GLOBAL CLIMATE ACTION SUMMIT

AFFILIATE EVENT

Managing Lands in a Changing Climate to Improve Agricultural Resilience, Food Security, and Health

Afternoon PowerPoint Presentation – Jackson Hall

State of California
Department of Conservation

UCDAVIS ONE HEALTH INSTITUTE

UCDAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

UCDAVIS VETERINARY MEDICINE

UCDAVIS SCHOOL OF MEDICINE

UNIVERSITY OF CALIFORNIA Global Health Institute

Afternoon Agenda

Jackson Hall

1:30	Actions & Strategies to Strengthen Ag and Forest Resilience, and Food Security
2:30	Lightning Talks | Success Stories at the Ag-Food Security Nexus
3:00	Break for Networking and Refreshments
3:30	Combating the Impacts of Climate Change on Food Systems and Disease
4:30	Lightning Talks | Success Stories at the Food-Health Nexus
5:00	Key Ideas and Outcomes from Afternoon Sessions and Wrap Up

California Dialogue: Actions and Strategies to Strengthen Agriculture and Forest Resilience and Food Security

Moderator: Terry Watt, Liaison, California Governor's Office of Planning and Research

- Karen Ross, Secretary of Agriculture, California Department of Food and Agriculture

- John Laird, Secretary, Natural Resources Agency, State of California

- Jim Branham, Executive Officer, Sierra Nevada Conservancy, Forest Management Actions and Strategies

Instant Polling Questions for Participants

- **Meeting Sift – informal, real time polling**

Please Participate

1. open smartphone browser
2. go to **sift.ly**
3. enter participant code **change**

California Dialogue: Actions and Strategies to Strengthen Agriculture and Forest Resilience and Food Security

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There is Hope!

… at least in British Columbia.

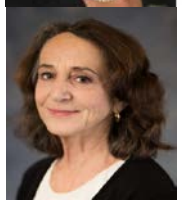
Lightning Talks: Success Stories at the Ag-Food Security Nexus

Moderator: Terra Kelly, One Health Institute & UCGHI Planetary Health Center, School of Veterinary Medicine, UC Davis

- Frank Mitloehner, Addressing the 2050 Food Challenge – a Sustainable Solution Must Include Livestock

- Kate Scow, Long-term, Large-scale Agroecological Experiments are Unique Testbeds for Investigating Climate Change Adaptation and Mitigation in Agriculture

- Carrie Monohan, Meadow Restoration as a Strategy to Increase Resiliency for Climate Change



- Sibella Kraus, The Bay Area Agriculture and Food Economy: Existing Conditions and Strategies for Resilience

Frank Mitloehner, Addressing the 2050 Food Challenge – a Sustainable Solution Must Include Livestock

UCDAVIS

AGRICULTURAL SUSTAINABILITY INSTITUTE

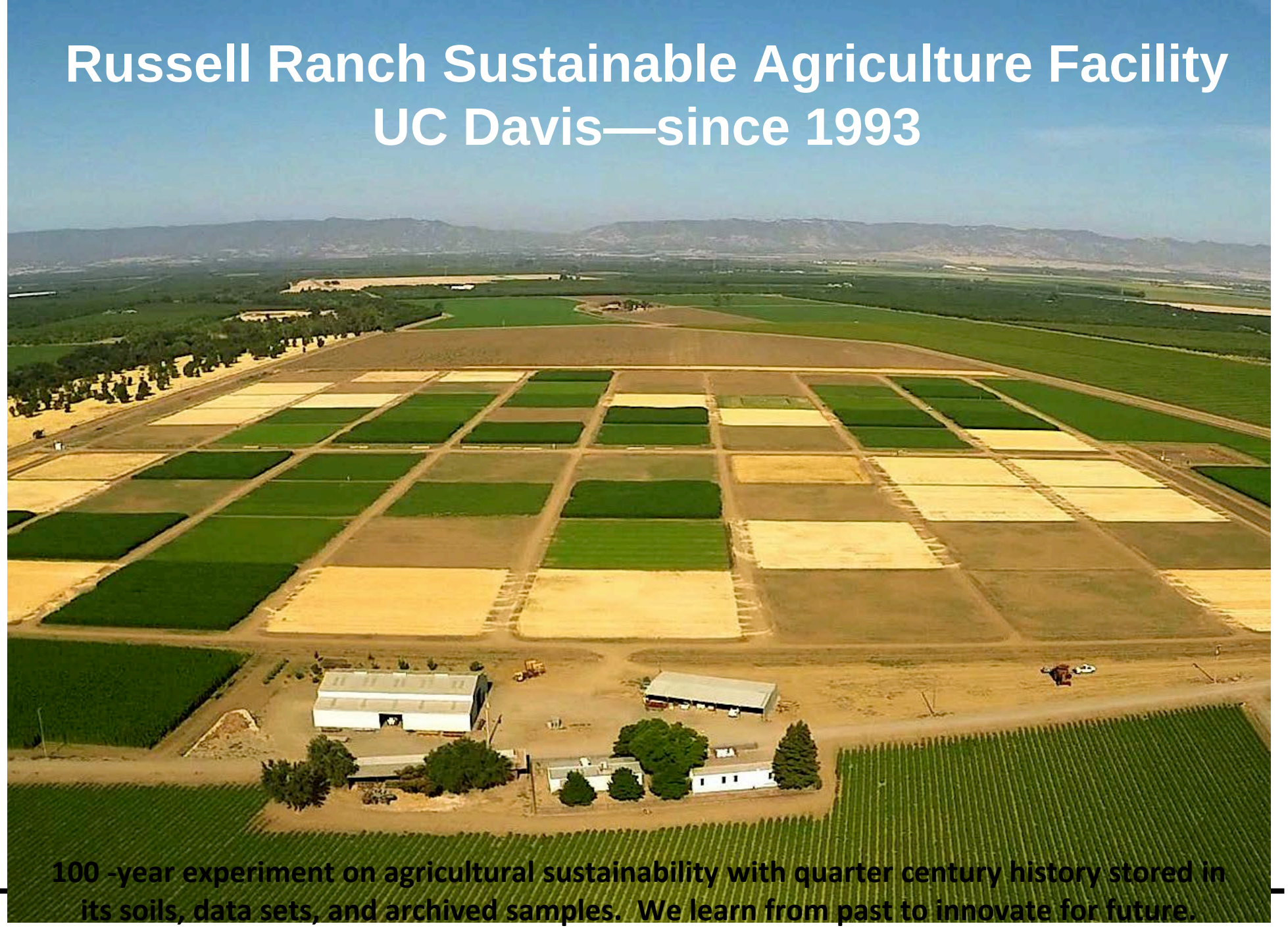
Kate Scow, Long-term, Large-scale Agroecological Experiments are Unique Testbeds for Investigating Climate Change Adaptation and Mitigation in Agriculture

Long-term agroecological experiments are unique testbeds for investigating climate change adaptation and mitigation

Kate Scow and Nicole Tautges
Russell Ranch Sustainable Agriculture Facility
Land, Air and Water Resources, UC Davis
kmscow@ucdavis.edu

UCDAVIS
AGRICULTURAL SUSTAINABILITY INSTITUTE

Russell Ranch Sustainable Agriculture Facility
UC Davis—since 1993



100 -year experiment on agricultural sustainability with quarter century history stored in its soils, data sets, and archived samples. We learn from past to innovate for future.

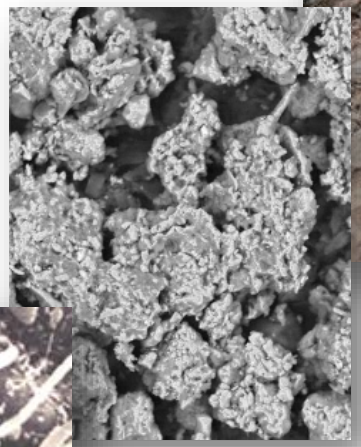
Research spans different scales in time and space

Global

Regional Landscape

Field-scale

Soil Profile



Soil Aggregate

Bacteria-Mineral Interface

Daily

Growing season

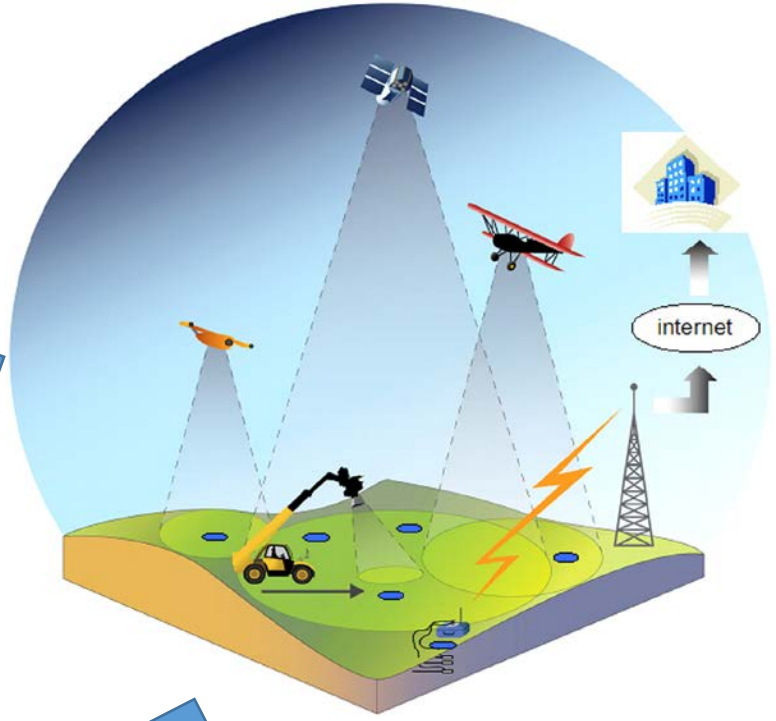
Annual

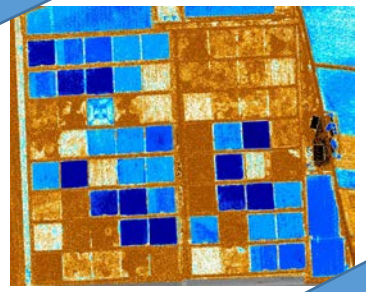
Decade

Centuries

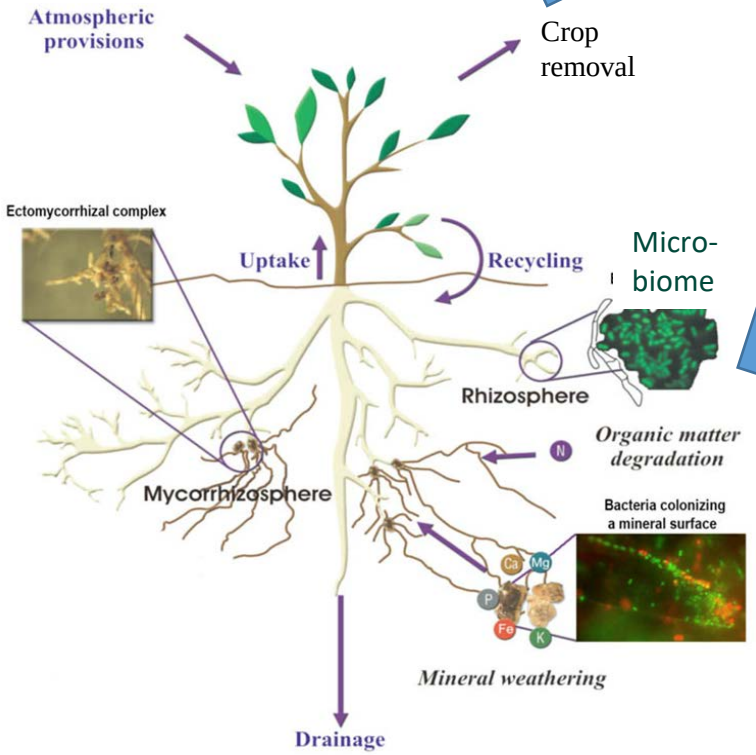
Mitigation and adaptation

Mechanisms
Interrelationships
Feedbacks





Crop
removal



Tools
Practices

Impacts
Monitoring and evaluation

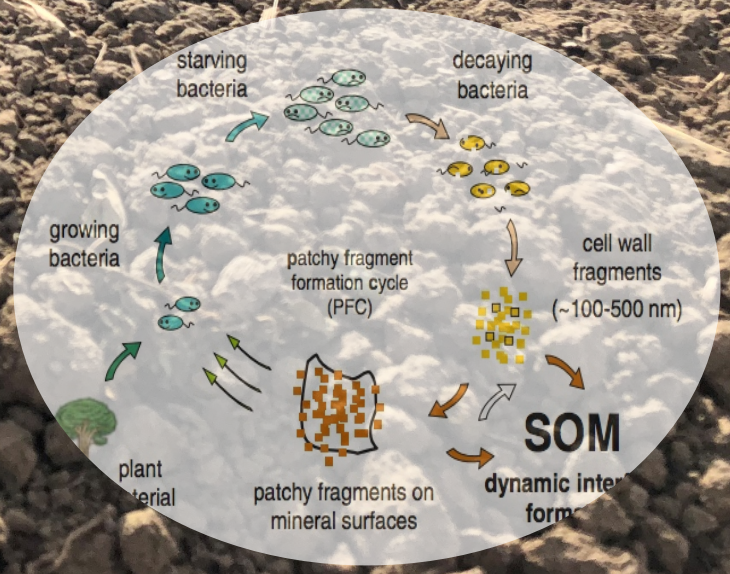
Mitigation: management impacts on soil carbon sequestration

After 20 yrs, soil carbon concentration:

