
# Spurring Innovation in Agriculture: Research Priorities Over the Next Two Decades

Sally Rockey, Executive Director, Foundation for Food and Agriculture Research

Farm Foundation Roundtable| June 9, 2017

We are a knowledge-base and technology-based economy.

We expect innovation.

But we can’t always predict from where the next great innovation will come . . .

And sometimes we are totally wrong . . .

**1876:** *"The Americans have need of the telephone, but we do not. We have plenty of messenger boys."* — William Preece, British Post Office.

**1921:** *"The wireless music box has no imaginable commercial value. Who would pay for a message sent to no one in particular?"* — David Sarnoff's associates in response to his urgings for investment in the radio

**1946:** *"Television won't be able to hold on to any market it captures after the first six months. People will soon get tired of staring at a plywood box every night."* — Darryl Zanuck, 20th Century Fox.

**1977**: *"There is no reason for any individual to have a computer in his home."* — Ken Olsen Founder of Digital Equipment Corp in a speech to the World Future Society.

**1995** *"I predict the Internet will soon go spectacularly supernova and in 1996 catastrophically collapse."* — Robert Metcalfe, founder of 3Com, inventor of Ethernet, tech pundit and columnist

**2005:** *"There's just not that many videos I want to watch."* — Steve Chen, CTO and co-founder of YouTube expressing concerns about his company's long term viability.

More data generated in the past two years than in the entire history of the human race.

The pace of science continues to accelerate

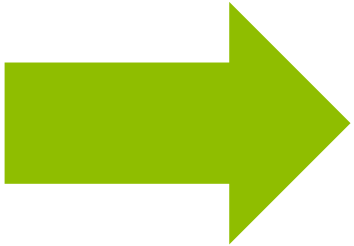
We must take advantage of this incredible time in science

# The Pace of Ag Science

## Dr. Ed Buckler

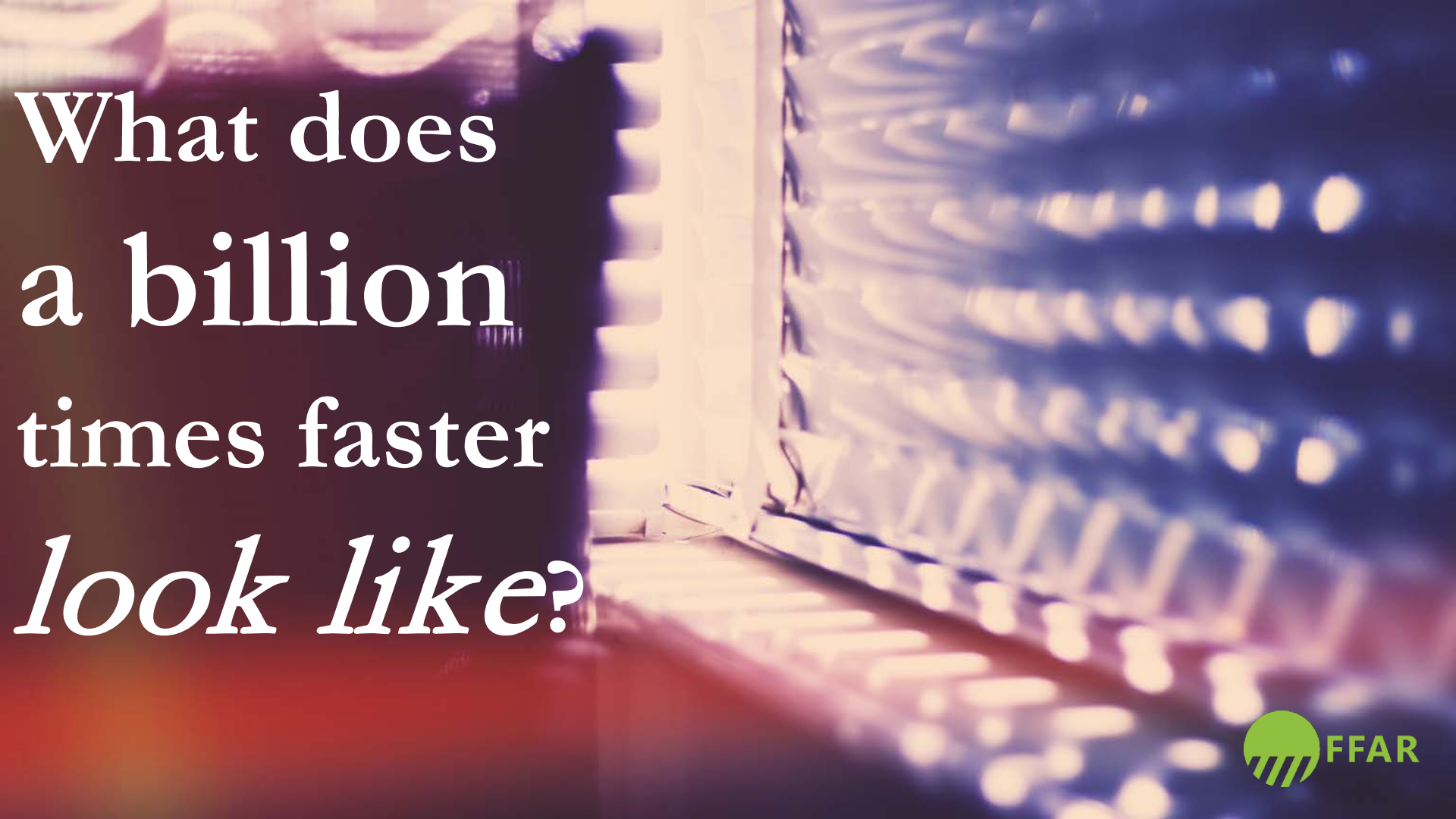
*Inaugural Recipient of the NAS Prize in Food and Agriculture Sciences, established by FFAR and Bill & Melinda Gates Foundation*

