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The U.S. Government's Global Hunger & Food Security Initiative

Global Food Security: What role for livestock?



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OUTLINE

- Food security – why study and understand?
- Long term impact of stunting on child and societal development
- Food security as a component of stunting - UNICEF framework
- SDG Target 2
- Threats to food security
- Example of the Sahel
- Role of livestock in food security
- Value of ASF for child growth and development
- Role of livestock in SDGs more generally



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FOOD SECURITY

“The condition in which all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”

- UN Committee on World Food Security



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DIMENSIONS OF FOOD SECURITY

Food security is multi-dimensional and must consider:

- **Food availability**

Sufficient quantities of food available on a consistent basis.

- **Food access**

Having sufficient resources to obtain appropriate foods for a nutritious diet.

- **Food utilization**

Appropriate use based on knowledge of basic nutrition and care, adequate water and sanitation, and feeding and care practices within the household.



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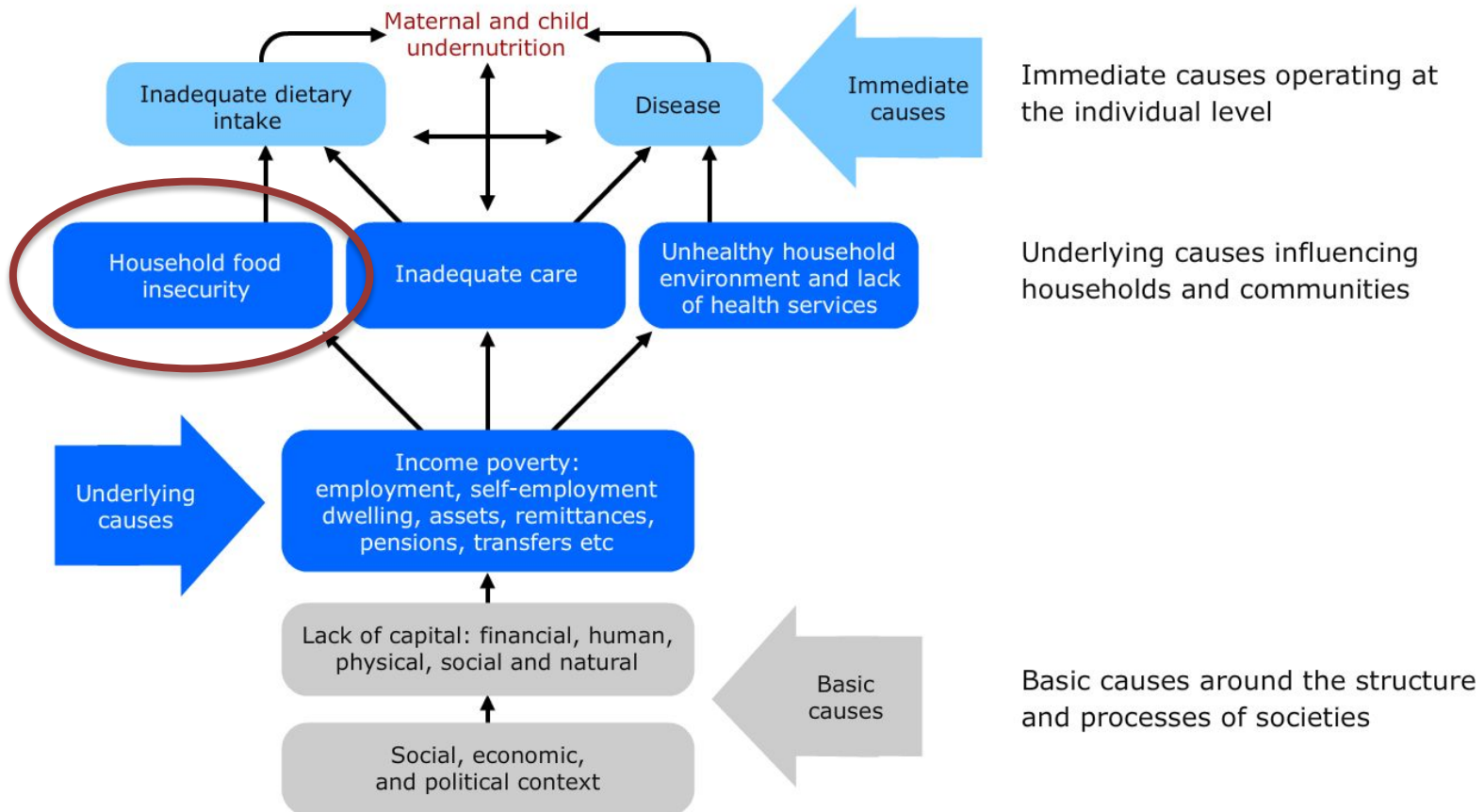
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FOOD SECURITY AND MALNUTRITION



modified by Black et al, Lancet 2008



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STUNTING (LOW HEIGHT FOR AGE)

- Best measure of **undernutrition**
- Kills **45%** of children;
155 million under fives affected
- Impairs **cognitive** and motor development
- Increases **incidence of chronic diseases** (diabetes, obesity, etc.)

(de Onis et al., 2013; Black et al., 2013,
UNICEF/WHO/World)



<http://miraclesinaction.org>



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THE **LIFETIME COSTS** OF STUNTING

CHILD MORTALITY

STUNTED CHILDREN ARE



THAN
CHILDREN
WHO ARE
NOT

IQ SCORES

STUNTING CAN
REDUCE IQ BY



INCOME

ADULTS WHO ARE
STUNTED EARN



ECONOMY

IN
COUNTRIES
STUNTING
CONTRIBUTES
TO **LOSSES**
IN GDP AS
HIGH AS



16%

www.concernusa.org

- Reduces the GDP of African / Asian countries by 10% on average (World Bank, 2017)
- Must be reduced by 40% by 2030 (World Health Assembly)



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IMPACTS OF STUNTING IN THE FIRST 1000 DAYS

- “Associated with nearly **irreversible brain damage**.” *Senior nutritionist, World Food Program.*
- “Condemns children to a **life time of underachievement and underperformance**”. *Roger Thurrow, Former Wall Street Journal Foreign Correspondent*
- “If our **children are stunted today, our economies will be stunted tomorrow**”. *Akinwumi Adesina, President, Africa Development Bank; 2017 World Food Prize Winner*



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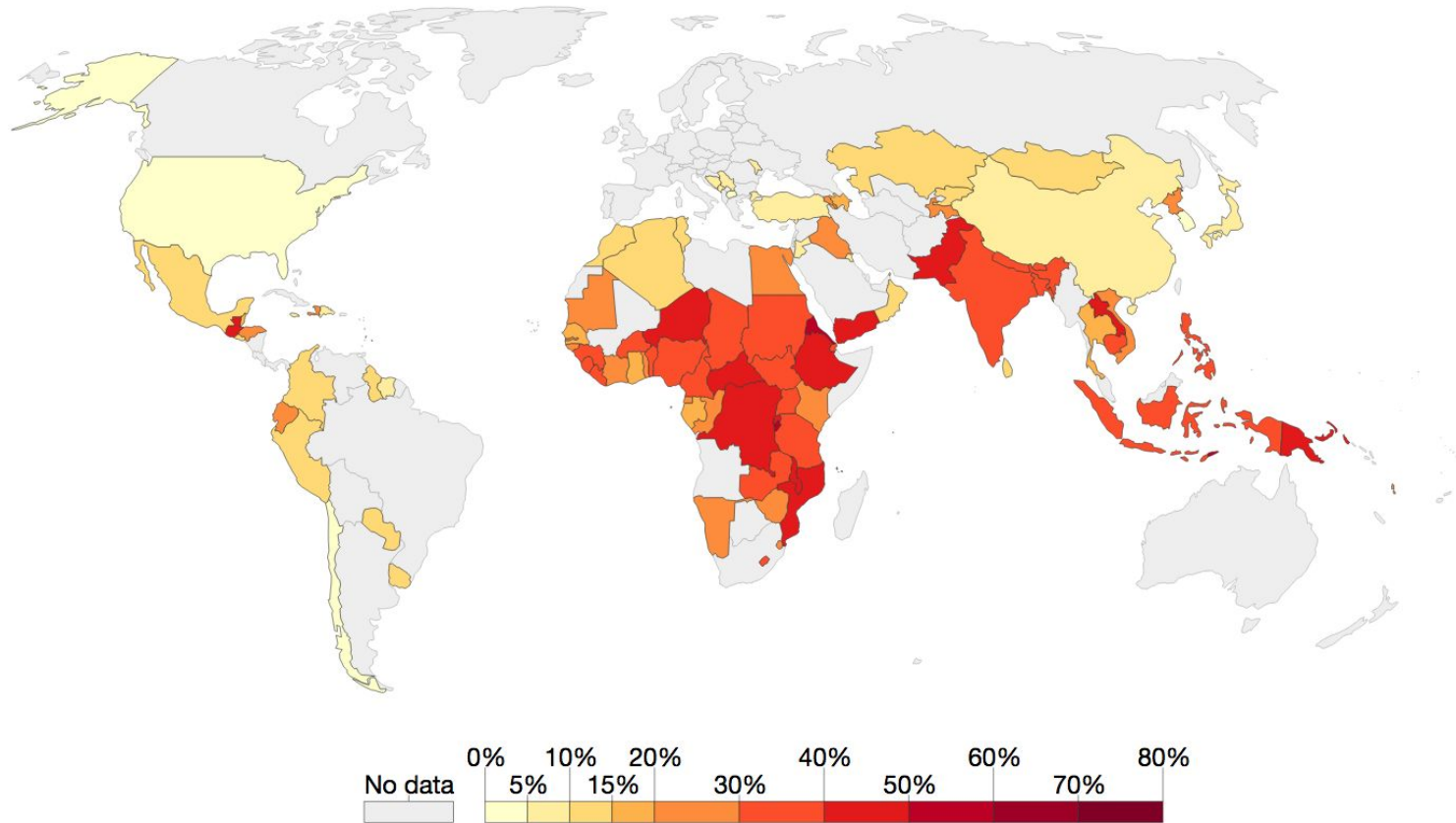
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GLOBAL PREVALENCE OF STUNTING (CU5)



