



HIGH LEVEL FORUM
on sustainable plant nutrition

18-19 NOVEMBER 2019

Plant Nutrition in Changing Food Systems under Climate Change

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CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



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1. Mega challenges →

2. Mega food system trends

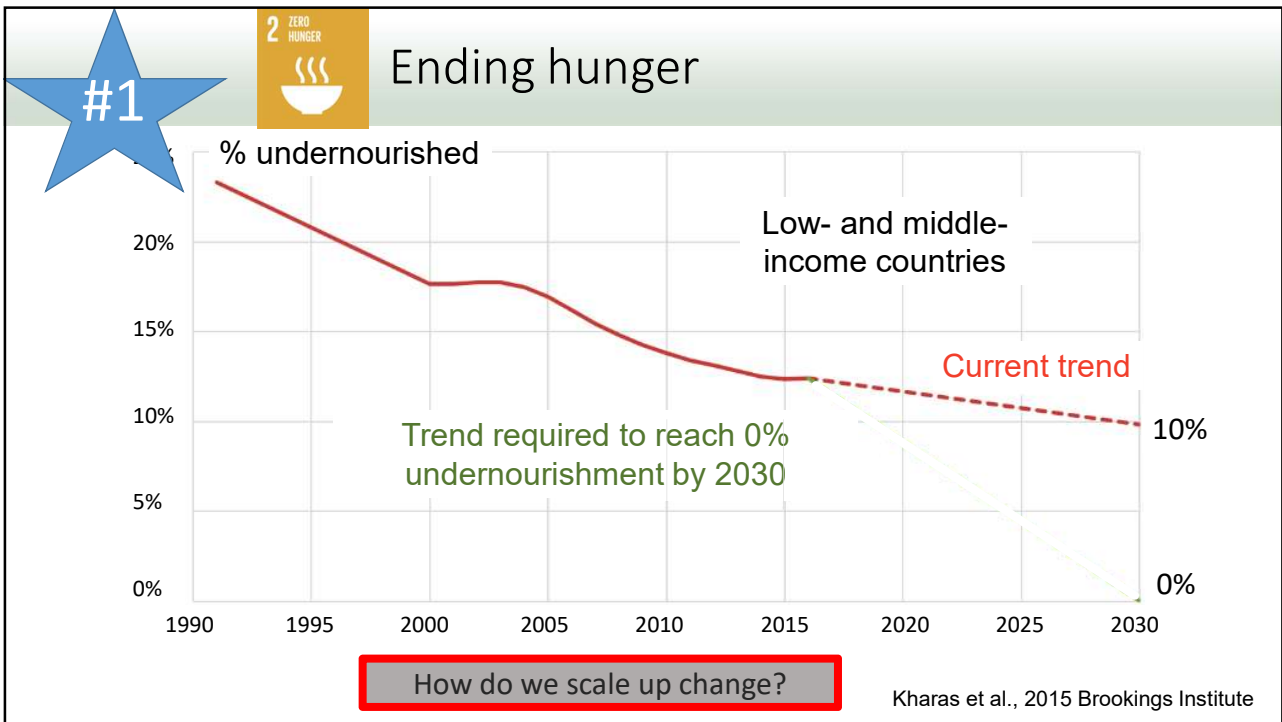
3. Progress is significant

4. We need a food system transformation

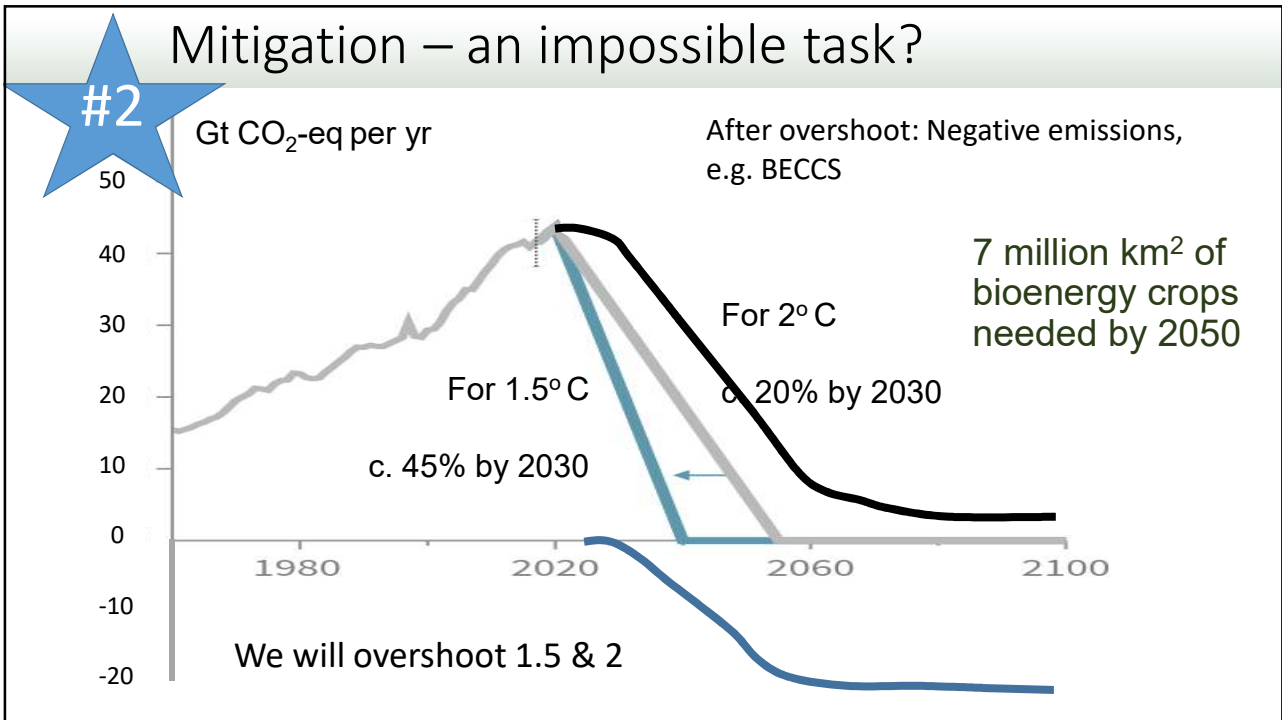
5. What does this mean for plant nutrition?

