Exploring Adoption Effects of Subsidies and Soil Fertility Management in Malawi

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Food and nutritional security issues and policy responses in Malawi

- Soil degradation from continuous monocropping and limited fallowing

- Shrinking farm sizes due to high population growth
  - From 1.2ha in the 1980s to 0.6ha in 2016

- Low use of modern agricultural technologies
  - 54.7% use inorganic fertilizers
  - 20% use improved open pollinated and hybrid maize varieties

- Primary Government response is subsidizing these inputs

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Background on Malawi`s Input Subsidy Programs

FISP started in 2004/05 and ended in 2019/20

- Targeted 0.9-1.5 million smallholder farmers
- Inorganic fertilizer (Two 50-kg bags)
- Improved cereal seeds (2-8 kg)
- Improved legume seeds (1-3 kg)

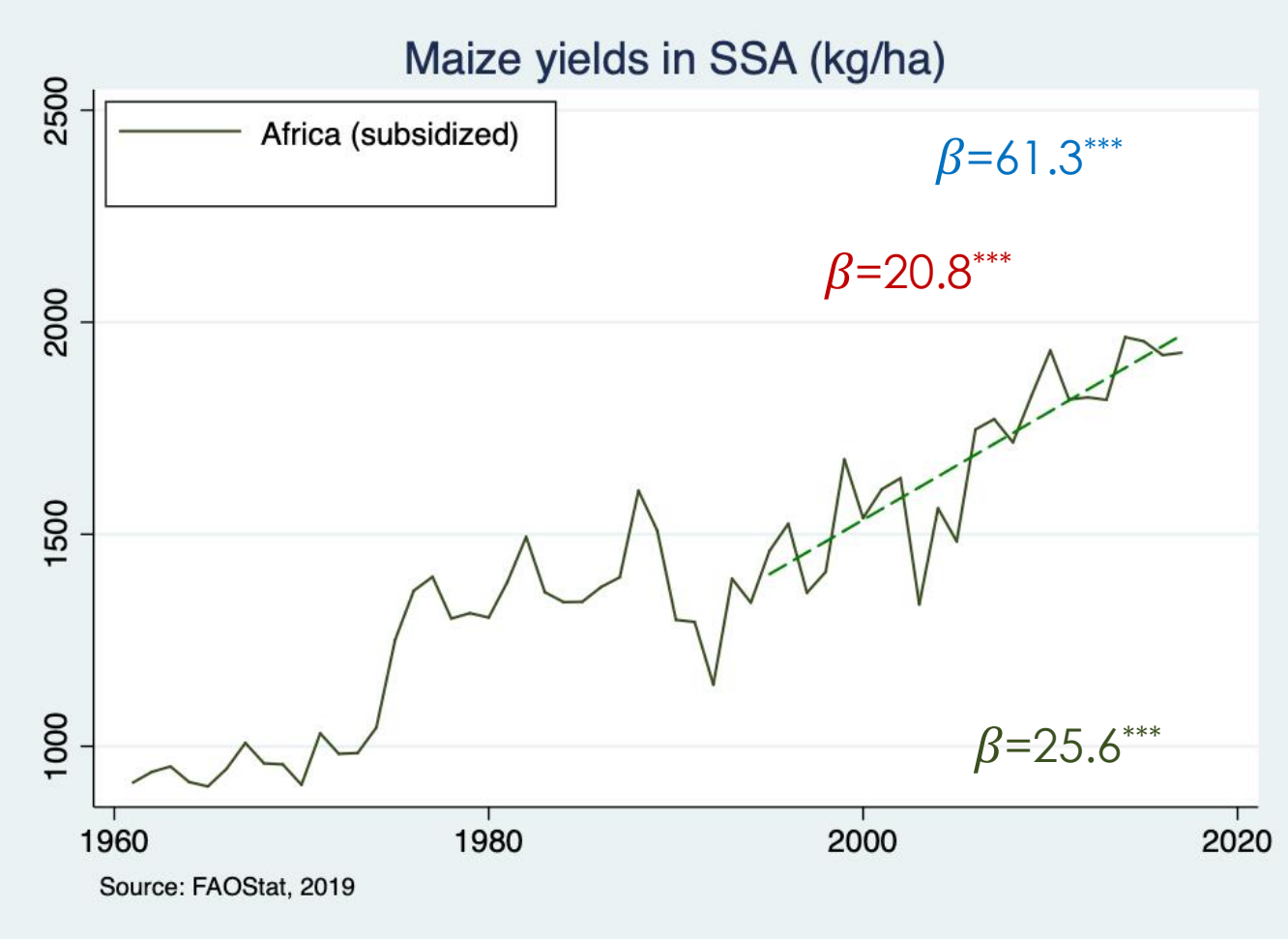
Affordable Inputs Program starting 2020/21:

- Targeting 3.7 million smallholder farmers
- Inorganic fertilizer (Two 50-kg bags)
- Improved cereal seeds (2-8 kg)
- Goats

Are farm input subsidies beneficial?

- **Fertilizer increases cereal yields**

- **However:**
  - Other (unsubsidized) countries also increase yields
  - Yields and yield growth remain low
  - Compromise dietary quality
  - Disincentivize crop rotation
  - Crowd out commercial input purchase
  - Crowd out other government investments



In this study we examine…

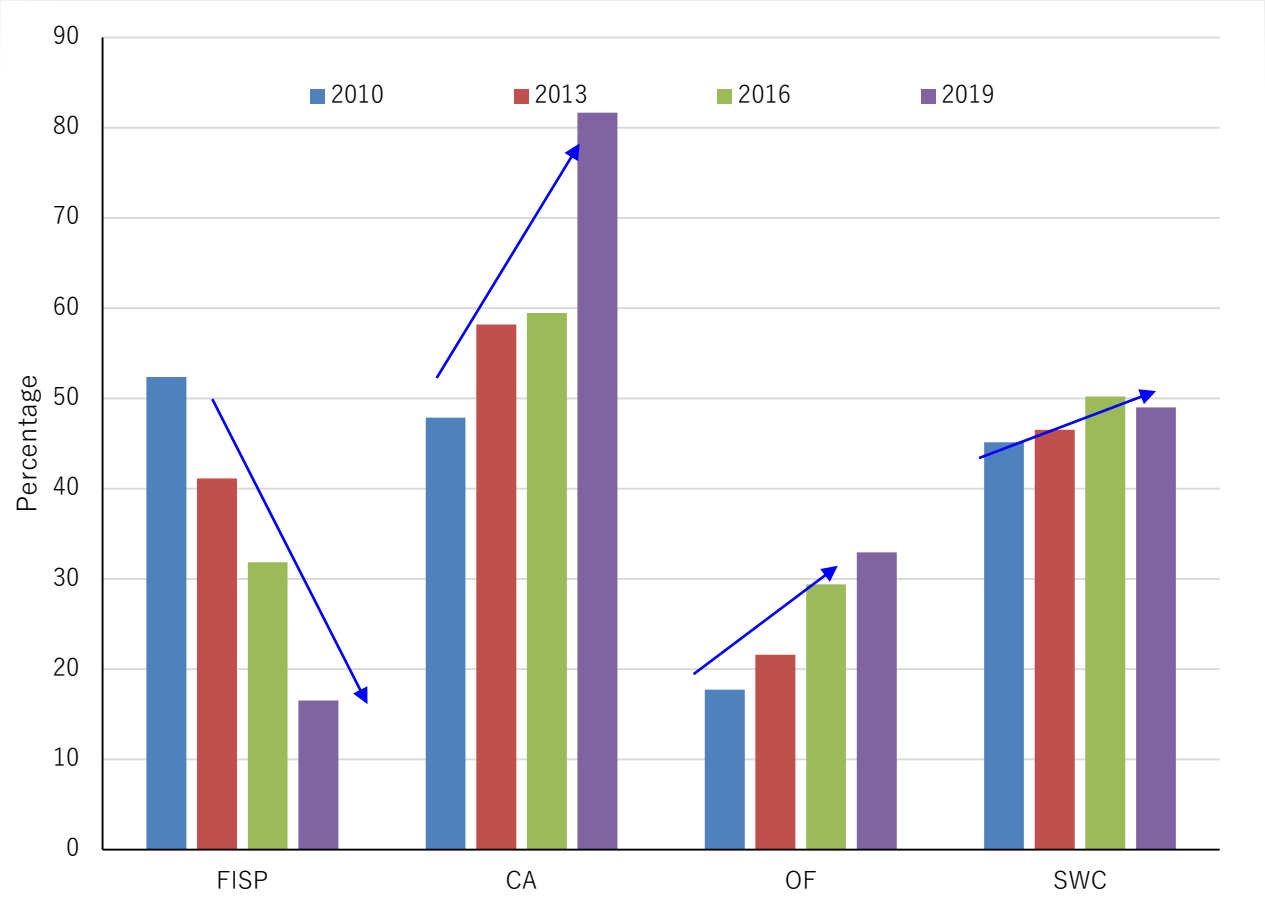
- Whether input subsidies increase or decrease use of ISFM?
  - Conservation agriculture
  - Organic fertilizer
  - Soil and water conservation