--increases by 12.5% w/ compost + cover crops

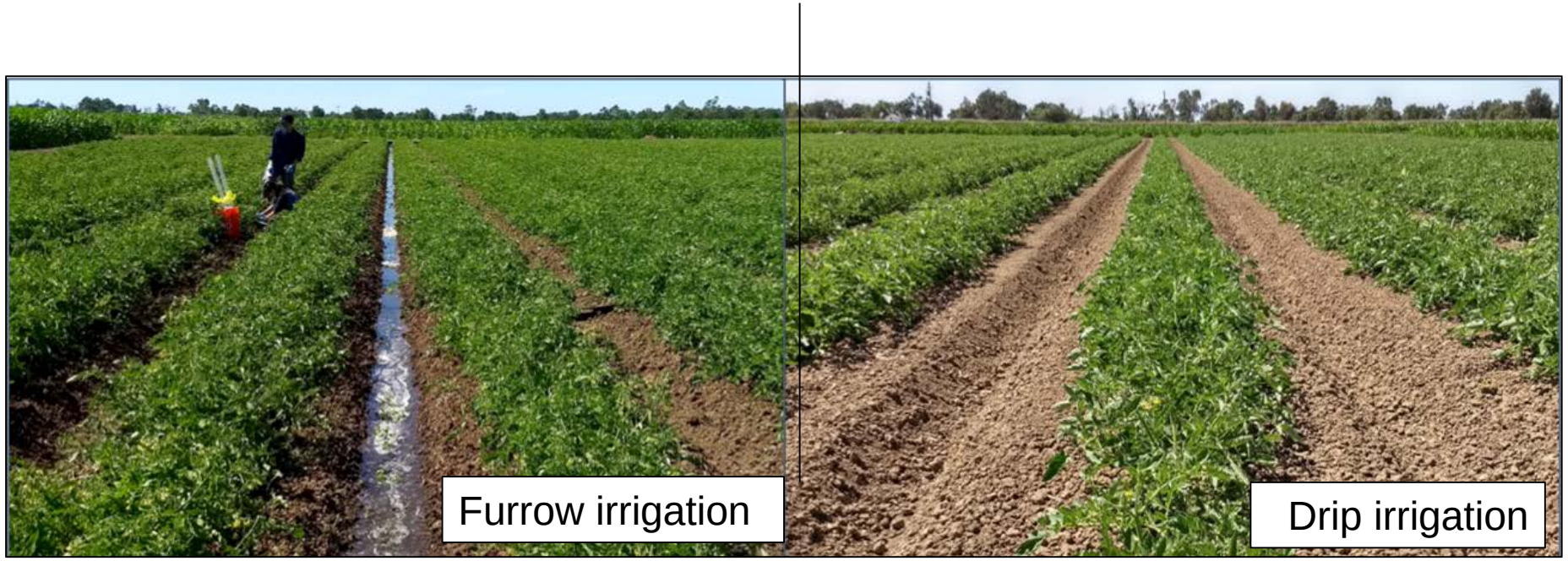
--increases by 3.5% w/cover crops

--remains same without extra inputs



Adaptation: growing technologies & practices to support more efficient use of water in agriculture.

- **environmental trade-offs; e.g. soil health**
- **incentives for farmer adoption, scaling from farm to basin?**



Farm is meeting place and hub for exchange/innovation

The memories of soil may be most instructive

'One way of fostering this long view is through "listening places"—places set aside for patient and oft-repeated measurements, where our observations are melded into those of our predecessors, then handed off as heirlooms to those who follow us.

(Janzen 2016)

Carrie Monohan, Meadow Restoration as a Strategy to Increase Resiliency for Climate Change

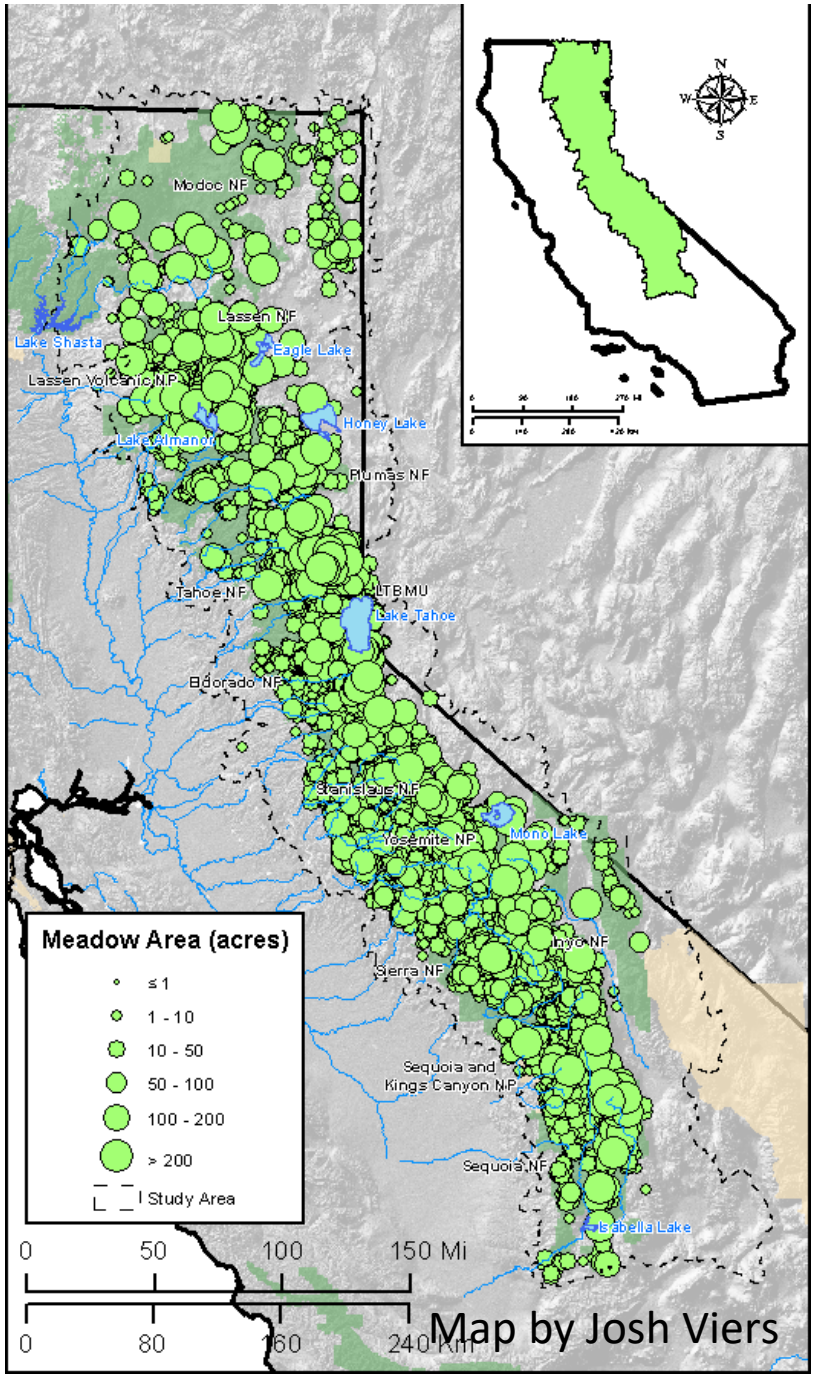
Meadow Restoration as a Strategy to Increase Resiliency for Climate Change

