

# Leveraging food systems to improve nutrition in low- and middle-income countries

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SCHOOL OF PUBLIC HEALTH  
**NUTRITIONAL SCIENCES**  
UNIVERSITY OF MICHIGAN

# the global nutrition landscape

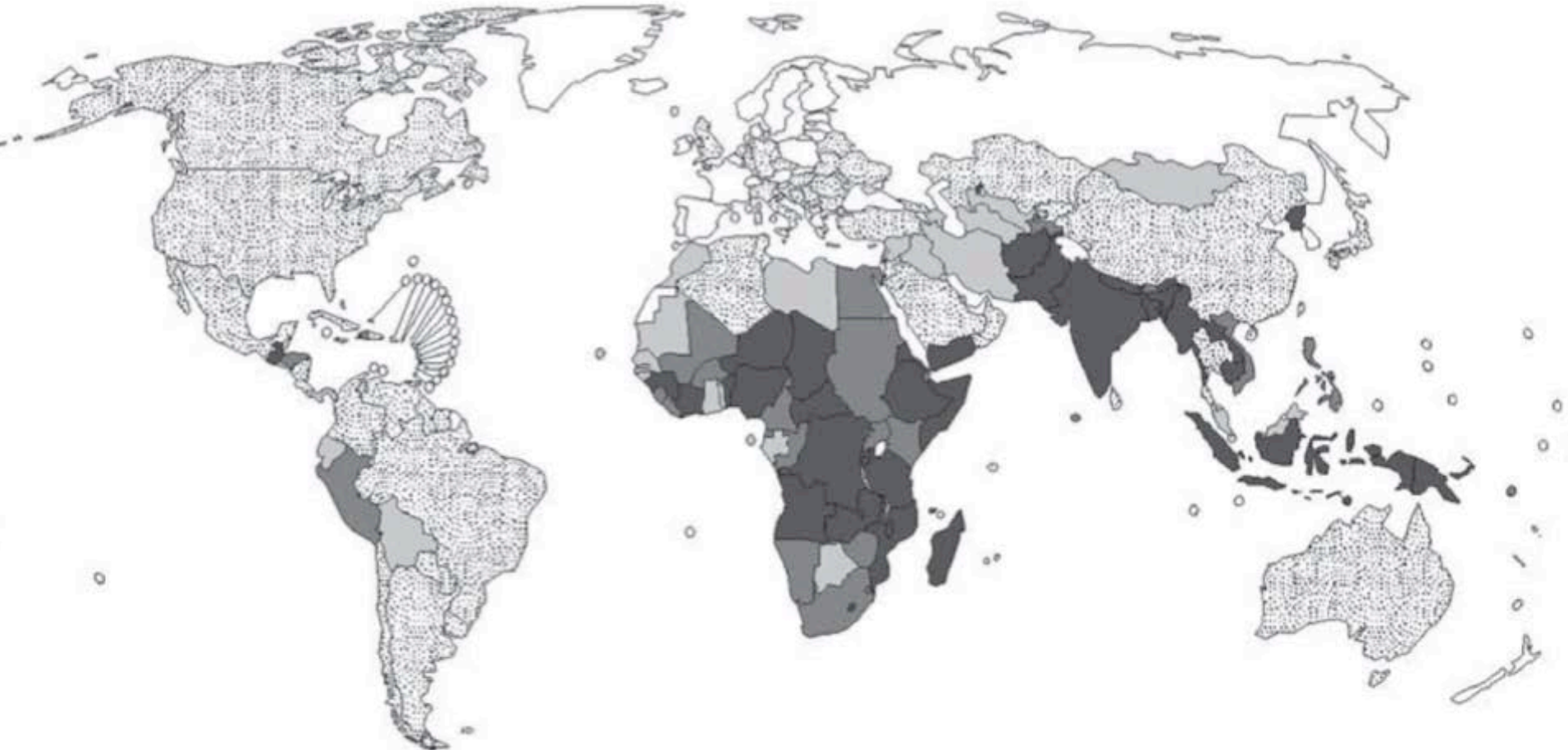


**2 years  
9 months**



**2 years  
6 months**

