



# Transforming Agriculture through Technological Advancements

October 24, 2017



# About FFAR

- Created in the 2014 Farm Bill to spur innovation and collaboration in agriculture
- \$200M to invest with partners in cutting edge research



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



“ *The world’s population will multiply more rapidly than the available food supply.*”

--Thomas Malthus

# Progression of Agriculture

**Increase Yield, Less Land**

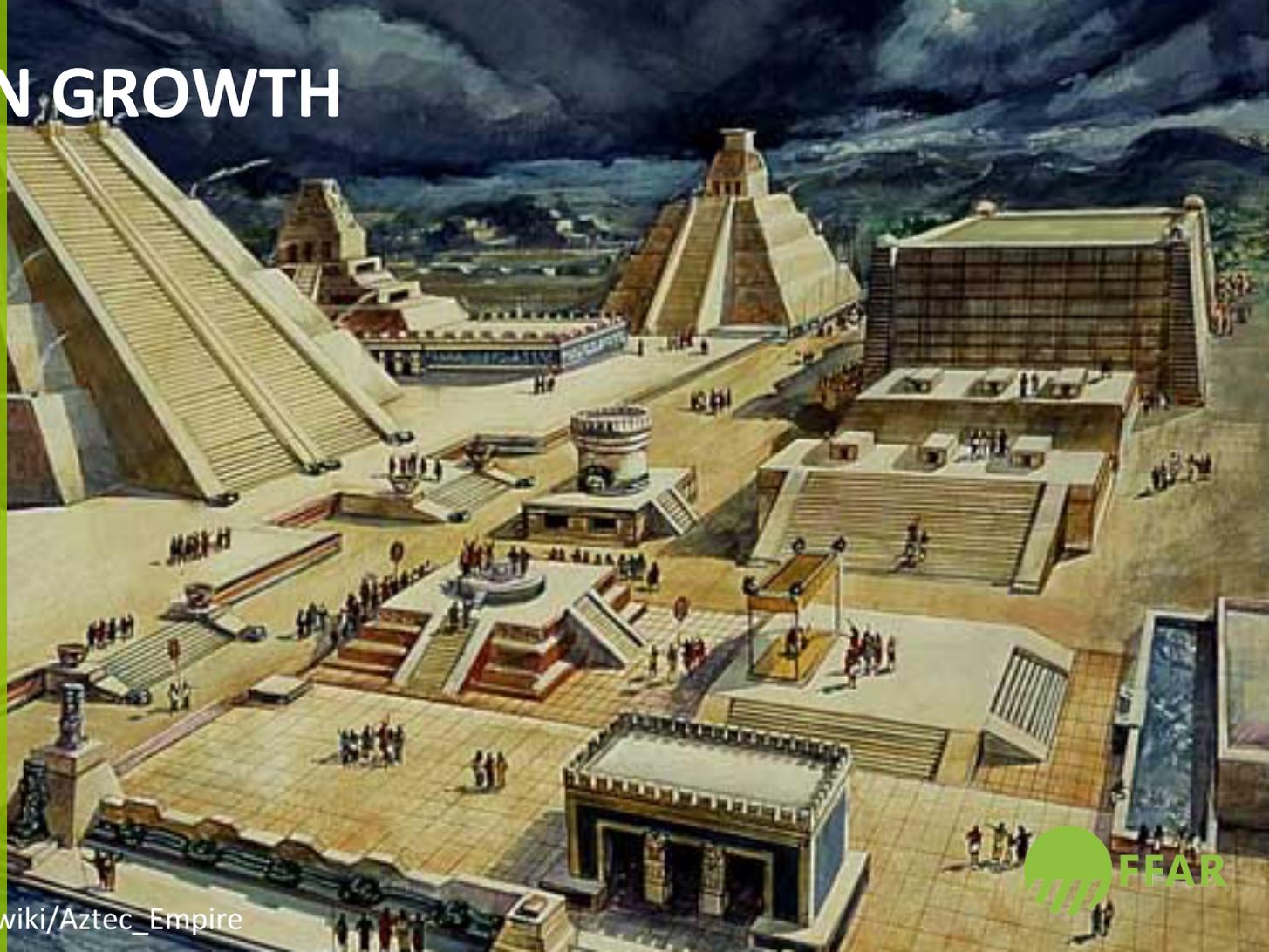
# AGRICULTURAL REVOLUTION

## *Farming, Cultivation*

- Movement from hunting and gathering to farming
- Plant and animal domestication



