGD participant*

Moreover, a small (6.4%) percentage of the respondents indicated that they lacked additional collaterals, such as household equipment or a house, to supplement their CCRO when seeking credit. This lack of additional collateral forms another obstacle in accessing credit for these households. Furthermore, these statistics were significant at 0.05 level in both with and without CCRO households indicating the meaningful differences. According to Sanga, (2009) the banks are willingly to offers loans to farmers with registered land as collateral but the terms and condition that banks set are imposing challenges for most smallholder farmers to fail access to credits.

**Table 8:** Key barriers faced by communities to use CCRO as collateral for loan.

Barriers	Without CCRO				Stat-Sig	With CCRO				
	Frequency	%	Valid%	Cum %		Frequency	%	Valid%	Cum %	Stat-Sig
Lack of collateral	15	7.4	7.4	7.4		13	6.4	6.4	6.4	
Lack of awareness	136	67.3	67.3	74.8	<b>Sig 0.035</b>	125	61.9	61.9	68.3	<b>Sig 0.009</b>
Lack of business ideas	43	21.3	21.3	96.0	<b>Chi-Square 435.537</b>	30	14.9	14.9	83.2	<b>Chi-Square 383.766</b>
Inadequate access to financial services	8	4.0	4.0	100.0		34	16.8	16.8	100.0	
<b>Total</b>	<b>202</b>	<b>100.0</b>	<b>100.0</b>			<b>202</b>	<b>100.0</b>	<b>100.0</b>		

Source: Research Data (2022)

Among the study participants who obtained loans, a significant proportion (72.3%) allocated these funds to agricultural production. A smaller percentage (10.2%) utilized the loans for various household necessities, including school fees and clothing. Additionally, 8.4% of the individuals directed the credit towards business expansion, 7.8% spent it on purchasing food, and a marginal (1.2%) treated the credit and loans as a source of income. One respondent said:

*"In rural areas like Iringa, the decision to take a loan is primarily driven by the intention to invest in agricultural activities, procure food, or address basic household needs such as school fees and clothing. Additionally, it can be to expand one's business. Absent these needs, acquiring a loan is generally deemed unnecessary."* (Mgama Village Influential Leader, Iringa district, 14<sup>th</sup> March 2022).

This quote reflects the practical considerations of loan acquisition in rural settings, underscoring the prioritization of agriculture, essential needs, and business growth as primary factors influencing borrowing decisions.

According to existing literature, rural households often resort to borrowing for a multitude of reasons. These include investing in agricultural activities to boost crop yields and farm productivity (Barrett, 2008), securing financing for specific crop seasons (Morduch, 1995), addressing healthcare and other essential needs (Hazarika, 2011), starting, or expanding small businesses (Banerjee & Duflo, 2007). These diverse motivations for borrowing reflect the intricate financial strategies employed by rural households to navigate their unique economic environments.

#### Household Income Source

The study focused on various sources of household income, including agricultural crop harvests, livestock sales and products, the renting or selling of parcels with CCRO, salaries, remittances, and business activities. According to the study findings (Table 9), households possessing Certificates of Customary Right of Occupation (CCRO) generated greater income from agricultural crop harvests and livestock, compared to those without CCROs. Specifically, crop harvests accounted for a substantially higher-ups' proportion (60%) of the total income for households with CCROs than for those without. This aligns with existing literature, whereby Myers (2013) reported a positive correlation between the diversity of income sources and the total income entitlement of a household. This was presented during FDG with participants;

*Our primary source of income is agriculture, and having stable land ownership has greatly benefited us. Our families benefit financially from our increased ability to invest in our fields and raise yields."* - FGD participant

*Some of us make money not only from farming but also from laboring on larger farms or renting out land with CCROs. Even if it's not much money, each cent helps provide for our family."* - FGD participant

*We feel more assured about our future revenue thanks to CCROs. We can make long-term plans because we are certain that our land is secure. Knowing that we have something to leave for our kids brings us comfort."* - FGD participant