Carrie Monohan Ph.D., The Sierra Fund and

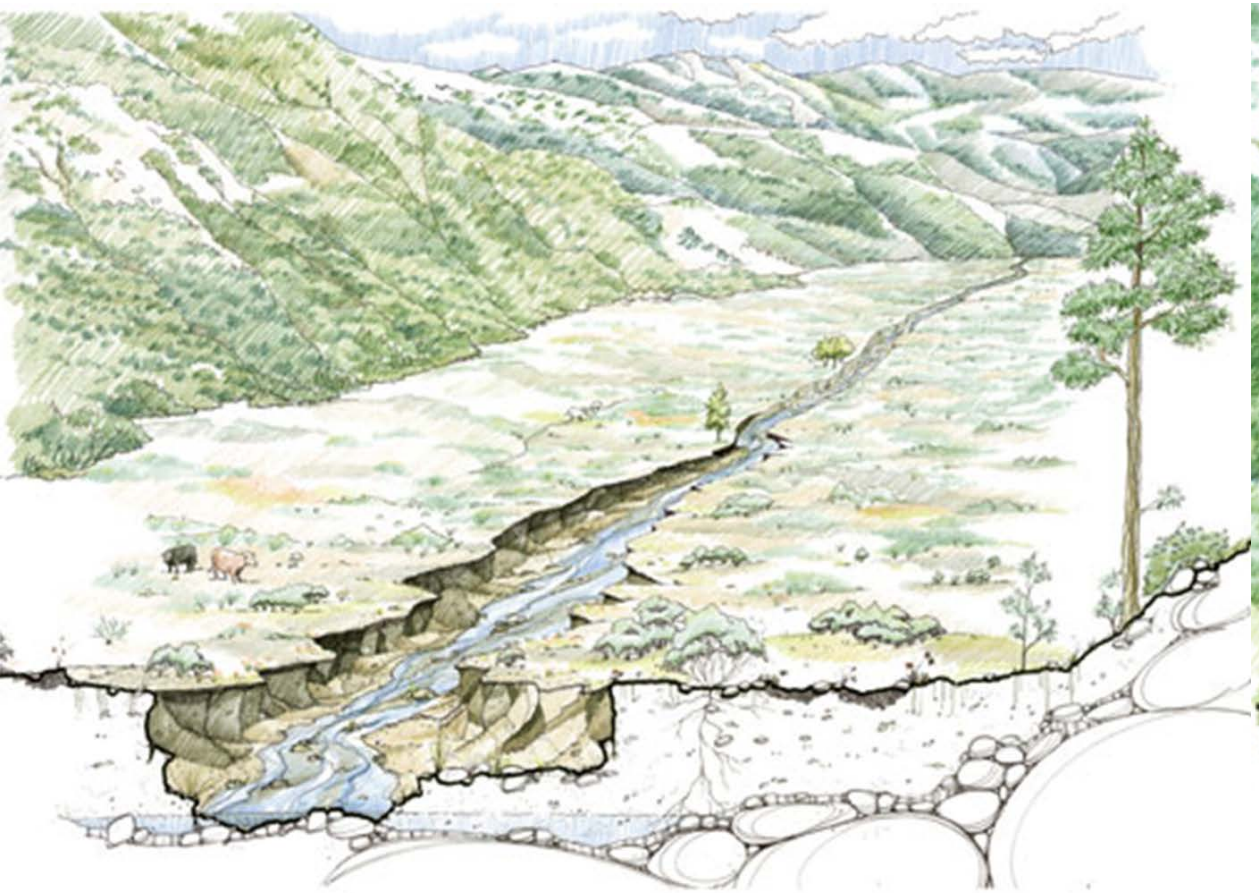
California State University, Chico

and

Cody Reed, University of Nevada, Reno

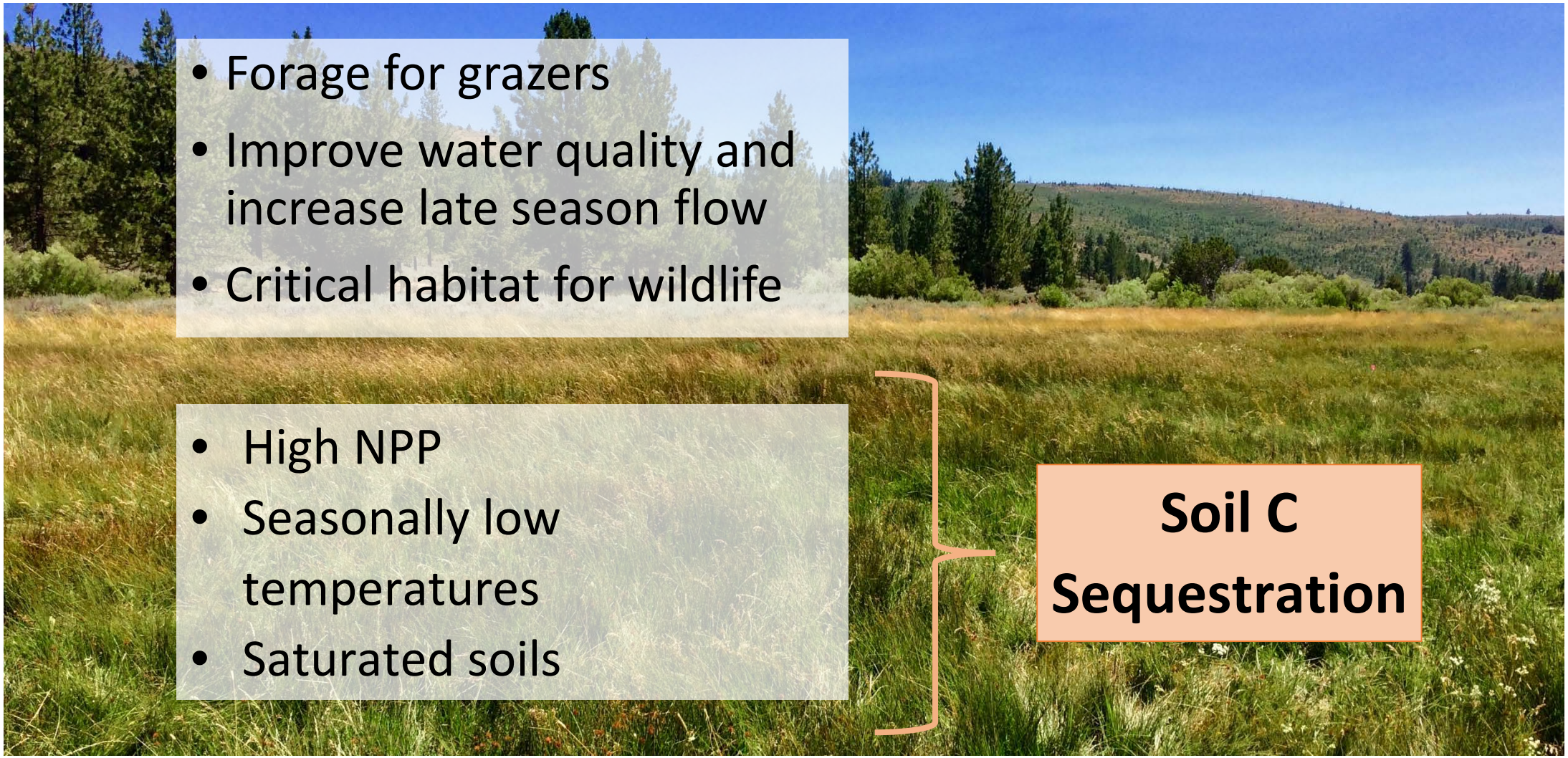


Meadow
Degradation and Restoration



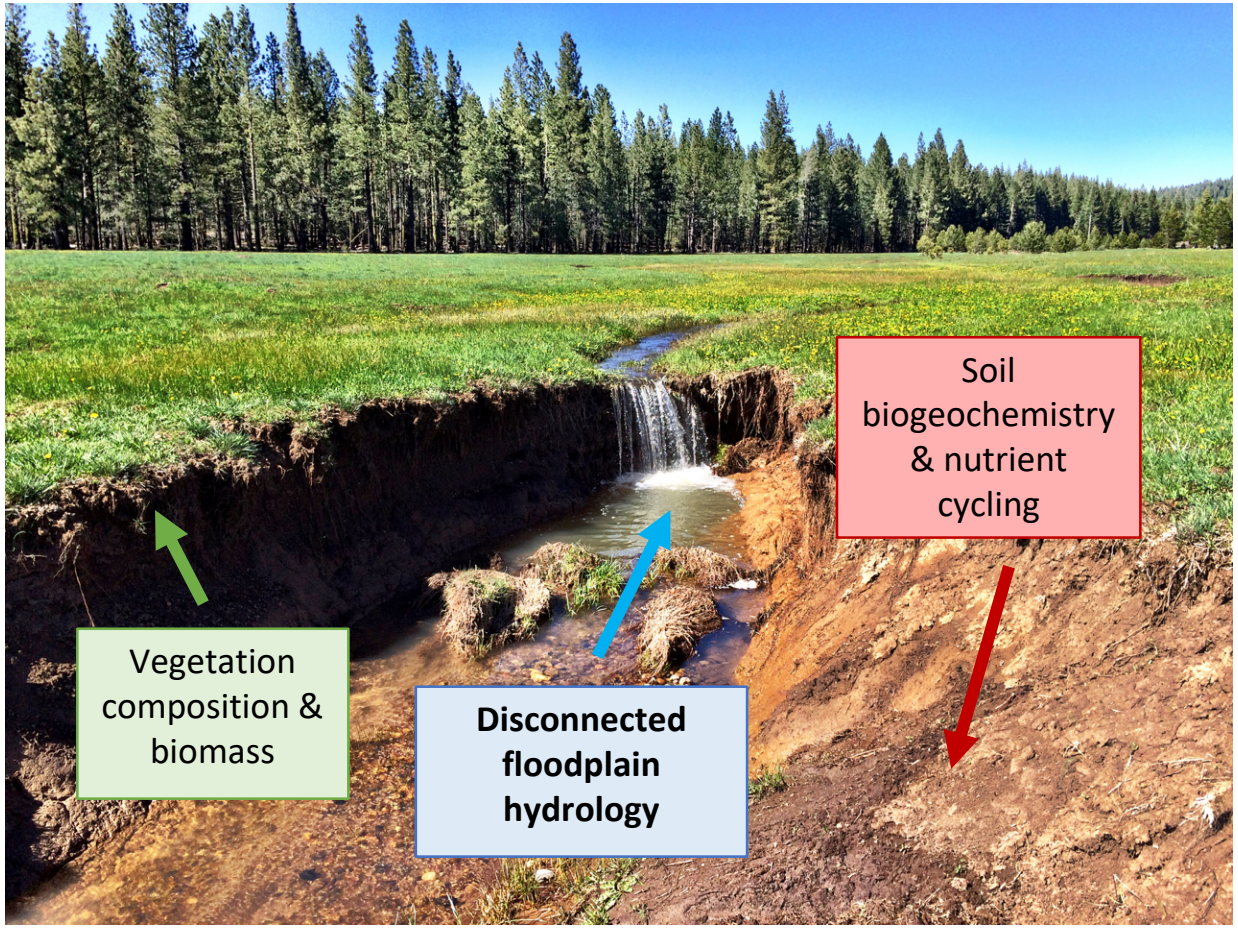
Artwork by Restoration Design Group

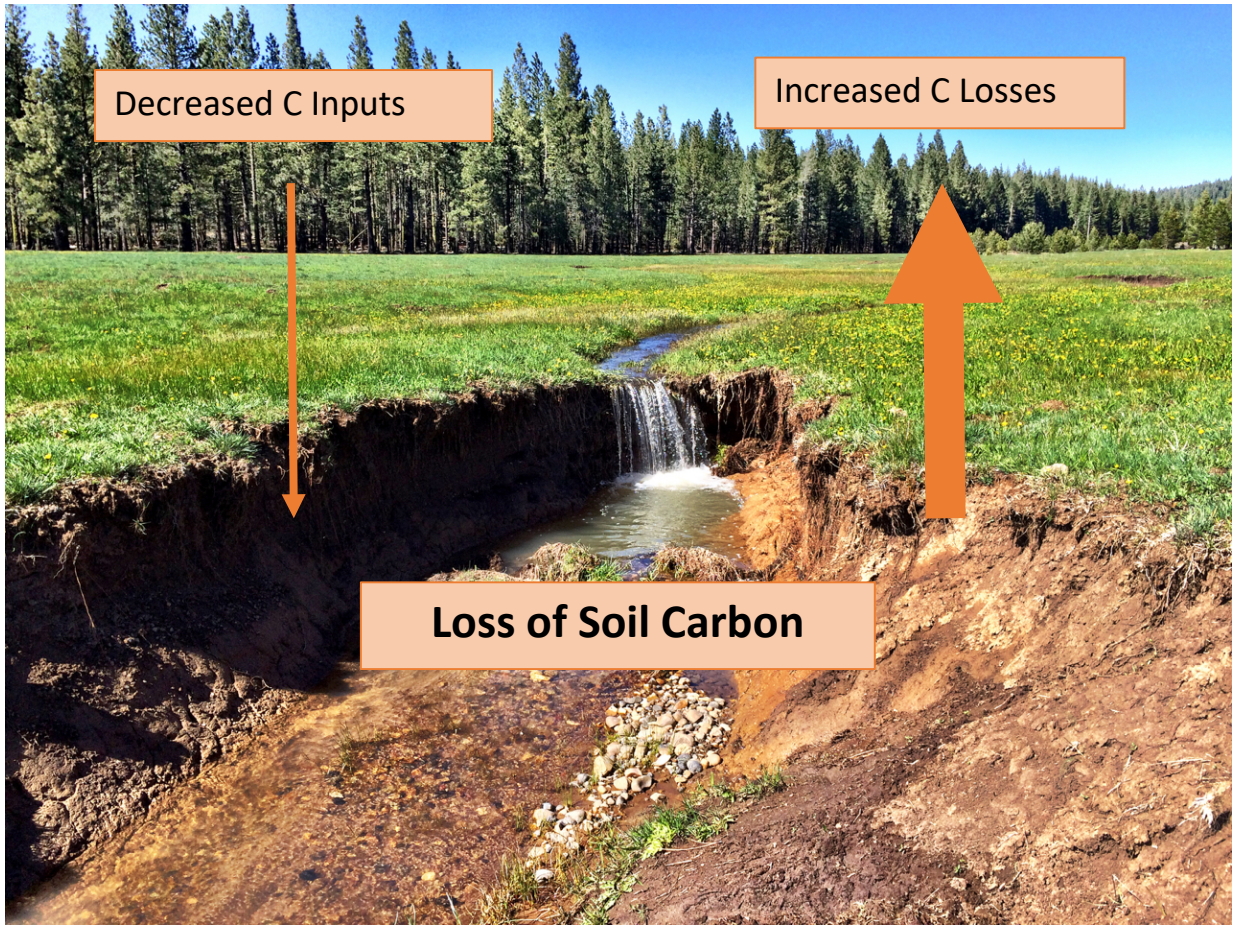
Benefits of Healthy Meadows



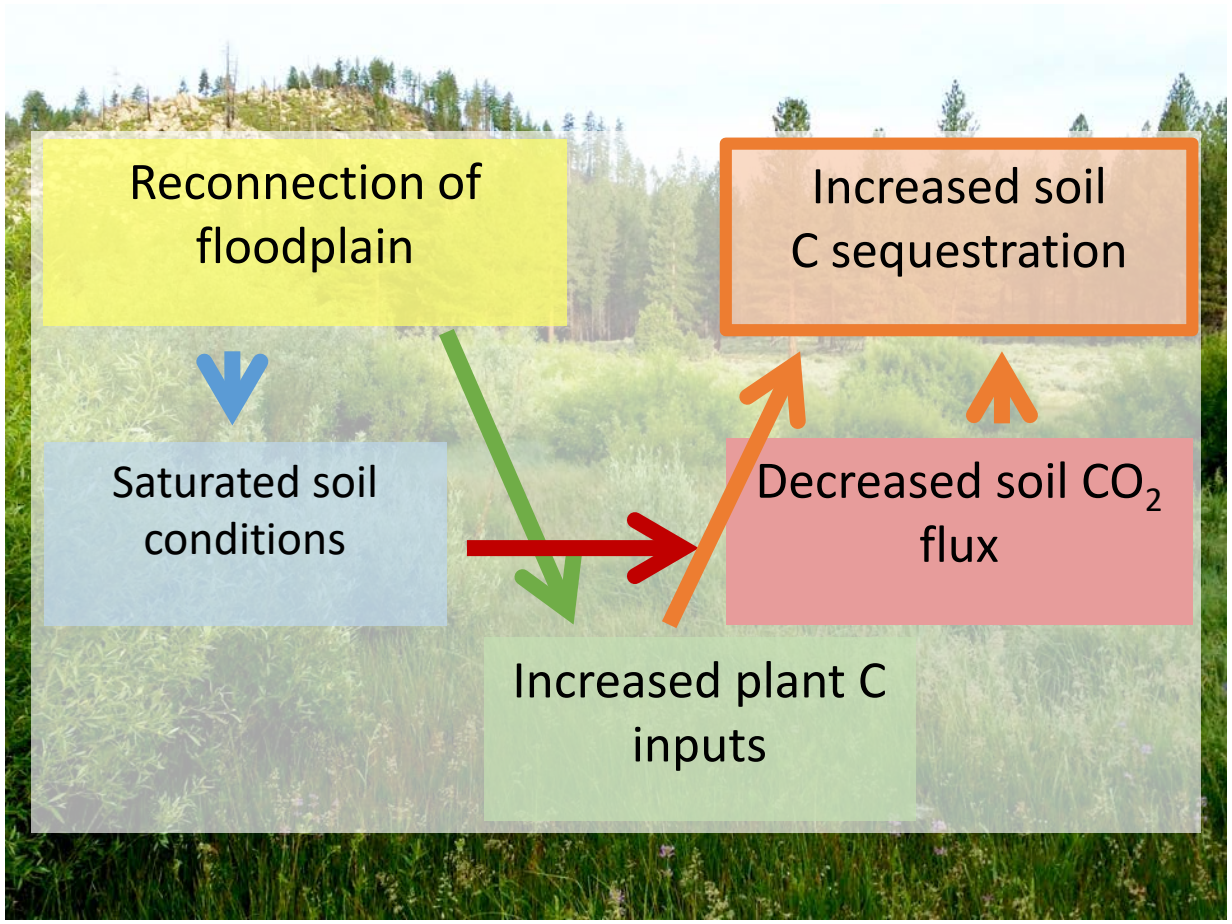
"The biology lives in the hydrology, and the hydrology flows over the geology."

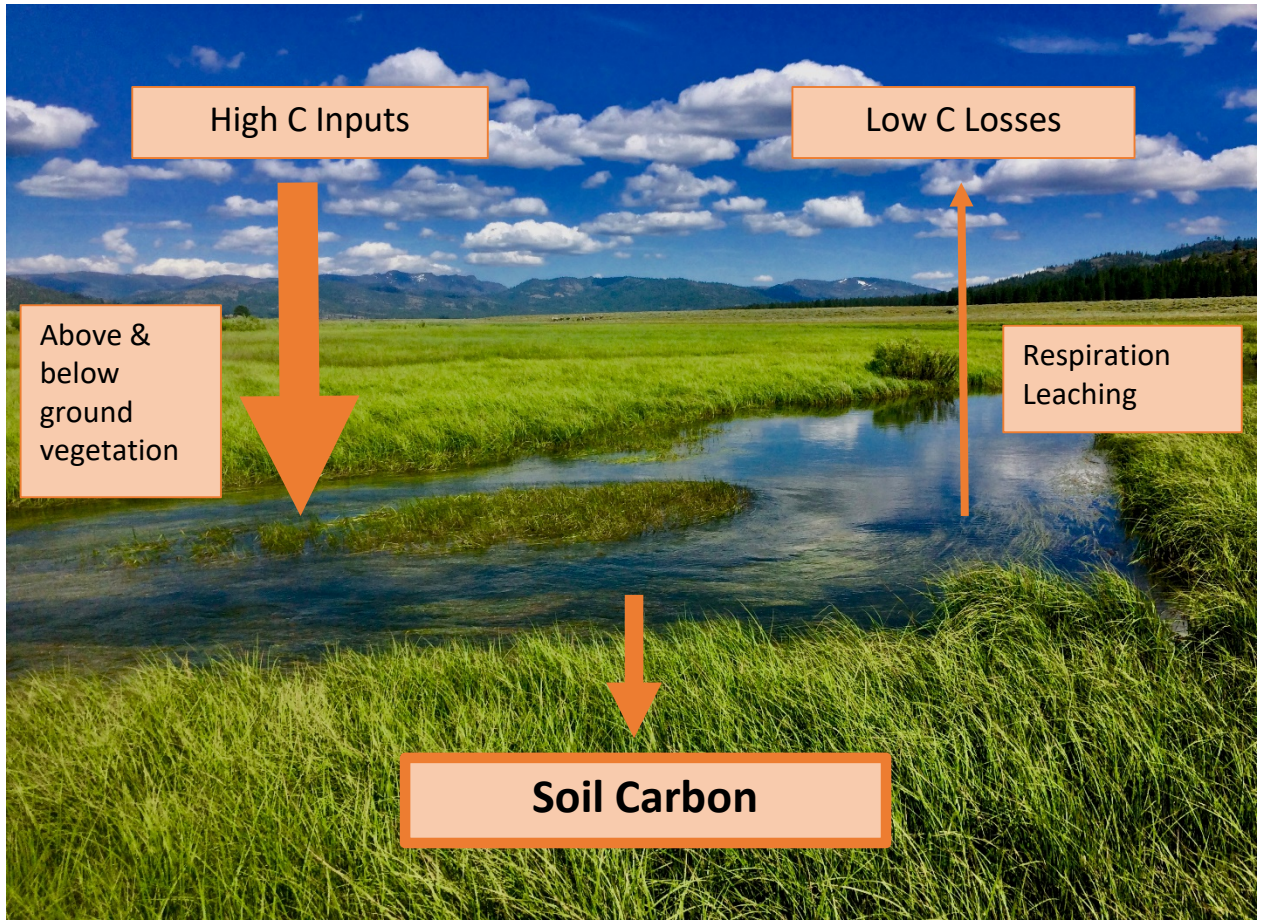
60-70% of Sierra Nevada Meadows are Degraded (180,000 – 210,000 acres)





