The Foundation for Food and Agriculture Research

FFAR

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Executive Director

10th Annual HBCU Philanthropy Symposium

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50 Innovations that have "Done the most to shape the nature of modern life"

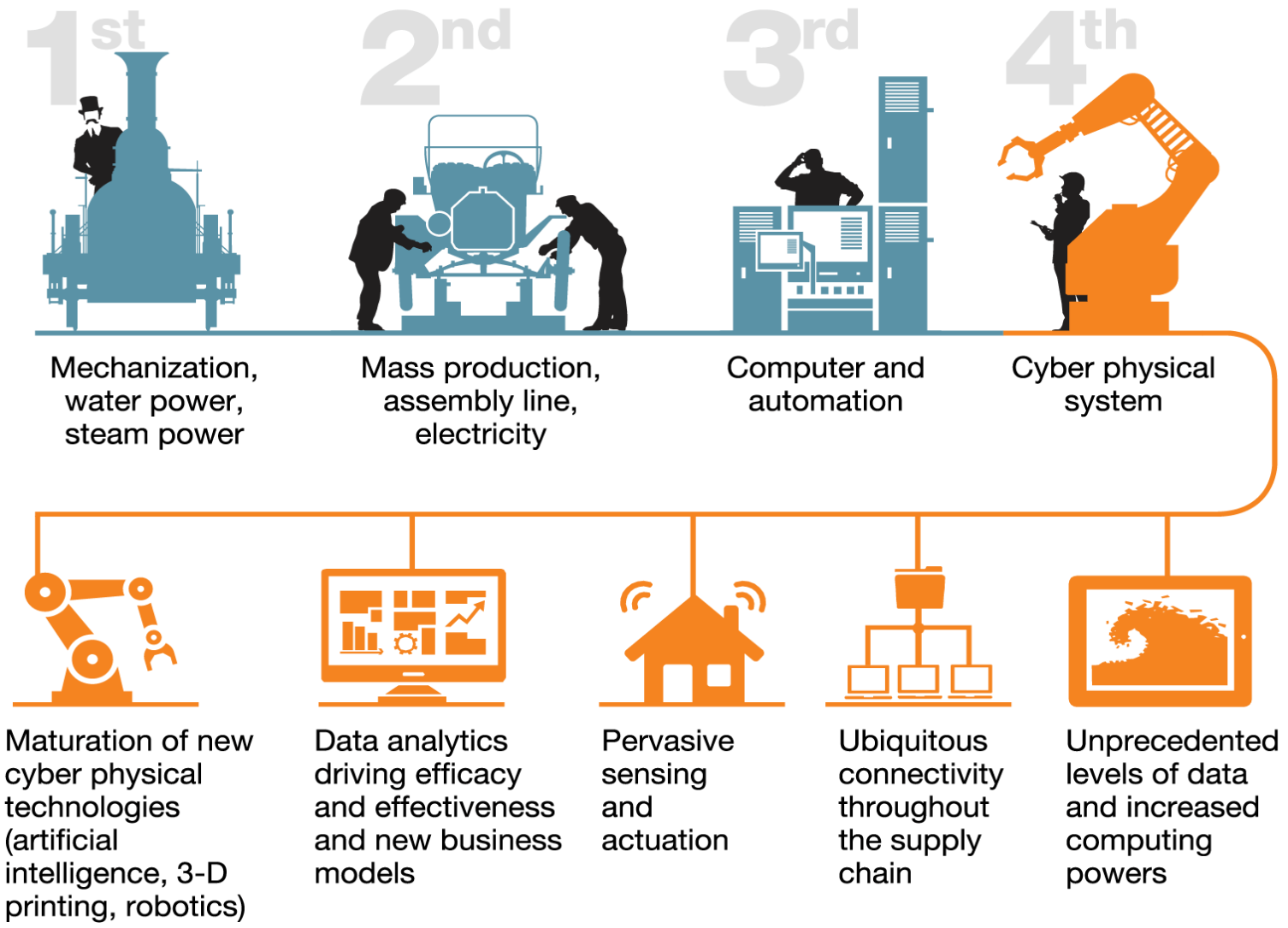
Top 10: Printing press, electricity, penicillin, semiconductors, optical lens, internal combustion engine, vaccination, paper, Internet, and steam engine

11. **Nitrogen fixation, 1918** Fritz Haber wins a Nobel Prize for the ammonia-synthesis
13. **Refrigeration, 1850s**
22. **Green Revolution, mid-20th century:** Norman Borlaug
30. **Moldboard plow, 18th century**
32. **Cotton gin, 1793**
33. **Pasteurization, 1863**
38. **Scientific plant breeding, 1866:** Gregor Mendel
50. **Self-propelled Combine harvester, 1930s**

How quickly can science make a difference?

On average, public agricultural research undertaken today will begin to noticeably influence agricultural productivity in as little as 2 years and its impact could be felt for as long as 30 years.

The 4th Industrial Revolution is here.



