Assessing Climate-Smart Agriculture's impact on Food Security: The case of Semi-arid Tanzania

Mahlet Degefu Awoke, Katharina Löhr, Anthony A. Kimaro, Marcos A. Lana, Johannes Hafner, Stefan Sieber

Introduction

- Climate change poses a significant threat to global food security, in developing countries like Tanzania where, 78% of the population relies on rain-fed subsistence farming (Rioux et al., 2017).
- Transforming agricultural systems to enhance productivity and resilience is crucial for sustained food security.
- Sustainable agriculture such as Climate-Smart Agriculture (CSA) are essential for enhancing food security and mitigating climate change impacts (Arif et al. 2020).

Objective

- To evaluate the determinants of CSA adoption and assess the impact of CSA on food security among smallholder farming households (HHs).

Methodology

Case study Area:
- Conducted in Kongwa and Chamwino Districts of Dodoma Region, semi-arid central Tanzania

Data collection
- 380 HH survey, 12 focus group discussions and 15 key informant interviews

Data Analysis
- Probit regression and Inverse probability weighted regression adjustment
- Content analysis

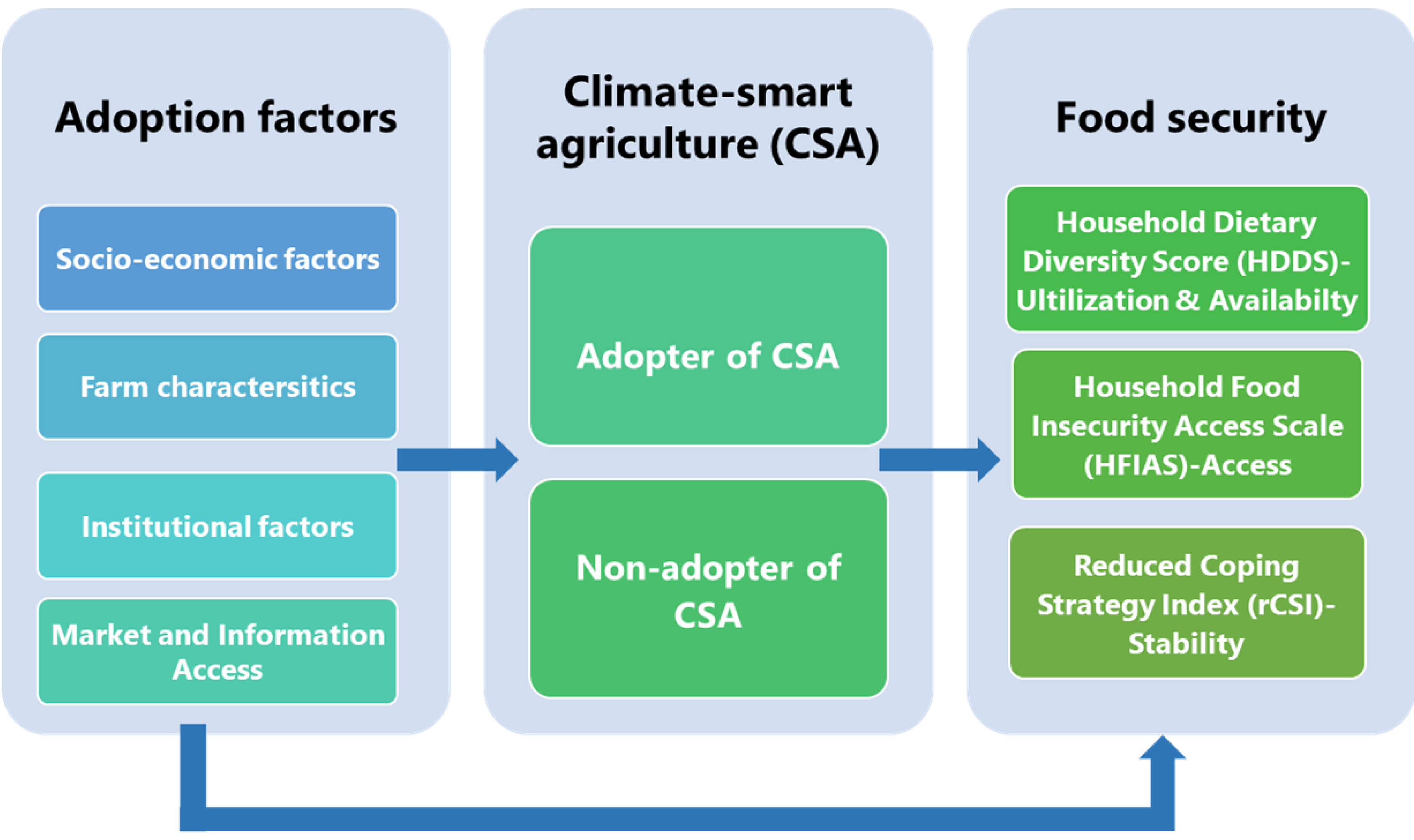

Figure 1: *Methodological framework*

- CSA practices under evaluation includes: Integrated Soil Fertility Management, (ISFM), Crop Management (CM), Soil and Water Conservation (SWC), and Agroforestry (AF).

