

# International Agricultural R&D

## World Food Day

16 October

**‘NextGen’ Scientists Needed to Build on Historic Successes of Agriculture R4D**

**Huge Successes + Need for More  
= NextGen**

Lindsay Falvey

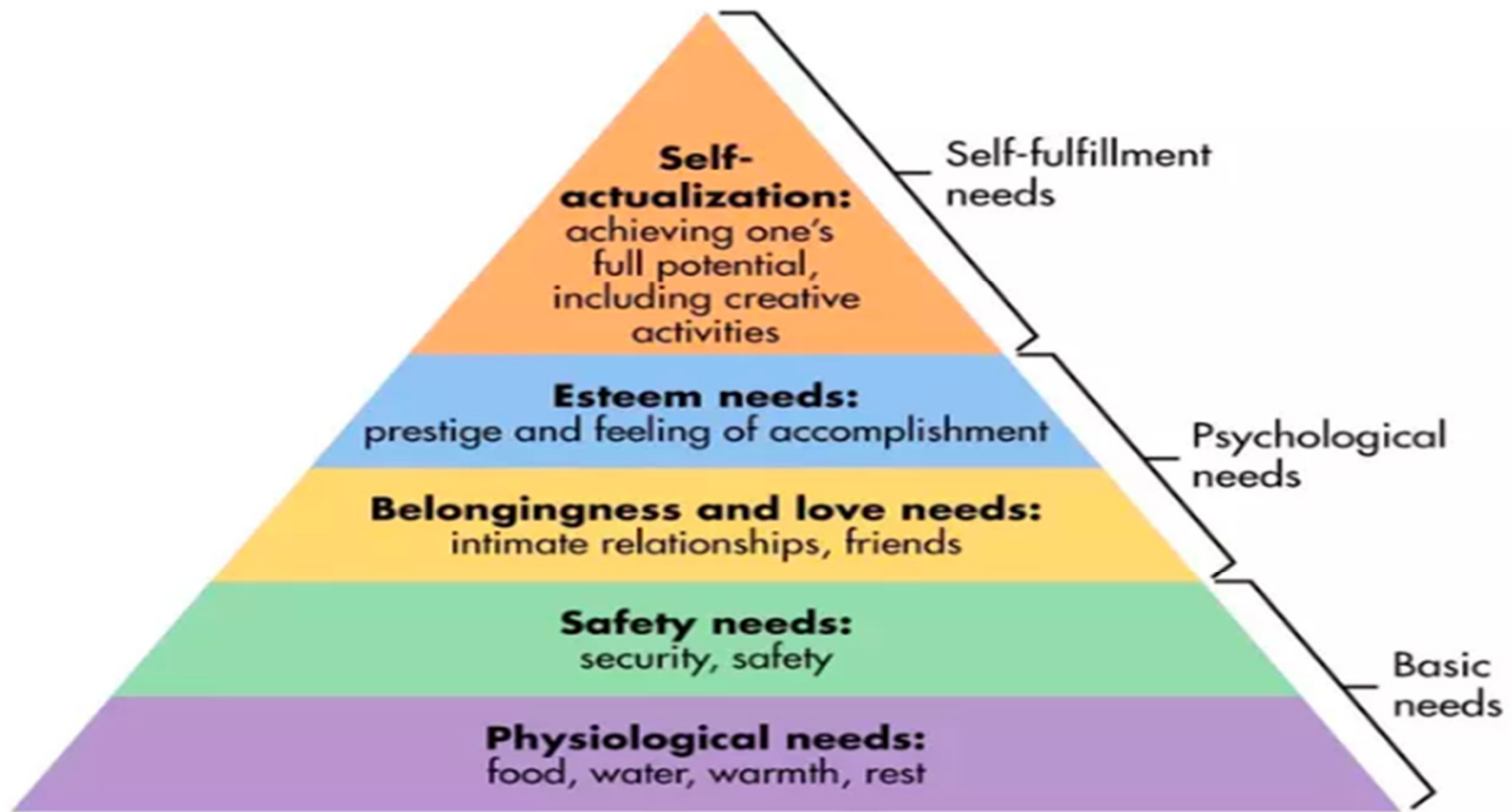
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What is Food Security?