Source: World Bank – WDI

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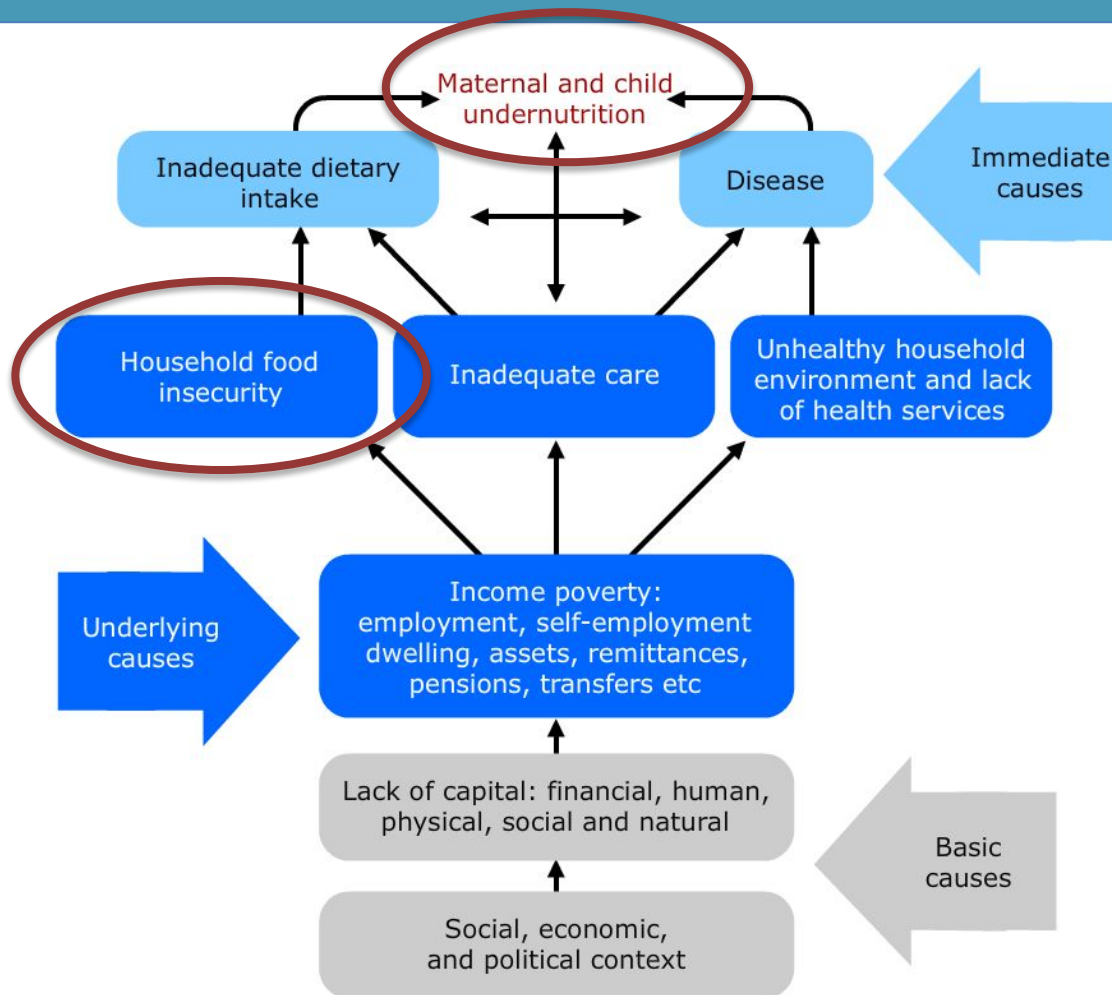


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modified by Black et al, Lancet 2008

- Threats to food security undermine efforts to improve maternal and child nutrition.
- Interventions that improve underlying causes of food insecurity, may improve nutritional outcomes as well.



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SUSTAINABLE DEVELOPMENT GOAL 2

- How to feed almost 800 million hungry today?
- How to feed a global population projected to rise from 7.3 billion to 9.5 billion by 2050?



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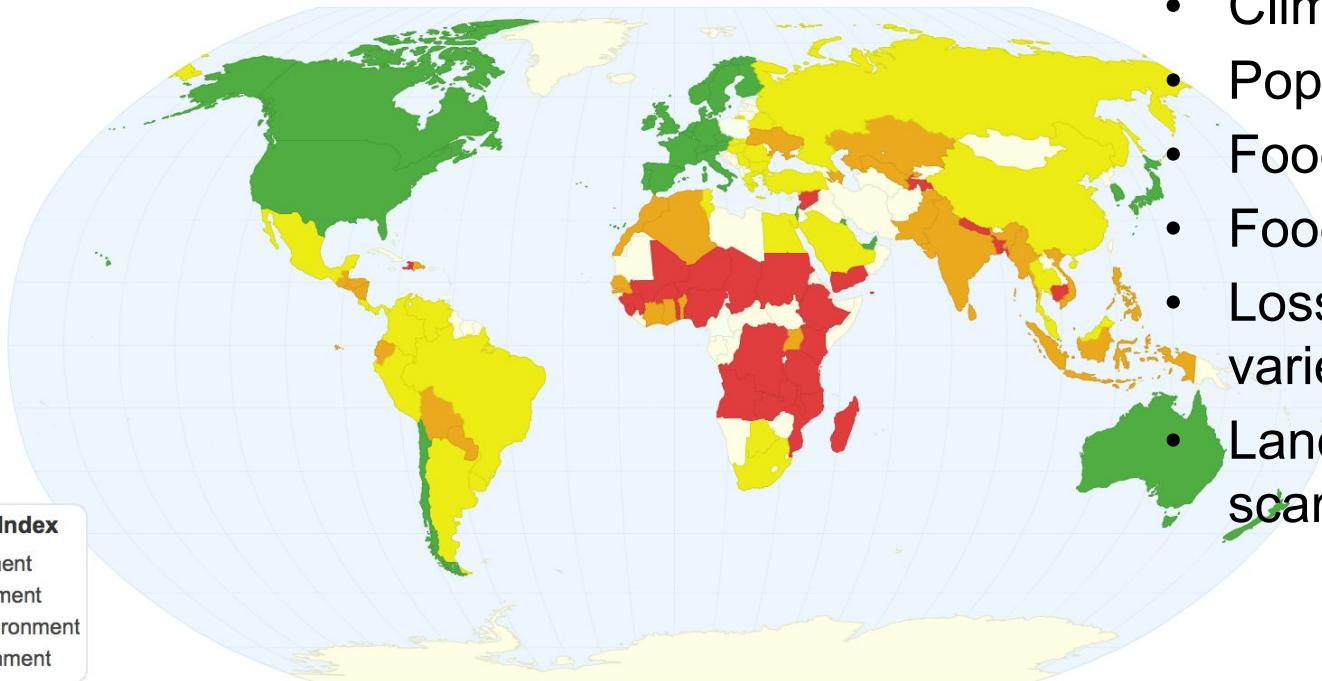