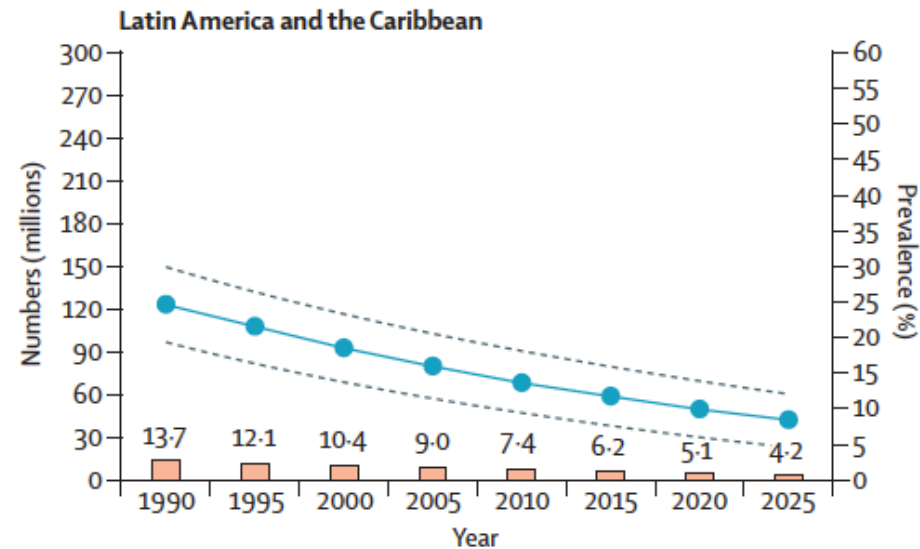
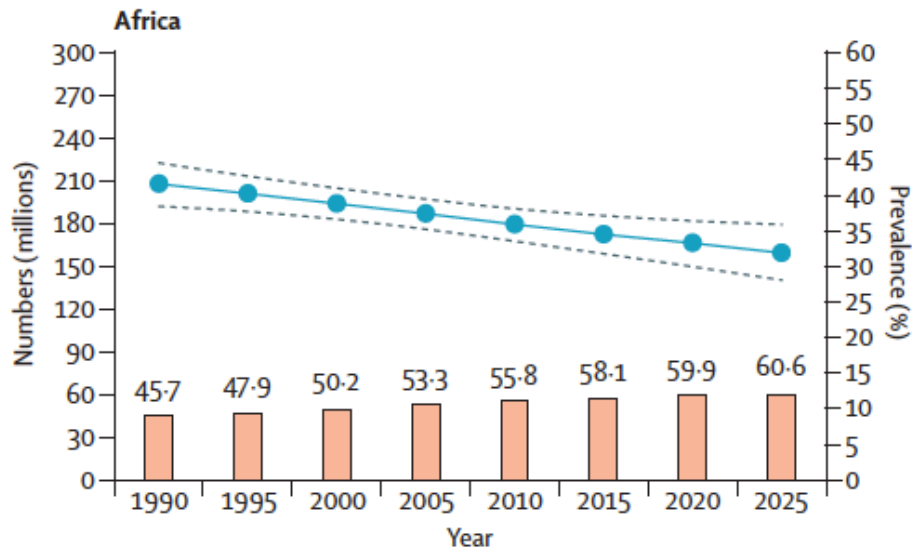
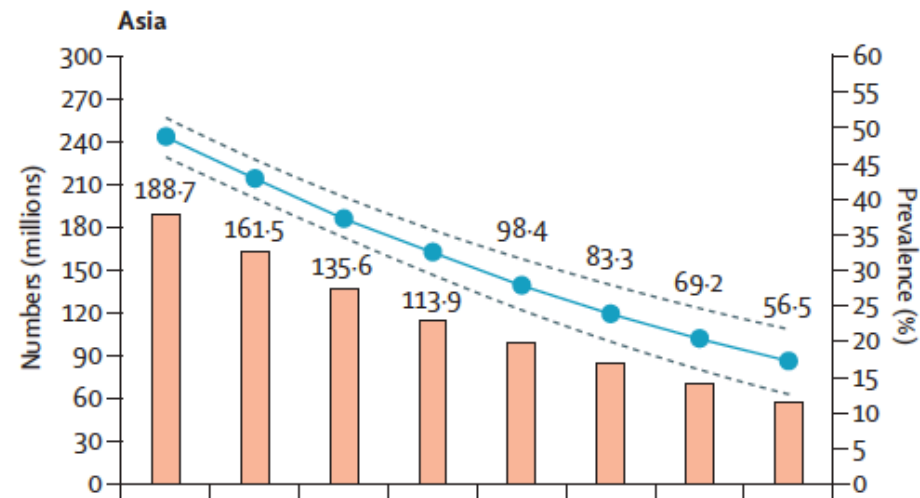
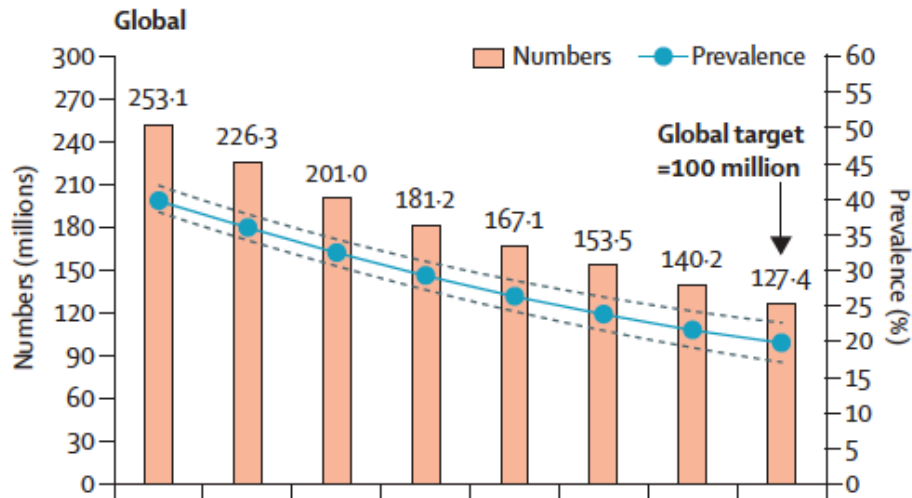
# GLOBAL PREVALENCE OF <5 CHILD STUNTING



□, no data; ▨, <20%; ▩, 20-29.9%; ▤, 30-39.9%; ▀, ≥40%

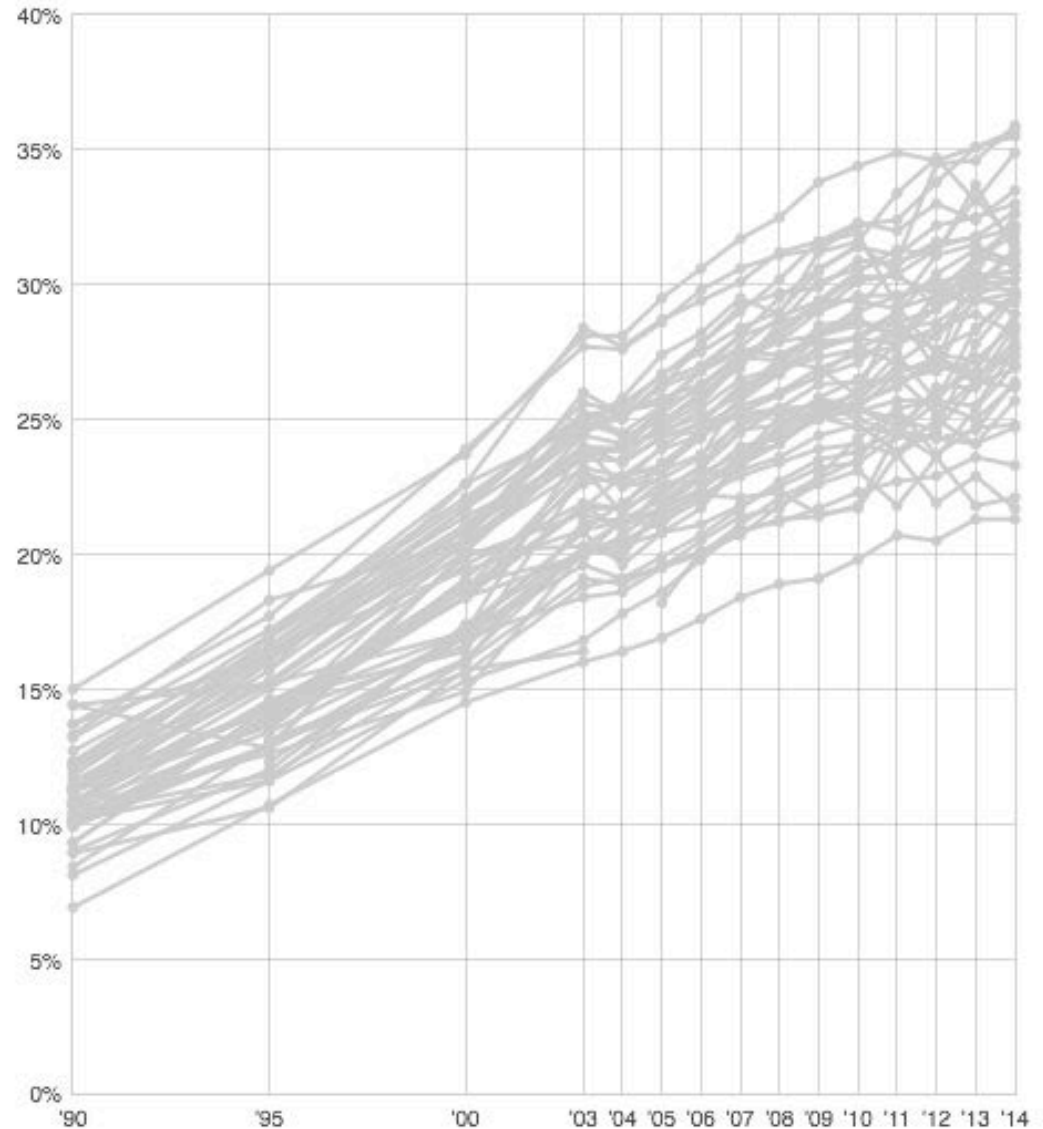
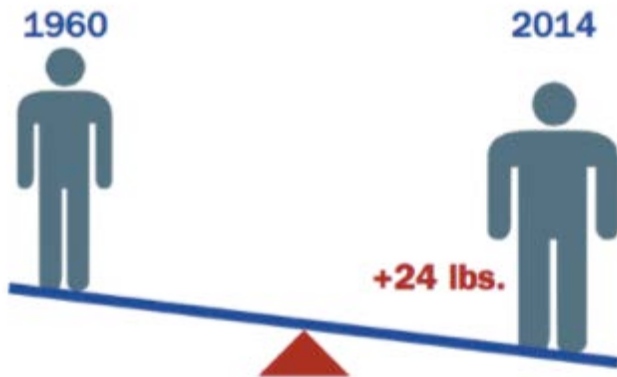
Source: de Onis et al (2011), PHN

