RAISING CROP RESPONSE:

Bidirectional learning to catalyze sustainable intensification at multiple scales

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USAID FROM THE AMERICAN PEOPLE
Feed the Future Innovation Lab — Collaborative Research on Sustainable Intensification

Project goal

- To improve family nutrition, reduce poverty, and enhance use of environmentally-sound farming practices among smallholder farmers in East Africa

Project objectives

1. **To generate improved agronomic knowledge** of practices that sustainably raise **maize and bean** yields and crop response to inorganic fertilizer
2. **To evaluate bidirectional learning and effective extension approaches** to promote SI technologies among researchers, extension, agrodealers, NGOs, and farmers
   - **Bidirectional learning**: an iterative, participatory process by which information providers (extension, agrodealers, and NGOs), researchers, and farmers fine-tune recommendations

Project objectives (cont'd)

3. **To generate improved knowledge of the nutrition impacts** of adoption SI technologies through analysis of Tanzania household surveys
4. **To provide practical guidance to governments on staple food marketing, trade, and extension policies** that support adoption of OM/SI technologies to support broader diffusion and scaling, and to work synergistically with activities under Obj. 1-3

Objective 1: Maize response

1. **Survey of 600 households/maize fields across Southern and Northern highlands, to quantify crop yield, legume presence, soil properties and document farmer practices.**
2. **Partners: CIMMYT (TAMASA Project - BMGF), SARI, Uyole Research Staff, MSU Agronomists and Ag Economists.**