- Food and nutritional security
- Mitigating GHG emissions
- Adaptation
- Farming as a viable livelihood

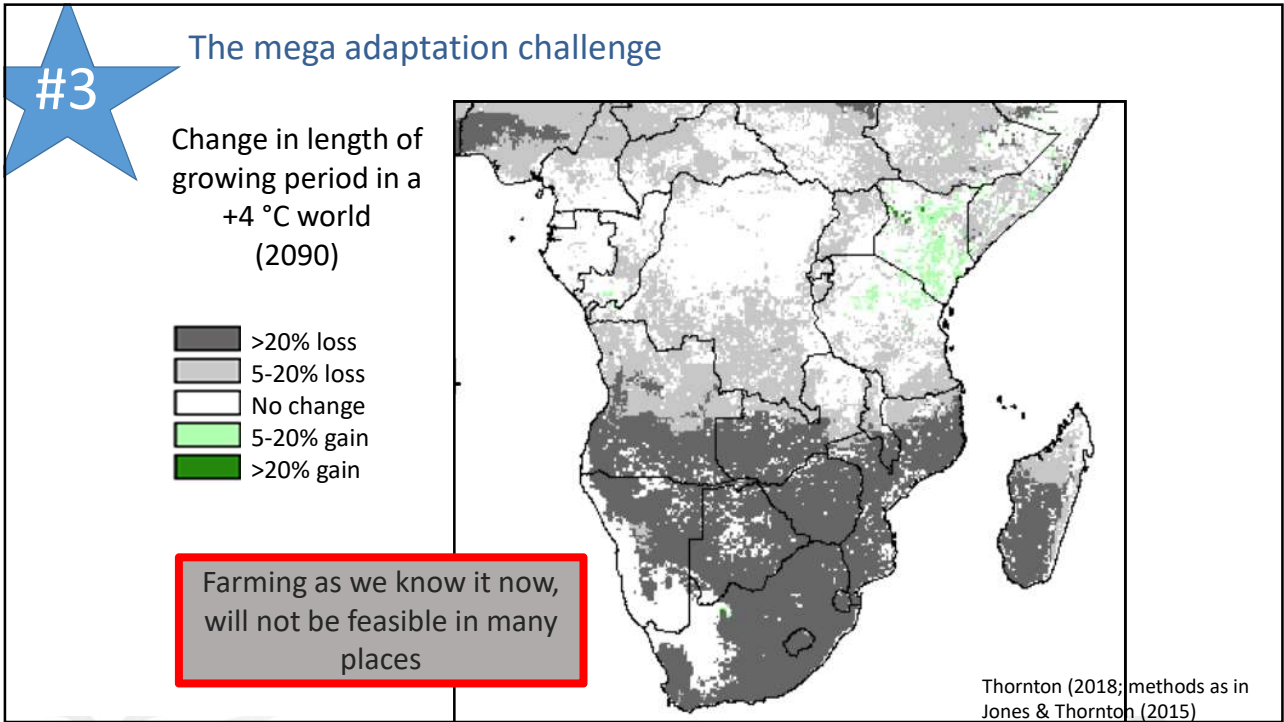
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Many records are being broken

How, in only 11 years, do we reach 500-750 M farming households with resilient-building services and technologies?

Number of record-breaking monthly temperature extremes now 5X times more
Coumou et al. (2013) *Climatic Change*

Dry record-breaking events in SSA have increased by up to 50%
Lehmann et al. (2018) *Geophysical Research Letters*