- If the use of input subsidies with ISFM improve household income and nutrition?
  - Income: value of maize and crop production
  - Nutrition: dietary diversity, calories and micronutrient consumption

Why analyze subsidies and soil fertility management issues in Malawi?

- **Few studies have analyzed the link between input subsidies and ISFM:**
  - **But the evidence is mixed-subsidies increase or decrease adoption of maize-legume intercropping and organic fertilizers**
  - **Most previous studies did not use nationally representative samples**
  - **None of the studies analyzed joint adoption effects on income and nutrition**

Use of ISFM technologies has increased over time



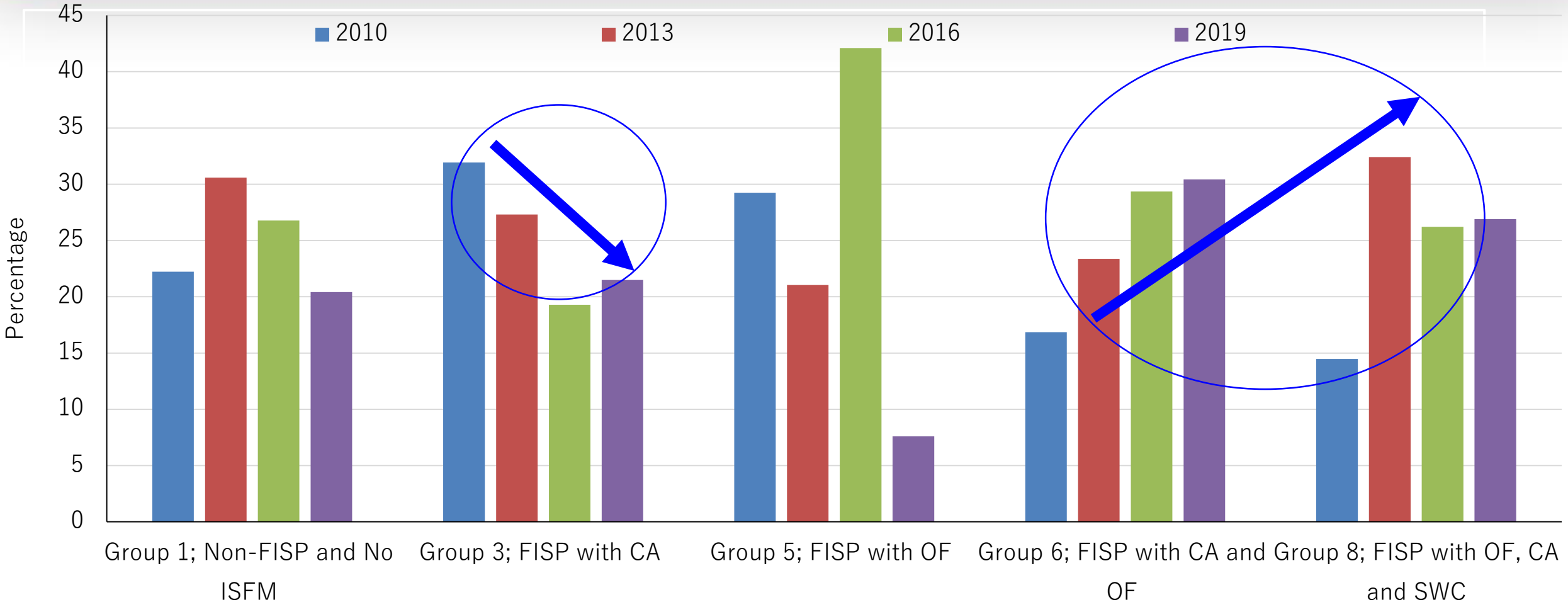
Data source: World Bank Integrated Household Panel Survey (IHPS) data collected in 2010, 2013, 2016 and 2019. N=7034.