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THREATS TO FOOD SECURITY

Global Food Security Index



Food Security Index

- Best Environment
- Good Environment
- Moderate Environment
- Needs Environment

- Climate change
- Population growth
- Food production
- Food prices
- Loss of food varieties
- Land and water scarcity



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CLIMATE CHANGE IMPACT ON DIMENSIONS OF FOOD SECURITY

- **Food Availability**

Changes in rainfall patterns may reduce agricultural production, limiting the availability of food, both at the household and market level

- **Food Access**

Access to food for people who rely on market exchange of animal products for grains is constrained during climate related crisis (e.g. drought) through poor terms of trade

- **Food Utilization**

Increased demands on time required for activities of daily life (i.e., herding, water collection, fuel collection, etc.) reduce the time available for child feeding (breastfeeding and young child feeding)



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VULNERABILITY TO FOOD INSECURITY

- **Intersectional**

Gender

Class

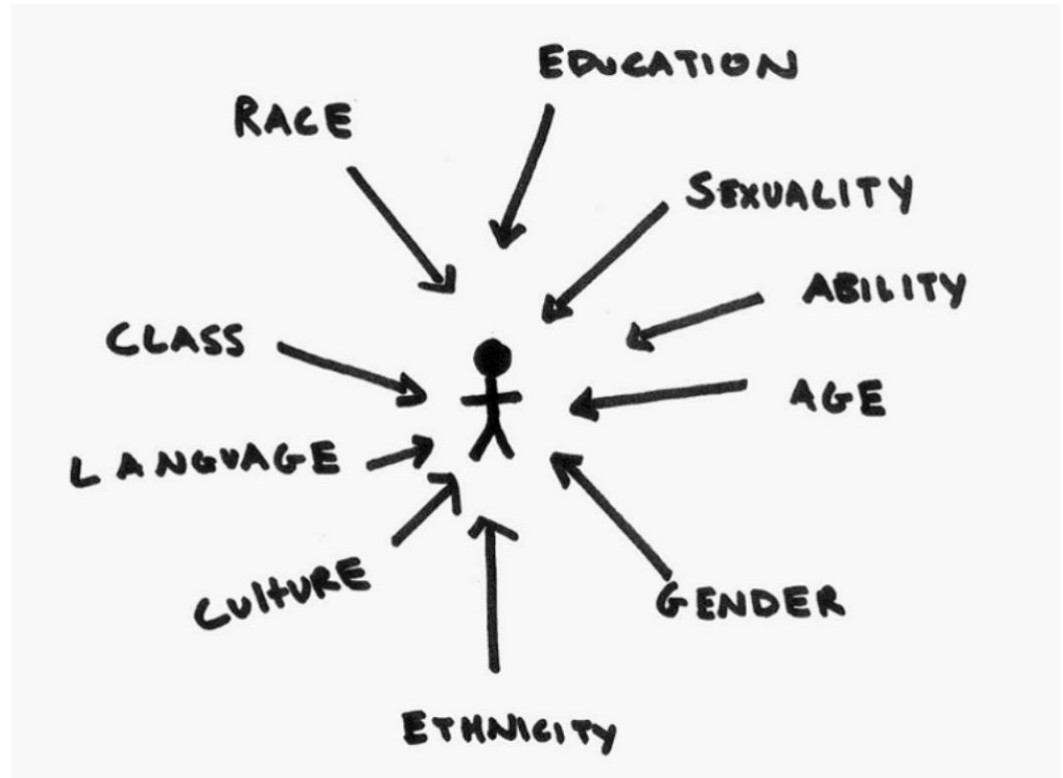
Ethnicity

Livelihood

Age

Caste

Geography



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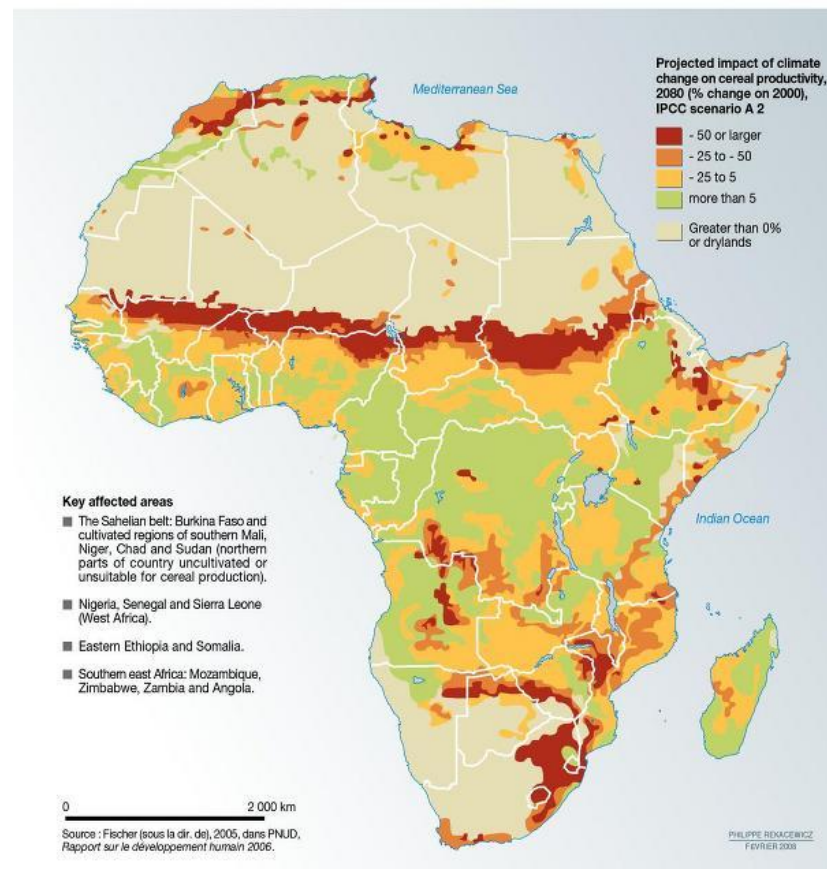
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VULNERABILITY TO FOOD INSECURITY: *Example: the Sahel*

- Climate change impacts + increasing population (Potts, et al., 2013)
- Ability to produce food (NPP) being outpaced by consumption (Abdi et al., 2014)
- Focus has been on agricultural improvements to increase yields, but production has not (cannot?) keep up.

Cereal productivity in Sub-Saharan Africa under a scenario of the IPCC that shows CO₂ atmospheric concentrations a level at 520-640 ppm by 2050



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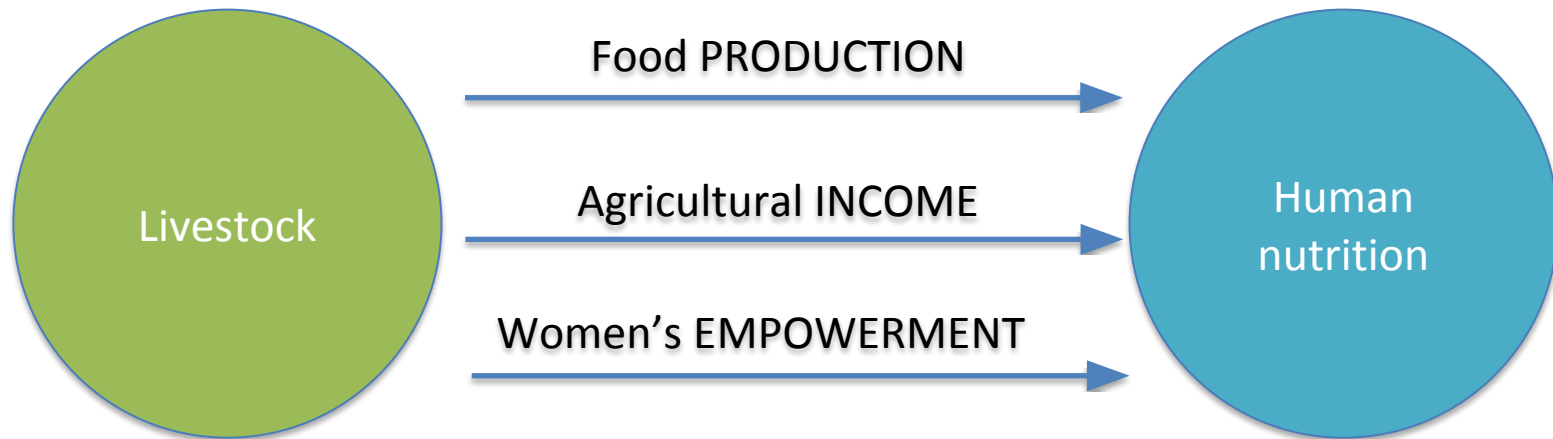
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LIVESTOCK AND NUTRITIONAL OUTCOMES