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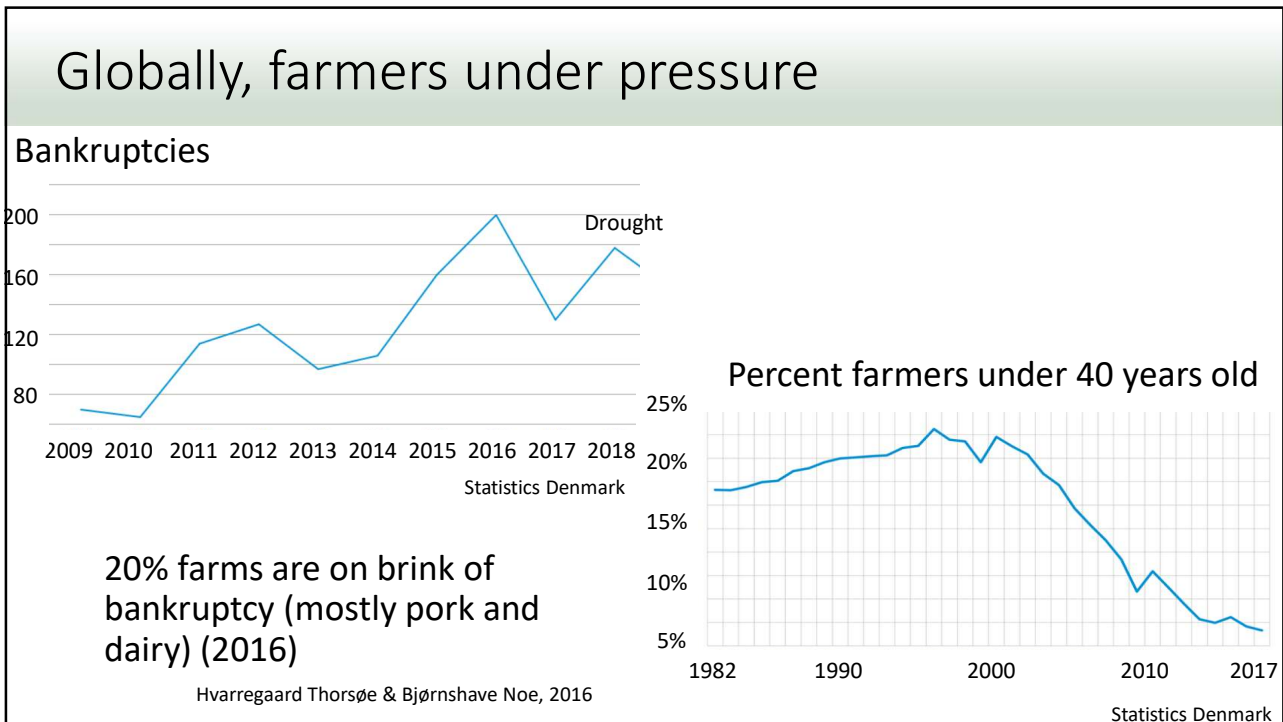


#4 Farmers, farming and the food industry are getting a bad press

Global food system is broken, say world's science academies



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How are agric practices changing?

Percentage of households of each type				
	Stepping up <i>(intensifying)</i>	Stepping out <i>(accumulating non-ag assets)</i>	Hanging in <i>(coping)</i>	Scraping by <i>(> 5 food deficit months)</i>
East Africa	14	[Data obscured]		
West Africa	11			
South Asia	17			
South East Asia	12			
Latin America	21			

How do we improve farmer livelihoods? Fast?

Thornton et al. (2018)

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RethinkX

By 2030

- Number of cows in U.S.: 50% ↓
- Cattle industry all but bankrupt

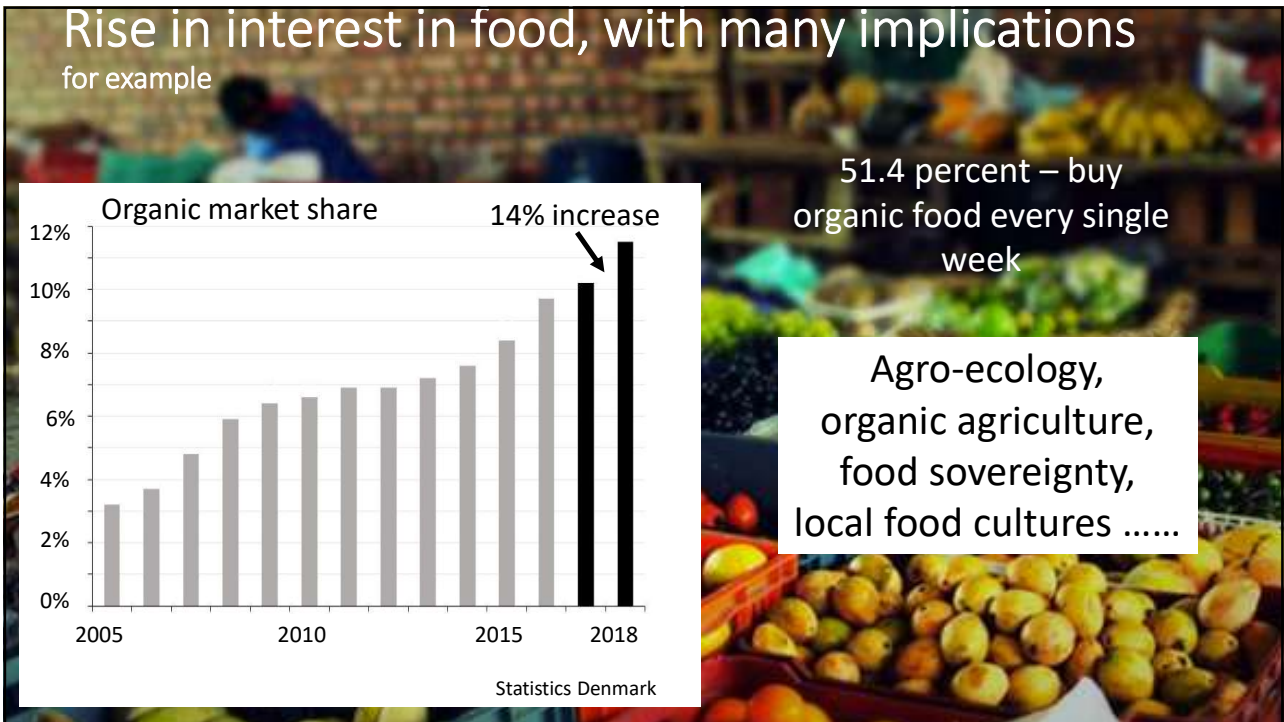
We are on the cusp of the fastest, deepest, most consequential disruption of agriculture in history.

