

Land tenure security, climate adaptation, and household welfare outcomes nexus in northern Ghana

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Status Seminar 2025



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of Research, Technology
and Space



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Introduction

Insecure land tenure deter investment (Huntington & Shenoy, 2021).

Tenure security incentivize investment in sustainable land management (SLM) (Brassele et al., 2002; Akram et al., 2019).



Source: Author (2024)



Source: Acheampong et al. (2020)

Strengthening tenure security has become a global priority for enhancing:

- ⑩ farm investment
- ⑩ productivity
- ⑩ food security (Holden & Ghebru, 2016).



Research Questions

Research Questions:

1. Do risk tolerance, time patience, and secure land tenure influence adoption of climate adaptation strategies?
2. What is the individual and interaction effects on household food security?
3. Does land property right influences land fragmentation, crop diversification, productivity, and household welfare?



Data Analytical Approach

Methods of data analysis:

- Descriptive statistics
- Multivariate Probit and Poisson models
- Multinomial Endogenous Switching model
 - ✓ Accounts for Selection Bias
 - ✓ Handles Multiple Choices
 - ✓ Improves Causal Inference
(Bourguignon et al., 2007)
- Endogenous Switching Regression (ESR) (Lokshin & Sajaia, 2004)



Major Findings



High land tenure insecurity – a call for action

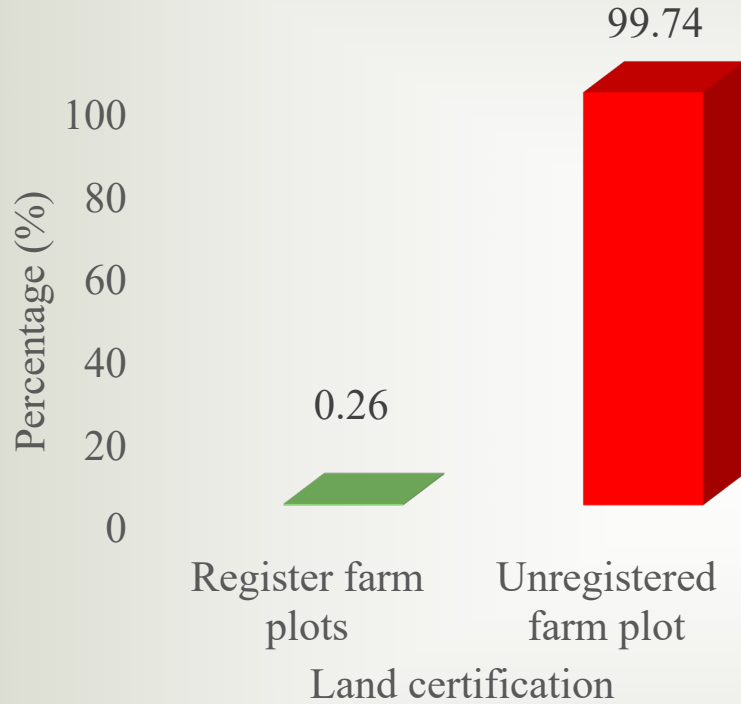


Figure 2. Land certification status

Table 1. Reasons for unregistered farmland

Reason for unregistering plots	%
There is no need	63.62
Too expensive	20.48
Process is too complicated	8.10
Do not know where or how to get it	3.62
Land is owned by chiefs	2.89
Land registration office is too far away	1.08
Not trust the land registration office	0.08