Results

Level of CSA adoption and determinants influencing farmers adoption decisions

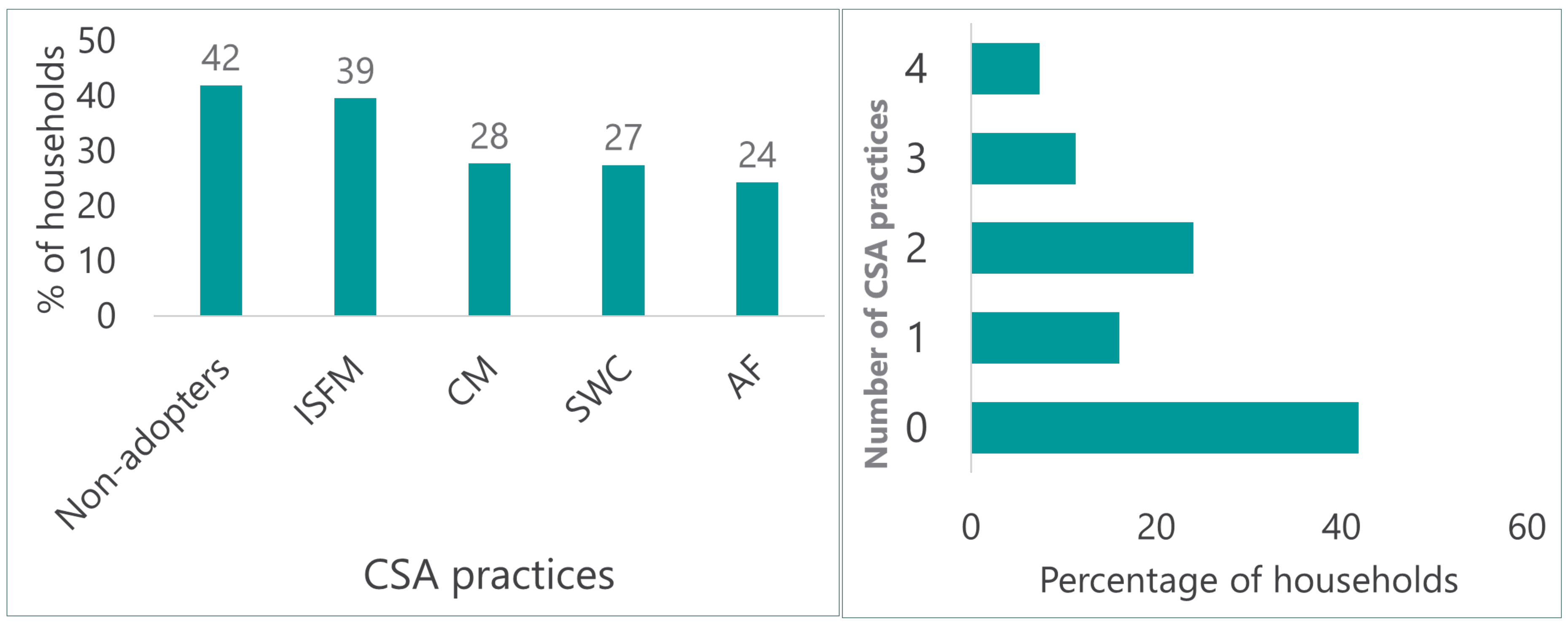

Figure 2: *Percentage of households adopting CSA practices and the average number of CSA practices adopted (n=380)*

Table 1: *probit regression results: Determinants of CSA adoption (n=380)*

Variables	Coefficient (SE)	Marginal Effects (SE)
Household head gender	-0.475*** (0.170)	-0.136*** (0.484)
Livestock ownership	0.394**(0.185)	0.114** (0.054)
Land access through leasing	-0.301** (0.153)	-0.086** (0.043)
Extension service availability	0.789***(0.183)	0.247*** (0.057)
Training access	1.226***(0.301)	0.315*** (0.057)
Farmer group membership	0.701***(0.222)	0.207*** (0.064)
Constant	-0.989**(0.464)	
Wald chi2(12)	90.96	
Prob > chi2	0.000	
Pseudo R2	0.265	

*Robust standard errors (SE) in parentheses, Statistical significance level *** p<0.01, ** p<0.05, * p<0.1*

Impact of CSA practices on food security

Table 2: *Inverse probability weighted regression adjustment result (n=380)*

Outcome variables	Mean value: Adopters	Mean value: Non-adopters	Average treatment effect (ATE)	Average treatment effect on the treated (ATET)
HDDS	5.04	3.92	0.858*** (0.1788)	0.983*** (0.212)
HFIAS	5.52	8.41	-1.632*** (0.775)	-2.143** (0.894)
rCSI	4.06	6.56	0.002 (2.207)	-1.799 (1.159)
Annual farm income (usd)	551.66	260.45	151.669*** (43.845)	204.808*** (69.583)

*Robust standard errors (SE) in parentheses, Statistical significance level *** p<0.01, ** p<0.05, * p<0.1*

- Furthermore, market distance and farmland size also impact food security.

Conclusion and Outlook

- Adoption of CSA practices enhances food security, emphasizing the need for policies that support CSA dissemination.
- Effective dissemination requires strong institutional frameworks and supportive policies, which can be achieved through improved extension services and training programs.
- Additionally, indigenous knowledge, along with horizontal knowledge sharing (e.g. farmer groups) and networking, plays a significant role in advancing CSA practices.

Correspondence: Mahlet Degefu Awoke
email: Mahlet-Degefu.Awoke@zalf.de
Leibniz Centre for Agricultural Landscape Research (ZALF)
Eberswalder Straße 84 · 15374 Müncheberg, Germany,
www.zalf.de
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