# GLOBAL TRENDS IN STUNTING AMONG CHILDREN

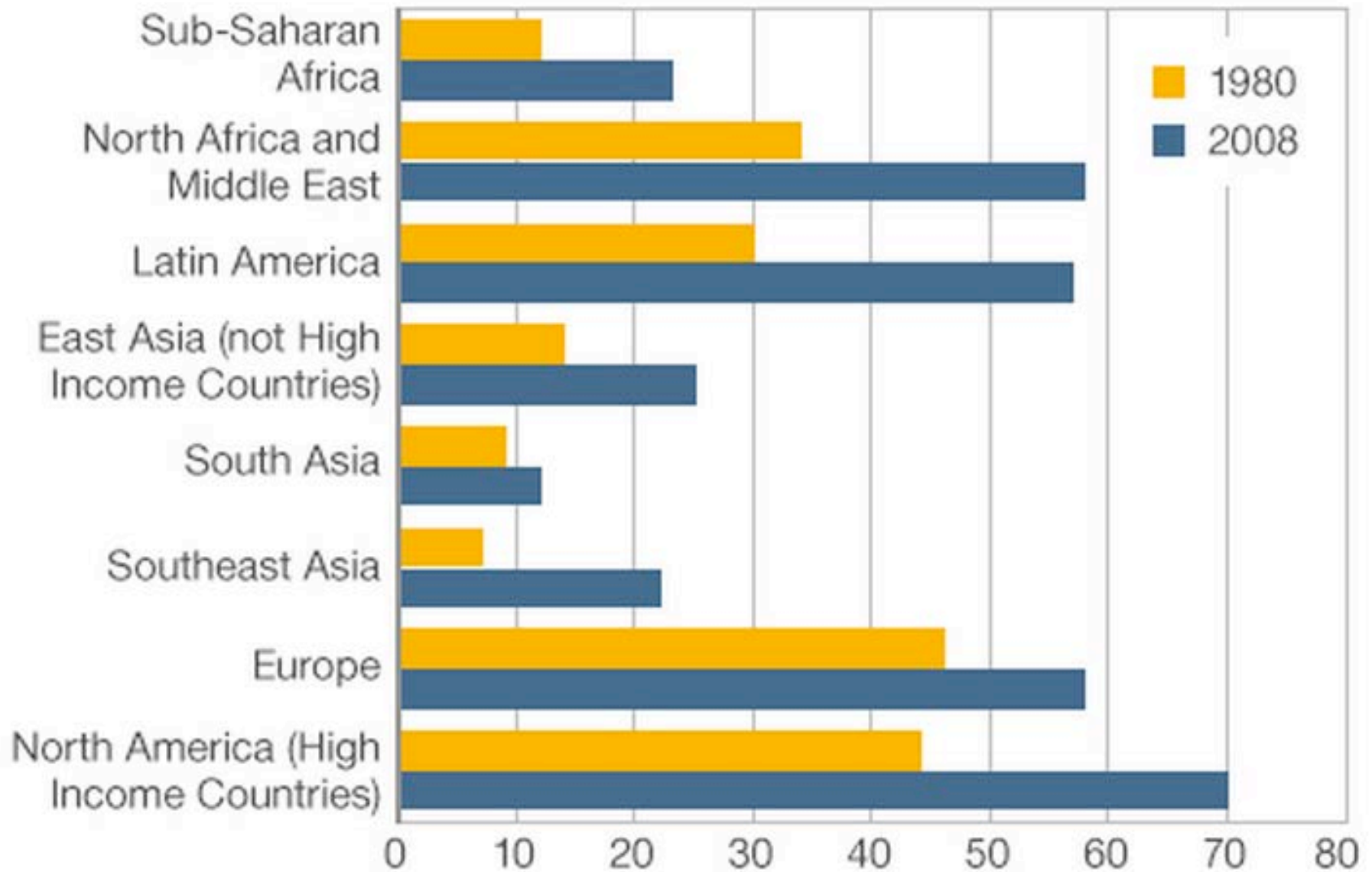


# PREVALENCE OF ADULT OBESITY IN THE UNITED STATES, 1990 TO 2014

- Over the past 35 years, the prevalence of obesity among adults in the U.S. has more than doubled
- The average American is more than 24 pounds heavier today than in 1960
- The prevalence of childhood obesity has more than tripled since 1980



# OVERWEIGHT AND OBESE ADULTS (%), BY REGION



# THE NUTRITION TRANSITION

- Diets in low- and middle-income countries converging toward “Western diets”
- Shifts in diet and activity patterns are occurring rapidly
- Country capacity to address rapid increases in NCDs is limited
- The co-occurrence of undernutrition and overweight



