



United States Department of Agriculture  
Rural Development



US San Francisco Bay Area Chapter

# Disruption and California The Agriculture Sector

## What's Going On?

Robert Tse  
USDA CA Rural Development  
Redwood City, CA  
June 29, 2016

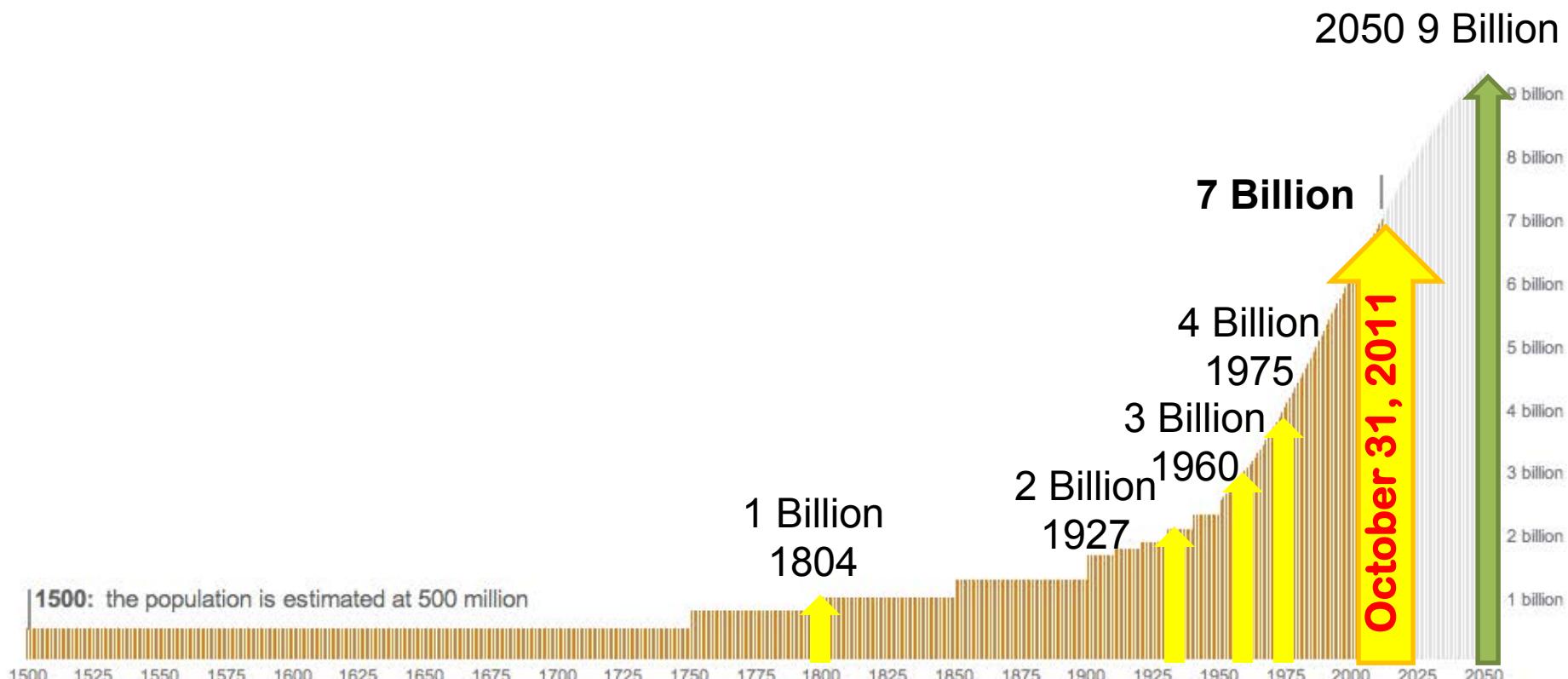


# Global Demographic Drivers Global Ag Challenges Global Ag Opportunities

# World Population Reaches 7 Billion

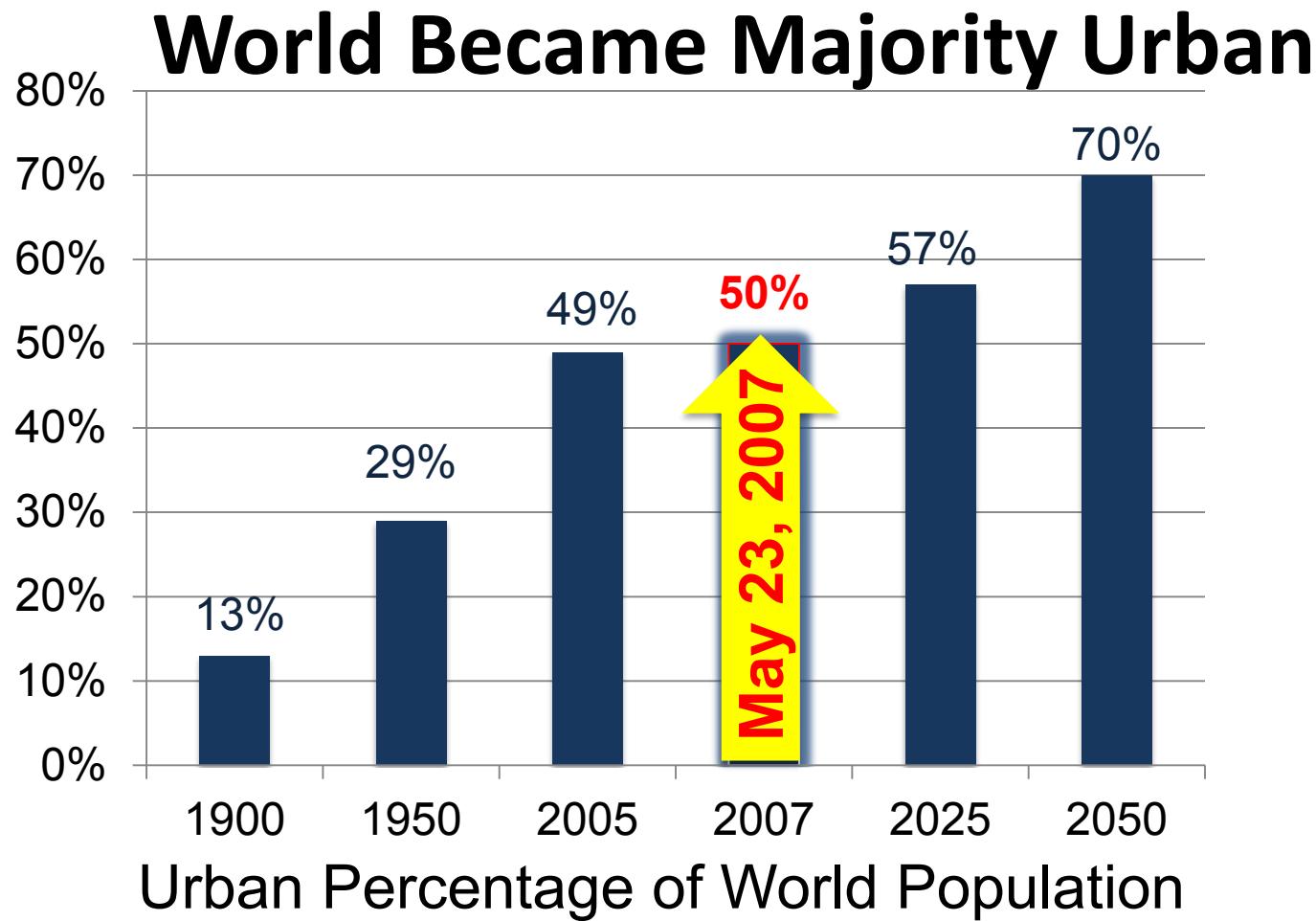
October 31, 2011

Projected to Reach 9.3 Billion in 2050

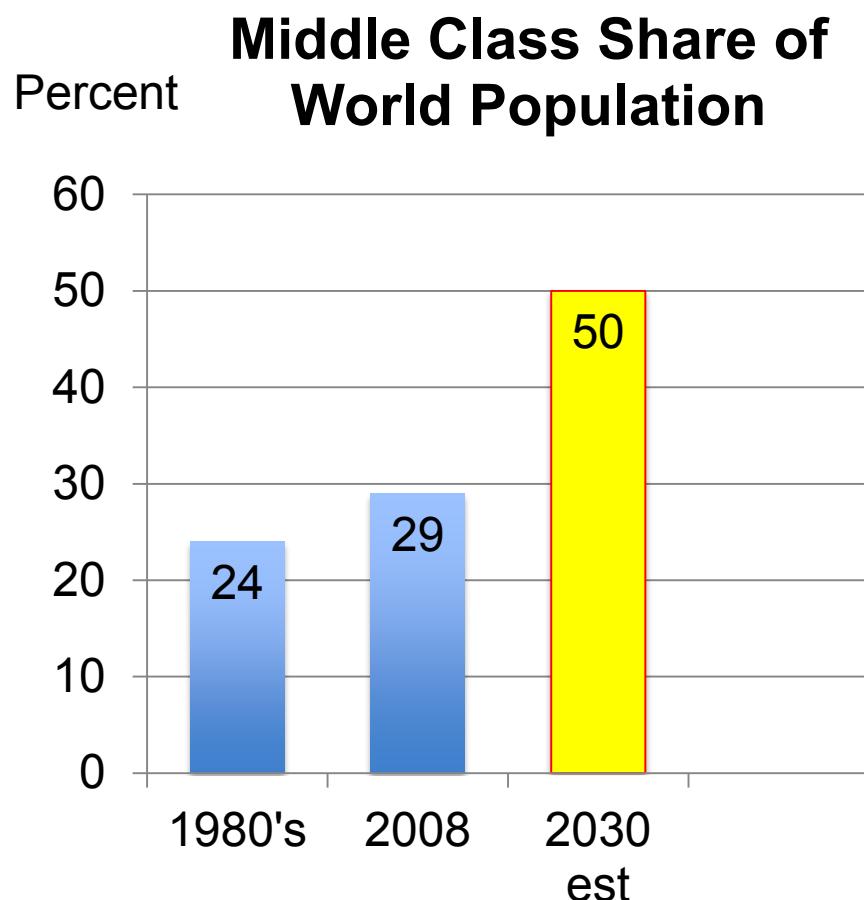


# World Becomes More Urban

May 23, 2007



# Rise of the Global Middle Class



By 2030,  
50% of world  
population will be  
middle income  
(\$6 – 30,000 PPP)

Source: Goldman  
Sachs Economic  
Research



# Global Demand Drivers to 2050

- Global Population Increase
- Rapid Urbanization
- Growing Middle Class
- Climate Change Impact



- Rising Food Prices
- Rising Global Trade of Food
- Rising Demand for Protein, Fruits and Vegetables
- Agriculture Adapts to Climate Change

# Global Agriculture Challenges

- Limited availability of more arable land for production without high environmental costs
- Double Productivity on farm land already in production
- Adapt to Global Climate Change
- Meet Local Disruptive Events



# Disruptive Events

A composite image of Earth's horizon showing a bright blue glow on the left and a large, dark, smoky comet-like object streaking across the sky towards the right, with a bright yellow/orange fireball at its point of impact.