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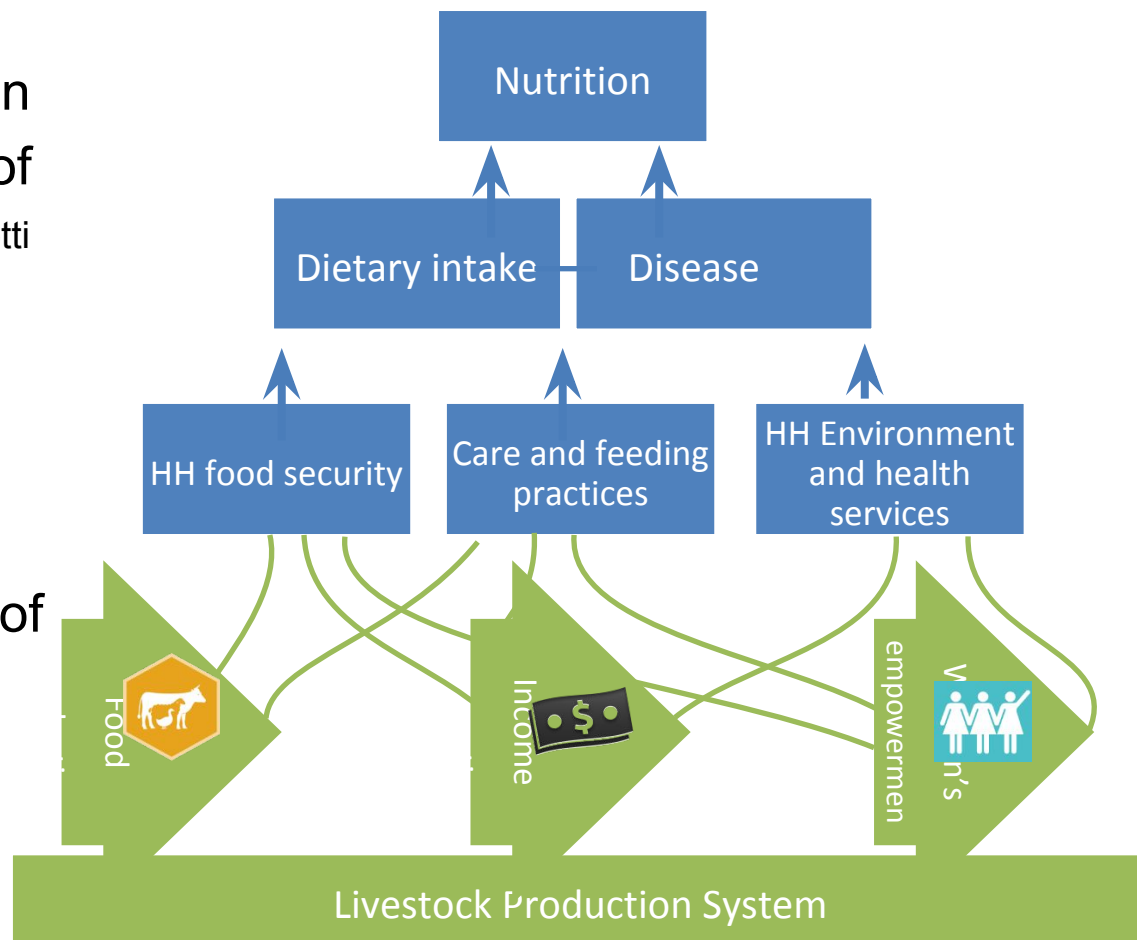
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LIVESTOCK AND FOOD SECURITY

Livestock to improve nutrition

- Household consumption of animal-source foods (Iannotti et al., 2017)
- Incomes to purchase enough food of nutritional quality (IFPRI, 2017)
- Resilience, livelihood diversification in the face of CC (Jones and Thornton, 2009)
- Women's control over assets and income (Jin and Iannotti, 2014)



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LIVESTOCK AND FOOD SECURITY

- Growth in agriculture yields greater reduction in nutritional stunting than other economic growth (Webb and Block, 2012).
- Significantly food and nutrition insecure households are those who rely on agriculture, including livestock, for their livelihood (World Bank 2007; World Bank 2013).
- Livestock holders are more likely than counterparts to consume Animal-Source Foods (FAO, 2009).



IMPORTANCE OF ANIMAL-SOURCE FOODS

Best source of high-quality, nutrient-rich foods for children aged 6 to 23 months (WHO, 2017)

ASF contain important bioavailable nutrients:

- **Ideal protein** – contains all essential amino acids
- **The four most deficient micronutrients globally**
Iron, zinc, iodine and vitamin A
- **Other nutrients** – Calcium, choline, EPA, DHA, vitamins D₃, B₁₂ and B₂, etc.





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MICRONUTRIENTS IN ASF

Nutrient	Source	Consequences of deficiency
Calcium	Dairy products	Nutritional rickets
Zinc	Meats	Dermatitis, diarrhoea, growth faltering and stunting, impaired immune function and increased risk of infections
Iron	Meats	Children: impaired growth and cognitive development and reduced immune function Adults: lowered work capacity
Vitamin A	Dairy products, liver, egg-yolk	Night blindness, corneal ulceration, loss of vision, growth faltering, increased risk of infectious disease, morbidity and mortality
Vitamin B12	ASFs are only source	Anaemia, disorders of central nervous system
Vitamin B2 (riboflavin)	Dairy products, meats, eggs, organs	Skin lesions, angular stomatitis, glossitis, cheilosis
Iodine	Dairy products, eggs	Mental retardation, low IQ, stunting
DHA, EPA	Fish, eggs	Rough, scaly skin and dermatitis, increased coronary heart disease risk

(FAO, 2016)



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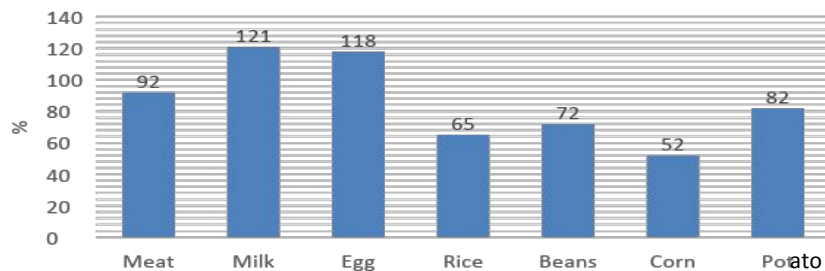


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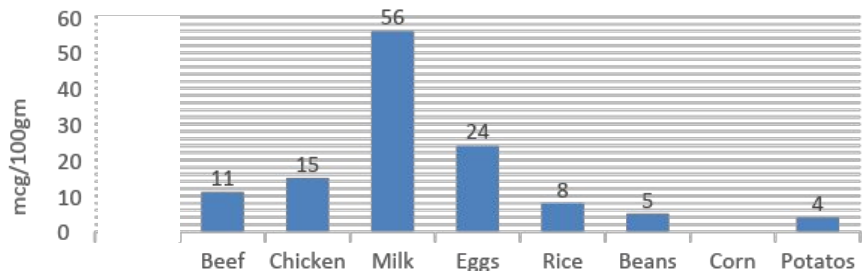
NUTRIENTS BY FOOD SOURCE

Protein biological value



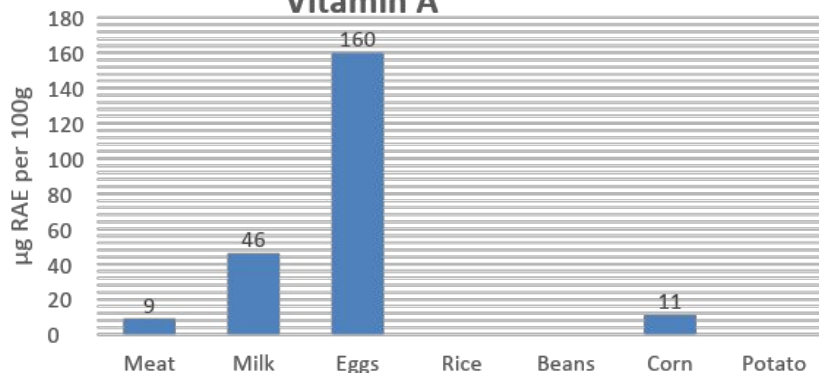
<http://www.food-info.net/uk/protein/bv.htm>

