

# Food insecurity and fertilizer prices

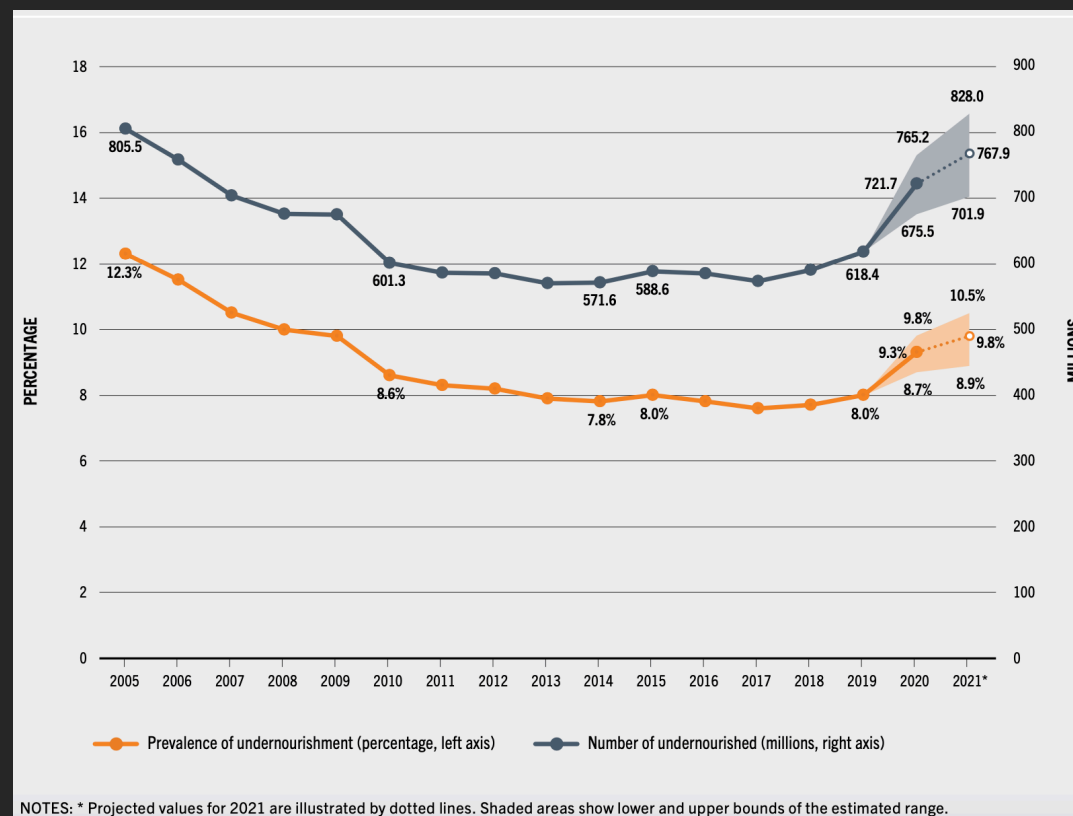
Hope Michelson

University of Illinois at Urbana-Champaign

February 23, 2023

After decades of declines, global hunger is increasing, affecting

- 46 million more people in 2021 than in 2020
- 150 million more people in 2021 than in 2019



Graph from: FAO, IFAD, UNICEF, WFP and WHO. 2022. *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable*. Rome, FAO.

## There are two main types of food insecurity: Acute Food Insecurity and Chronic

- **Acute/catastrophic food insecurity:** what we see in the news. Severe but a small share of the world's food insecure population
- **Chronic food insecurity:** what does not make the news. The dominant form of food security in the world

### Populations in Catastrophe (IPC/CH Phase 5)

2016	85 000	IN NORTH EAST NIGERIA AND SOUTH SUDAN
2017	150 000	IN NORTH EAST NIGERIA AND SOUTH SUDAN
2018	235 600	IN SOMALIA, SOUTH SUDAN AND YEMEN
2019	108 500	IN SOUTH SUDAN AND YEMEN
2020	133 000	IN BURKINA FASO, SOUTH SUDAN AND YEMEN
2021	570 000	IN ETHIOPIA, MADAGASCAR, SOUTH SUDAN AND YEMEN

### Populations in Crisis (IPC/CH Phase 3)

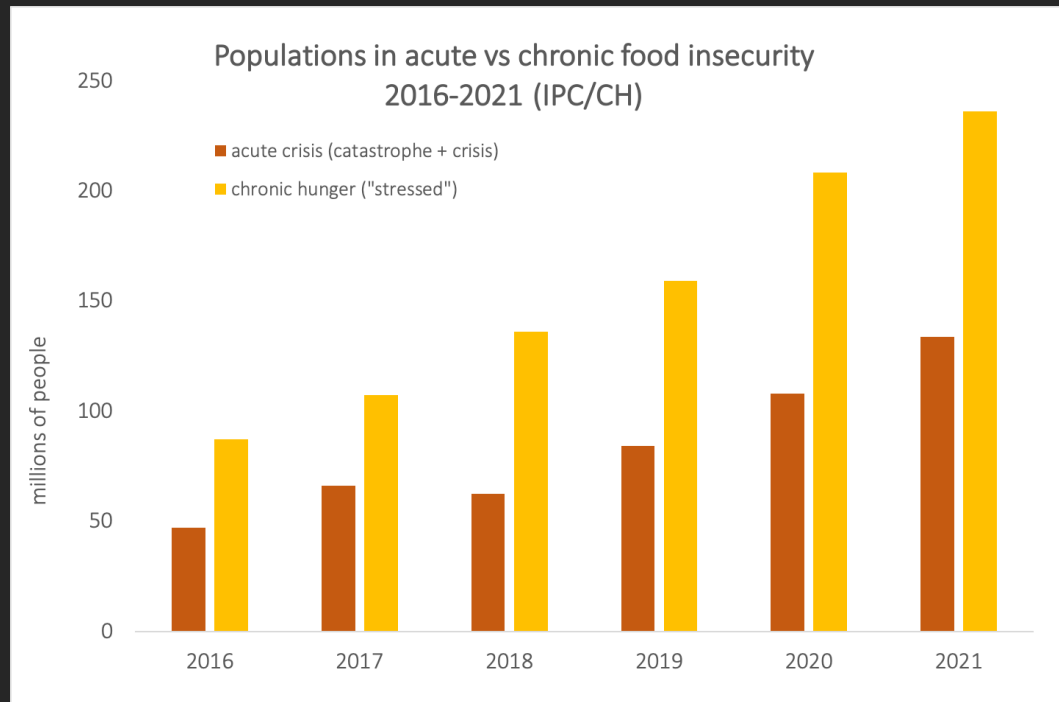
2016	47.0M	IN 23 FOOD CRISES
2017	66.1M	IN 34 FOOD CRISES
2018	62.2M	IN 32 FOOD CRISES
2019	84.2M	IN 39 FOOD CRISES
2020	107.9M	IN 43 FOOD CRISES
2021	133.1M	IN 41 FOOD CRISES

### Populations in Stressed (IPC/CH Phase 2), 2016–2021

2016	87.4M	IN 27 FOOD CRISES
2017	107.5M	IN 32 FOOD CRISES
2018	136.2M	IN 32 FOOD CRISES
2019	159.2M	IN 39 FOOD CRISES
2020	208.3M	IN 43 FOOD CRISES
2021	236.2M	IN 41 FOOD CRISES

Source: FSIN, using IPC and CH data.