McKinsey&Company | Source: *Forbes*; World Economic Forum

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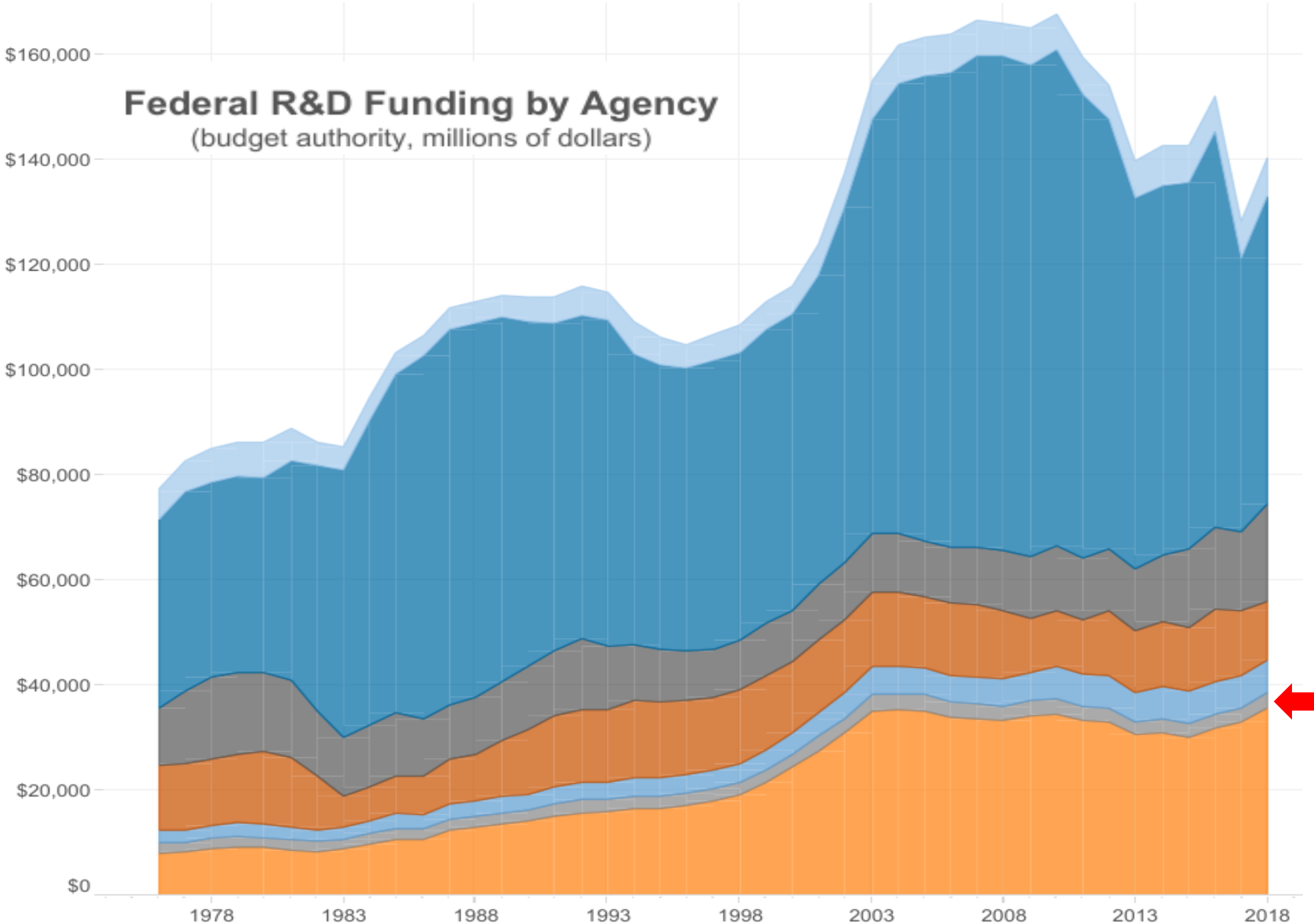

Agency
- All Other
- DOD
- DOE
- NASA
- NSF
- USDA
- NIH

Select Agency
Multiple values

"All Other" includes the Depts. of Transportation, Veterans Affairs, Homeland Security, and State, the Environmental Protection Agency, and others.

Based on agency budget documents and data, supplemented with NSF survey data. Last updated May 2018. FY 2018 data are estimates.
(c) AAAS

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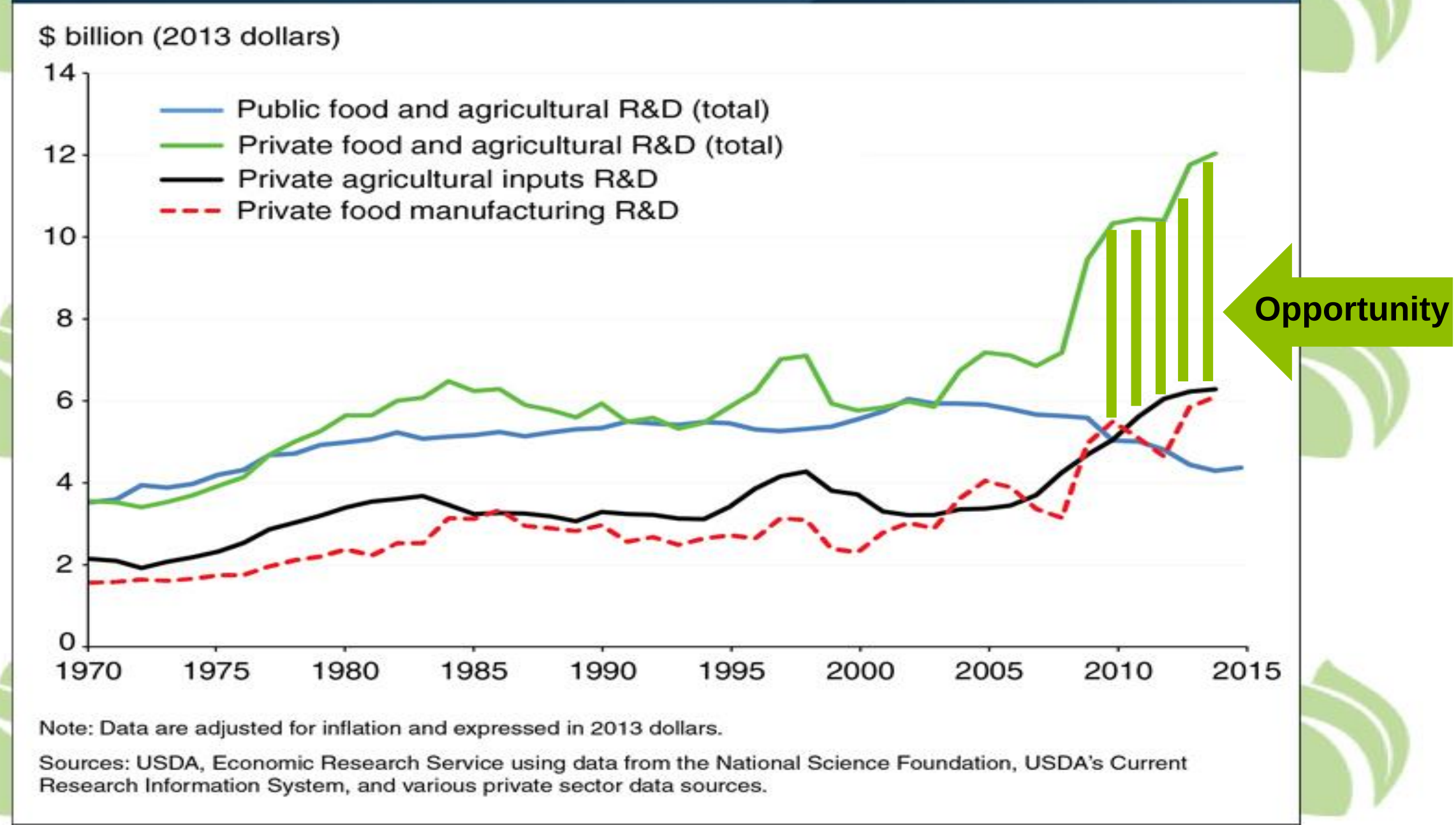
Agricultural research and development (R&D) funding in the United States, 1970–2015



Note: Data are adjusted for inflation and expressed in 2013 dollars.