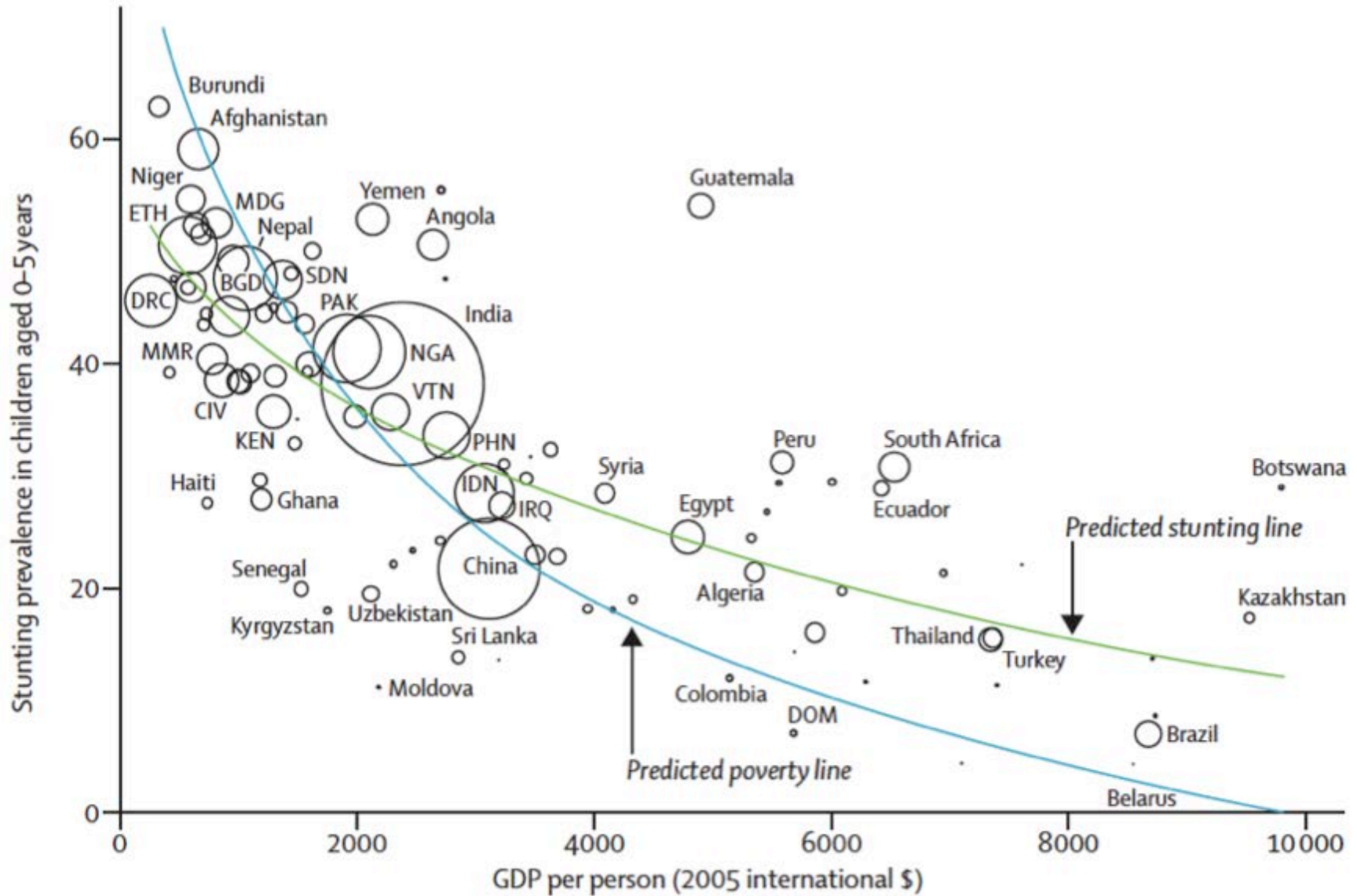
Source: <http://www.manutritionniste.com/>



A modern conference room with a large screen at the front. The screen displays the text "business as usual" in a bold, dark blue font. The room is furnished with several black office chairs around a dark conference table. Large windows are visible on the left and right sides of the room, providing natural light.

