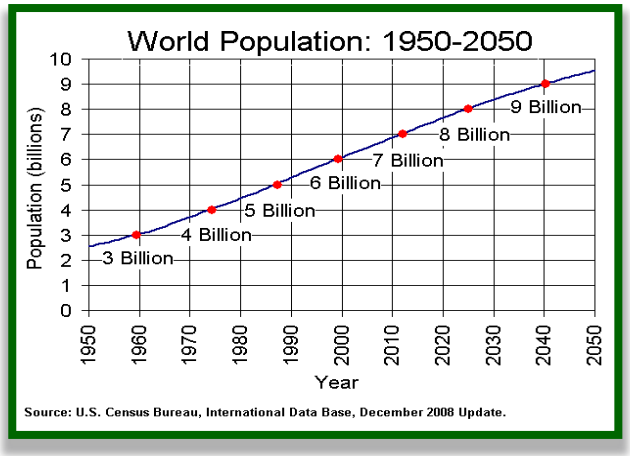
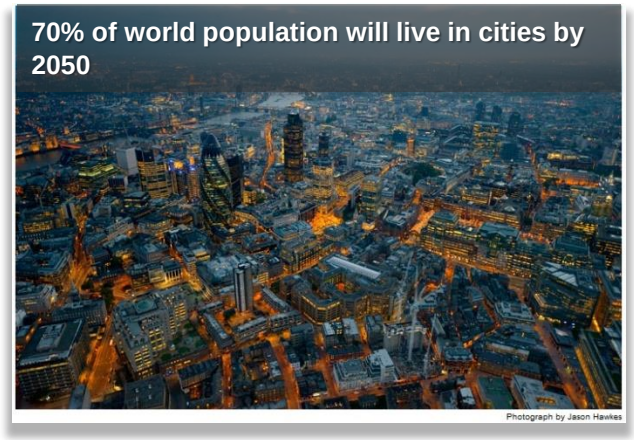
# Towards Sustainable Food Systems: Metrics and Considerations with Examples from the Dairy Sector

**Gregory Miller, PhD**
Global Chief Science Officer
National Dairy Council
gregory.miller@dairy.org
@drdairy50

# The Challenge








2009, FAO's Director-General on How to Feed the World in 2050. Population and Development Review, 35: 837–839.

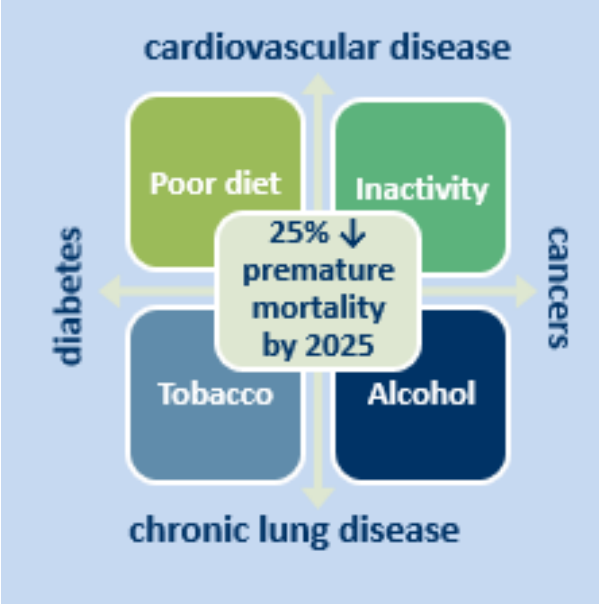
# Triple burden of malnutrition impacts all countries

- One person in three is malnourished worldwide
- ~815 million people are undernourished
- 1.9 billion adults are overweight or obese

*Nutrition and food systems, HLPE, 2017*
*The state of food security and nutrition around the world, FAO, 2017*

# The rise of non-communicable diseases

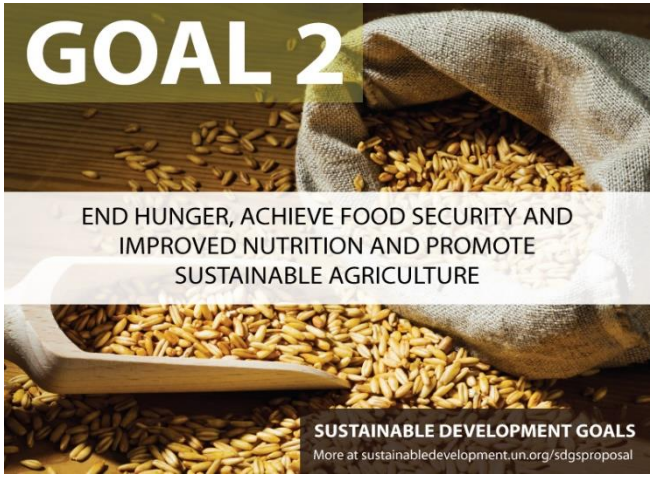
Non-communicable diseases
are responsible for 3 out of 5 deaths worldwide




- Preventable
- Huge cost to governments
- Rapid expansion from developed markets to emerging markets


SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

# Focus on nutrition and food systems

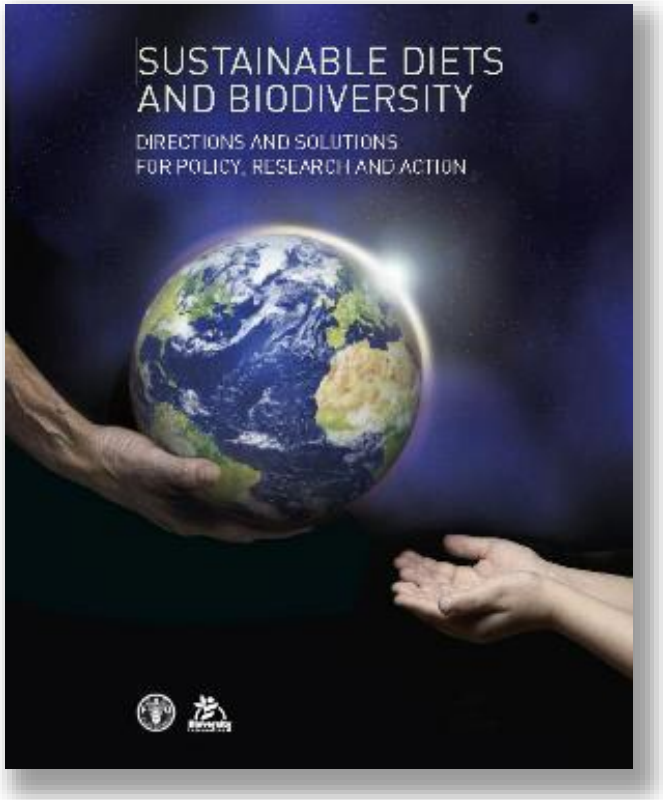

## Rome Declaration on Nutrition

- Multiple challenges of malnutrition to inclusive and sustainable development and to health
- A common vision for global action to end all forms of malnutrition
- Commitment to action

***The UN Decade of Action on Nutrition 2016-2025***

# Sustainable diets as defined by FAO

*"Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources."*



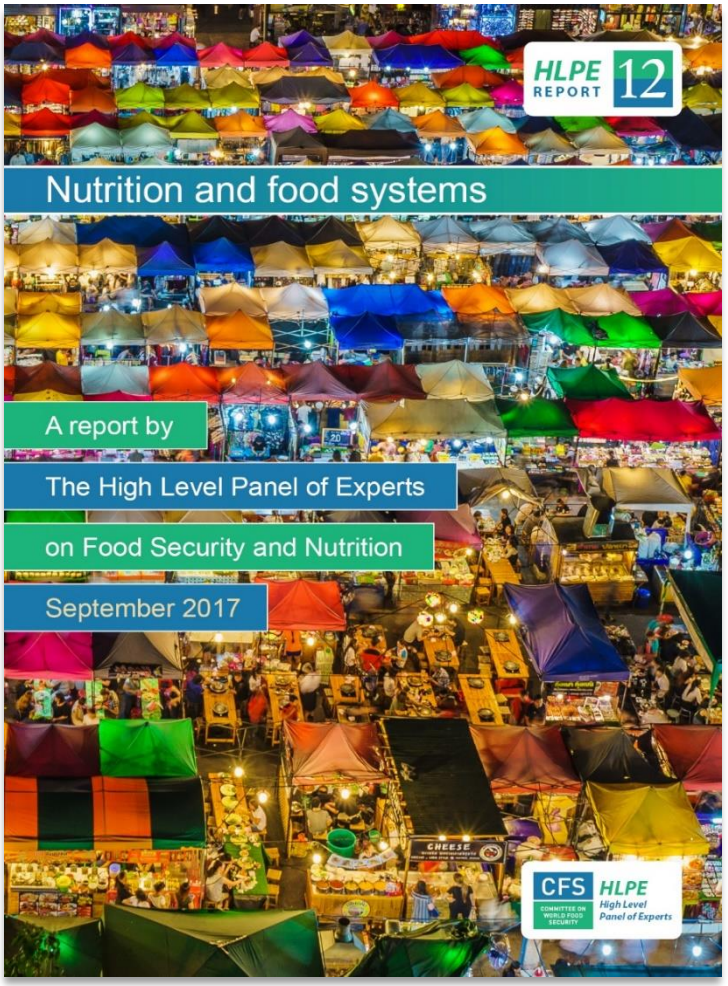

*FAO and Biodiversity International 2012*

**Proceedings of the International Scientific Symposium, BIODIVERSITY AND SUSTAINABLE DIETS UNITED AGAINST HUNGER, 3–5 November 2010, FAO Headquarters, Rome**