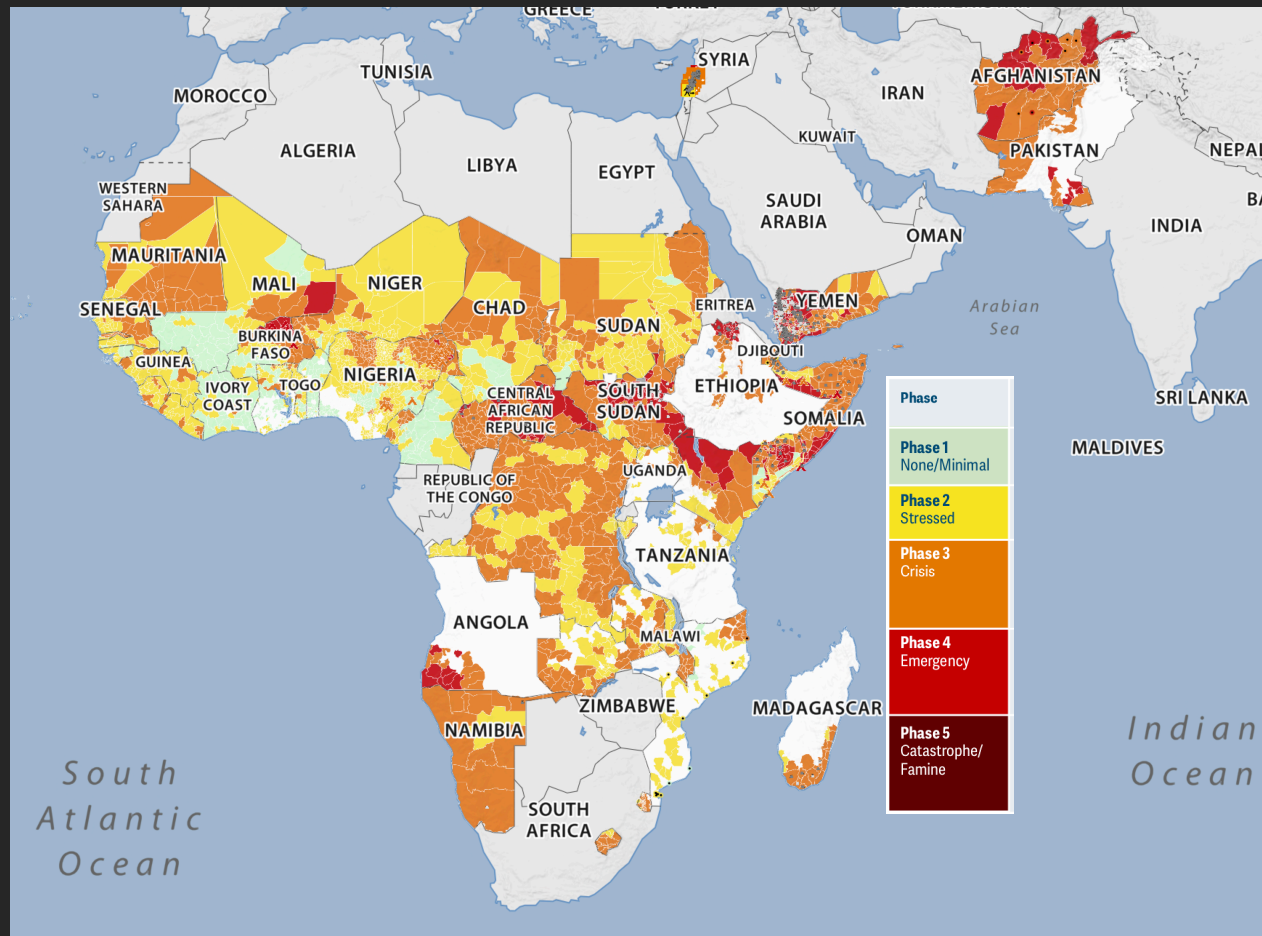
The global population of chronically food insecure is growing quickly



- 999/1000 food insecure people in the world are chronically food insecure, living in low productivity, high poverty regions of the world



## Chronic and acute food insecurity co-exist within countries



## The chronically food insecure are essential to the world food system

- The chronically food insecure are often farmers or rural laborers.
  - They grow food for others
  - But many also self-provision. That's really important and something we often forget
- Small farms (less than two hectares) produce roughly 35% of the world's food (Lowder et al. 2021)
  - Share of food produced in low income countries by small farmers is even higher: IFAD estimates 60-80%
- Small farmers employ the world's poorest
  - Globally, ~2.5 billion people work in smallholder agriculture



Small farmer maize field in Central Malawi, photo credit: Annemie Maertens

# SHOCKS matter for the chronically food insecure and those who rely on them

- Small farmers' production and marketing is exposed to weather risks, output market price risks, input market price risk...

- Perilous circumstances: lack insurance
- Can tip the chronically hungry into crisis
  - reduce own food production
  - ALSO reduce food available to others
- Longer-term effects: depress regional agricultural development, keep crop yields and production low

→ increasing the likelihood and severity of future crises

## Real prices for food and fertilizer

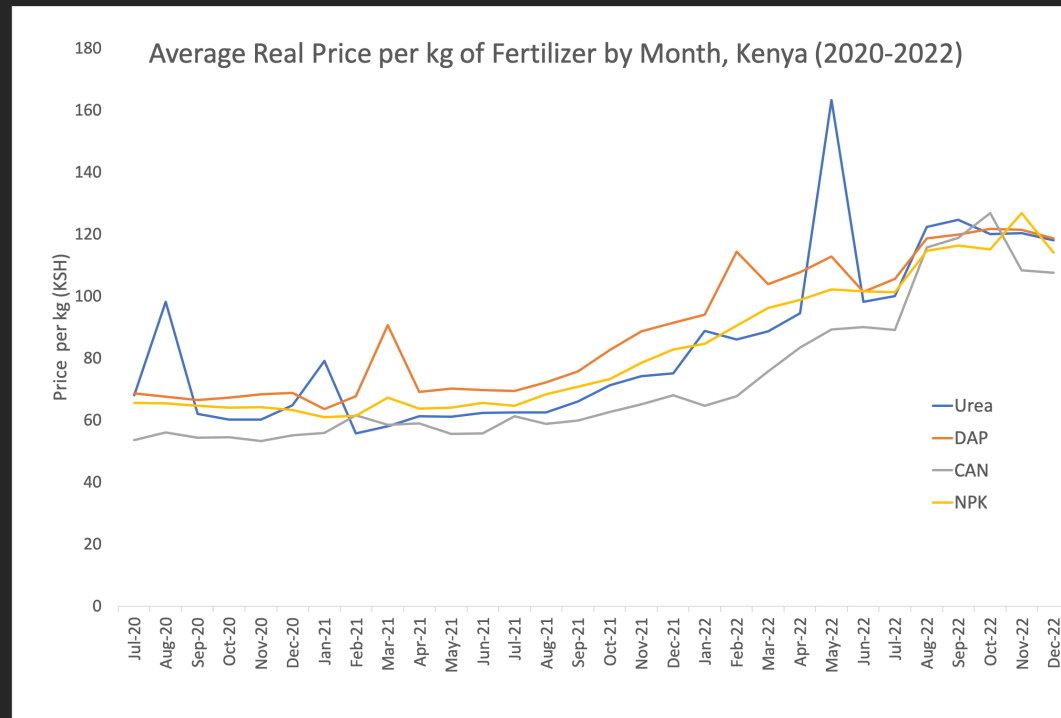
Index based on constant USD prices. Base 100 = Average 2000-2020



