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Impact of Climate-Smart Agriculture on Resilience and Food Security among Farm Households in Bale-Eco Region, Ethiopia

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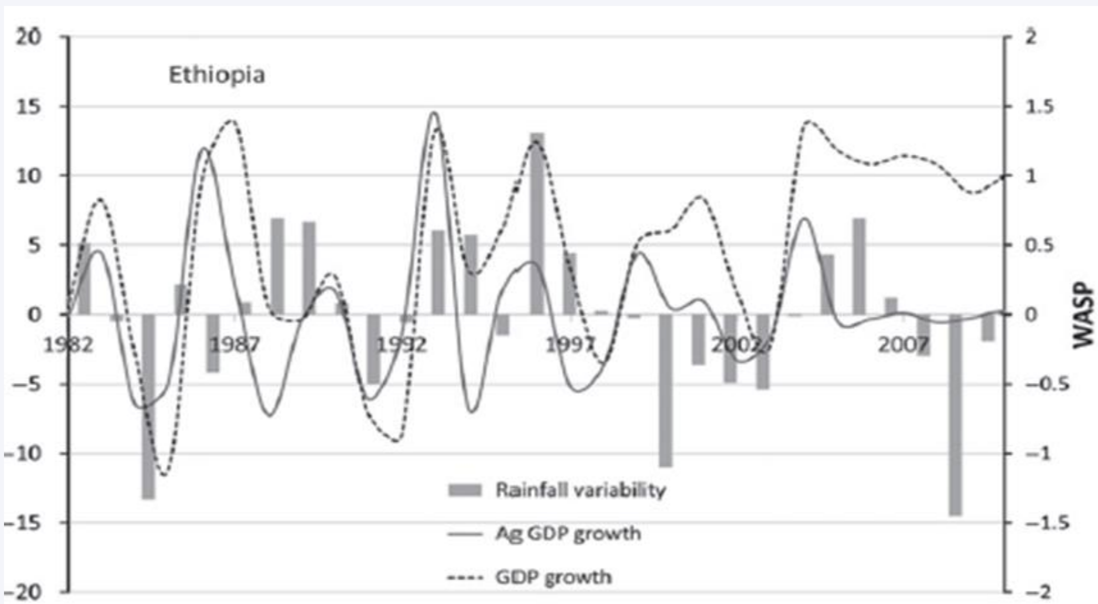
Presentation outline

- Introduction
- Climate resilience measurement
- Food security measurement
- Methodology
- Results
- Recommendations

1. Introduction

- Climate change remains a significant threat to farmers.
- This has great implication for household vulnerability to food insecurity (FAO, 2015).
- Ethiopian economy is among the most vulnerable in SSA (Demeke et al., 2004; Kassie et al., 2013; Tesfaye et al.,



Whatever happens to the agricultural sector due to climate change affects the national economy of Ethiopia.

Thornton et al (2014)

Introduction ... cont

- Farmers in Ethiopia are highly vulnerable to the impacts of climate change, which exacerbate their food insecurity (Hagos et al., 2011; Mekonnen et al., 2020).
- Investment in resilient agriculture is a powerful strategy for developing resilient farmers and achieving food security goals (Alemu & Mengistu, 2019).
- Farmers' adoption of Climate Smart Agriculture (CSA) helps to achieve these overlapping goals.
- Building climate resilience and ensuring food security through CSA are major development agendas.
- However, the impacts of CSA practices on the resilience and food security of smallholder farmers have not been adequately studied in the Ethiopian context.

Introduction ... Cont

- Measuring climate resilience for empirical analysis is challenging.
- Most of the previous studies used food security indicators that rely on food production, consumption, and expenditure (Bongole et al., 2022; Radeny et al., 2022; Abegunde et al., 2022; Zegeye et al., 2022).
- **Contributions of this study**

(1) We examined the impact of individual CSA practices on the resilience and food security of farm households, considering the interdependence between these practices.

(2) We applied Categorical Principal Component Analysis (CPCA) to create climate resilience index.

(3) We multiple indicators to measure food security/insecurity.