DROUGHT

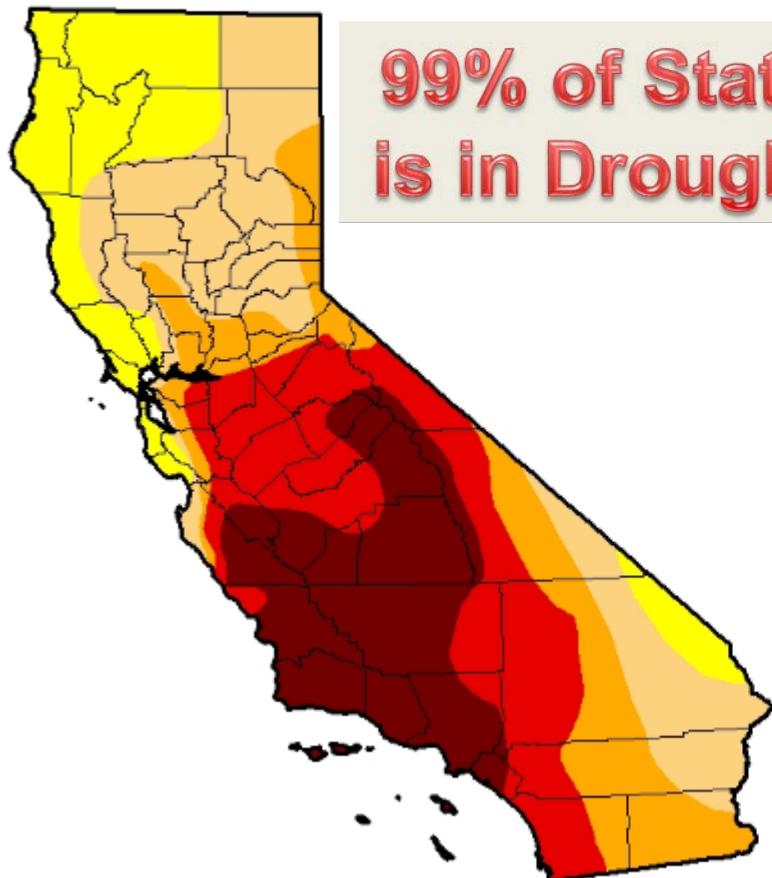
Invasive Species

Shrinking Farm Labor Pool



# Disruptive Event

## U.S. Drought Monitor California



June 21, 2016

(Released Thursday, Jun. 23, 2016)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	83.59	59.02	42.80	21.04
Last Week 6/14/2016	0.00	100.00	83.59	59.02	42.80	21.04
3 Months Ago 3/22/2016	1.16	98.84	81.55	72.88	56.31	34.74
Start of Calendar Year 12/29/2015	0.00	100.00	97.33	87.55	69.07	44.84
Start of Water Year 8/29/2015	0.14	99.86	97.33	92.38	71.08	46.00
One Year Ago 4/23/2015	0.14	99.86	98.71	94.59	71.08	46.73

### Intensity:

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.

### Author:

Eric Luebehusen  
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>



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# Disruptive Events

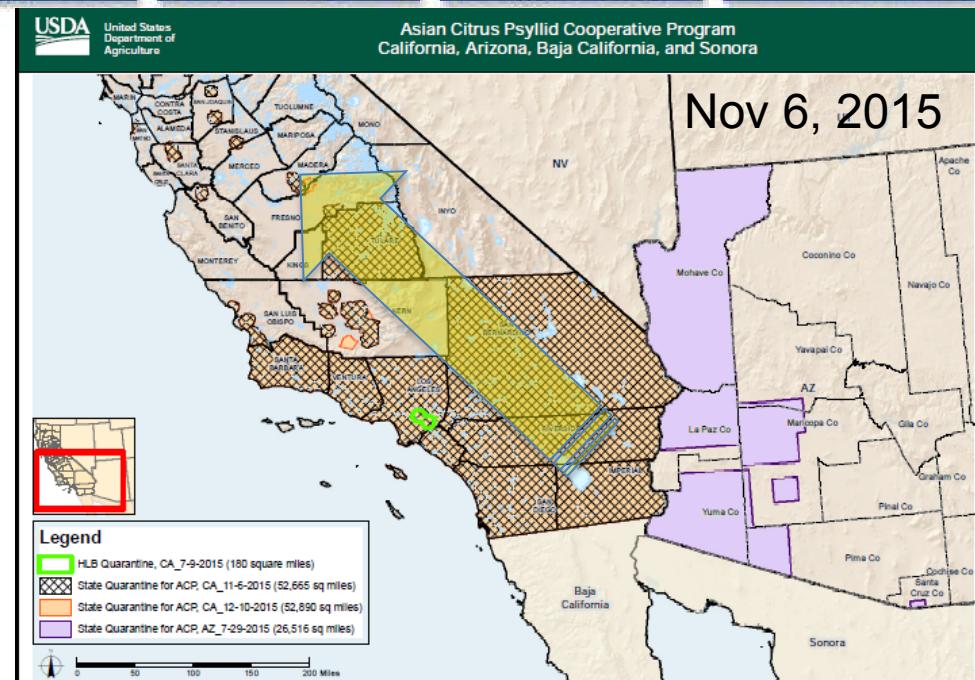
## INVASIVE SPECIES & NATIVES GONE WILD

THE BATTLE AGAINST

### Invasive Pests and Diseases



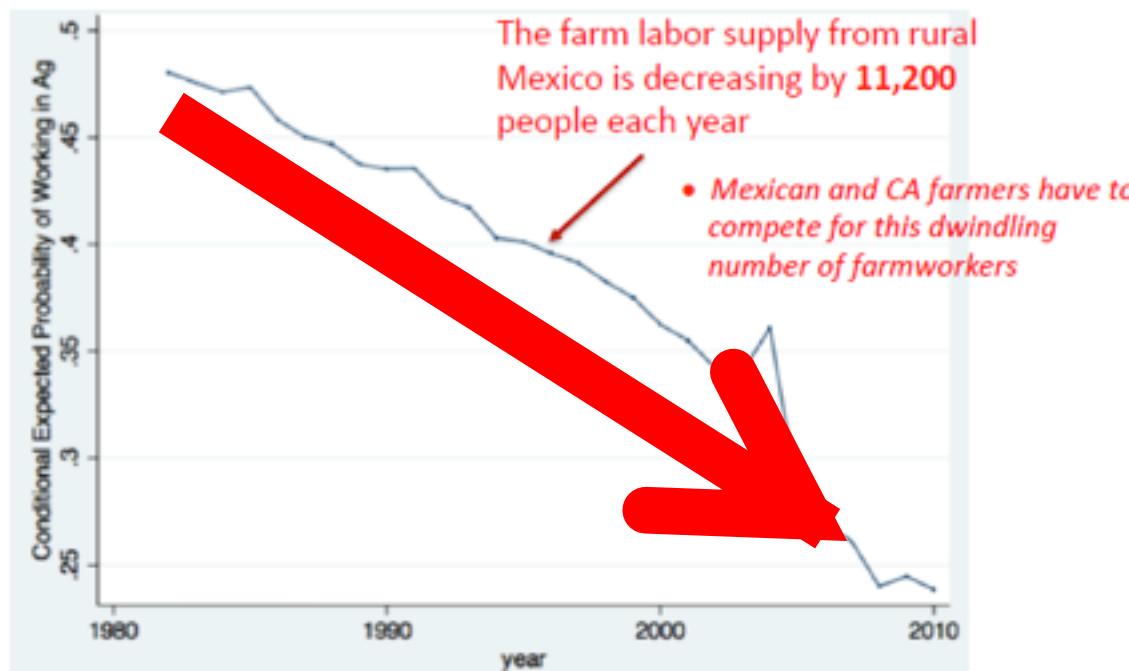
Asian Citrus  
Psyllid Spreads  
Across  
California