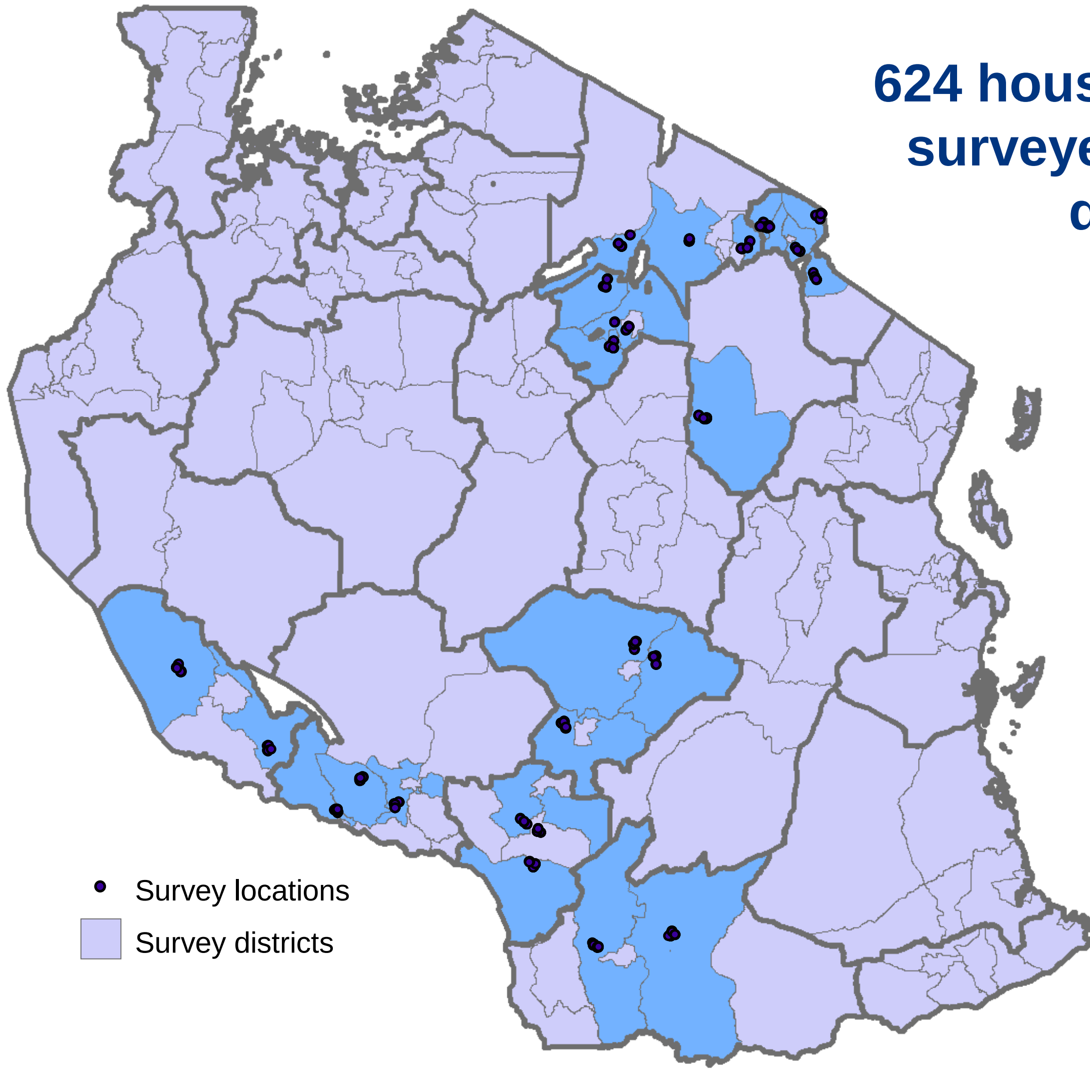
CIMMYT

IITA Research to Nourish Africa

MICHIGAN STATE UNIVERSITY

Obj 1. SIIL/CIMMYT TAMASA Agronomic Panel Survey locations

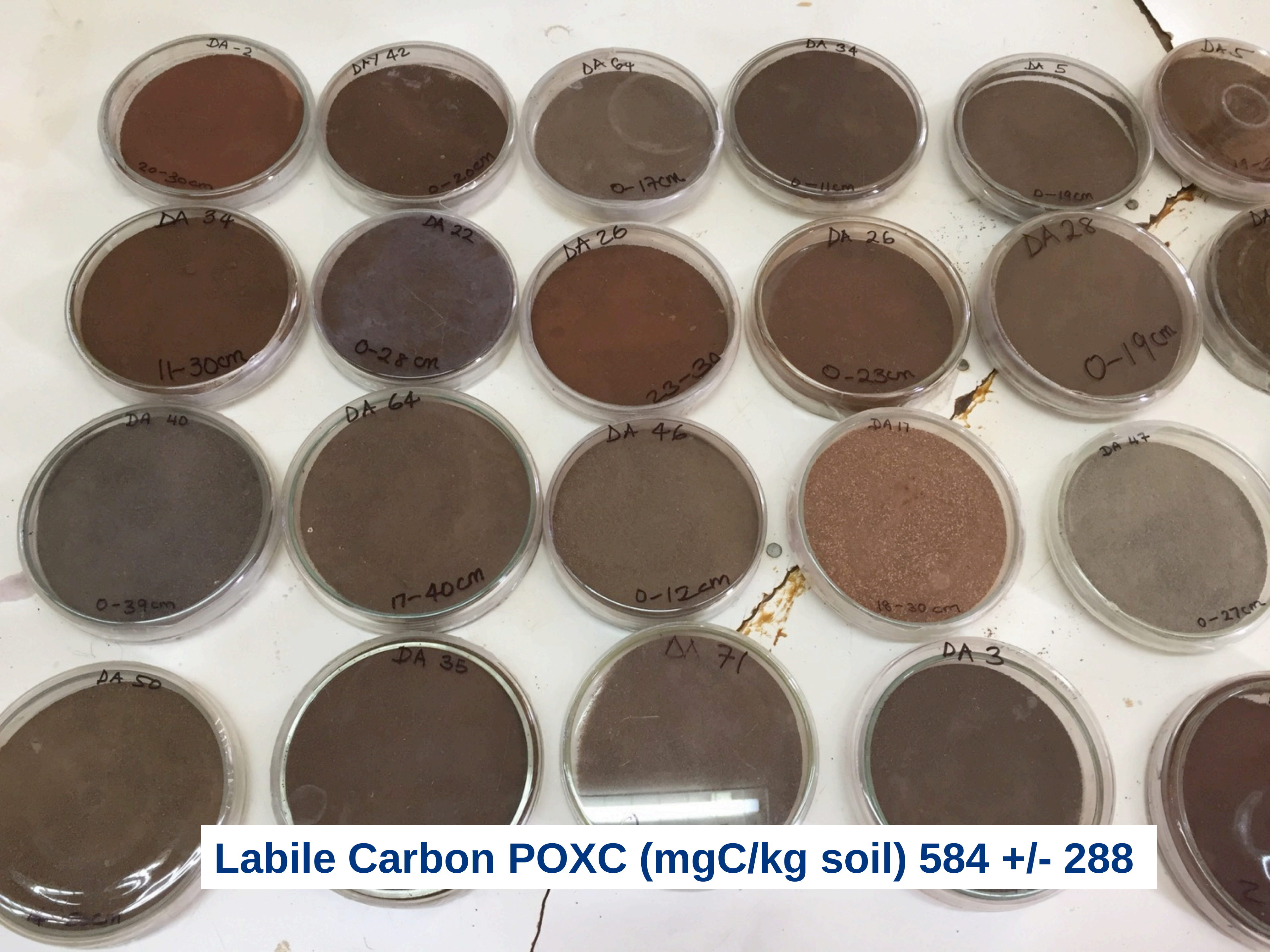
624 households surveyed in 25 districts



Objective 1: CIMMYT/SIIL survey

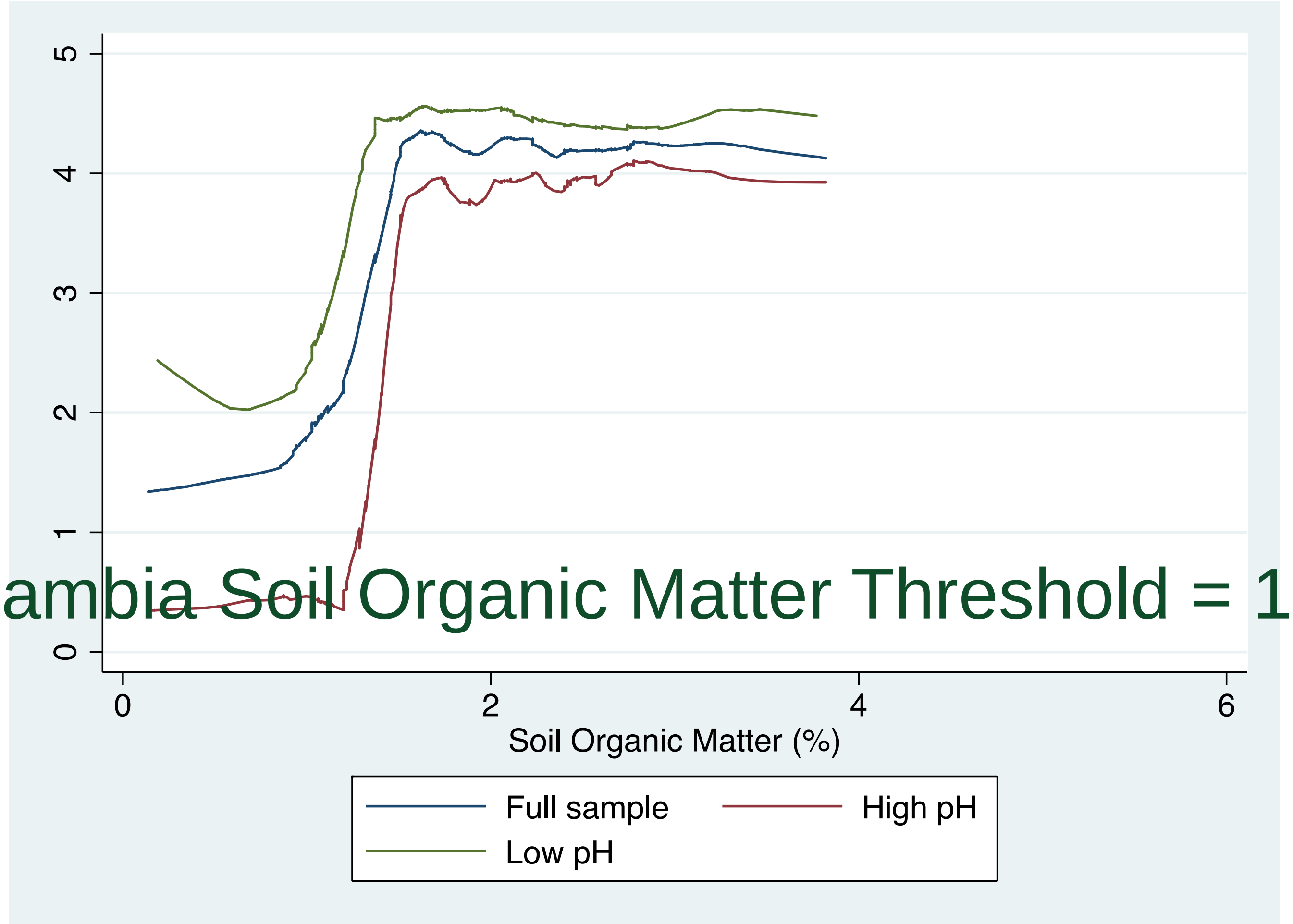
Unique features of this dataset

- Comprehensive data on:
  - Household characteristics, farm-level management data
  - Additionally, for focal maize plot:
    - Detailed agronomic mgt questions (including 5 yrs mgt history)
    - Yields (based on crop-cuts) & Drone monitoring in 2018
    - Soils data
    - GPS location and area measurement
- High-frequency panel
  - Revisit each household and plot every year
  - Insights into inter-seasonal variability of mgt & productivity outcomes



Labile Carbon POXC (mgC/kg soil) 584 +/- 288

Research question: Soil C threshold maize fertilizer response?



