



Transforming food systems under a changing climate to meet the Sustainable Development Goals

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transformingfoodsystems.com

Outline

- Background: the global food system needs changing
- The *Transformation Initiative*
- Changes in the food system
- What's next

The scale of the challenge



2 billion people lack key micronutrients like iron and vitamin A



155 million children are stunted



52 million children are wasted



2 billion adults are overweight or obese



41 million children are overweight



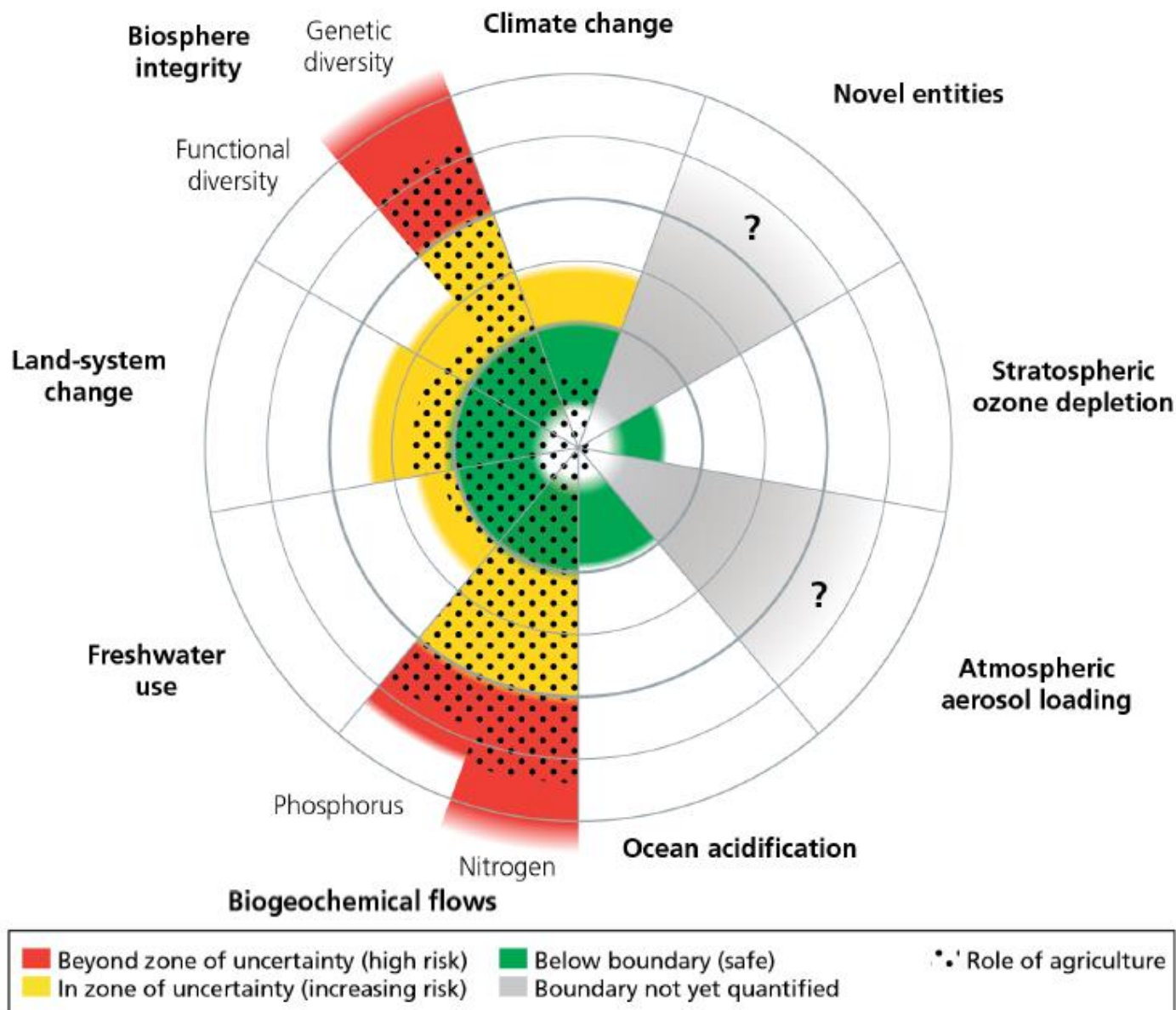
88% of countries face a serious burden of either two or three forms of malnutrition



Can the food system address the challenges and still stay within planetary boundaries?