# Disruptive Event

## Shrinking Farm Labor Pool

Probability of Rural Mexicans Working in Ag (anywhere, in Mexico or the US)



Source: Charlton and Taylor (2014)



# Disruptive Events

## Impact on Farming

- ✓ Produce More with Less Labor
- ✓ New plant hybrids, and animal breeds
- ✓ New agricultural production practices
- ✓ Greater efficiency in agricultural utilization of water



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# Climate Change

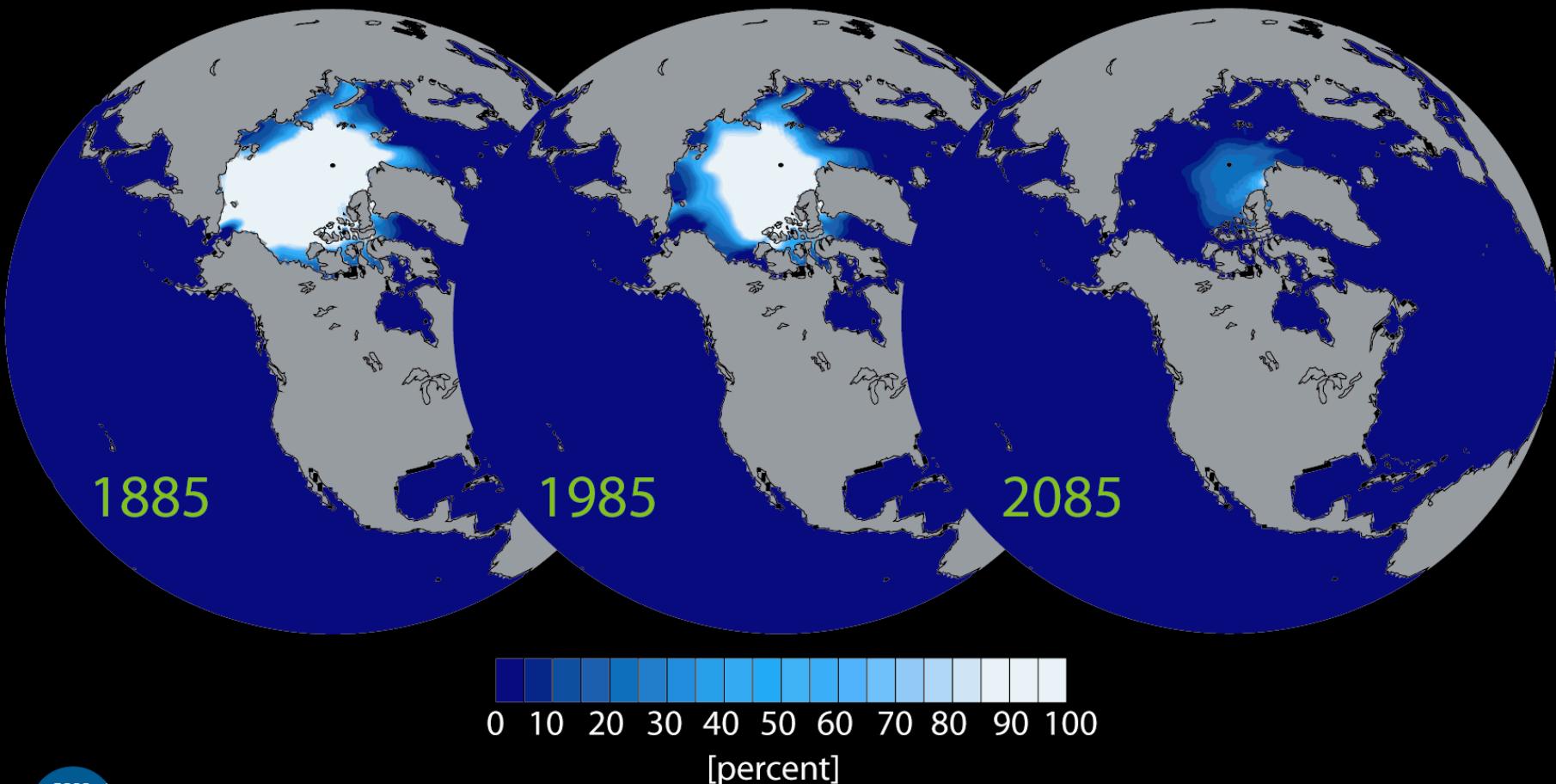




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# CLIMATE CHANGE POLAR ICE CAP MELTS

