An Income-Based Food Security Indicator for Agricultural Technology Impact Assessment

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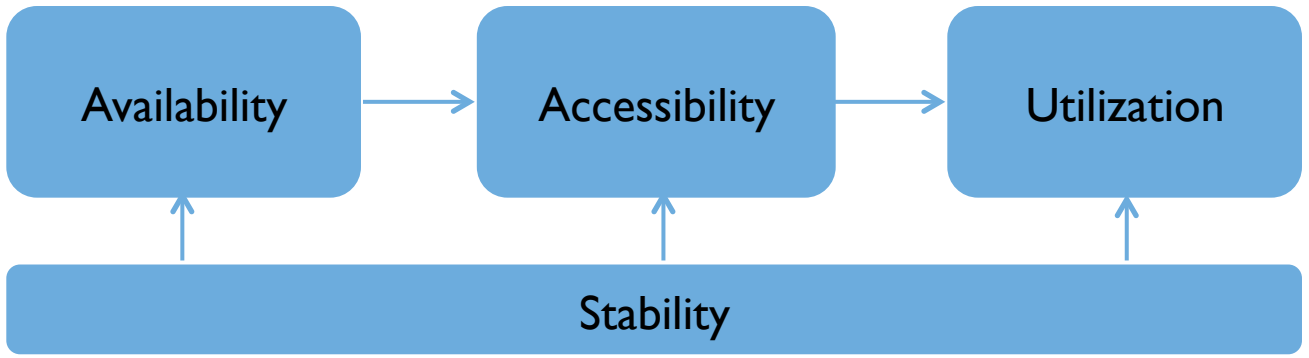
Measuring Food Security



Dimensions of Food Security

Indicators:

1. Calorie Deprivation
2. Monetary Poverty
3. Dietary Diversity
4. Subjective

A measure that is valid and reliable, is comparable over time and space, and is able to capture different elements of food insecurity

IBFS : Calculation

- Share of income devoted to food purchases (S_f)
- Cost (C_f) of a nutritionally adequate food basket
- Income-based food security threshold: $\tau_f = C_f / S_f$
    - Indicates the amount of income needed per person to purchase a nutritionally adequate diet

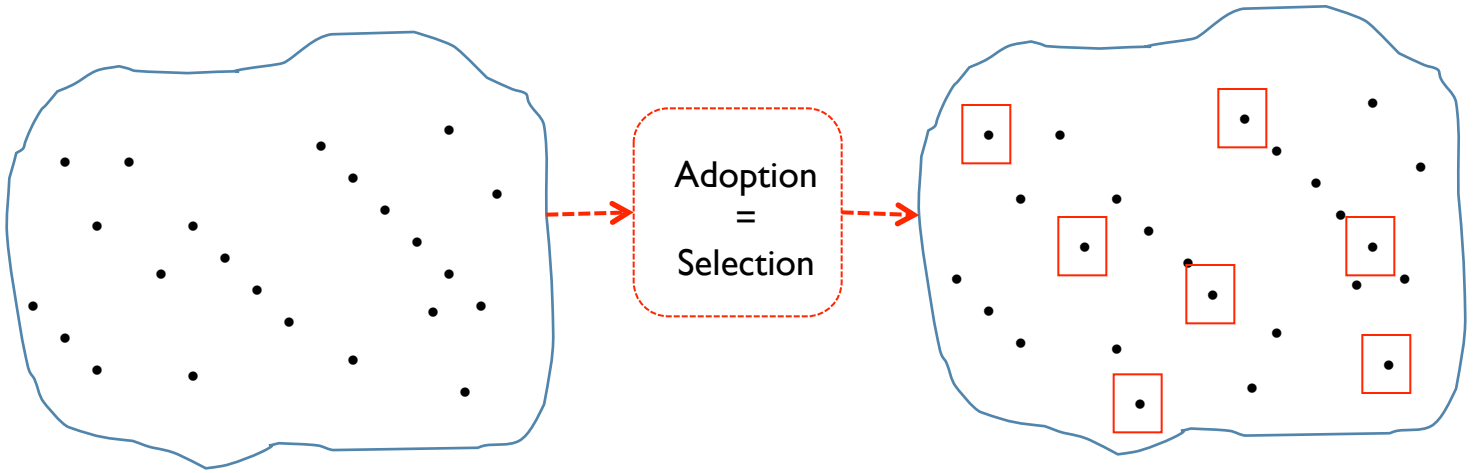
- $(\tau_f / PCI)*100$ = food security index
    - Household with an index value of less than 100 is food insecure and can afford the percentage of the food basket indicated by its index value