# CIVILIZATION GROWTH



[https://simple.wikipedia.org/wiki/Aztec\\_Empire](https://simple.wikipedia.org/wiki/Aztec_Empire)

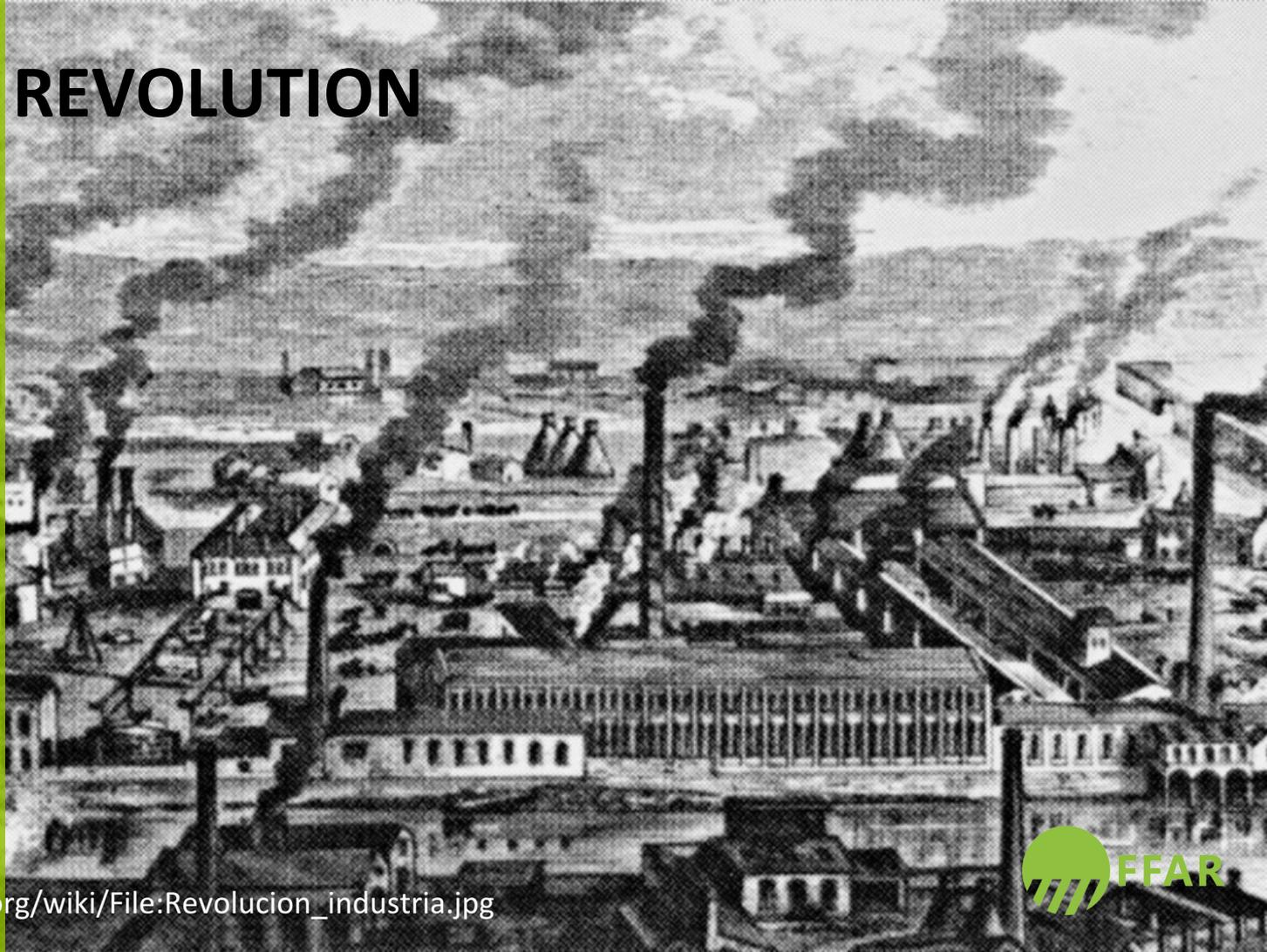
## 2<sup>nd</sup> AGRICULTURAL REVOLUTION

