

Dietary & Food Security Metrics for Climate Modeling: Spatial Scales for Different Populations

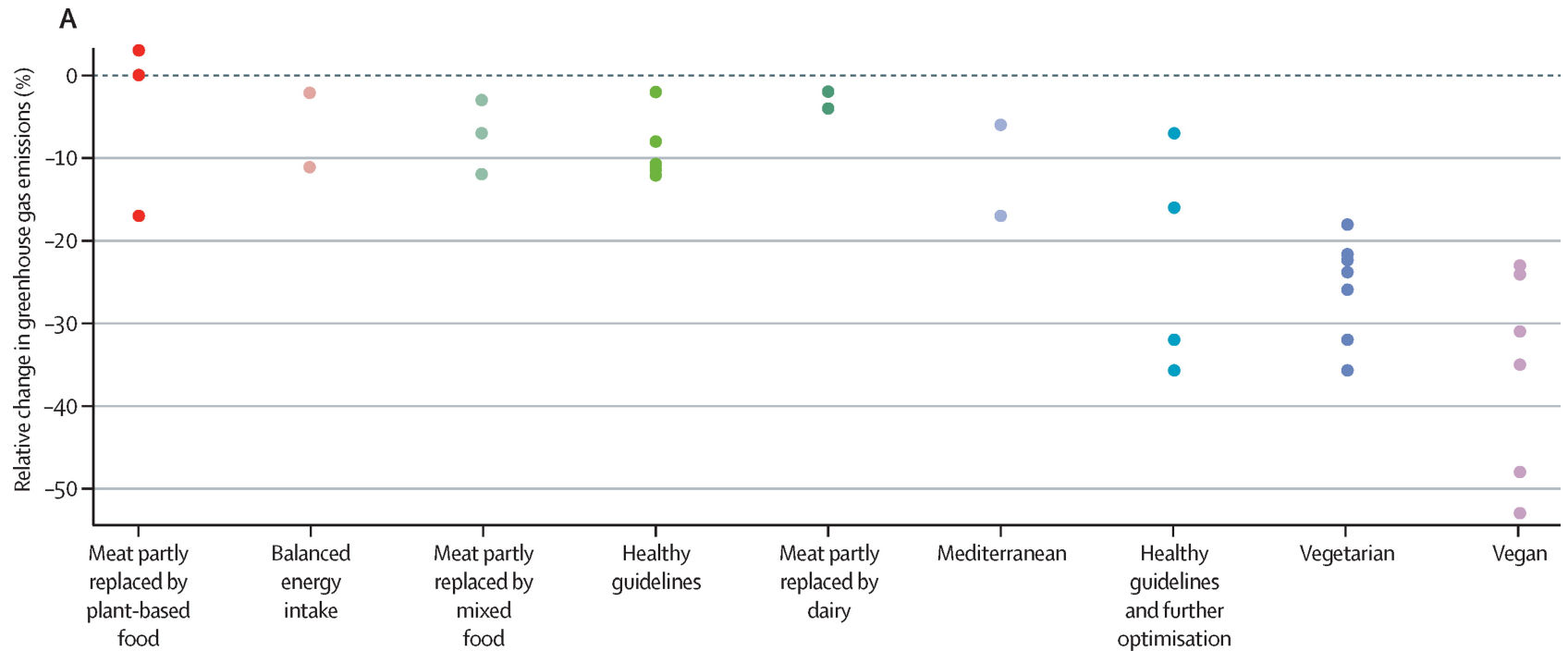
Jess Fanzo PhD

Bloomberg Distinguished Professor of
Ethics, and Global Food and Agriculture