Status of planetary boundaries overlaid with an estimate of agriculture's role in that status

Campbell et al. (2017) based on Steffen et al. (2015) and others



Report card on the global food system

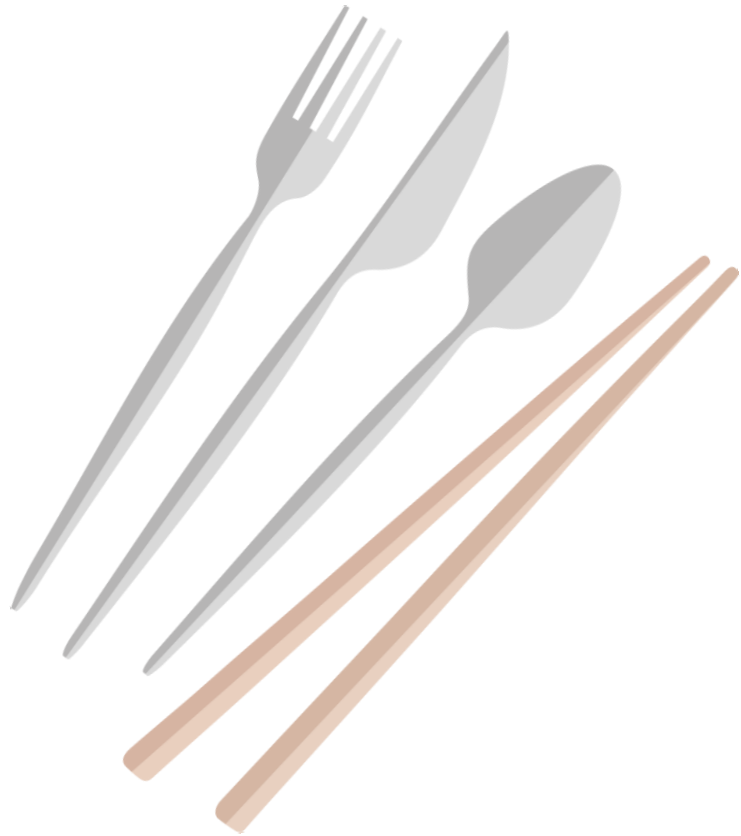
Subject	Comments	Grade
Quantity of food produced	<ul style="list-style-type: none"> • Constant real food prices since 1950s even with a tripling of population • Undeniable progress in reducing undernourishment and improving nutrition and health 	Very good
Accessibility of food produce	<ul style="list-style-type: none"> • Rise in hunger in the last 3 years after a prolonged decline • 1 in 9 still undernourished, 2 billion suffer micronutrient deficiencies 	Previously improving but now a cause of real concern
Human health and nutrition	<ul style="list-style-type: none"> • Triple burden of malnutrition: protein-energy malnutrition, micronutrient deficiency, and obesity • Global Nutrition Index improving (decreased deficits > rise in obesity globally) but may not last 	Good progress overall, but looming challenges
The environment	<ul style="list-style-type: none"> • Agriculture now playing a significant role in pushing the Earth system beyond safe operating boundaries (genetic diversity, P, N use); GHG emissions, land system change, water? 	More efficient crop & livestock production, but now a major and increasing cause of concern
FINAL GRADE		Cause for grave concern

Healthy Diets

2500 kcal/day







The reference diet:

- *vegetables, fruits, whole grains, legumes, nuts, unsaturated oils*
- *low to moderate amount of seafood and poultry*
- *no or little red meat, processed meat, added sugar, refined grains, starchy vegetables*



The EAT-Lancet Scenarios

Scenarios

			 GHG emissions	 Cropland use	 Water use	 Nitrogen application	 Phosphorus application	 Biodiversity loss
Food production boundary			5.0 (4.7–5.4)	13 (11.0–15.0)	2.5 (1.0–4.0)	90 (65.0–140.0)	8 (6.0–16.0)	10 (1–80)
Baseline in 2010			5.2	12.6	1.8	131.8	17.9	100–1000
Production (2050)	Waste (2050)	Diet (2050)						
BAU	Full waste	BAU	9.8	21.1	3.0	199.5	27.5	1,043
BAU	Full waste	Dietary shift	5.0	21.1	3.0	191.4	25.5	1,270
BAU	Halve waste	BAU	9.2	18.2	2.6	171.0	23.2	684
BAU	Halve waste	Dietary shift	4.5	18.1	2.6	162.6	21.2	885
PROD	Full waste	BAU	8.9	14.8	2.2	187.3	25.5	206
PROD	Full waste	Dietary shift	4.5	14.8	2.2	179.5	24.1	351
PROD	Halve waste	BAU	8.3	12.7	1.9	160.1	21.5	50
PROD	Halve waste	Dietary shift	4.1	12.7	1.9	151.7	20.0	102
PROD+	Full waste	BAU	8.7	13.1	2.2	147.6	16.5	37
PROD+	Full waste	Dietary shift	4.4	12.8	2.1	140.8	15.4	34
PROD+	Halve waste	BAU	8.1	11.3	1.9	128.2	14.2	21
PROD+	Halve waste	Dietary shift	4.0	11.0	1.9	121.3	13.1	19

A global initiative ...