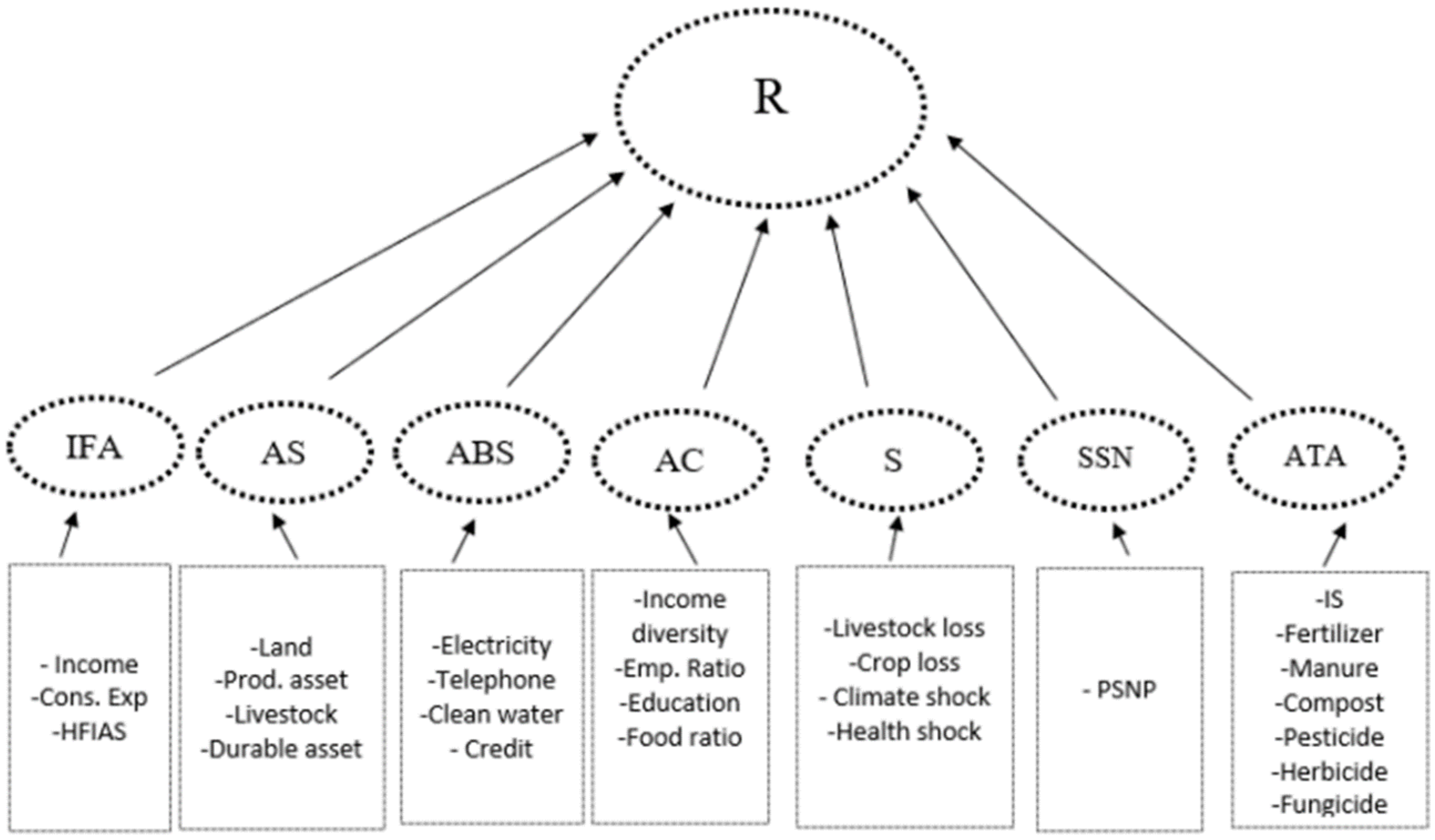
Objectives of the study

1) To investigate the impact of adoption of different CSA practices on climate resilience at farm household level.
2) To examine the impact of adoption of CSA practices on farm household food security.

2. Climate resilience measurement

- Climate resilience is the capacity of socio-economic system to absorb, adapt, and transform climate-related shocks (Folke, 2006; Ansah et al., 2019).
- Climate resilience is multidimensional, and latent concept.
- We constructed household resilience index based on seven indicators: income and food access (IFA), assets (AS), access to basic services (ABS), adaptive capacity (AC), stability (S), social safety nets (SSN), and agricultural technology adoption (ATA).

Household climate resilience framework



3. Food security measurement

- We focused on the access dimension of food security at the household level.
- We selected indicators that capture the quantity and quality components of food access.
- We used three important indicators to measure food security/insecurity: HFCS, HDDS and HFIAS.
- HFCS is constructed using 8 food groups that were consumed within the last 7 days. (Leroy et al., 2015; INDDEP, 2022).
- HDDS is constructed based on 12 food groups that are consumed within the previous 24 hours (Kennedy et al., 2011; INDDEP, 2022).
- HFIAS is a measure of food insecurity that uses 9 experiential questions covering a recall period of the past 30 days (Coates et al., 2007; Leroy et al., 2015).