*More food using more land*

- New crops
- More livestock
- Advancements in technology



# INDUSTRIAL REVOLUTION



[https://commons.wikimedia.org/wiki/File:Revolucion\\_industria.jpg](https://commons.wikimedia.org/wiki/File:Revolucion_industria.jpg)



# GREEN REVOLUTION

## *Agricultural Intensification*

- High-input/high-output crops
- Intensification under specific environmental conditions



## AS A RESULT...

- Crops yields of specific crops dramatically increased
- Fall in real food prices
- Poverty reduction



# Modern Problems

# CLIMATE CHANGE

- Decreasing nutrition
- Drought
- Heat
- Extreme Weather

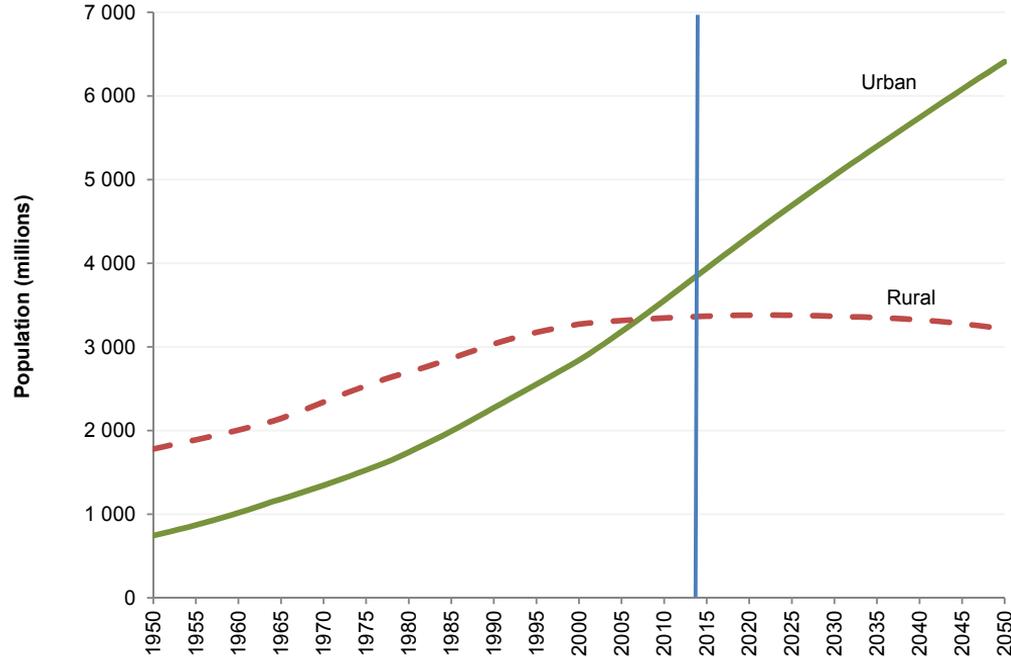


# NUTRITION

- Overnutrition/undernutrition
- Access
- Distribution
- Behavior

# INCREASING AND SHIFTING POPULATIONS

Figure I.1. The world's urban and rural populations, 1950-2050



# Scientific Advancements Increase Agricultural Capacity

# TRANSFORMATIONS IN AGRICULTURE

## *Harnessing Advances in Technology*

- Precision agriculture