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Transforming Food Systems Under a Changing Climate

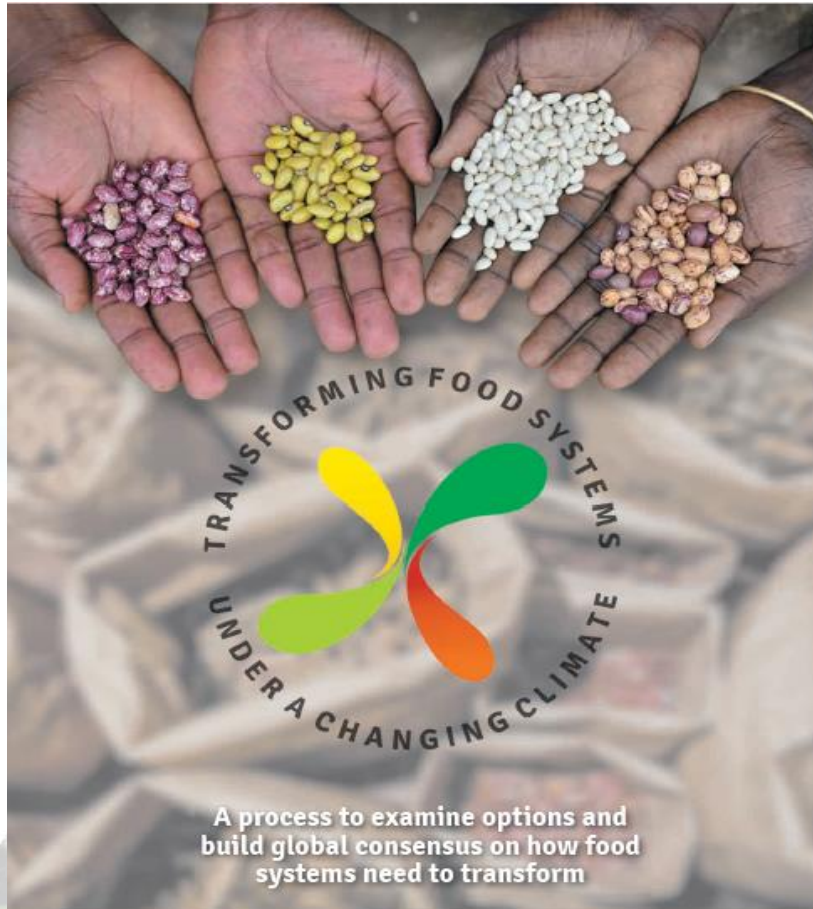
Over 100 partners have come together in a new initiative to identify pathways for food systems transformation.

[ACTION AREAS](#)

[ABOUT THE INITIATIVE](#)



... to help set global agendas



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



UNIVERSITY OF
COPENHAGEN



Objective

Build consensus on how global food systems need to transform and how such a transformation can be achieved.

Process

A globally representative group of scientists and senior technical advisors, including the private sector, will prepare a summary report on the topic, based on five work packages. This will involve virtual and physical stakeholder meetings to solicit ideas and feedback. The final draft report will be discussed by a high-level panel, prior to completion and dissemination.



Five background papers ...

Adaptation and development pathways for different types of farmers



What is the role of changing diets in the transformation of the global food system?



Financing the transformation of food systems under a changing climate



Transforming food systems under climate change: Local to global policy as a catalyst for change



Future technologies and food-systems innovation for accelerating progress towards the Sustainable Development Goals

... contributing to a short “action” document

Twelve actions in four groups

1 Reroute

farming and rural livelihoods to new trajectories

- 1.1 **Zero agriculture land expansion on high carbon landscapes:** End emissions from agricultural expansion in carbon rich landscapes, through greater accountability to financial flows and commodity supply chains
- 1.2 **Maintaining soil health in croplands for regenerative agriculture:** Avoid loss of soil carbon on 250 Mha by protecting high carbon landscapes and sequestering carbon
- 1.3 **Enable markets and public sector actions to incentivize climate-resilient practices** that meet dietary needs and address poverty, gender and social inclusion: Bring 200 M farmers into climate-resilient and nutritionally appropriate markets through increased profitability and market development
- 1.4 **Prosperity through mobility and rural reinvigoration:** Build attractive rural livelihoods, including exits from agriculture, and create 50 M rural jobs, investing in infrastructure and youth

