PAPUA NEW GUINEA

IFPRI

Workshop for testing and refining the Food Security Simulator Papua New Guinea (FSS-PNG)

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ACIAR

Workshop overview

- Day 1

  - Morning

    - Key concepts related to the FSS-PNG & preliminary discussion of the tool

  - Afternoon

    - Using the FSS-PNG – live demonstration

    - Beginning of independent work on presentations

- Day 2

  - Morning

    - Continuing independent work

    - Final presentations and feedback session

Introduction to food security and microsimulation

What is "food security"

- "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."*

- Achieving food security requires concerted actions at all levels—the individual, household, national, regional and global level.

  - These will also make up the different levels you can analyze food security.

- Four pillars of food security: food availability, access, utilization, stability.

- Nutrition/diet quality is an integral part of food security!

Related concepts – poverty and malnutrition

- Poverty - "pronounced deprivation in well-being".

    - Can also be defined as "low incomes and the inability to acquire the basic goods and services necessary for survival with dignity".

    - The concept focuses on people's (economic) ability to achieve a standard minimum level of well-being, and therefore, poverty is primarily determined in terms of income.

- Malnutrition - chronic condition caused by under- or overconsumption of nutrients (primary MN) or adverse health conditions affecting nutrition (secondary MN).

    - Macronutrients: Carbohydrates, protein, fat, providing dietary energy (calories).

    - Micronutrients: minerals and vitamins essential for metabolism.

    - Undernutrition is a manifestation of sever food insecurity!

Food Security at the macro-and-micro level

- For analytical purposes, we can differentiate between macro-level and micro-level food security.

- **Macro-level** means that a country has enough food (in terms of quantity and quality) to feed all of its people.

  - The population's food demand can be met by the country's own food production, food imports, or, usually a combination of the two.

- **Micro-level** food security refers to a household's ability to access adequate food, including all household members (i.e. intra-household distribution of food), as well as the availability of foods and the access to basic services relevant for achieving healthy nutrition.

Micro-level food security indicators

- **Quantitative assessments** - using numbers to measure different aspects of food security systematically (often relative to specific reference levels) and with a given level of error.

- **Qualitative assessments** - explore food preferences and attitudes, cultural factors related to food, or subjective perceptions about the type, quality, and sufficiency of the own food consumption and the nutritional outcomes.

- The FSS-PNG focuses on quantitative assessments because of the nature of the data and the comparability of results.

- We will use common nutrition-related indicators that can be derived from standard surveys and household food consumption data.

Micro-level food security indicators

- "Hunger" indicators

  - Food poverty rate

  - Prevalence of undernourishment (PoU)

- Diet/nutrition deficiency indicators

  - Prevalence of calorie and nutrient deficiencies

  - Number of deficient people

  - Average consumption gaps

- Anthropometrics can be used to determine nutritional status from data on individuals' body composition data.

Micro-level simulation analysis

- Looks at changes in micro-level indicators based on exogenous or endogenous "shocks".

    - Shocks can be multiple and come from many different sources.

- Flexible time period. For our purposes, we are choosing to look at the baseline – t0 and the results – t1.

- This time of analysis provides a "before and after" style picture of what are the effects from a proposed shock.

- Useful for rapidly assessing the potential effects of some event on micro-level food security indicators.

