



INTERNATIONAL FOOD  
POLICY RESEARCH INSTITUTE

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# Supply, demand, and projected nutritional need for fruits and vegetables

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Aligning the Food System to Meet Dietary Needs:  
Fruits and Vegetables

2-3 June 2017

World Food Center, University of California – Davis

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Scientist, IFPRI

# Support Acknowledgement

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And, thanks to the World Food Center for the invite to participate in this conference!

# Organization

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- Approach: quantitative foresight modeling
  - Overall view of the approach
  - IFPRI's IMPACT model (structure, drivers, spatial disaggregation, commodity representation)
  - What are “F&V” in IMPACT? (aggregated)
- Baseline outlook for F&V
  - History and future of global supply
  - Changing diets, per capita consumption, total demand, production/supply, prices
  - Part of healthy diet and micronutrient supply
- Future work

# QUANTITATIVE FORESIGHT MODELING AND IMPACT



June 2017

**All models are wrong,  
but some are useful**

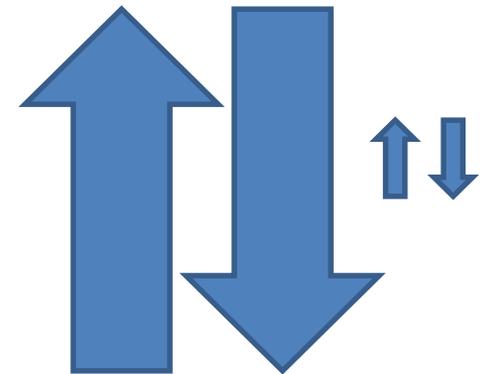
-- G.E.P. Box

# Quantitative Foresight Modeling

- Forward-looking modeling for scenarios of agricultural and food security futures
- Structural modeling informed by theory, expert knowledge, and latest science
- Critical context necessary for making informed policy and decision-making
- **DIRECTION & MAGNITUDE** of changes: UP/DOWN + BIG/SMALL

In this case:

- Precision helps inform the modeling
- But policy is not informed by the precision



# International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT)

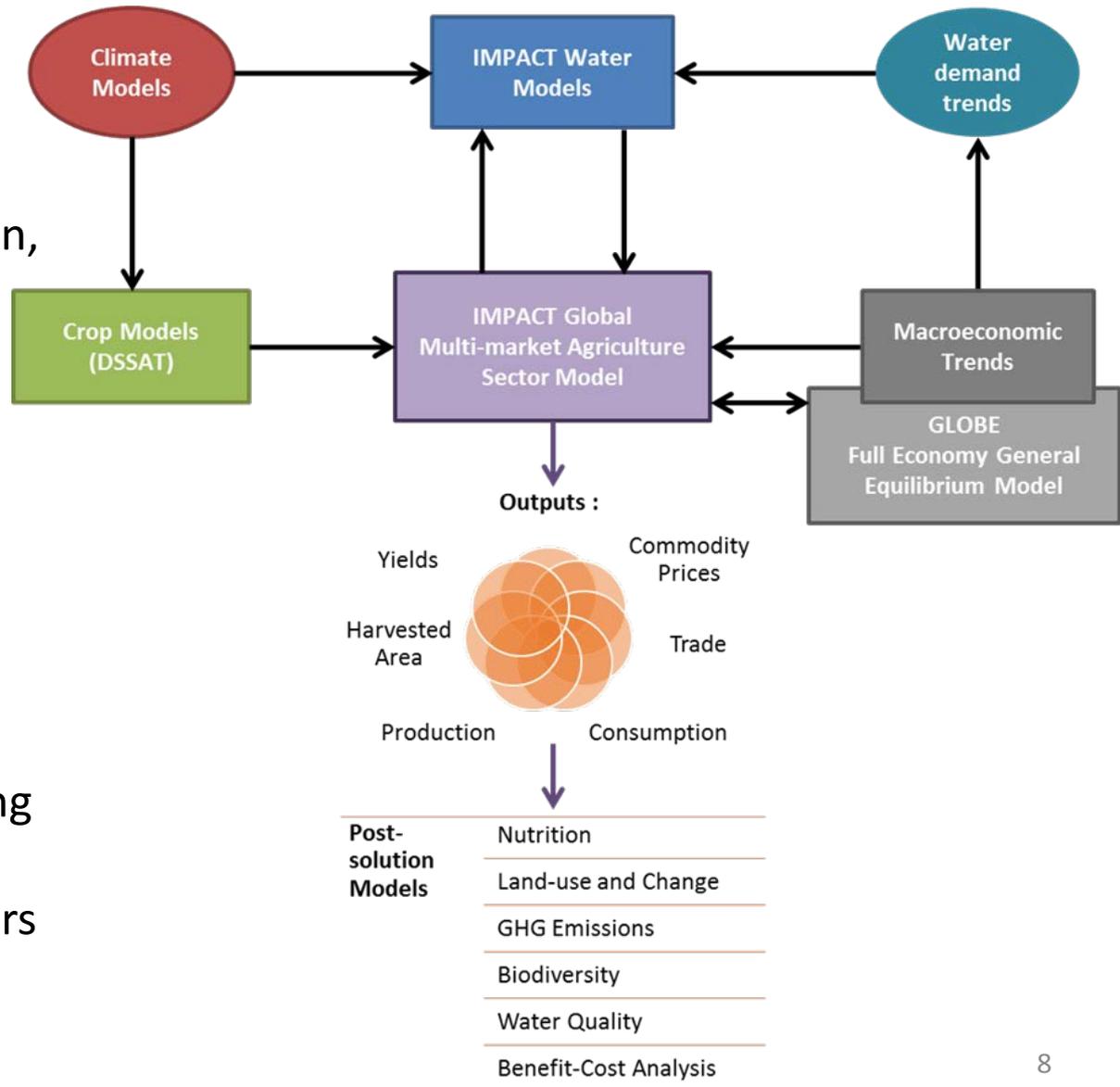
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- An integrated system of linked economic, climate, water, and crop models focused on the agricultural sector
- Exploration of the future of supply, demand, trade, and critical aspects of the global agricultural system
- Allows:
  - Fundamental, global baseline projections of agricultural commodity production and trade and malnutrition outcomes
  - Along with cutting-edge research results on quickly evolving topics such as bioenergy, climate change, changing diets and food preferences, and many other themes

