



# **Junior Scientists Tandems**

## **Final Report**

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**Start and end date of stay at IARC/ GRI: 01/05/2025 – 31/10/2025**

**Title: The role of Agricultural credit in the adoption of sustainable intensification practices in Northern Ghana**

Funded by the German Federal Ministry for Economic Cooperation and Development (BMZ)





## Introduction

This report documents my six-month career exploration stay under the ATSAF Junior Scientists Tandem (JST) program, hosted at the University of Passau, Germany, with collaborative support from the International Institute of Tropical Agriculture (IITA). My research, titled “The role of Agricultural Credit in the Adoption of sustainable intensification practices in Northern Ghana,” explored the sources of credit available to smallholder farmers, the factors influencing credit access, and the impact of credit access on the adoption of sustainable intensification practices. Supervised jointly by Prof. Dr. Martina Padmanabhan (University of Passau) and Dr. Bekele Kotu Hundi (IITA), this research stay provided an opportunity to be a part of an academic environment and a research institute while focusing on independent research.

My experience at the University helped me understand the importance of qualitative research and how it can be integrated into quantitative research. The findings from these studies were shared via academic and scientific venues: an oral presentation to Supervisors and a presentation at the research lab within the Department of Development Studies at the University of Passau. Both venues fostered meaningful interactions with colleagues and experienced scientists, enhancing my research's analytical depth and policy significance. It provided me with the space and support to strengthen my research abilities, networks, and exposed me to new perspectives on development. It has also widened my worldview by connecting me to other researchers and fellow students from diverse backgrounds.

## Research Summary

Agriculture remains the mainstay of livelihoods in Northern Ghana, providing income, employment, and food for the majority of the rural population. Despite its central role, the sector continues to experience low productivity due to farmers' limited ability to invest in improved and sustainable production technologies. Modern agricultural technologies and practices have the potential to close yield gaps, enhance food security, and reduce poverty across sub-Saharan Africa. However, adoption levels remain low, mainly because smallholder farmers face multiple constraints, including inadequate access to credit, limited extension support, and low awareness of financial and insurance services.

Access to agricultural credit plays a critical role in enabling farmers to overcome liquidity constraints, adopt productivity-enhancing technologies, and transition towards sustainable intensification (SI) a production pathway that increases output while preserving natural resources. In Ghana, particularly in the northern regions, smallholder farmers face significant barriers to credit access. Formal financial institutions often perceive them as high-risk clients because of insufficient collateral, irregular income, and vulnerability to weather shocks. As a result, many farmers depend on informal credit sources such as Village Savings and Loans Associations (VSLAs) or personal networks, which offer limited and often costly financial

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support. This financing gap restricts farmers' ability to invest in capital-intensive practices like irrigation, improved seed varieties, and soil fertility management.

### **Objective of the Study**

The study aimed to examine how access to credit influences the adoption of sustainable intensification practices among smallholder farmers in Northern Ghana. Specifically, it sought to:

1. Identify the main sources of agricultural credit available to farmers.
2. Examine the factors that determine access to credit.
3. Assess the effects of credit access on the adoption and intensity of sustainable intensification practices.

### **Study Area and Data**

The study was conducted in 19 districts across the Northern, Upper East, Upper West, and Savannah regions of Ghana, where agriculture is the dominant economic activity and vulnerability to climatic variability is high. The analysis was based on cross-sectional household survey data collected from 1,196 farming households between May and July 2020. The data were obtained from the International Institute of Tropical Agriculture (IITA) baseline survey, which covered detailed information on household demographics, credit access, market participation, agricultural production, and adoption of sustainable farming practices.

### **Methods**

A combination of econometric approaches was used to address the study's objectives. A logit model was applied to identify the socio-economic, institutional, and demographic factors influencing farmers' access to credit. Multivariate Probit (MVP) model was employed to analyze the association between credit access and the adoption of multiple sustainable intensification (SI) practices. The Inverse Probability Weighted Regression Adjustment (IPWRA) method was used to estimate the average treatment effect of credit access on the number of SI practices adopted. The results were further validated using Propensity Score Matching (PSM) as a robustness check.