Generic simulation function

$$Q_{hf}^1 = (1 + Shock) * Q_{hf}^0$$

Q^1 = <u>predicted</u> food consumption quantity or calorie consumption amount

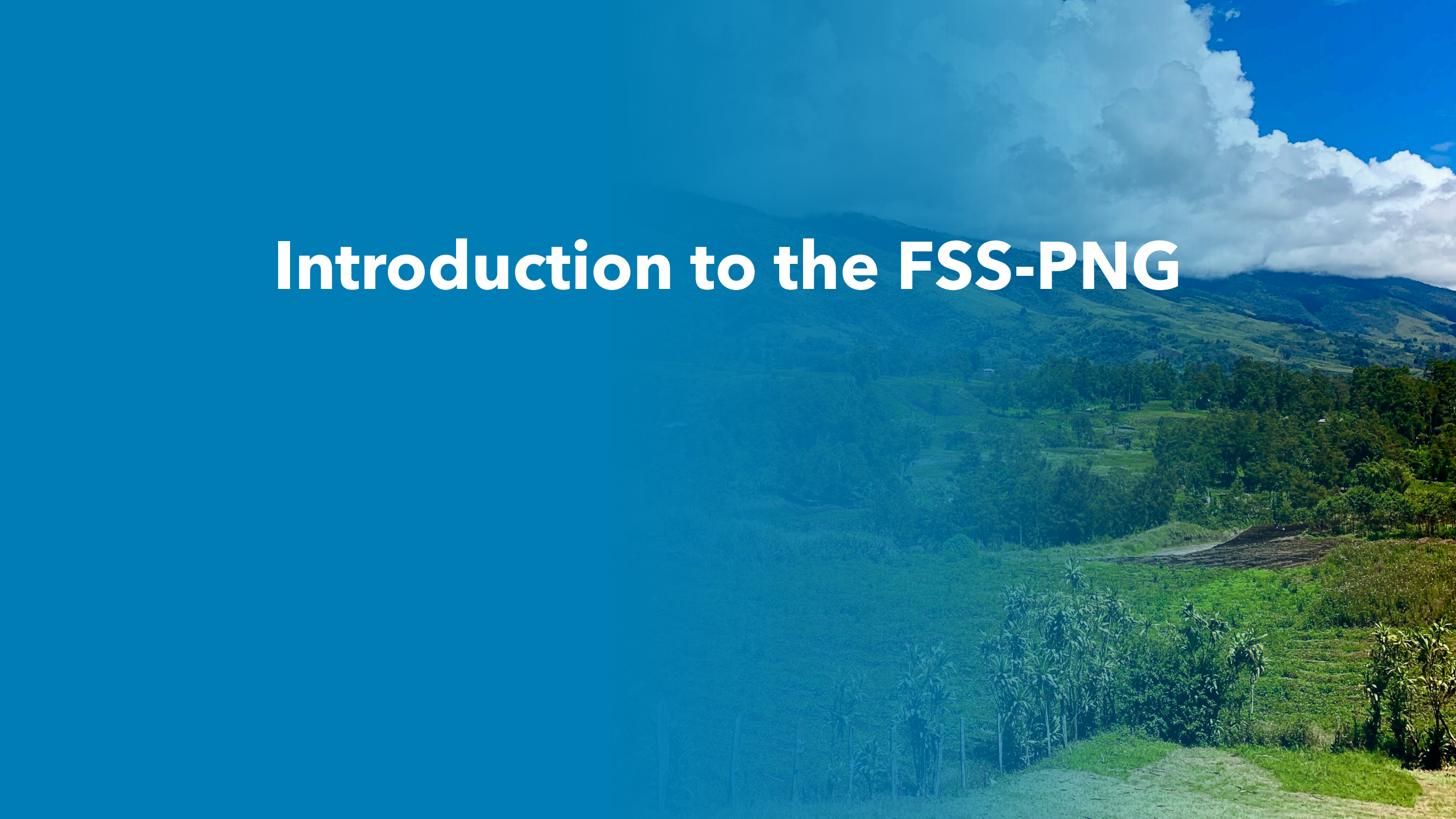Q^0 = <u>observed</u> food consumption quantity or calorie consumption amount

h = household

f = food item

Questions? Feedback?

Introduction to the FSS-PNG

Motivation and purpose

- Food security in many countries has been impacted by a succession of recent crises.

- Especially when a crisis hits unexpectedly, policymakers need to take quick action.

- To inform such policy action, IFPRI and its partners developed the Food Security Simulator (FSS).

- The FSS is an innovative tool for first-cut evaluations of direct, household-level outcomes of economic crises and policy responses in a timely manner.