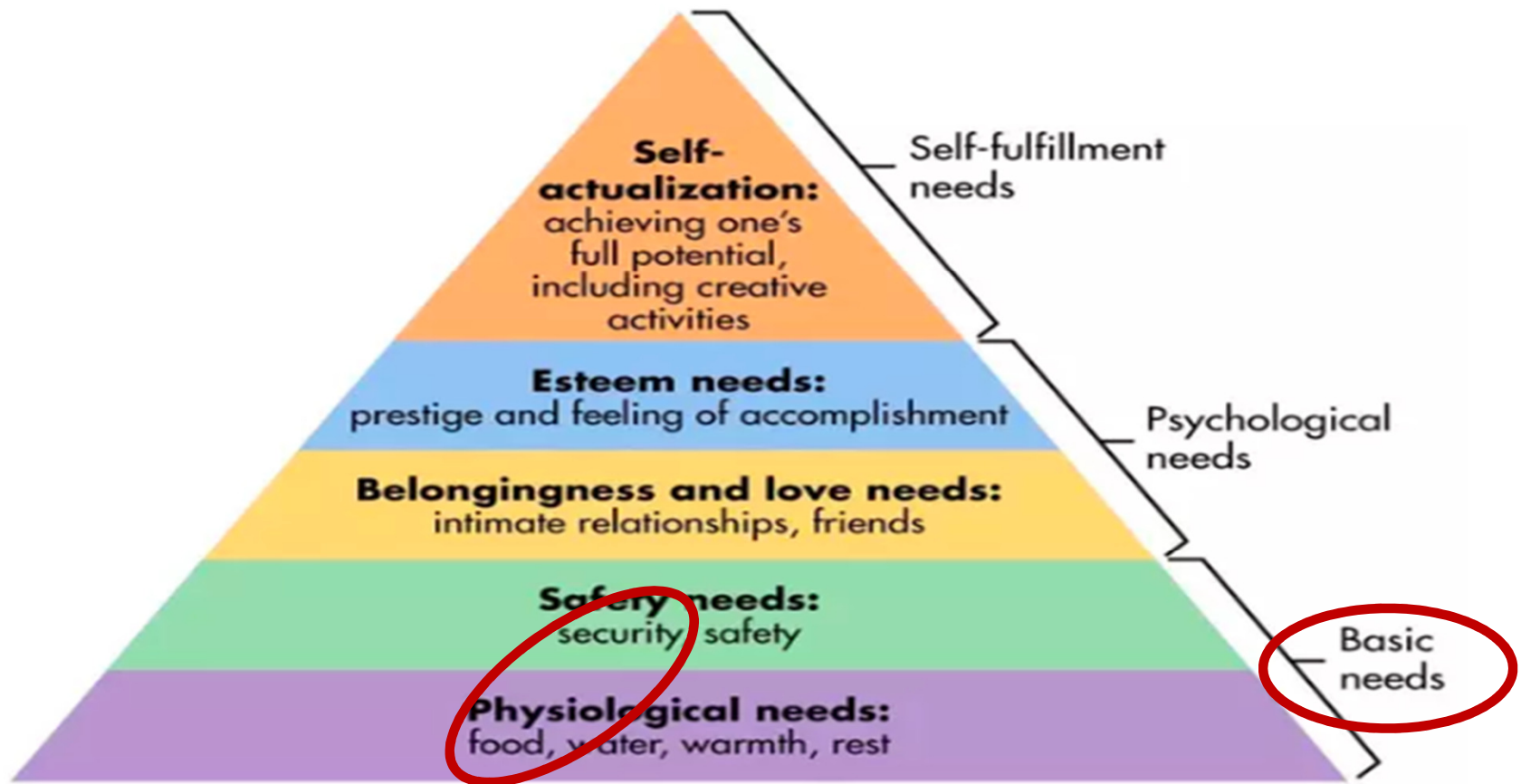
Malnutrition

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## World Agriculture Today

**Ex-USSR + New World:** main food exporters

**Western Europe:** more than sufficient

**Populous Asia:** average sufficiency

**Sub-Saharan Africa (SSA) + West Asia-North Africa (WANA):**

**low yield, high animal mortality, food importers**

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## Fifty Successful Years

- famine averted
- >30% of the world hungry in 1960s; today around 15%.
- Population doubled; an extra 3 billion people fed
- aid + civil organizations + national governments
- policy, yields, vaccines, NRM, nutrition, etc
- Australians highly represented - as should continue

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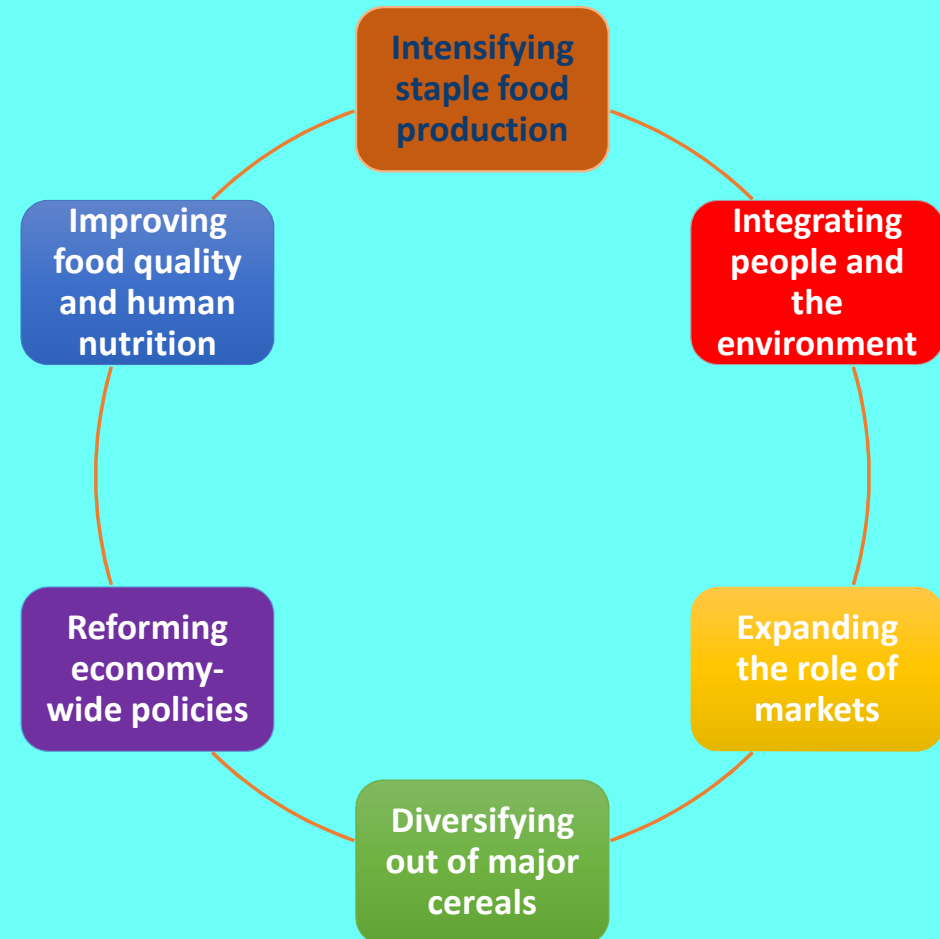


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Huge Success:

- 3 billion extra fed in 50 years
- reduced malnutrition

What Worked? Integrated R4D





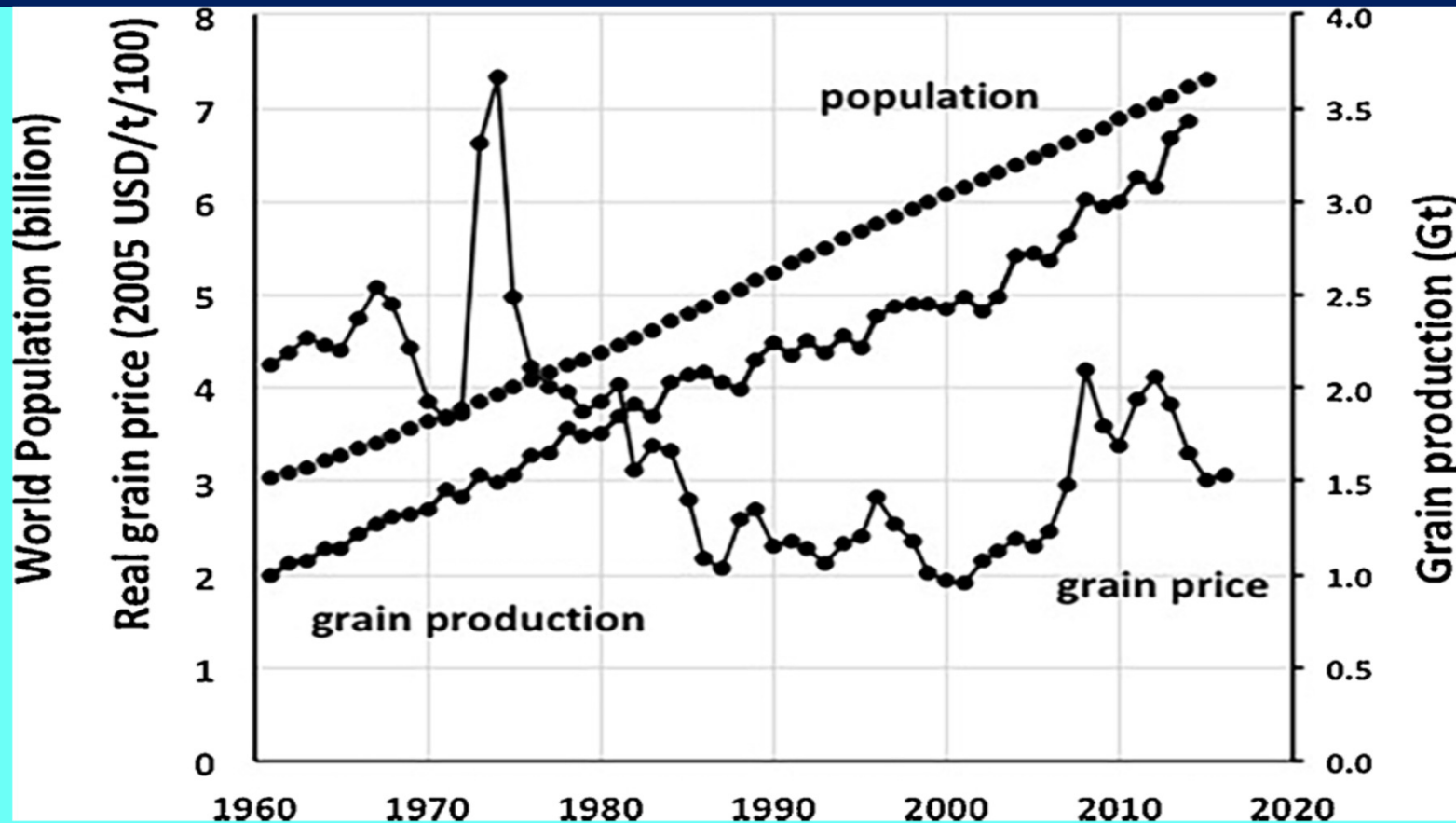
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- ✚ **Wheat Rust:** 117 million hectares protected; >60 million households food secure
- ✚ **Asia 1965-85:** income up 190%; food security for 1.8 billion
- ✚ **Improved Maize:** now 75% of land under cereal cultivation
- ✚ **Cassava Mosaic Virus & Mealybug:** yields up 40%; 29 million fed
- ✚ **Re-Greening the Sahel:** > 5 million hectares transformed; 3 million additional people fed
- ✚ **Argentina Pampas:** 22 million hectares sustainable; world leader in soybean production
- ✚ **Indo-Gangetic Plain:** 1.8 million hectares; income gains \$340 per household
- ✚ **Bangladesh:** 67% reduction in well costs; doubled rice production; 22 million more fed
- ✚ **China:** Yield increases of 15-31%; 63% of rice is hybrids; 60 million more fed
- ✚ **Land-tenure reform in China 1978-84:** grain up 34%; incomes by 137%



**Successes**

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World population, grain crop production and real prices of staples