# Nutrition and Food Systems

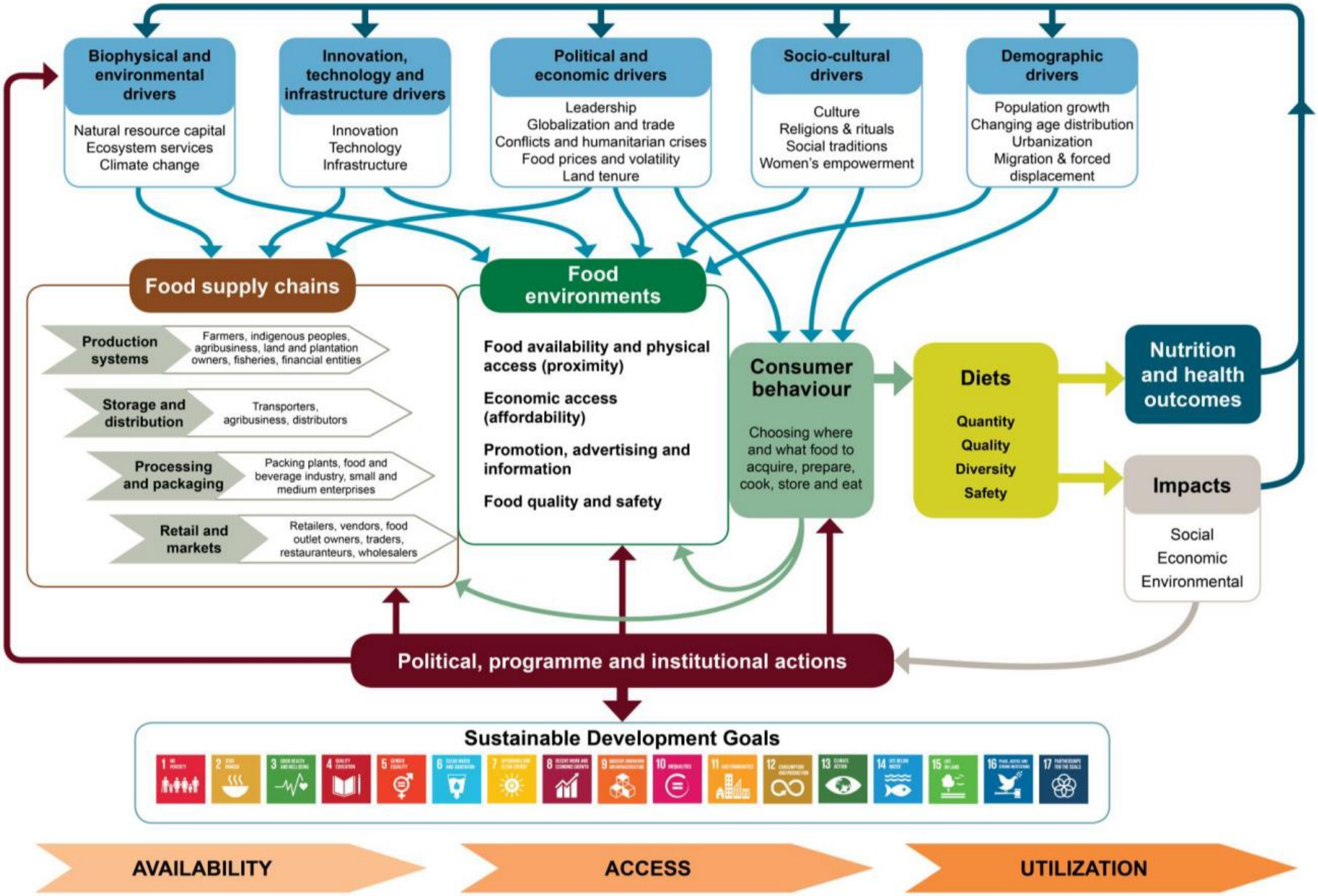
*A report by the High Level Panel of Experts (HLPE) on Food Security and Nutrition*