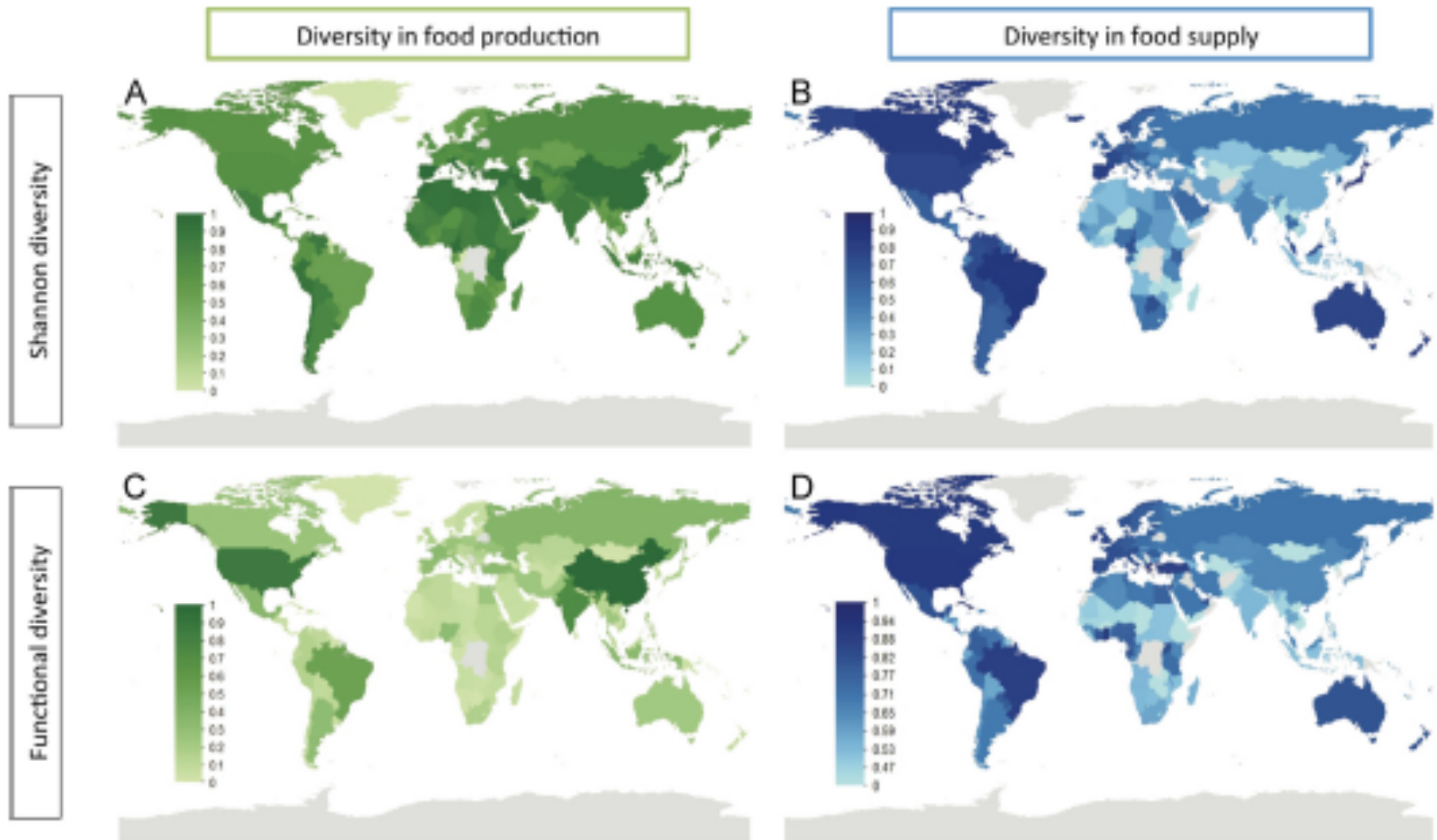


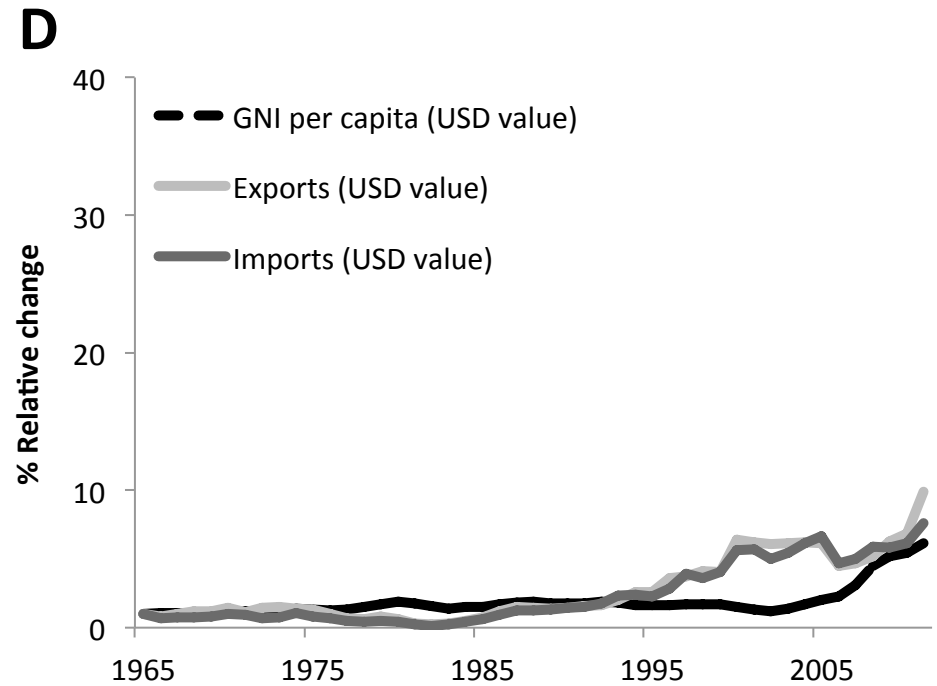
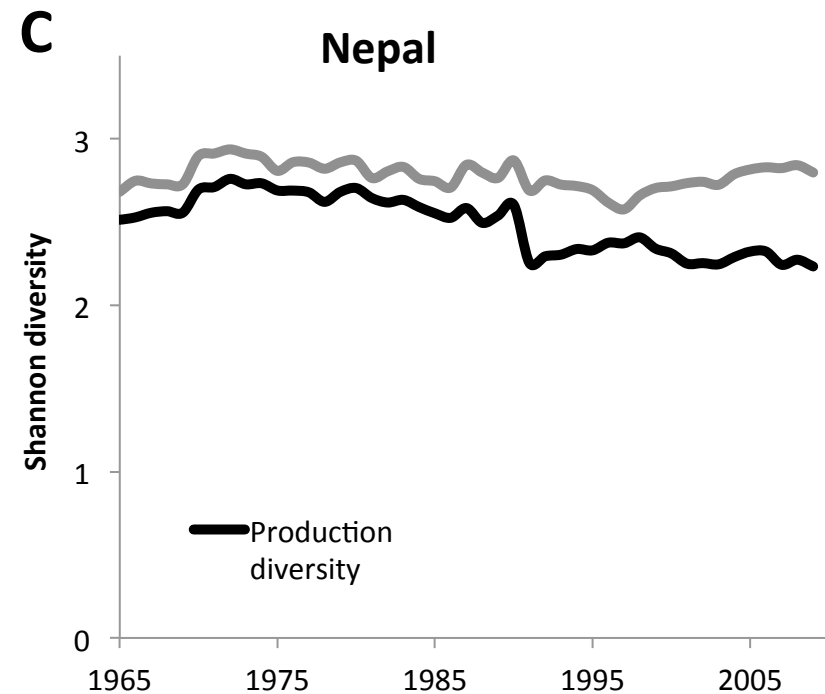
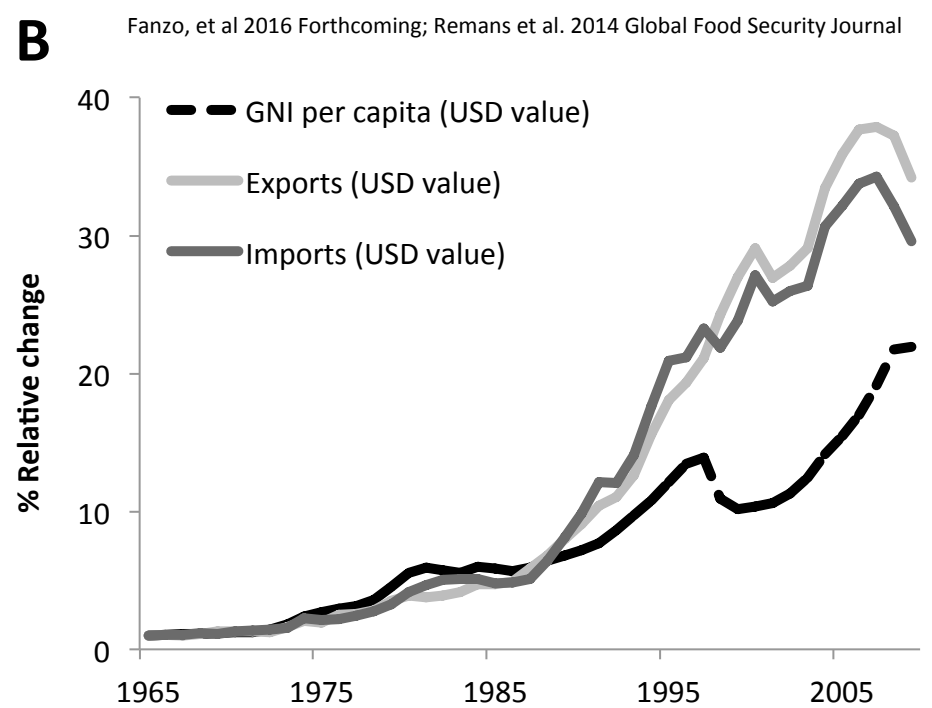
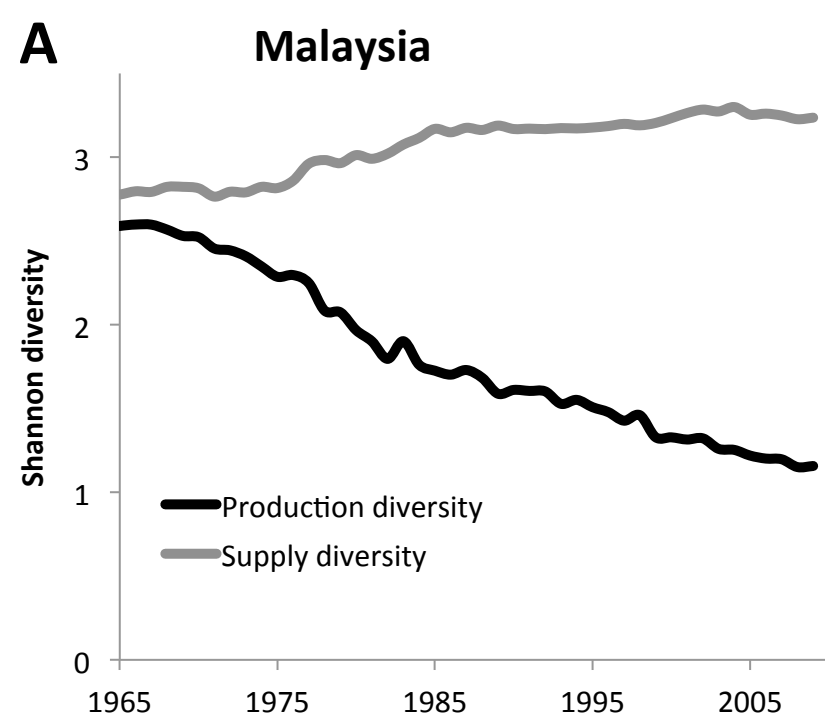
BERMAN INSTITUTE
of BIOETHICS