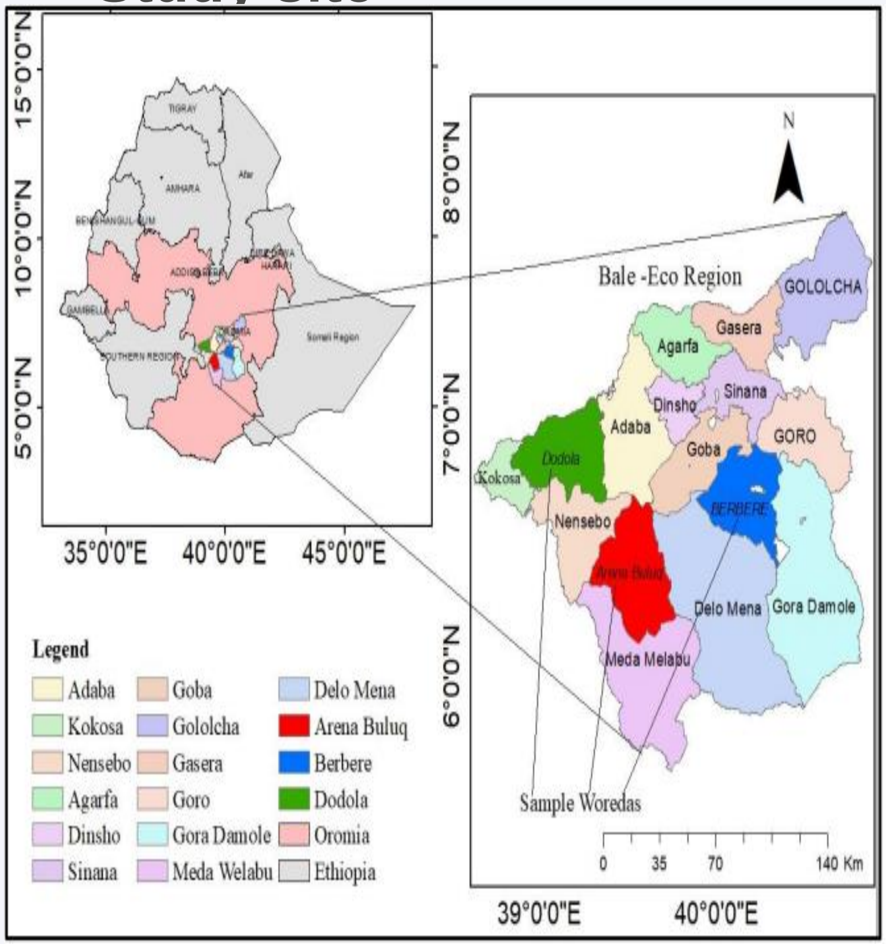
Econometric Framework

- We applied ESR model to control selection bias.

1. *Multivariate probit: models choice of six CSA practices*
   - Improved agronomic practices/IAP
   - Soil and water conservation practices/SWC
   - Drought tolerant high yielding crop varieties/DTHYCV
   - Small-scale irrigation/SSI
   - Integrated pest management/IPM
   - Integrated soil fertility management/ISFM
2. Sample selection bias correction
3. Counterfactual impact estimate — Average Treatment on the Treated

4. Methodology

Study site



Data

- Data was collected from 404 farm households.
- The sample size was determined using a power calculation (MDE = 5% , significance level = 5% , power = 80% & baseline proportion of non-poor = 83.3%).
- The overall sample size was shared equally between CSA beneficiaries and non-beneficiaries.
- A structured questionnaire was implemented with the use of CAPI to collect the data.