Chart: David Laborde • Source: World Bank, U.S. Bureau of Labor Statistics

David Laborde, IFPRI

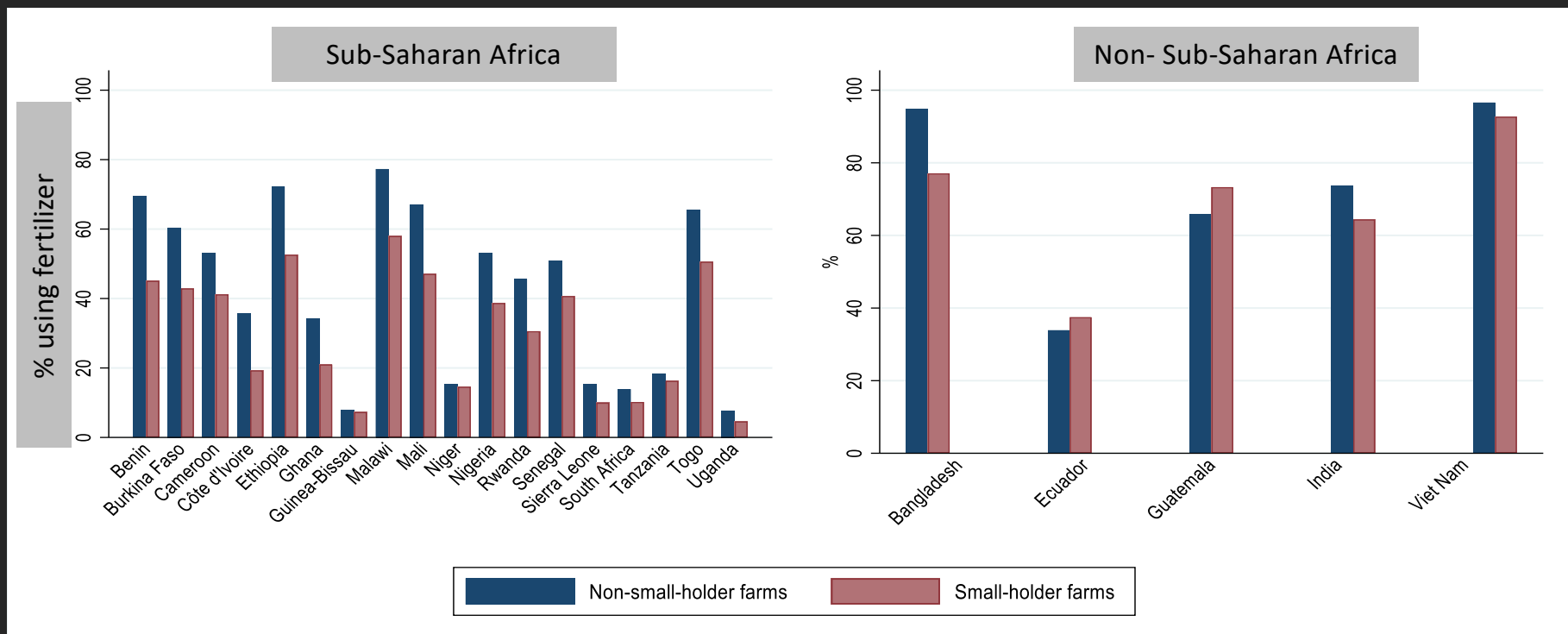
## A key shock: fertilizer price increases



Data: CIMMYT AgNexus agri-dealer panel

Kenya example: Consistent with global trends, fertilizer prices have doubled since July 2020

## Important: small farmers In low income countries use fertilizer



Data: FAO Rural Livelihoods Information System (RuLIS)

# How do fertilizer prices affect food security for small farmers?

Two primary pathways:

1. Cost of producing their own food increases. In response:

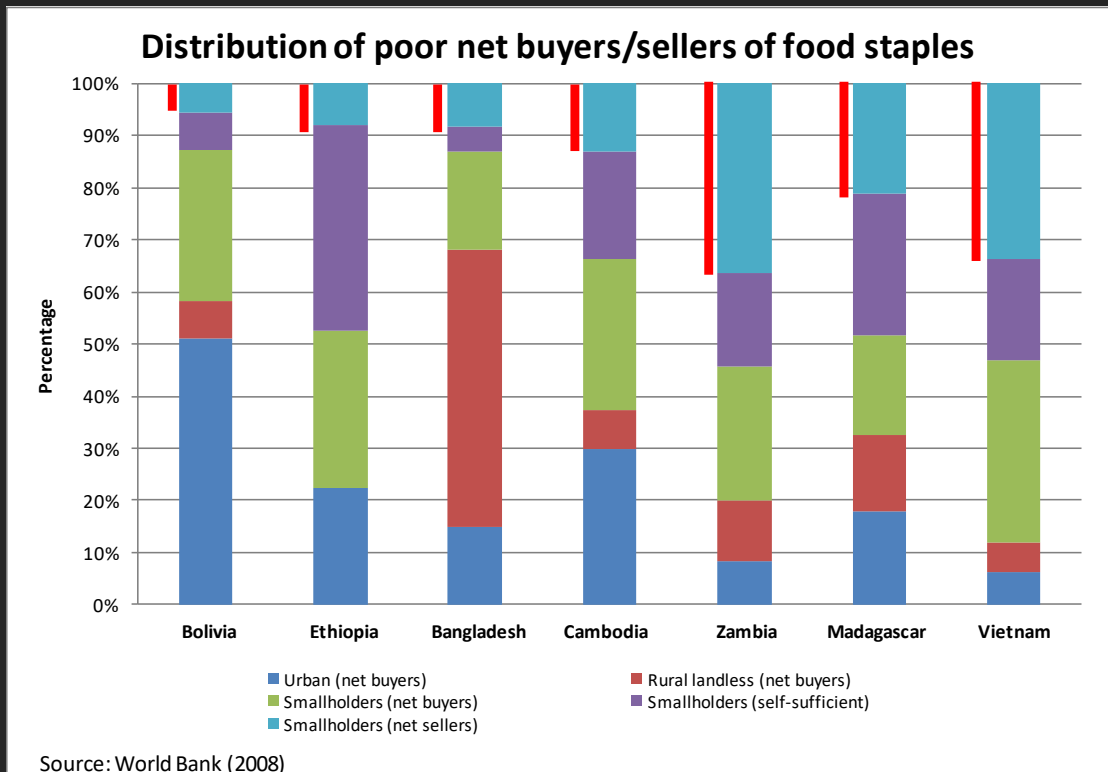
- use less fertilizer and produce less food
- switch to less fertilizer-intensive crops
- maintain fertilizer use and increase production costs

2. The price of food that they buy increases

- Higher input prices → lower crop yields + higher food prices
- Higher food prices are a problem for the poor, even for most small farmers

## Poor small farmers are in one of two regimes: net food buyers or net food sellers

- Most small farmers are **net food buyers**
- Most of the chronically food insecure are **net food buyers**
- Net food buyers are hurt by increases in the cost of food.
- Net food sellers are hurt by increases in the cost of production.



BUT, regimes are somewhat dynamic: a small farmer is a net buyer or net seller depending on market prices

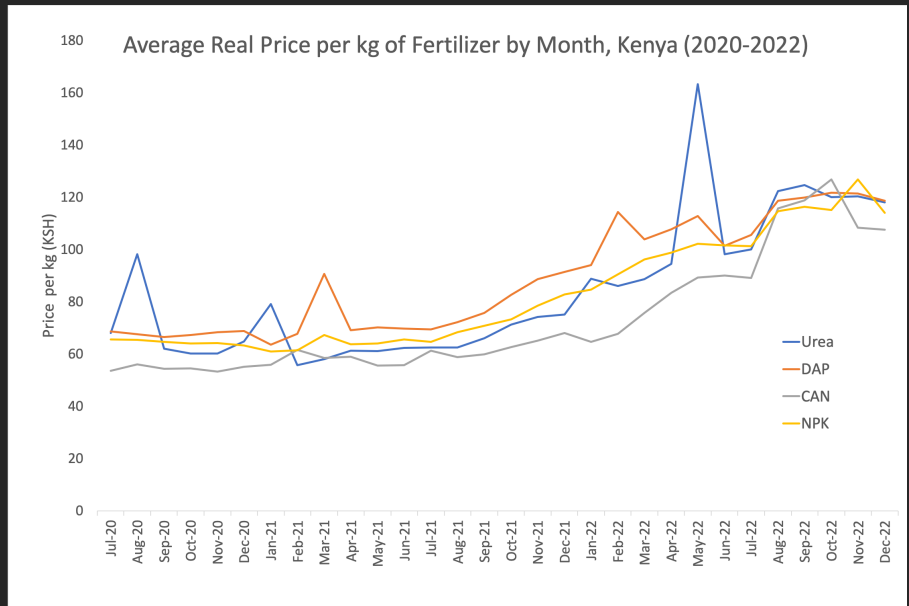
When their local crop production falls:

- Net food buyers will turn to the market earlier in the year, driving up prices
- Some net food sellers will become net buyers, putting further upward pressure on local food prices



## Example from Kenya: how does a fertilizer price shock affect farmer fertilizer purchasing?

- Working with the International Maize and Wheat Improvement Center (CIMMYT)
- Using a two-year panel dataset (monthly, July 2020 - July 2022) of 1,356 Kenyan agri-dealers
- Kenyan context:
  - Two-thirds of Kenyan farmers are net food buyers (Nzuma, 2014)
  - 65% of Kenyan maize farmers use fertilizer: 100 kg/ha on average (Jena et al. 2013)



Data: CIMMYT AgNexus agri-dealer panel

## How does the fertilizer price shock affect farmer fertilizer purchasing?

CAN fertilizer	2021 long rains growing season	2022 long rains growing season	2021-2022 % change
Price per kg (ksh)	60	100	+68%
Total sales quantity (kg)	6,168,930	3,538,402	-43%
DAP fertilizer			
Price per kg (ksh)	73	118	+61%
Total sales quantity (kg)	6,267,700	5,475,810	-13%
UREA fertilizer			
Price per kg (ksh)	66	111	+69%
Total sales quantity (kg)	2,383,148	1,085,674	-54%

*Data: CIMMYT AgNexus agri-dealer panel*

- Fertilizer prices in the primary growing season (mid-March to May) increased more than 60%
- Total purchases (aggregated across 1300 agri-dealers) declined between 13-54%!