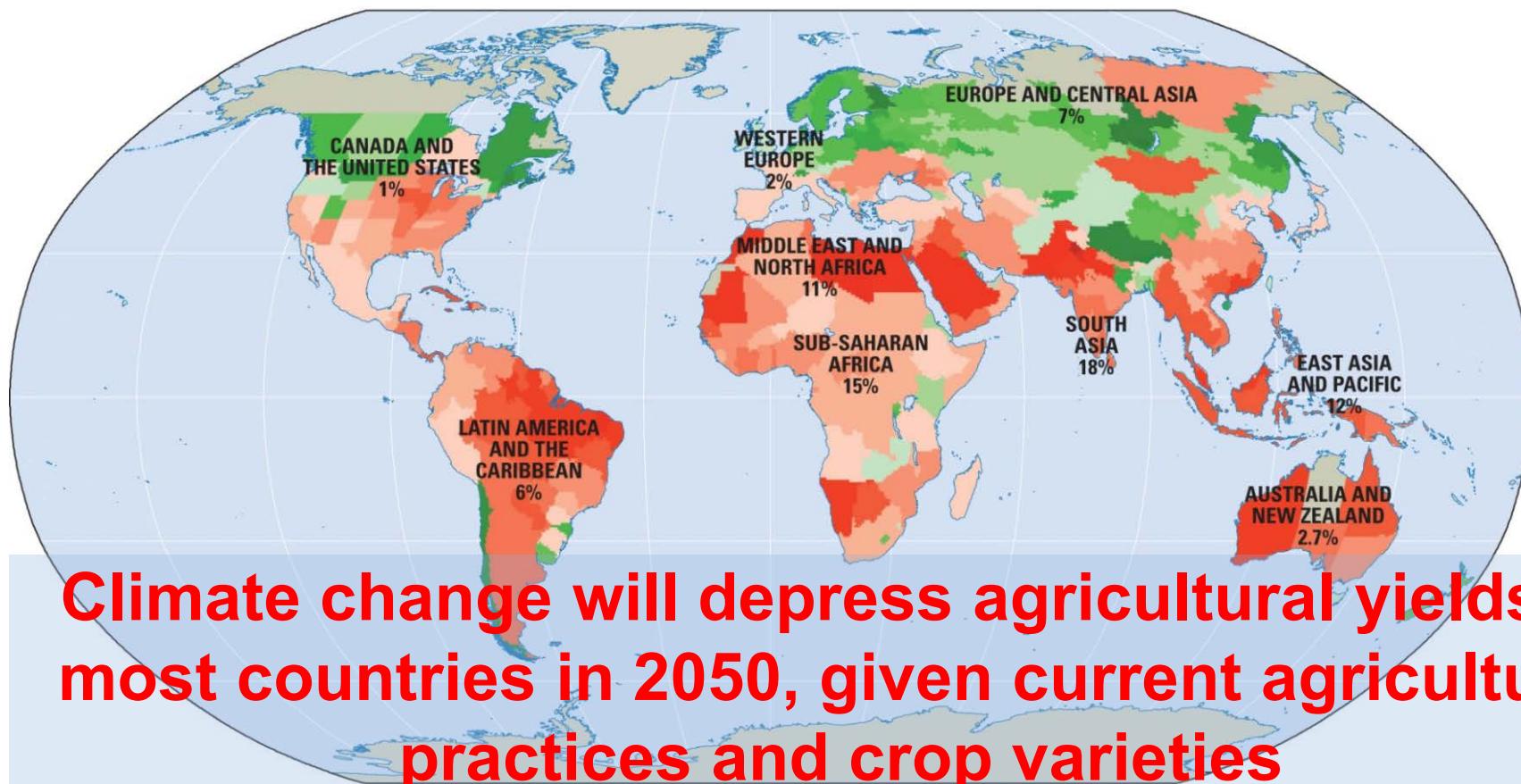
NOAA GFDL CM2.1 Model Simulation



Aug Sept Oct Avg Sea Ice Concentration

NOAA Geophysical Fluid Dynamics Laboratory

# Global Impact on Ag



Percentage change in yields between present and 2050



No data

Note: The coloring in the figure shows the projected percentage change in yields of 11 major crops (wheat, rice, maize, millet, field pea, sugar beet, sweet potato, soybean, groundnut, sunflower, and rapeseed) from 2046 to 2055, compared with 1996–2005. Large negative yield impacts are projected in many areas that are highly dependent on agriculture.

*World Development Report 2010*



# Disruptive Events

- ✓ DROUGHT
- ✓ CLIMATE CHANGE
- ✓ INVASIVE SPECIES &  
NATIVES GONE WILD
- ✓ FARM LABOR
- ✓ DISRUPTIVE TECHNOLOGY



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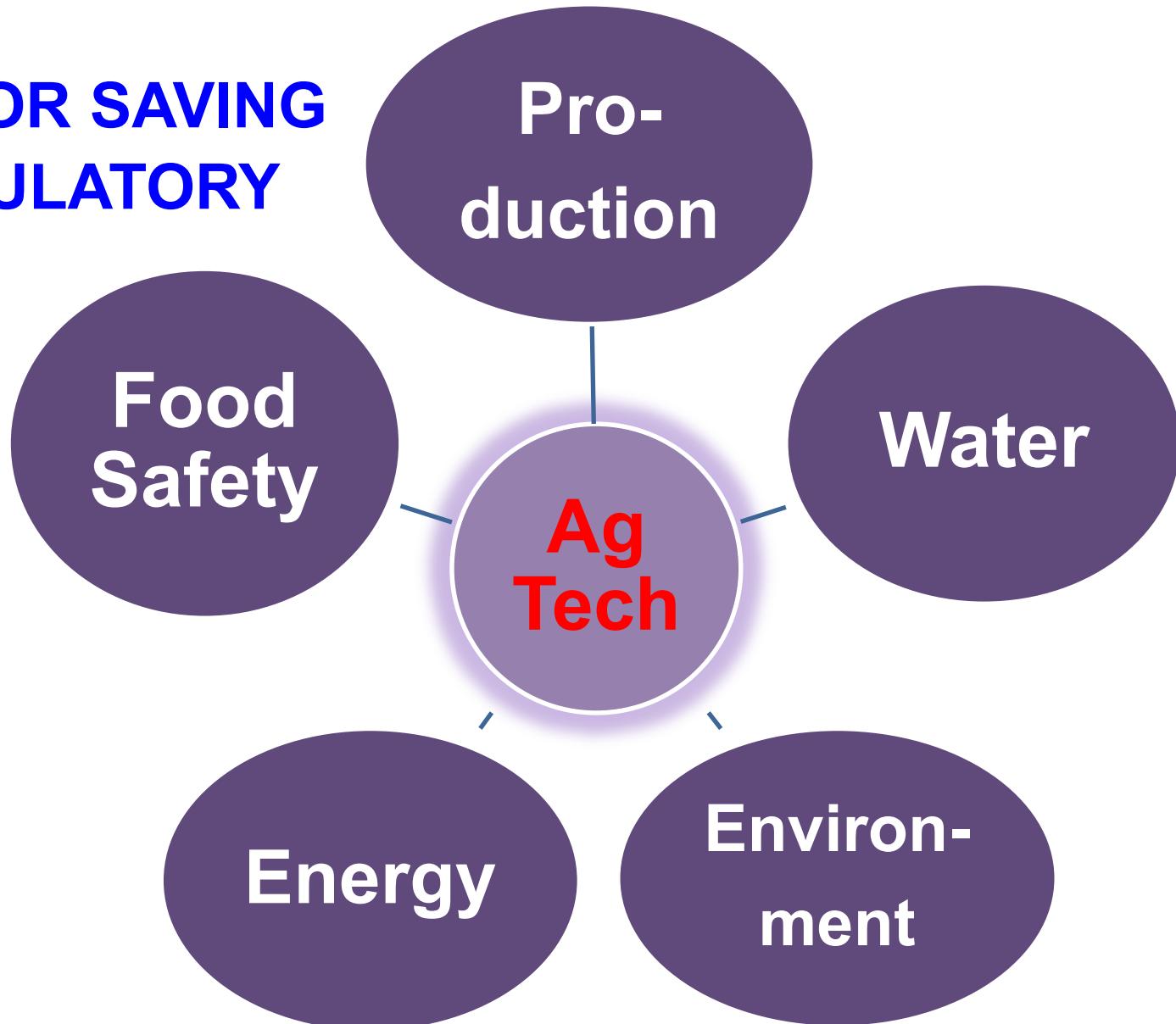
# Disruptive Events