**business as usual**

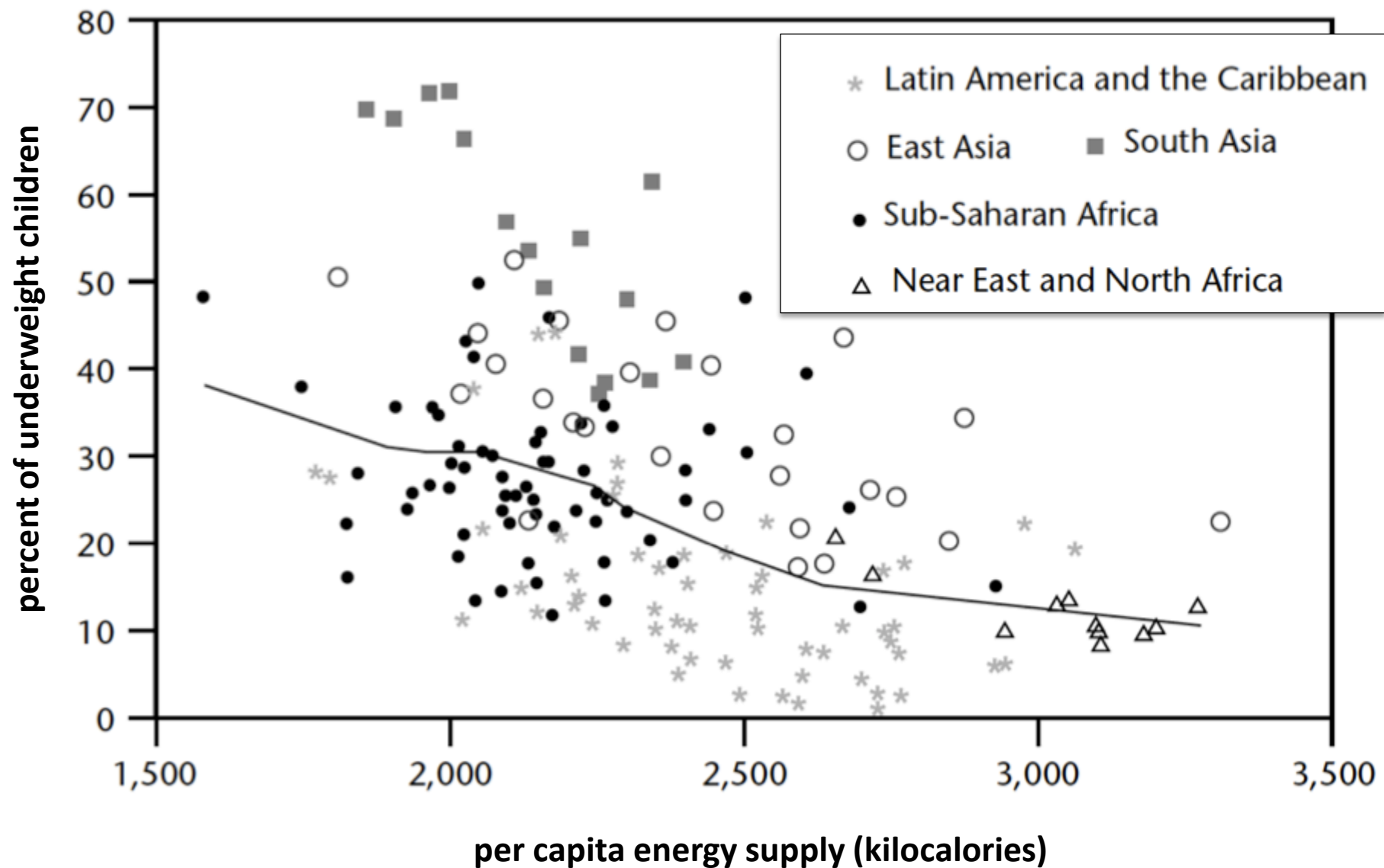
# PREVALENCE OF STUNTING IN CHILDREN AGED 0-5 Y AND GDP PER PERSON



Source: Ruel et al. (2013), Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?, Lancet