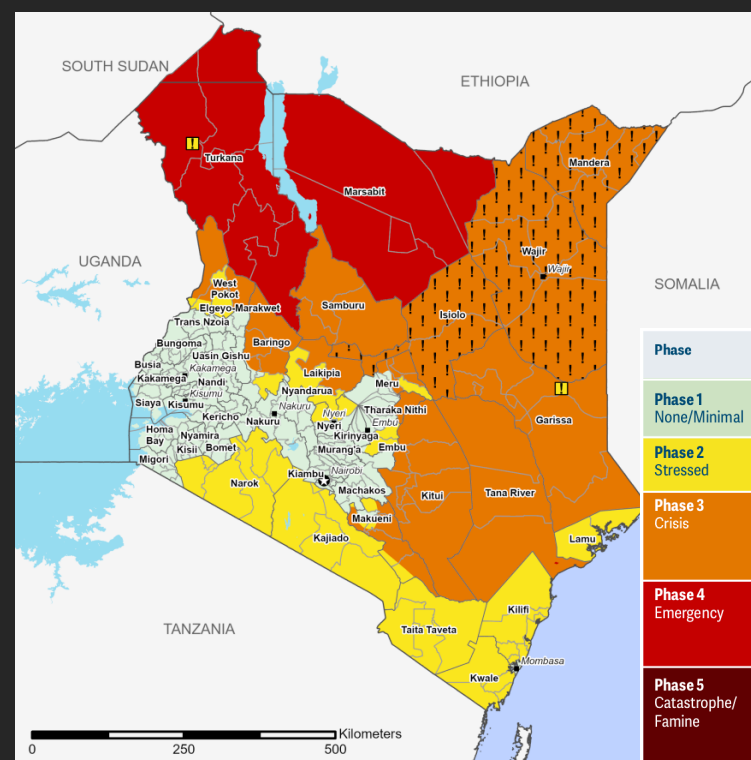
We don't yet know how this decrease in fertilizer purchasing impacts food security – these are open and important research questions

- Some evidence maize production has declined (drought also a factor):

Kenyan national maize production statistics	2020-2021	2021-2022	2022-2023 forecast
Total Kenyan maize production (1000 MT)	4000	3100	3200
Total imports (1000 MT)	222	800	700
Total area harvested (1000 HA)	2000	1950	1900
Total yield (MT/HA)	2	1.59	1.68

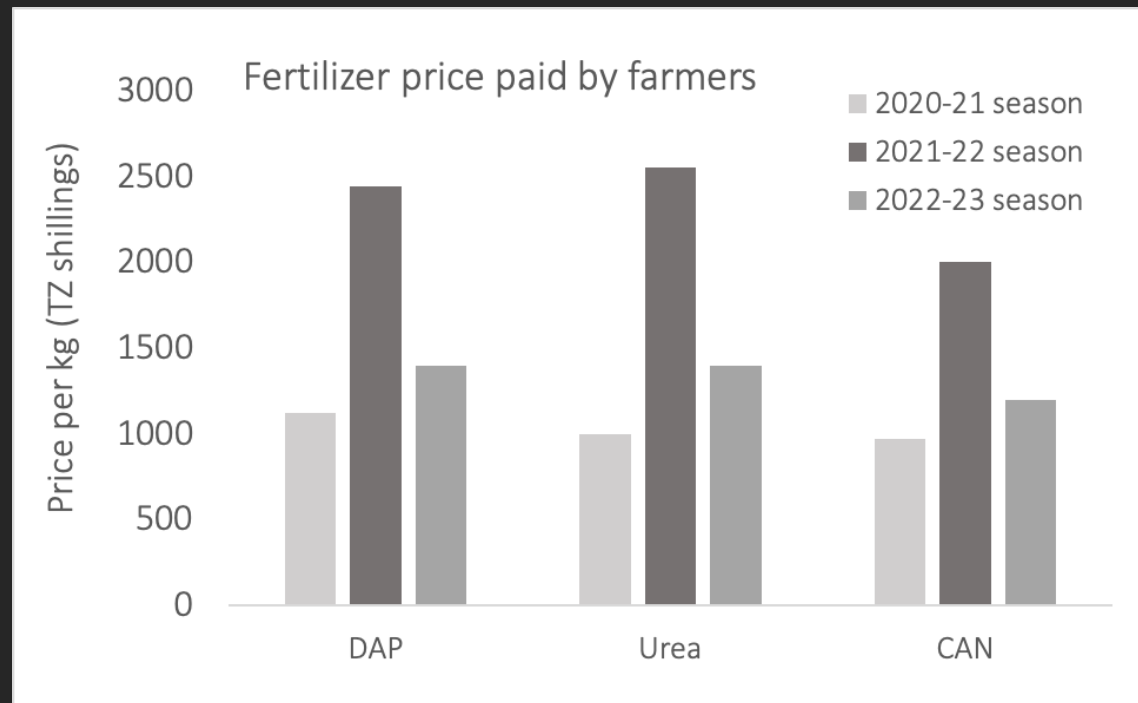
*Data from USDA FAS*

- Potentially dangerous situation: Most Kenyan farmers buy food. When they produce less, prices will rise, food security declines further
- In Dec 2022, maize prices ranged from 35-140 percent above the five year average (FEWS)
- Latest FEWS projections: 5.4 million at risk of food insecurity (>10% of population)



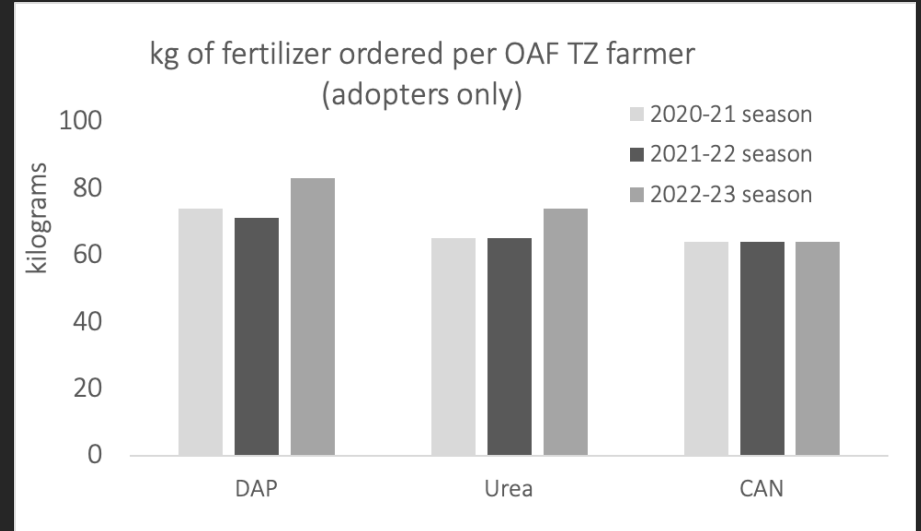
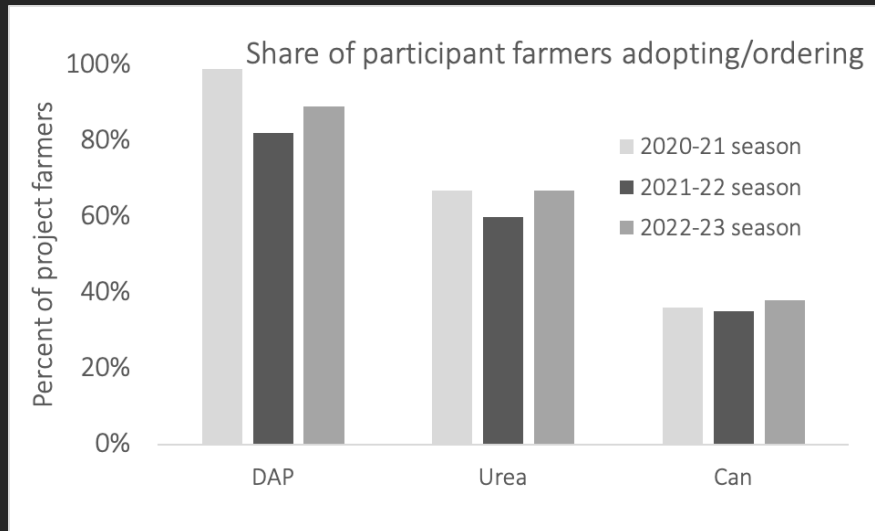
FEWS IPC