Additionally, land tenure security, which includes CCROs, serves as an acceptable form of collateral asset, enhancing the land's value. This, in turn, empowers both women and men with greater decision-making authority to purchase, transfer, lease, mortgage, bequeath, or utilize land over an adequate period, thereby fostering investment and, consequently, augmenting household income, as observed by (Woubet, 2014). Table 9 indicates that, household with CCRO has relatively higher total income than otherwise. Household with CCRO has significantly at 95% received additional income from livestock sales and production; and rent or sale-out parcel with CCRO because of their P-Value of 0.049 and 0.001 respectively significance level. While household without CCRO were insignificantly get additional income from livestock sales and production (P-Value 0.771>0.05 level). Kauzen, et al., (2022) reported

that income making opportunities like producing commercial crops, renting lands as well as using land as a collateral for credit access, are created by land tenure security under CCRO. According to World Bank 2018 secure land rights tend to increase their productivity and ultimate income by 24 percent more than the households with insecure tenure rights.

**Table 9:** Household Source of Income (TZS)

Source of Income	Total CCRO	Income-With	Proportio n	Sig	Total Income CCRO	-No-	Proportio n	Sig
Livestock sales and production	142545041		35.4	0.04 9	74370000		43	0.77 1
Rent or sale out parcel with CCRO	1740000		0.4	0.00 1	-		0	-
Grand Total	144,285,041				74,370,000			

It was further found that, 8.4% of households owned CCROs have decided to change the type of crops or other changes in farming practices since they have land mapped and obtained CCRO; specified started planting trees and long-term crops and has led to changes in the income they receive from farming. The altered farming practice has direct influence on household total income, because by diversifying crops and farming methods including long-term cultivation, will expose households in the new experience in terms of revenue they receive from farming. This change will lead to improved livelihood, increase resilience and better food security. However, considering the remaining 91.6% have not made any changes might be due to factors like resources access, knowledge and local context as argued by (Ymeri, et al., 2020).

**Table 10:** Decision to change type of crop after land mapping and obtaining CCRO

		Frequenc y	Percent
Decision to changes	Yes	17	8.4
	No	185	91.6
		202	100.0
If yes, What type of changes?	Planted trees and long- term crops	17	8.4
Has this led to any changes in the income you receive from farming?	Yes	34	16.8

## Conclusions

Generally, it can be concluded that households in Iringa district with CCRO tend to have higher incomes compared to those without. It is also concluded that the majority of the study's respondents, primarily engaged in agriculture, and households with CCROs reported relatively higher agricultural productivity compared to those without. In addition, the households invested more in their production which consequently led to higher household incomes.

Comparative income analysis indicated that households holding CCROs experienced better agricultural yields and sales, coupled with reduced production expenses, relative to their counterparts without CCROs. Investment patterns discerned a notable inclination of CCRO holders towards investing in agricultural advancements, encompassing modern farming technologies and soil conservation techniques.

The use of Lorenz Curves and Gini Coefficients clearly illustrates that households with CCROs tend to experience lower income inequality compared to those without CCROs. This underscores the significance of land tenure security through CCROs in reducing income inequality among households in Iringa district. The possession of CCROs appears to promote economic well-being by enabling households to capitalize on land resources for income generation, ultimately leading to a more equitable distribution of wealth and opportunities within the community.

Lastly, it is concluded that despite the issuance of over 50,000 CCROs within the Iringa district, their utilization to secure loans was minimal. This was largely attributed to a deficit in awareness regarding the use of CCROs as collateral and the necessity for supplementary collateral requirements. Furthermore, the acquired loans were predominantly used for agriculture, basic needs, and business expansion.

Based on the conclusion, it is hereby recommended that there is need for Iringa district authorities to create more include enhancing awareness and educate households on the importance of acquiring provide education programs on leveraging CCROs and how the same could be used in accessing credit. In addition, there is need for the government and formal for credit access, encouraging financial institutions to work out on modalities on how CCROs could be used as collateral by rural households as doing this will

allow households to access credit to invest in their agricultural activities, but also allow extend their services to rural areas, promoting diversified diversification of household's income sources, and implementing strategies to boost agricultural productivity and investment. Lastly, Further research is suggested on the to explore exploration of barriers to credit access for CCRO holders and develop tailored financial products for rural households what needs to be done to resolve the impulse.

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