Sources: USDA, Economic Research Service using data from the National Science Foundation, USDA's Current Research Information System, and various private sector data sources.

New Opportunities for Agricultural Research Funding

Stagnant Federal funding and increased private research investments has led to new funding models and opportunities

FFAR Mission

We build unique partnerships to support innovative science addressing today's food and agriculture challenges.


OUR VISION
We envision a world in which ever-innovating and collaborative science provides every person access to affordable, nutritious food grown on thriving farms.
FFAR

How We Work

Private-Public Partnerships

We build unique partnerships to support innovative science addressing today's food and agriculture challenges.

$385M + **$385M**

FFAR Investment | Non-Federal Match

> "The model of public private partnership is a really important space that wasn't previously filled in the US [food and agriculture] R&D world before FFAR."
>
> -FFAR Stakeholder

The FFAR Paradigm

- **Creates novel research partnerships**
- **Works nimbly** to efficiently address emerging issues
- **Leverages public dollars** with private dollars to expand research impact
- **Fills research gaps** to support farms, reduce food insecurity and improve health

FFAR CHALLENGE AREAS

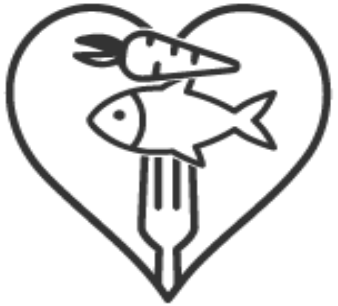
Next Generation Crops

Advanced Animal Systems

Urban Food Systems

Soil Health

Sustainable Water Management



Health-Agriculture Nexus

Thriving Farms

Environmental Resilience

Wellbeing

FFAR Grants by the Numbers

130+ grants awarded

1:1.21 matching ratio

$204M funding awarded or in the pipeline

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Industry and Foundation Partners Include:

FFAR Funding Models

FFAR may award funds in four ways:

- Competitive Grants
- Direct Awards
- Prizes
- Consortia

FFAR Next Generation Opportunities

- National Academy of Sciences
  Mid-Career Prize in Food & Agriculture Sciences
- New Innovators

- FFAR Fellows
- Vet Fellows

Grand Challenges in Ag

Feeding the World

Competing Resources

Changing Climate

Environmental Stewardship

Improving Health & Nutrition

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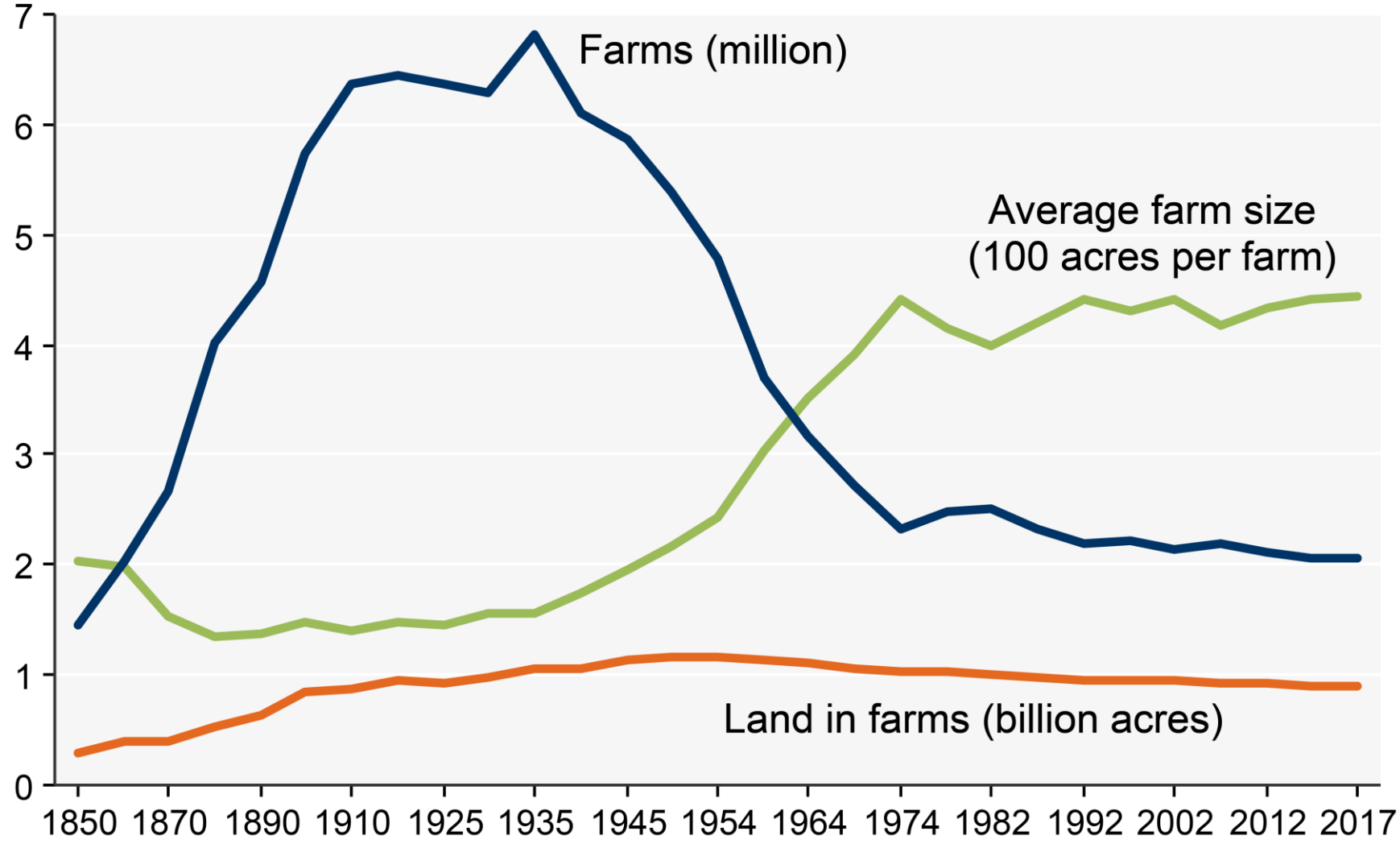
Farming in the United States