# PREVALENCE OF UNDERWEIGHT CHILDREN BY PER CAPITA DIETARY ENERGY SUPPLY, BY REGION, 1970-96

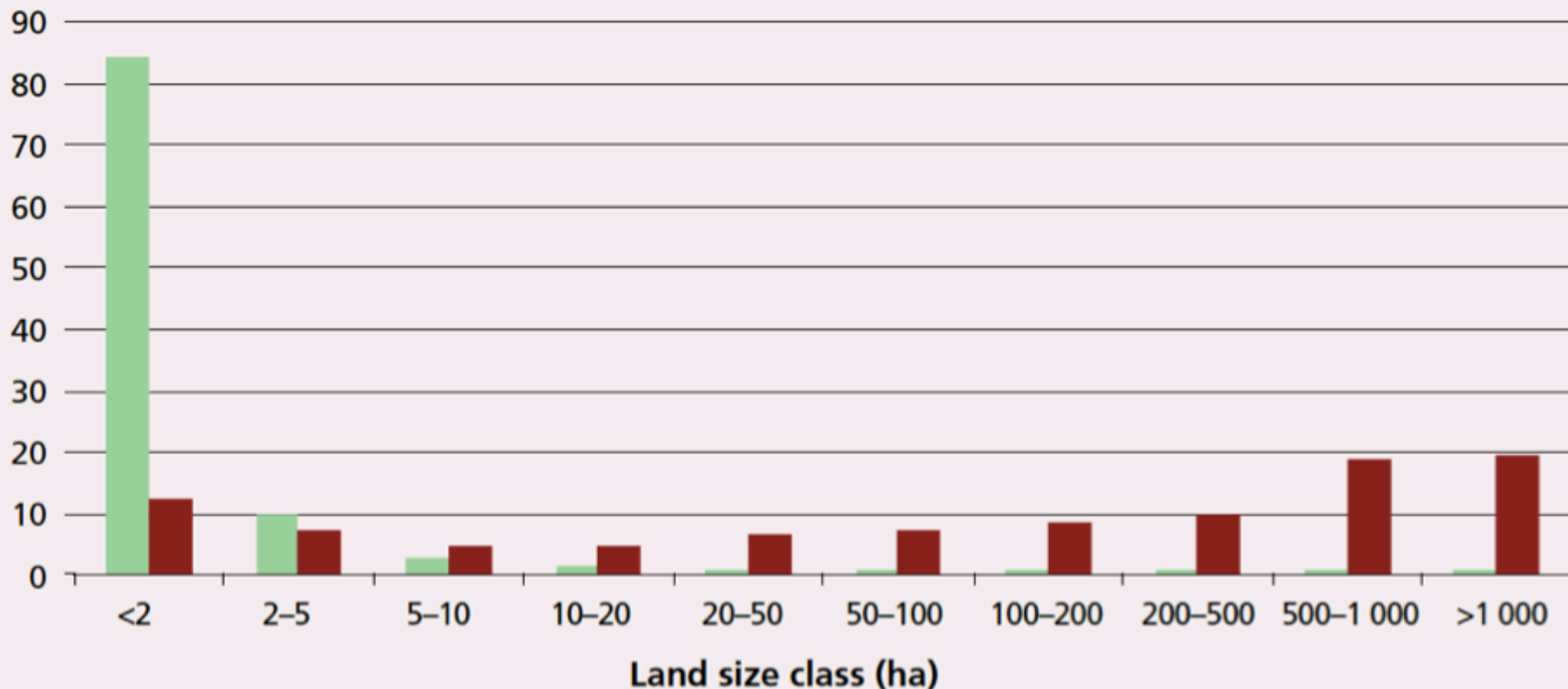


# the potential for food systems to make a difference



# DISTRIBUTION OF FARMS AND FARMLAND AREA WORLDWIDE, BY LAND SIZE CLASS

Percentage



Shares of agricultural holdings

Shares of farmland area





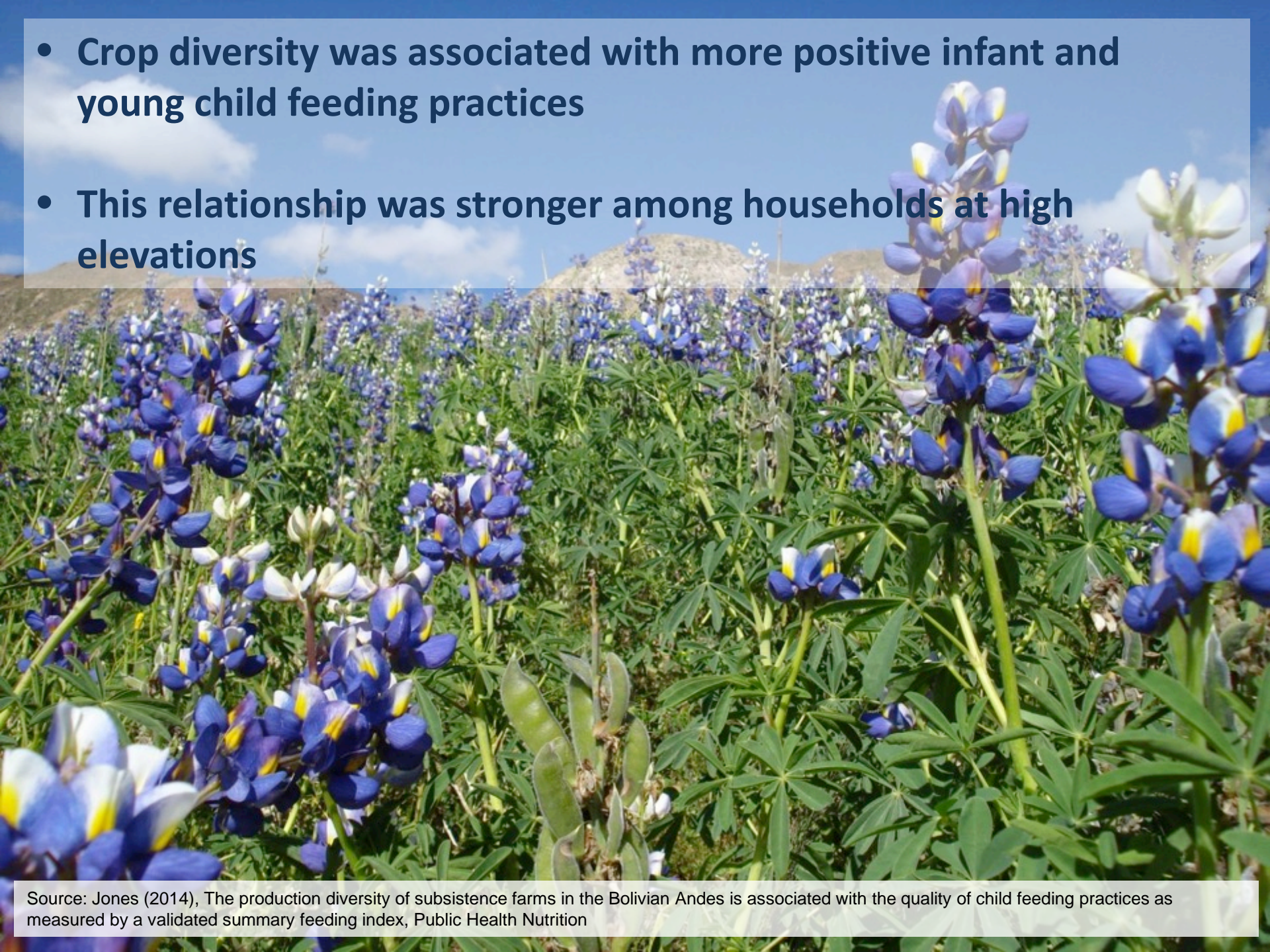








- **Crop diversity was associated with more positive infant and young child feeding practices**
- **This relationship was stronger among households at high elevations**



Source: Jones (2014), The production diversity of subsistence farms in the Bolivian Andes is associated with the quality of child feeding practices as measured by a validated summary feeding index, Public Health Nutrition

- Households with more diverse agricultural production in Malawi had more diverse diets
- Market-orientation of production, wealth, and gender played important roles in this relationship



Source: Jones et al. (2014) Farm production diversity is associated with greater household dietary diversity in Malawi: Findings from nationally representative data, Food Policy





**HarvestPlus**

Breeding Crops for Better Nutrition



Inputs  
into Food  
Production

Food  
Production

Food  
Storage  
and Home  
Processing

Industrial  
Food  
Processing

Distribution,  
Transport &  
Trade

Food  
Retailing,  
Marketing &  
Promotion

Food  
Preparation  
& Catering



Greg Elms/Getty Images

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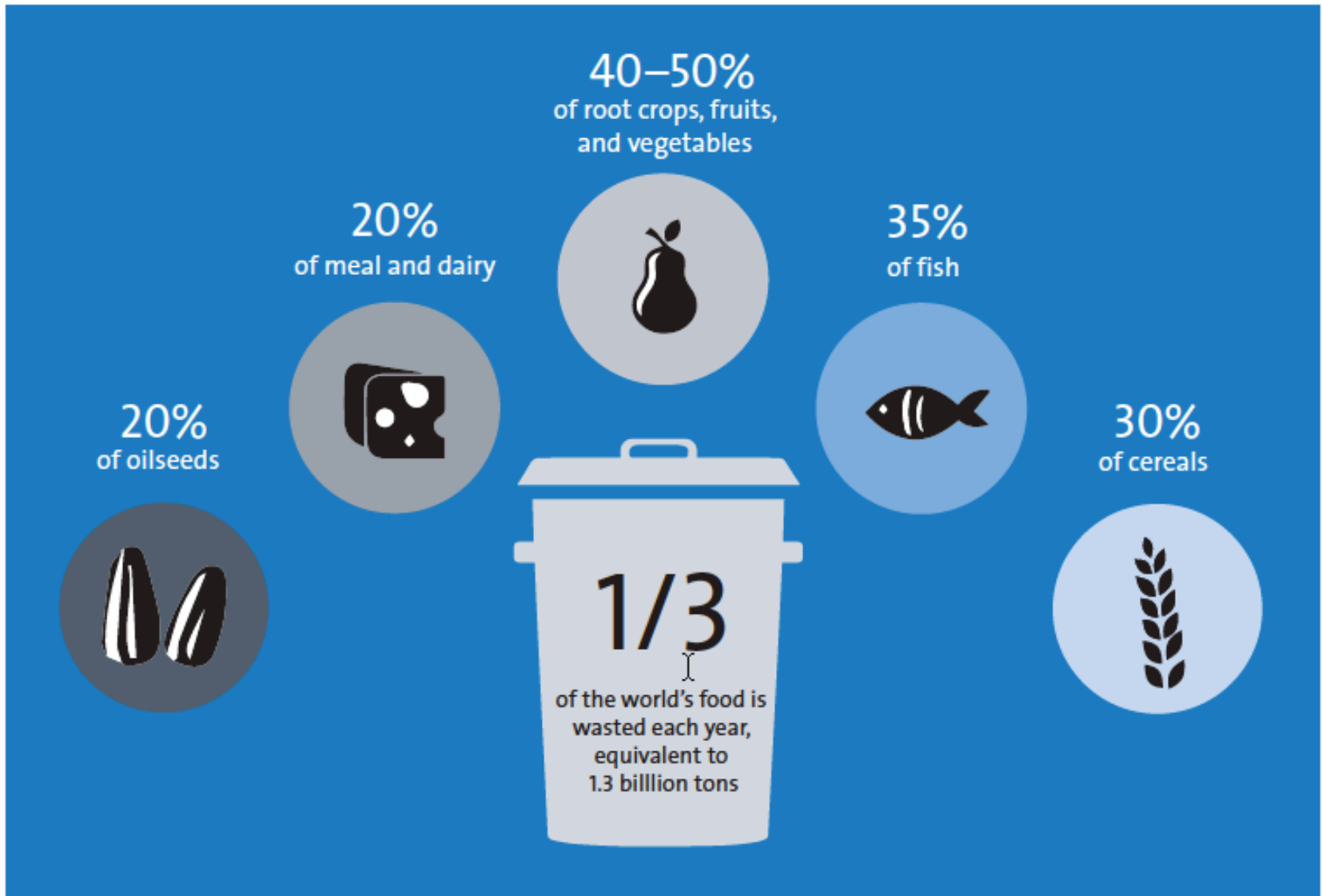
# IMPORTANCE OF VALUE CHAINS FOR NUTRITION