Data from One Acre Fund (OAF) in Tanzania presents a different picture:



Prices for all fertilizer increased significantly in 2022, but...

## Interventions help!: Prices increase, but farmers maintain their use of fertilizer



- One Acre Fund bundles credit, recommendations, input package provision
- These are 56,000 very poor farmers
- Highly inelastic demand
  - elasticity for urea: -0.01!

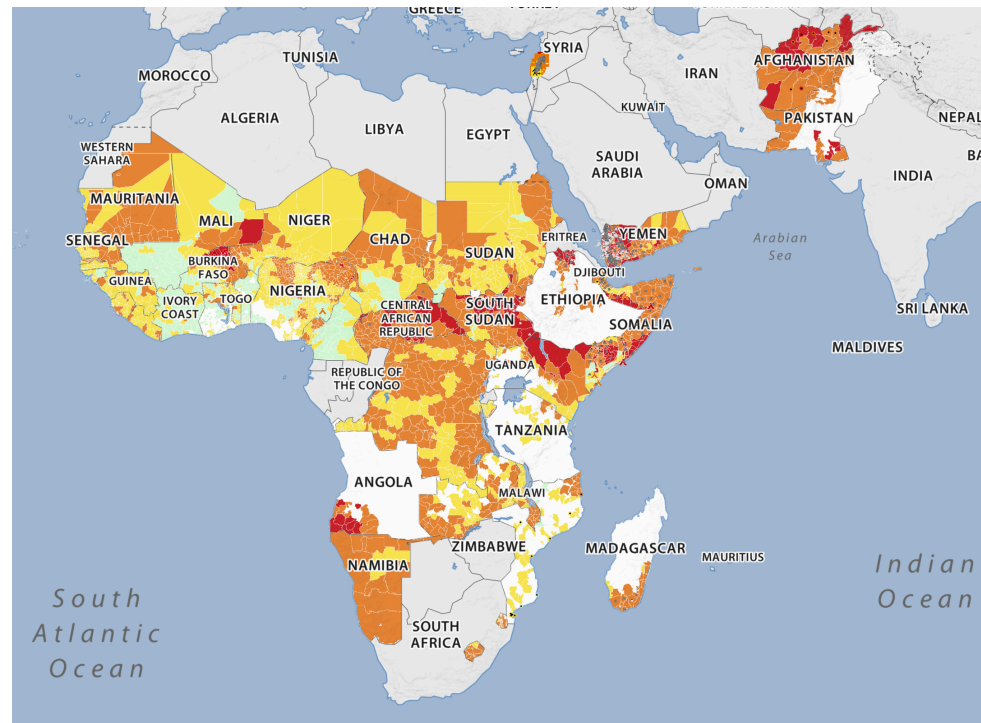
## Concluding thoughts

- Addressing food insecurity requires significant, sustained investment in agricultural productivity in low income countries.
- Fertilizer access is only a part of what is needed:
  - Genetic improvements in crops and livestock
  - Sustained investment to promote technology diffusion (i.e. seed systems)
  - Extension funding
  - Infrastructure improvements
  - Risk protection
- These investments are a means to protect already vulnerable households, communities, and regions from crises to come

Thank you

## WHAT IS THE TITLE?

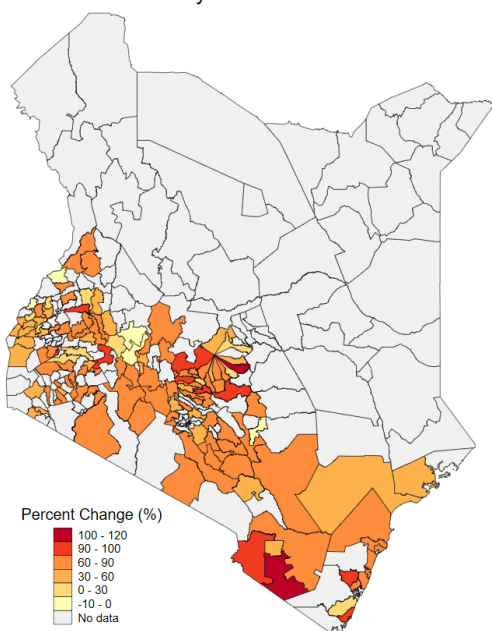
The distribution and severity of food crises in February 2023 based on the Integrated Phase Classification System (IPC)





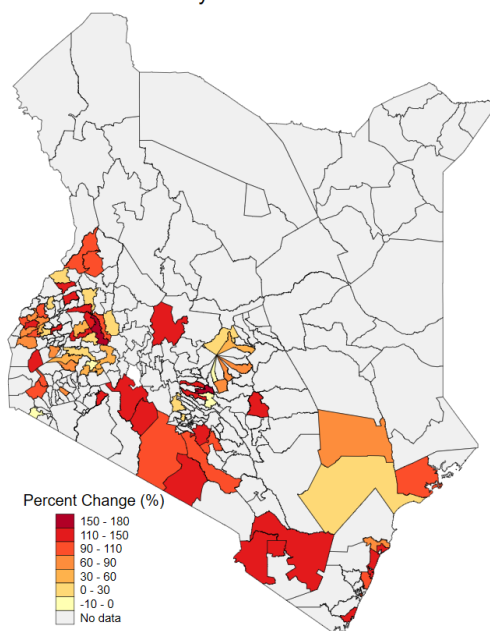
# Fertilizer prices increased heterogeneously across Kenya btw 2021 and 2022

Change in Real DAP Fertilizer Prices between the  
2021 and 2022 Long Rains  
Kenya Subcounties



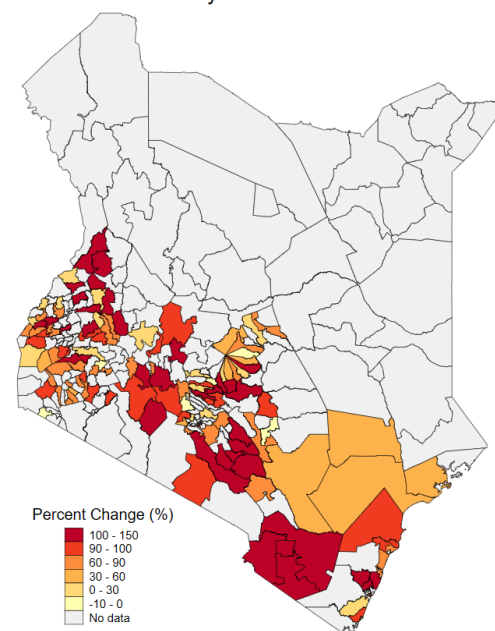
DAP

Change in Real Urea Fertilizer Prices between the  
2021 and 2022 Long Rains  
Kenya Subcounties