Effects of Diet Type on Climate Change but what about the other way around?

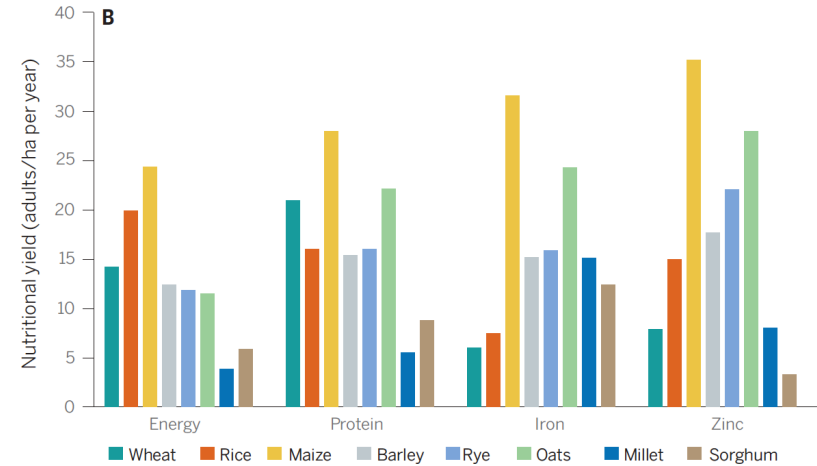
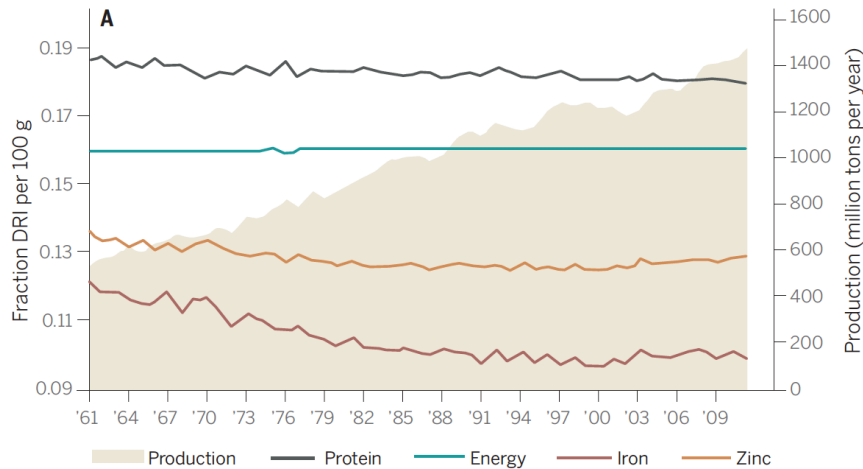


Production and Supply at the Global Scale: Species and Nutrition Diversity





Nutritional Content Declines in Global Cereal Supply with Increased Production



(A) Fraction of DRI provided by 100 g dry weight from a mix of eight cereals (barley, oats, maize, millet, rice, rye, sorghum, and wheat) from 1961 to 2011 for macronutrients (energy and protein) and micronutrients (iron and zinc). Values were calculated from production quantity (excluding cereals used for livestock feed) and nutritional composition for each cereal crop. DRI does not account for differences among cereals in bioavailability or refining, both of which would further reduce DRI values.

(B) Nutritional yields (number of adults who can obtain 100% of annual DRI from 1 ha per year) of eight cereals for energy, protein, iron, and zinc for global supply in 2013

Landscape and Farm Level Scale: Multi-functionality

Water ponds: used for washing, drinking and irrigation, malaria flies breeding areas

Livestock: products for consumption and sale, manure for fertilizer, close animal-human living relationship