### **Results**

The findings revealed that informal financial sources dominate the credit landscape in Northern Ghana. Village Savings and Loans Associations (VSLAs) accounted for about 45% of total credit access, while relatives, friends, and neighbors contributed approximately 39%. Formal credit institutions, including banks, reached only about 4% of farmers, with another 6% accessing credit through farmer cooperatives and 4% through moneylenders. The dominance of informal credit highlights the limited reach of formal financial systems due to collateral requirements, high interest rates, and bureaucratic procedures. The determinants of credit access were consistent with expectations. Membership in farmer-based organizations emerged as the

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most significant positive factor, indicating that collective action improves farmers' credibility and access to group lending schemes. Access to extension services also had a strong positive effect, suggesting that farmers who receive technical guidance are more confident and better positioned to engage with financial institutions. Access to market information and awareness of crop insurance similarly increased the likelihood of obtaining credit by reducing uncertainty and demonstrating repayment capacity. Conversely, households with larger numbers of active laborers were less likely to seek or obtain credit, relying instead on internal labor resources to sustain production.

The Multivariate Probit analysis showed that credit access significantly increased the likelihood of adopting capital-intensive SI practices, such as irrigation, contour ploughing, and improved seed varieties. Farmers with credit access were 76% more likely to adopt irrigation, 29% more likely to adopt contour ploughing, and 36% more likely to use improved seed compared to those without credit. However, credit access had limited influence on less capital-demanding practices such as manure and fertilizer application, which are often financed through household resources. The IPWRA results reinforced these findings, showing that access to credit increased the average number of SI practices adopted by 0.206, representing about a 14.5% improvement compared to farmers without credit. The effects were similar across treated and untreated groups, confirming the consistency of the results. The robustness check using PSM produced comparable treatment effects (0.17–0.19), with strong post-matching balance across covariates, validating the reliability of the estimates.

### **Findings and Policy Implications**

Policies should prioritize the expansion of inclusive financial systems that integrate both formal and community-based lending approaches. Enhancing connections between Village Savings and Loan Associations (VSLAs) and formal financial institutions can extend outreach and minimize transaction expenses. Furthermore, combining credit with extension and insurance services can boost farmers' confidence and mitigate the risks associated with borrowing and adopting new technologies. Investing in rural financial infrastructure, along with training programs aimed at improving financial literacy and management skills, will further ensure that credit is utilized effectively to foster sustainable agricultural development. When paired with institutional strengthening and capacity-building initiatives, access to credit can promote the widespread adoption of sustainable intensification practices, increase productivity, and enhance long-term resilience among smallholder farmers.

### **Conclusion and Acknowledgment**

My ATSAF Junior Scientists Tandem Fellowship has been a transformative milestone in my academic and professional journey. Being hosted at the University of Passau, Germany, under the mentorship of Prof. Dr. Martina Padmanabhan (University of Passau), provided an exceptional opportunity to engage with diverse perspectives on sustainability, gender, and

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agricultural transformation. My sincere appreciation also goes to Dr. Bekele Kotu Hundi (IITA) for providing data support and contributing to the economic framing of this research, and to Dr. Mirja Michalscheck (Agroscope) for her constructive feedback and encouragement. I am thankful to the teams at IITA Ghana and the University of Passau for their collaboration, technical support, and collegial environment that enriched this experience.

Finally, I express my profound gratitude to the ATSAF e.V. and the German Federal Ministry for Economic Cooperation and Development (BMZ) for their generous funding and to the ATSAF Academy team for their exceptional coordination, guidance, and continued support. This fellowship has been both intellectually stimulating and personally fulfilling, shaping my future aspirations to contribute to inclusive and sustainable agricultural development in Africa.

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