- Total farmland acres in the U.S.: 899,500 million
- Average farm size: 443 acres/farm
- 39% of the nation’s 2.1 million farms receive subsidies
- Farm debt has increased to more than $400 billion

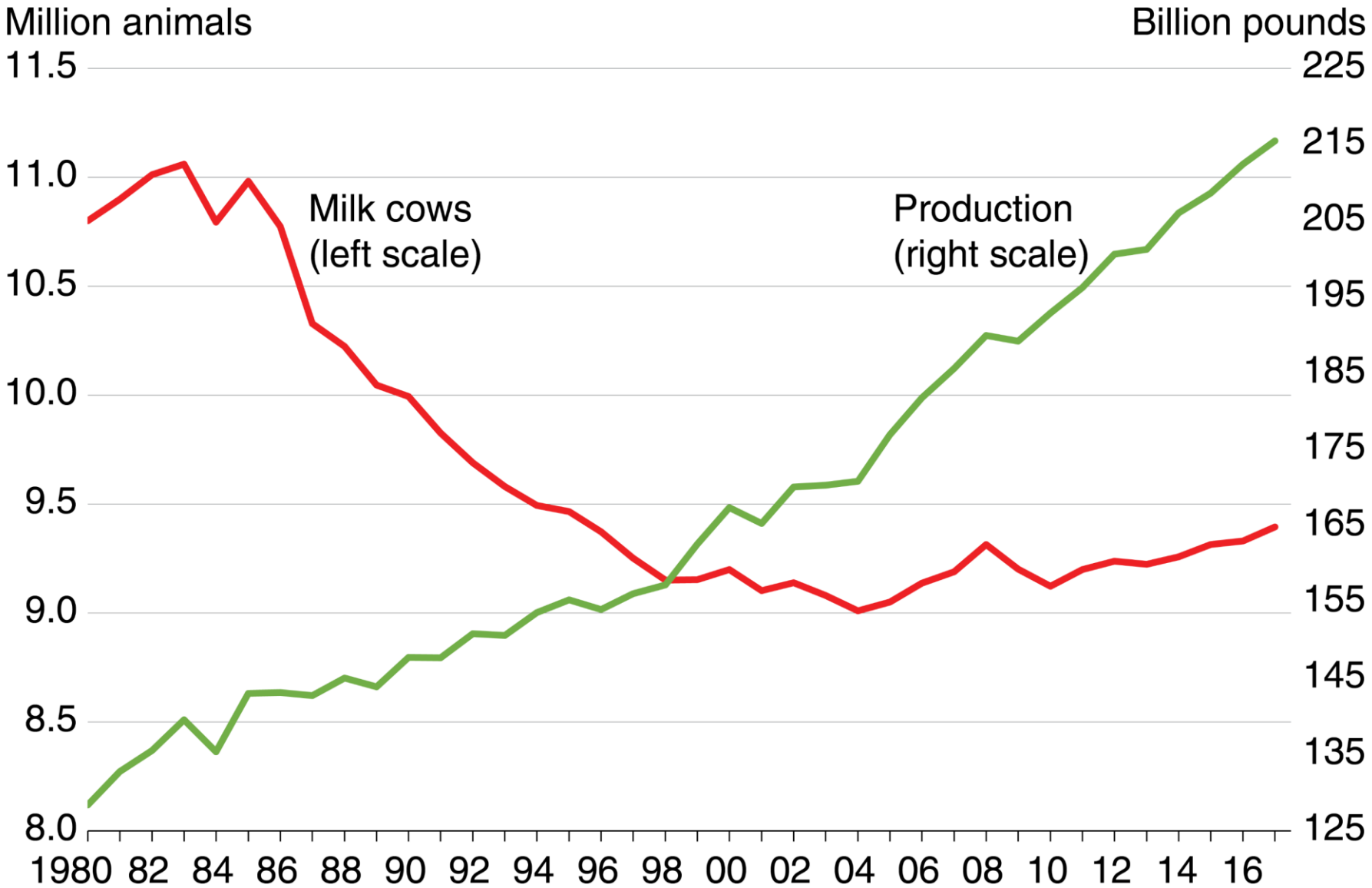
Farms, land in farms, and average acres per farm, 1850-2017

Million farms, billion acres, or 100 acres per farm



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, Census of Agriculture (through 2012) and *Farms and Land in Farms: 2017 Summary.*