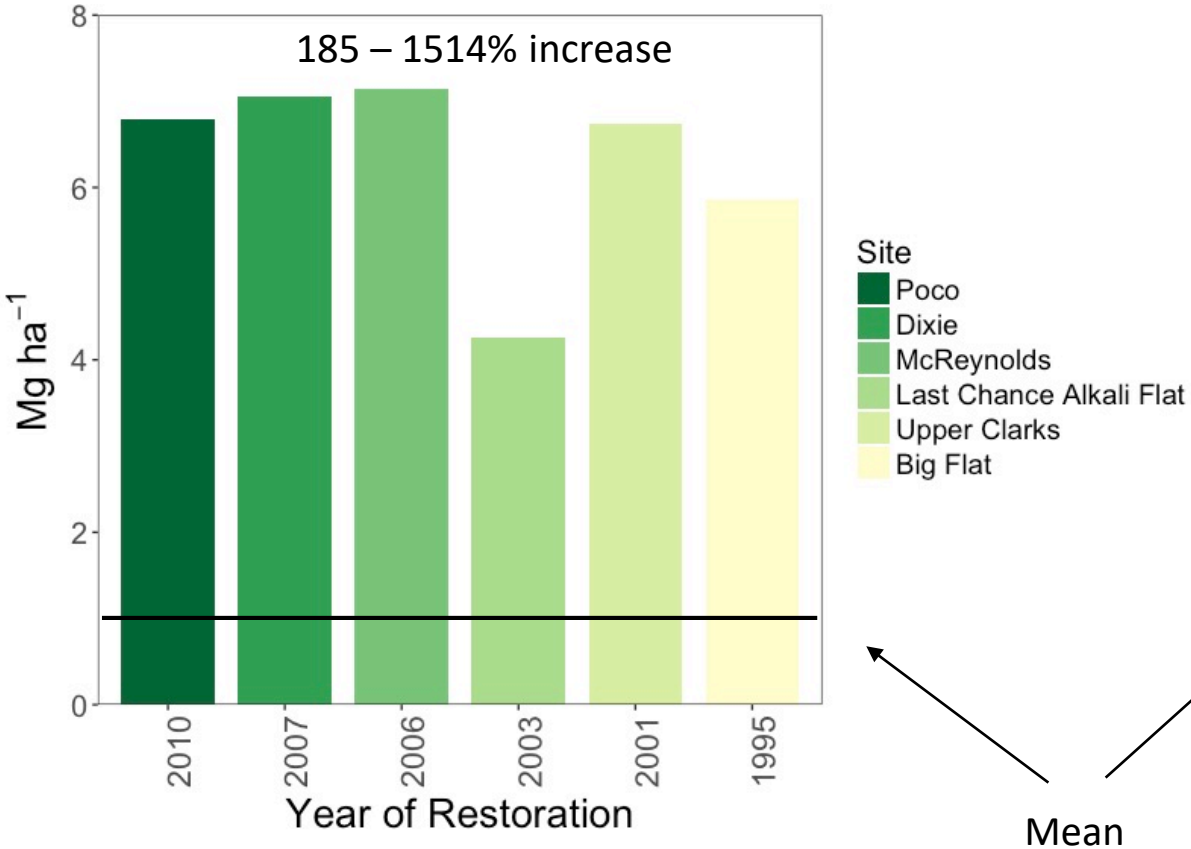
Restoration of Floodplain Hydrology may be a Solution



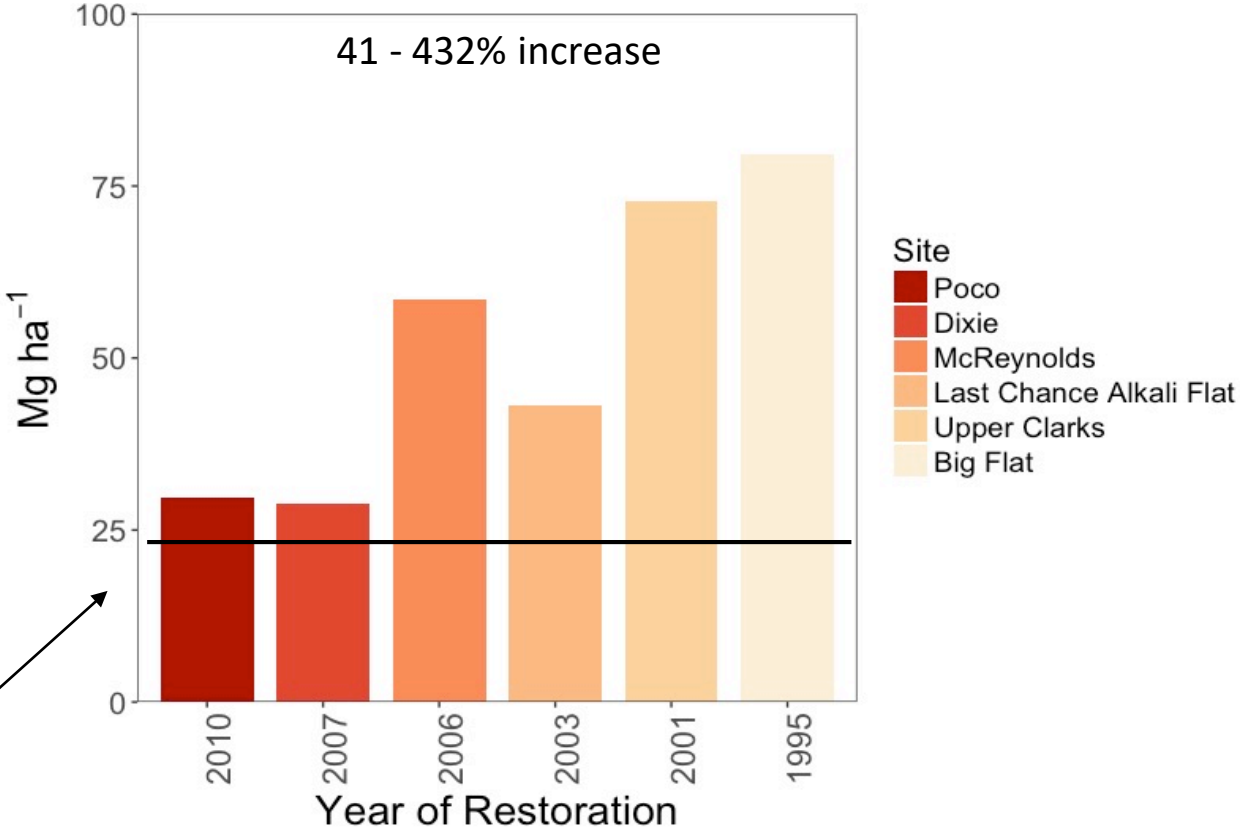


Meadow Restoration and Biomass

Above Ground Biomass



Below Ground Biomass



Mean pre-restoration values

Reed et al. *In prep.*

Summary

- Preliminary results indicates that healthy meadows are net C sinks, whereas degraded meadows are net sources of C to the atmosphere
- Restoring meadows could stem net C losses and may sequester additional soil C
- Meadow restoration may also yield benefits for forage and downstream water supplies

Carrie Monohan, Ph.D.,
Science Director

carrie.monohan@sierrafund.org

Cody Reed,
University of Nevada, Reno

coditareed@gmail.com

Thank You

Sibella Kraus, The Bay Area Agriculture and Food Economy: Existing Conditions and Strategies for Resilience

Bay Area Food Economy

Existing Conditions and Strategies for Resilience

Sibella Kraus, Sustainable Agriculture Education (SAGE)
www.sagecenter.org

Managing Lands in a Changing Climate to Improve Agricultural Resilience, Food Security and Health
Global Climate Action Summit Affiliate Event
University of California, Davis September 10, 2018

Vision

The Bay Area's extraordinarily rich and diverse food system is recognized and invested in as an integral part of our region's economic prosperity, environmental sustainability, social equity, regional identity, and vibrant cultural life.

Sunol Agricultural Park

Photo credit: Stephen Joseph

Agriculture and Food Sector Jobs

Conditions

- Almost ½ million jobs, 13% of regional workforce
- Wages 64 % lower than regional average
- Labor shortages
- Mobility

Issues

- Pathways to better jobs
- Skills and training needed
- Food and ag jobs of the future

Opportunities

- Transportation demand management (*Moving to Work*)
- Employer and training program collaborations
- Employee ownership models
- Housing and jobs match; immigration overhaul

Ag-Food Sector Infrastructure

Conditions

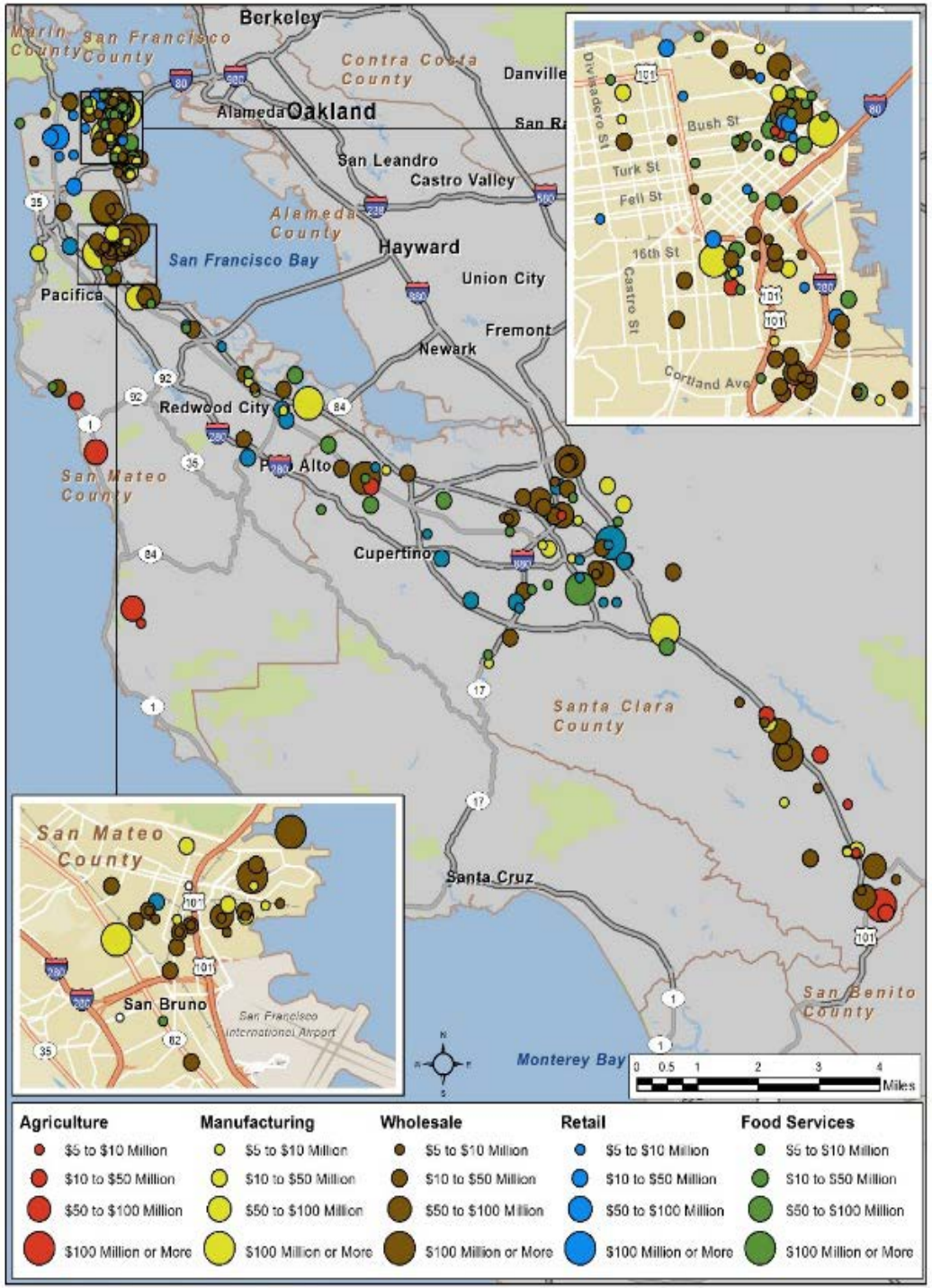
- Almost 38,500 businesses; 84% with 1-14 employees
- $113 billion annual revenues
  - 70% from distribution and retail

Issues

- Competitive industrial real estate market
- Traffic congestion and food distribution
- Resilience to natural disasters and shocks

Opportunities

- Disaster preparedness for small food businesses
- Investments in distribution and processing facilities
- Analysis of food goods movement