R.A. Fischer, D.J. Connor

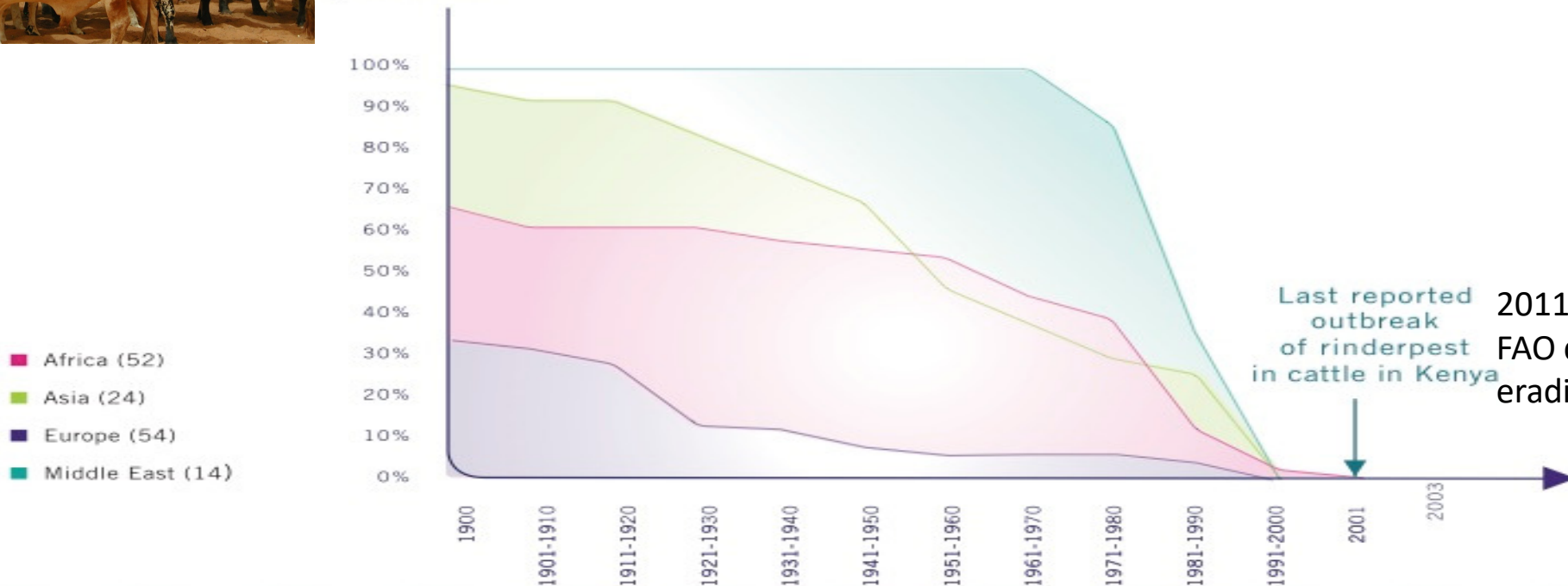
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## ERADICATING RINDERPEST : moments in time

Reported outbreaks of rinderpest steadily declined over the last 100 years.

Share of countries infected with rinderpest in the different regions of the world.



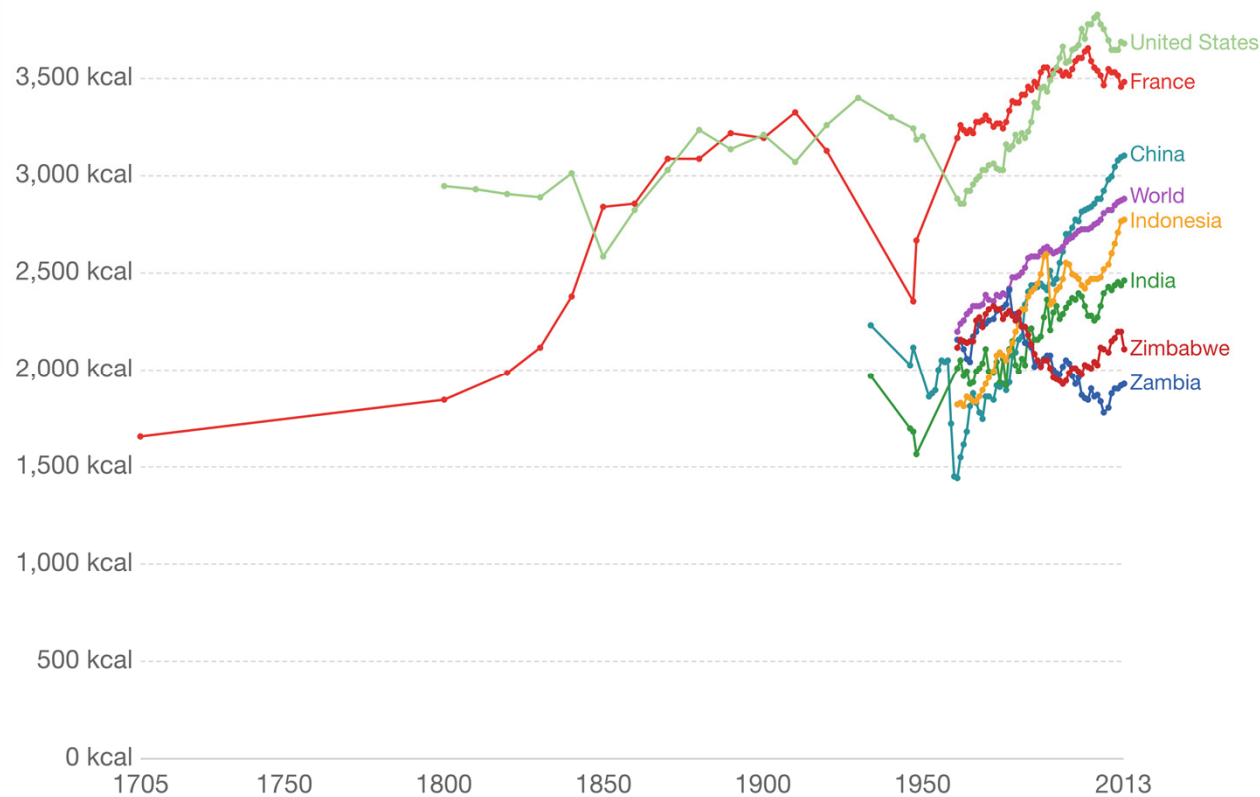
Virus decoded;  
2019 Pirbright  
destroys stocks