U.S. milk production and dairy herd, 1980-2017

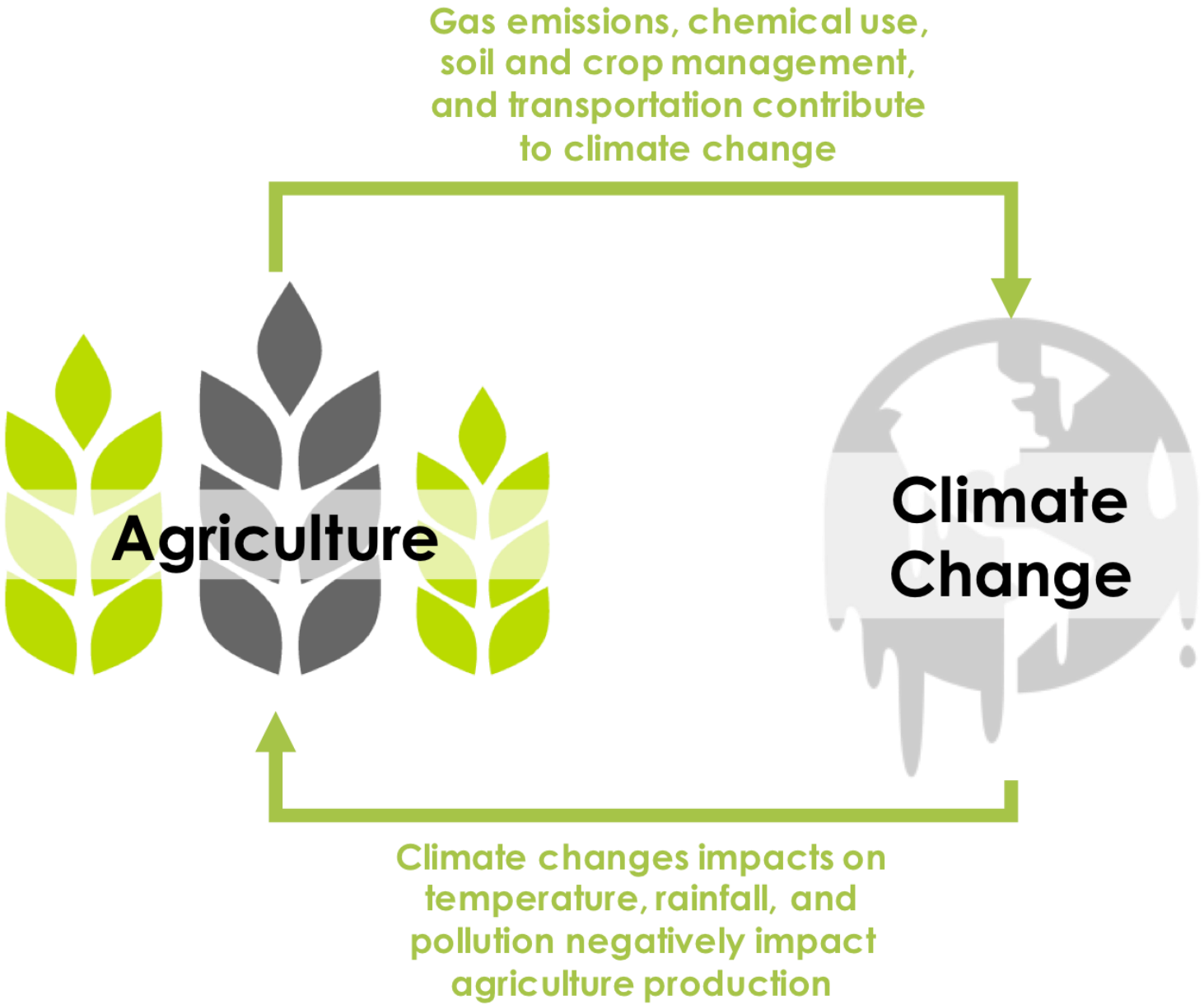


Source: USDA, Economic Research Service, Baseline Related Historical Data.