2 De-risk

livelihoods, farms and value chains

- 2.1 **Secure resilient livelihoods and value chains through early warning,** and end dependence on humanitarian assistance for 20 M farmers and realigning US\$2 billion for adaptive safety nets
- 2.2 **Helping farmers make better right choices:** Take climate services to scale by connecting 200 M farmers and agribusinesses to ICT-enabled bundled advisory services, based on greater connectivity, inclusivity and public-private partnerships

Twelve actions in four groups

3 Reduce emissions through diets and in value chains

- 3.1 **Healthy and sustainable climate-friendly diets:** reshape beef and dairy consumption in 15 high- and middle-income countries, including through health promotions and social movements
- 3.2 **Reduce food loss and waste:** target 50% reductions in five major supply chains where both greenhouse gases and loss or waste are high

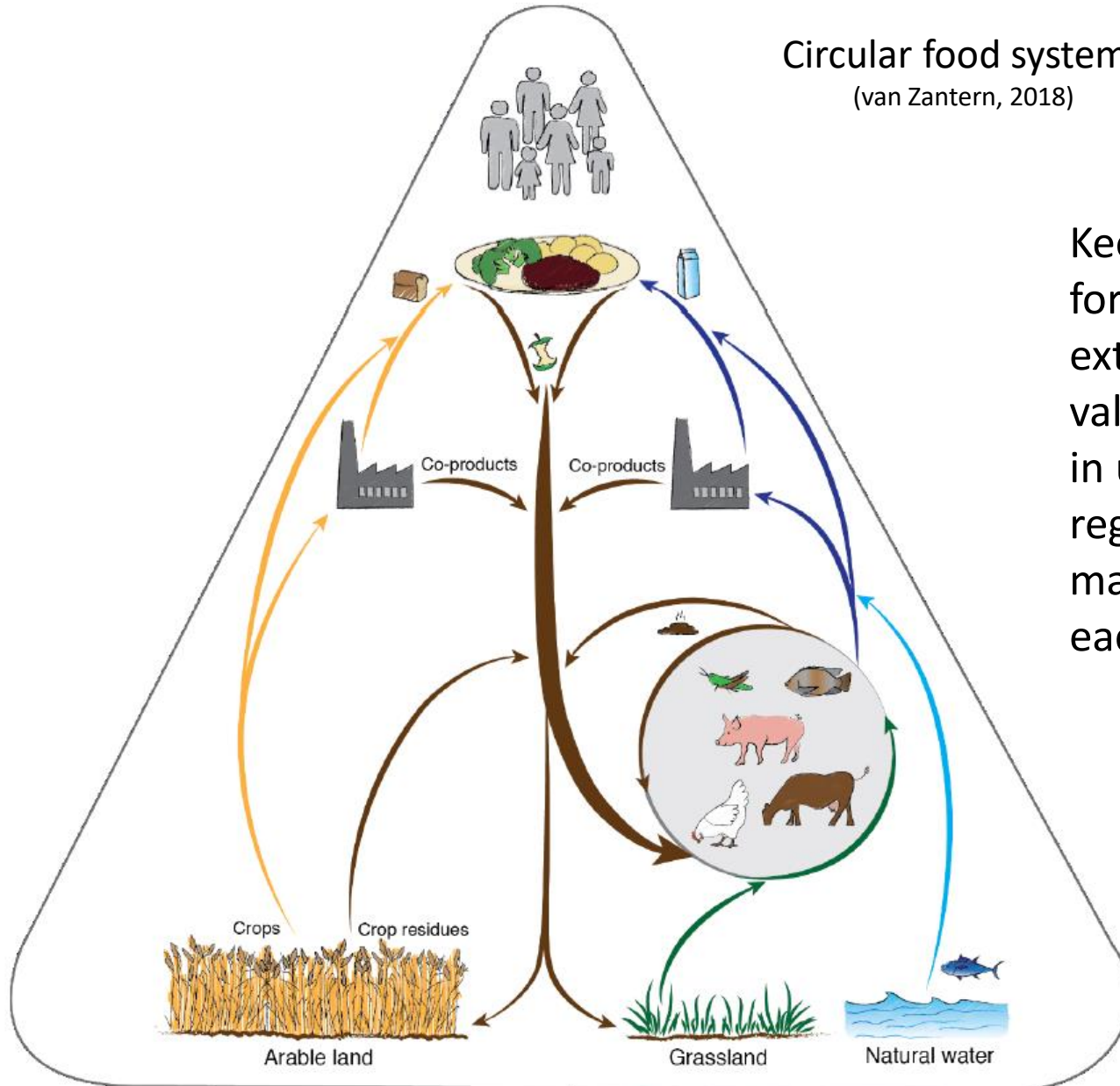
4 Realign policies, finance and knowledge to build more resilient food systems