Agricultural Resource Base

Conditions

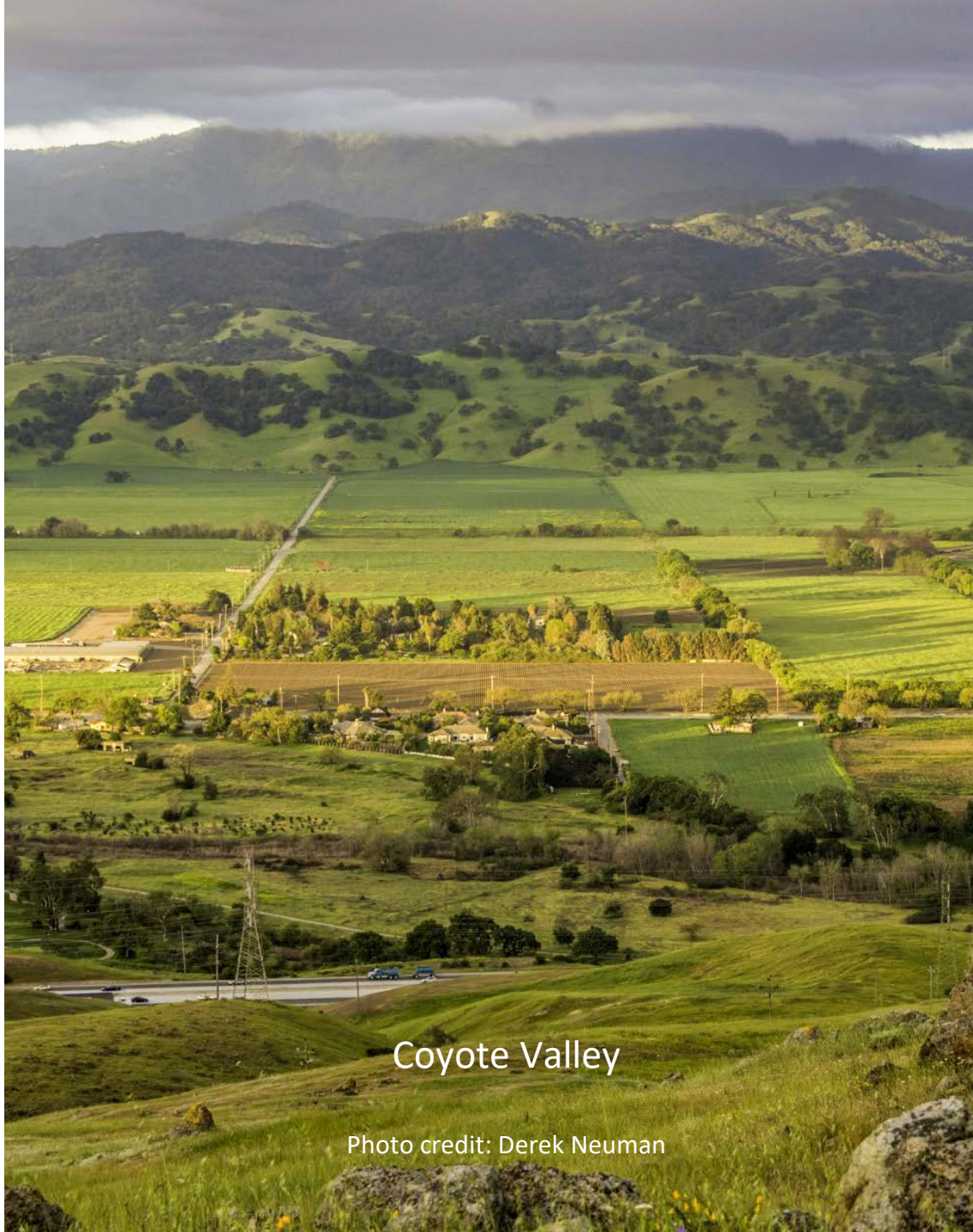
- 40 % of Bay Area land (2.3 M acres)
- 1.7 M acres of ranchland; 570,00 acres of farms
- $2.7 B production value; $ 6.1 B total value

Issues

- Over 200,000 acres at risk of development
- Accessibility for new farmers
- Regulatory challenges
- Valuing and securing critical resources

Opportunities

- Santa Clara Valley Ag Plan: Investing in Working Lands for Regional Resilience
- San Jose's Measure T could protect multi-benefit farmland



Coyote Valley

Photo credit: Derek Neuman

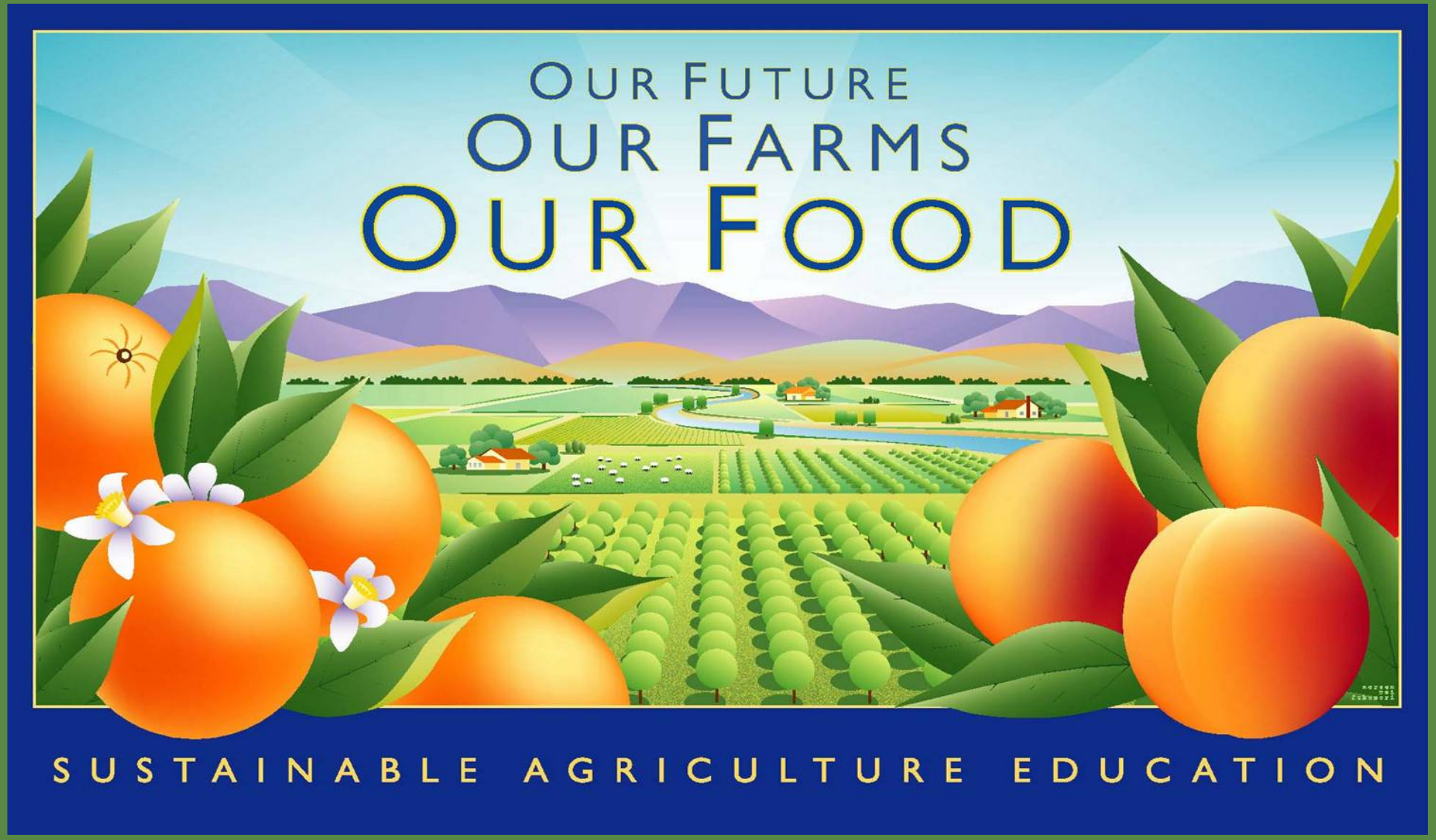
Plan Bay Area 2050 - Role Agriculture and Food

HORIZON

Project of the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC)

Agriculture and Food Sector challenges and opportunities

- Land base - further development or preservation
- Ecosystems services on working lands – how valued
- Food production – local, global, land-based, lab-based
- Ag and food jobs – artisan, high tech, fair, marginal
- Ag and food infrastructure – dispersed, centralized
- Distribution – internet and AVs, market centers
- Food security – accessible, privileged



www.sagecenter.org

Bay Area Food Economy White Paper

Lightning Talks: Success Stories at the Ag-Food Security Nexus

If you have questions or comments please connect with the presenters during the break

Moderator: Terra Kelly, One Health Institute & UCGHI Planetary Health Center, School of Veterinary Medicine, UC Davis

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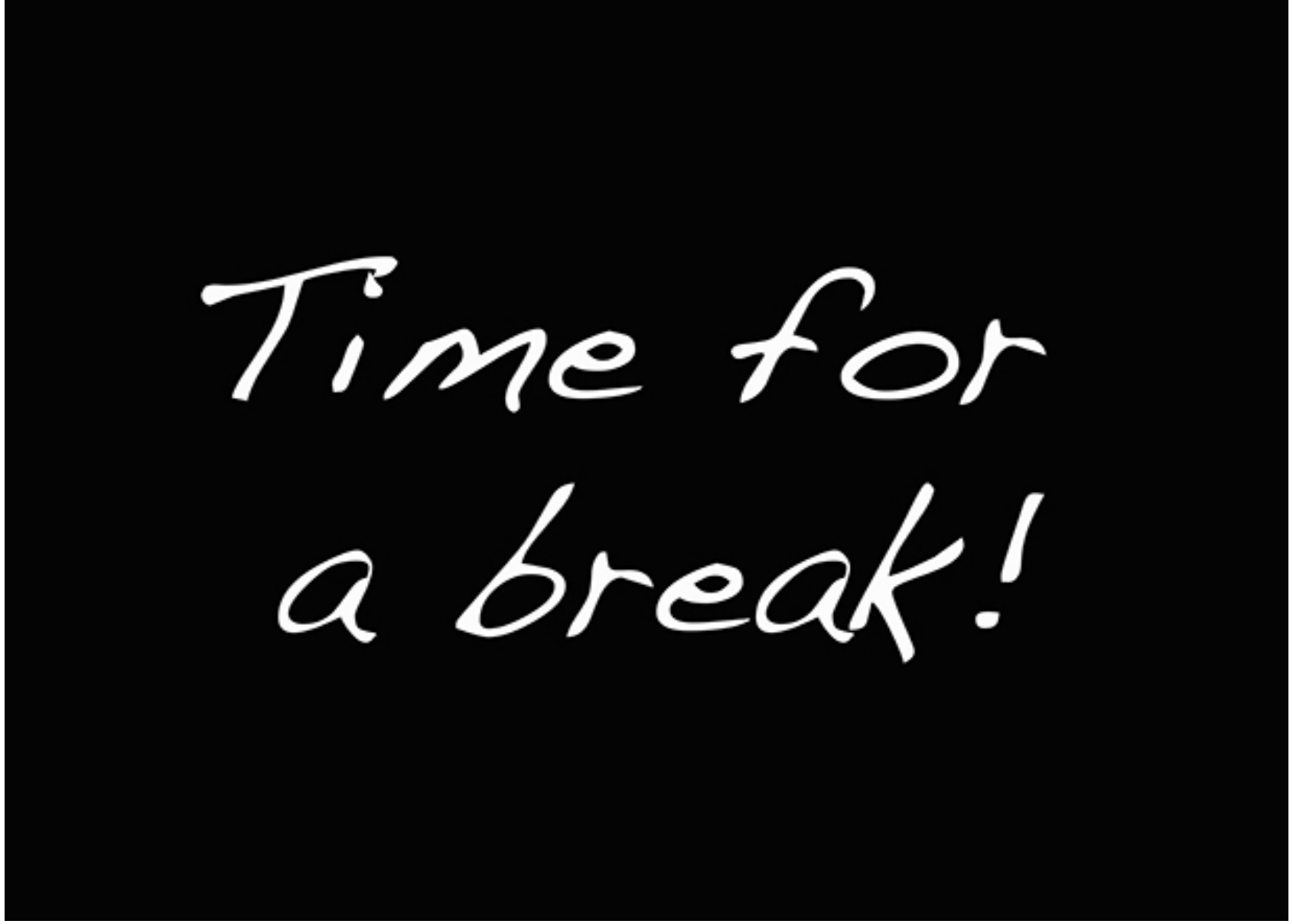
- Carrie Monohan, Meadow Restoration as a Strategy to Increase Resiliency
- Sibella Kraus, The Bay Area Agriculture and Food Economy

During the Break

Please Check Out the Posters

From 3:00 – 7:00 PM the posters will be available for viewing in the lobby of the Mondavi Center

- "The Effects of Climate Change on Poultry Production in California" **Sarai Acosta**, Junior Specialist with Population Health and Reproduction, School of Veterinary Medicine, UC Davis and Maurice Pitesky,
- "The Impact of Climate Change on Food Security in Northeastern Uganda" **Laura Atukunda**, School of Public Health, University of California Berkeley
- "San Joaquin Land and Water Strategy: Exploring the Intersection of Land and Water Resources in California's San Joaquin Valley" **Justin Bodell**, California Conservation and Stewardship Program Manager, American Farmland Trust, and Serena Unger
- "Communicating the "state of the science" of key soil health practices in California" **Tom Tomich**, Director, Agricultural Sustainability Institute at UC Davis. UC Sustainable Agriculture Research and Education Program, and Kate Scow, Sonja Brodt, and Laura Crothers.
- And more…



Please Return at 3:30 PM

Combating the Impacts of Climate Change on Food Systems and Disease Issues at Multiple Scales

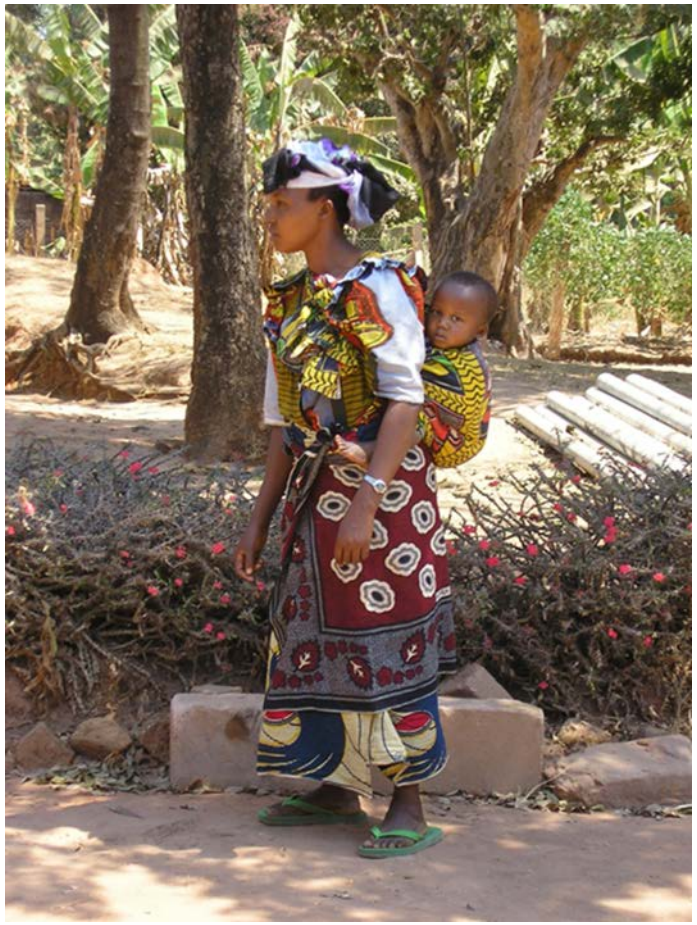
- Moderator: Christine Johnson, Associate Director, One Health Institute, School of Veterinary Medicine, UC Davis