Perceived land tenure security

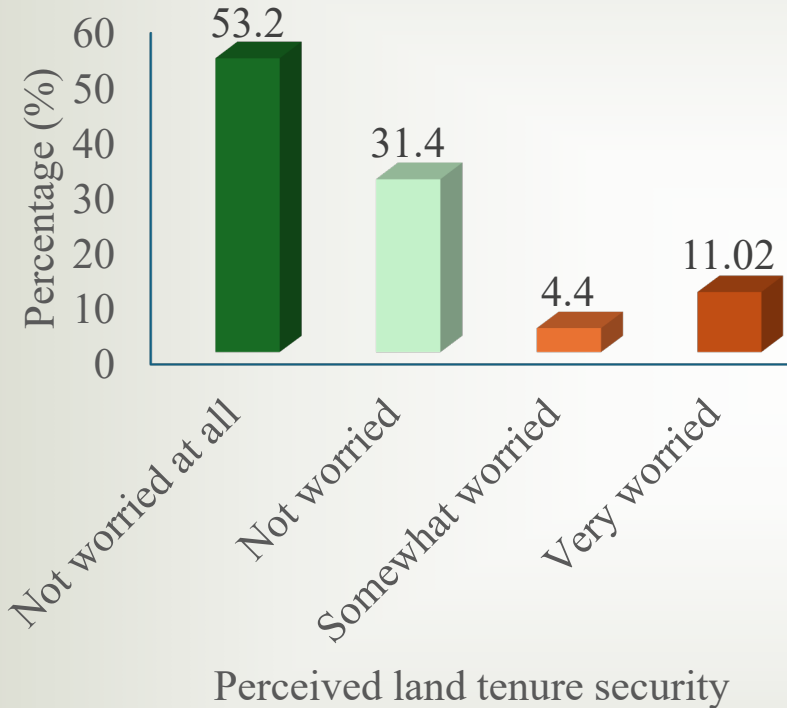


Figure 3. Perceived land tenure security status

Table 2. Why worried for losing land

why worried about losing the right to use a plot	Percent
The owner/renter may ask me to leave	33.88
Issues with local/customary authorities	30.92
Difficulty of reclaiming land if I had to leave due to a natural disaster	29.28
Lack of money or other resources needed to live on this parcel	28.29
Disagreements with family or relatives	9.21
Death of a household member	5.59
Conflict over land	5.59
Other people or groups may seize this parcel	2.96
Government may seize this parcel	2.96
Missing or inaccurate land records	0.66