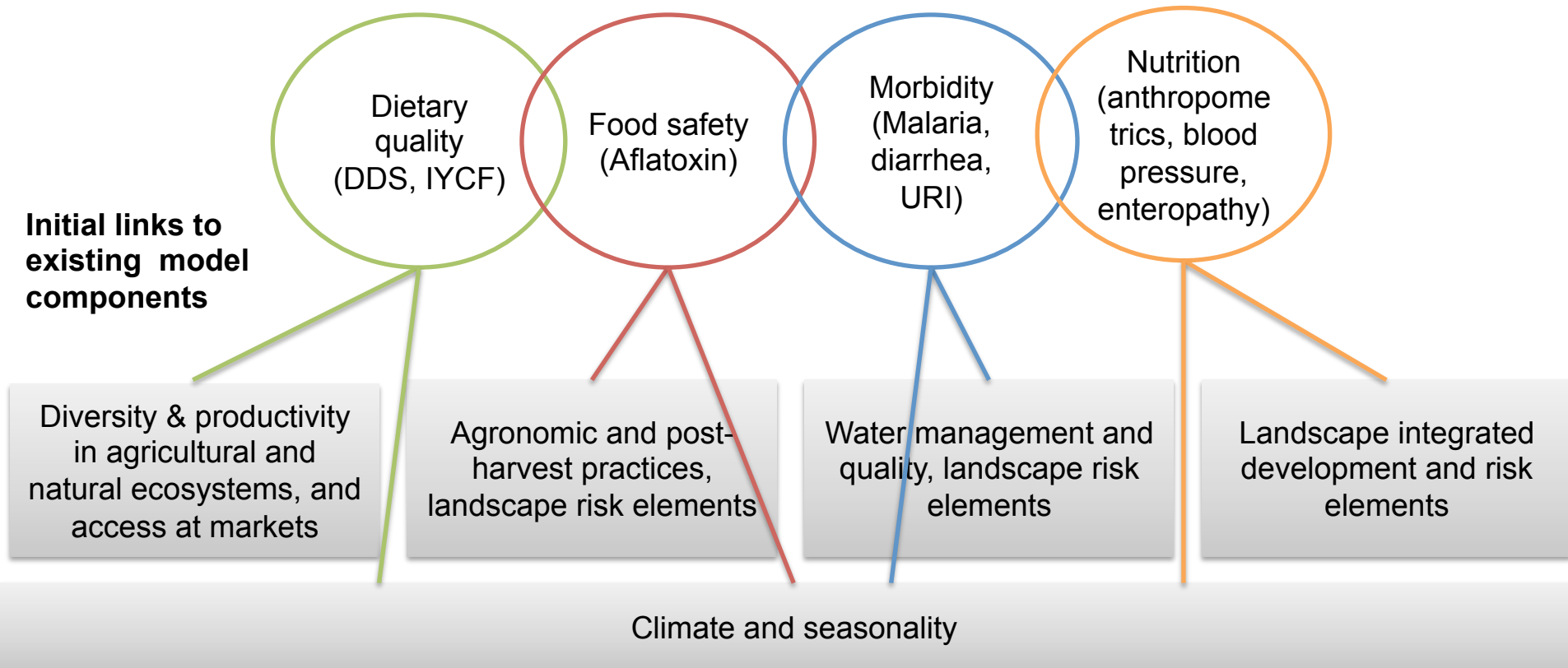


Crop and tree diversity: products for consumption and sale; pest control and pollination

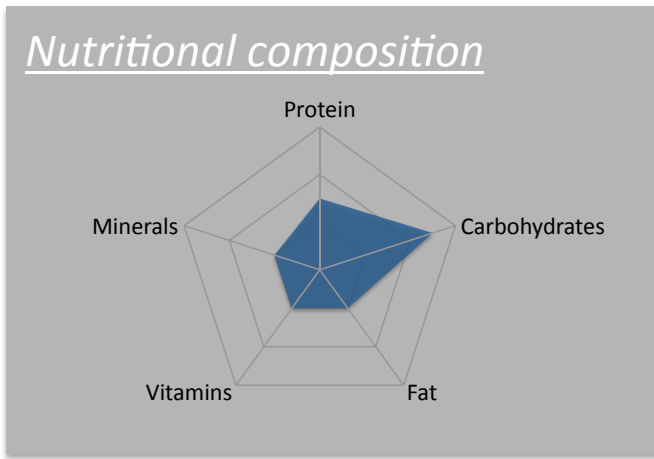
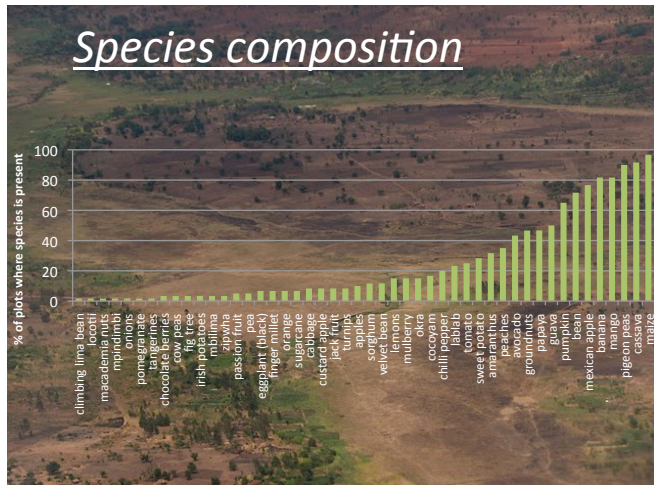
Vegetation along river: filtration of run-off, biodiversity habitat

Barotse Floodplain in Zambia

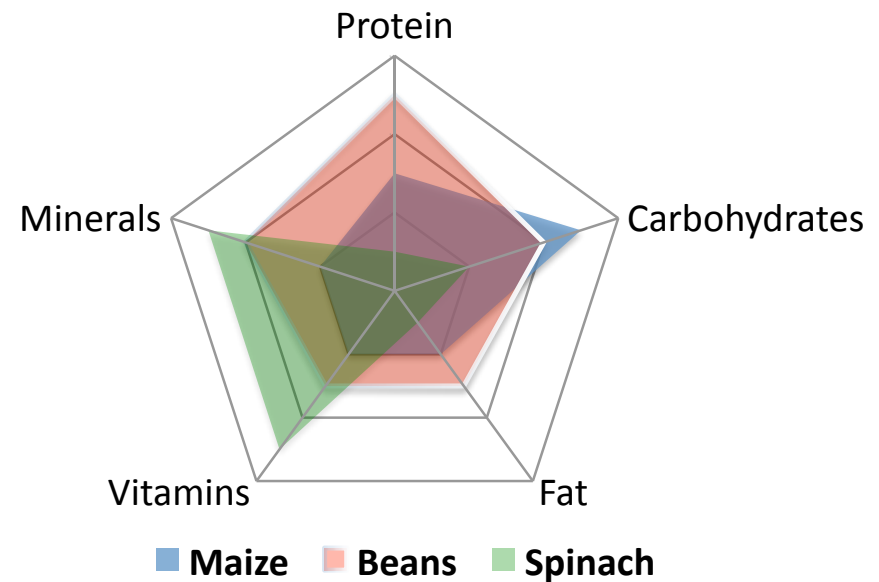
Inclusion of Human Health and Diet Indicators into Landscapes



Farm Scale: Nutritional Functional Diversity (NutFD)



Nutritional functional diversity



“Data from smallholder farm households in Indonesia, Kenya, Ethiopia, and Malawi were examined. Higher farm production diversity significantly contributes to dietary diversity in some situations, but not in all. Improving small farmers’ access to markets seems to be a more effective strategy to improve nutrition than promoting production diversity on subsistence farms.” Sibhatu et al PNAS 2015