- 4.1 **Policy as a key to transformation:** realign agricultural subsidies and trade to foster more resilient and nutritious food systems and address power inequalities
- 4.2 **Sustainable finance to unlock billions in support:** target US\$ 320 billion per year to realize business opportunities, through assessing risk and strengthening intermediation
- 4.3 **Driving social change for more sustainable decisions:** underpin social movements with science and support
- 4.4 **Transform innovation systems to deliver impacts at scale:** including end-to-end solutions for actors in food systems

Farming will be changing ...

Circular food systems

(van Zantern, 2018)



Keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life

Farming will be changing ...

Aeroponic vertical farming



Floating agriculture

Urban agriculture



Information needs will be changing ...

e.g. early warning systems for pests, diseases, heat stress (humans & livestock)



Satellite data, rainfall estimates, ground surveillance (sometimes by drone)

Information needs will be changing ...


e.g. market info & advisories for joined-up food systems that link producers and consumers

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BLOG

A beginners guide to onion farming in kenya



Jul 22nd 2016

50 percent of the red onions in Kenya are imported from Tanzania, as indicated by Food and Agriculture Organisation's (FAO) 2014 report. Kenyan Farmers have been doing their best to address the demand and close the gap, but there is still more supply to be achieved. This makes the Red Bulb Onion a very attractive commercial investment for the Kenyan market at the moment, since local production is not enough.

Major types of onions farmed in Kenya are bulb onions and spring onions. The best areas suited for farming being Karatina, Oloitoktok, Naivasha, Kieni, Emali and Mai Mahiu.

Bulb...

CONTINUE

Getting started on chili farming

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Tags

plants, green

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Markets will be changing ...

... driven by producers ...



- Cattle and goat numbers fell by 70% across northern Kenya during the drought of 2005/06
- Widespread adaptation response: switch from cattle to camels (need less water, eat arid shrubs, generate more milk): camel population has >tripled in 15 years
- Initially big market constraints (animals, hides, no value chain)
- Increased government support via restocking programmes, extension services, veterinary care and infrastructure

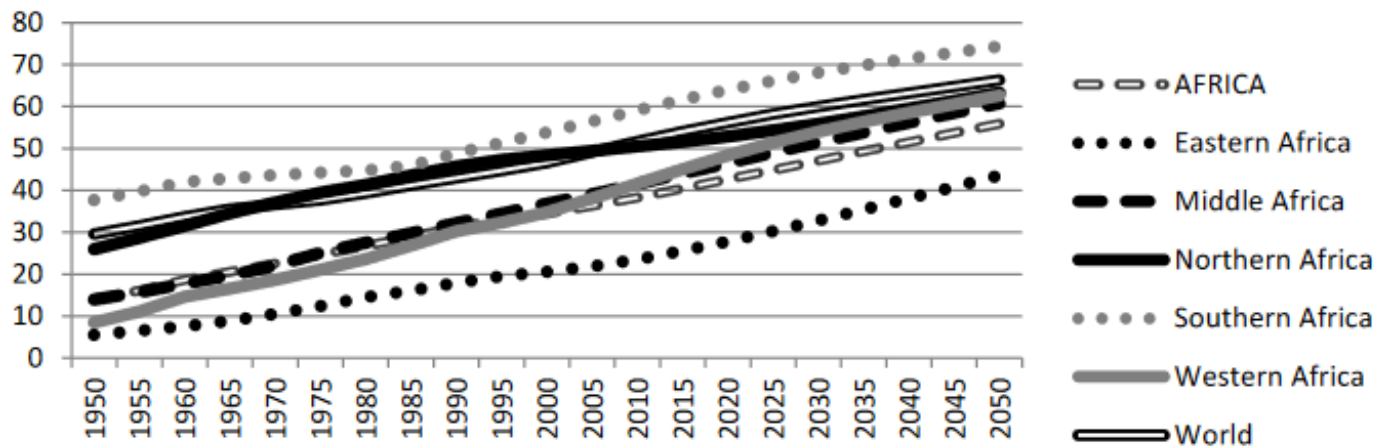
Markets will be changing ...