CFS
COMMITTEE ON WORLD FOOD SECURITY

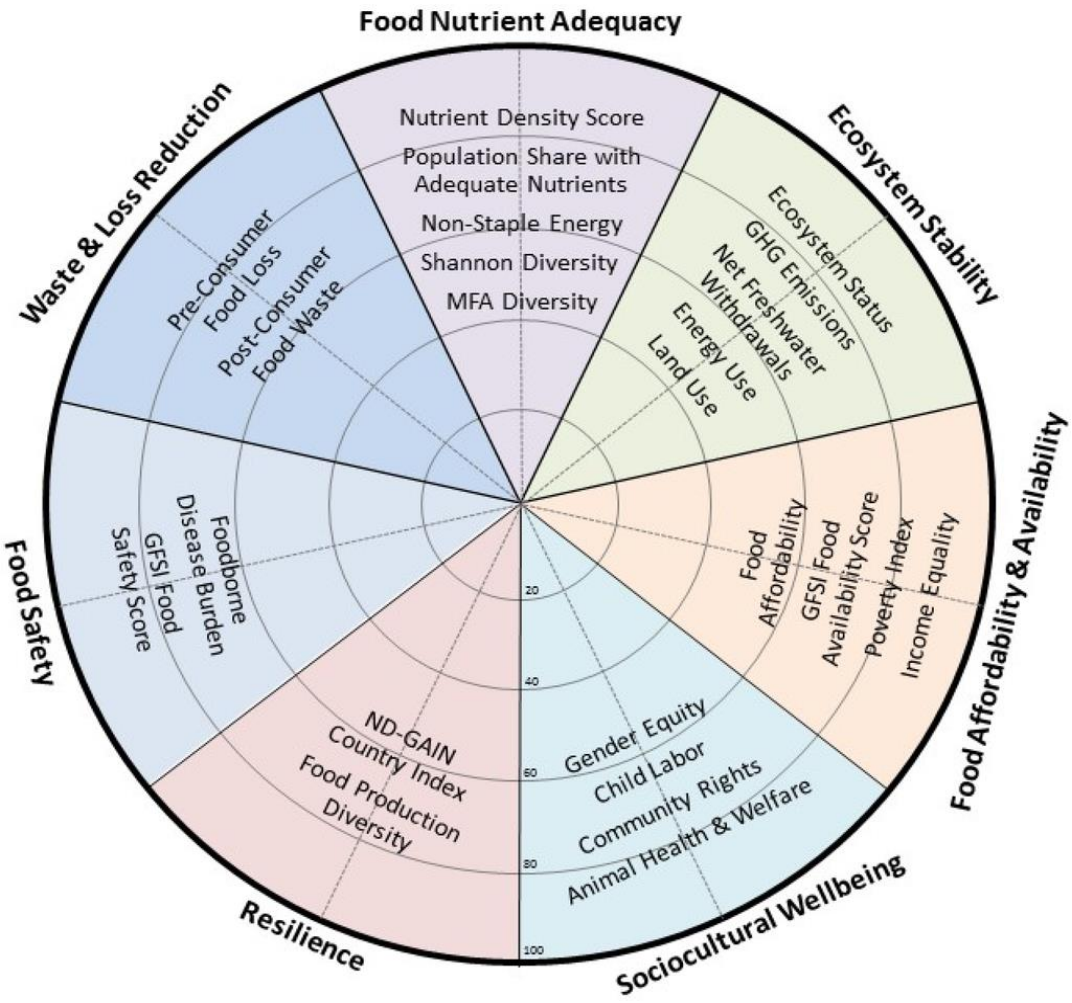



http://www.fao.org/3/a-i7846e.pdf

# Food Systems: A Conceptual Framework



# Metrics to evaluate sustainability of food systems need to assess the multiple aspects

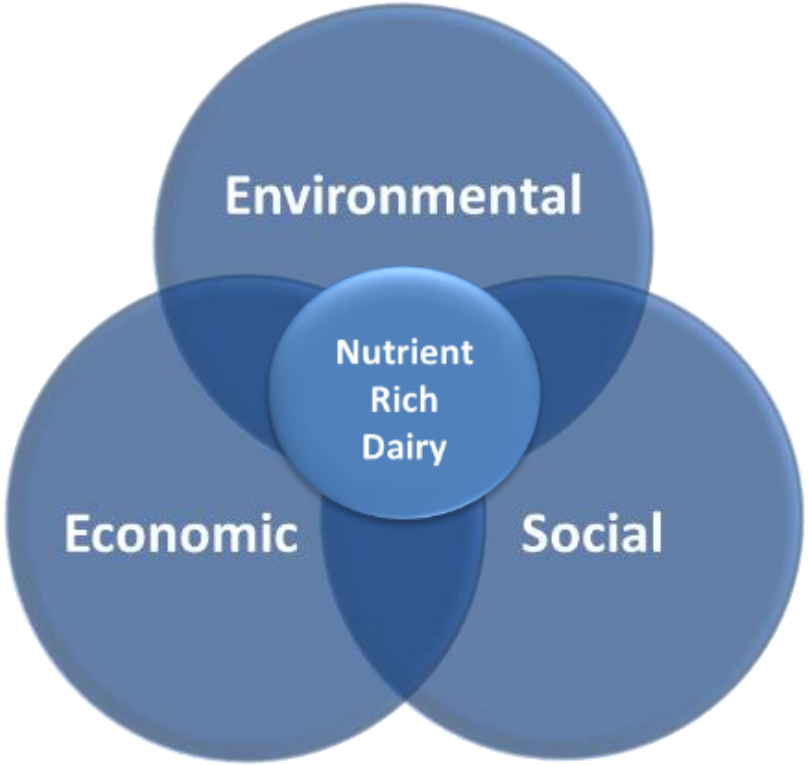





Gustafson et al. *Sustainability*. 2016

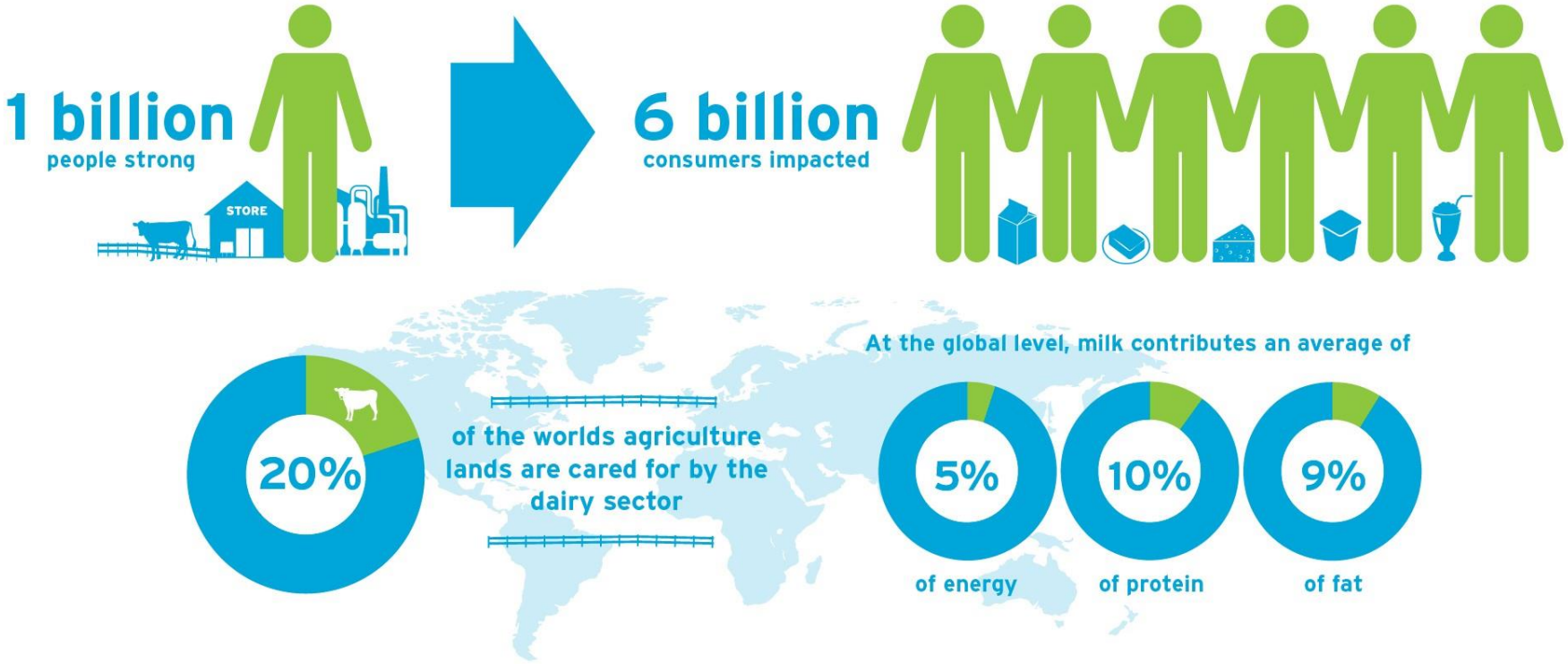
**Bringing to life the dairy community's shared vision of a healthy, happy, sustainable world, with science as our foundation**

# The three pillars of sustainability underpin dairy's role




***Dairy is an important component of healthy, sustainable diets***

# Global Dairy Sector



Alliance Dairies
Clauss Dairy Farms
Fair Oaks Farms
Fiscalini Farms
Foster Brothers Farm
Gar-Lin Dairy Farm
Graywood Farm
Haubenschild Farms Inc.
Holsum Dairies
Kooistra Farms
Maddox Dairy
MarBec Dairy
Medeiros & Sons Dairy
McCarty Family Farms
Mystic Valley Dairy
Nobis Dairy
Prairieland Dairy
Rovey Dairy
Simonson Dairy
Spruce Haven Farm

Associations/Government

Dairy Processor
Cheese
Suppliers
Transport
Coops & Farmers
Retail & QSR
Crop Production
Commu

# Dairy Sustainability Council

*We commit to being leaders in sustainability, ensuring the health and well-being of our planet, communities, consumers and the industry*