zoonosis  
calories

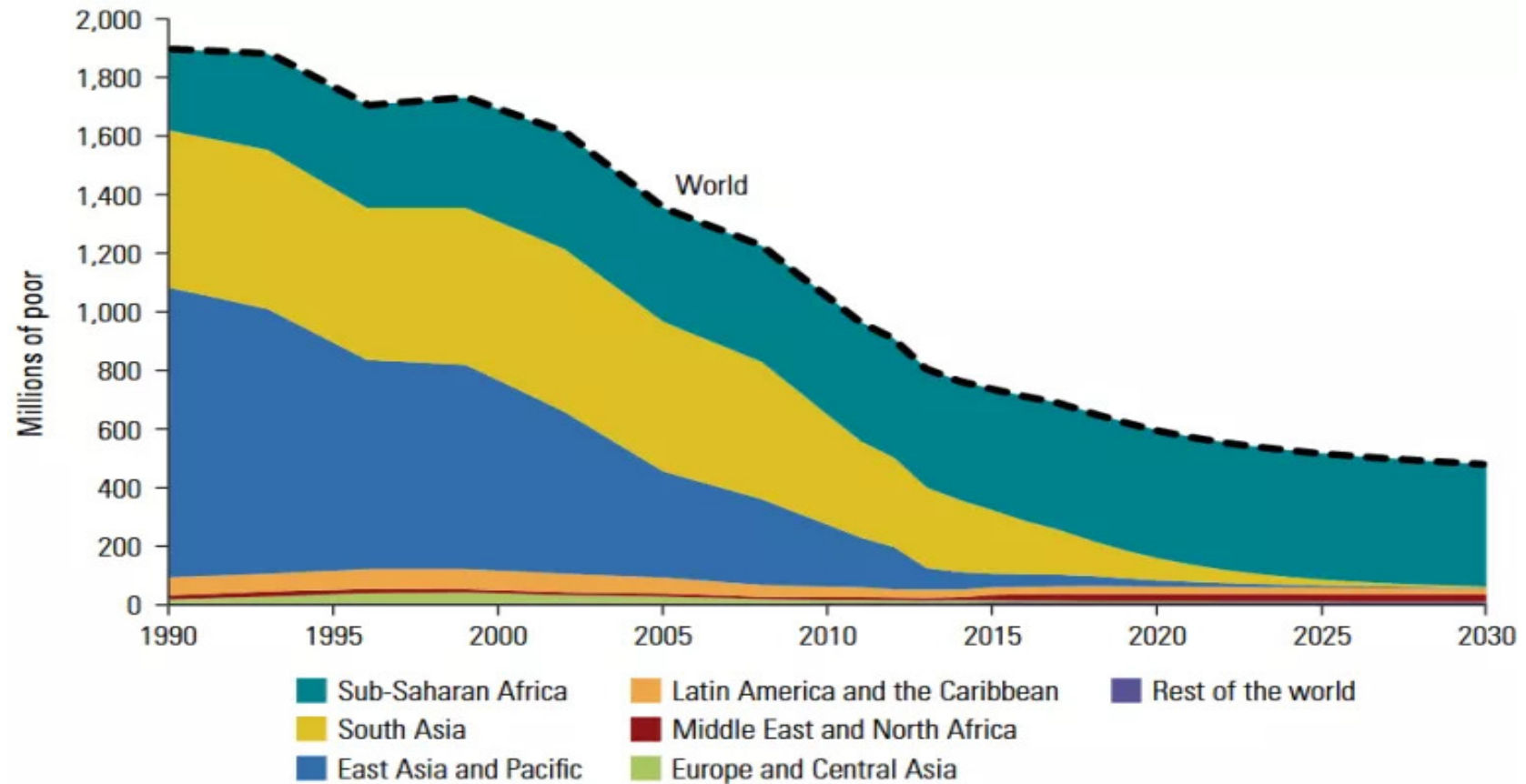
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Daily per capita supply of calories

Our World  
in Data



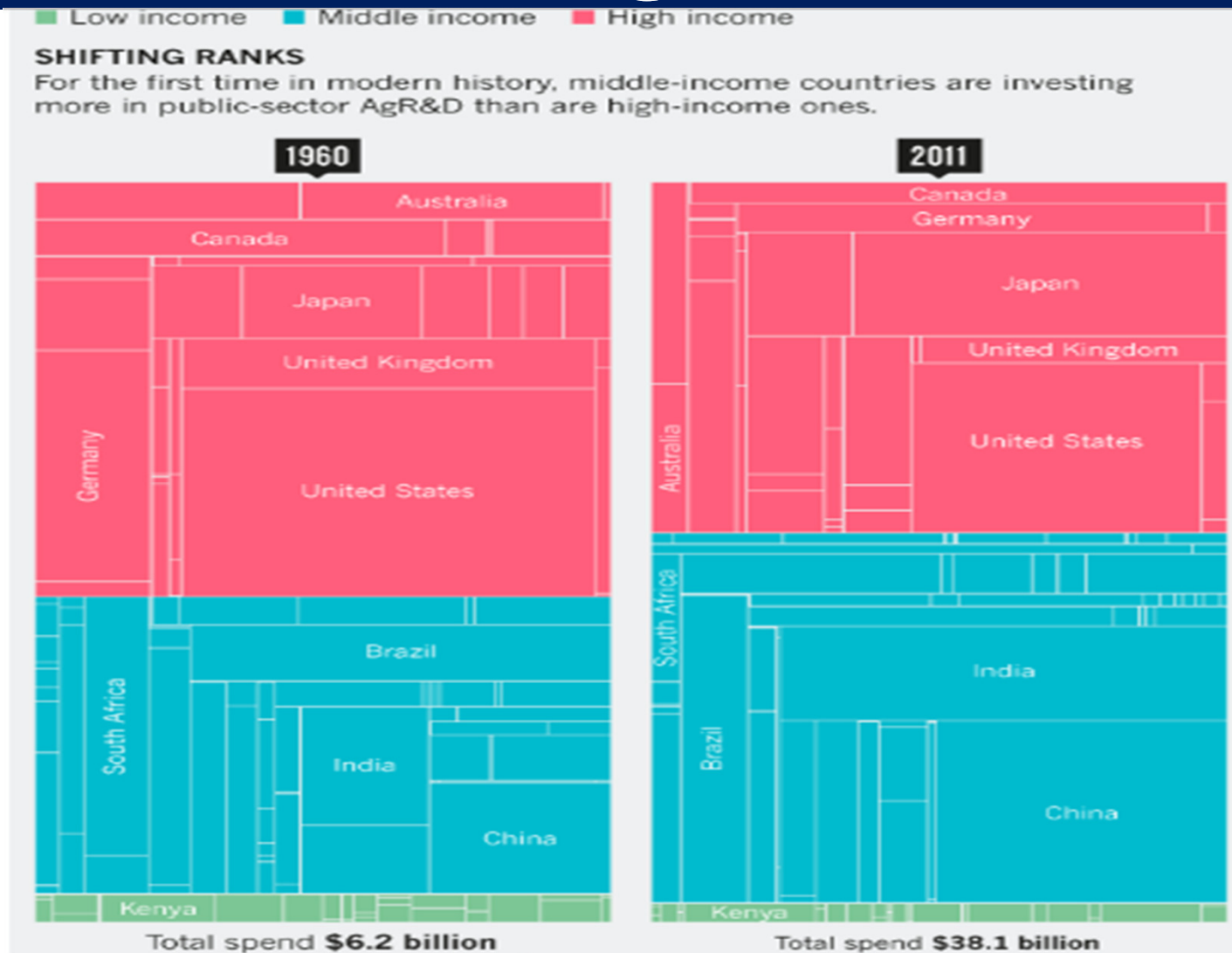
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Source: PovcalNet (online analysis tool), World Bank, Washington, DC, <http://iresearch.worldbank.org/PovcalNet/>. World Development