... and by consumers



The “nutrition transition”: with rising incomes and urbanization, people consume more animal-source foods, sugar, fats and oils, refined grains, and processed foods

Share of population living in urban areas

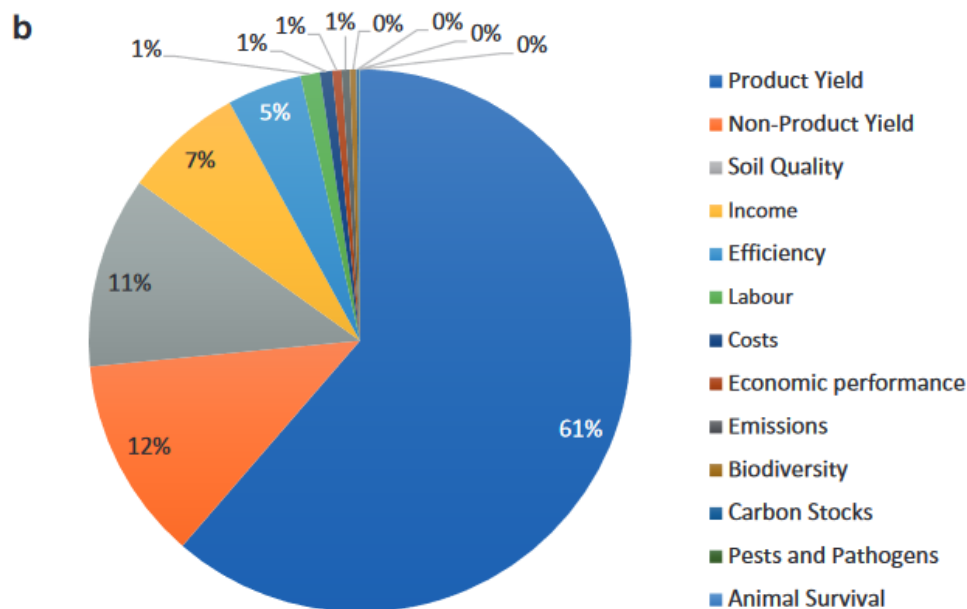
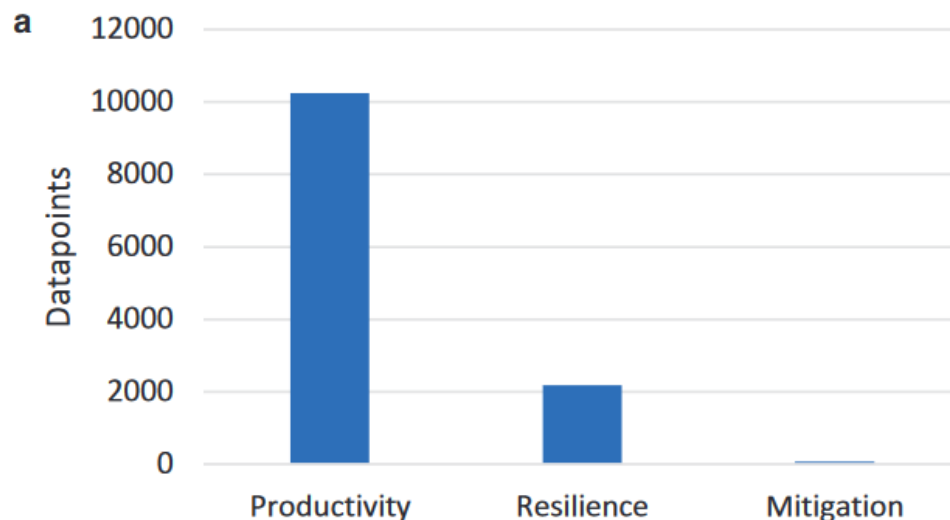


Source: UN DESA, World Urbanization Prospects: The 2014 Revision

Technology will be changing ...

Making better use of the “back catalogue” from 50+ years of research for development

Compendium of Climate Smart Agriculture practices: >12,500 data points comparing conventional with CSA practices in eastern and southern Africa



Evidence for Resilient Agriculture (ERA)

A platform of data and tools that pinpoint which agricultural technologies work where, from a synthesis of the effects of shifting from one technology to another on key indicators of productivity, system resilience and climate change mitigation



Agricultural Decisions, Rooted in Data

Evidence for Resilient Agriculture (ERA) makes data on the performance of agricultural technologies accessible for development decisions.



Explore

Where does the data come from? Interrogate about 75,000 data points to learn what evidence is available on agriculture technologies.



Data Explorer

Analyze

Harness the power of meta-analytics to discover what works where, as well as the expected benefits from adopting new technologies.