- Big data
- Phenomics
- Breeding
- Genome editing



Courtesy CIAT via WikiCommons

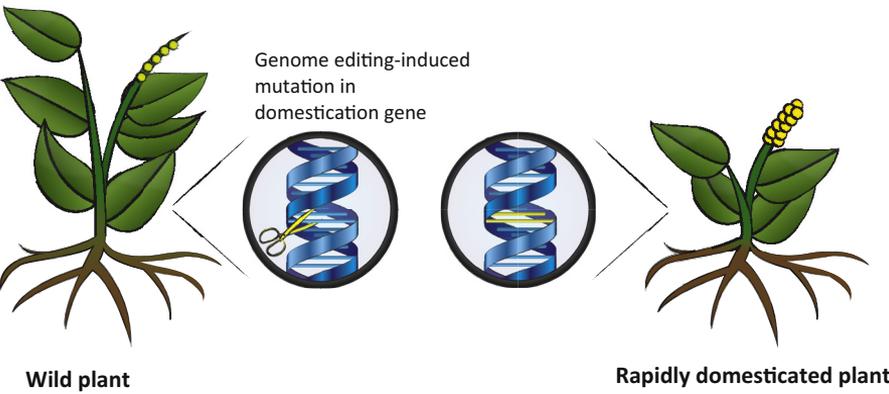
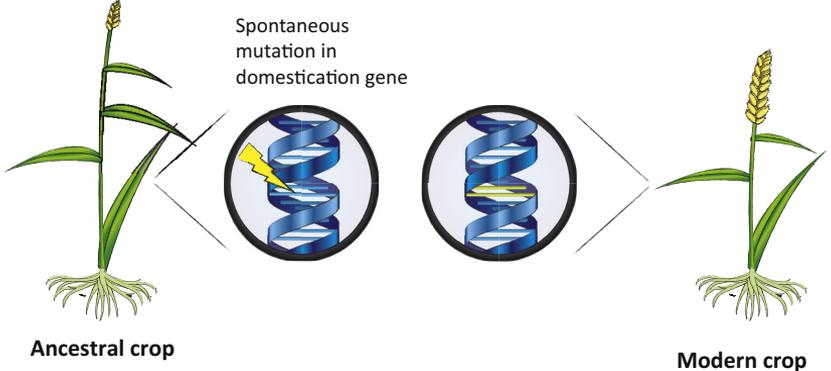
# GENE EDITING: A TOOL TO ACCELERATE SCIENTIFIC DISCOVERY AND BREEDING

- Accelerate breeding
  - Multi-genic traits
- Increase biological understanding

# CREATING MORE RESILIENT SYSTEMS

- Nutritious crops
- Environmental sustainability
- Lower inputs

# DOMESTICATION OF NEW CROPS



# SHIFTING CROPS TO CONTROLLED ENVIRONMENTS

- What crops can we grow?
- Can we grow more nutritious crops?
- More flavorful crops?

**Advancements can greatly benefit controlled environment agriculture as a whole, and will require a concerted effort**



*Photo courtesy of Valcentéau and WikiCommons*



## **OUR VISION**

**Accelerate our ability to develop the crops that benefit humanity now and in the future by increasing our understanding of the relationship between traits, genes, and the environment.**