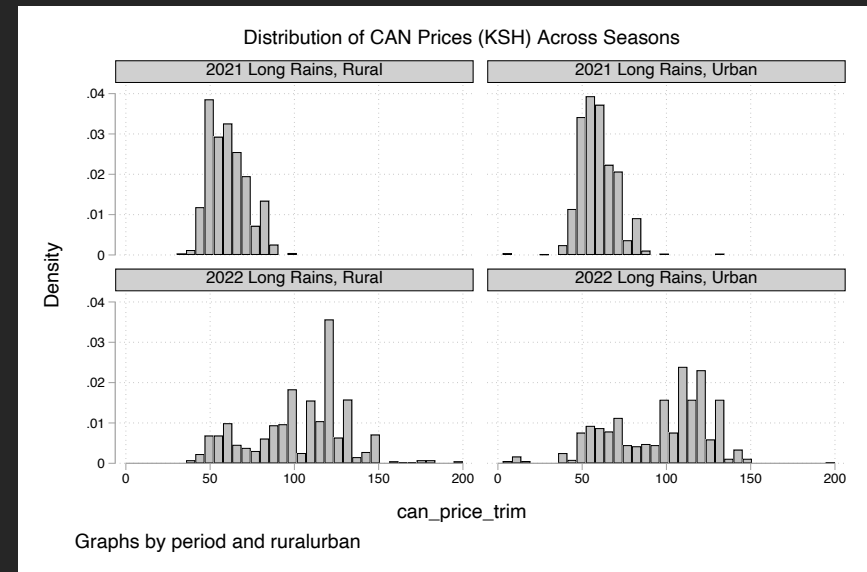
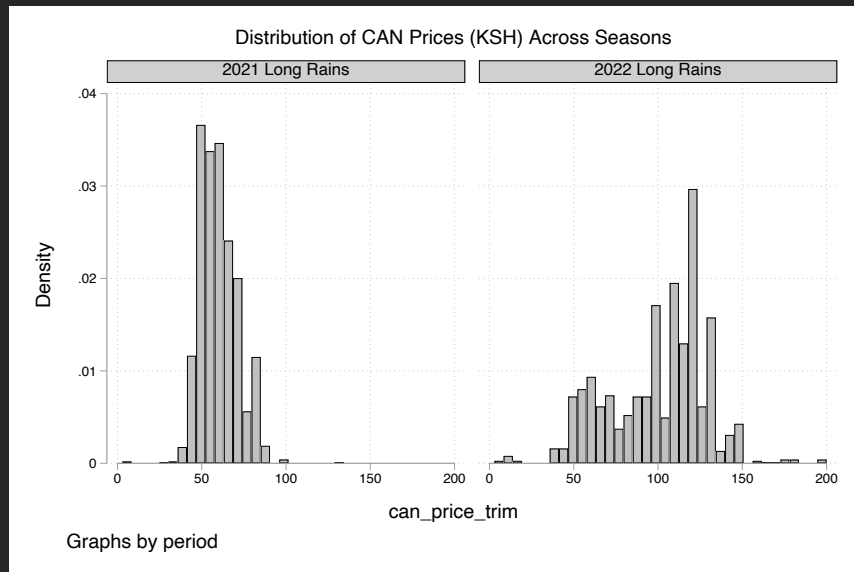
Urea

Change in Real CAN Fertilizer Prices between the  
2021 and 2022 Long Rains  
Kenya Subcounties



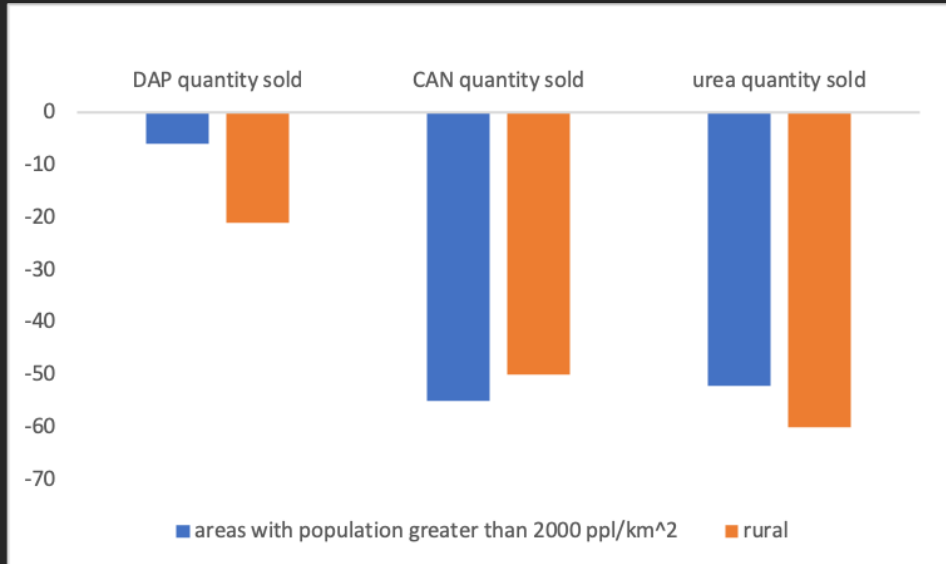
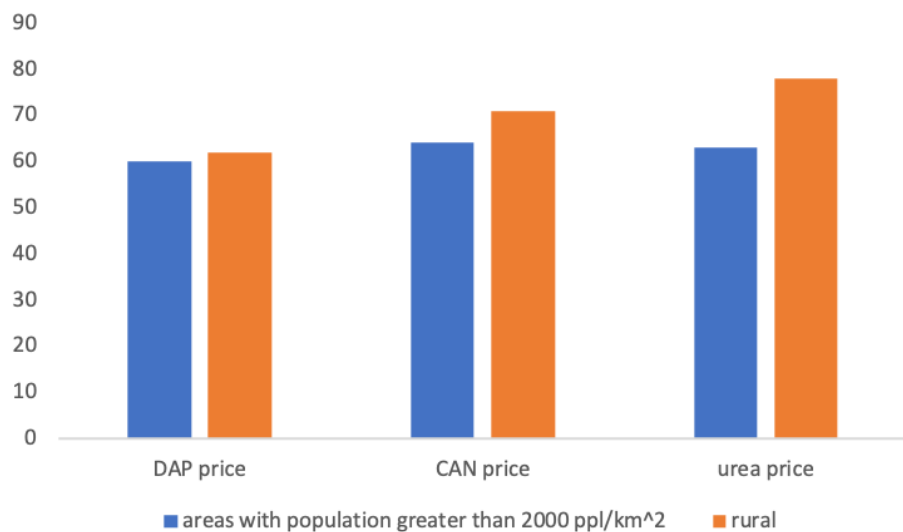
CAN

Prices have increased but also spread out. **WHAT DOES “SPREAD OUT” MEAN??** We see this spread in prices in both urban (>2000 people per km<sup>2</sup>) and rural agri-dealers