Zambia Soil Organic Matter Threshold = 1.2%

Average product of fertilizer (Maize yield response)

Burke et al., 2016

Objective 1: Legumes and soil

1. **Measuring soil impact of legume crops (bean, pigeonpea and lablab) in long-term trials**
2. **Partners: Sokione Univ., Wageningen Univ., SARI, IITA, MSU.**
   1. Three PhD students - all have started courses (at SU, WU and MSU) Said Hamad; Esther Mugi; Ali Nord
   2. Two of the students have started measurements in long-term maize-legume trials underway in Tanzania

Objective 1: Quantifying soil C, N

Lablab
(*Lablab purpureus*)

W. Mariki, N. Miller,
A. Nord, S. Snapp and team

Objective 1: Legumes and soil

Objective 2: Research on Extension

Africa RISING

FIPS-Africa
FARM INPUT PROMOTIONS AFRICA LTD.

MICHIGAN STATE UNIVERSITY

CIAT 45
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture
A Remarkable Record of Science for Change
Since 1967

Objective 2

A scalable extension model - FIPS works through village-based agricultural advisors (VBAAs)

1. **VBAAs are selected by community members:**
   - farming experience
   - competency in record keeping
   - ability to train other farmers,
   - to follow up on FIPS activities
   - interest in business to supply ag inputs

2. Training:

- Agronomy (Bean seed treatment with input from Uyole, Syngenta (Apron star seed treatment), FIPS)
- Participatory training to improve farmer engagement, use of mother and baby demos, drama

Objective 2

District	Dates	Village Based Advisors VBAA Trained	Farmers Advised
Iringa	January 23-24	24	4,800
Mufindi	January 25-26	30	5,940
Makambako	January 27-28	25	5,048
Njombe	January 30-February 2	49	9,751
Songea	February 3-4	29	5,807
Mbozi	February 6-7	29	5,815
Mbeya	February 8-9	30	5,880
TOTAL		**216**	**43,041**