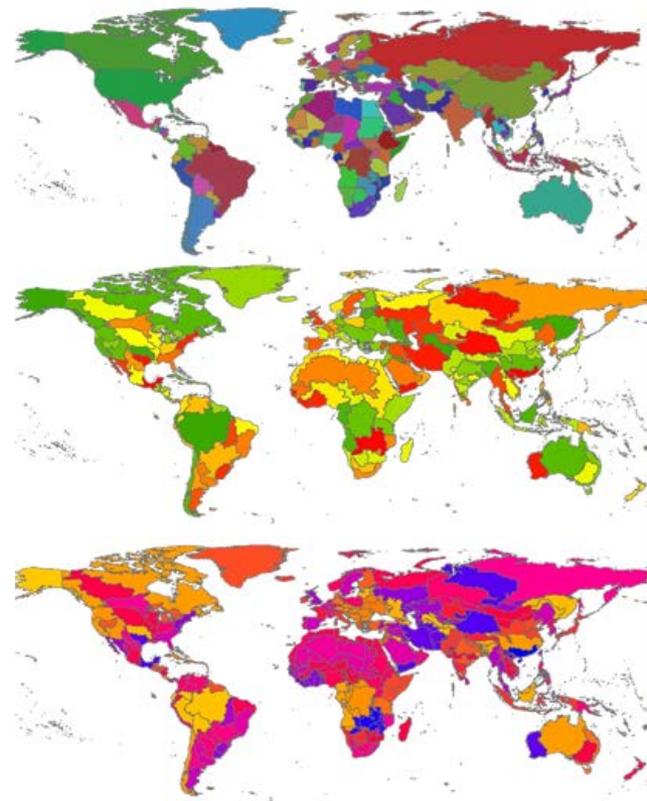
Brief description here, more info at  
<http://www.ifpri.org/program/impact-model>

# IFPRI's IMPACT Model

- Linked climate, water, crop and economic models
- Estimates of production, consumption, hunger, and environmental impacts
- High level of disaggregation
  - 158 countries
  - 154 water basins
  - 60+ commodities
- Links to global modeling groups through AgMIP and all 15 CGIAR centers through GFSF



# IMPACT: Spatial Disaggregation



159

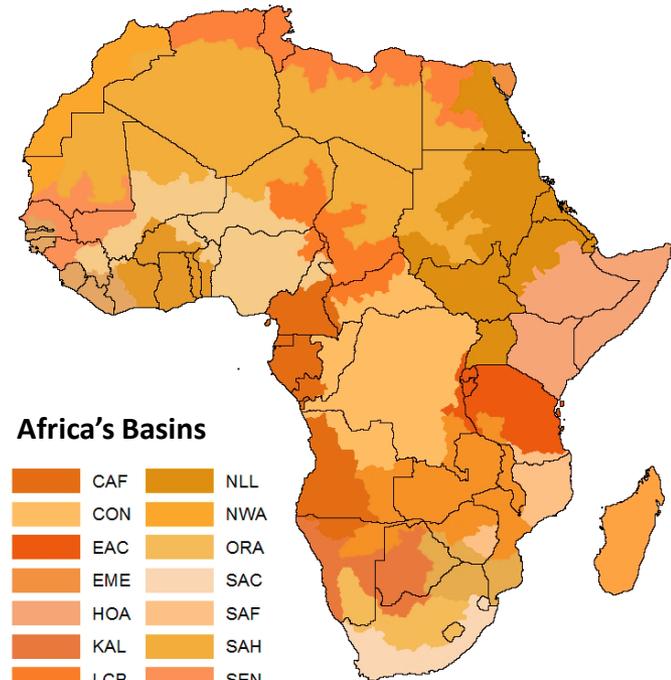
• Countries

154

• Water Basins

320

• Food  
Production  
Units



Africa's Basins

CAF	NLL
CON	NWA
EAC	ORA
EME	SAC
HOA	SAF
KAL	SAH
LCB	SEN
LIM	VOT
MAD	WAC
NAC	ZAM
NIG	

# IMPACT: Commodity Disaggregation

Spatially disaggregated irrigated and  
rainfed agricultural production by water basin