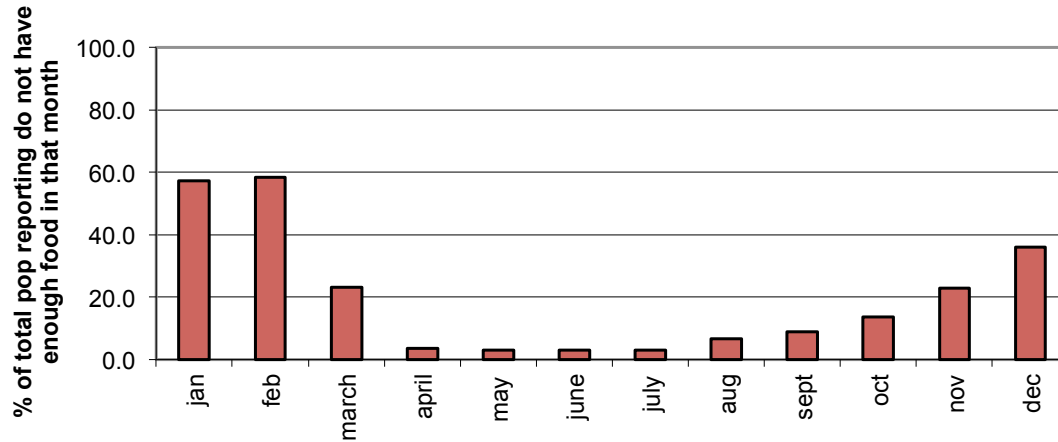
Household Scale: Food Availability & Access Diet Metrics

- Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access
- Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access
- Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access

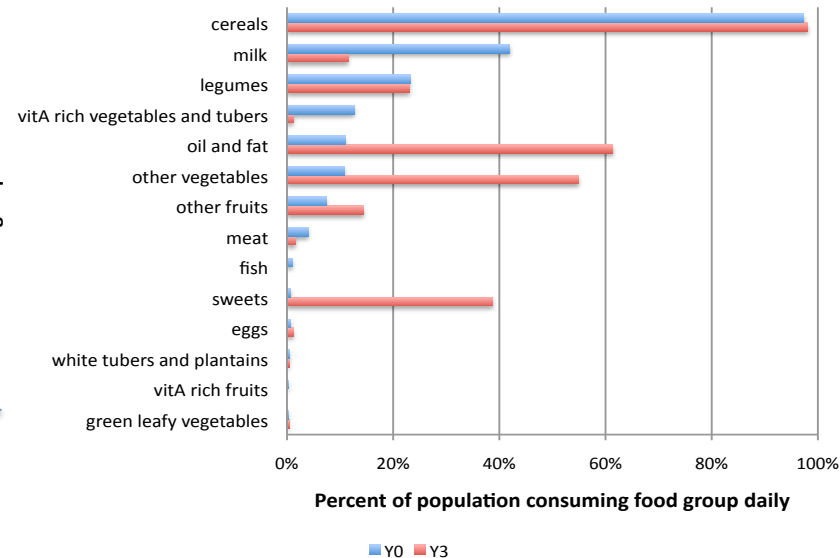
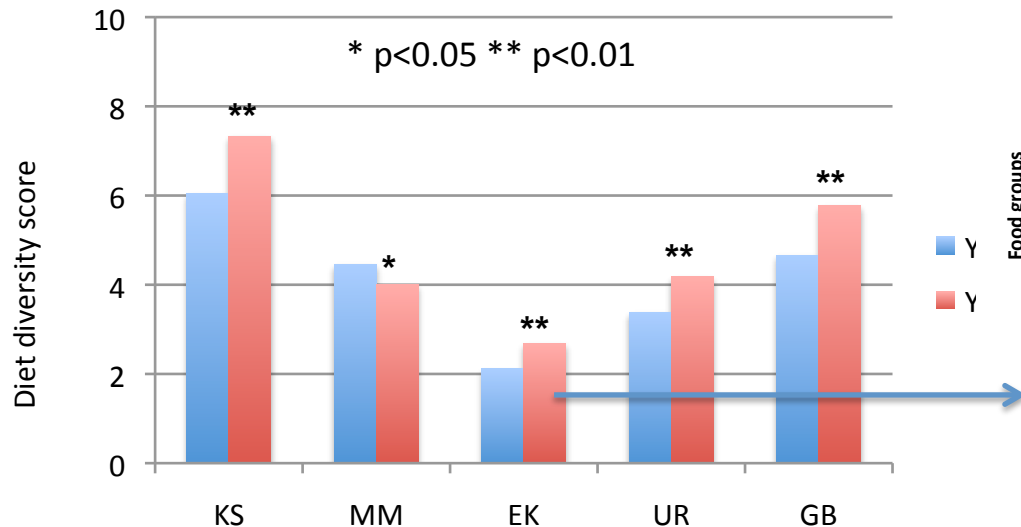
Increasingly collected in national level surveys (DHS etc)

Examples of Food Security & Diet Metrics

Months of Adequate Household Food Provisioning (MAHFP)



Household Dietary Diversity Score (HDDS¹)



Individual Scale: Diet Metrics

- Women's Dietary Diversity Score (FANTA, USAID, IFPRI)
- Infant's Minimum Acceptable Diet (WHO and UNICEF)
- Optifood (Linear programming model)
- Cost of Diets (Save the Children)

Not systematically collected at the national level

Women's Dietary Diversity: Key Vulnerable Population

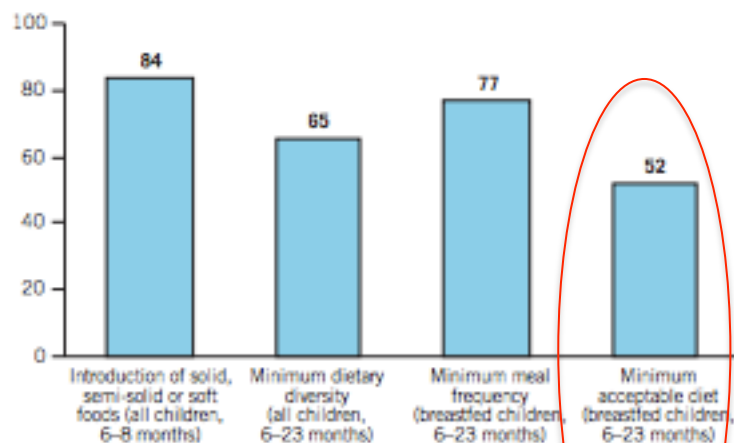
WDD food groups	Isiolo	Marsabit	Turkana
	% consuming		
Grains, roots and tubers	96	95	99
Legumes and nuts	44	71	56
Dairy products including milk, yogurt, cheese	80	97	38
Organ meat	2	2	0
Eggs	6	1	2
Flesh foods	9	16	10
Vitamin A dark green leafy vegetables	36	2	40
Other vitamin A rich fruits and vegetables	8	3	2
Other fruits and vegetables	56	41	23
Mean number of food groups	3.4	3.3	2.7

Minimum Acceptable Diet: First 1000 days

- This indicator is the percentage of children aged 6-23 months who receive a minimum acceptable diet
- The composite indicator the proportion of who had at least the minimum dietary diversity and the minimum meal frequency during the previous day