113 companies & 180 professionals in the Sustainability Council

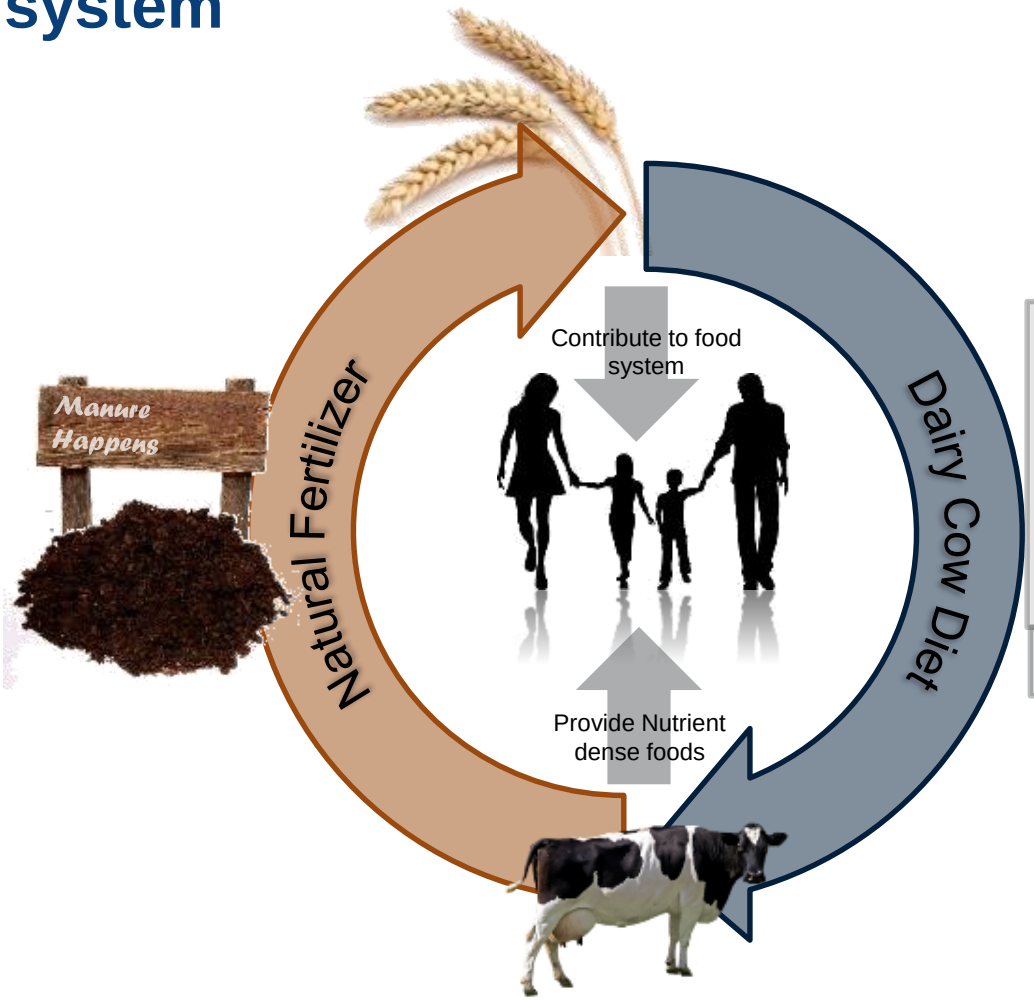
# Grounded in science

- Life cycle science establishes baseline environmental footprint for U.S. Dairy
- Peer-reviewed, published, and contributed to open-source National Agricultural Library
- Greenhouse gas emissions of milk = 17.6 lbs. CO2 per gallon
- Goal to reduce GHGe by 25% by 2020


**U.S. Dairy** is **~2%** of U.S. GHGe, **5%** total water withdrawal and <4% farmland occupation

https://dairygood.org/content/2017/2016-us-dairy-sustainability-report

# Dairy cows contribute to the nutrient cycle of the food system




# Reducing use of resources and lowering our impact

- American farmers have succeeded in improving efficiency while caring for the environment.

- Compared with 1944, the U.S. dairy industry now produces a gallon of milk using:

**90% less land**

**65% less water**

And producing:

**75% less manure**

**63% smaller carbon footprint**

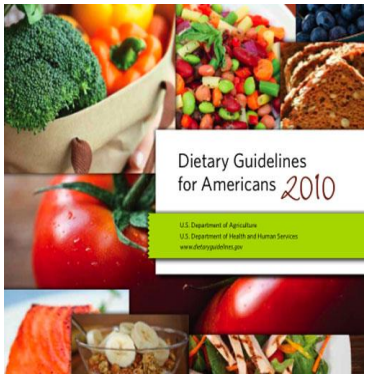
USDA-NASS, http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats_1.0/index.asp, Last accessed 25OCT10
USDA-ARS-AIPL, http://aipl.arsusda.gov/eval/summary/trend.cfm, Last accessed 26,OCT10
Capper J. Cady A. Bauman D. 2009. The environmental impact of dairy production; 1944 compared with 2007. Journal of Animal Science. 87:2160-2167

# Animal Care

## FARM Program

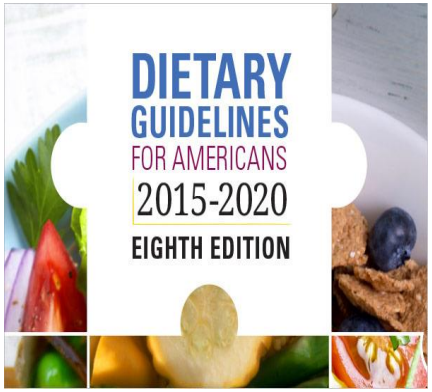
**~98% of U.S. milk comes from farms participating in the FARM Program**

# Dairy's role in cardiovascular and metabolic health recognized by Dietary Guidelines for Americans Advisory Committees 2010 and 2015




"Moderate evidence also indicates that intake of milk and milk products is associated with a reduced risk of cardiovascular disease and type 2 diabetes and with lower blood pressure in adults."