Cattle	Barley	Bananas
Dairy	Maize	Plantains
Eggs	Millet	Sub-tropical fruits
Pigs	Other cereals	Temperate fruits
Poultry	Rice	Vegetables
Sheep/goat	Sorghum	
	Wheat	
Groundnuts	Cocoa	Beans
Other oilseeds	Coffee	Chickpeas
Oil palm fruit	Cotton	Cowpeas
Palm kernel	Tea	Lentils
Rapeseed		Other pulses
Soybeans		Pigeonpeas
Sunflower		
Cassava	Sugarbeet	Others...
Other tubers	Sugarcane	
Potato	Refined sugar	
Sweet potatoes		
Yams		

# IMPACT's Fruits and Vegetables from FAOSTAT

**Banana** – Banana

**Plantain** – Plantain

**Sub-tropical fruits** – Avocados, Cashewapple, Dates, Citrus, Grapefruit/pomelos, Lemon/lime, Mangoes/mangosteens/guavas, Melons, Oranges, Papayas, Persimmons, Pineapples, Tangerines/mandarins/clementines, plus others

**Temperate fruits** – Apples, Apricots, Berries, Blueberries, Cherries, Cranberries, Currants, Figs, Gooseberries, Grapes, Kiwi fruit, Peaches and nectarines, Pears, Plums and sloes, Quinces, Raspberries, Strawberries, Watermelons, plus others

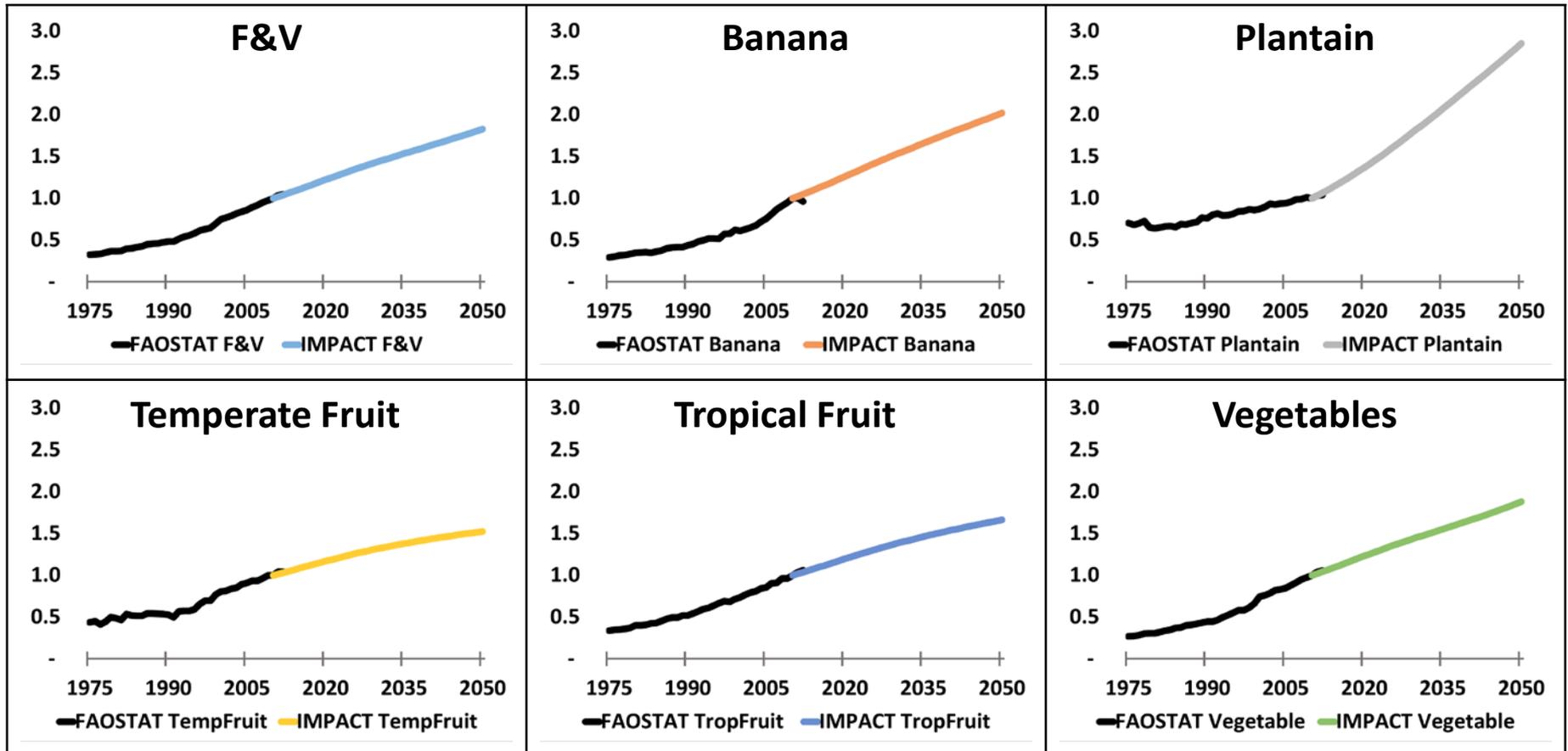
**Vegetables** – Artichokes, Asparagus, Cabbages/brassicas, Carrots/turnips, Cauliflower/broccoli, Chillies/peppers, Cucumbers/gherkins, Eggplants, Garlic, Ginger, Leeks, Lettuce/chicory, Mushrooms, Okra, Onions/shallots, Pumpkins/squash, Spinach, String beans, Tomatoes, plus others