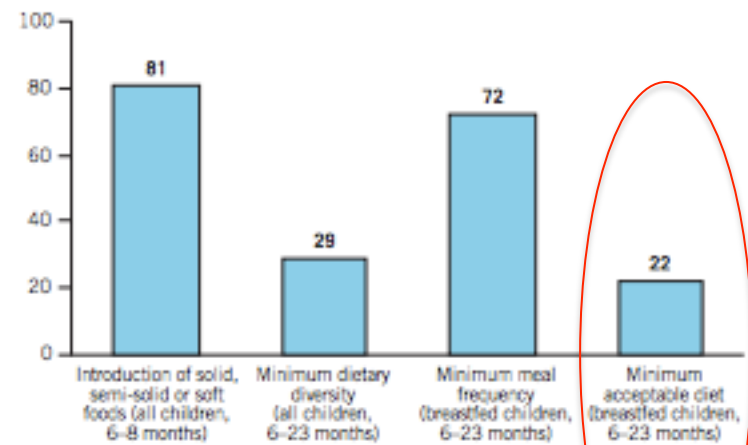
HONDURAS

Complementary feeding indicators (%)



CAMBODIA

Complementary feeding indicators (%)



Optifood Programming: Key Nutrient Gaps from Local Foods

	Isiolo			Marsabit			Turkana		
	6-8 mo	9-11 mo	12-23 mo	6-8 mo	9-11 mo	12-23 mo	6-8 mo	9-11 mo	12-23 mo
Folate									
Niacin									
Riboflavin									
Thiamine									
Vitamin A RE									
Vitamin B-12									
Vitamin B-6									
Vitamin C									
Calcium									
Iron									
Zinc									



Nutrient requirements could be met with local foods

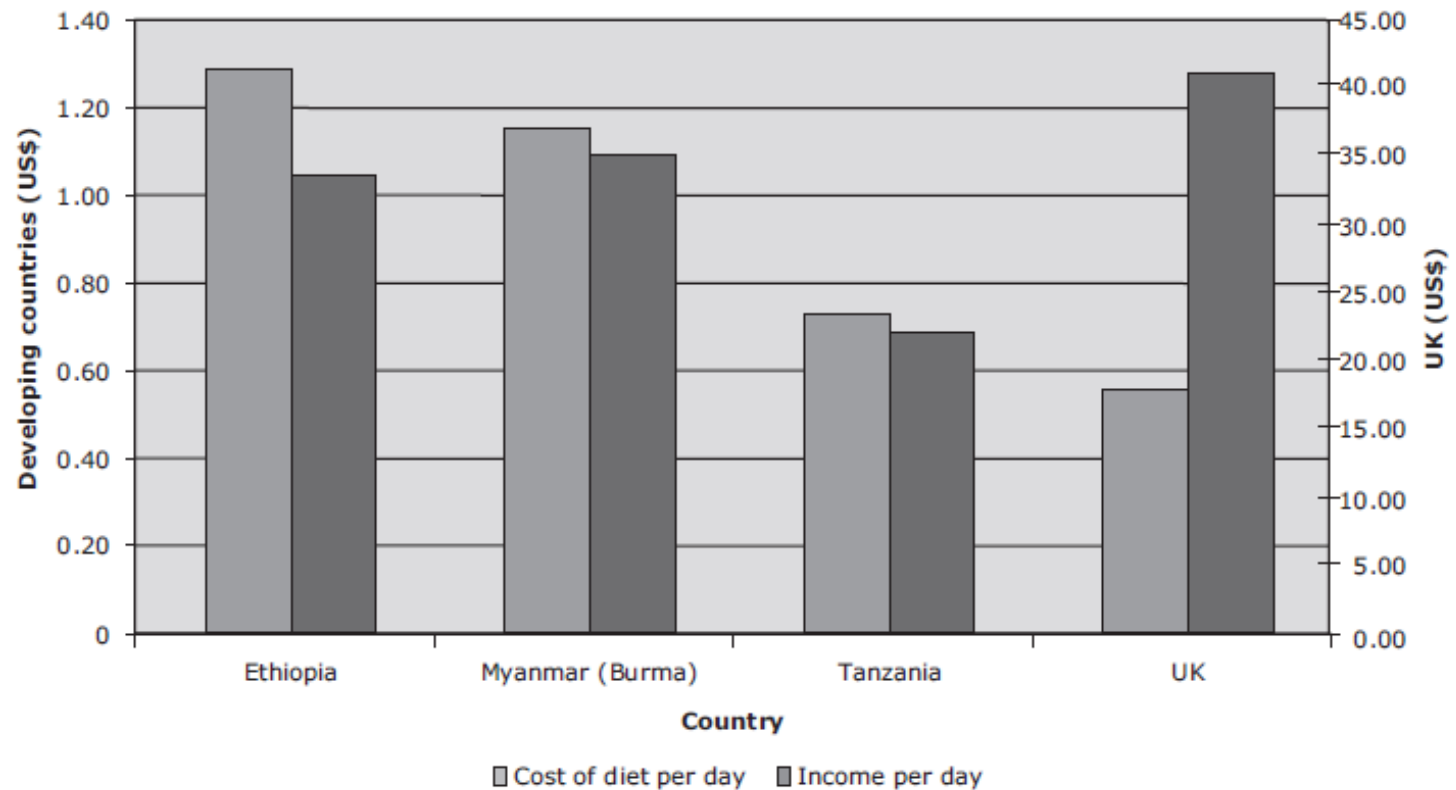


Nutrients requirements could be met but may require too many changes to food patterns or may affect other nutrient requirements



Nutrient requirements cannot be met with any combination of local foods

Cost of Diets: Income and Diet Links



Data Sources

The following websites contain survey data that can include information on anthropometry, biochemical status and dietary intake:

WHO NLiS

<http://apps.who.int/nutrition/landscape/report.aspx>

WHO child growth database

(<http://www.who.int/nutgrowthdb/en/>)

WHO BMI database

(<http://apps.who.int/bmi/index.jsp>)

Global Nutrition Report

<http://globalnutritionreport.org/>

Demographic and Health (DHS) surveys

(<http://www.measuredhs.com>)

Multiple Indicator Cluster (MICS) surveys

(http://www.unicef.org/statistics/index_24302.html)

WHO surveys

(<http://www.who.int/healthinfo/survey/en/>)

Global Disease Burden Project

<http://www.healthdata.org/gbd>

Lives Saved Tool

<http://www.jhsph.edu/research/centers-and-institutes/institute-for-international-programs/current-projects/lives-saved-tool/>

UNICEF ChildInfo

<http://data.unicef.org/>

UNICEF NutriDash

http://www.sightandlife.org/fileadmin/data/News/2015/2_Feb/UNICEF_Global_NutriDash_report_2013.pdf

Food balance sheets

(<http://faostat.fao.org/site/368/default.aspx#ancor>)

Functional Diversity Database

<https://sites.google.com/site/functionaldiversity/downloads>

FAO Stat

<http://faostat.fao.org/>

Nut Val

<http://www.nutval.net/>

USDA food composition tables

http://www.ars.usda.gov/main/site_main.htm?modecode=12-35-45-00

European food information resource

(<http://www.eurofir.net>)

International Network of Food Data Systems (INFOODS)

(<http://www.fao.org/infoods/en/>)

FAO/INFOODS e-Learning Course on Food Composition Data

(<http://www.fao.org/infoods/infoods/training/en/>)

IFPRI Global Hunger Index

<https://www.ifpri.org/topic/global-hunger-index>

Food and Nutrition Technical Assistance

<http://www.fantaproject.org/>

Cost of Diet

<http://www.heawebsite.org/home>

Thank you!