IBFS: Features

- Impacts of tech. adoption → price, income, and agricultural shocks on PCI → IBFS
- Any nutrient (micro, macro) associated with the basket can be assessed
- Desirable aggregation properties of the Foster-Greer-Thornbecke poverty indicator
- Forecasting future food security states

Application: TOA-MD Model

- Assessment of adoption and impact of a legume inoculant technology in Tanzania
- TOA-MD: uses a statistical characterization of farming population to assess adoption potential of a new technology and its impacts



Sub-populations of non-adopters and adopters

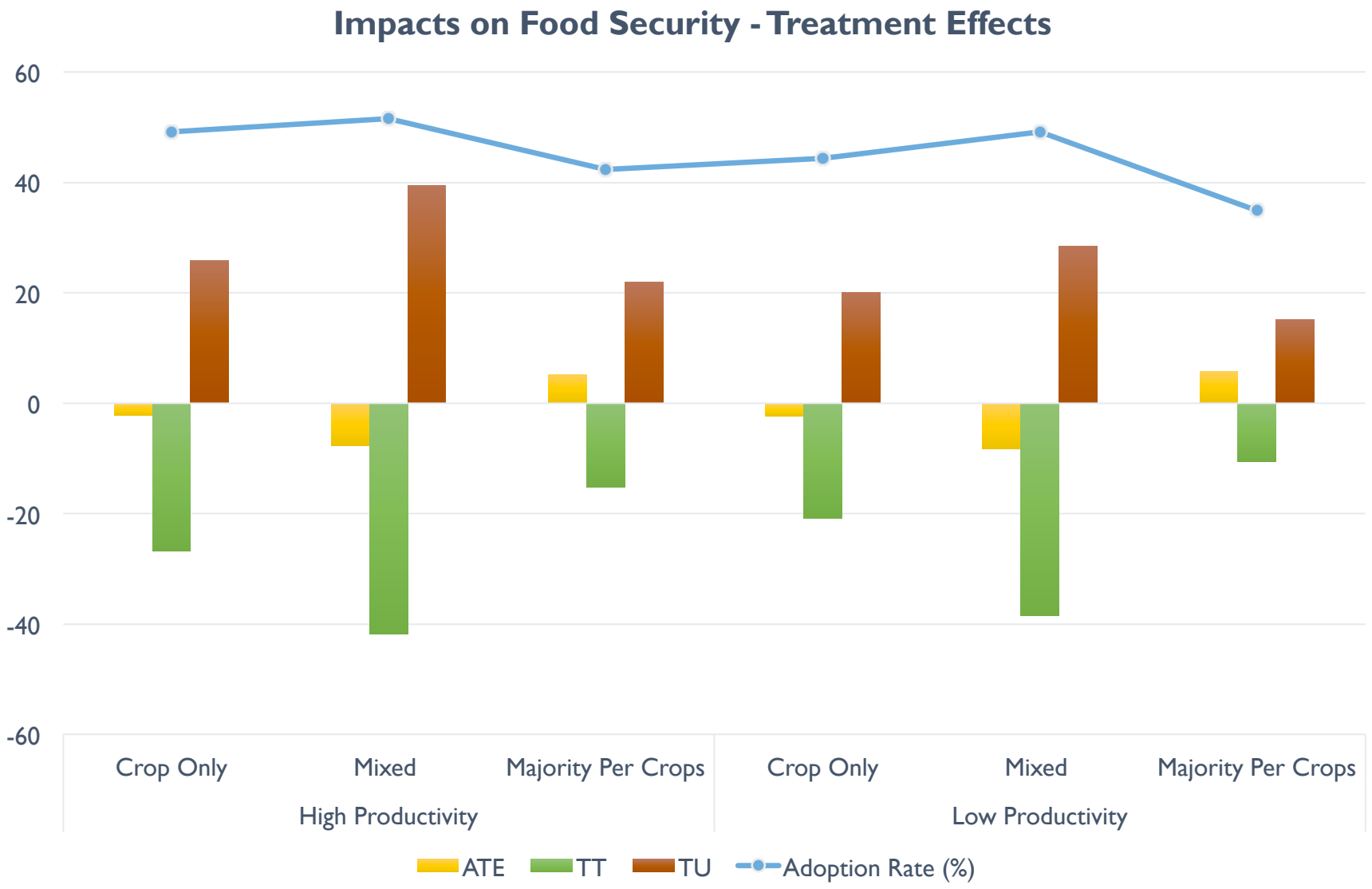
Adoption Analysis

	High Productivity			Low Productivity			
	Crop Only	Mixed	Majority Perm. Crops	Crop Only	Mixed	Majority Perm. Crops	All Households
Adoption Rate (%)							
Households	49.2	51.6	42.4	44.4	49.1	34.9	43.9
Net Returns (US$)							
Adopters	$674	$1,297	$1,040	$481	$1,143	$579	$666
Non-Adopters	$349	$689	$757	$202	$614	$370	$358
Total	$509	$1,003	$877	$326	$874	$443	$496
Treatment Effects on Net Returns (% of US$)							
ATE	2.8	10.2	–4.3	3.7	8.9	–12.2	–0.3
TT	58.2	73.2	15.0	58.8	79.5	17.8	46.4
TU	–65.6	–73.8	–19.7	–83.7	–82.8	–30.1	–58.5

6 stratas