Conservation agriculture (CA)

Organic fertilizer (OF)

Soil & water conservation (SWC)

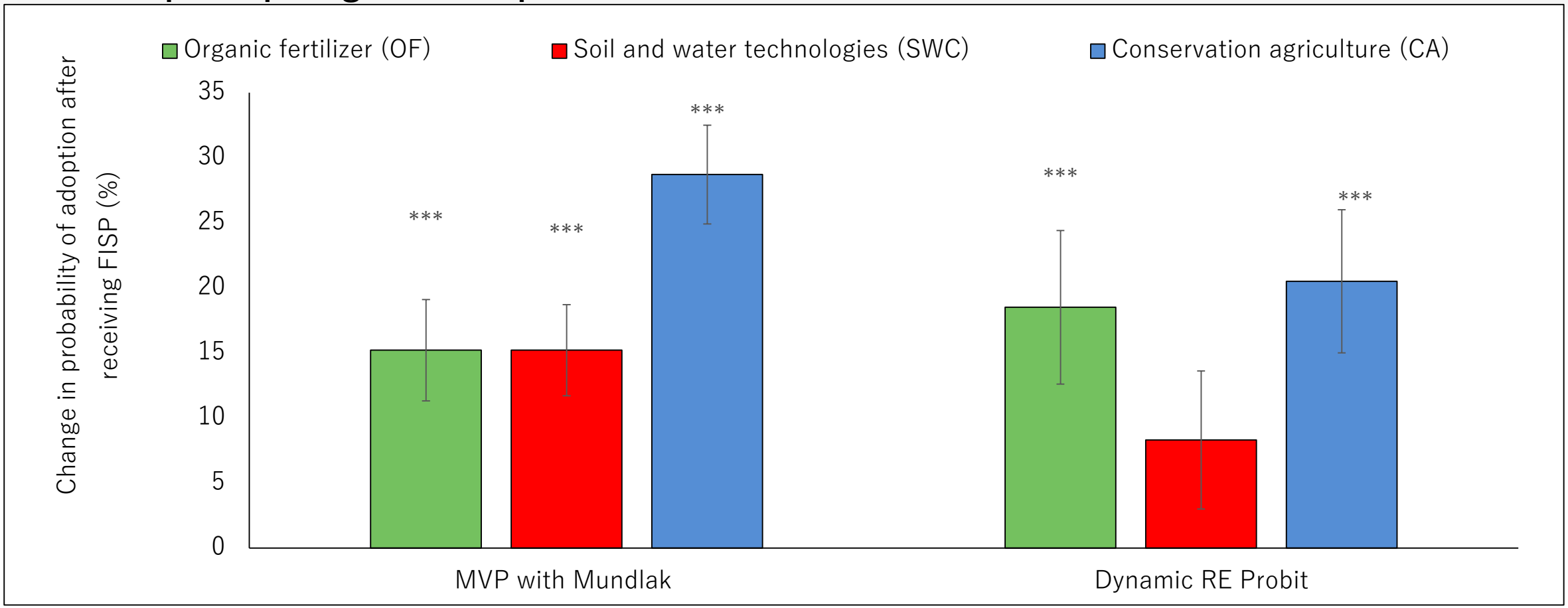
Use of input subsidies with ISFM is mixed over time