# **IMPACT PROJECTIONS FOR THE FUTURE OF FRUITS & VEGETABLES**

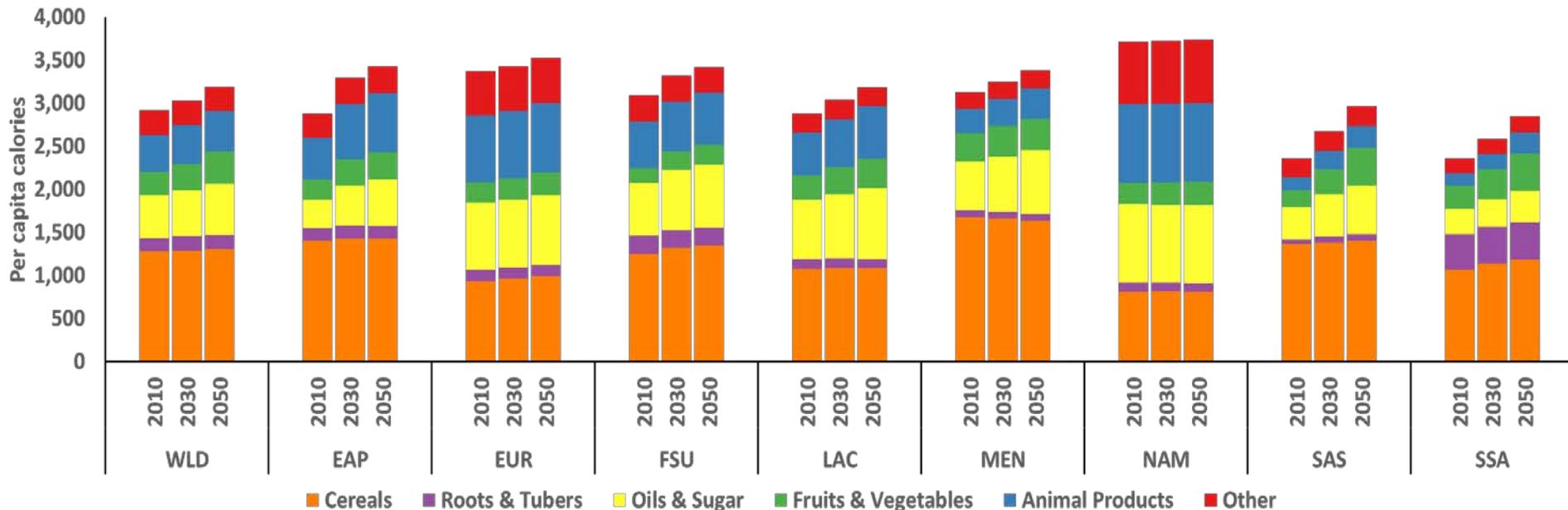


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# Supply trends: FAOSTAT history and IMPACT future