Cost of Precision Fermentation

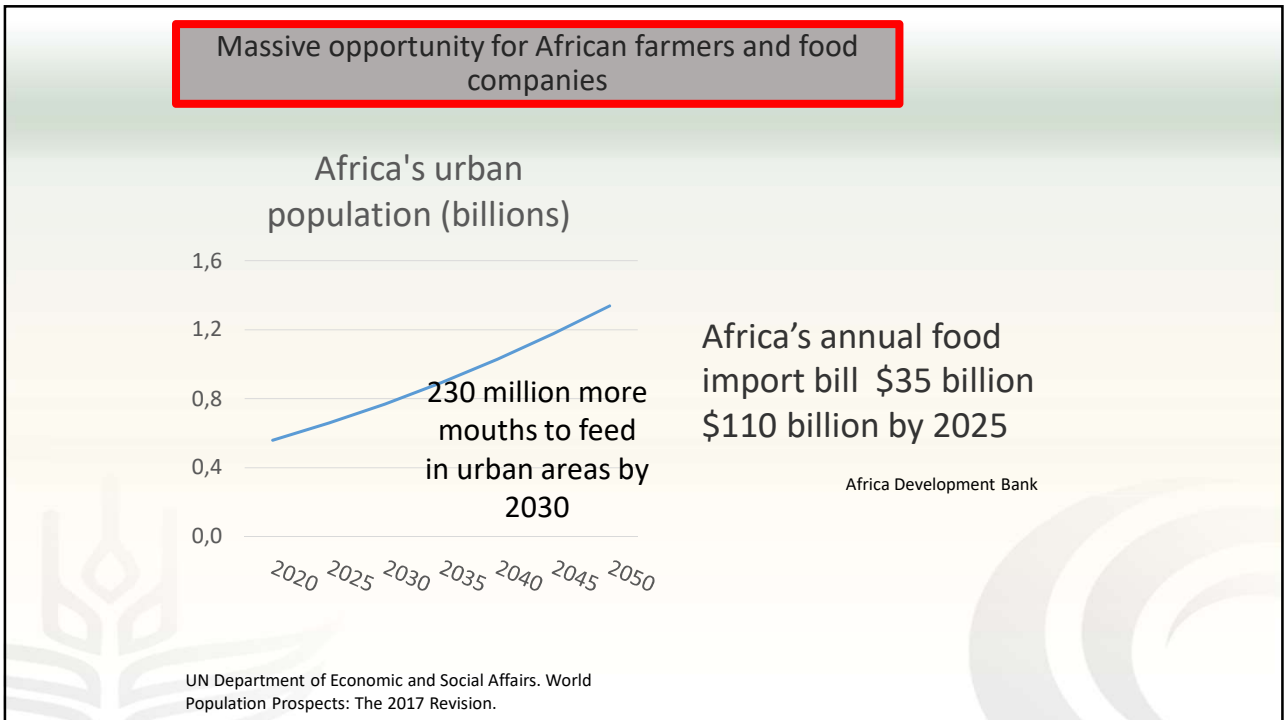
\$1,000,000 /kg	in 2000
\$100/kg	in 2019
\$10/kg	by 2025

[DOWNLOAD REPORT](#)

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Global initiative




www.transformingfoodsystems.com/

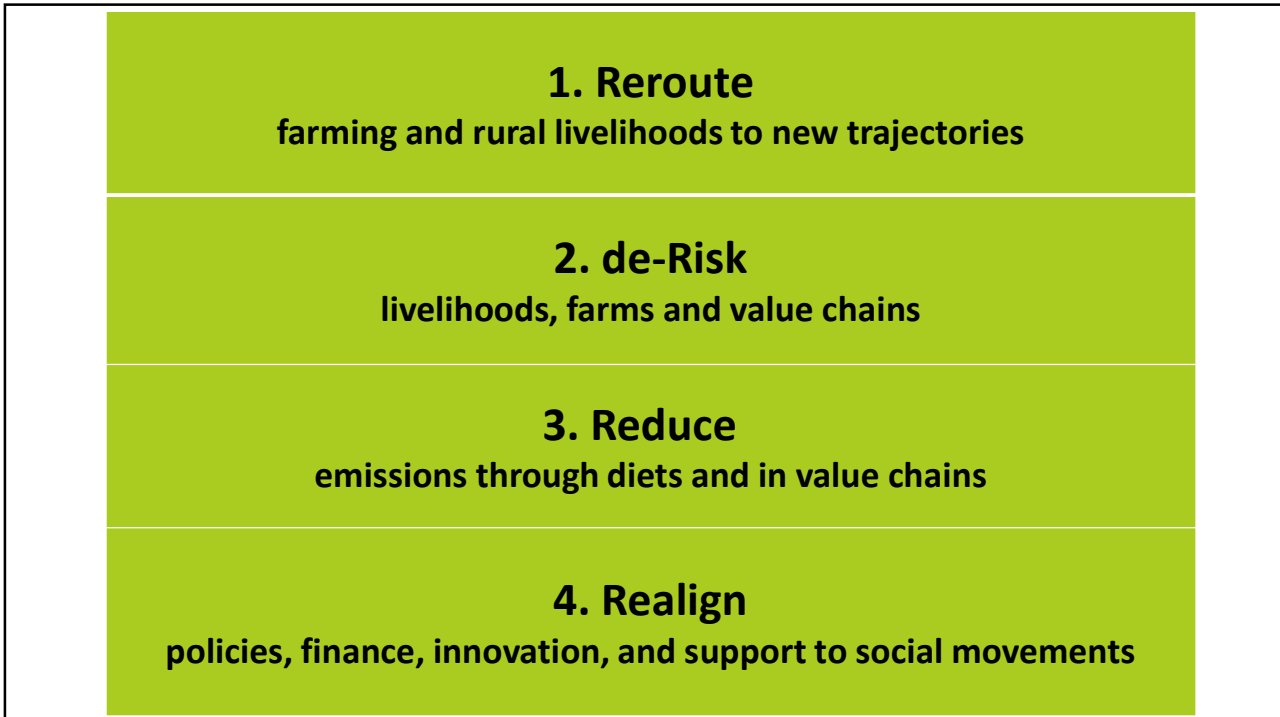
Transforming Food Systems Under a Changing Climate

Over 100 partners have come together in a new initiative to identify pathways for food systems transformation.