Data Dashboard

Decide

Read how diverse users are already making use of ERA in decision-making.



Data In Action

Technology will be changing ...

Examples of technologies that balance readiness, adoption potential and impact

REPLACEMENT FOOD AND FEED



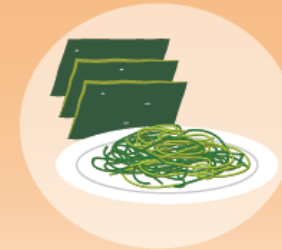
Livestock/seafood substitutes



Insects



Microalgae and cyanobacteria



Seaweed

RESOURCE USE EFFICIENCY



Circular economy

INTENSIFICATION



Vertical agriculture

INPUTS

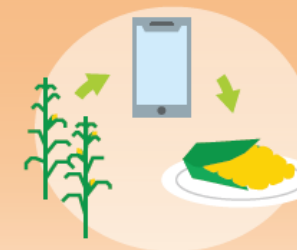


Botanicals

DIGITAL AGRICULTURE



Improved climate forecasts



Farm-to-fork virtual marketplace



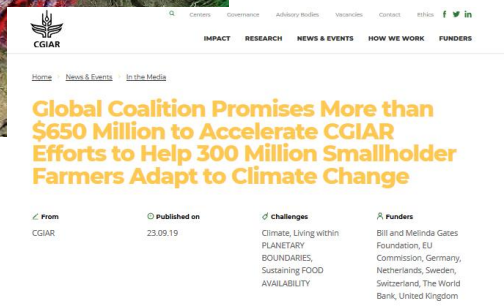
Disease and pest early warning

Interactions among the SDGs with respect to global N fertilizer consumption





ADAPT NOW: A GLOBAL CALL FOR LEADERSHIP ON CLIMATE RESILIENCE



Food Security and Rural Livelihoods

Increase resilience to climate change for smallholder farmers in low-income countries.

Two Degree Initiative for Food and Agriculture



CGIAR is already on track to help improve the livelihood opportunities of hundreds of millions of small-scale farming families and consumers by 2030 through better, more productive, resilient and sustainable crop, livestock and fish technologies and practices, and improved nutrition.

Doubling down CGIAR's efforts on climate change through the 10-year "Two Degree Initiative for Food and Agriculture" would help another [200]¹ million small-scale food producers across the globe adapt their farming systems, livelihoods and landscapes by 2030 to weather extremes and climate variability, and be more climate change resilient, as well as put food systems on a low emissions development pathway. The focus needs to be on those living in poverty, women, youth and other marginalised communities.

Achieving such scale must be underlain by deep and successful partnerships, so that practical demand-led science is delivered to change agents, these being national Ministries in beneficiary countries, regional and continental agencies and economic communities (e.g. CEN-SAD, COMESA, IGAD, ECOWAS, SADC, AGRA, NEPAD, ASEAN), multi-lateral and bilateral development agencies (e.g. World Bank, IFAD, GIZ, FAO), policy think tanks (e.g. WRI, Global Centre on Adaptation) and civil society and farmer organisations (e.g. EAFF, SACAU, CARE). In addition, there would be strong partnerships with other advanced research organisations (e.g. Wageningen University & Research, CIRAD, IRI, CSIRO) and with national research organisations (e.g. Universities, capacity building networks such as WASCAL), and the national agricultural and extension systems (NARES). Knowledge will be co-produced among partners, with local and traditional knowledge also part of the knowledge system.

The challenge of achieving Zero Hunger in a changing climate: The effects of climate change on food systems are being under-estimated. These include the impacts of increasing frequency and intensity of extreme events, the impacts of variable weather and climate conditions, the effects on the nutritional content of a wide range of commodities, and the ever-rising cost of inaction.

We have 11 years to achieve the UN Sustainable Development Goal of zero hunger – to end all forms of malnutrition and double the agricultural productivity and incomes of small-scale food producers. In many parts of the world that means 11 growing seasons. Lags in the climate system imply that warming of 1.5-2°C is already locked-in, no matter what happens to greenhouse gas (GHG) emissions in the future