# Changing composition of diets, by per cap kcal

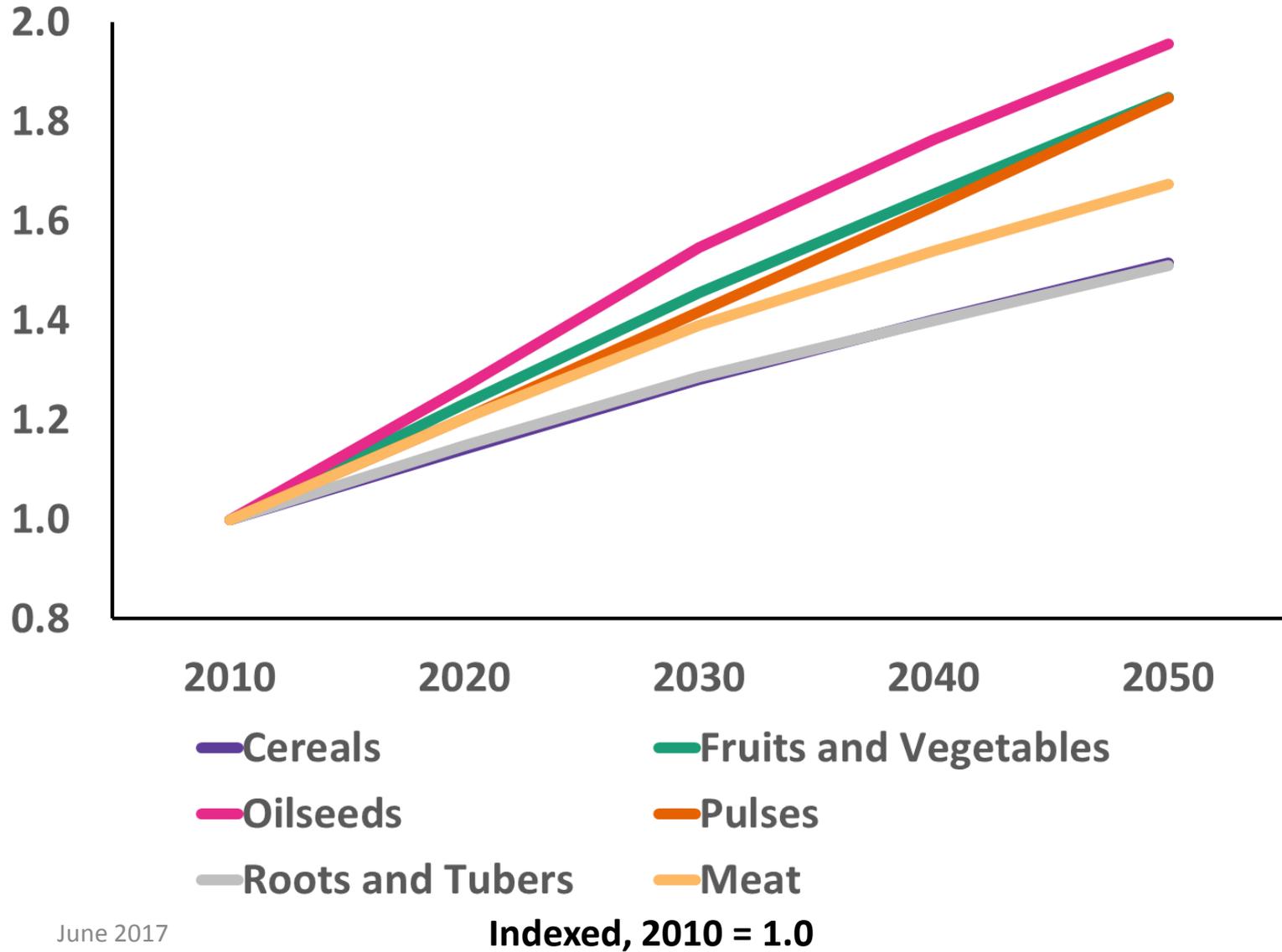


- Important increases in F&V and animal products
- Concerning trends with oils and sugar