VBAA Training: Hands on learning


KISIMA

Objective 2

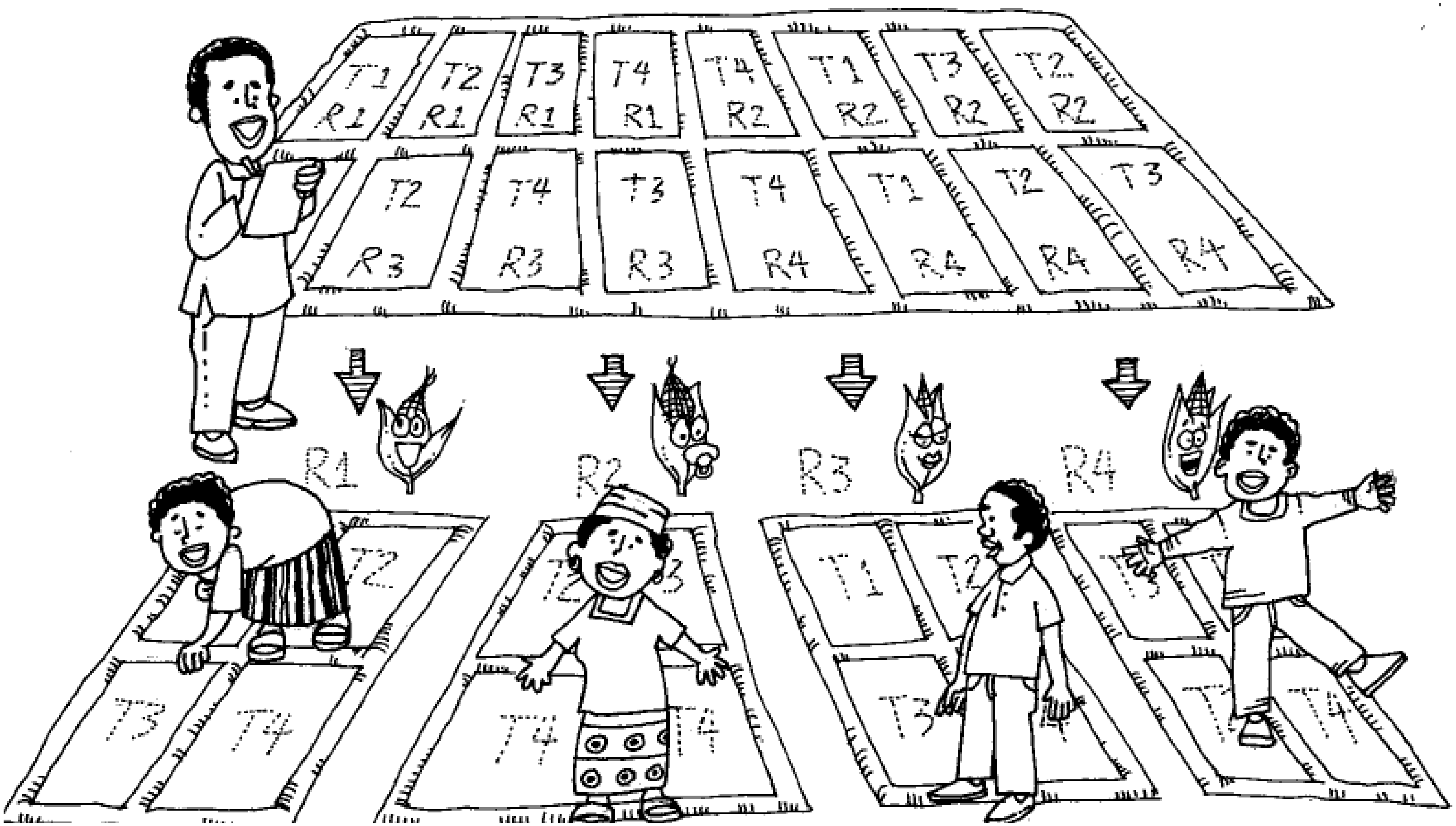
FIPS works VBAAs Certified by Tanzania Extension

1. **VBAAs are lead farmers, selected by communities**

1. **Mother and baby demos:**
   mother demo setup by VBAA to show improved varieties, inputs (bean varieties, with and without fertilizer, seed treatment)
   baby demos VBAA advises ~200 farmers and provides small packs of inputs

3. **We are testing if 'baby demos' farmer involvement improves extension**

Mother and baby trial design



Snapp et al., 2002

Mother demo: VBAA teaching tool

Does addition of baby demos improve extension? Improve VBAA advise?

Objective 2: Research on Extension

- 108 VBAAs **Mother demos** on bean varieties, fertilizer and Apron star seed treatment
- 108 VBAAs **Mother demos** + **baby demos** (~200 farmers provided seed and Apron star)

All VBAAs trained on farmer participatory extension, learning by doing and fine-tuning extension advise

Monitoring of VBAA performance, advice given and inputs sold, profit, and farmer adoption

Objective 2

Iringa: Mother demo and baby demo (+/-Apron star treated bean varieties)

Objective 2

1. **Baseline and endline survey**

2. **Monitoring log**

Farmer Name	Phone	Bean Variety	Seed dressing	Advised?	Baby demo?	Hands on training?