**Sequencing DNA has become 1 billion times *faster* and *cheaper* in the past 25 years**

Copyright Apple

*Only* 125, 000 times faster


What does
a billion
times faster
look like?
FFAR

# What does a billion times faster look like?

Imagine a 3.7 mile commute


**1 hr walk**

3.7 mph

**home**

**work**

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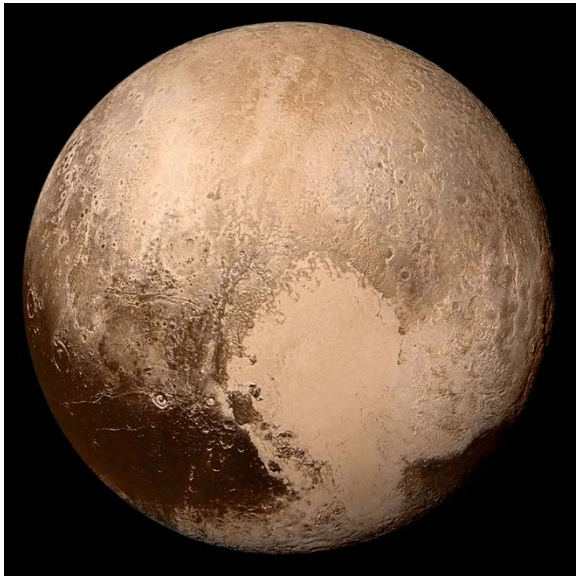
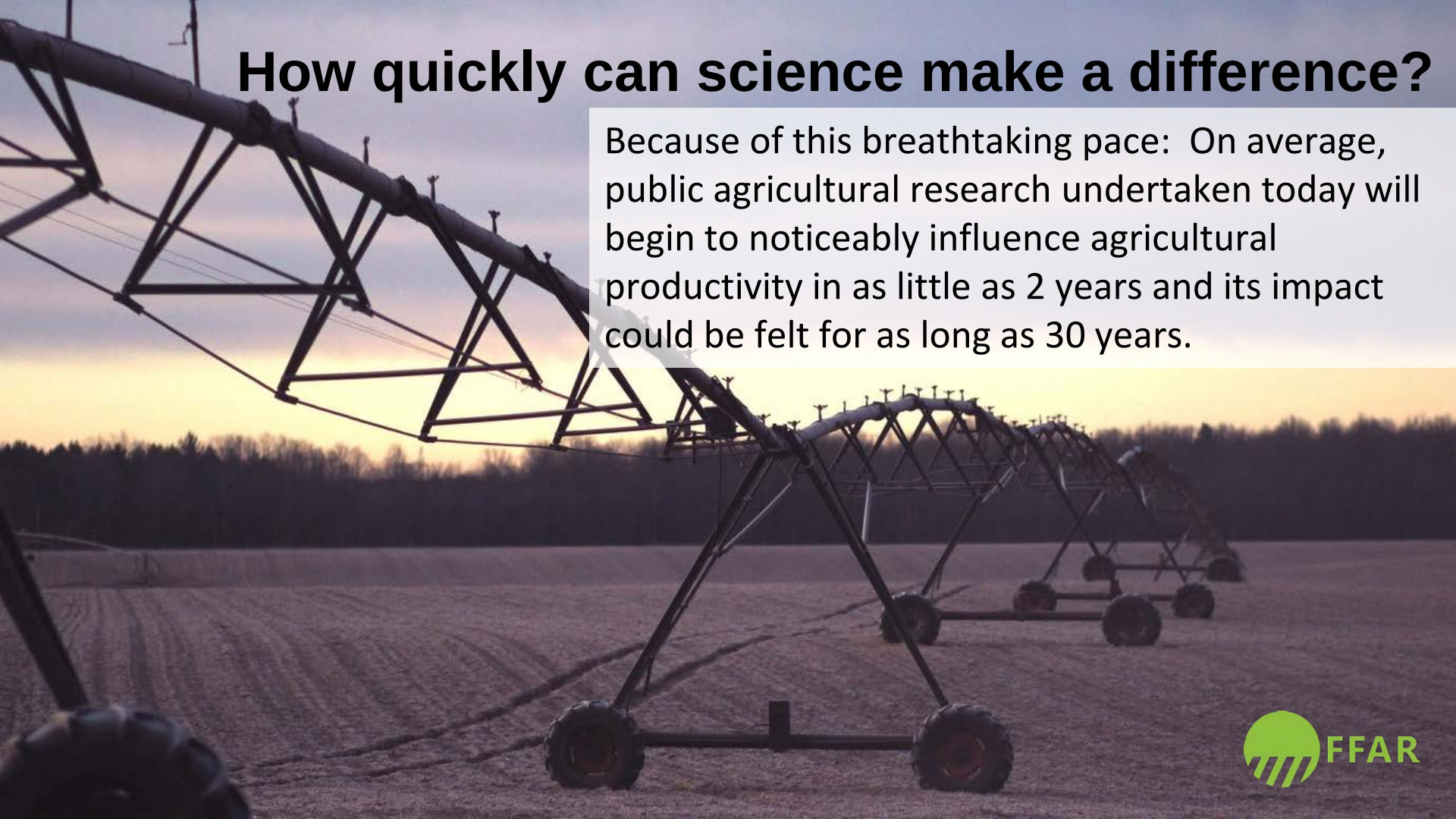