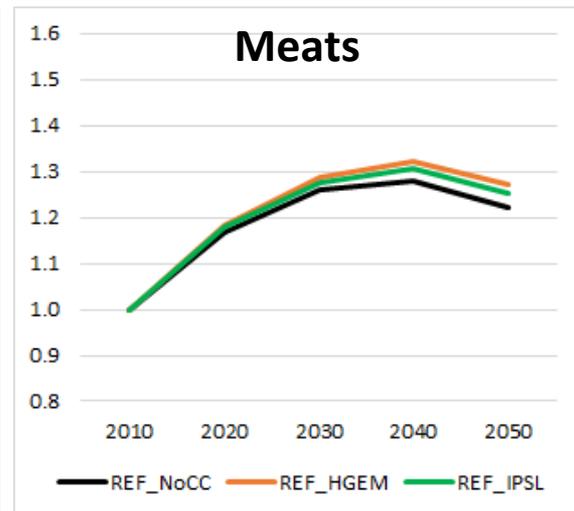
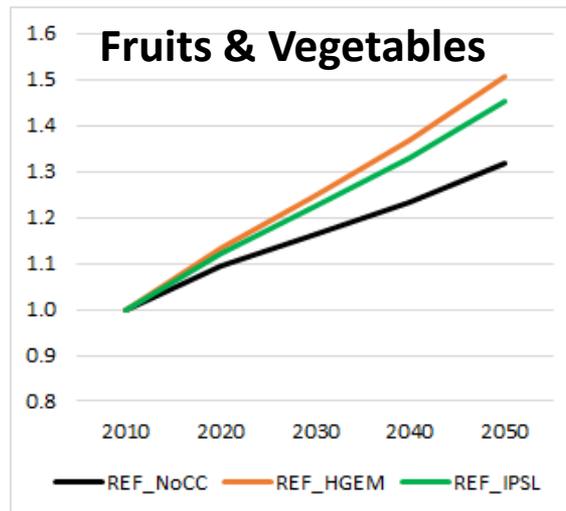
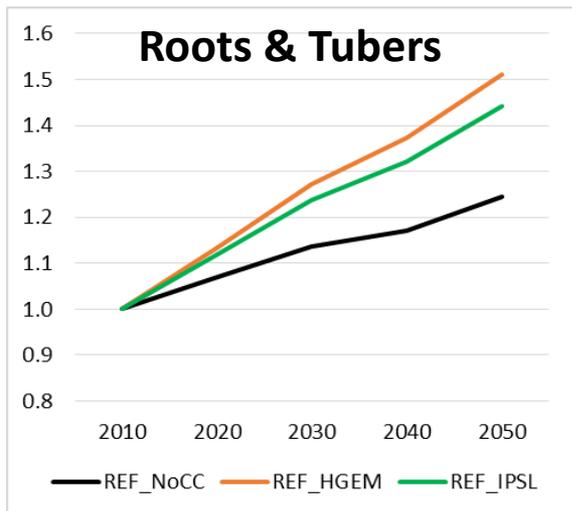
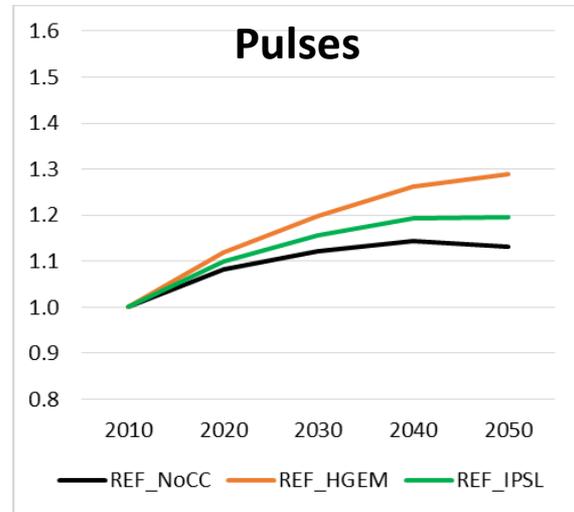
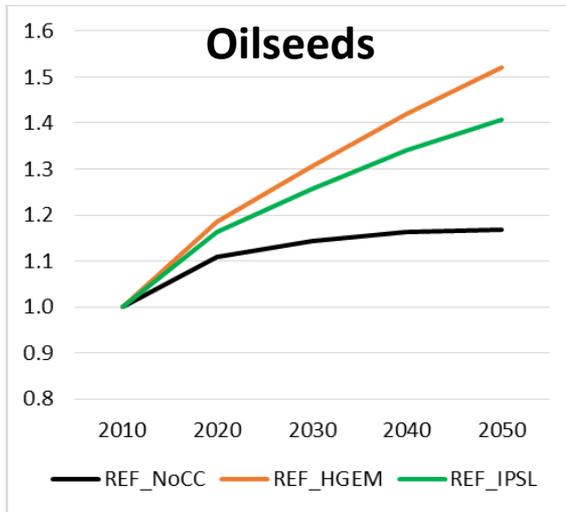
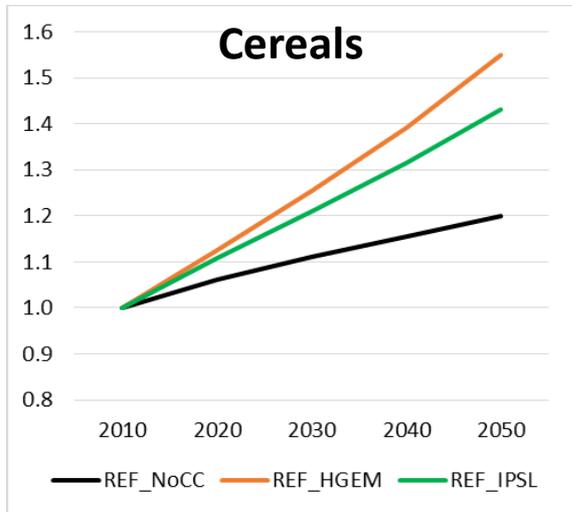


WLD = World; EAP = East Asia and Pacific; EUR = Europe; FSU = Former Soviet Union; LAC = Latin America and Caribbean; MEN = Middle East and North Africa; NAM = North America; SAS = South Asia; SSA = Sub-Saharan Africa

# Growth in total global commodity demand



# Projected price trends (with climate change effects)



# WHO healthy diet targets

Region	2010				2030				2050			
	F&V (g/cap)	% KCAL Fat	% KCAL Sugar	Total KCAL	F&V (g/cap)	% KCAL Fat	% KCAL Sugar	Total KCAL	F&V (g/cap)	% KCAL Fat	% KCAL Sugar	Total KCAL
EAP	813	22.1	9.2	2,873	979	25.8	10.5	3,267	963	27.5	11.1	3,326
SAS	287	17.0	11.4	2,360	526	18.3	14.7	2,617	939	18.8	16.9	2,826
FSU	502	21.7	14.4	3,090	602	22.1	16.3	3,287	637	22.5	17.1	3,339
MENA	752	20.0	13.5	3,126	778	20.6	15.1	3,207	784	21.4	17.0	3,280
SSA	262	16.2	8.4	2,356	320	16.9	8.9	2,513	391	18.1	9.8	2,703
LAC	469	24.7	18.2	2,876	492	25.5	19.0	2,984	536	26.6	19.8	3,080

Failed to achieve target

Achieved target

Surpassed target

- F&V consumption improving globally, but SSA and LAC lagging
- Again, concerning trends with oils and sugar

From Rosegrant et al. 2017, Available at <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/131144>.