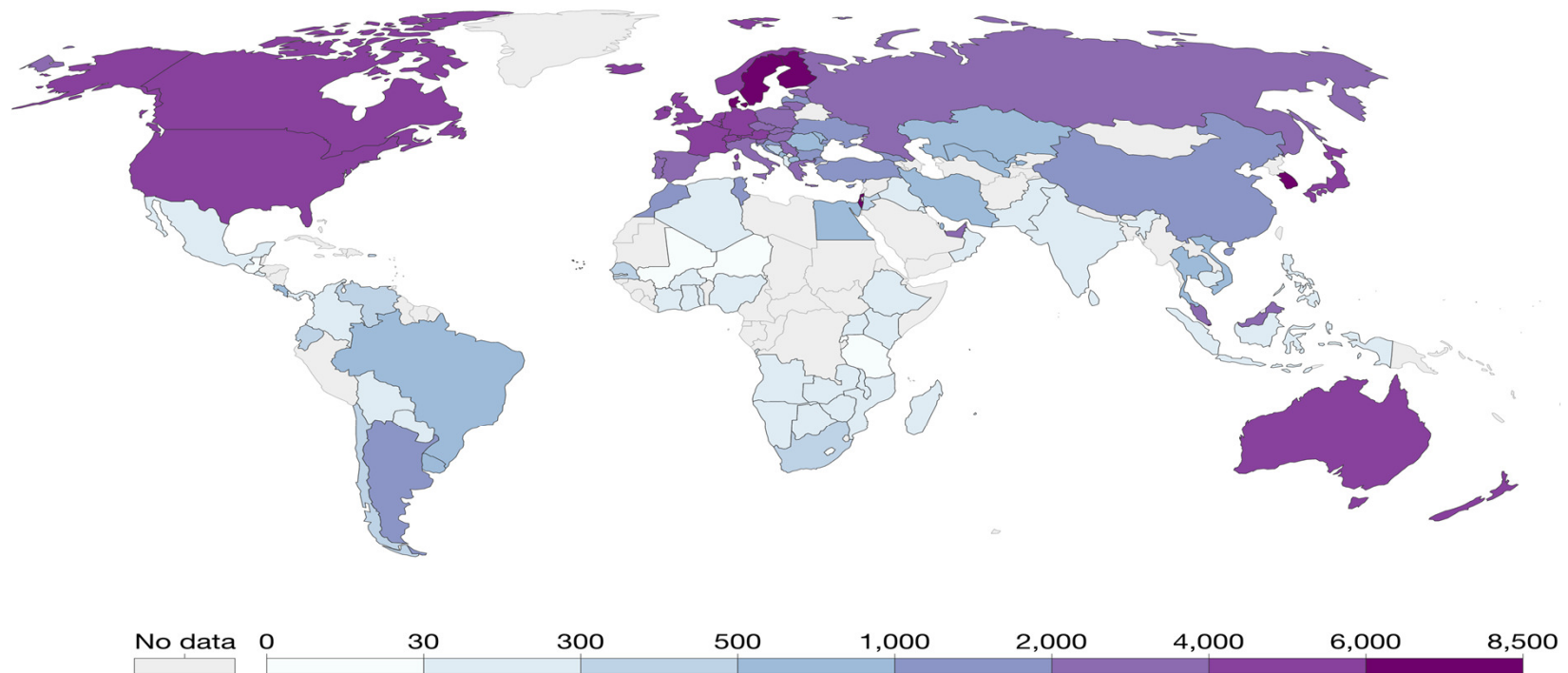
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## Researchers in R&D per million people, 2015

Researchers in Research & Development (R&D) are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the management of the projects concerned. Postgraduate PhD students engaged in R&D are included.



Source: World Bank

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Nutrition

Poverty

Ecosystem

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**IAR** = ARI + **NRI** + CGIAR + CABI + WV + + +  
(WB, RegDBs, **BRICs**, UN, **Philanth'ts**, NGOs, ...)

**ACIAR** = Australia's Globally Unique IAR Mechanism

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Crawford Fund for IAR

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## Q. Why Did It Work?