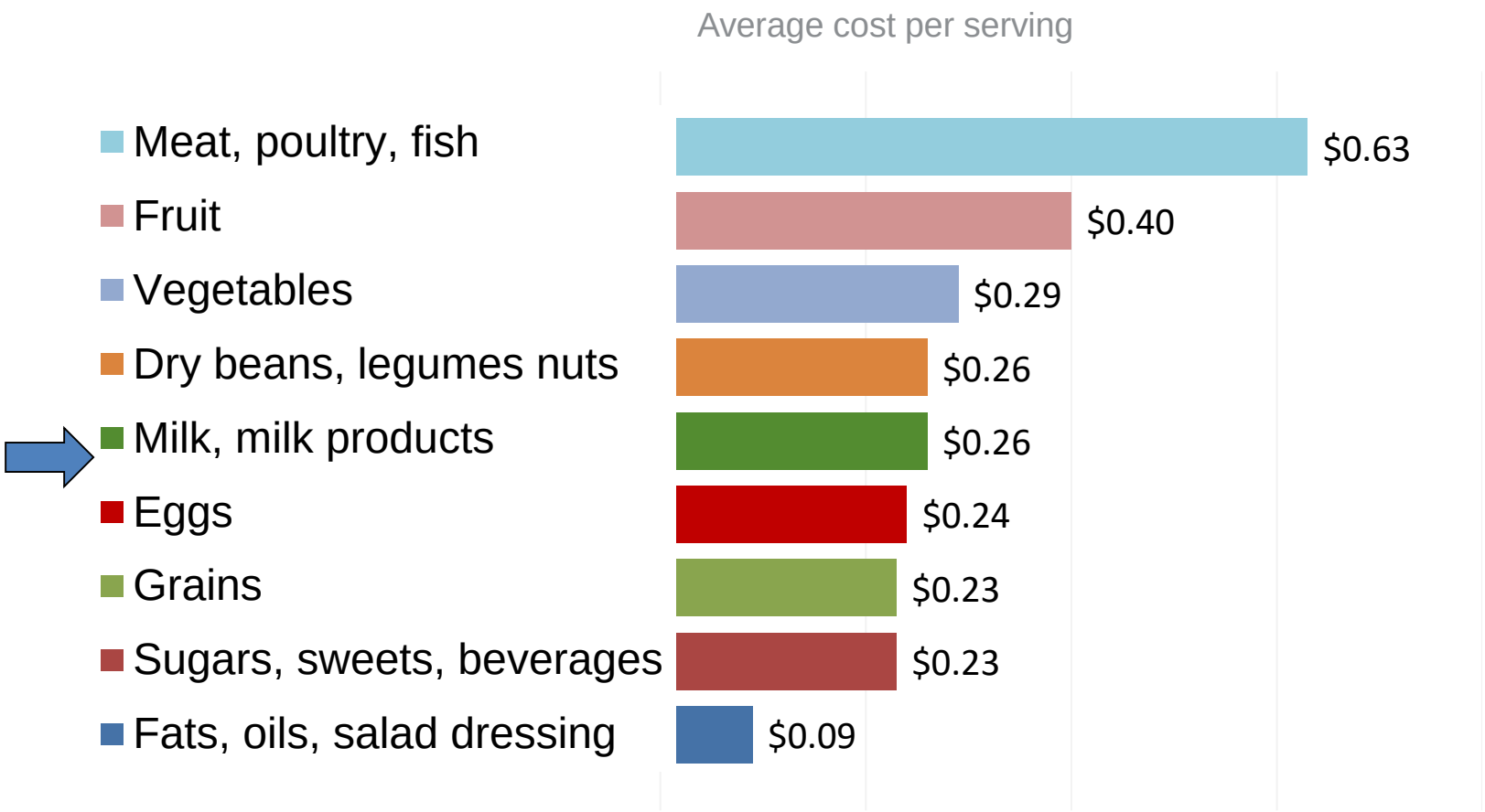
*2010 Dietary Guidelines Advisory Committee Report*




"Consumption of dairy foods provides numerous health benefits, including lower risk of diabetes, metabolic syndrome, cardiovascular disease and obesity."

*2015 Dietary Guidelines Advisory Committee Report*

# Milk and milk products are an economical source of nutrition




*Values, 2001-2002 USDA CNPP database, Serving size, Reference Amount Customarily Consumed.*

*Drewnowski. Nutr Rev; 2017*

# Milk's essential nutrients can be hard to replace

Three servings of milk provides the same level of nutrients found in these foods

**PROTEIN**
50% DV

4 hardboiled eggs

**CALCIUM**
90% DV

36 ½ cups of raw kale (about 7 bunches)

**PHOSPHORUS**
70% DV

2 ½ cups kidney beans

**POTASSIUM**
29% DV

3 small bananas**

**VITAMIN D**
90% DV

6.6 oz. of sardines (about 15 sardines)

**RIBOFLAVIN**
80% DV

1 cup of almonds

**VITAMIN B12**
60% DV

1 lb. pork chops, broiled (about 3, 6-oz. chops)

**VITAMIN A**
30% DV

2 cups of cooked grean beans

"…similar amounts of calcium can be obtained from fortified rice, soy and almond milks, and fortified juices, but absorption of calcium is less efficient from plant beverages...vitamin D and potassium amounts vary across these milk alternatives" (DGAC 2015)

# Recommended dairy substitutes not always practical in terms of meals and quantities

"… the **amount** of many potential alternatives to provide sufficient calcium would provide **too many calories** and/or **be a large amount to consume daily**."



calcium fortified

"…**bioavailability** of the calcium in vegetable products has not been addressed and **could pose a concern**."

***… and not widely consumed***

*2010 Dietary Guidelines Advisory Committee Report. Appendix E3.6*

# Adequate dairy intake projected to reduce health care costs

- U.S.

  Potential for more than $214 U.S. billion in health care cost savings over 5 years by increasing dairy to 3 to 4 servings per day[1]

- Australia

  Estimated cost of direct health care spending attributable to low dairy product consumption in 2010–2011 was AUD$2.0 billion [U.S. equivalent of $2.1 billion][2]


[1]McCarron and Heaney. Am J Hypertension 2004; 17:88-97
[2]Doidge et al. J Nutr 2012: doe:10.3945/jn.111.154161