- The FSS is designed for assessing the potential, short-term impacts of food price or household income changes ("shocks"), as well as preference changes, on food consumption, diet quality, and other food security indicators among different population groups in different countries of interest.
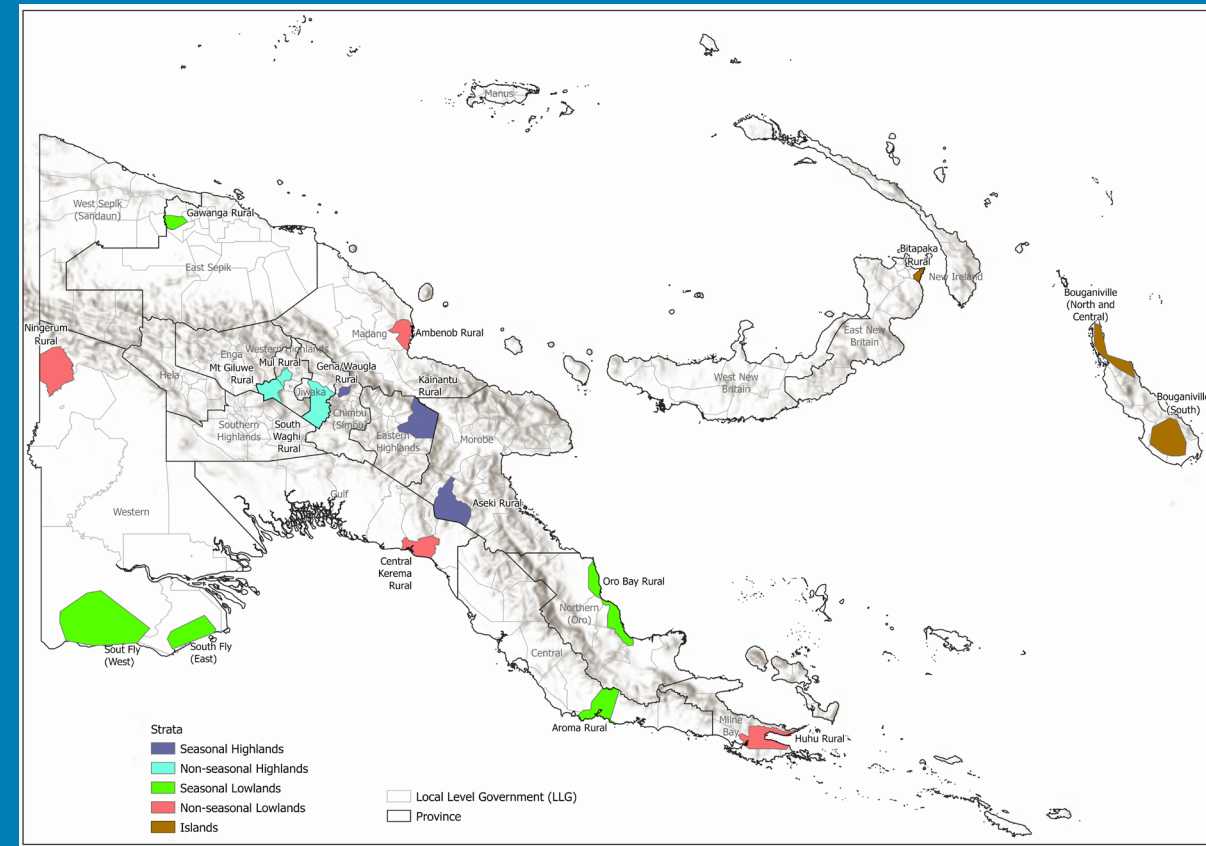
Features of the Food Security Simulator

- Is easy-to-use, with an intuitive Excel-based interface, and has a detailed user guide.

- Provides detailed simulation results tables, but also concise overview tables and graphs for key indicator results (for e.g., export to policy reports or presentations).

- Is based on rigorous research, incl. sophisticated food demand models to capture consumer behavior:

  - *Income and price elasticities of food demand (E-FooD) dataset: Documentation of estimation methodology* (IFPRI Data Paper, 2021).