## Disruptive Technology



# New Ag Technology

## LABOR SAVING REGULATORY



# New Data Driven Technology Production Side of Agriculture

Genetically Modified Crops



Variable Rate Irrigation



Multispectral Imagery (satellite and aircraft)



Drip Irrigation



Precision Input Application (e.g., planting, fertilizer)



Wireless Soil Sensors



# Data Analytics

# Disruptive Events

## Technology

Test kit detects foodborne pathogens

By Jenni Spinner, 09-Jul-2013



Variable Rate Irrigation

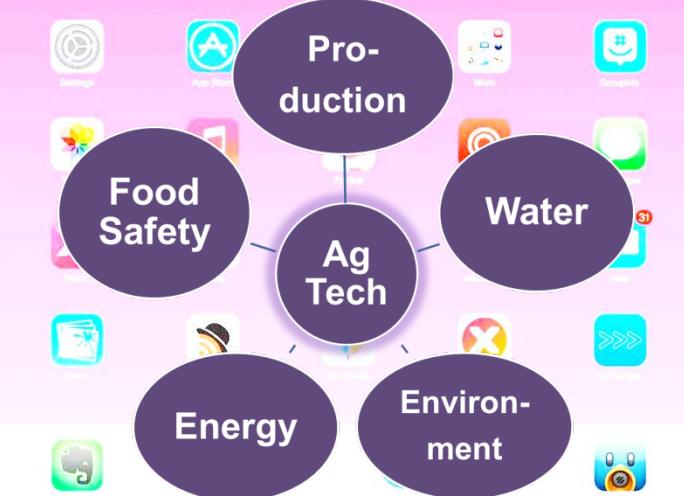


**DISRUPTIVE PERSON**

Steve Jobs

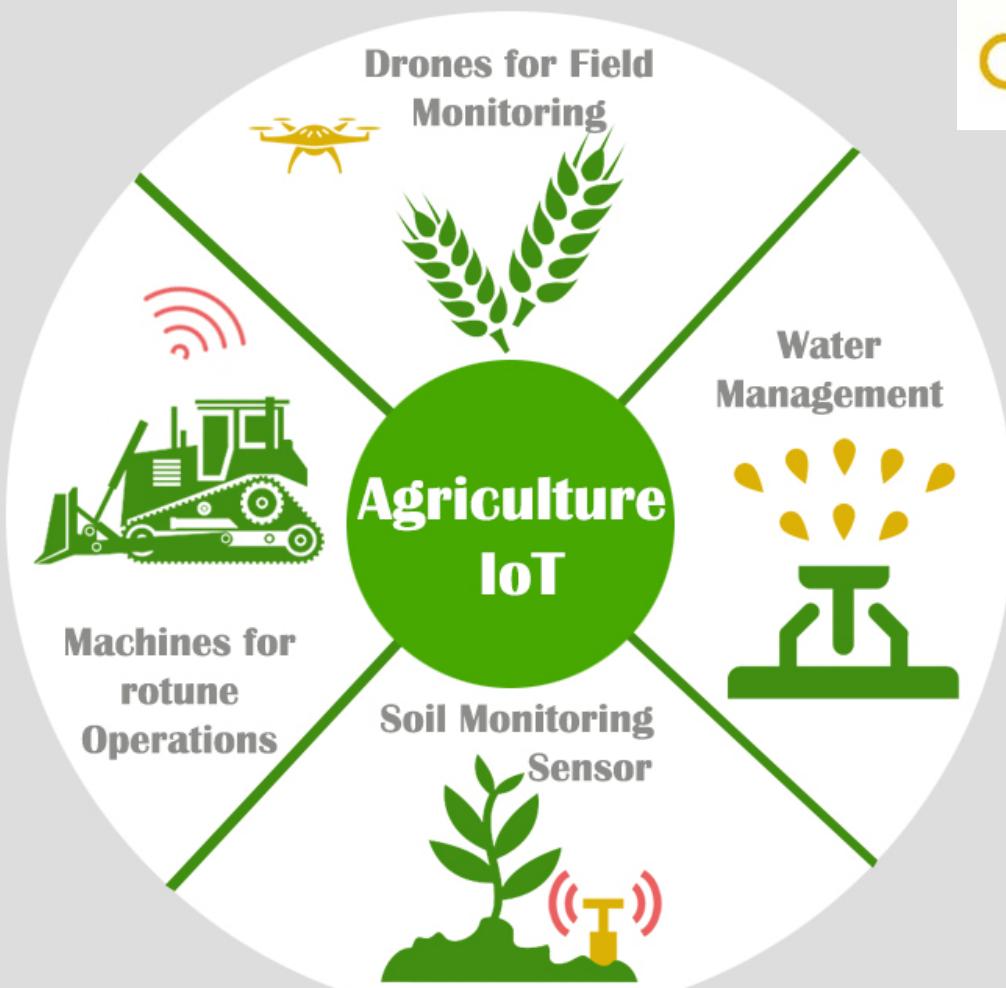


Wireless Soil Sensors



# The IOT Challenge with Farmers

How IoT technology is  
benefiting today's modern farming industry



# Tools to Implement Variability Management

- Mobile Device – P.C. w/GPS
- Internet Connectivity
- Soil Moisture Sensors
- Valve and pump automation
- Qualified Integrator