- AgMIP group for the invitation
- Roseline Remans, Cheryl Palm, Madeleine Thomson and Ruth DeFries at Columbia University
- Lawrence Haddad at IFPRI





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by

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Agenda for
Ethics and
Global Food
Security



2015

GLOBAL
NUTRITION
REPORT

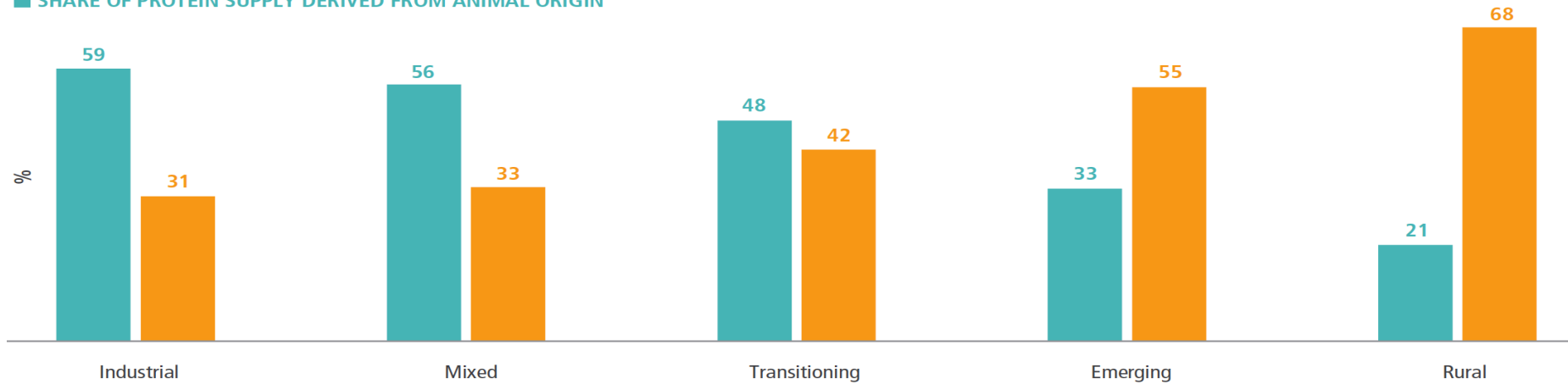
**ACTIONS AND
ACCOUNTABILITY**
TO ADVANCE NUTRITION
& SUSTAINABLE DEVELOPMENT

Other Considerations

Modeling Food Systems & Environmental Metrics at Global Scales

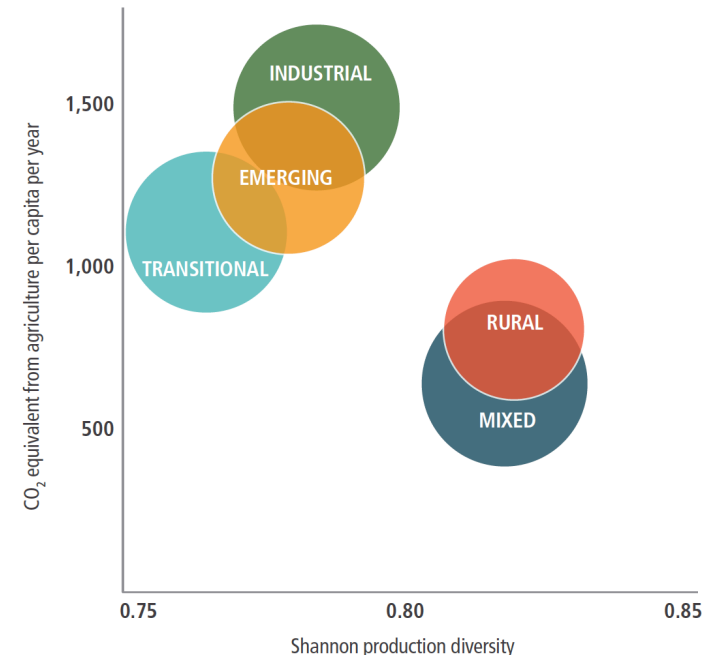
■ SHARE OF DIETARY DIVERSITY SUPPLIED BY STAPLES

■ SHARE OF PROTEIN SUPPLY DERIVED FROM ANIMAL ORIGIN



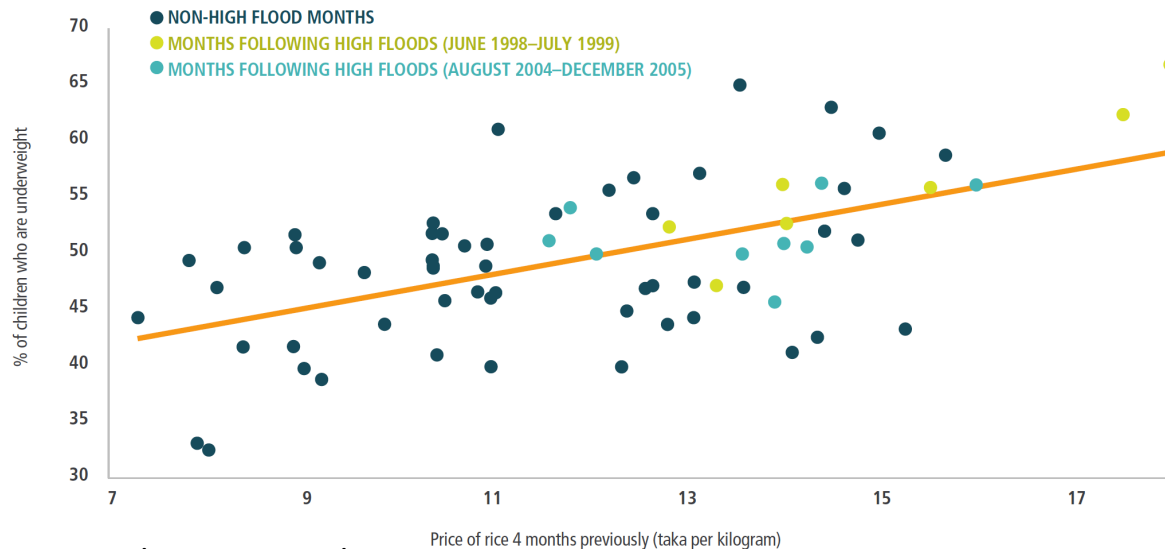
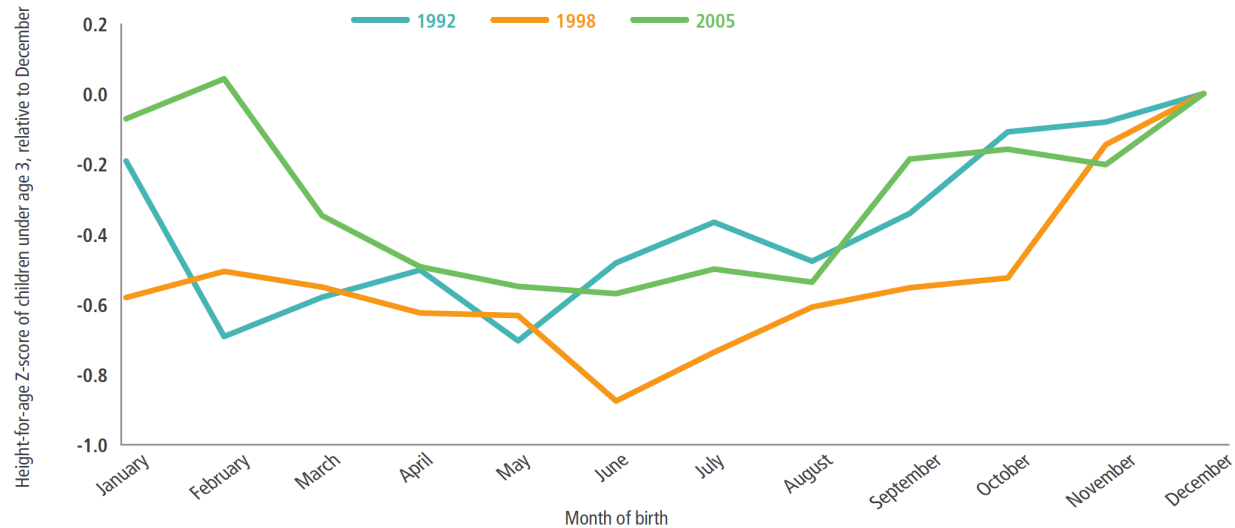
Food system typography based on: food affordability, food consumption diversity, nutrition and health, environmental sustainability