Objective 2

3. VBAA effectiveness at extension advisors and input providers

4. Monitoring log

VBAA Name	Phone	Seed sold	Inputs sold (fert., seed trt)	Costs	Profit	Advice provided

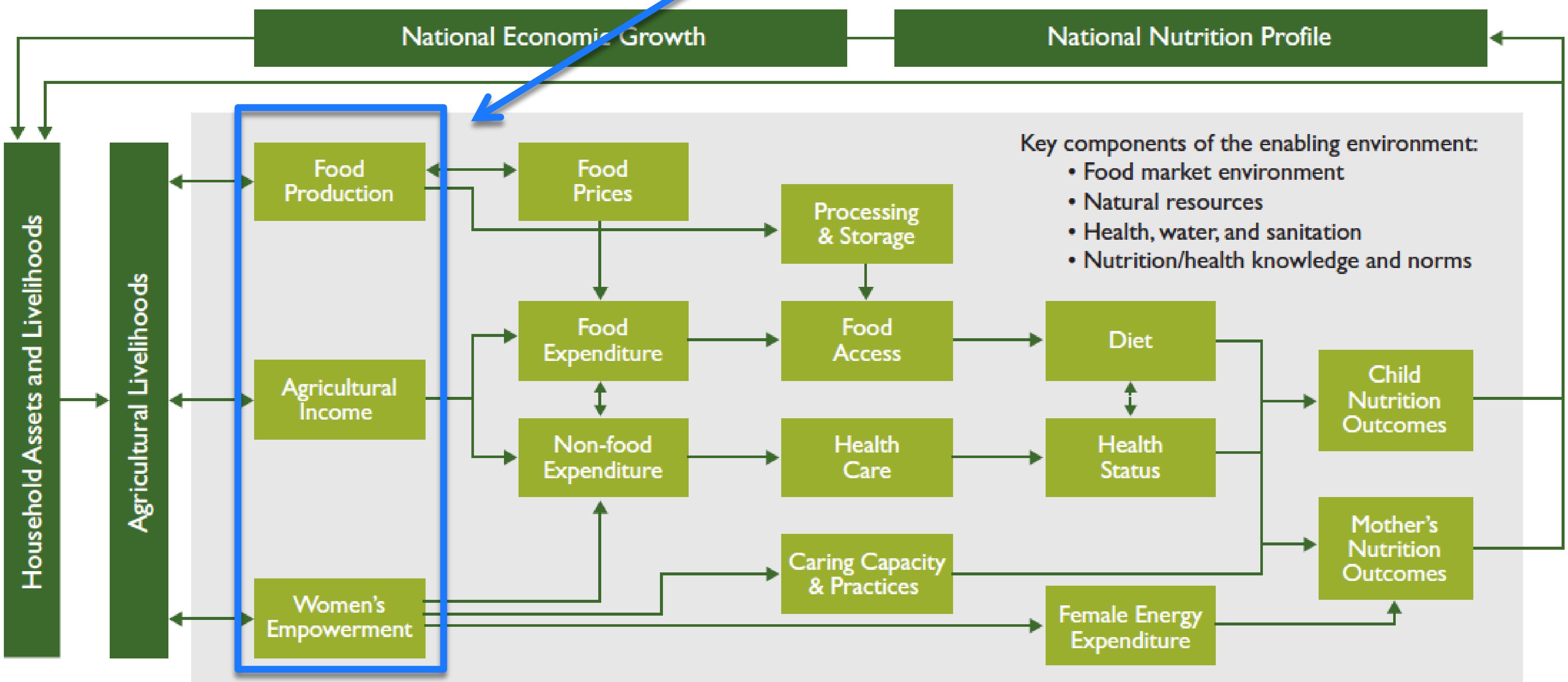
Objective 3: Nutrition & SI Adoption

Fert.	Manure	Maize-Ppea/Lab	Maize-Legume	NPS Survey 2012/13	SI Rank
				(45.38%)	0 None
			X	(20.96%)	1 Weak Sust.
X				(7.43%)	2 Intensification
		X		(18.80%)	3 Sustainable
	X				
	X		X		
	X	X			
X	X			(7.48%)	4 Sustainable Intens.
X		X			
X			X		
X	X	X			

Does SI adoption affect nutrition outcomes?

- And if so, via which **pathway(s)**?