  - *Measuring changes in diet deprivation: New indicators and methods* (Food Policy journal article, 2023).

- Uses recent household survey data:

  - Papua New Guinea Rural Household Survey, 2023 (PNG-RHS)
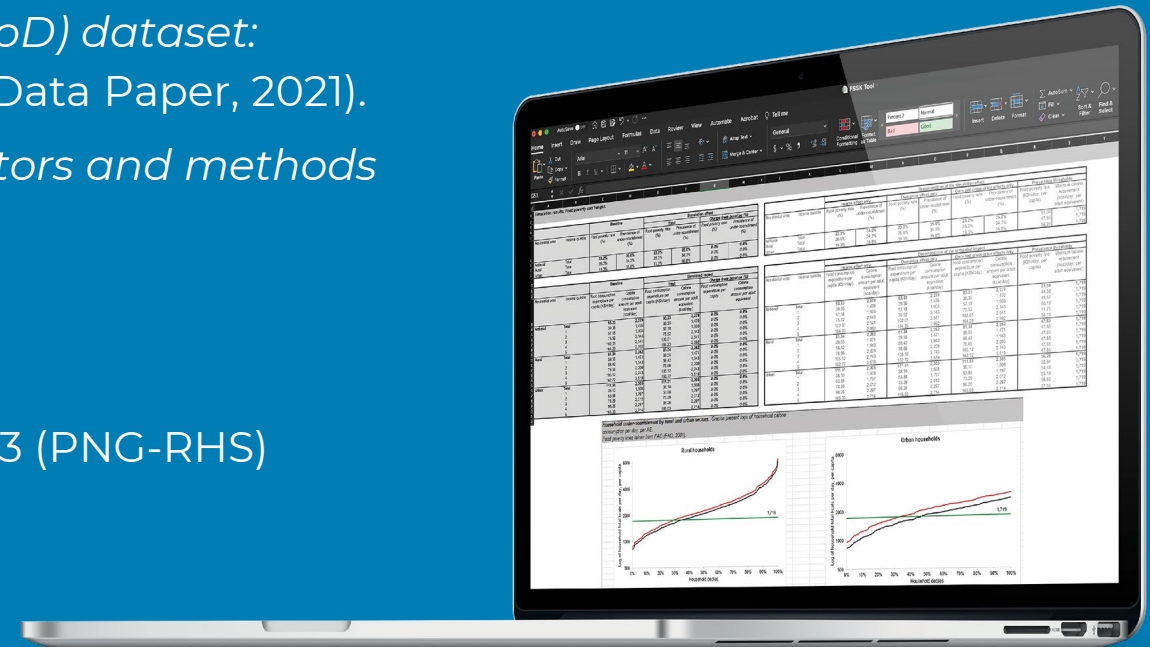
Data used in FSS-PNG

- Papua New Guinea Rural Household Survey, 2023 (PNG-RHS)