Risk tolerance and climate adaptation strategies-1/2

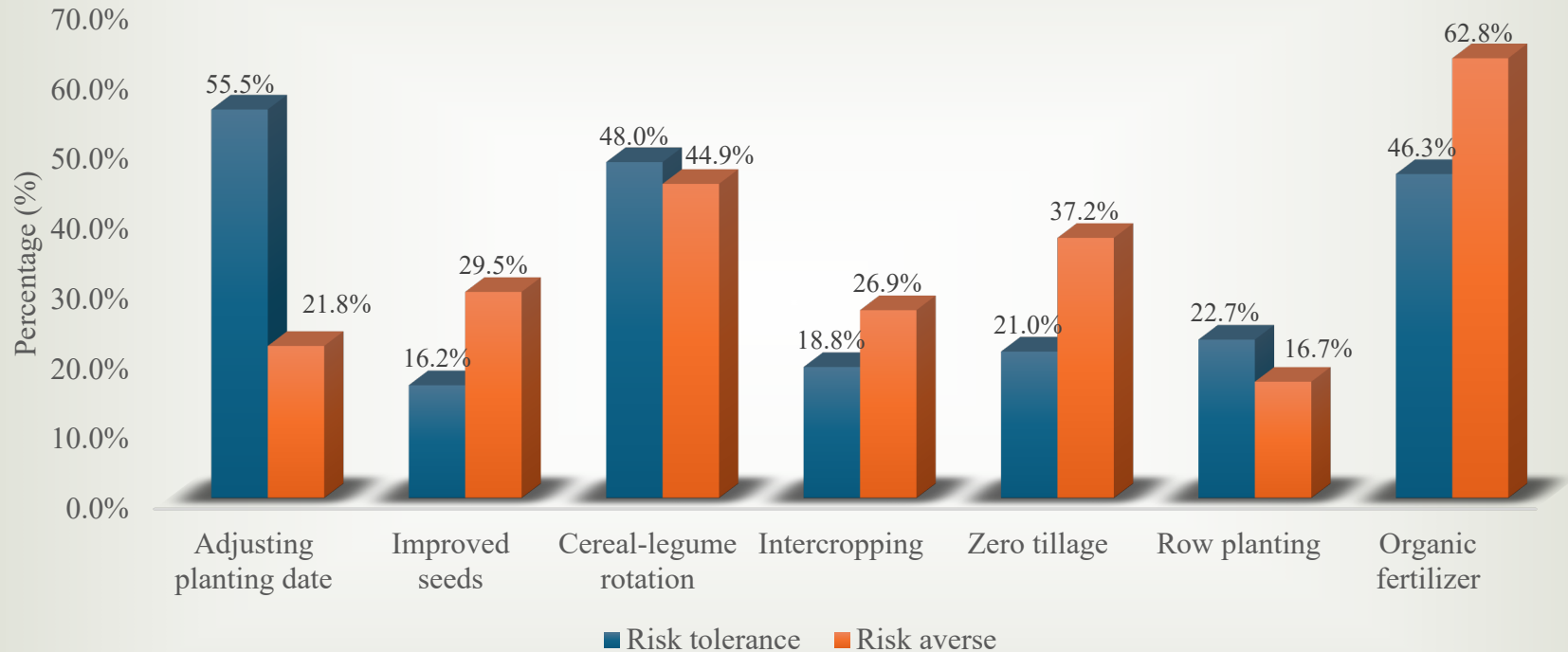


Figure 4. Risk tolerance and climate adaptation strategies



Risk tolerance and climate adaptation strategies-2/2

Table 3. Behavioural drivers for climate adaptation strategies

Variable	Coef.	Std. Err.	t-value	p-value
Risk tolerance (1. Yes)	0.062**	0.029	-2.10	0.035
Time impatient (1. Yes)	-0.278***	0.088	-3.17	0.002
Financially viable (1. Yes)	0.376***	0.092	4.07	0.000
Control factor	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Constant	0.869**	0.242	3.59	0.000
Model summary				
Chi-square	152.414			
Prob > chi2	0.000			
Pseudo R-squared	0.131			
Deviance goodness-of-fit = 294.6135; Prob > chi2(290) = 0.4136				