Iodine



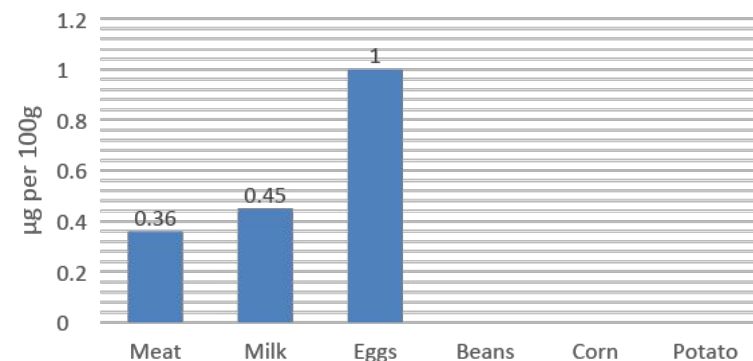
Pennington et al. Young et al., 1995

Vitamin A



USDA, ARS

Vitamin B12



Dror and Allen (2011) Neumann et al. (2002)



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LULUN EGG PROJECT, ECUADOR

(Ianotti, 2017)

- Giving one egg per day to 6-9 month olds in Ecuador for six months
- Reduced stunting (low height or length for age) by **47%**
- Reduced wasting (low weight for age) by **74%**



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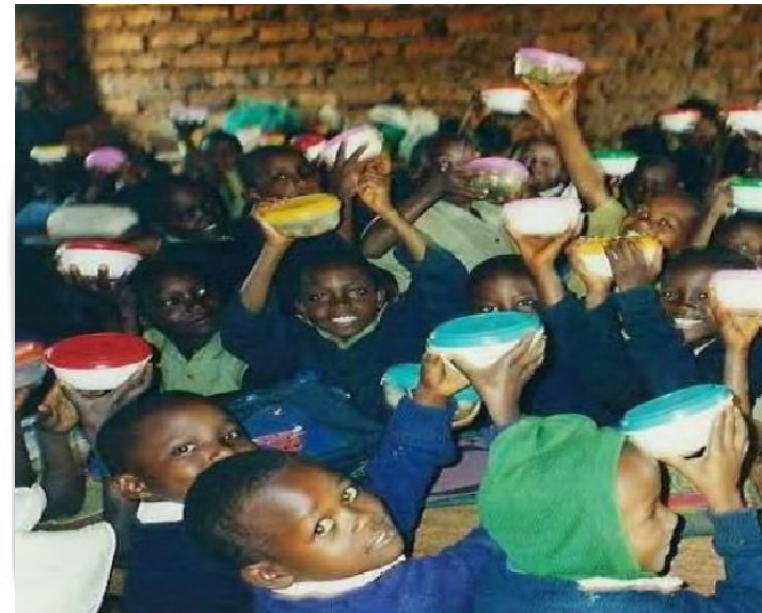
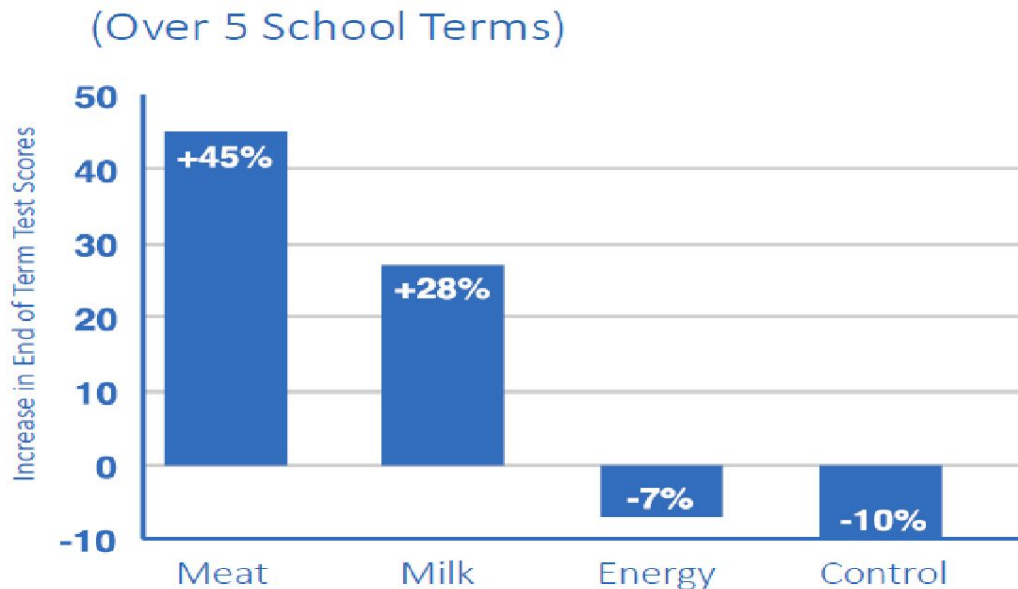
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ASF SUPPLEMENTATION EFFECTS ON SCHOOL TEST SCORES



Adapted from Weldon, 2016; Hullet et al., 2014



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ASF EFFECTS ON SCHOOL TEST SCORES

Meat group

- Highest Raven scores
- Higher Vit. B12 status
- More physically active
- More Arm muscle mass
- More leadership and initiative
- Higher test scores
- More playful

Milk group

- Improved growth
- Higher test scores
- Higher B12 status

Adapted from Demment, 2013



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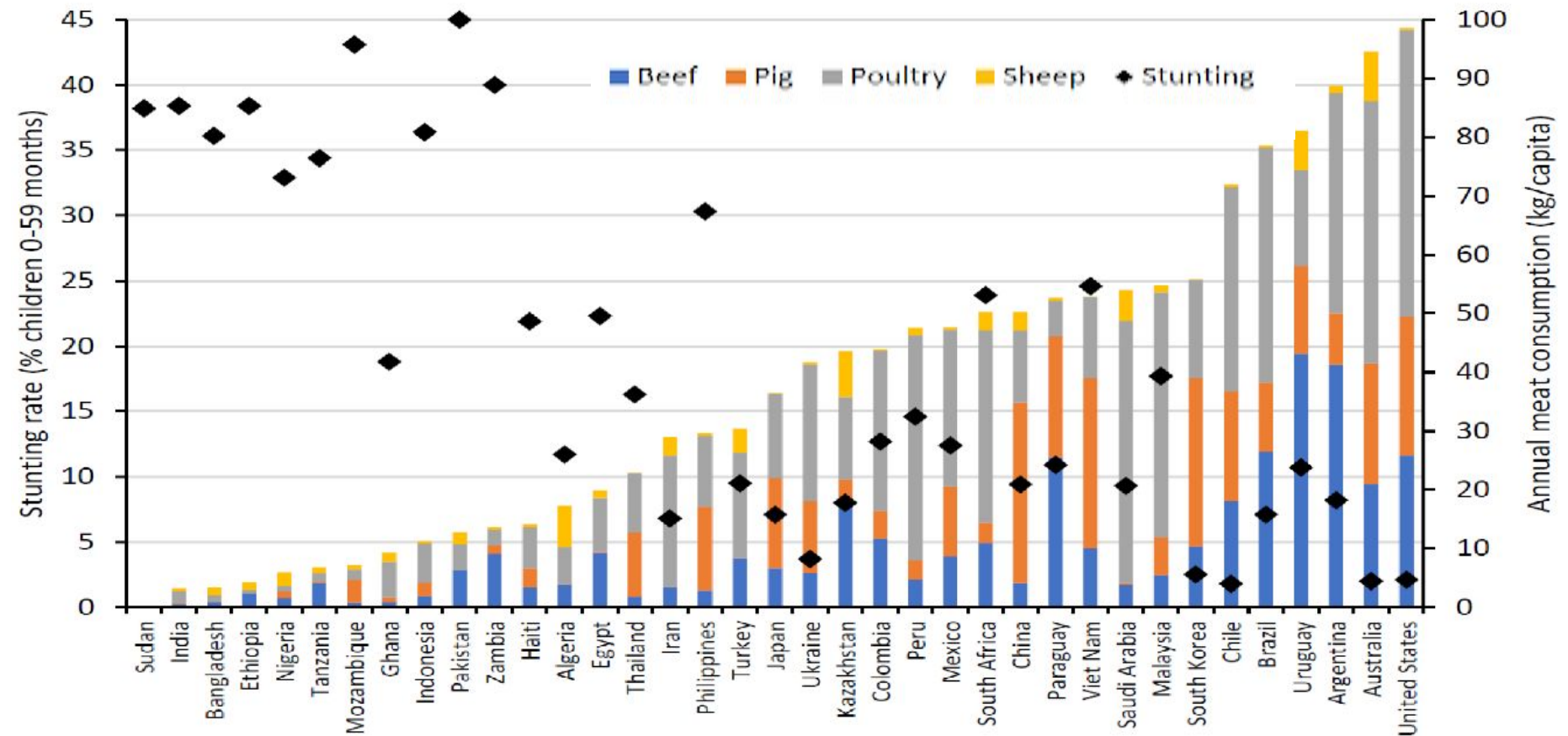
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Stunting is inversely related to meat consumption