- Available for download – for free – from Harvard Dataverse

- Data covers 2,699 households…

- in 270 villages…

- across 14 provinces

- Located throughout 5 agro-ecological zones
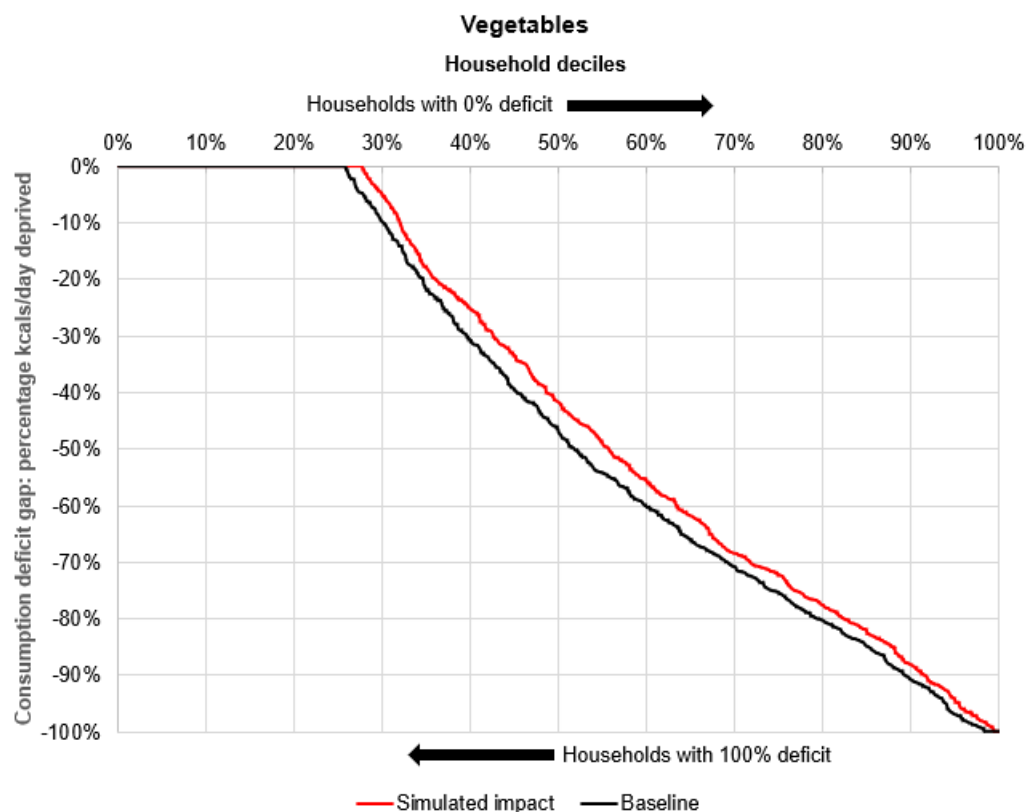
Using the Food Security Simulator

User input

Price Shocks

Name	Highlands	Lowlands
Other roots, tubers	↓ -10.0%	-10.0% ↓
Sweet potatoes	↓ -10.0%	-10.0% ↓
Cooking Bananas	↓ -10.0%	-10.0% ↓
Other grains/grain products	0.0%	0.0%
Rice	0.0%	0.0%
Aibika and leafy vegetables	0.0%	0.0%
Other vegetables	0.0%	0.0%
Ripe banana	0.0%	0.0%
Other fruits	0.0%	0.0%
Pork	0.0%	0.0%
Chicken	0.0%	0.0%
Beef and other meat	0.0%	0.0%
Fresh fish and seafood	0.0%	0.0%
Dried fish and seafood	0.0%	0.0%
Tinned fish	0.0%	0.0%
Eggs	0.0%	0.0%
Dairy	0.0%	0.0%
Nuts	0.0%	0.0%
Coconut	0.0%	0.0%
Oils and fats	0.0%	0.0%
Snacks/sweets	0.0%	0.0%
Sugars	0.0%	0.0%
Seasonings	0.0%	0.0%
Sugary drinks	0.0%	0.0%
Alcoholic beverages	0.0%	0.0%
Non-alcoholic beverages	0.0%	0.0%

Income Shocks

	Highlands	Lowlands
Poor	↑ 10.0%	10.0% ↑
Non-poor	0.0%	0.0%

Income Preference Changes

Name	Highlands Poor		Highlands Non-poor		Lowlands Poor		Lowlands Non-poor	
Other roots, tubers	0.868 / 0.868	0%	0.826 / 0.826	0%	0.394 / 0.394	0%	0.274 / 0.274	0%
Sweet potatoes	0.025 / 0.025	0%	0.155 / 0.155	0%	0.579 / 0.579	0%	0.572 / 0.572	0%
Cooking Bananas	0.868 / 0.868	0%	0.826 / 0.826	0%	0.394 / 0.394	0%	0.274 / 0.274	0%
Other grains/grain products	1.156 / 1.156	0%	0.802 / 0.802	0%	1.345 / 1.345	0%	1.772 / 1.772	0%
Rice	0.883 / 0.883	0%	0.610 / 0.610	0%	0.956 / 0.956	0%	0.802 / 0.802	0%
Aibika and leafy vegetables	0.610 / 0.610	0%	0.301 / 0.301	0%	0.689 / 0.689	0%	0.596 / 0.596	0%
Other vegetables	0.752 / 0.752	0%	0.550 / 0.550	0%	1.140 / 1.140	0%	1.022 / 1.022	0%
Ripe banana	0.949 / 0.949	0%	0.768 / 0.768	0%	0.942 / 0.942	0%	0.889 / 0.889	0%
Other fruits	0.949 / 0.949	0%	0.768 / 0.768	0%	0.942 / 0.942	0%	0.889 / 0.889	0%