### A. Integration of Diverse Factors

- ✓ *Science and technology*
- ✓ *Complementary investments*
- ✓ *Private incentives*
- ✓ *Cooperation and collaboration*
- ✓ *Timing and planning*
- ✓ *Experimentation and evolution*
- ✓ *Community involvement*
- ✓ *Leadership and dedication*



continuing  
challenges



# International Agricultural R&D

## It Worked

### Integration of Diverse Factors

- ✓ *Science and technology*
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Yet: 1 billion malnourished

- Progress faltered: food price crisis and global economic downturn
- Sub-Saharan Africa, malnutrition doubled
- South Asia, 314 million remain malnourished

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## Challenge of intergenerational cycle of survival, growth and development

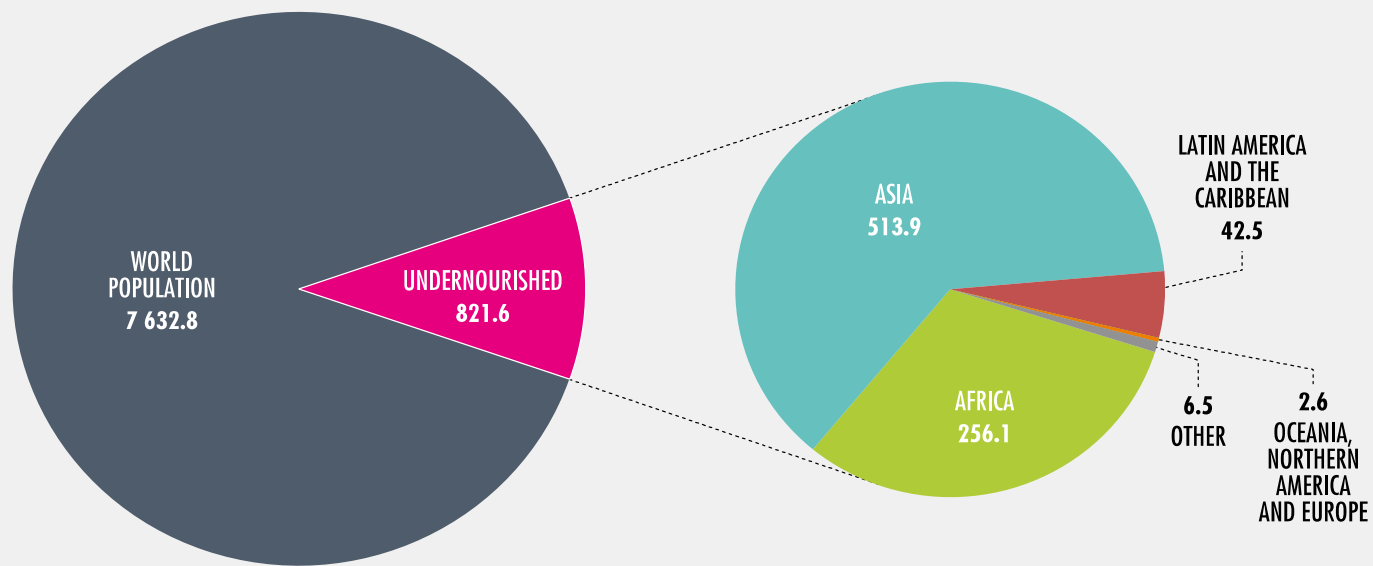


malnutrition

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EVEN THOUGH ASIA STILL PREDOMINATES, MORE THAN THIRTY PERCENT OF THE UNDERNOURISHED IN THE WORLD LIVE IN AFRICA

DISTRIBUTION OF UNDERNOURISHMENT IN THE WORLD (IN MILLIONS) IN 2018\*



NOTES: \* Projected values.  
SOURCE: FAO.

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Figure 1. Biofortified crops bred by CGIAR Centers and partners

					
SWEET POTATO	CASSAVA	MAIZE	BANANA/ PLANTAIN	BEANS	PEARL MILLET
Vitamin A	Vitamin A	Vitamin A Zinc	Vitamin A	Iron	Iron
					
COWPEA	IRISH POTATO	SORGHUM	LENTIL	WHEAT	RICE
Iron Zinc	Iron Zinc	Iron Zinc	Iron Zinc	Zinc	Zinc

ABF

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## Farming the Aquatic Chicken *Improved tilapia in the Philippines*

1988–1997



WorldFish

- **Challenge:** Overuse and overexploitation of marine fish stocks endangers fish supplies
- **Innovation:** Selective breeding and wide distribution of genetically improved tilapia within the region
- **Impact:** Production increases of 186%; lower prices for tilapia benefitting 19-23 million consumers

Author: Sivan Yosef

## Connecting the Milk Grid

### *Smallholder dairy in India*

1970–1996



NOOB

- **Challenge:** Dairy demand outpacing supply; smallholders unable to access national dairy markets
- **Innovation:** Creation of a national milk grid and organization of dairy cooperatives to improve production and marketing
- **Impact:** India becomes a top global dairy producer; incomes double for 9 million direct beneficiaries, 73% of whom are landless farmers

Author: Kenda Cunningham



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## Why Animal Research?

**Nutrition:** FAO - 20 g/person/day animal protein (1½ eggs)

**Income:** Dr Jacob Mignouna, Togo

**Mobility:** move as local climate changes

**Integration:** Crop-Livestock Systems



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## Conception to >1000 days animal-source food for:

vitamin A/retinol (absorbed at 20 times faster than plant beta-carotene); heme iron (absorbed twice as readily as non-heme plant iron); vitamin B12 (from anaerobic bacteria found only in animal-sourced foods), choline (for neurotransmission, memory, learning and gene expression).