Note: *** and ** represents 1% and 5% significance levels respectively



Climate adaptation strategies and tenure security-1/2

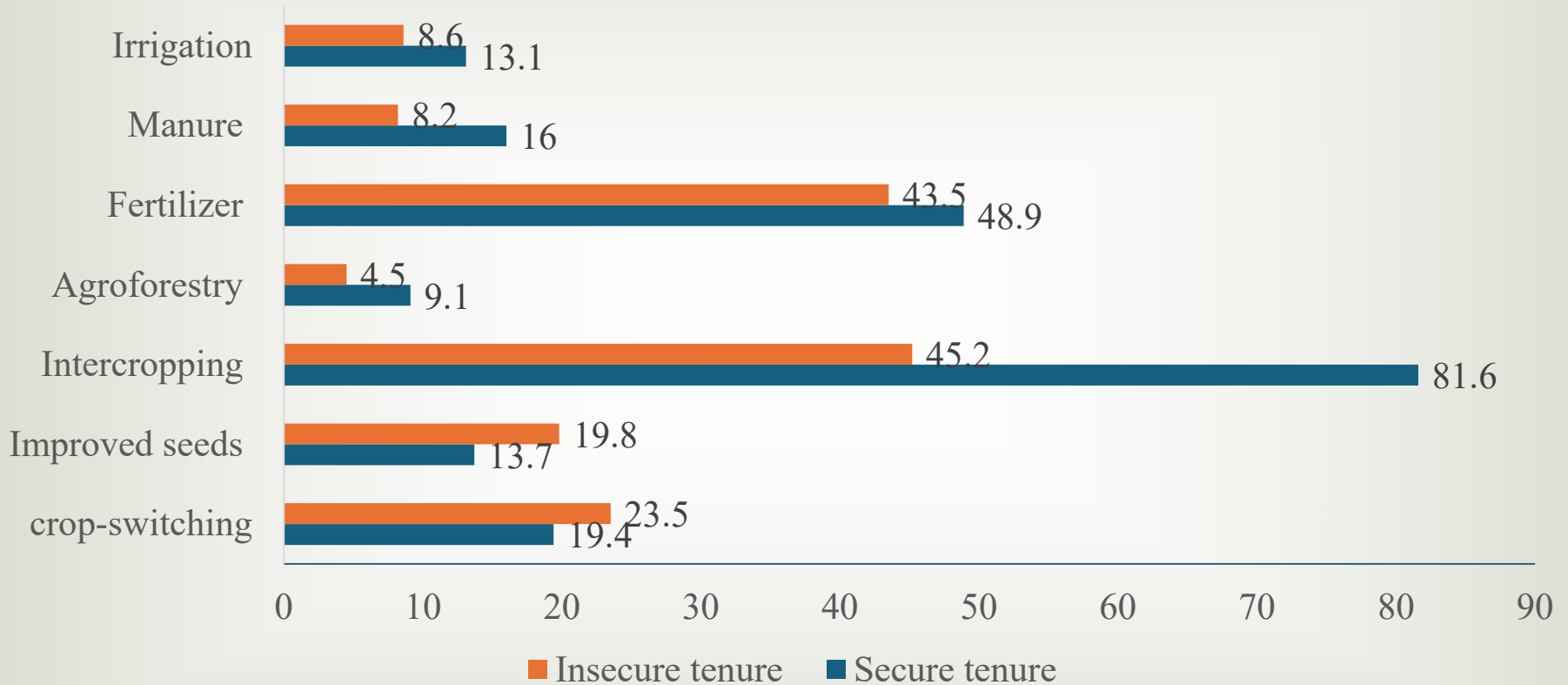


Figure 5. Climate adaptation and land tenure security



Climate adaptation strategies and tenure security-2/2

Table 4. Land tenure systems security effects on climate adaptation strategies-MVP model

Variable	Crop-switching	Manure	Fertiliser	Agroforestr y	Impr. seeds	Intercrop.	Irrigation
Perceived tenure security	0.276*** (0.094)	0.305*** (0.108)	0.127 (0.092)	0.605*** (0.110)	0.216** (0.096)	-0.066 (0.093)	0.639*** (0.108)
Land use right	0.036 (0.050)	-0.029 (0.062)	0.009 (0.050)	0.013 (0.074)	0.039 (0.050)	0.185*** (0.055)	0.117 (0.085)
Exclusion land right	0.133*** (0.022)	-0.089*** (0.027)	0.087*** (0.021)	-0.056 (0.040)	0.154*** (0.024)	-0.023 (0.021)	0.069* (0.037)
Transfer land right	-0.050** (0.020)	0.050* (0.028)	-0.035* (0.020)	0.124*** (0.031)	-0.080*** (0.022)	0.020 (0.020)	0.049* (0.028)
Land ownership duration	0.142* (0.075)	-0.009 (0.104)	0.142* (0.073)	0.304** (0.142)	0.503*** (0.089)	-0.069 (0.077)	0.088 (0.139)
Socioeconomic factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixe location effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.947*** (0.248)	-2.608*** (0.335)	-1.276*** (0.220)	-5.826*** (0.404)	-2.733*** (0.310)	-0.954*** (0.217)	-3.269*** (0.363)

Model summary

Wald chi²(154) 1504.63

Prob. > Chi² 0.0000

Note: ***, **, and * represent 1%, 5%, and 10% significance levels respectively.