Using the Food Security Simulator

Output

Vegetables

Household deciles

Households with 0% deficit →

Simulated impact — Baseline

Consumption deficit gap: percentage kcals/day deprived

Households with 100% deficit ←

		Simulated Impact	Change from baseline
Food poverty rate	National	46.1%	-5.4%
	Highlands	53.7%	-4.5%
	Lowlands	42.3%	-5.9%
Prevalence of undernourishment	National	34.1%	-6.4%
	Highlands	42.4%	-7.8%
	Lowlands	29.9%	-5.7%

		Change from baseline (% points)					
		Total	**Quintile**				
			1	2	3	4	5
Food consumption expenditure per capita (PGK/day)	National	3.1%	12.2%	11.7%	5.5%	1.0%	0.2%
	Highlands	3.8%	11.8%	11.9%	6.2%	1.4%	0.1%
	Lowlands	2.8%	12.4%	11.6%	5.1%	0.9%	0.3%
Calorie consumption amount per adult equivalent (calories/day)	National	3.8%	11.1%	11.3%	5.3%	1.2%	0.3%
	Highlands	5.0%	11.5%	13.0%	7.5%	1.9%	0.3%
	Lowlands	3.2%	10.9%	10.5%	4.3%	0.9%	0.3%

		Change from baseline					
		Total	**Quintile**				
			1	2	3	4	5
Diet quality indicator	National	5.0%	11.8%	9.8%	4.4%	1.1%	0.3%
	Highlands	6.2%	12.9%	13.7%	7.1%	1.5%	0.2%
	Lowlands	4.5%	11.3%	8.1%	3.3%	1.0%	0.4%
Average adequate food groups	National	8.1%	34.0%	22.9%	6.3%	2.3%	0.7%
	Highlands	10.2%	33.6%	37.4%	13.4%	6.5%	0.3%
	Lowlands	7.2%	34.2%	19.6%	3.5%	0.3%	0.9%
Share of deprived households with sufficent calorie consumption (% points)	National	1.2%	1.2%	2.1%	2.1%	0.2%	0.0%
	Highlands	0.5%	0.0%	0.0%	2.1%	0.6%	0.0%
	Lowlands	1.5%	1.8%	3.1%	2.1%	0.0%	0.0%

Generic simulation function

$$Q_{hf}^1 = \hat{Q}_{hf}^0 * \left(1 + E_{gi}^M * dM_g + e_{gi}^p * dp_k + \sum_{j,l} e_{gj}^p * dp_l\right) + Q_{hf}^0 - \hat{Q}_{hf}^0, \quad i \neq j \text{ and } k \neq l$$

Q^1 = <u>predicted</u> food consumption quantity or calorie consumption amount

Q^0 = <u>observed</u> food consumption quantity or calorie consumption amount

$\widehat{Q^0}$ = <u>latent</u> [estimated] food consumption quantity or calorie consumption amount

h = household
f = food item ($\approx$ 120-200)
g = household group (income quintile × residential area)
i,j = food group in the demand system (= 15)
k,l = food commodity on input sheet (subgroups of i,j)

E_{gi}^M = estimated income elasticity

e_{gi}^p = estimated own-price elasticity

e_{gj}^p = estimated cross-price elasticity

from food demand system estimations (by IFPRI)

dM_g = household income change (%)

dp_k = price change for commodity k (%)

dp_j = price change for commodity l (%)

"Shocks", specified by user

Questions? Feedback?