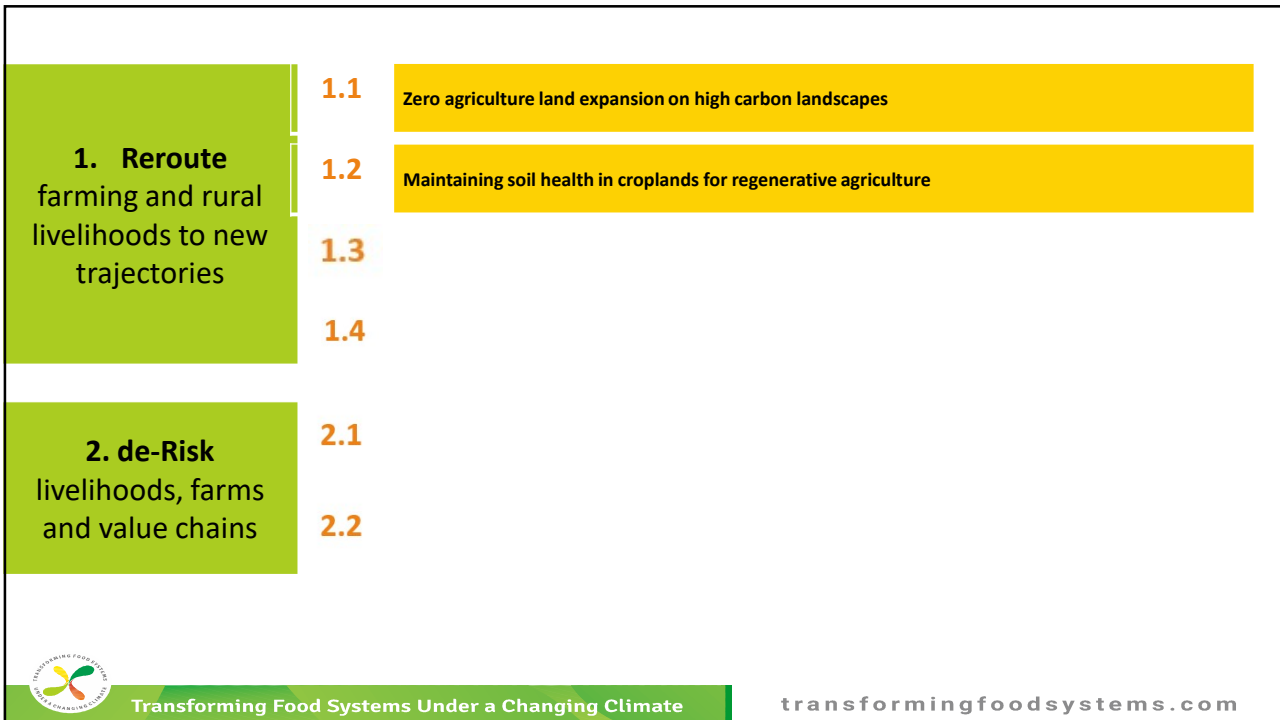
ACTION AREAS **ABOUT THE INITIATIVE**



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3. Reduce emissions through diets and in value chains	3.1 Healthy and sustainable climate-friendly diets 3.2
4. Realign policies, finance, innovation, and support to social movements	4.1 Policy and institutional change as a key to transformation, (subsidies) 4.2 4.3 4.4

Transforming Food Systems Under a Changing Climate

transformingfoodsystems.com

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#2. Getting the balance

Current Opinion in Environmental Sustainability

Propose standards for fertilizer application (e.g. by agro-ecological zone)

Raise ambition of targets related to nutrient use

Campbell et al. 2019

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#3. Redirect public support away from distortionary subsidies that incentivize overfertilization



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#4. Shifting diets

Context matters !!!!!!!

#5. Getting more efficient production

Fertilizer industry:

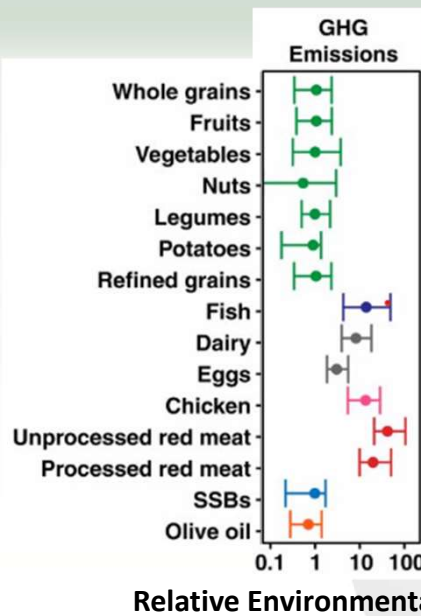
novel products and methods

increase energy efficiency in production

increase nutrient efficiency

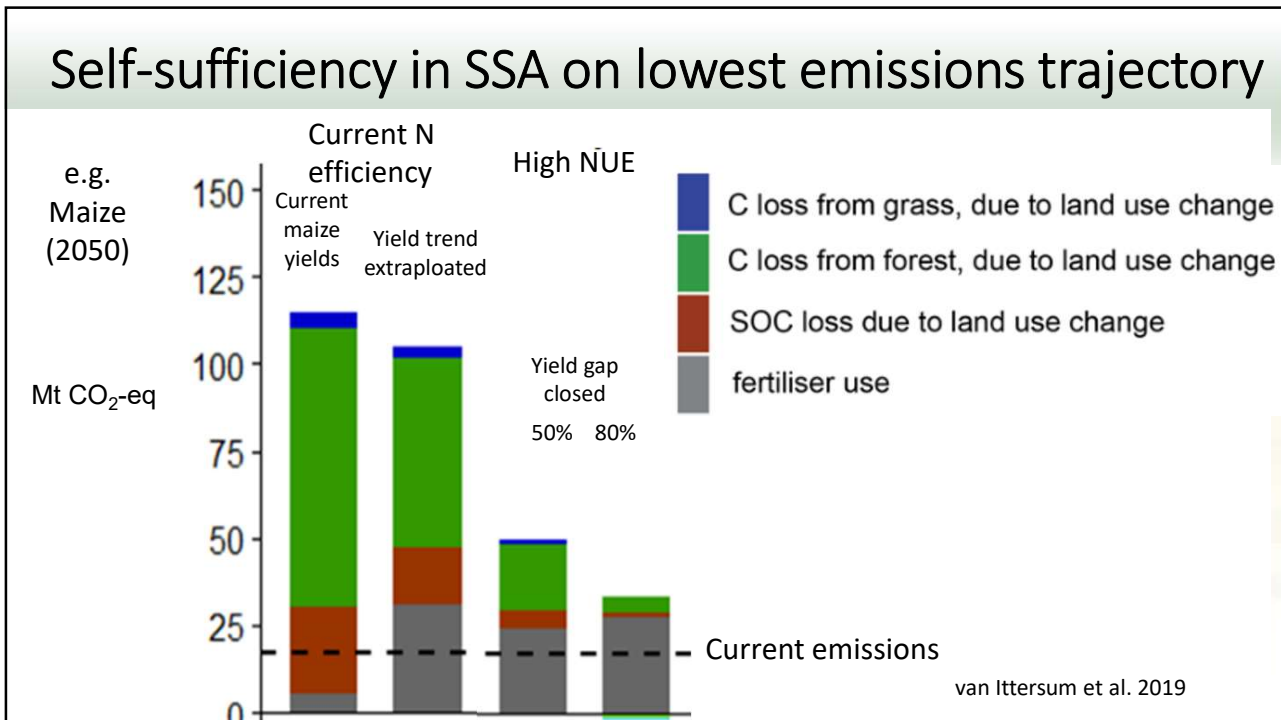
slow nitrification

enhance soil carbon and its stability



Clark et al. 2019 PNAS

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Thank you



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www.ccafs.cgiar.org
@bcampbell_CGIAR



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Stress-tolerant varieties

Potato and sweetpotato can now be developed in 4 years

Drought tolerant maize:

- 2 million smallholders
- 13 countries





**RESEARCH PROGRAM ON
Roots, Tubers
and Bananas**



CIP
INTERNATIONAL
POTATO CENTER
A CGIAR RESEARCH CENTER



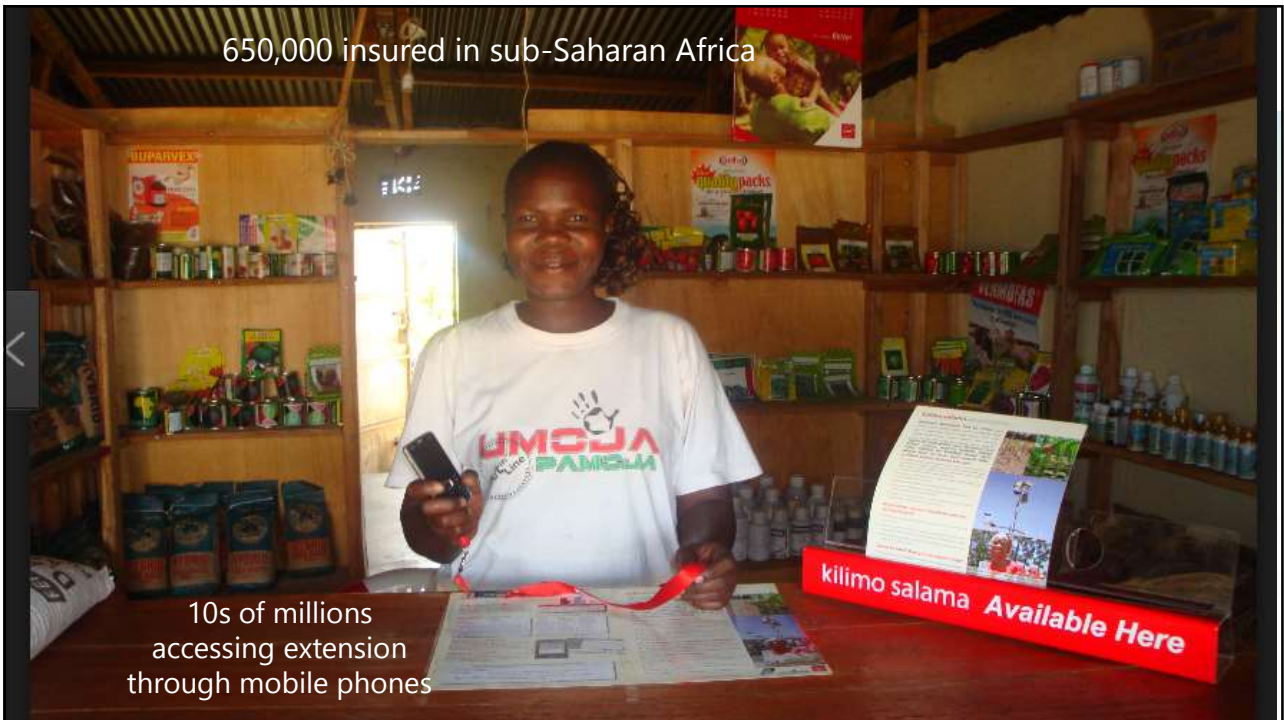
CIMMYT
International Maize and Wheat
Improvement Center