- Ndola Prata, Associate Professor, School of Public Health, UC Berkeley

- Stephen Luby, Director of Research, Center for Innovation in Global Health, Stanford University

- Christine Stewart, Professor, Department of Nutrition, UC Davis

Ndola Prata, Associate Professor, School of Public Health, UC Berkeley



INVESTING IN WOMEN AND GIRLS TO MITIGATE THE THREATS FROM RAPID POPULATION GROWTH

Ndola Prata, MD MSc

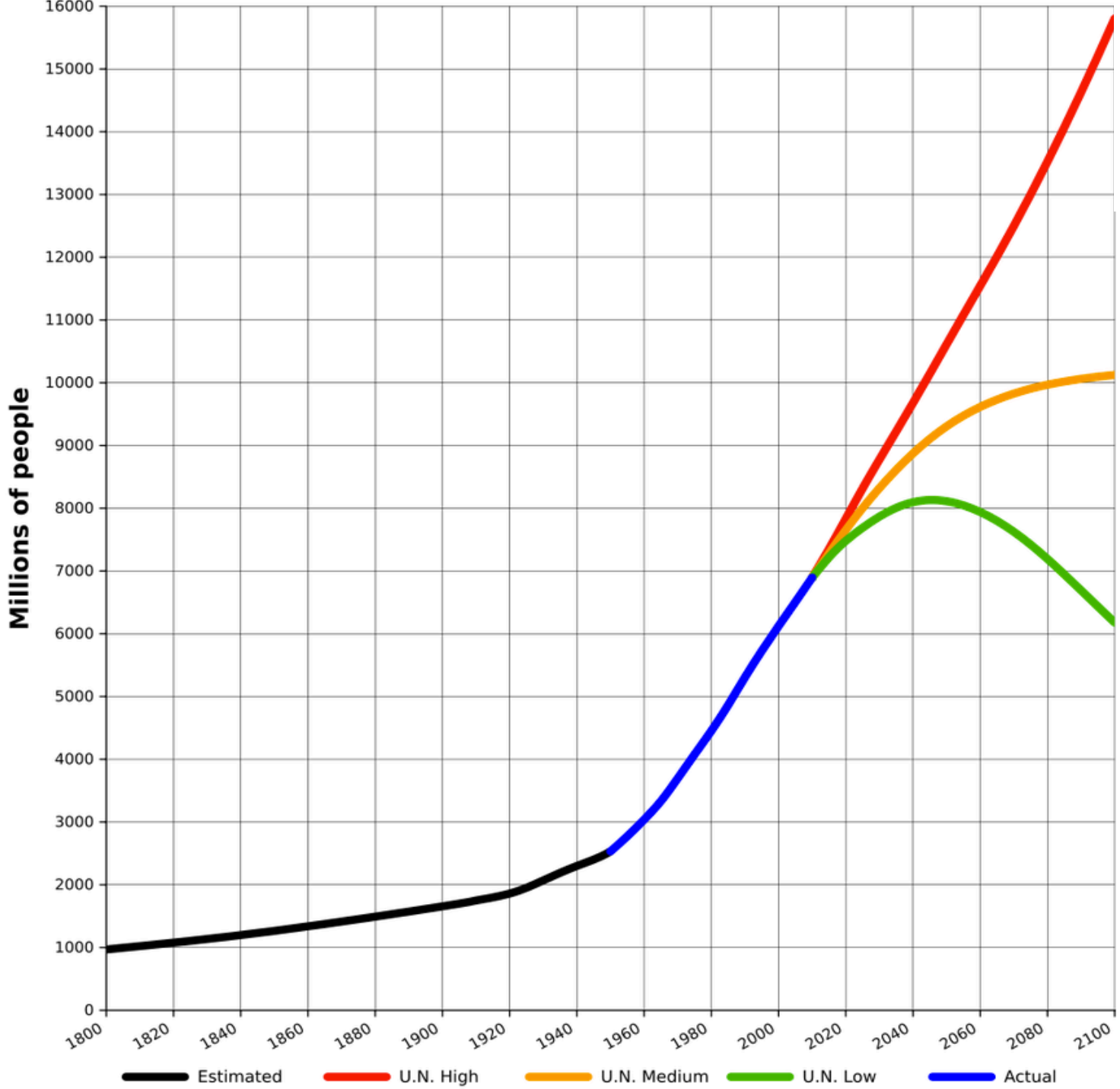
School of Public Health, University of California, Berkeley

Symposium: Managing Lands in a Changing Climate

UC Davis, September 10, 2018

World population today: 7.6 billion

- 200,000 years to reach first billion
- 130 years to add second billion
- 30 years to add third billion
- 15 years to add fourth billion
- 12 years to add the fifth and sixth billion



UN high-variant projection: 16.6 billion (half a child MORE than the medium variant).

Medium variant: 10.9 billion.

Low variant: 8.3 billion (half a child FEWER than the medium variant).

Rapid population growth

- **1965:** Most rapid **percentage** increase in global population
    - Population = 3.3 billion
    - Annual increase = 2.5%/year
    - Absolute increase = 68 million more births than deaths
- **2015:** Most rapid increase in **absolute** numbers
    - Population = 7.3 billion
    - Annual increase 1%/year
    - Absolute increase = 88.9 million more births than deaths

Population Growth Rate (r)

Percent growth:	Doubling time:
1%	70 years
2%	35 years
3%	23 years

Threats Posed by Rapid Population Growth

- Use of natural resources
- Conflict
- Environmental degradation
- Poverty & Inequality
- Nutrition
- Disease
- Climate change
- …and much more….

Fertility levels and where most of the population growth comes from

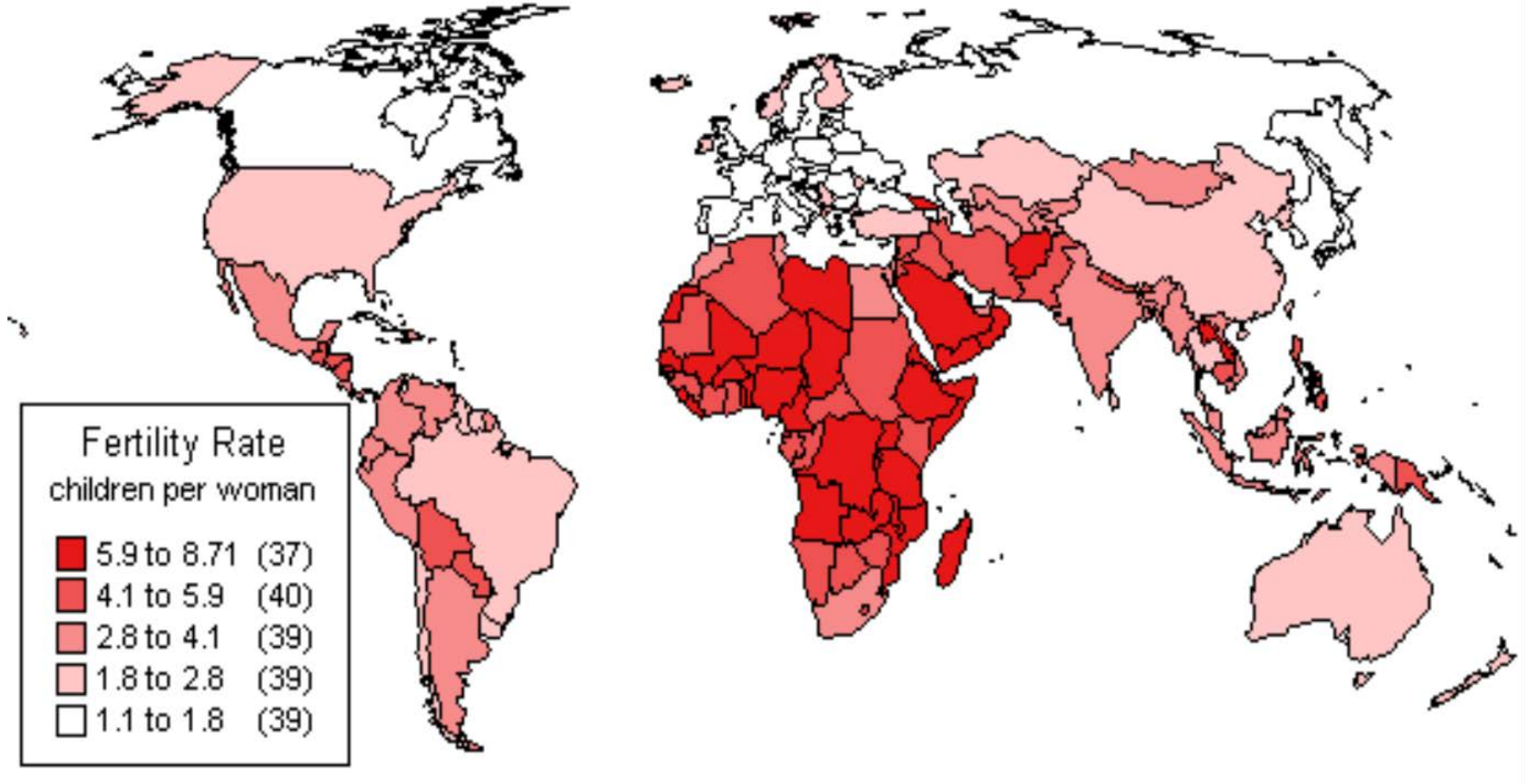
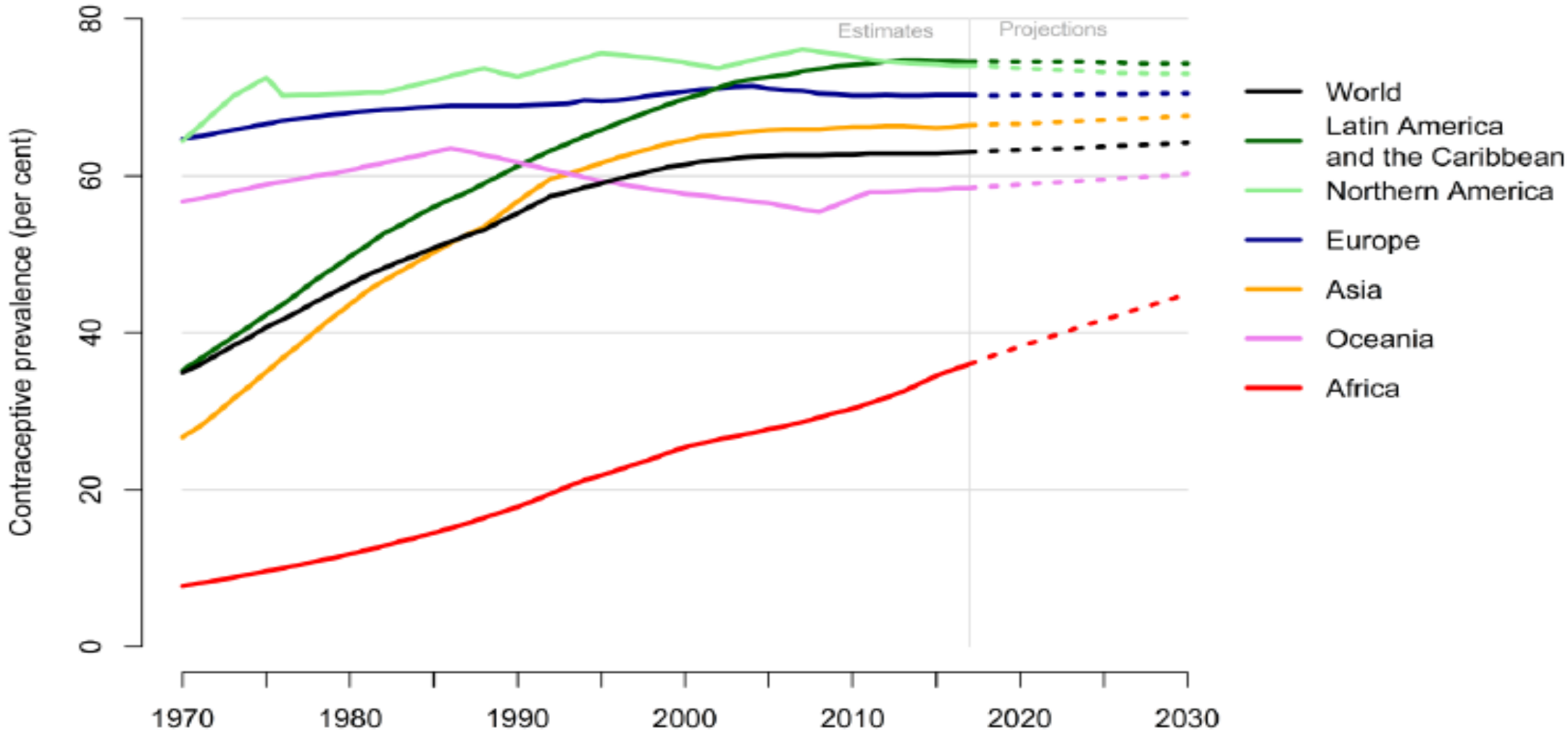
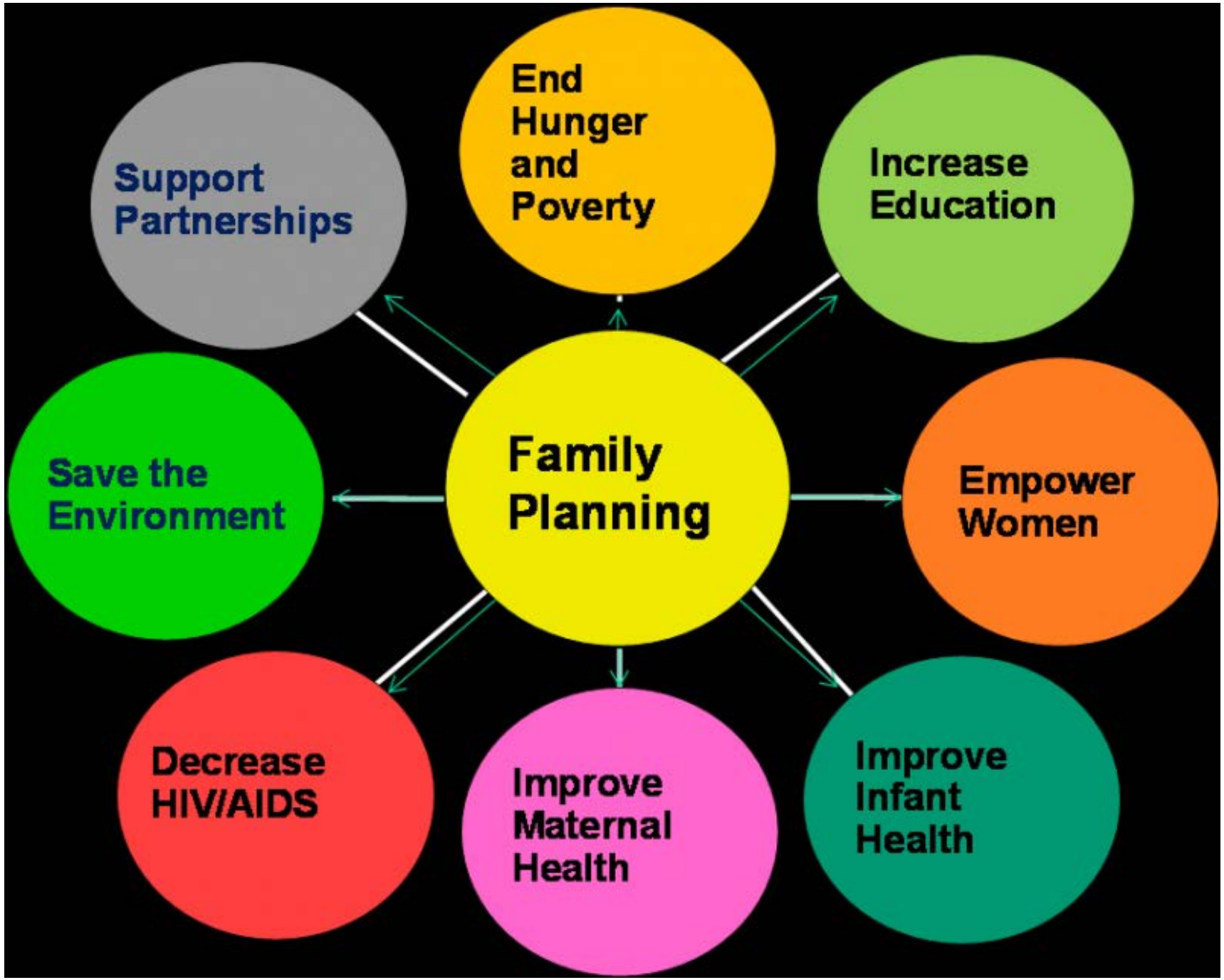