***“Global efforts to limit or reduce the consumption of meat, milk and eggs over environmental concerns should exclude pregnant and breastfeeding women and babies under the age of two, especially in low-income settings where other sources of protein and micronutrients are not available or not customarily used.”***

Grace, D. et al

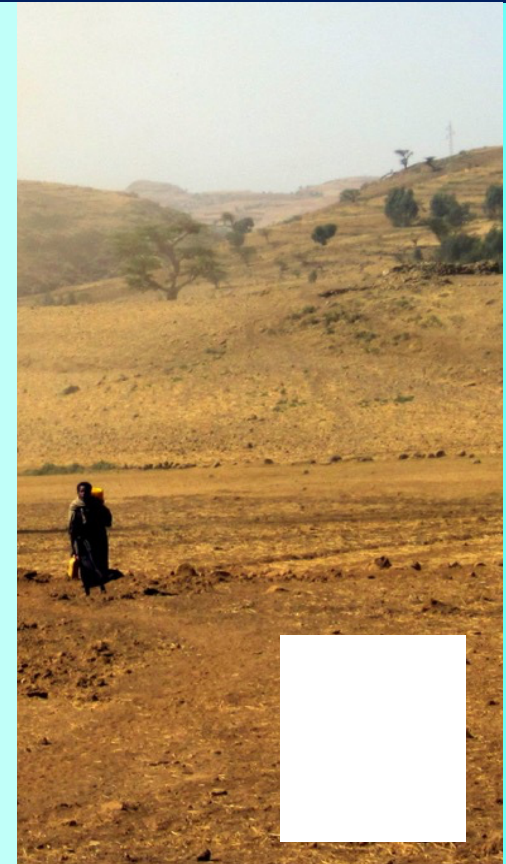
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## Current & Future Needs

- **Health**
- **Climate Change**
- **Environment**
- **Migration**
- **Employment**
- **Production**
  - **Sustainable Intensification:** crops & livestock, recycling nutrients, emissions
  - **Genetic Modification:** pests & diseases, climate adaptation, micronutrients
  - **Agricultural Education:** integrated knowledge, applied research capacity

### SSA & WANA:

all above + e.g. yield gap, livestock mortality & reproduction, policy



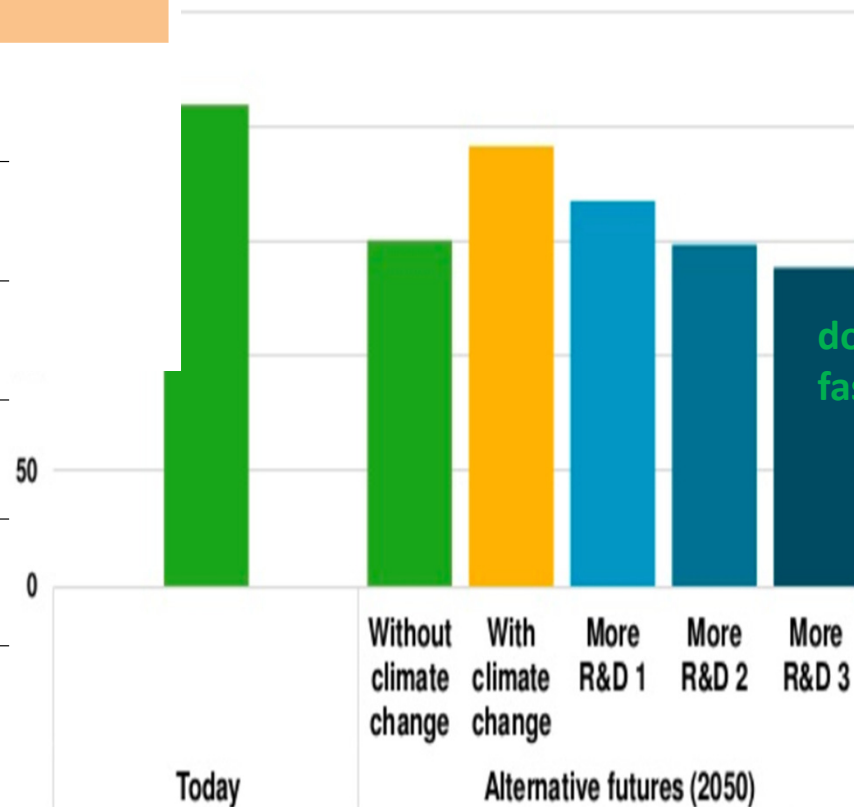
SSA climate

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## DRIVERS OF FOOD CRISES

Economic slowdown or downturn	Conflict	Climate	Conflict and climate
Slowdown	Central African Republic, Jordan*, Lebanon*	Madagascar, El Salvador, Guatemala, Honduras	Cameroon, Djibouti, Kenya, Myanmar
Downturn		Mozambique	Nigeria, Uganda
Slowdown	Ukraine*	Eswatini*, Pakistan*	Niger, Syrian Arab Republic*
Downturn		Malawi	Chad, Afghanistan
Slowdown	Palestine	Zambia	Sudan
Downturn	Iraq, Turkey	Zimbabwe	Burundi, Democratic Republic of the Congo, South Sudan, Yemen, Haiti

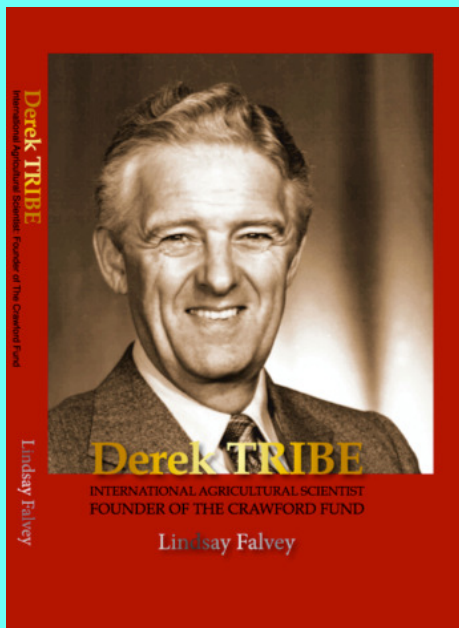
## Population at Risk of Hunger in Sub-Saharan Africa



double R&D & faster adoption

CF

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## Next Gen:

- Int. Scholarships
- IAR Volunteering
- Int. Conferences
- IAR Mentors

curiosity



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## To summarize:

- Integrated & contextualized
- Malnourishment → ?? → ?? Education → Development
- Yields, pest & disease, zoonoses, AMR, safe foods, recycling, policy
- All within more rapid climate change
- Old/current generation experience ≠ NewGen
- Newgen: intercultural, integrationists = ???

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- Old/current generation experience ≠ NewGen
- Newgen: intercultural, integrationists = the world is in good hands

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