Based on food available for consumption by an average consumer; 2010 values are calibrated model results; 2030 and 2050 values from projected baseline that includes climate change effects on agricultural sector

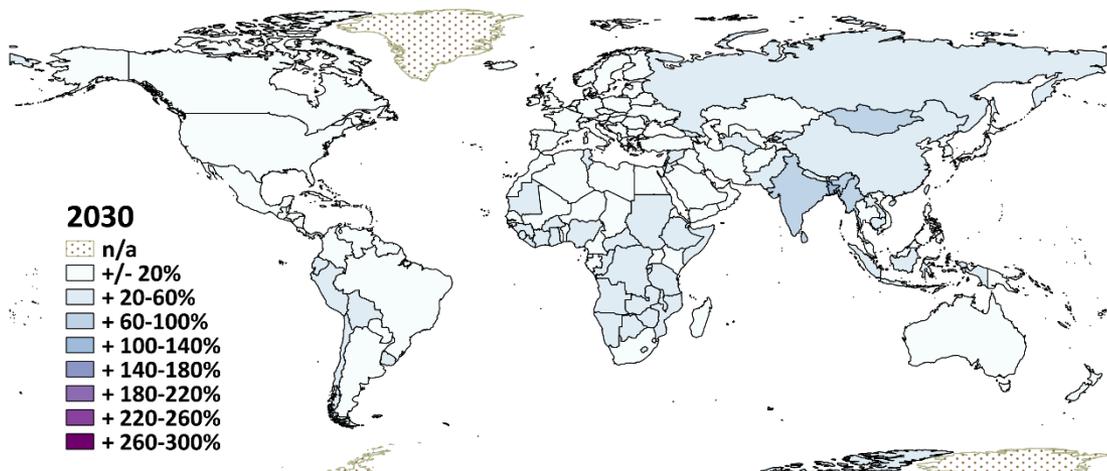
EAP-East Asia and Pacific; SAS-South Asia; SSA-Africa South of the Sahara; MEN-Middle East and North Africa; LAC-Latin America and the Caribbean.

WHO recommends a healthy diet should have:

- At least 500 g/person/day of fruits and vegetables
- Less than 30% of energy coming from fat
- Less than 10% of energy coming from sugar, with less than 5% being ideal
- Energy intake corresponding with activity levels, where 3,000 kcal/person/day and 2,400 kcal/person/day is the recommended for an active male and female respectively (20-35 years old)

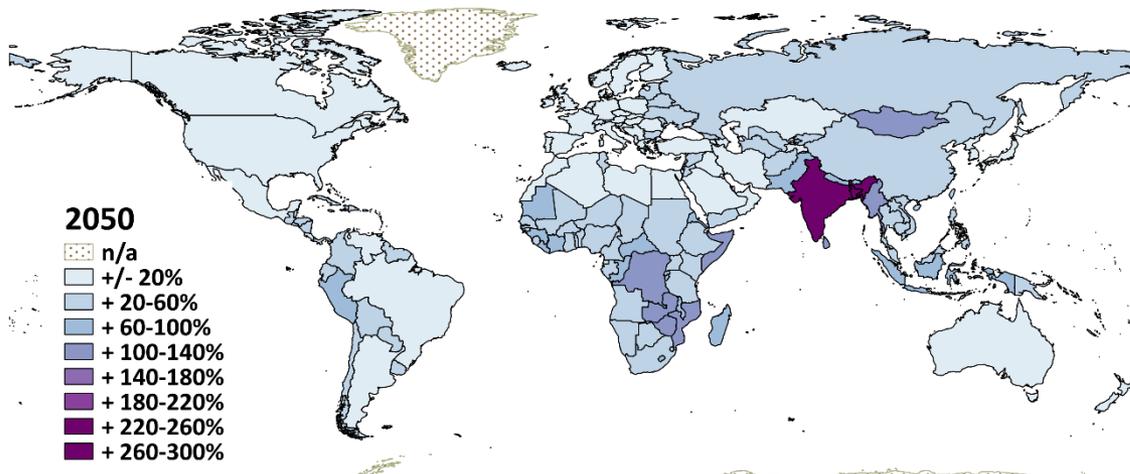
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# Increasing per capita F&V consumption