Figure 1. Contraceptive prevalence (any method) among married or in-union women, by region, from 1970 to 2030



Data source: United Nations, Department of Economic and Social Affairs, Population Division (2017b). *Model-based Estimates and Projections of Family Planning Indicators 2017*. New York: United Nations.


Support Partnerships
End Hunger and Poverty
Increase Education
Save the Environment
Family Planning
Empower Women
Decrease HIV/AIDS
Improve Maternal Health
Improve Infant Health

Children
by choice,

not by
chance.

Investing in women and girls

- Education
- Empowerment
- Access to comprehensive sexual and reproductive health information and services

Solutions that help humans, plants and animals

PHOTO COURTESY OF PABLO TOSCO/OXFAM

Stephen Luby, Director of Research, Center for Innovation in Global Health, Stanford University

Photo: Mizan Rahman

Brick Manufacturing and Public Health in Bangladesh

Steve Luby, MD
North South University
10 September 2018

FSI STANFORD

icddr,b
KNOWLEDGE FOR GLOBAL LIFESAVING SOLUTIONS

Global warming from
South Asian brick kilns

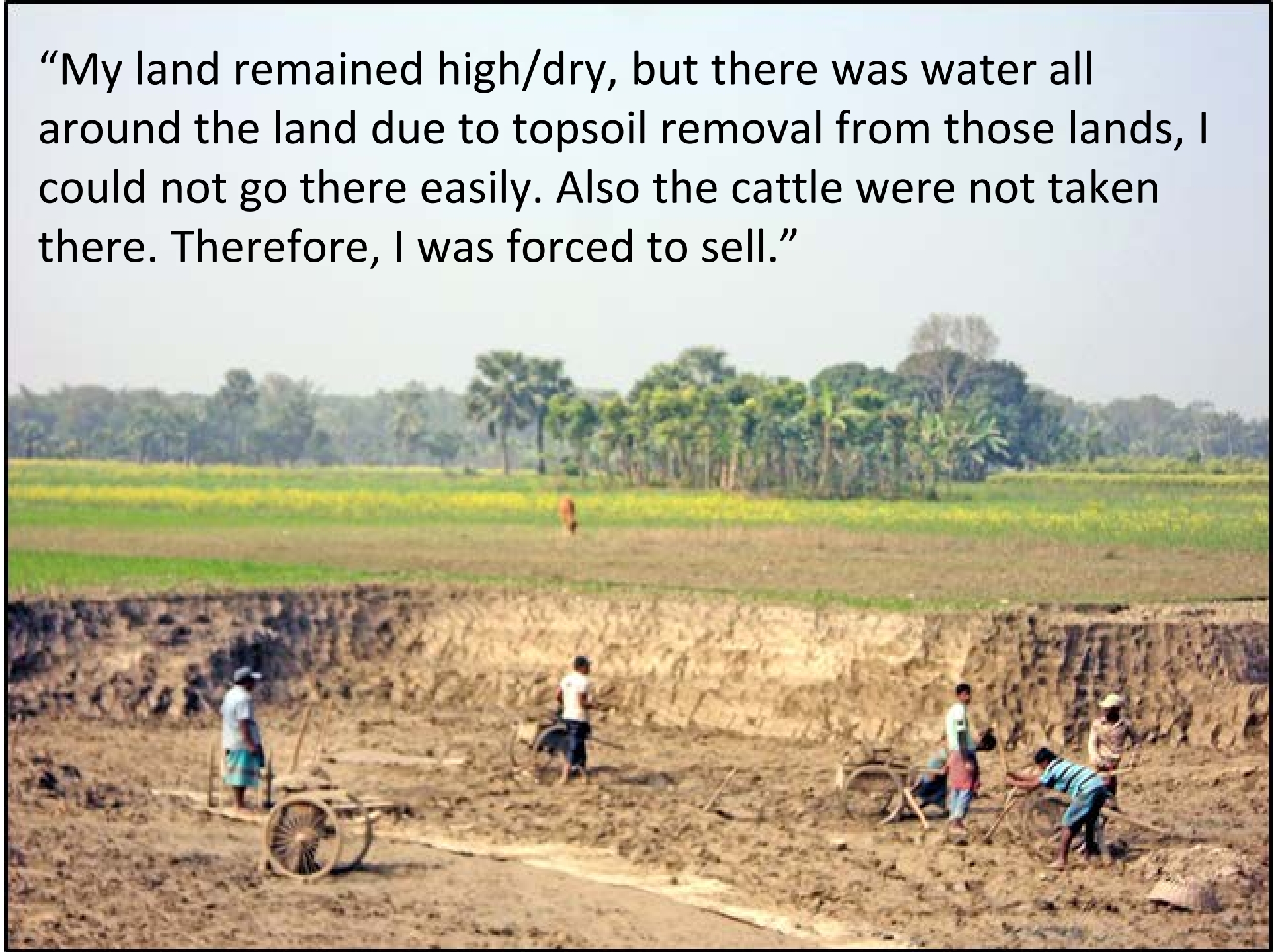
- Black carbon / aerosols
  - 1.4 TW global radiative forcing
  - over 1 year
- Green house gases
  - Generates 3.1 TW radiative forcing
  - Over 100 years
- Passenger cars in the U.S. generate ~5 TW of integrated radiative forcing annually

Weyant C, *Environ. Sci. Technol*. 2014, 48, 6477−6483

Why do farmers sell their soil?

- Financial gain:
  - One time 1 – 4x annual agricultural income
- 61% of farmers reluctantly sold soil to level land with neighbors

“My land remained high/dry, but there was water all around the land due to topsoil removal from those lands, I could not go there easily. Also the cattle were not taken there. Therefore, I was forced to sell.”



Why do farmers sell their soil?

Debashish Biswas, Anjali Menon

- Financial gain:
  - One time 1 – 4x annual agricultural income
- 61% of farmers reluctantly sold soil to level land with neighbors
  - 36 – 77% loss in agricultural productivity in the following year
  - Not fully recovered after 5 years
- 100 million kg lost harvest nationally over 5 years
  - A salient issue for a country that has repeatedly experienced famine

Atmospheric Pollution Research
www.atmospolres.com

2013

Air pollution by fine particulate matter in Bangladesh

Bilkis A. Begum [1], Philip K. Hopke [2], Andreas Markwitz [3]

- Air sampling at the Atomic Energy Centre, Dhaka twice weekly since 1996
  - Measured black carbon and fine particulates
  - Chemical analysis of the particulates

- 2007 – 2009: Brick kilns account for
  - 91% of black carbon
  - 23% of PM 2.5 (40% during winter)

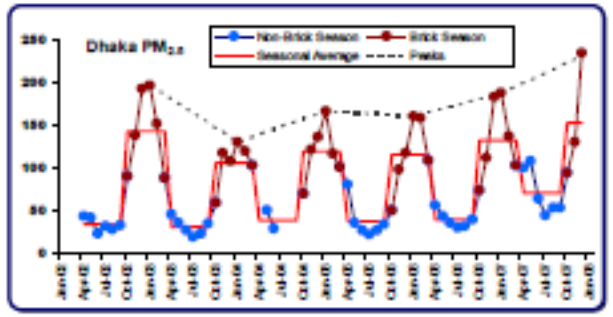
Simple Interactive Models for Better Air Quality

www.sim-air.org

Impact Analysis of Brick Kilns on the Air Quality in Dhaka, Bangladesh

Dr. Sarath Guttikunda

May, 2009



SIM-air Working Paper Series: 21-2009

"The incremental pollution of 40 µg/m3 (particulate matter), due to the brick kilns . . . translates to an increase in ~5,000 premature deaths annually in Dhaka city"

RobinM

Bangladesh

- Current brick production
  ≈25 billion / year
- Projected to increase
  2 – 3 times in the next 20 years
- Similar projections across South Asia

Brick kiln types in Bangladesh

Kiln type	Number	% of total kilns	% of total brick production
Fixed chimney kiln	<4,500	92	91.4
Zigzag kiln	<150	3	0
Hoffman gas	<20	0.4	3.5
Hybrid Hoffman kilns	<10	0.2	1.4
Others	<200	4	0.9

Source: Bangladesh Department of the Environment 2010

Fixed Chimney kiln

Inefficient combustion generates lots of black carbon and particulate matter

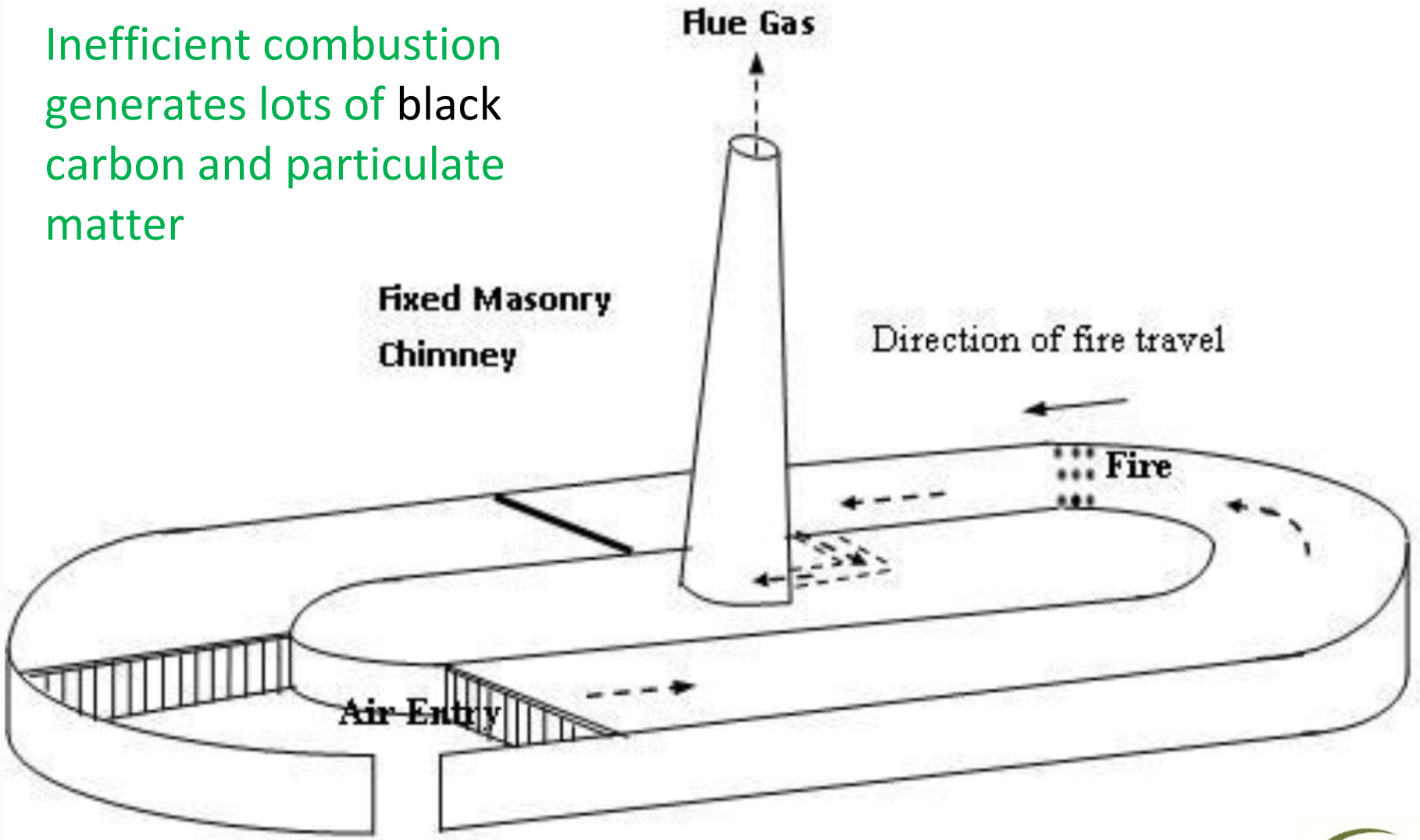


Image from: Dheeraj Lalchandani

Greentech Knowledge Solutions Pvt. Ltd.