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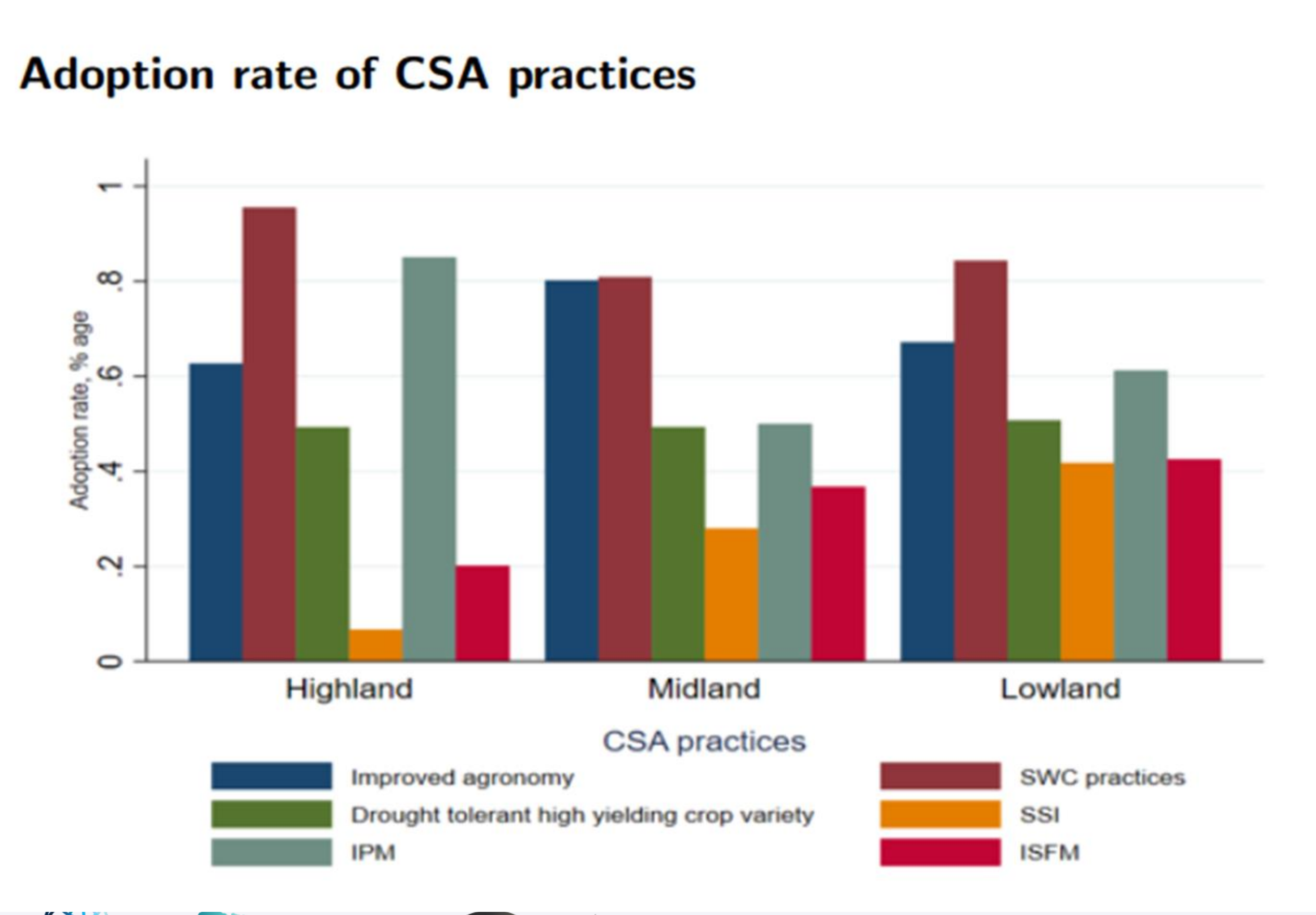
5. Results



Adoption rate of CSA practices
Adoption rate, % age
0
.2
.4
.6
.8
1
Highland
Midland
Lowland
CSA practices
Improved agronomy
SWC practices
Drought tolerant high yielding crop variety
SSI
IPM
ISFM

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Results from multivariate probit regression

- The CSA practices are complementary.
- Adoptions of CSA practices are significantly influenced by:
    - Extension service
    - Land holding size
    - Parcel fertility
    - Parcel terrain
    - Agro-ecological zone
    - Farmers' awareness about climate change
    - Farmers' experience of previous climatic shocks
    - Household head age

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Impacts of CSA on household resilience and food security

CSA practices	Average treatment on the treated (ATT)			
	Resilience index	Food security		
		HFCS	HDDS	HFIAS
Improved agronomic practices/IAP	0.147***	8.456***	2.178***	-0.685
Soil & water conservation practices/SWC	0.153***	28.042***	2.849***	8.026***
Drought tolerant crop variety /DTCV	0.323***	5.205***	1.934***	-4.410***
Small-scale irrigation/SSI	0.428***	2.948*	0.365**	-0.608
Integrated pest management/IPM	0.556***	22.836***	2.147***	-17.074***
Integrated soil fertility management/ISFM	0.512***	33.913***	4.075***	-5.940***

- For resilience, HFCS, and HDDS, ATT is positively and significantly affected by the adoption of CSA practices.
- DTCV, IPM, and ISFM have significant and negative impacts on HFIAS.

6. Recommendations

- *Promoting agricultural policies that enhance the scaling up of CSA practices is crucial for supporting the SDGs of no poverty, zero hunger, good health and well-being, and climate action.*
- ✓ *Designing and implementing various incentive mechanisms for farmers to promote the adoption of CSA practices.*
- ✓ *Improving extension services and providing regular climate information to smallholder farmers can enhance their awareness of climate change.*

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THANK YOU!