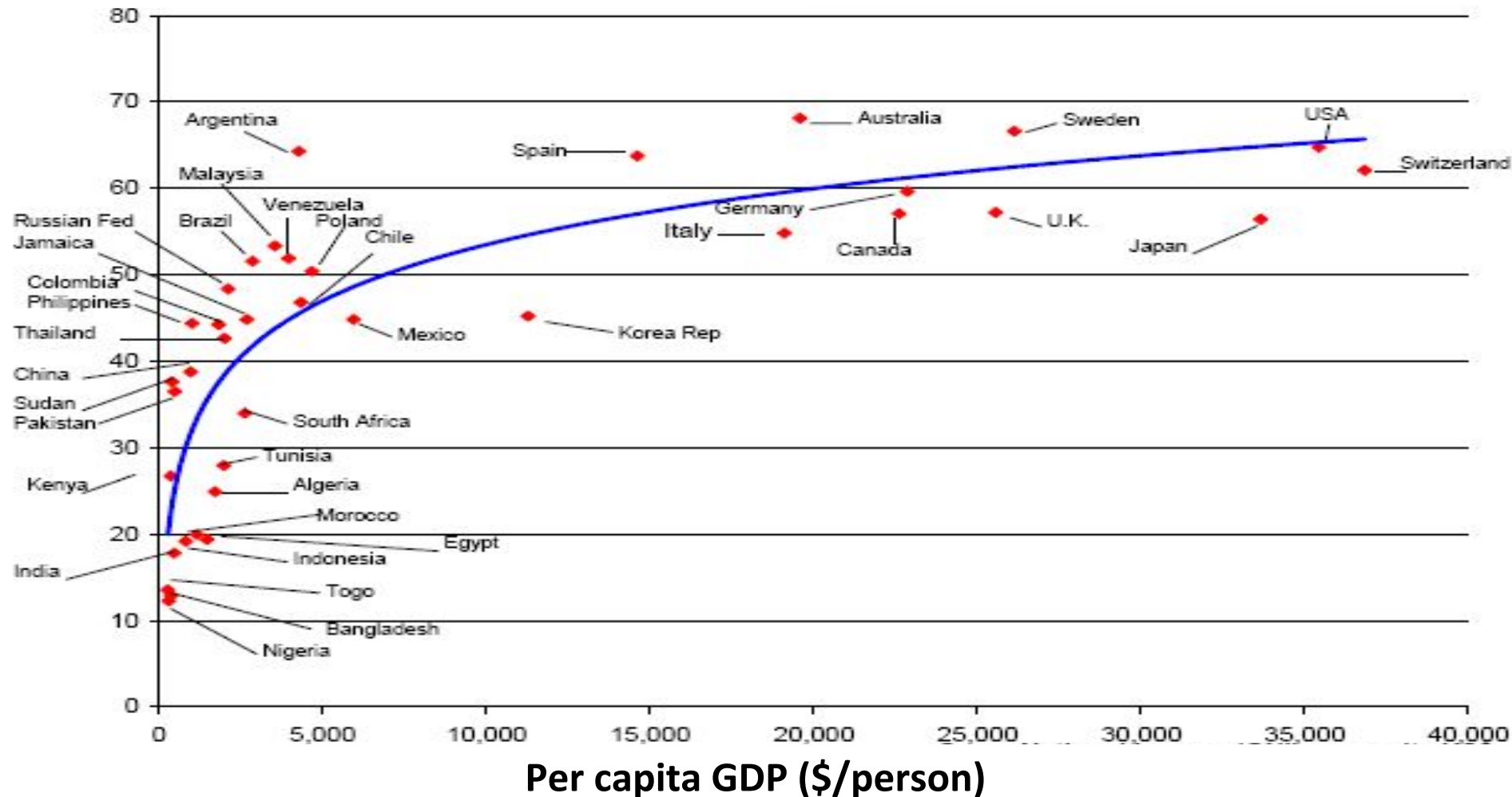


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Animal protein consumption increases with income

% of animal protein of total protein



Drivers of increased demand for ASF

- Urbanization, Income growth and Population growth
- 70% more food needed for approx. 10 billion people in 2050



(Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat)



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SUSTAINABLE DEVELOPMENT GOALS

Developed in 2015 by UN to transform the world by 2030



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SDG 2

End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

How do livestock contribute to SDG 2?





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GLOBAL LIVESTOCK CONTRIBUTIONS

- Wealth
- Status
- Insurance
- Resilience
- Manure
- Building materials
- Traction
- Cooking/heating fuel





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GLOBAL LIVESTOCK CONTRIBUTIONS

- Employs over 1.5 billion, with over $\frac{3}{4}$ billion dependent livelihoods
- Contributes 40% (mean) to the ag. GDP of developing countries
- **Supplied 25% of protein and 18% of calories consumed globally in 2016**
- Provided traction for about 50% of the world's farmers in 2009 (World Bank)

(Smith, 2017)



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GLOBAL LIVESTOCK CONTRIBUTIONS

Supports and empowers many of the world's smallholder women farmers who own no other assets.

Livestock manure supports more than half of the world's crops (World Bank)



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GLOBAL LIVESTOCK CONTRIBUTIONS

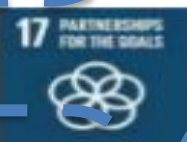
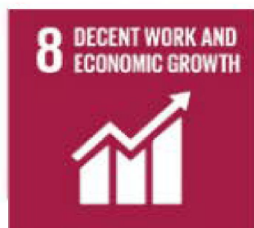
- Offers greatest opportunity to reduce greenhouse gas emissions from agriculture
- Allows food production on 57% of earth's land *that cannot be used for crop production*
- Converts millions of tons of agroindustrial by-products that cannot be consumed by humans into livestock feeds, turning waste into food and reducing pollution.
- Only about 14% of the feed dry matter ingested by livestock is edible to humans based on recent FAO data



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Livestock contribute to inclusive sustainable economic growth



Livestock contribute to equitable liv



ASF improve nutrition and health



Livestock and sustainable ecosystems



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Tarawali, 2015



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CONCLUSIONS

- Chronic malnutrition, or stunting, kills about half of all children who die worldwide and constrains their growth, health, education, and future productivity
- Food insecurity is an underlying cause of malnutrition
- Animal-source foods are an important source of vital nutrients and are effective in preventing malnutrition in children and PLW
- Livestock production is vital for the educational, nutritional, economic and sustainability needs of the world.
- Sustainably increasing livestock production is crucial to ensuring food and nutritional security of future populations
- Increasing access, availability, affordability, safety, environment stewardship and consumption of ASF in the developing world is critical



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Thank you!