IITA
Research to Nourish Africa

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650,000 insured in sub-Saharan Africa



10s of millions
accessing extension
through mobile phones

kilimo salama Available Here

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ICRISAT INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SUB-SAHARAN TROPICS

esoko

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

GHANA METEOROLOGICAL AGENCY (GMet) ENHANCING TIMELY AND ACCURATE WEATHER FORECAST FOR SUSTAINABLE DEVELOPMENT

CSIR COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH GHANA

vodafone glo

Within a few seasons of R&D 300,000 farmers paying for climate-informed digital advisory services

aWhere

Toto Agriculture

MOFA

airtel tigo MTN everywhere you go

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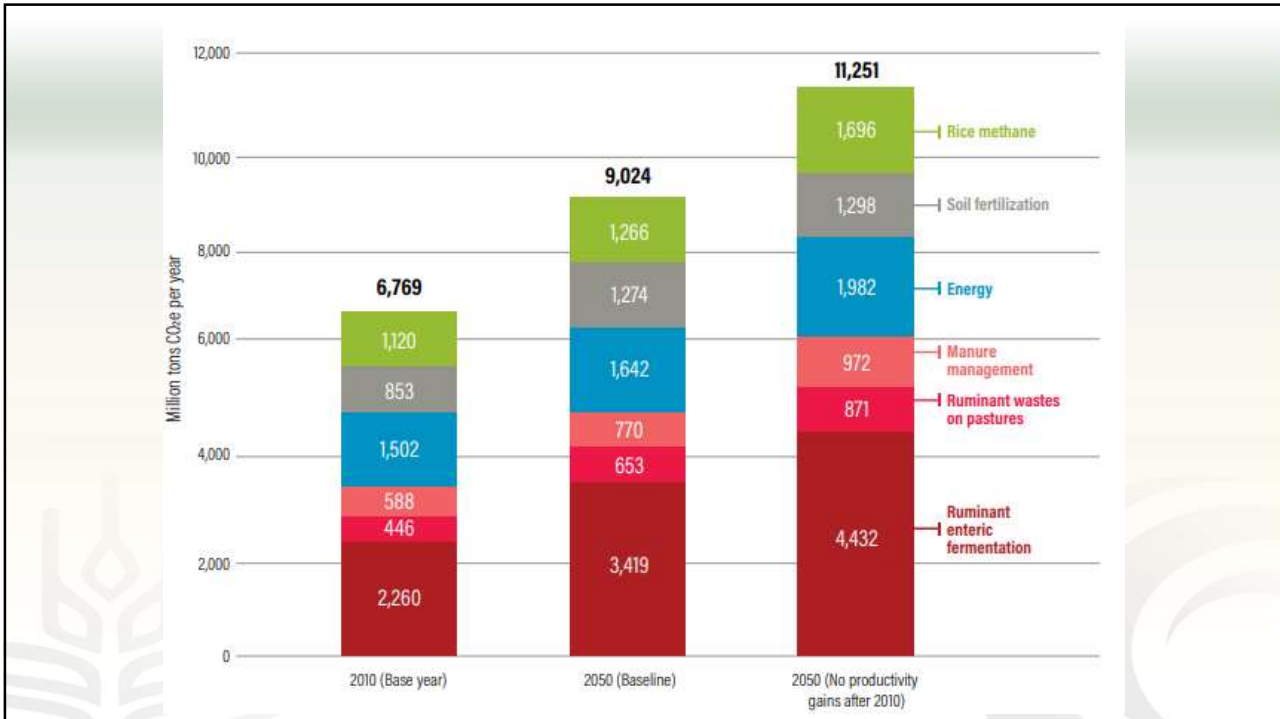
Solar powered irrigation as a “remunerative crop”

- Sell to the grid
- Sell water to other farmers
- Win-win for adaptation and mitigation
- USD 21.5 billion
 - → 2.75 M solar irrigation pumps