What's next

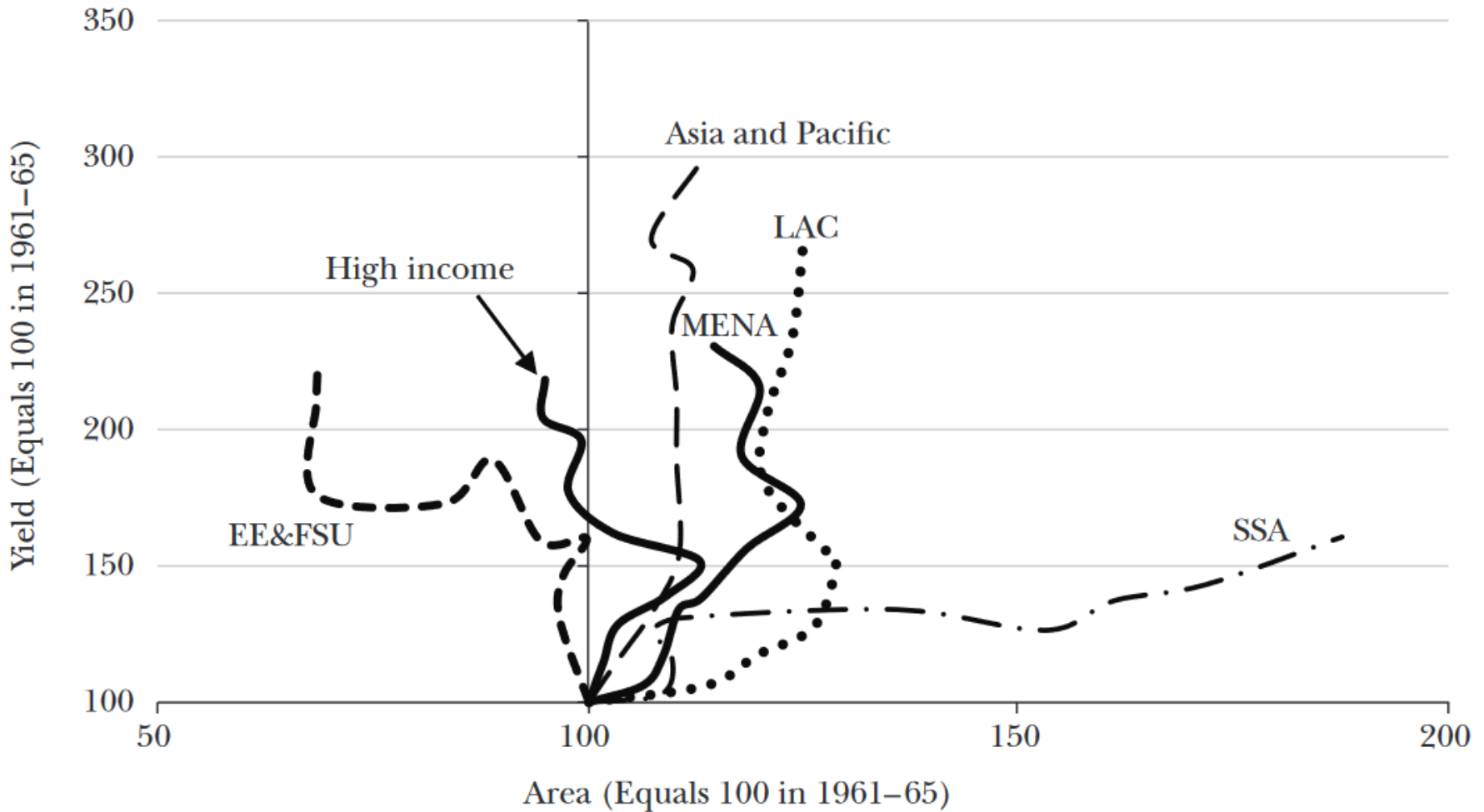
- Finalization of Transformation Initiative materials in early 2020
- Launch at a high-profile event in Copenhagen (early 2020)
- Build on the Transformation Initiative to provide inputs for next round of NDCs in the lead up to COP26 in late 2020
- Inputs to the GCA Action Track and the Two Degree Initiative



With only 11 growing seasons left to achieve 2030 goal to eliminate hunger, leaders respond to call to action from Global Commission on Adaptation to counter surge of climate extremes

Agricultural transformation: what's next?

Expansion in Yield versus Area of Cereal Production, 1961 to 2010



What's needed to foster food system tech innovation?

- **Robust modelling and evaluation studies:** which direct and indirect effects where (including SDGs), which target groups most affected
- **Investment in dissemination and implementation:** which leverage points in current food systems, which factors can influence uptake to scales that transform
- **The private sector** will have a crucial role to play in driving the uptake of these technologies – need new financing mechanisms to incentivise
- **Regulatory frameworks and market structures** needed to align advances with the aims of public policy
- **Social licence and acceptability:** need broad public dialogue to legitimise support (e.g. food is not just about price and safety)
- Innovation produces winners and losers, may need **safety nets** for the losers in the short and long terms

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