**WHAT IS THE RELEVANCE HERE TO THE FERTILIZER USAGE? CHRONIC STRESS STORY? I'M MISSING IT.**

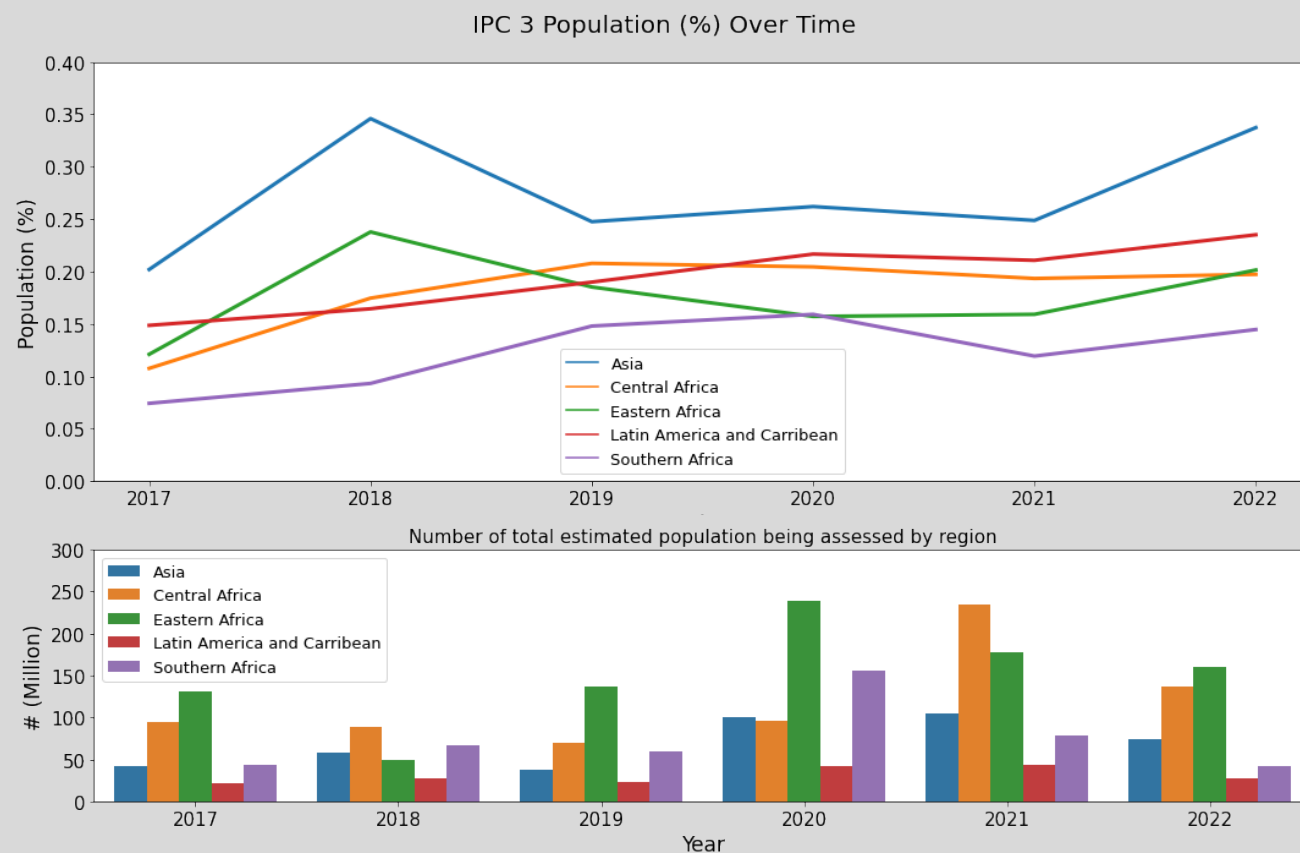
Fertilizer price increases are slightly larger in more remote regions; declines in purchases are larger in more remote areas



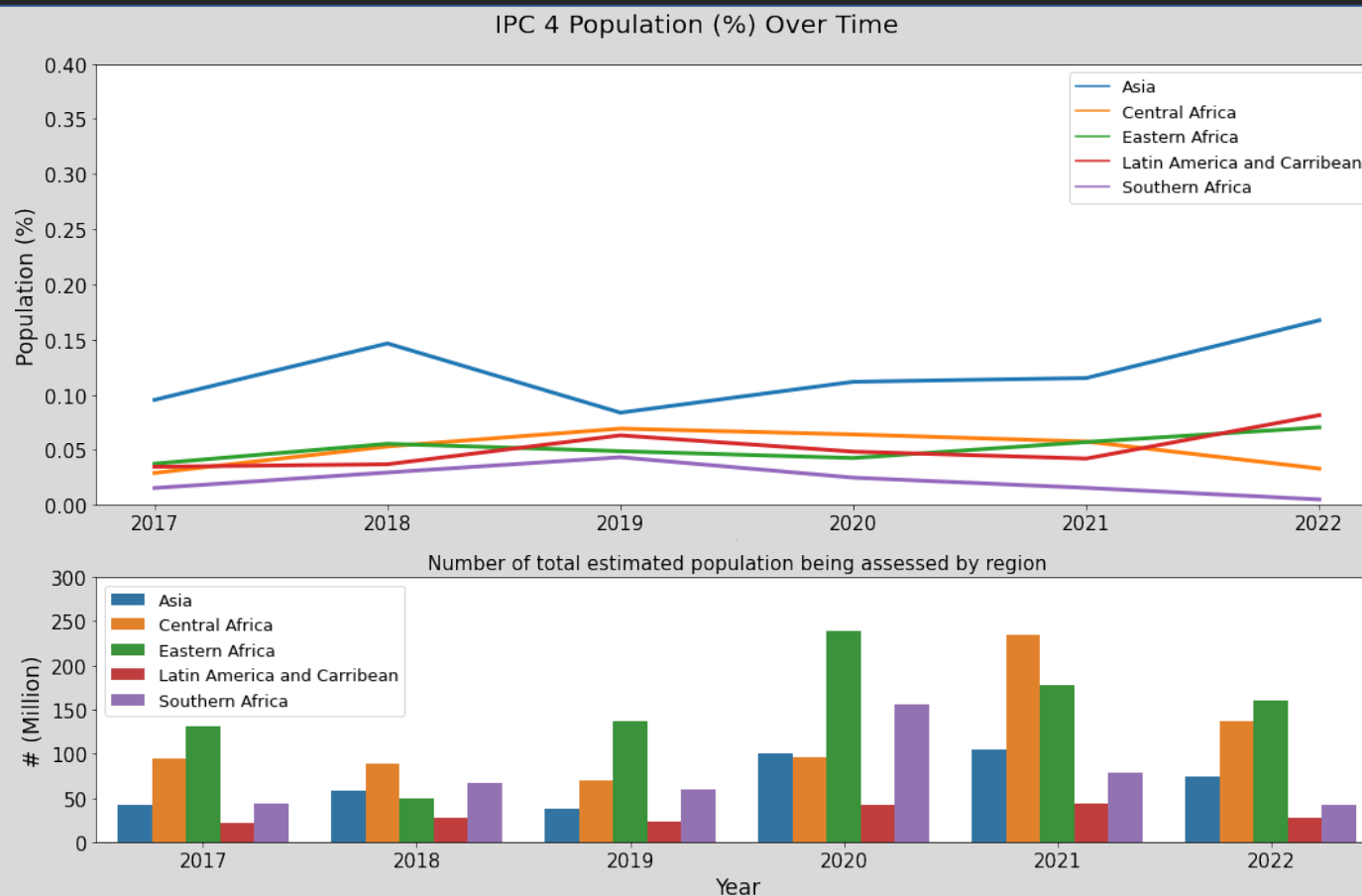
IS BLUE URBAN?? DUNNO WHAT THAT DENSITY MEANS  
RIGHT HAND PLOT – LOOKS LIKE SMALL DIFFERENCE BTW URBAN AND RURAL

Data: CIMMYT AgNexus agri-dealer panel

35% of households in IPC-assessed regions are now in Phase 3 (crisis) or higher



35% of households in IPC-assessed regions are now in Phase 3 (crisis) or higher



# Overview

1. The state of food insecurity in the world: the number of hungry people is increasing
2. The food insecure include both acute and chronically food insecure
3. A crisis can tip the chronic into acute circumstances, eroding the ability
4. Focus on a recent shock: fertilizer prices – estimates of effects on food insecurity
5. Example with new data from XX agridealers in Kenya

CIMMYT acquired a representative, two-year (July 2020 - July 2022) panel dataset of 1,356 medium and large agro-dealers in Kenya from AgNexus. Here we need to add a footnote that we don't have monthly sales data for all of them and that the size of the panel has reduced to x.