Contact: smckune@ufl.edu

For more information about the Livestock System
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<http://livestocklab.ifas.ufl.edu/>

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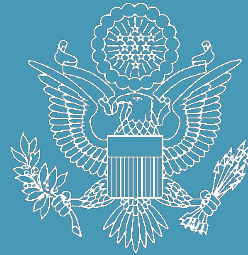


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www.feedthefuture.gov





Brain Food: Clever Eating

(Gupta, 2016; Nature)

- Early human meat eaters developed bigger brains than plant eaters.
- Iron is crucial for the growth and branching of neurons in the womb;
- Zinc is found in high concentrations in brain regions for learning and memory;
- Vitamin B12 maintains the sheaths that protect nerves;
- **Deficiencies in micronutrients in meat linked with disorders like - low IQ, autism, depression and dementia.**

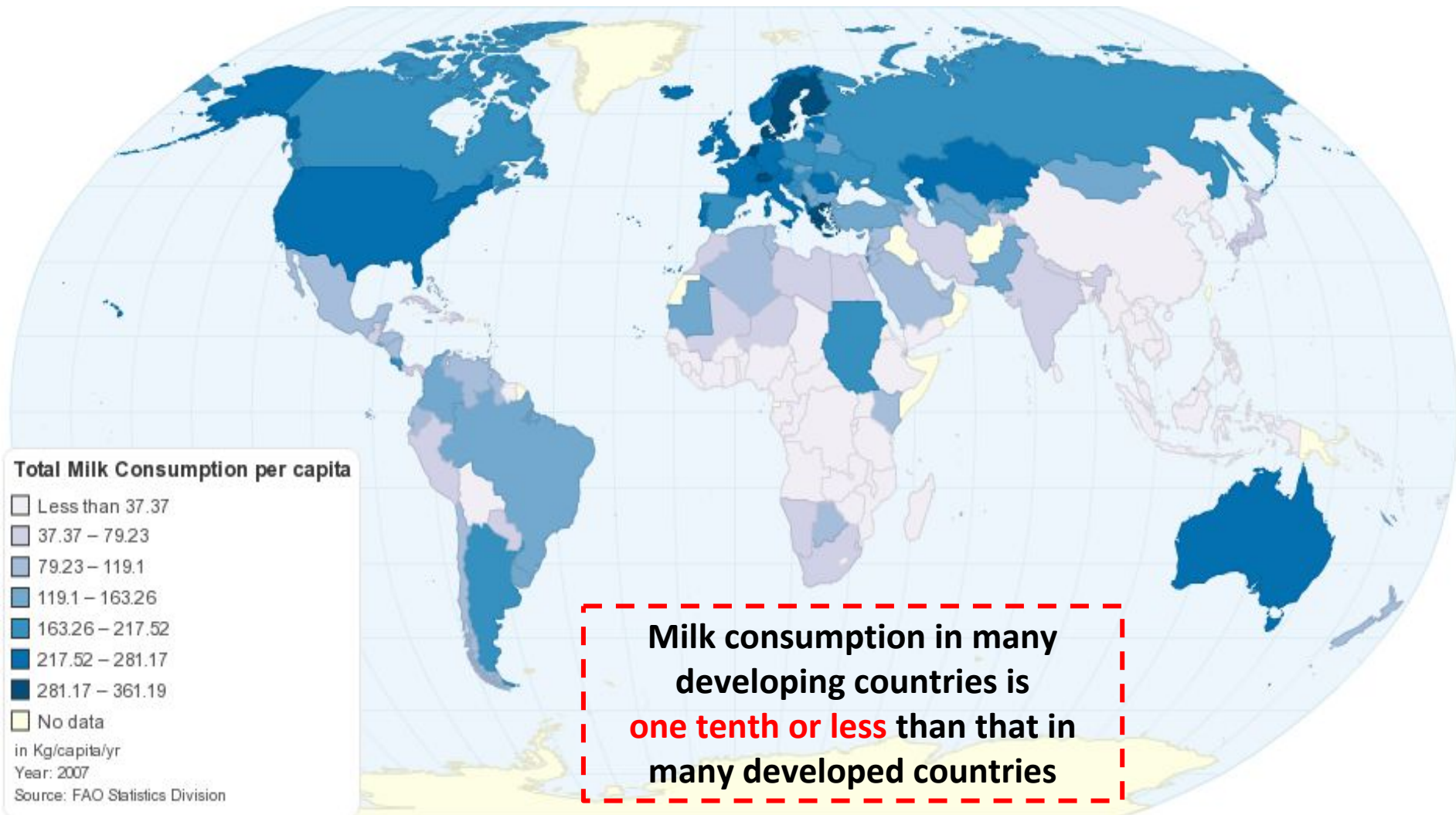




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Global milk consumption per capita



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FAO (2011)

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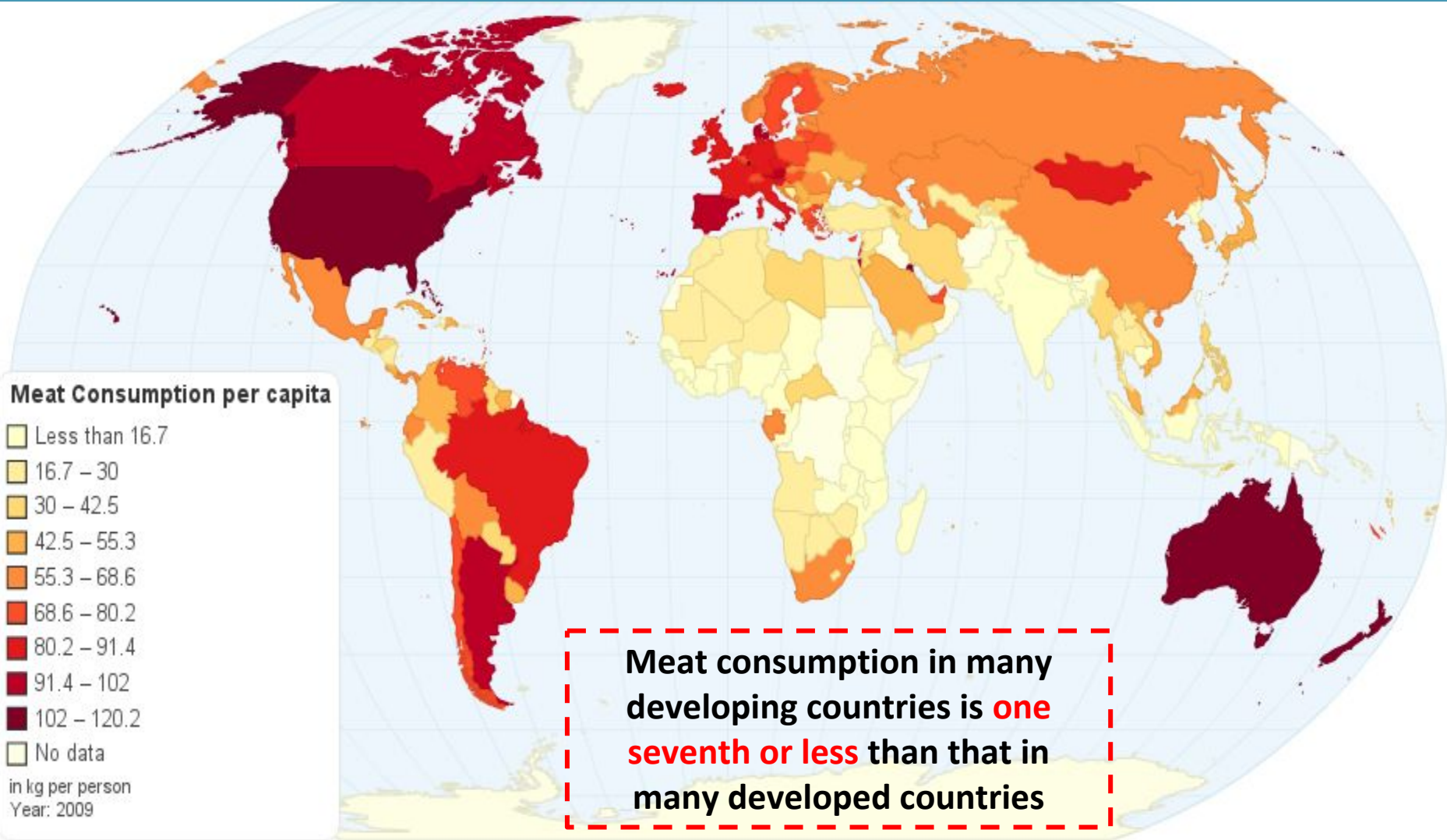
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Global meat consumption per capita