Impacts on Food Security

	High Productivity			Low Productivity			
	Crop Only	Mixed	Majority Per Crops	Crop Only	Mixed	Majority Per Crops	All households
Adoption Rate (%)							
Households	49.2	51.6	42.4	44.4	49.1	34.9	43.9
Food Insecure (%)							
Base	57	56.9	40.2	63.6	68.3	54.3	58.8
Adopters	39.8	32.2	30.7	46.9	41.5	44	42.5
Non-Adopters	59.3	58.3	43.3	66.6	68.8	57.1	61.3
Total	49.7	44.8	38	57.8	55.4	52.5	52.9
Counterfactual (%)							
Adopters	54.4	55.2	36.1	59.2	67.5	49.2	55.1
Non-Adopters	74	80.7	52.1	79.3	88.2	65.3	74.3
Treatment Effects (%)							
ATE	-1.3	-4.4	2.1	-1.4	-5.7	3.1	-0.7
TT	-14.5	-23.1	-5.5	-12.4	-26	-5.2	-12.6
TU	14.7	22.4	8.8	12.8	19.4	8.2	13.1
Treatment Effects (% of counterfactual)							
ATE	-2.2	-7.7	5.2	-2.3	-8.3	5.7	-1.1
TT	-26.7	-41.8	-15.2	-20.8	-38.5	-10.6	-22.9
TU	25.8	39.4	21.9	20.1	28.4	15.2	22.2


Impacts on Food Security - Treatment Effects
60
40
20
0
-20
-40
-60
Crop Only
Mixed
Majority Per Crops
Crop Only
Mixed
Majority Per Crops
High Productivity
Low Productivity
ATE
TT
TU
Adoption Rate (%)

Extensions

- Intensity of food insecurity
  - $100(FS - E[PCI \mid \tau_f \geq PCI] / \tau_f)$
- Intra-household assessment
- Stability dimension of food security