**home**

**Pluto**

# How quickly can science make a difference?

Because of this breathtaking pace:  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.

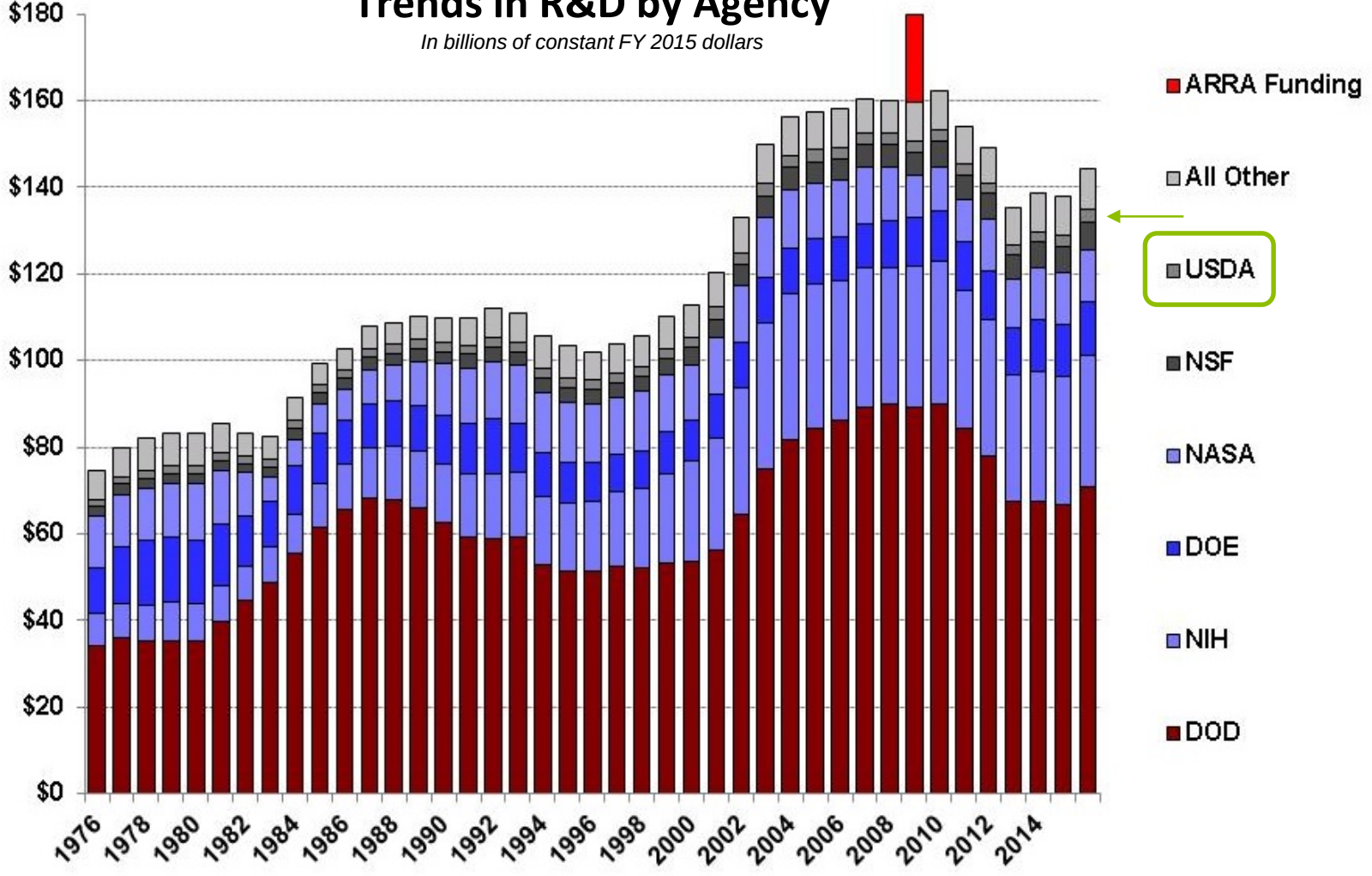


**Funding for Agricultural Research:**

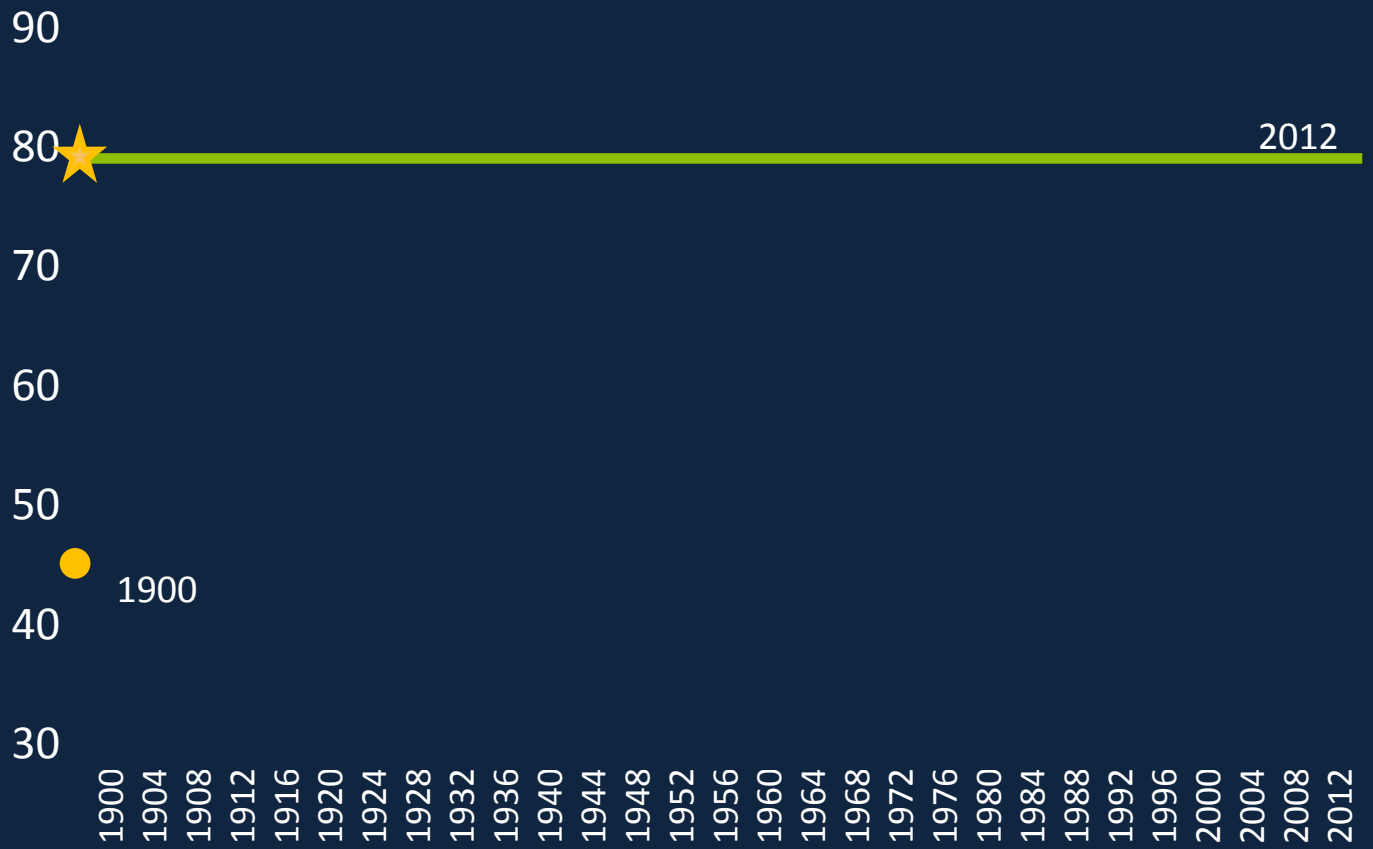
How stagnant funding has led to new funding models and opportunity

# Trends in R&D by Agency

*In billions of constant FY 2015 dollars*



# U.S. Life Expectancy



# Why is agricultural research funding not commensurate with its value in improving the quality of life?

*"When it comes right down to it, food is practically the whole story every time."*

- Kurt Vonnegut, Galápagos

**FFAR Mission**

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

# FFAR: A New Model for Ag Research Funding

- Created through bipartisan congressional support in the 2014 Farm Bill
- $200M to invest with partners
- With matching model, FFAR is at a minimum doubling the initial $200 million investment
- Governed by a Board of Directors, advised by expert Councils.
- FFAR complements the work of the USDA