## Optional

- UAV (Drone)



[www.h2o-optimizer.com](http://www.h2o-optimizer.com)



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CLIMATE  
CHANGE

INNOVATION

New  
Ag

# Precision Growing

*90% less water use than conventional and greenhouse cultivation*

*80% less fertilizer than conventional cultivation*

*Automatic record keeping for optimization*

*34% less inventory loss through simpler logistics*

Discover a whole new business model for agriculture

CROPBOX  
*Cultivating the future of food*



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# Agriculture in a Box



ANASTASIJ ANAKHINA / CNHI MONEY



*Poulsen weeder*

Company: F Poulsen Engineering ApS, Hvalso, Denmark  
Website: <http://www.visionweeding.com>  
Product: ROBOVATOR thermal and/or hydraulic weeder



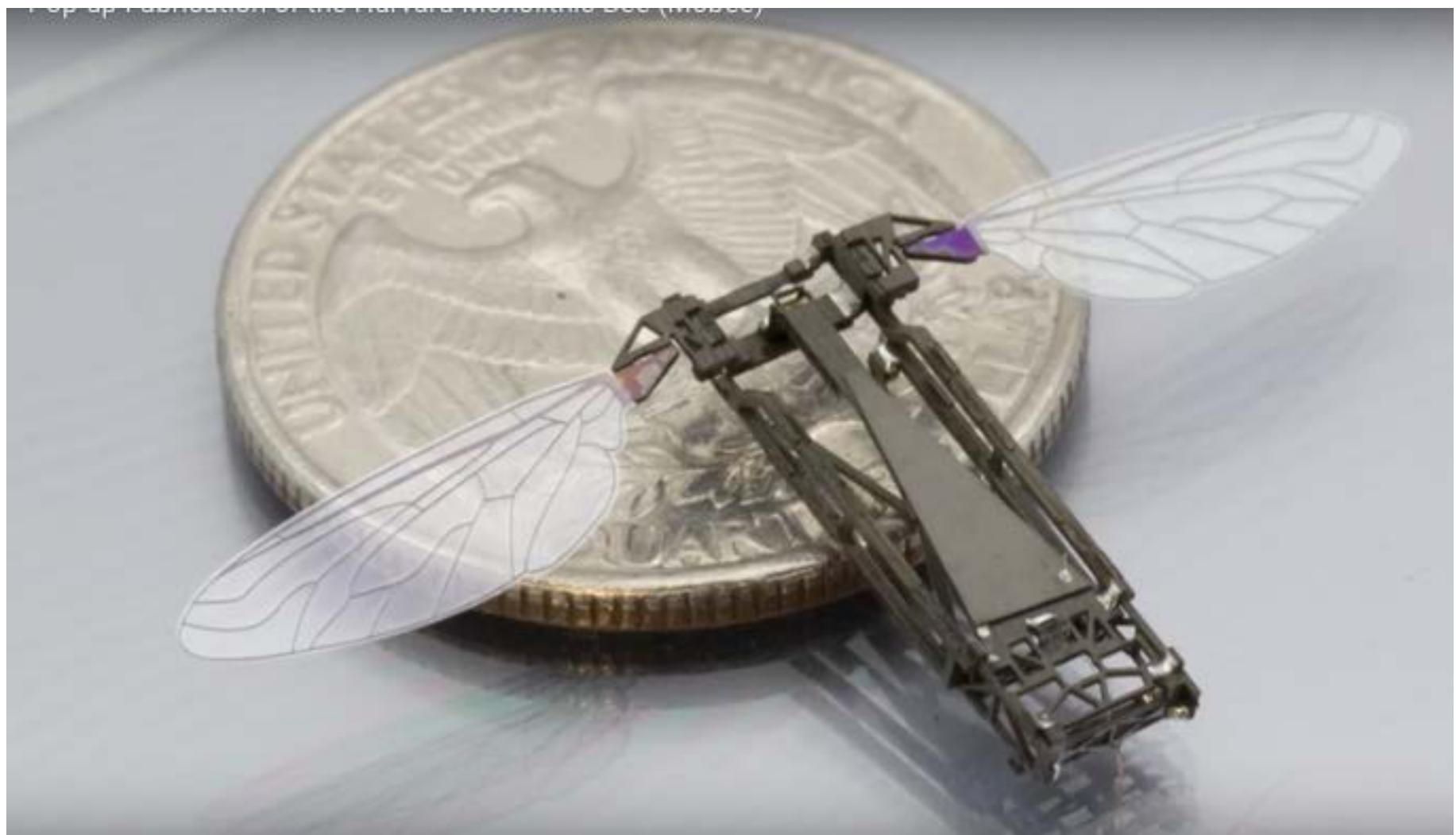
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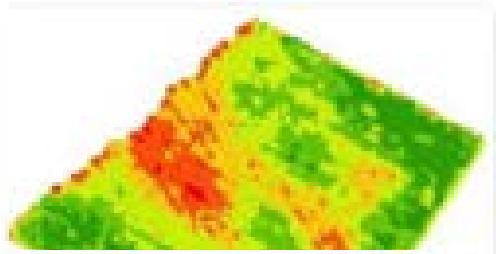


# 21<sup>st</sup> Century Agriculture Technology Innovation

Ag Drones



Multispectral Imagery (satellite and aircraft)