# Initial Focus



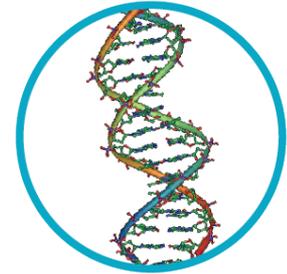
**Wheat**



**Maize**



**Leafy  
greens**



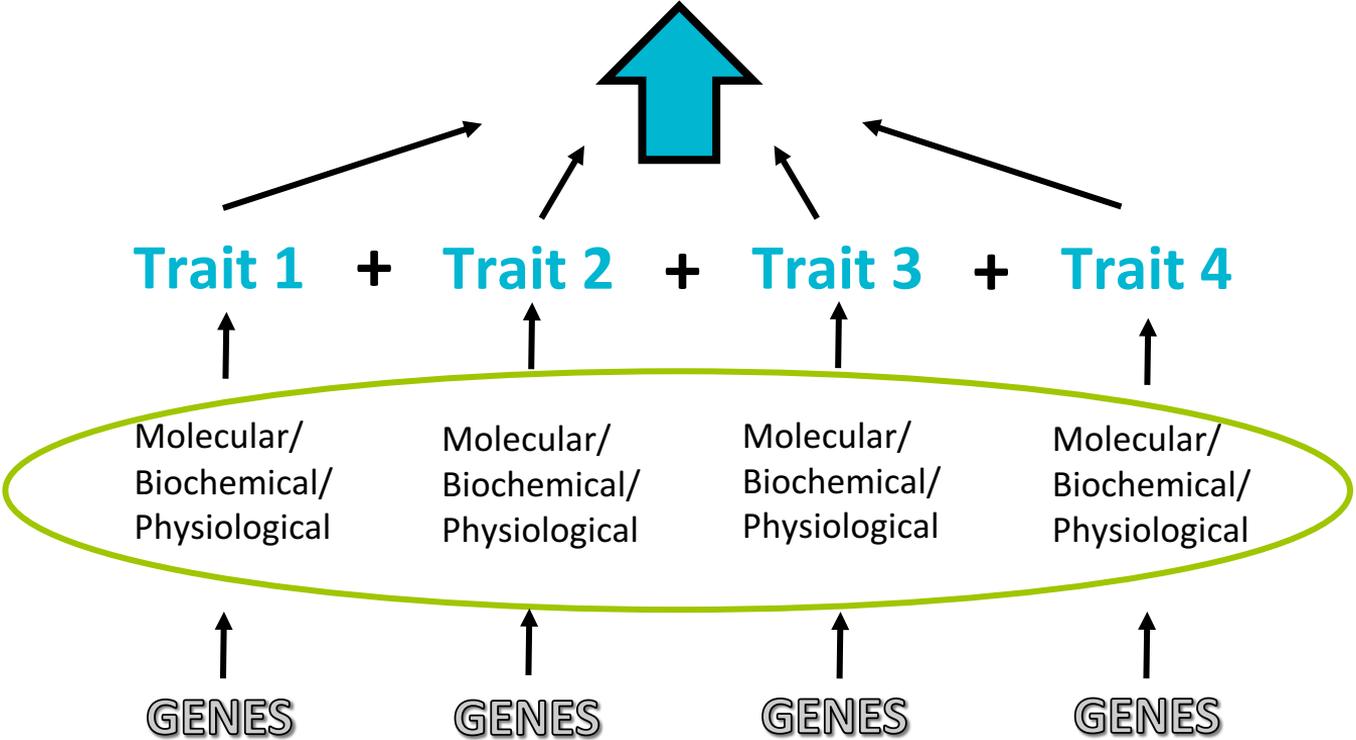
**Cross-crop  
technologies**

# COMPLEX CHARACTERISTICS

Understanding the **physiological**, **biochemical**, and **molecular** processes that influence the traits that give rise to complex characteristics.



# CROP CHARACTERISTIC



# 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**

# Looking Ahead

- **Engage with FFAR**

- Submit a research concept online
- Join a convening event to participate in developing future programs
- Start with a conversation: Contact us directly

- **Upcoming announcements**

- Seeding Solutions: 9 grants up to \$2 million each
- 2018 New Innovators Awards: Support for 9 standout scientists early in their university careers
- Programs in soil health, maximizing farm efficiencies, irrigation technology, and additional topics

# *Thank You*

## **How to Reach FFAR**

**John Reich**

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## **Connect with FFAR**

[www.foundationfar.org](http://www.foundationfar.org)



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