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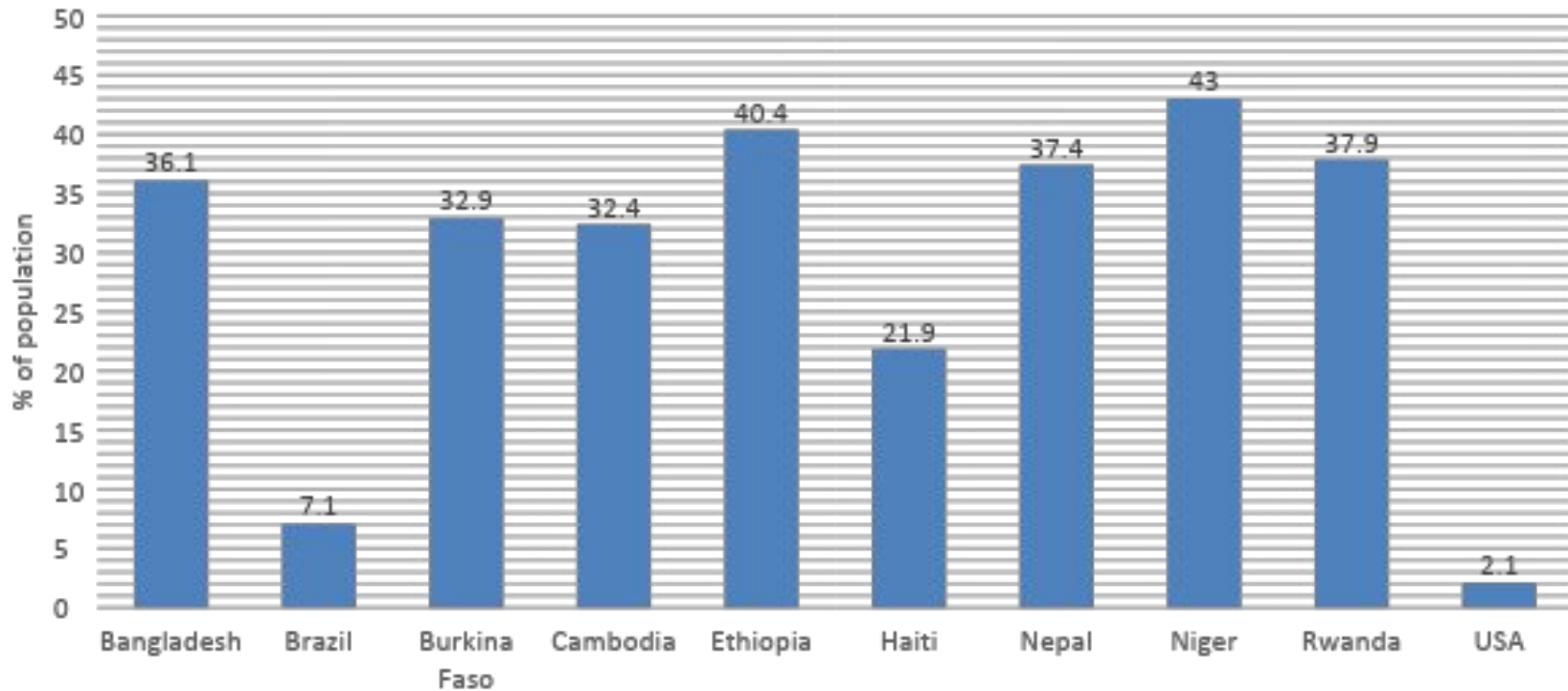
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Stunting Levels per Country



<http://www.who.int/nutgrowthdb/estimates2014/en/>



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GREENHOUSE GAS EMISSIONS FROM DIFFERENT SECTORS IN THE US



(EPA, 2015) (Mitloehner, 2016)

<http://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventories-2015-Main-Text.pdf>



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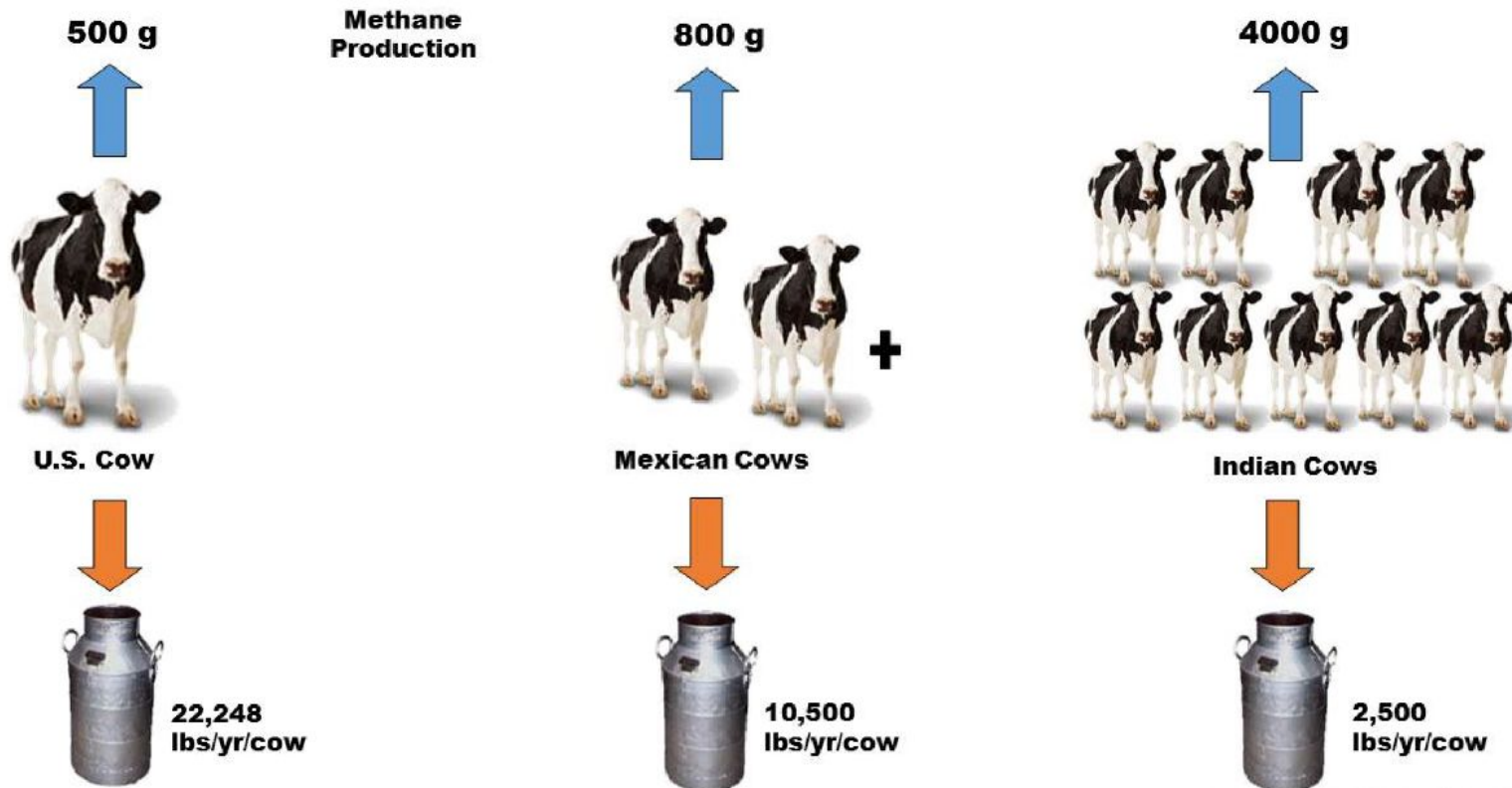
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More Milk Produced per Cow = Less Methane and Waste



USDA and Compassion in World Farming

(Mitloehner, 2016)



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GREENHOUSE GAS EMISSION INTENSITIES

- Amount of greenhouse gas produced per unit of livestock product produced.
- Vital measurement for meeting the nutritional needs of the poor with livestock and increasing the global demand for animal-source food while decreasing environmental impact of livestock



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GREENHOUSE GAS EMISSIONS FROM LIVESTOCK CAN BE CUT BY 30% BY

- Improving animal and herd efficiency
- Improved breeding and animal health interventions to shrink herd sizes (meaning fewer, more productive animals)
- Manure management to recover and recycle nutrients and energy,
- Grazing land management to improve productivity and create carbon sinks.
- Precision feeding, breeding, and better animal health care

(FAO, 2013)



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<http://www.fao.org/news/story/en/item/197623/icode/>



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ASF AND THE ENVIRONMENT

- Allows productive use of 30-40% of the earth's surface which is unsuitable for crop production (Sayre et al., 2013)
- ASF consumption prevents dumping of over 1 billion metric tons/year of agroindustrial co and by-products that we can't eat (Smith, 2017)



<http://www.pellet-making-machine.com>



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