FIGURE. CONCEPTUAL PATHWAYS BETWEEN AGRICULTURE AND NUTRITION



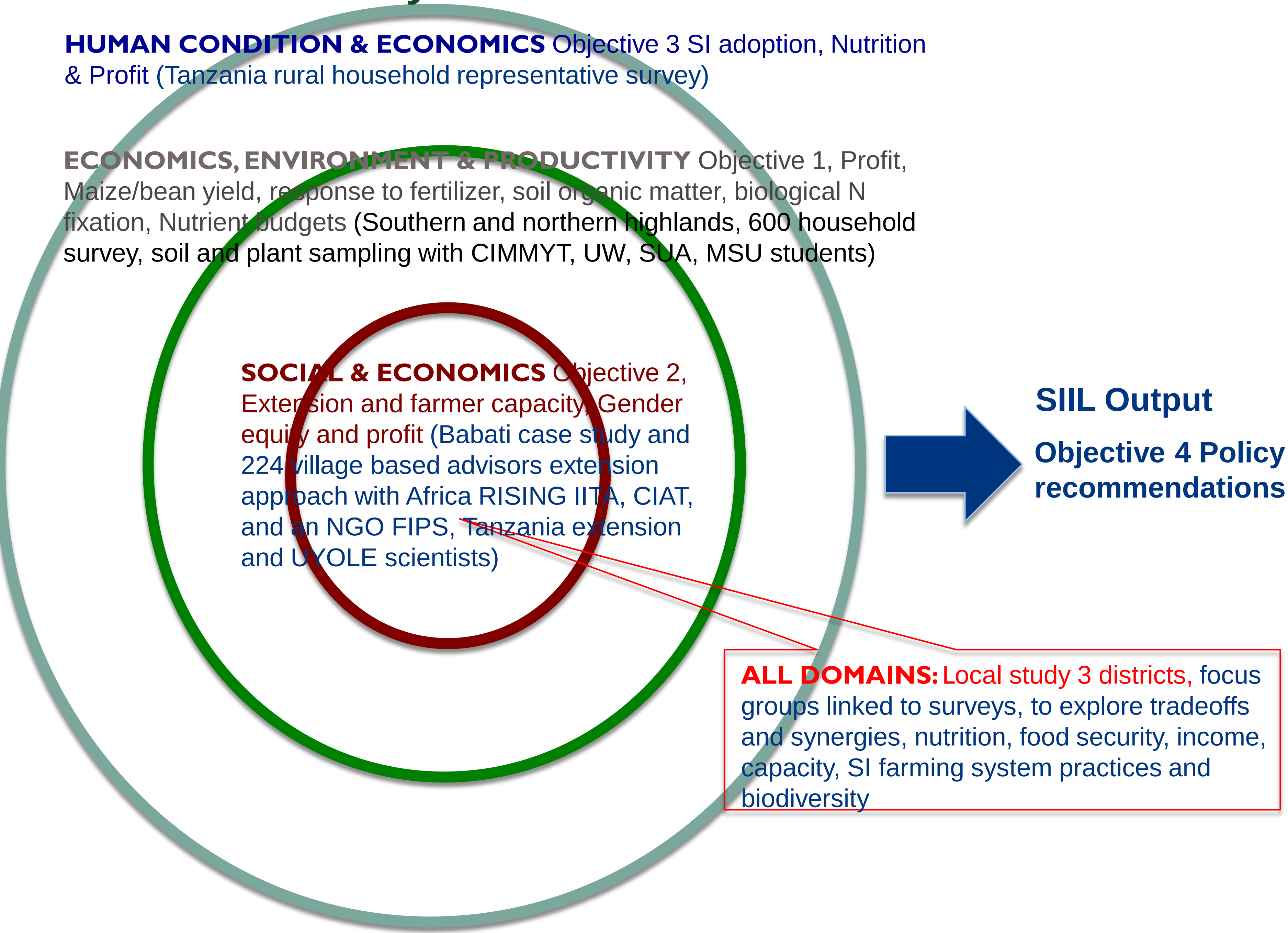
Adapted for Feed the Future by Anna Herforth, Jody Harris, and SPRING, from Gillespie, Harris, and Kadiyala (2012) and Headey, Chiu, and Kadiyala (2011).