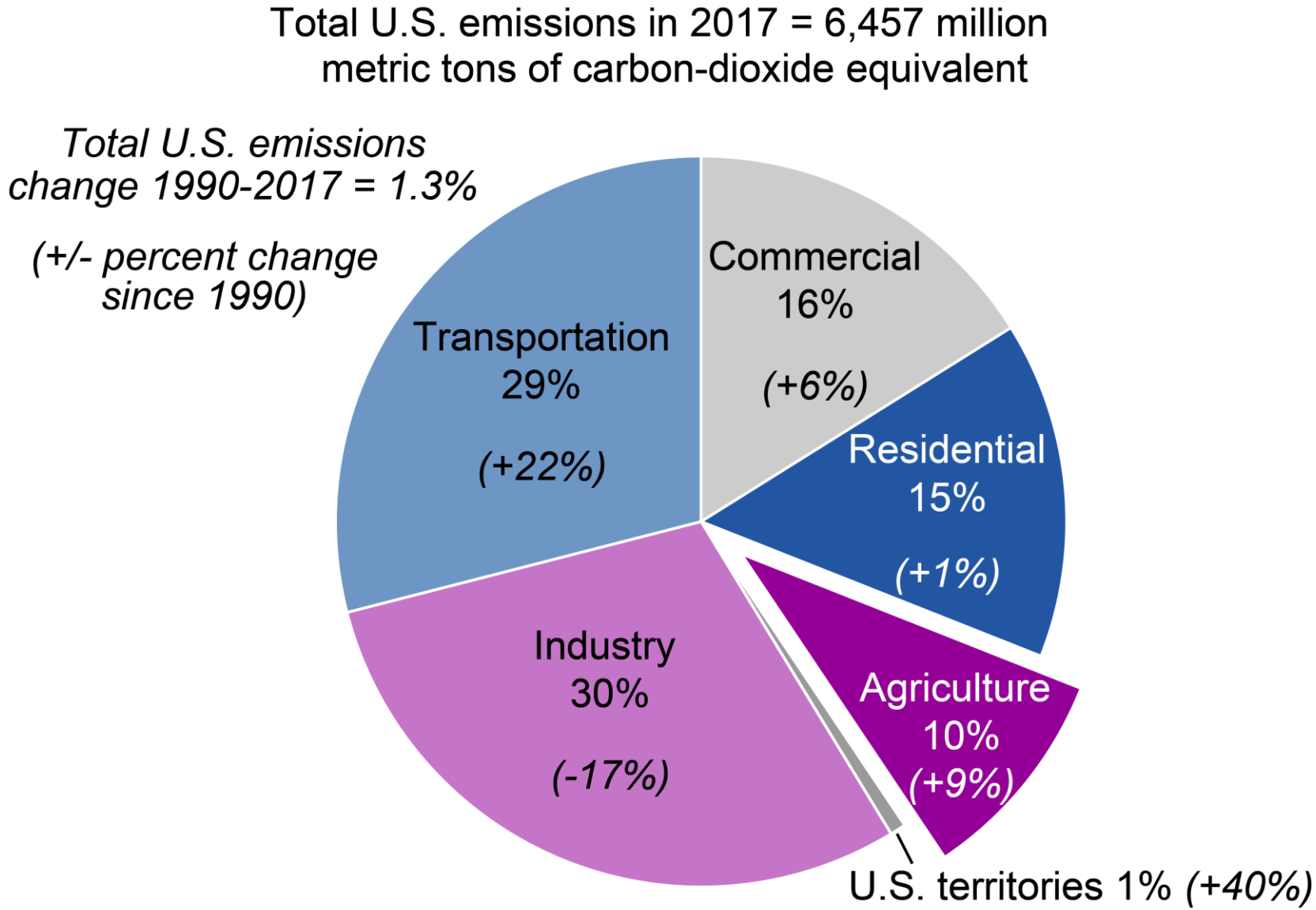
Ag and the Climate Crisis

- Agriculture is the industry most impacted by climate change
- Farmers are faced with increasing challenges posed by changing climate creating increasing financial and economic challenges
- Natural catastrophes in the last two years have caused 24,000 deaths worldwide
- In 2019, there were more than 800 natural disaster events that caused losses (hurricanes, flooding, severe storms, etc.) totaling $150 billion in damages
- How will climate change continue to affect farmers in the US and globally?
  - ✓ Temperatures will continue to rise
  - ✓ Frost-free season and growing season will lengthen
  - ✓ Heavy precipitation events will continue
  - ✓ Increase in droughts and heat waves
  - ✓ Hurricanes will be stronger and more intense
  - ✓ Sea level will rise 1-4 feet by 2100

Climate and Agriculture

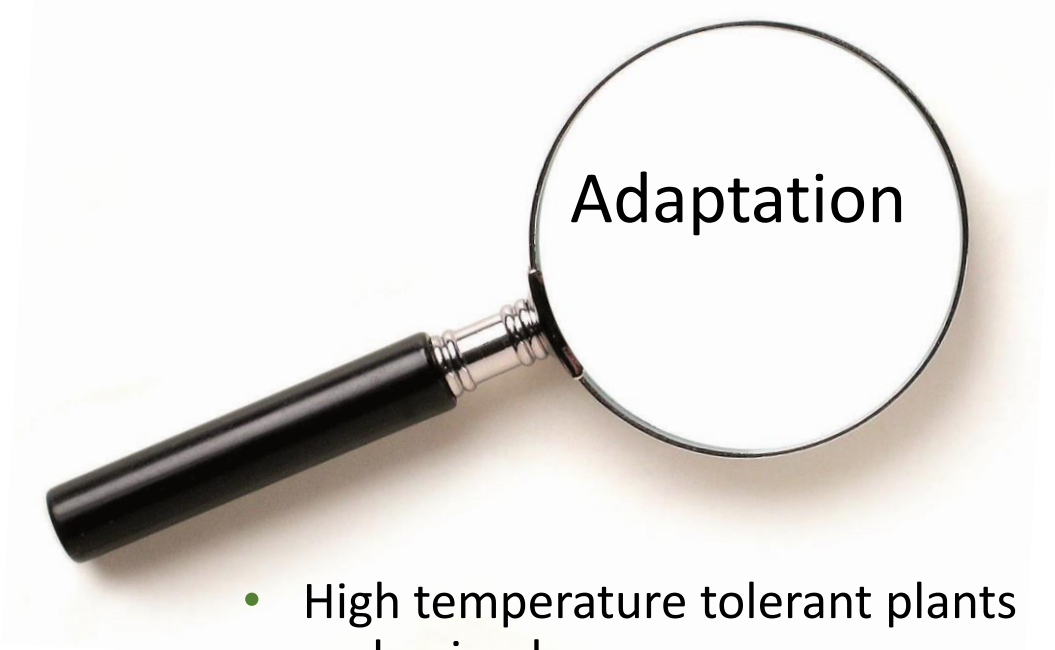


U.S. greenhouse gas emissions by economic sector, 2017



Note: Electricity emissions are allocated to each end-user sector based on its consumption.
Source: USDA, Economic Research Service using data from U.S. Environmental Protection Agency, April 2019: *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017*.

Approaches to Climate Change in Agriculture



- High temperature tolerant plants and animals
- Drought Resistant plants/animals
- Pest management for new and emerging pests/disease
- Water use efficiencies
- Reduced fertilizer use

- Deploying climate-smart practices that mitigate
  - ✓ Methane reducing feed
  - ✓ Carbon sequestration (cover crops, no till)
- More efficient farm enterprise
  - ✓ Reduced energy/fuels
  - ✓ Returning energy into the grid

If you have a footprint . . . .

Have an even bigger handprint!

Ag Climate Partnership

- Vision: We envision a world where every farmer and rancher deploys climate-smart solutions on every acre.
- Goal: U.S. agriculture is net negative for greenhouse emissions by the year 2030.
- Strategy: Mobilize scientists and farmers to unlock the climate-solving potential of our farmlands.
- One-of-a kind event to bring data and farmers together

What Science Do We Need?

- Integration of Data and systems
- Data analytics to understand practices and their impact
- Better understanding of soil health and soil-water interactions
- Study the system as a whole to understand economic impacts
- Phenotype/Genotype associations for traits for resilience or ghg reduction for breeding