Effects of climate adaptation and secure tenure on food security

Table 5. Conditional average effects of tenure and adaptation estimates-MESR

variable	Scenario	Treatment	Control	Treatment effect	%Change	t-value
FCS	Adaptation only	57.013	25.580	31.034***	121.32	11.700
	Secure tenure only	30.246	25.937	4.309***	16.61	13.003
	Interaction effect	33.935	32.655	1.279***	3.92	2.813
HFIAS	Adaptation only	7.364	8.111	-0.746**	9.20	-2.280
	Secure tenure only	4.332	4.477	-0.145*	3.24	-1.655
	Interaction effect	3.671	4.410	-0.739***	16.78	-9.660

Note: ***, **, and * represent 1%, 5%, and 10% significance levels respectively.



Land property right effects

Table 6. Conditional Average Treatment Effect on land fragmentation and Welfare – ESR

Outcome variable	Mean outcomes		ATT	t-value	%change
	Actual	Counterfactual			
Land fragmentation	0.731 (0.002)	1.619(0.003)	-0.888***(0.005)	-192.0211	-54.849
Crop diversification	1.809(0.003)	0.922(0.002)	0.890***(0.004)	188.420	96.529
Productivity	8.010(0.007)	7.481 (0.005)	0.529***(0.006)	92.2180	7.071
Per capita expend.	8.861 (0.005)	8.064 (0.004)	0.797***(0.005)	152.6289	9.883

Note: *** represents 1% significance level .



Conclusions -1/2

- Land certification is very low in Northern Ghana
 - ✓ High tenure insecurity
- Risk tolerance, time patience, and perception of financial viability have a positive significant association with the adoption of climate adaptation strategies.
- Land tenure systems security association with climate adaptation strategies is heterogenous.
- Adoption of climate adaptation strategies are high among secure land households.
 - ✓ *Manure, chemical fertiliser, intercropping, irrigation, and agroforestry*



Conclusions -2/2

- The study revealed that climate adaptation and tenure security have a positive significant association with household food security:

- ✓ *Increased food consumption scores*
- ✓ *Reduced household food insecurity access score*

• Land property right have a positive and significant association with the household welfare outcomes:

- ✓ *Reduce land fragmentation*
- ✓ *increased crop diversification portfolio*
- ✓ *increased farm productivity*
- ✓ *enhanced consumption expenditure per capita*



Policy implications

Based on the conclusion:

- ✓ Risk tolerance and time patience are pathway to SLM practices.
Governments and non-governmental organisations should encourage SLM practices by offering risk management tools and training to enhance farmers' risk tolerance.
- ✓ Land tenure systems security is a critical pathway to enhance SLM and household food security outcomes.
Governments and non-governmental organisations interventions to enhance land tenure security is essential for stimulating sustainable investments in climate change adaptation and ensuring food security.
- ✓ Integrated land tenure security and SLM action interventions should be the priority of policymakers.
- ✓ Experts should develop land tenure index to measure land tenure security as different land tenure systems security have different implication on SLM development.



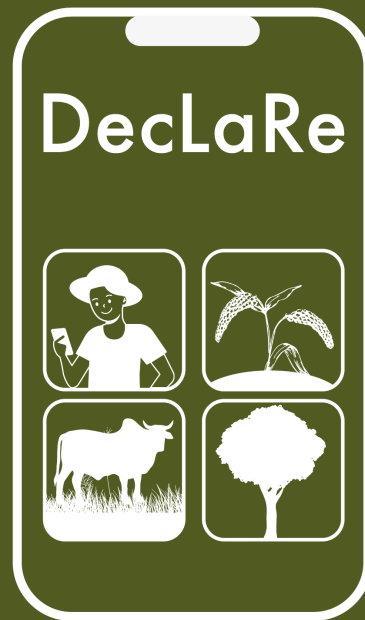
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