# Who We Are

**"One of the most exciting initiatives in the 2014 Farm Bill"**

*– Senate Agriculture Committee Chairman Pat Roberts*

- Independent 501 (c) (3) organization
- Governed by 20-Member Board of Directors
  - Chair: Mississippi State University President Dr. Mark Keenum
  - USDA and NSF represented through *ex-officio* members, including Secretary of Agriculture Sonny Perdue

# The FFAR Model

- FFAR works directly and easily with private sector partners
- Multiplying investment (20 donors to date), currently matching each dollar invested with $1.40 from partners.
- Filling gaps – can adapt quickly
- Stakeholder input through Board and Advisory Councils
- Flexibility and nimbleness
  - FFAR can quickly pursue emerging issues.
  - ROAR program fills a need for rapid response to pest and pathogen threats (Example: Grant to combat SWD in tart cherries)

# Agriculture is the place to be these days in science!

- Importance of the issues
- Ability to take fundamental knowledge almost immediately into application
- New technologies often apply directly to agriculture before any other sector
- Growing consumer interest in the food system

# Innovations that have “done the most to shape the nature of modern life,

Top 10: printing press, electricity, internal combustion engine, paper, Internet, and steam engine

**11. Nitrogen fixation, 1918:** Fritz Haber wins a Nobel Prize for the ammonia-synthesis **Martinus Beijerinck**
**13. Refrigeration, 1850s:**
**22. Green Revolution, mid-20th century:** Norman Borlaug’s green revolution
**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**

# New Burgeoning Fields

**Phenomic/genomic associations**

**Big Data**

**New technologies –imaging, drones**

**Bioeconomy**

**Systems analysis**


*Progress happens when our knowledge of how things work converges with technological advances to reveal new ways to approach problems!*

FFAR

# What I want:

# 1. Support fundamental science

Beginning of Genetic Engineering
or
*How a hot pastrami sandwich led to Rootworm resistant corn.*

Biochemists Stanley Cohen and Herbert Boyer

*"Boyer and I didn't set out to invent genetic engineering. Our invention came from efforts to understand basic biological phenomena and the realization that our findings had important practical applications."*