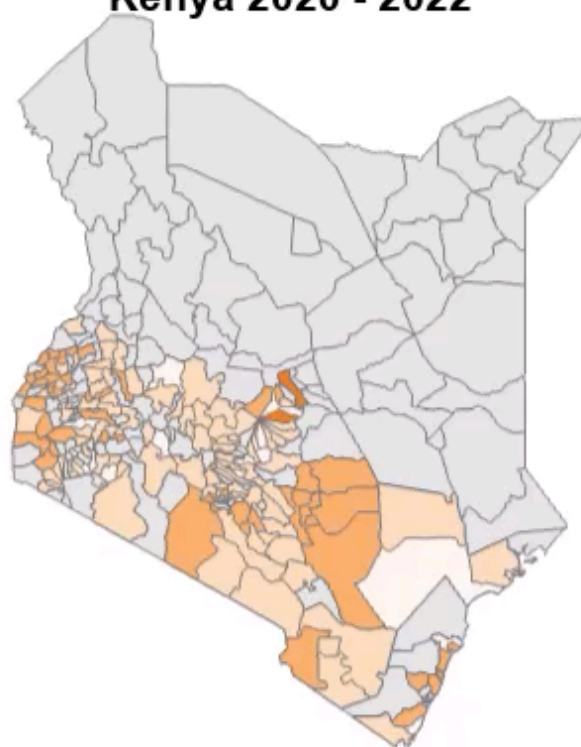
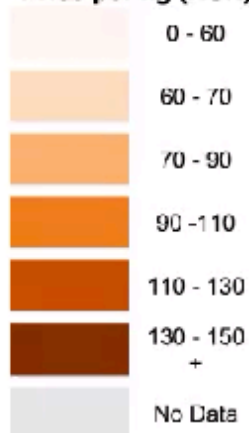
1. Fertilizer prices are rising
2. Purchasing is down
3. Trends are different in rural areas: rising faster and more significantly

1. Example from Tanzania

Title

### Change in Real DAP Fertilizer Prices Over Time Kenya 2020 - 2022

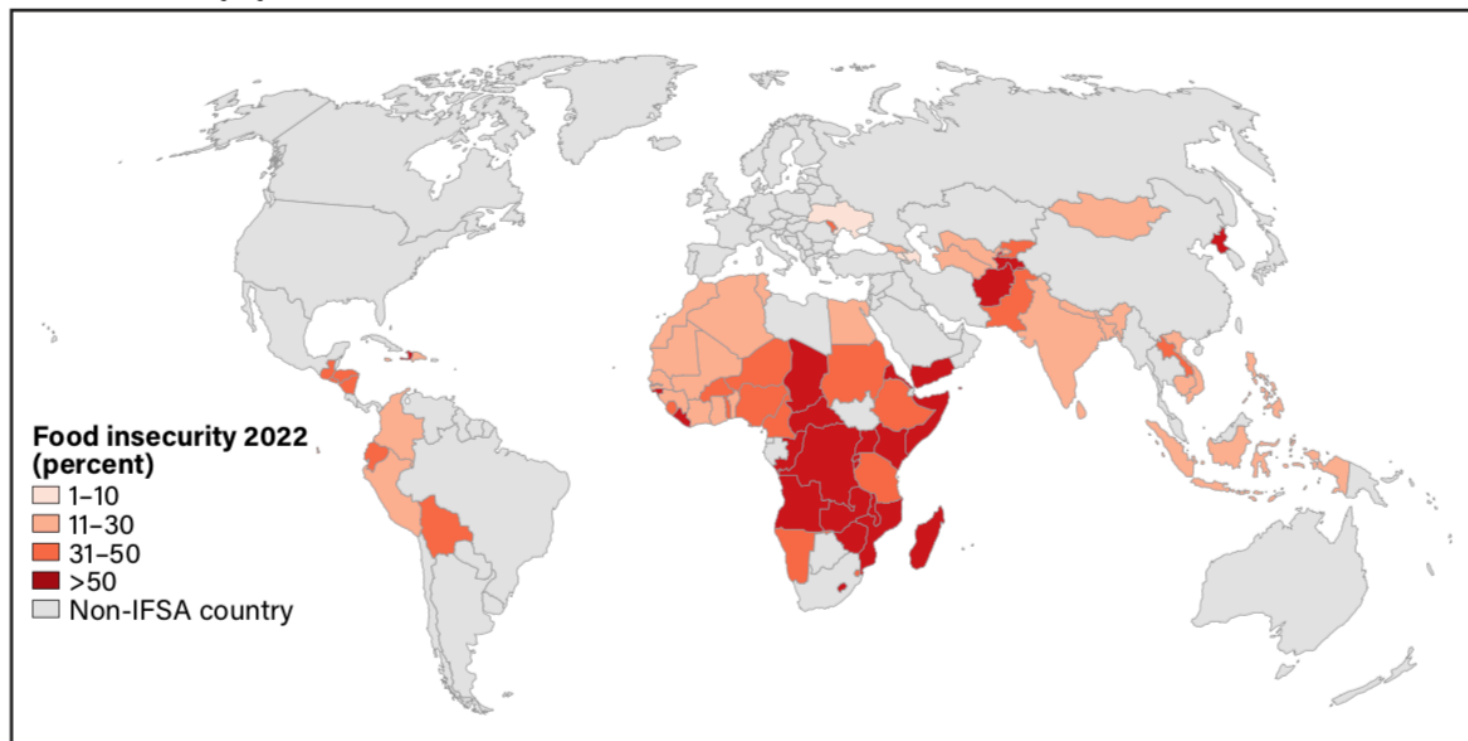
Price per kg (KSH)



June, 2020

## USDA IFSA report numbers that are even higher than the FAO/WFP/SOFI

Share of IFSA population estimated to be food insecure, 2022



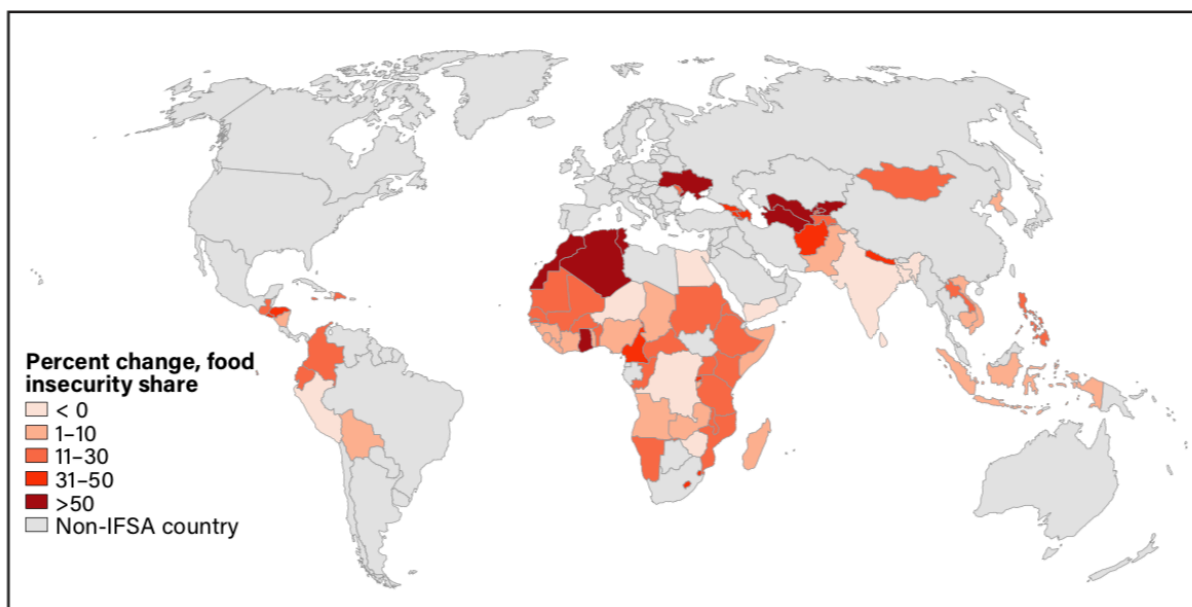
Note: IFSA = International Food Security Assessment.

Source: USDA, Economic Research Service based on results from the International Food Security Assessment model.



## USDA IFSA report numbers that are even higher than the FAO/WFP/SOFI

With the exception of rice, high prices of food grains and vegetable oils are associated with the deterioration of food security rates in 2022 relative to 2021



Note: IFSA = International Food Security Assessment.

Source: USDA, Economic Research Service based on results from the International Food Security Assessment model.

## Overview