Grand Challenges in Ag

Feeding the World

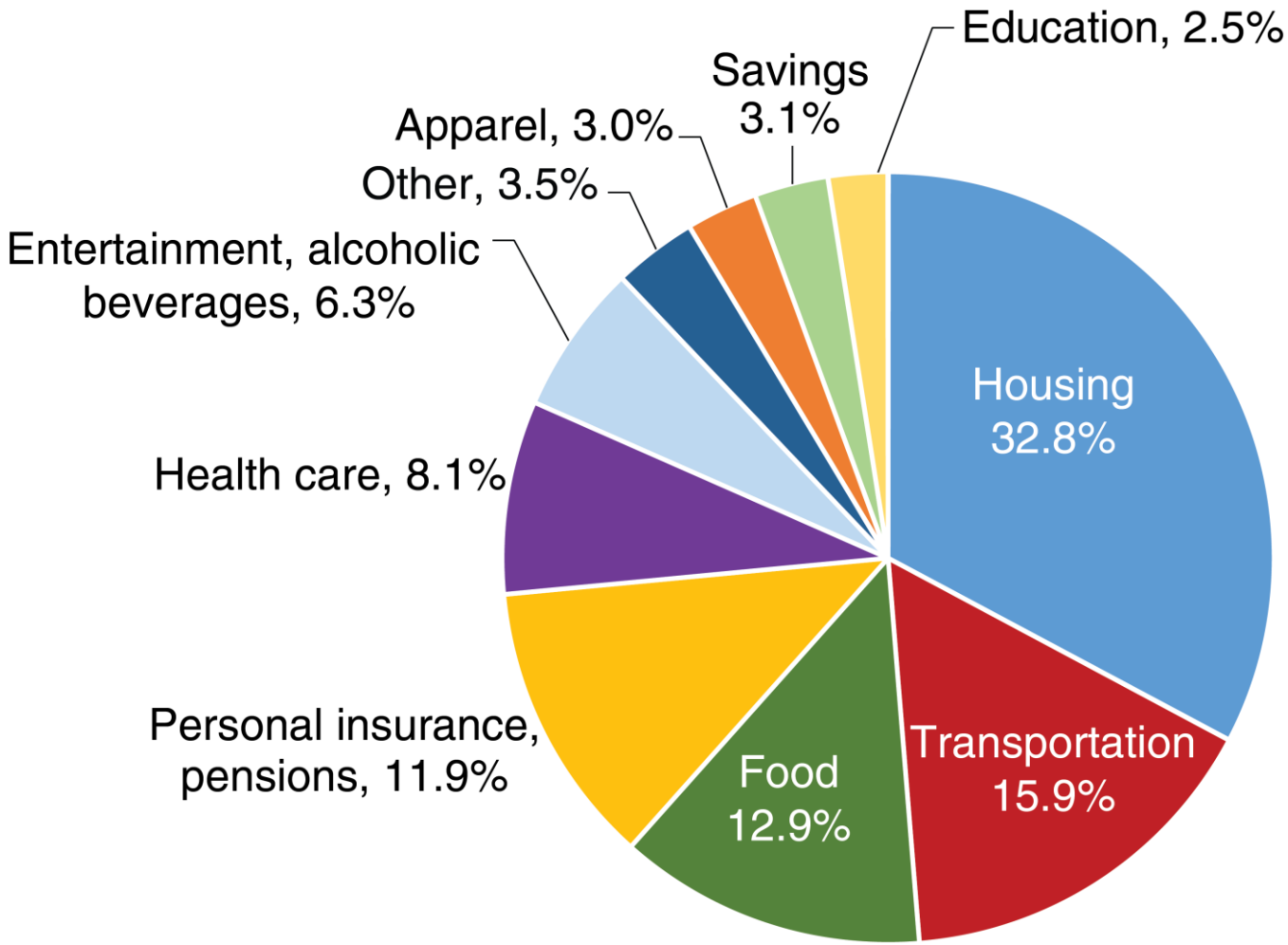
Competing Resources

Changing Climate

Environmental Stewardship

Improving Health & Nutrition

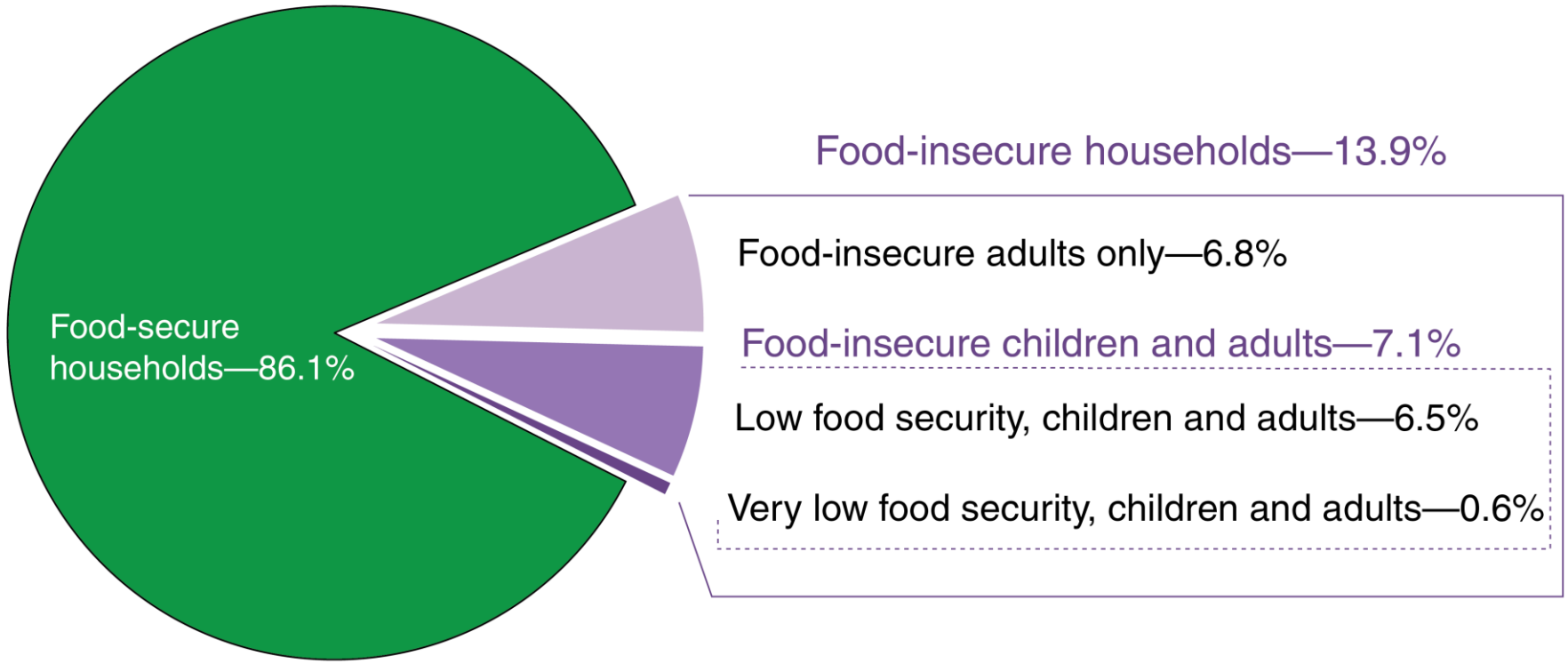
Share of U.S. household consumer expenditures by major categories, 2018



Note: "Other" includes personal care products, tobacco, and miscellaneous expenditures.
“Education” includes education and reading.