Precision Input Application

Wireless Soil Sensors



Food Safety



Variable Rate Irrigation

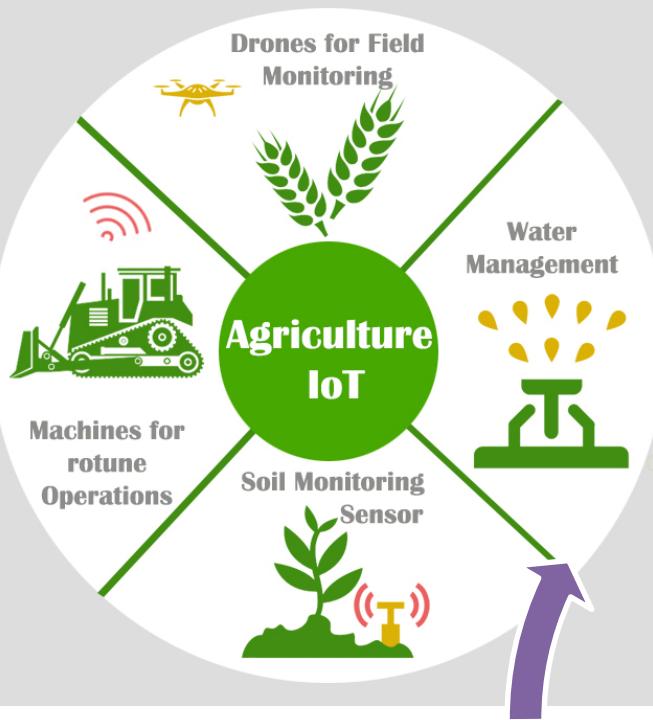


Drip Irrigation

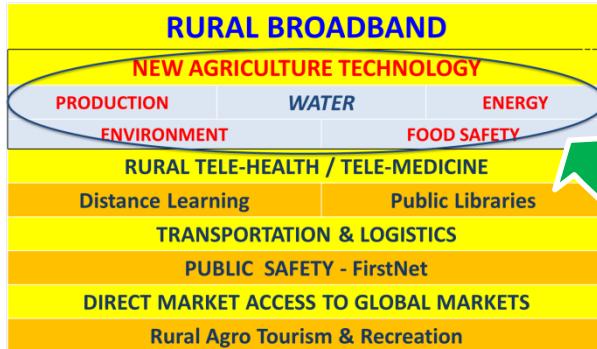


# New Agriculture Cycle

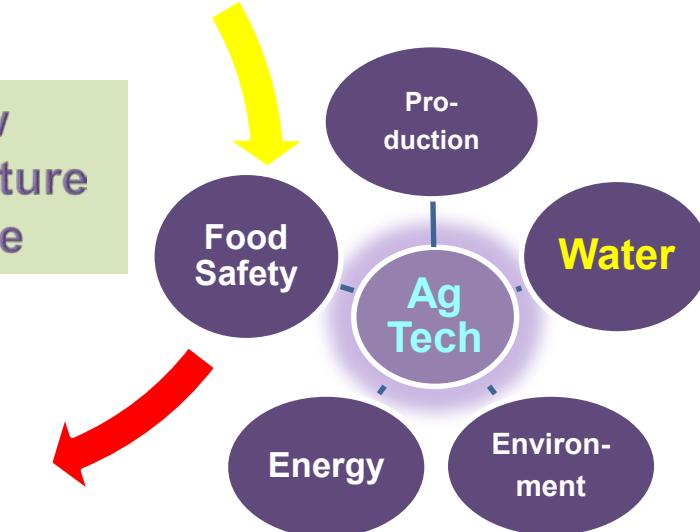
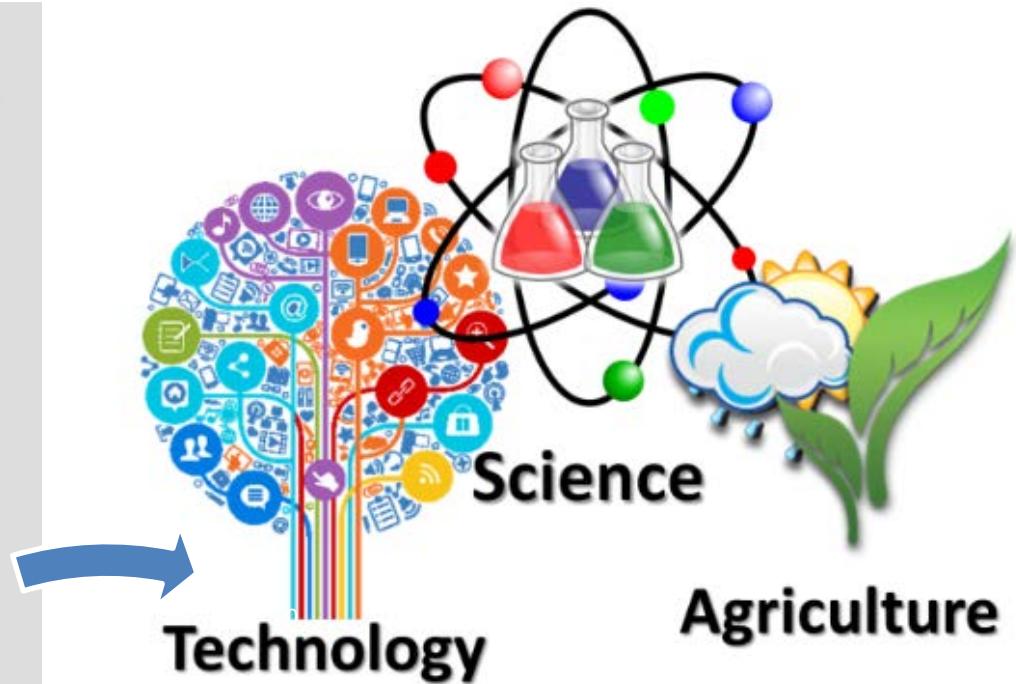
**How IoT technology is  
benefiting today's modern farming industry**



**Platform for Rural Prosperity**



**New  
Agriculture  
Cycle**



# Disruptive Challenges and Shortening The Timeline

- Natural Disaster
- Lifestyle Trends
- Resource Scarcity
- Favorable Policy

- ✓ Drought .... Climate Change
- ✓ Invasive species & Natives gone wild
- ✓ Farm Labor
- ✓ Technology



# California Statewide Ag Hackathon

July 15<sup>th</sup> - 17<sup>th</sup>, 2016  
Davis and Sacramento, CA

Final Pitches at:

*California*  
**STATE★FAIR**

Hackathon at:

**University of California**  
Agriculture and Natural Resources

[www.apps-for-ag.com](http://www.apps-for-ag.com)



# Thank you