Data source: World Bank Integrated Household Panel Survey (IHPS). N=3238.

Input subsidies increase use of ISFM technologies

Effects of participating in farm input subsidies on use of ISFM



Notes: Coefficient estimates from multivariate probit (MVP) with mundlak and dynamic random effects (RE) probit are shown with standard error bars. *** p < 0·01. N=7029. Data source: IHPS data.

Input subsidies increase use of ISFM technologies

- **Input subsidies increased use of CA practices; 20-29%**
  - **Inclusion of legume seeds in subsidies increased land under maize-legume intercropping**
  - **Possibly, the inclusion of improved legume seeds (1-3 kgs) in FISP helped farmers to allocate more land to legumes for intercropping with maize.**

Use of input subsidies with ISFM increases income

Dependent Variable (IHS) Estimator	**Maize Income (MK/ha)**		**Gross Value of Production (MK/ha)**	
	Mundlak	METE	Mundlak	METE
	(1)	(2)	(3)	(4)
Group 2; Input subsidy (FISP) only	2.36***	3.76***	2.02***	3.12***
	(0.25)	(0.56)	(0.23)	(0.55)
Group 3; FISP+CA	2.87***	4.07***	2.46***	3.65***
	(0.22)	(0.32)	(0.21)	(0.31)
Group 4; FISP+SWC	2.63***	2.61***	2.20***	2.10**
	(0.24)	(0.78)	(0.22)	(0.95)
Group 5; FISP+OF	2.57***	3.34***	2.03***	2.65***
	(0.28)	(0.41)	(0.24)	(0.32)
Group 6; FISP+CA+OF	3.14***	3.42***	2.51***	2.94***
	(0.23)	(0.38)	(0.21)	(0.29)
Group 7; FISP+CA+SWC	2.95***	2.56***	2.59***	2.28***
	(0.22)	(0.41)	(0.20)	(0.36)
Group 8; FISP+CA+SWC +OF	3.28***	3.73***	2.78***	3.02***
	(0.25)	(0.42)	(0.22)	(0.38)
Household controls	Yes	Yes	Yes	Yes