- Cost of farm commodities as ingredients in the U.S. is only a small share of the cost of retail food products (~20%); even less for sodas and prepared meals
- Healthfulness of “ingredients” produced by agriculture may matter less for nutrition as compared to how they are substituted, transformed, and marketed relative to each other throughout the supply chain





# ANNUAL GLOBAL FOOD WASTE



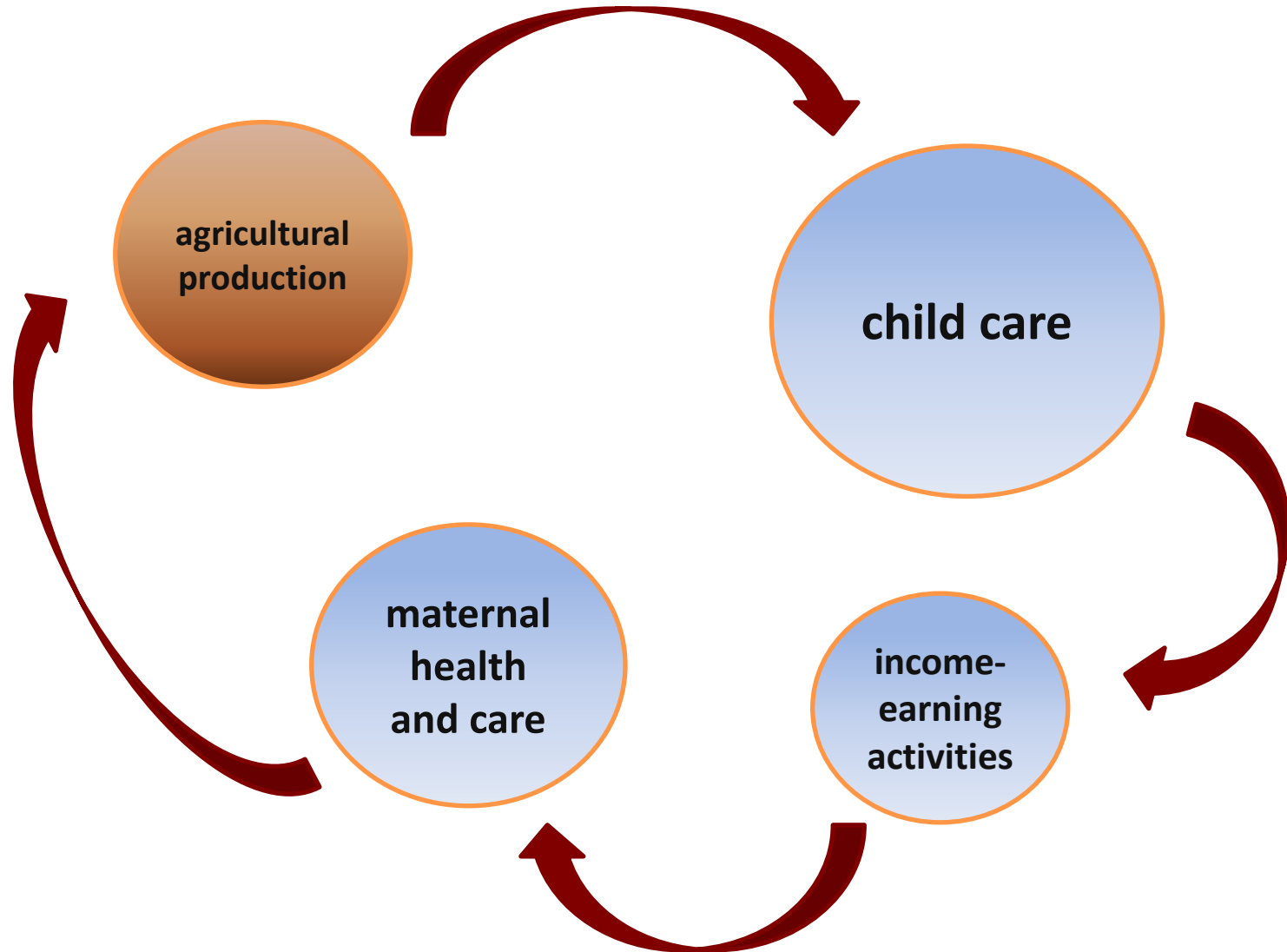




# FIVE DOMAINS OF EMPOWERMENT IN THE WOMEN'S EMPOWERMENT IN AGRICULTURE INDEX

Domain	Indicators	Weight
Production	Input in productive decisions	1/10
	Autonomy in production	1/10
Resources	Ownership of assets	1/15
	Purchase, sale, or transfer of assets	1/15
	Access to and decisions on credit	1/15
Income	Control over use of income	1/5
Leadership	Group member	1/10
	Speaking in public	1/10
Time	Workload	1/10
	Leisure	1/10