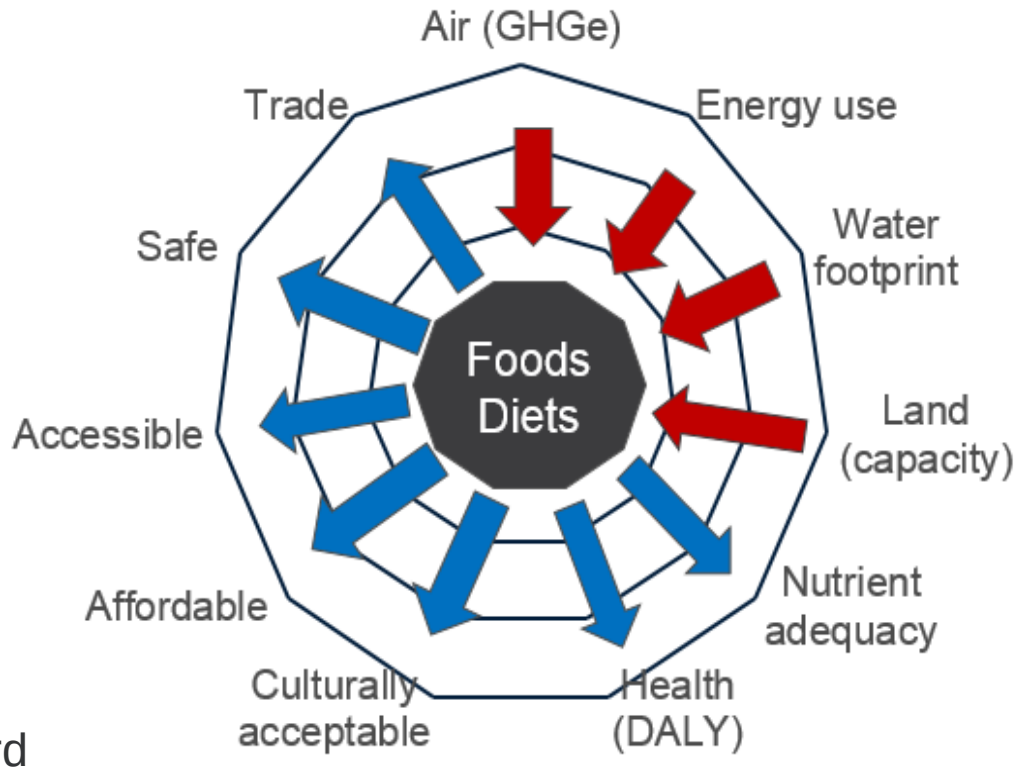
# Systematic approach to evaluating nutrition and food systems sustainability is required

Need to think systemically!

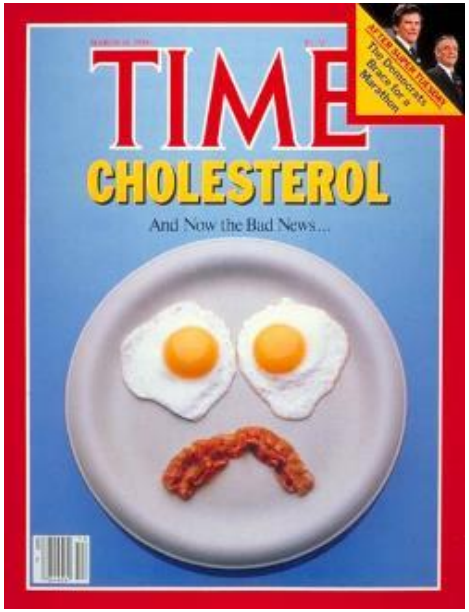
- Across different domains of a food system
- Farm to consumer to farm
- Multiple food and nutrition systems (not one diet nor one farm system!)

Nascent research

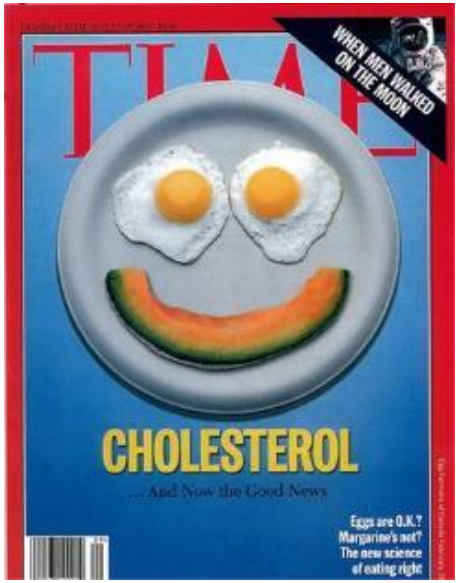
- Limited number of studies
- Inconsistent or nuanced
- Trade-offs among the domains of sustainability will likely have to be made.
- Focusing on the environmental footprint of food as the sole standard for sustainable food patterns may run counter to human nutritional needs.



# Policy created with limited data could produce unintended consequences



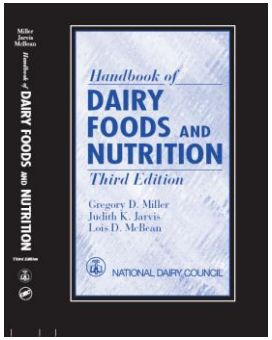

1984




1999


2014

# Thank you




www.usdairy.com

www.dairygood.org

**@DrDairy50**




Miller and Auestad, *Toward a sustainable dairy sector.* Int. J Dairy Technology (2013). Volume 66, Issue 3, Article first published online: 20 MAY 2013