Source: USDA, Economic Research Service using data from the U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018.

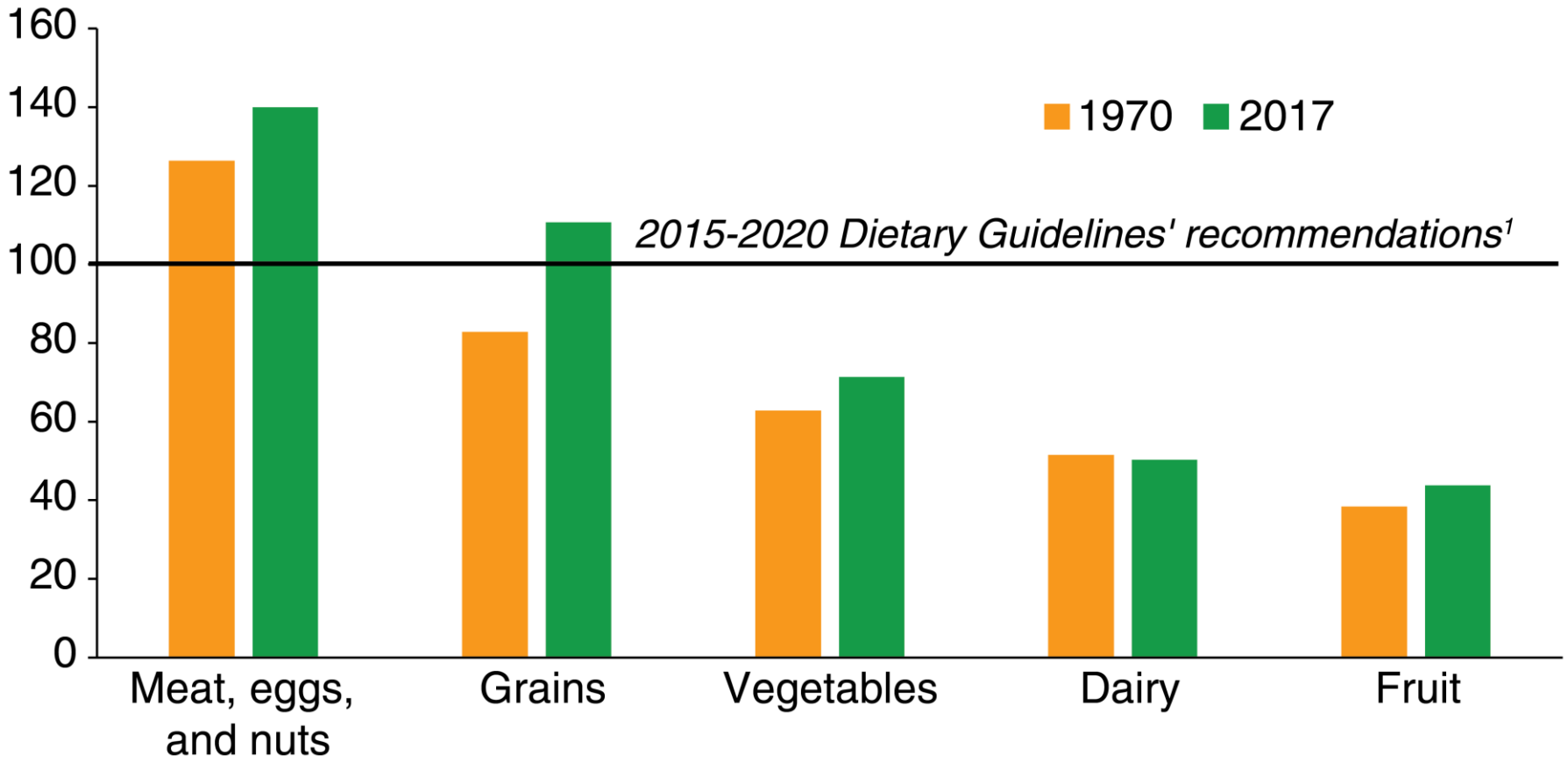
U.S. households with children by food security status of adults and children, 2018



Source: USDA, Economic Research Service using data from the 2018 Current Population Survey Food Security Supplement, U.S. Census Bureau.

Estimated average U.S. consumption compared to recommendations, 1970 and 2017

Percent of *2015-2020 Dietary Guidelines'* recommendations



[1]Based on a 2,000-calorie-per-day diet.
Loss-adjusted food availability data are proxies for consumption. Rice availability data were discontinued and thus are not included in the grains group.
Source: USDA, Economic Research Service, Loss-Adjusted Food Availability Data and *2015-2020 Dietary Guidelines*.

Current Food Production System

- There are ~30,000 edible plant species around the world
- However, only 3 crop species (rice, wheat, maize):
  - ✓ Provide over 50% of the world's plant-derived calories
  - ✓ Cover 40% of arable land globally
  - ✓ Form the basis of advanced food and ag production systems
  - ✓ Have pushed many traditional crops to the margins of R&D
  - ✓ Does not form sustainable model of food production in the long run

Minimal diversity leads to excessive homogeneity and oversimplification of both farming and food systems, disrupting the ecological, biological and social drivers of sustainable, resilient and healthy agriculture and food.

What Science is Needed

- Nutritional profile of a wider variety of plant and not just essential nutrients
- Bioavailability directly in plants as well as point in supply chain such as through storage, processing, transport
- Modeling of the entire food system to understand dynamics and how they impact food availability and access.
- Phenotype/genotype associations for breed for nutritional improvement

How Do We Incentivize the Entire Agricultural System?

- Major structural change need from farm gate to consumer
- Farmers must be part of solutions (often left out of the conversation)
- Better understanding of the system as a whole, where are the dependencies, touch points, low hanging fruit
- Unprecedented collaboration to end fragmentation of efforts
- Economics must be a centerpiece
- Research must be supported at unprecedented levels to affect real change
- Science based policies that spur innovation

35


Let’s work together to use available technology to spur agricultural innovation tomorrow
Connect with FFAR
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Thank you!

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