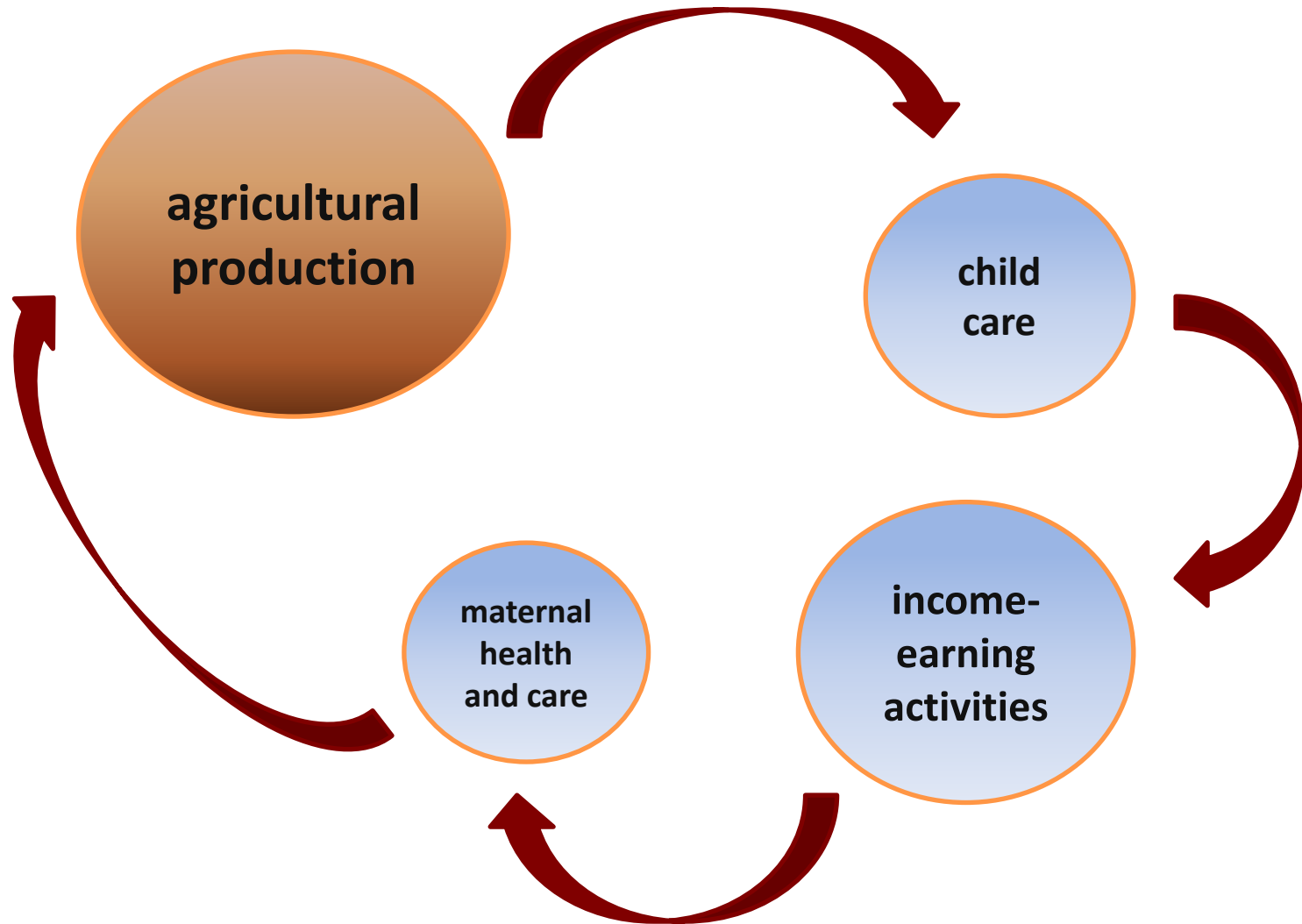
# A 'ZERO-SUM' GAME



*Source: McGuire and Popkin, 1989*



# A 'ZERO-SUM' GAME



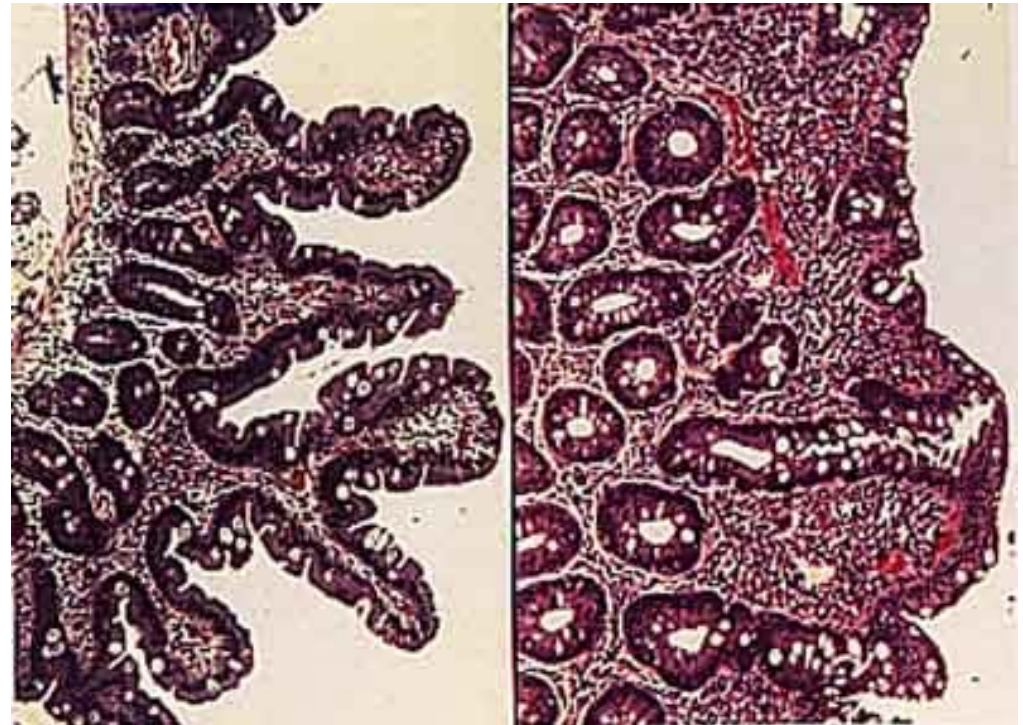
*Source: McGuire and Popkin, 1989*





# ENVIRONMENTAL ENTERIC DYSFUNCTION

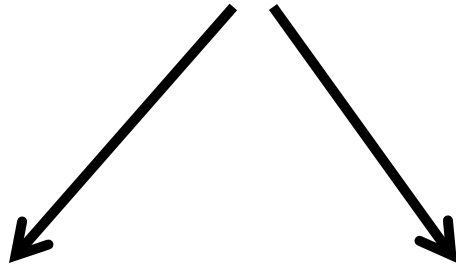
- Intestinal inflammation
- Shortened (“flat”) intestinal villi
- Crypt hyperplasia
- Microbial translocation (“leaky gut”)
- Systemic inflammation



# Chronic immune activation



pro-inflammatory  
cytokines



↑Hepcidin

↓Growth Factor  
(IGF-1)



Anemia



Stunting



Immunosenescence



Impaired response to  
vaccines and infections

# LEVERAGE POINTS FOR IMPROVING NUTRITION THROUGH FOOD SYSTEMS

1. Productivity and diversity of small-scale farms
2. Access to markets & food value chains
3. Social status and productive capacity of women
4. Livestock, infectious illness & environmental hygiene

# THANK YOU

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