Source: Herforth and Harris (2014)

Nutrition indicators

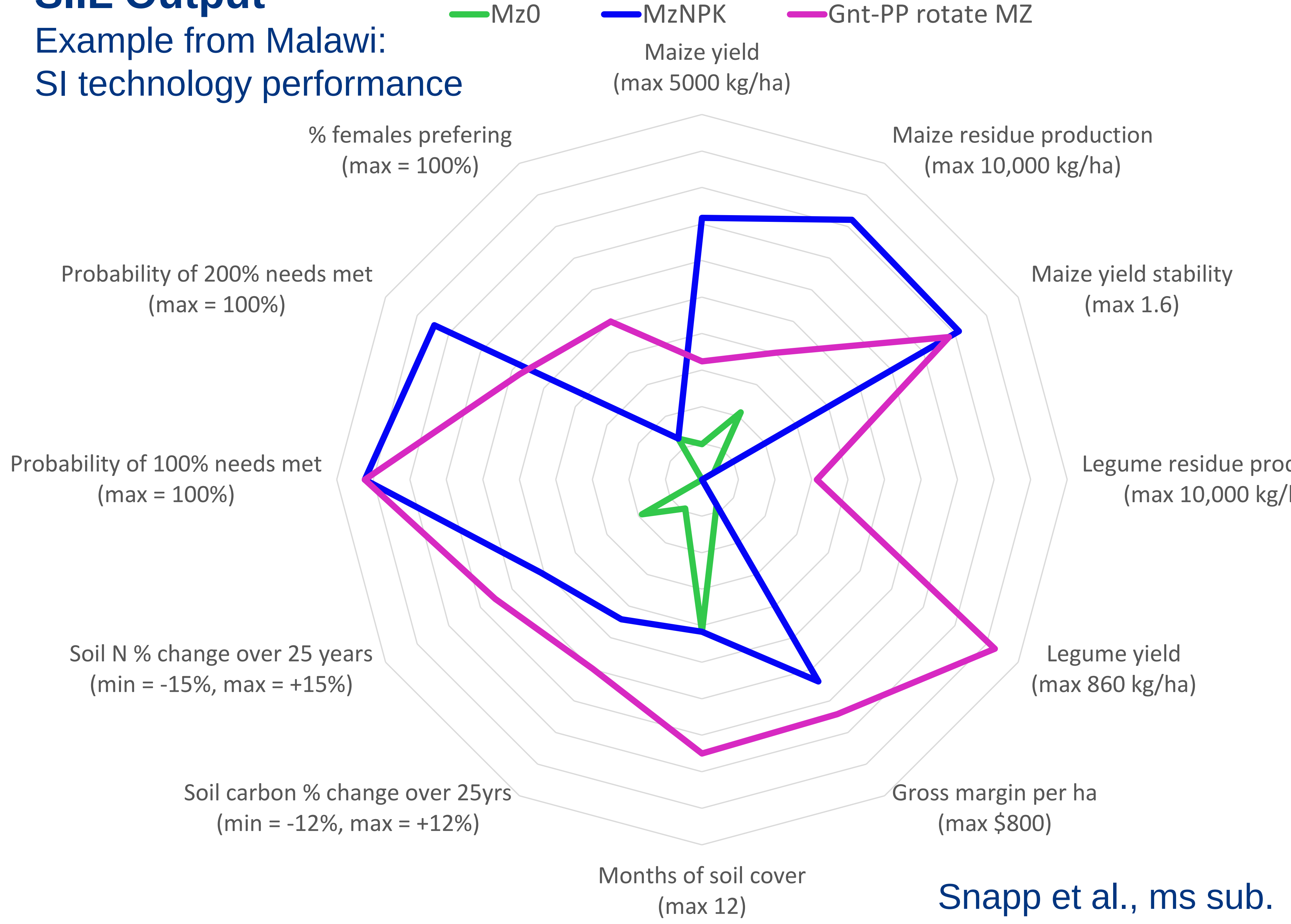
- Children under 5: height-for-age (stunting), weight-for-age (underweight), weight-for-height (wasting)
- Women of reproductive age (15-49): body mass index
- HH: dietary diversity (DD) – measure of food access (not nutrition per se)

SI indicators by domain – Overview



SIIL Output

Example from Malawi:
SI technology performance



Snapp et al., ms sub.

Outputs on Raising Crop response SIIL

- **SI technologies identified** that perform well in multiple domains (environment, economic, production, social and human/nutrition)
- **Quantify soil N and C contributions** of legume crops
- **Effective extension approaches** documented (do baby demos and VBAAs deliver?)
- **Policy recommendations** that improve maize-bean response to inputs

Raising crop response

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Apron® Star