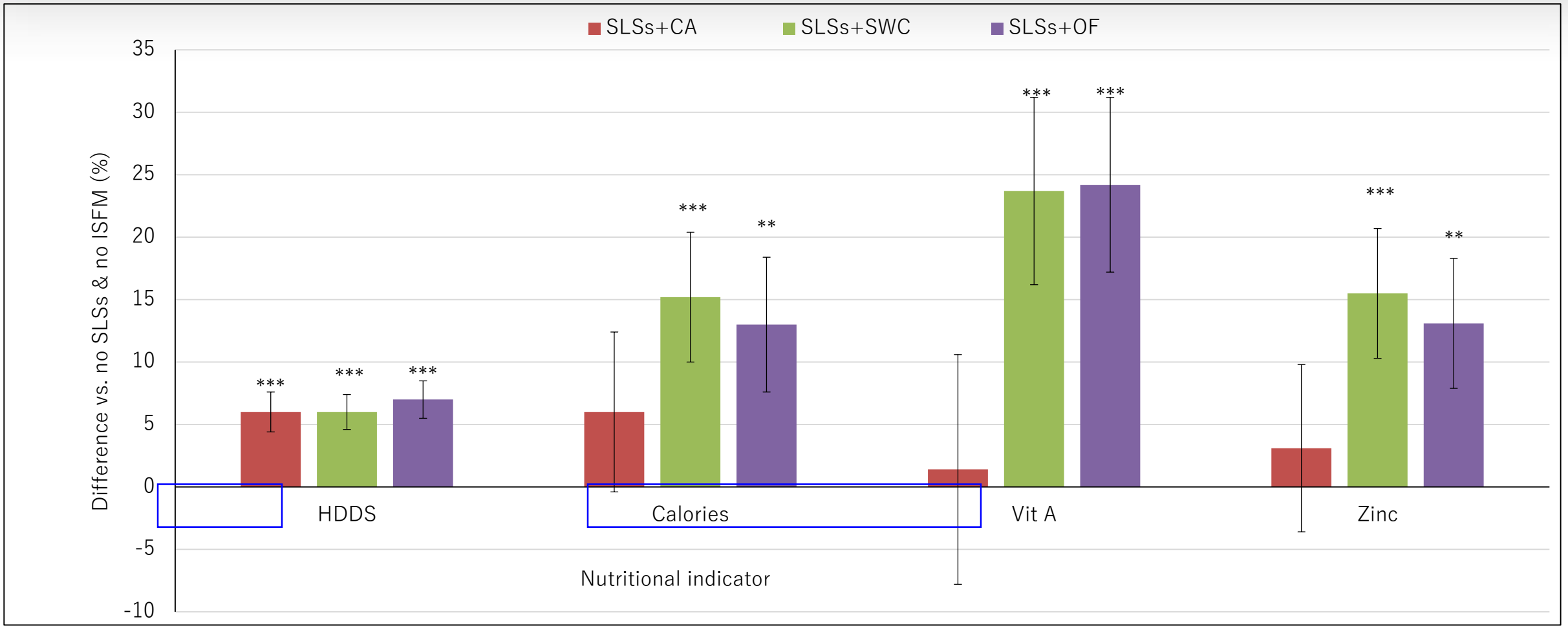
Notes: CA, SWC, and OF, denotes conservation agriculture, soil and water conservation technologies and organic fertilizer, respectively. IHS, inverse hyperbolic sine transformation. Coefficient estimates from Mundlak regressions and METE with the Mundlak approach are shown with robust standard errors clustered at household level in parenthesis . *** p < 0·01. N=3235. Data source: IHPS data.

Use of input subsidies with ISFM increases income

- **Input subsidies with ISFM increased crop income**
  - Input subsidies with soil and water conservation increased maize yield by 21-35%

- **Maximum benefits are from joint use of input subsidies and three ISFM technologies:**
  - organic fertilizers
  - conservation agriculture
  - Soil and water conservation

Use of input subsidies with ISFM improves nutrition



Notes: HDDS, household dietary diversity score. Vit A, Vitamin A. Coefficient estimates from Mundlak and Poisson (for HDDS) regressions are shown with standard error bars. *** $p < 0{\cdot}01$, ** $p < 0{\cdot}05$. N=1678. Data source: IHPS data.

Use of input subsidies with ISFM improves nutrition

- **Subsidized legume seeds with ISFM increased**
  - **Dietary diversity (6%)**
  - **Micronutrient (vitamin A and zinc) consumption (13-24%)**

- **Subsidized maize seed and fertilizer with ISFM increased Vitamin A consumption (9%)**

Take home message

- Inclusion of legumes in input subsidies is associated with higher use of ISFM technologies
- Joint use of input subsidies and ISFM increased income and micronutrient consumption
- Promoting use of fertilizers ***with ISFM*** is key to improving impact of input subsidies

Policy implications

- Consider investing in soil fertility training (extension) to improve agricultural productivity in line with MW2063
- Consider tying access to subsidized inputs to adoption of ISFM (OF, CA and SWC)
- Consider including improved legume seeds in ISP package to improve household nutrition and soil health
- Consider upscaling livestock in ISP as a source of organic manure

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