Slight improvements  
by 2030

Better by 2050,  
but plenty of room  
for improvement

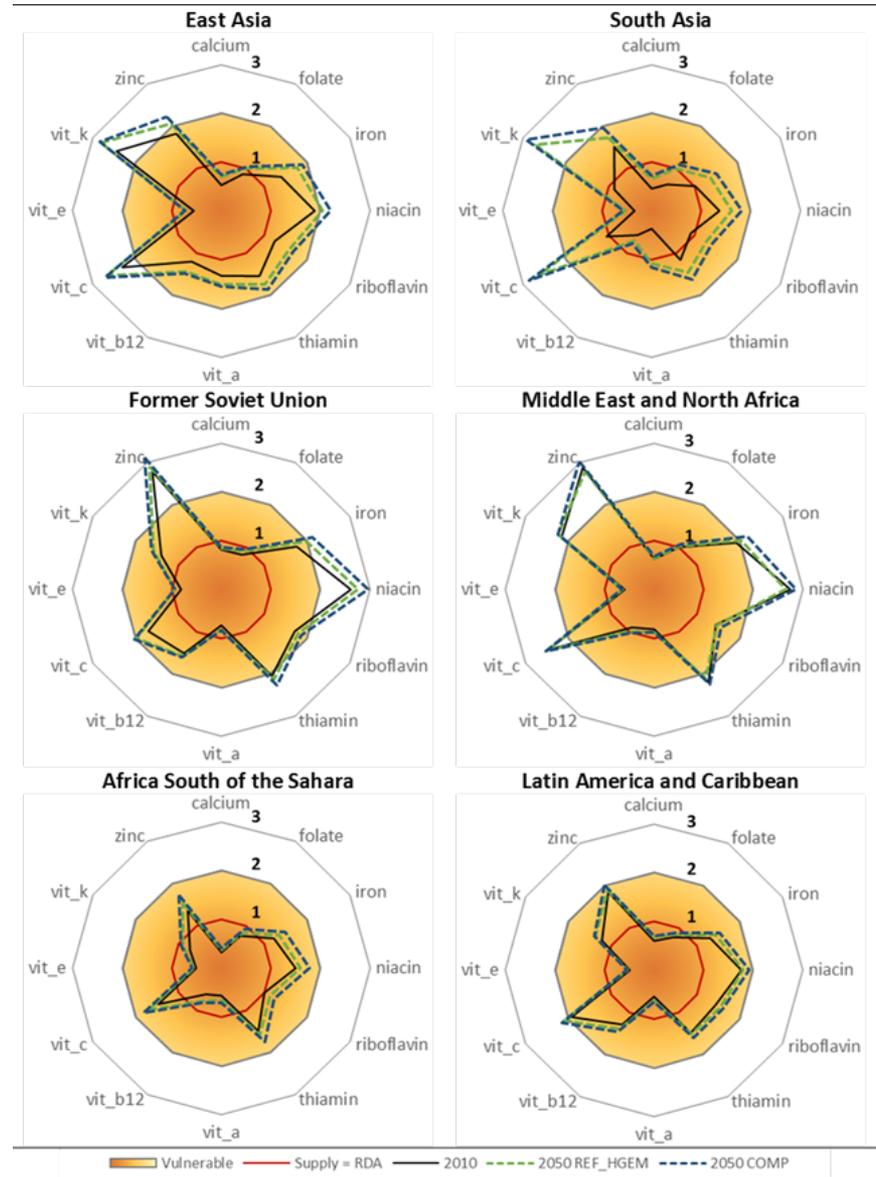


# Micronutrient supply (across all commodities)

## Ratios of micronutrient supply to recommended daily allowance (RDA) by region for 2010 and 2050

Need for developing a balanced approach that gives improvements across full spectrum of micro- and macro-nutrient requirements

Note: The colored region reflects where micronutrient supply (from IMPACT food commodities) is less than or equal to twice the recommended intake. The coloring goes from darker (more vulnerable) to lighter (less vulnerable) as you move away from the center of each spider graph. All points inside the red line reflect where the micronutrients supply is less than the recommended intake.



# Future work...

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- More studies and work on specific nutrition outcomes from different scenarios for the future (under different drivers of the global agricultural system; eg, population, income, climate change, investments in agricultural research and development)
- Better representation of range of F&V (color spectrum, highest “importance” w.r.t. markets)
- Scenario studies of pests and diseases
- Better understanding of value chains and potential for interventions (and positive impact)
- Demand side behavior
- More effective communication with policy-makers (and consumers!)

## **Key Resources:**

Global Food Policy Report 2017, available at [gfpr.ifpri.info](http://gfpr.ifpri.info)

Rosegrant et al. 2017, available at [ebrary.ifpri.org](http://ebrary.ifpri.org)

[pim.cgiar.org](http://pim.cgiar.org)

[www.cgiar.org](http://www.cgiar.org)

[www.ifpri.org](http://www.ifpri.org)

[globalfutures.cgiar.org](http://globalfutures.cgiar.org)

[www.ifpri.org/program/impact-model](http://www.ifpri.org/program/impact-model)

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