## 3. Figure out the Pre-Competitive Space

*Pooling resources for public benefit.*

*Accomplishing more, together.*

# 4. Fund Innovative Research with actionable outcomes

# FFAR Challenge Areas

Food Waste and Loss

Healthy Soils, Thriving Farms

Overcoming Water Scarcity

Protein Challenge

Making “My Plate” Your Plate

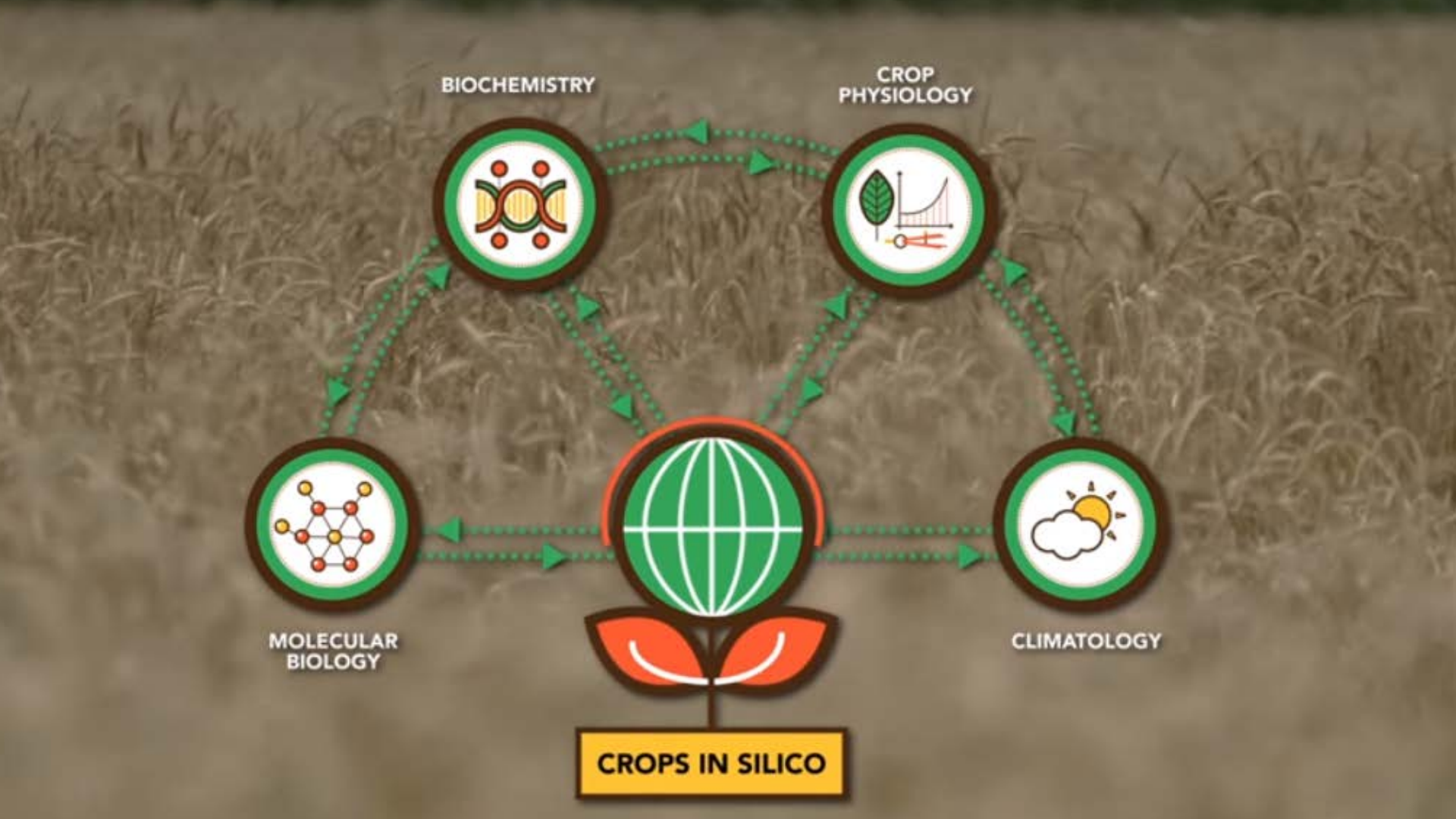
Urban Food Systems

Forging the Innovation Pathway

**Offer Input:** www.foundationfar.org/challenge

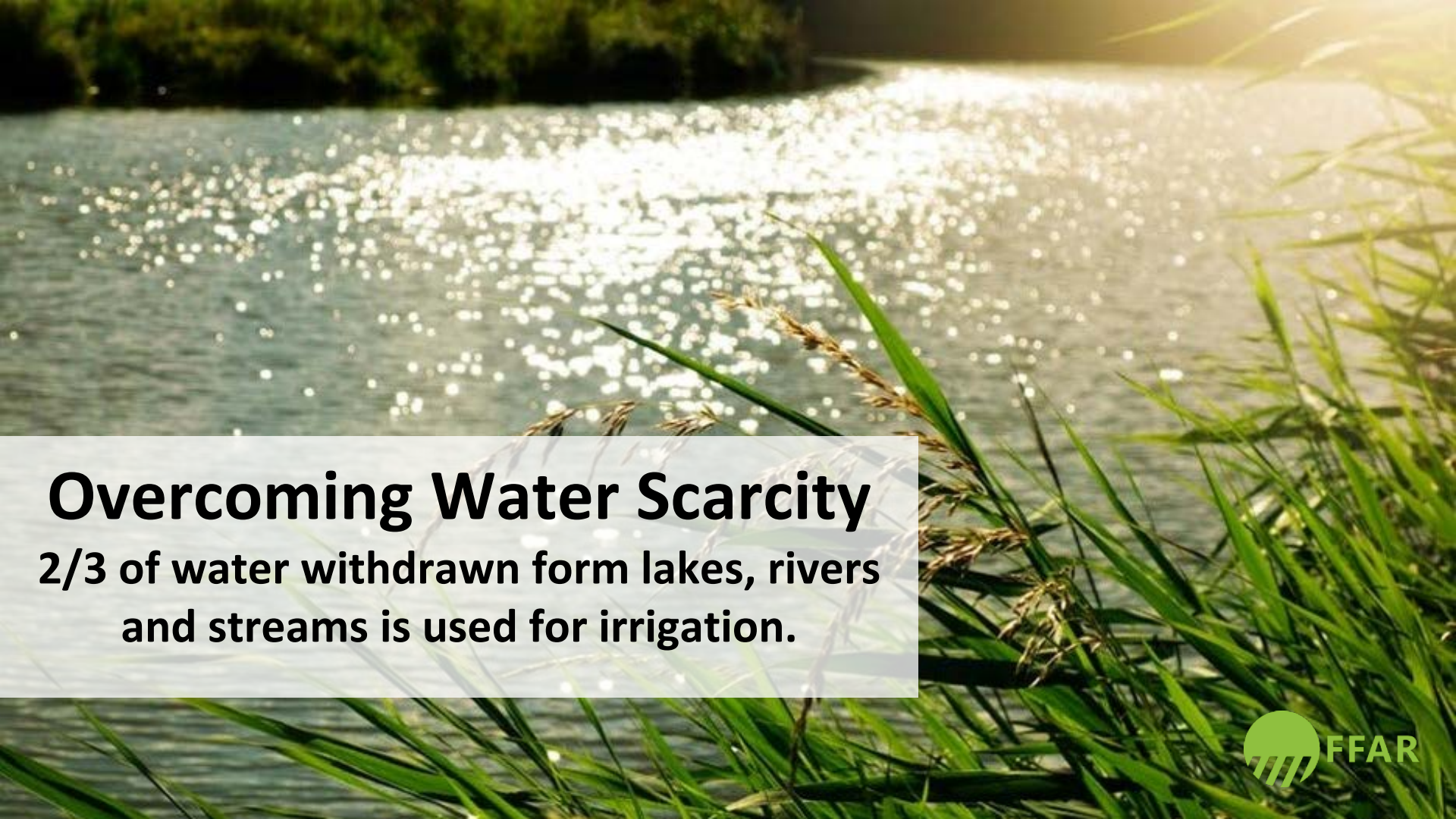
# Improving Plants

- Doubling photosynthetic efficiency increase yields up to 40%
- Phenotype/genotype
  - Environmental resilience
  - Increased yield
  - Desired nutritional traits
- Taking advantage of the latest technologies – gene editing