The Shannon production diversity index is a mathematical measure of species diversity (in this case, food item diversity) in a community (in this case, national food production or supply). The size of the bubbles represents the percentage of the population with access to improved drinking water.

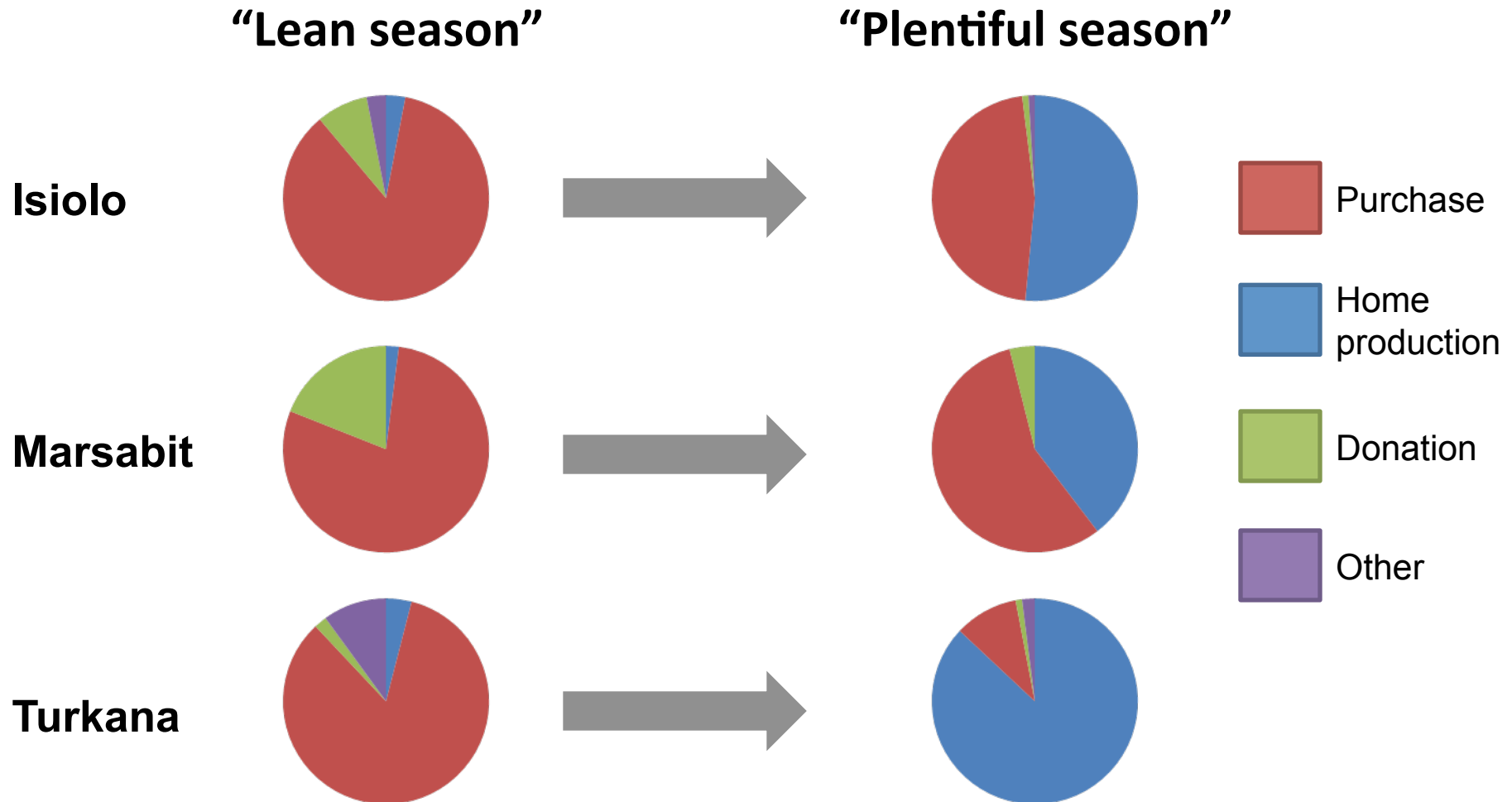


Nutritional Status and Seasonality

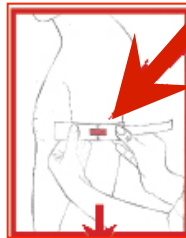
Extreme events including droughts and floods have significant impacts on year to year (or even month to month) variability of nutritional status



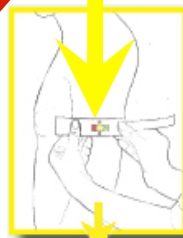
Food Acquisition Changes with Seasons



Linking Early Warning with Wasting



If the color is red (MUAC below 115 mm), then the child is severely malnourished.



If the color is yellow (MUAC between 115 mm and 125 mm), then the child is moderately malnourished.



Green color (MUAC above 125 mm) means that the child is healthy and not malnourished.