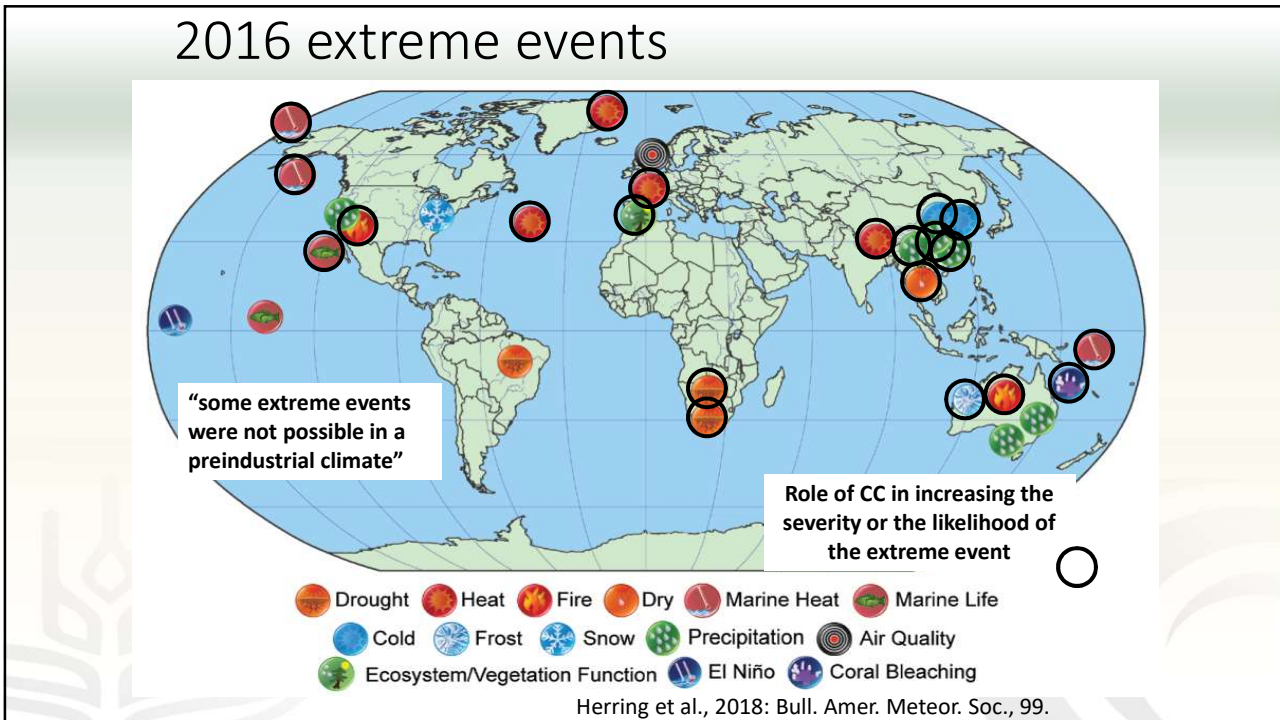
5% cropland in Africa irrigated – global average 20%
Can solar be an energy and water solution?

IWMI International Water Management Institute

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Australia's drought crisis and farmers' stories of anxiety, fear and resilience

We asked readers to share their stories - from rising grain prices, to the falling value of stock and the urgent need for help

- [Drought devastation seen from above - video](#)



Male farmer
suicide rate
2X general
male
population

Perceval et al 2018 BMC Public Health

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But, a significant challenge:



- Massive mitigation challenge
- Climate change intensifying
- Less than 20% of small-scale farmers are stepping up
- Must reach 500 million smallholders
- Disruptive technologies are coming

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#5 Raise ambition of targets related to nutrient use
 • in Nationally Determined Contributions (NDCs)
Key: getting markets working and incentives right

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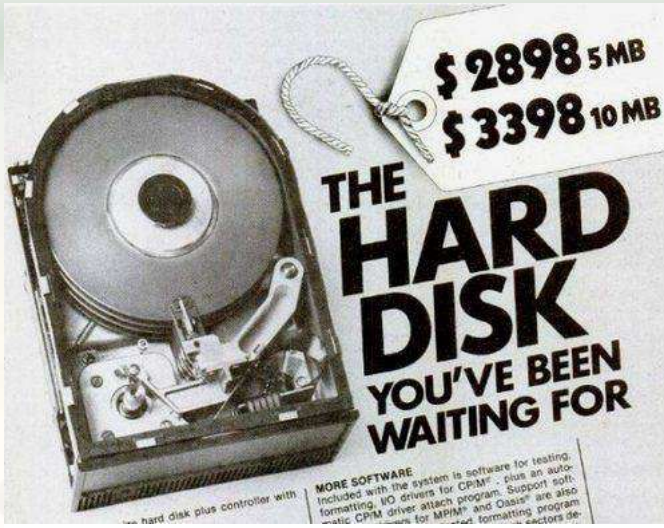
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East Africa	14	12	43	32	100%
West Africa	11	6	70	14	100%
South Asia	17	17	58	9	100%
South East Asia	12	15	63	10	100%
Latin America	21	14	60	6	100%

How do we improve farmer livelihoods? Fast?

Thornton et al. (2018)

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THE HARD DISK YOU'VE BEEN WAITING FOR

\$2898 5MB
\$3398 10MB

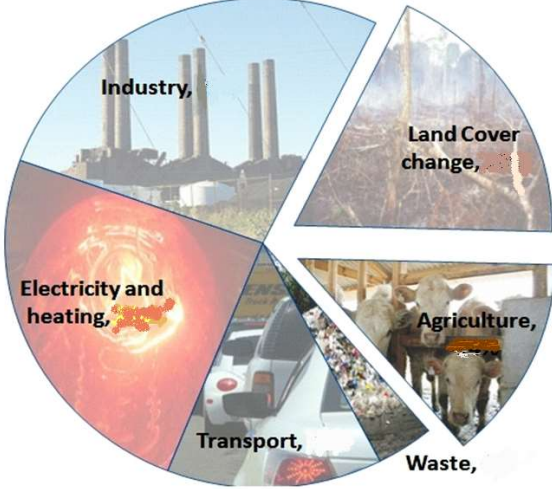
Cost of Precision Fermentation
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 \$100/kg in 2019
 \$10/kg by 2025

Food-as-Software

Now available for 1 cent

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The Mega Mitigation Challenge



19-29% global GHGs from food systems
 Vermeulen et al., 2012 ERER

Current agricultural technologies perhaps can only achieve 20-40% of what is needed by 2030

Wollenberg et al., 2017 Global Change Biology

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