BIOCHEMISTRY
CROP PHYSIOLOGY
MOLECULAR BIOLOGY
CLIMATOLOGY
CROPS IN SILICO

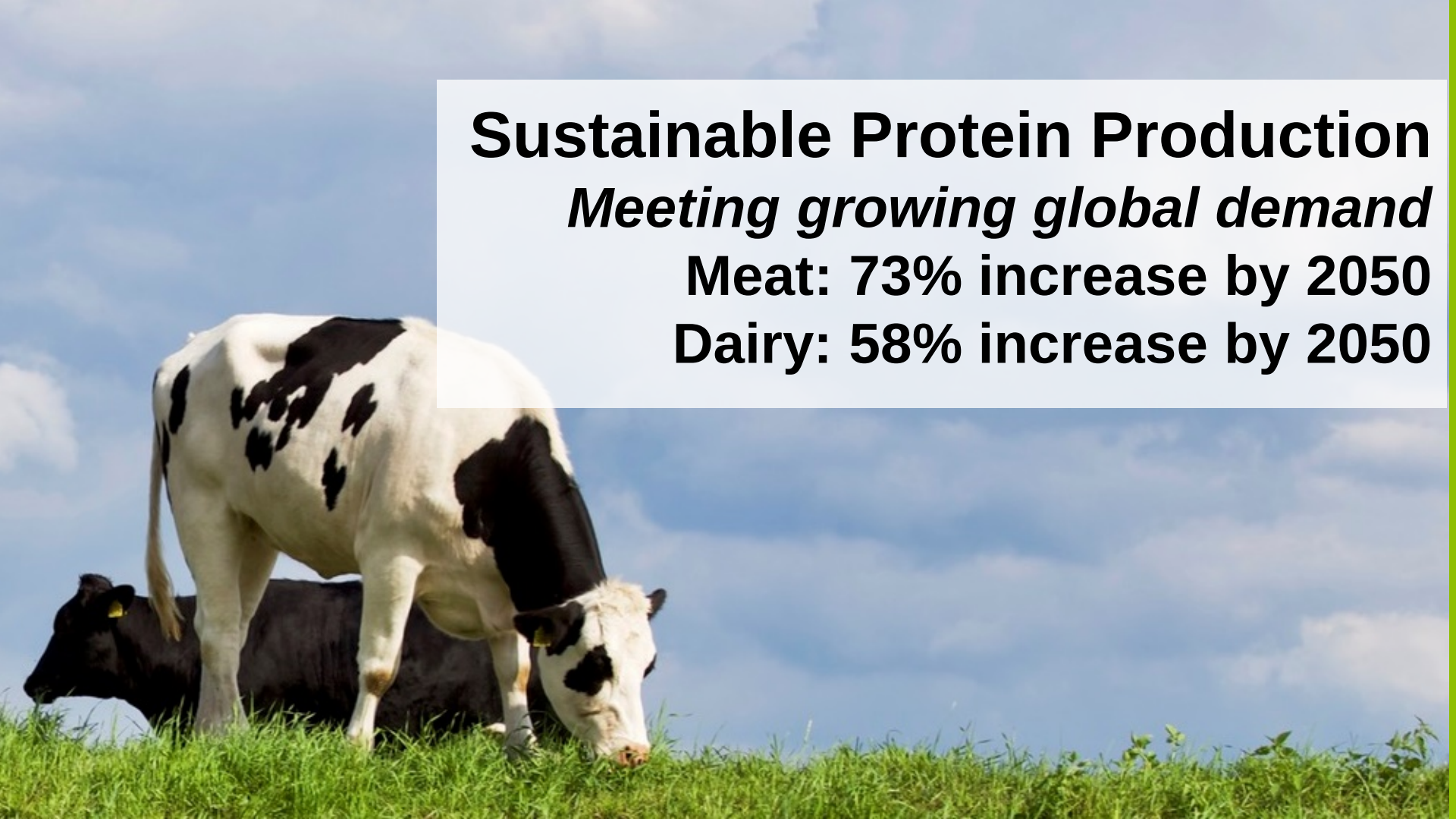
# Crops of the Future

- Systematic identification of genes that give rise to traits important now and in the future
- Multi-partner collaborative in the pre-competitive space
- Founding Partners announcement June 2017


Overcoming Water Scarcity
2/3 of water withdrawn form lakes, rivers and streams is used for irrigation.
FFAR

# Water Scarcity Research Priorities

- Irrigation technology innovations
- Water use efficiency in crops
- Reuse and Recycling


Sustainable Protein Production
Meeting growing global demand
Meat: 73% increase by 2050
Dairy: 58% increase by 2050

# Protein Challenge Research Opportunities

- Antibiotic stewardship
- Growth and reproduction
- Environmental sustainability
- Welfare

*Open Competitive RFA supports livestock farmers' efforts to adapt to a changing production environment*

# Soil Health National Cover Crop Germplasm Initiative

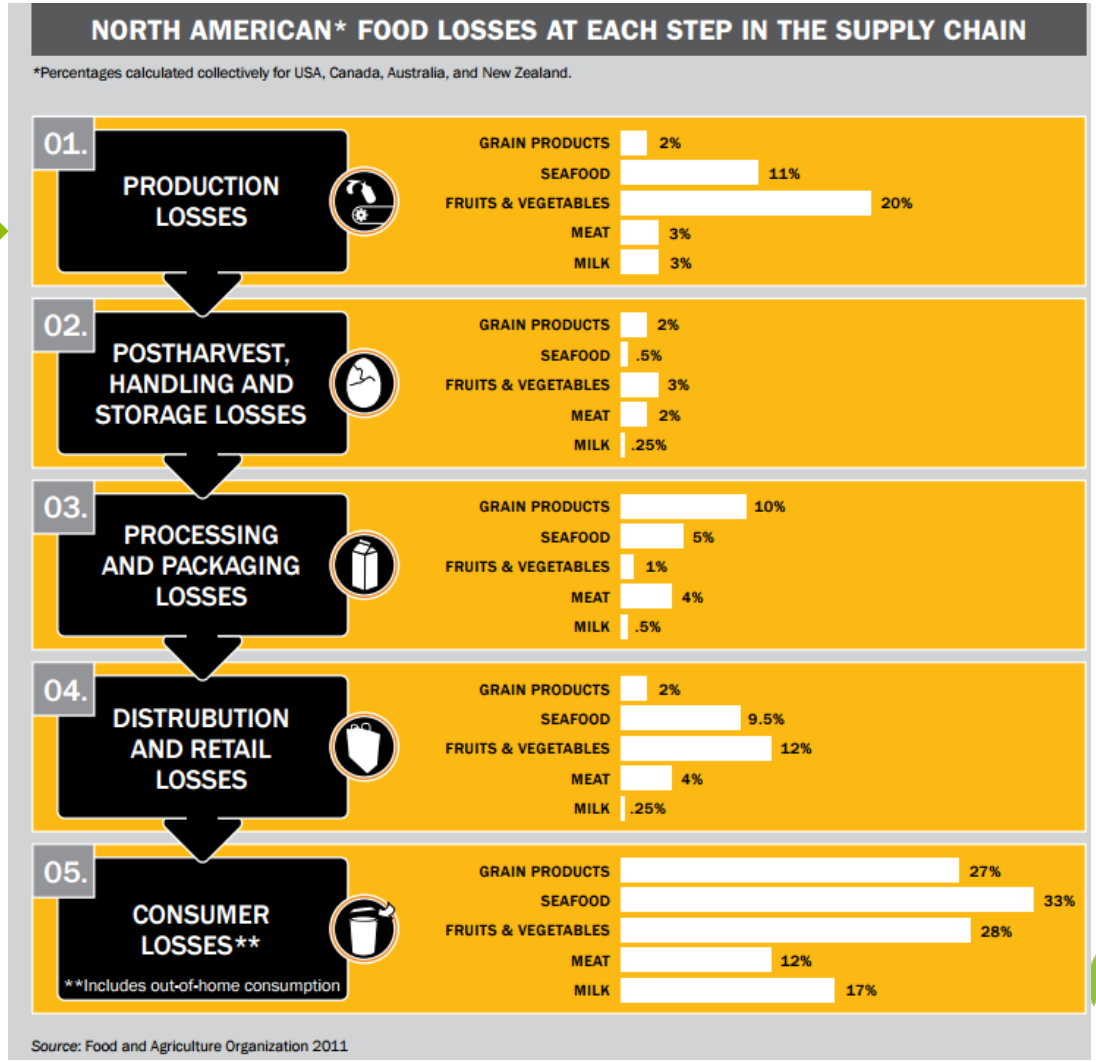
*Launched March 2017 with Samuel Roberts Noble Foundation*

## Program Goals:

- Enhance health and future productivity of U.S. soils for thousands of farmers
- Identify the cover crops most likely to improve soils
- Identify key traits that improve cover crops
- Make new genetic resources available

Production level

Consumer Level




Graphic: Natural Resources Defense Council

# Fostering the Future


Let’s work together to support and apply agriculture research that spurs the innovation we need for human, environmental and economic health in the future.

## Connect with FFAR

**Text FFAR to 22828 or**
**go to http://bit.ly/FFARenews**

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# *Thank You*

## Join Us

**Dr. Sally Rockey, Executive Director**
srockey@foundationfar.org

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