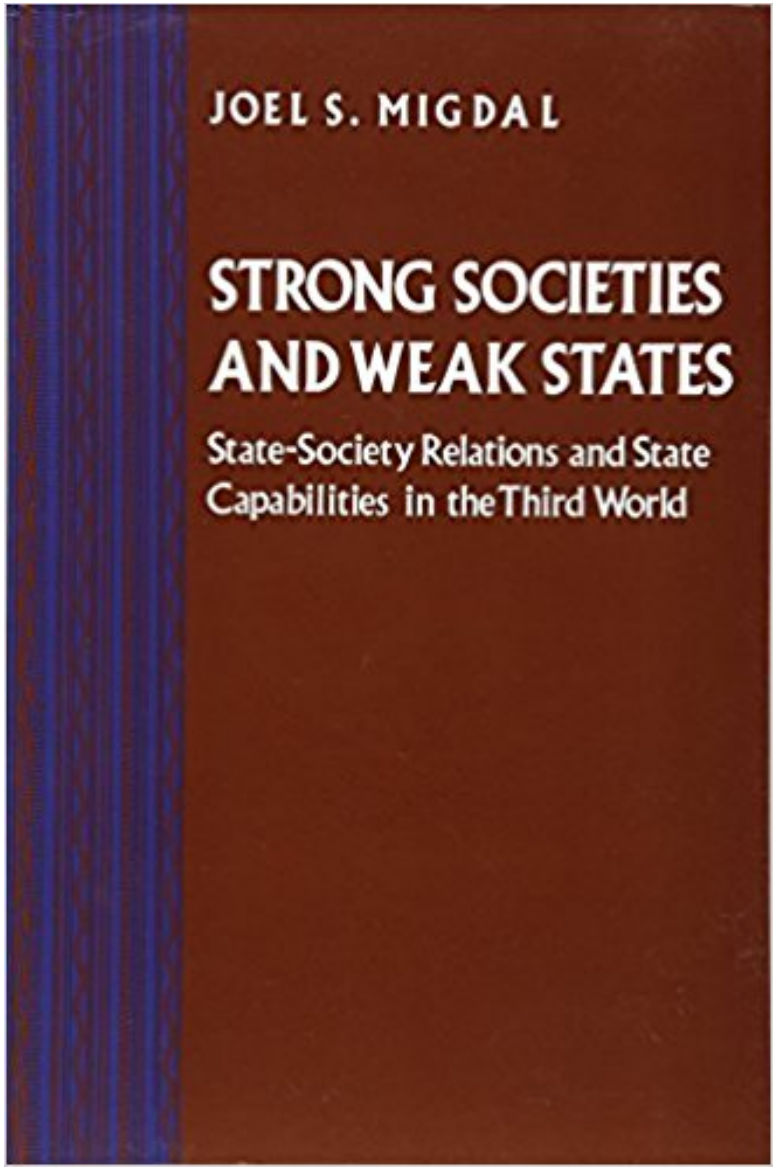
Why fixed chimney kilns?

- Lowest capital costs
  - 65% of the cost of a zigzag kiln
  - 10% of the cost of a Hoffman tunnel kiln
- Highest / fastest return on investment
  - Break even in 2-3 years
  - 80% return on investment
- Only operates 6 months a year
  - Permits using floodplain land
  - Complements labor availability
- Widespread knowledge on how to build and operate
- Bricks are heavy; expensive to transport

From: http://janmoellerhansen.smugmug.com/Bangladesh/The-Brick-Kilns-in-Dhaka


Typical small enterprise
• Low capital
• Low expertise
• Highly polluting
What can be done?

Weak states cannot enforce regulations



- State capabilities
  - Penetrate society
  - Regulate social relationships
  - Extract resources
  - Appropriate or use resources in determined ways
- Common measure of state strength is their ability to raise tax revenues
- In Bangladesh
  - <1% of individuals pay income tax

Sarker T. Pakistan Economic and Social Review, 2006.

Transitioning brick making to large formal year round enterprises

- Advocated for decades
- Targets elites (not current kiln owners)
- Some model kilns constructed
- Bricks cost 40% more
- <10% market penetration

www.alibaba.com

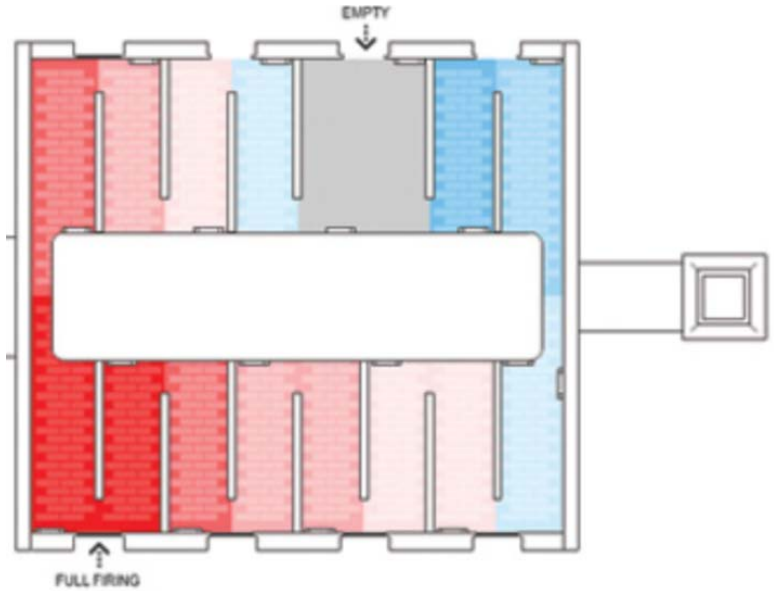
Objective

Transform the way bricks are manufactured in Bangladesh (and eventually across South Asia) so they generate less harm to the environment and health

Strategy

- Work with current kiln owners
- Incentive compatible improvements
- Co-funding from climate change donors
- Continuous iterative improvement

Technologies to improve efficiency

- Improving efficiency
  - Reduces black carbon and small particulate emission
  - Reduces coal costs
- Compatible with kiln owners' incentives
- Reduces environmental and health harm
- Marginal approaches
  - Improve fuel preparation and feeding
  - Optimize brick layout
  - 

  - Natural draft

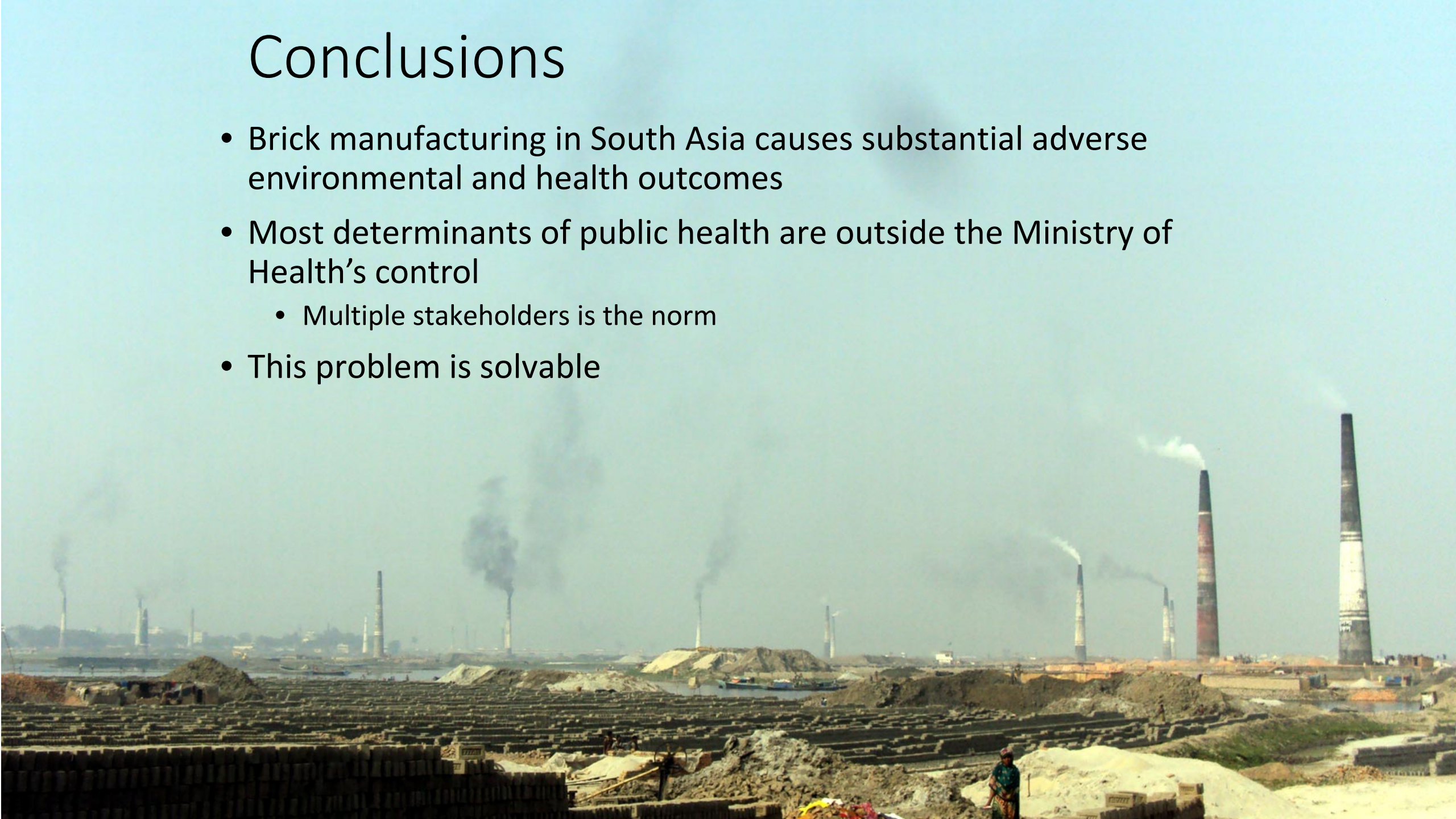
- Using remote sensing to identify all brick kilns in Bangladesh
- Develop a publically available website + community outreach:
  - Locate all kilns
  - Project impact on agriculture and health
  - Provide path to lessen impact

Howard Zebker
Electrical
Engineering

Francis Fukuyama
Freeman Spogli
Institute

Conclusions

- Brick manufacturing in South Asia causes substantial adverse environmental and health outcomes
- Most determinants of public health are outside the Ministry of Health's control
  - Multiple stakeholders is the norm
- This problem is solvable



Christine Stewart, Professor, Department of Nutrition, UC Davis

Nutrition, food security and climate change

Christine P. Stewart, MPH, PhD

Associate Professor of Nutrition

University of California, Davis

UCDAVIS
UNIVERSITY OF CALIFORNIA

PICN
Program in International and Community Nutrition

“Globally, one person in three is malnourished today and one in two could be malnourished by 2030 if nothing is done.”

High Level Panel of Experts for Food Security and Nutrition, 2017

Food and Agriculture Organization

Malnutrition comes in many forms

Image credit: WHO, 2017

How has the prevalence of undernutrition changed over the last 25 years?

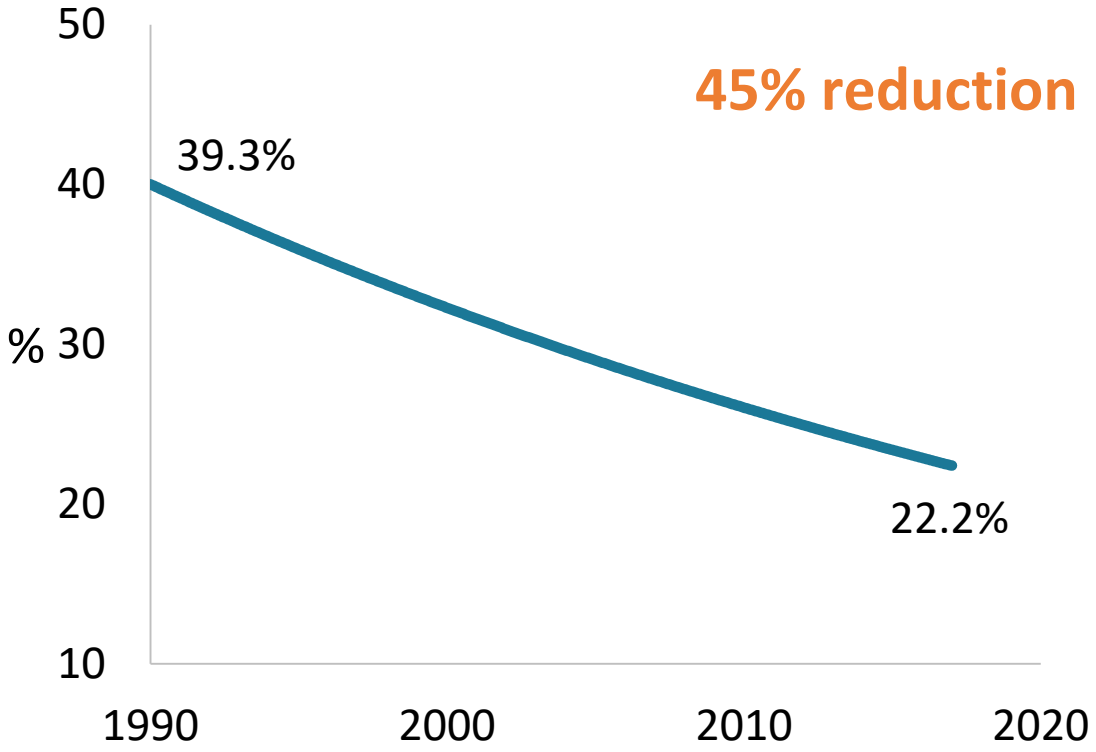
A. Increased

B. Stayed about the same

C. Declined

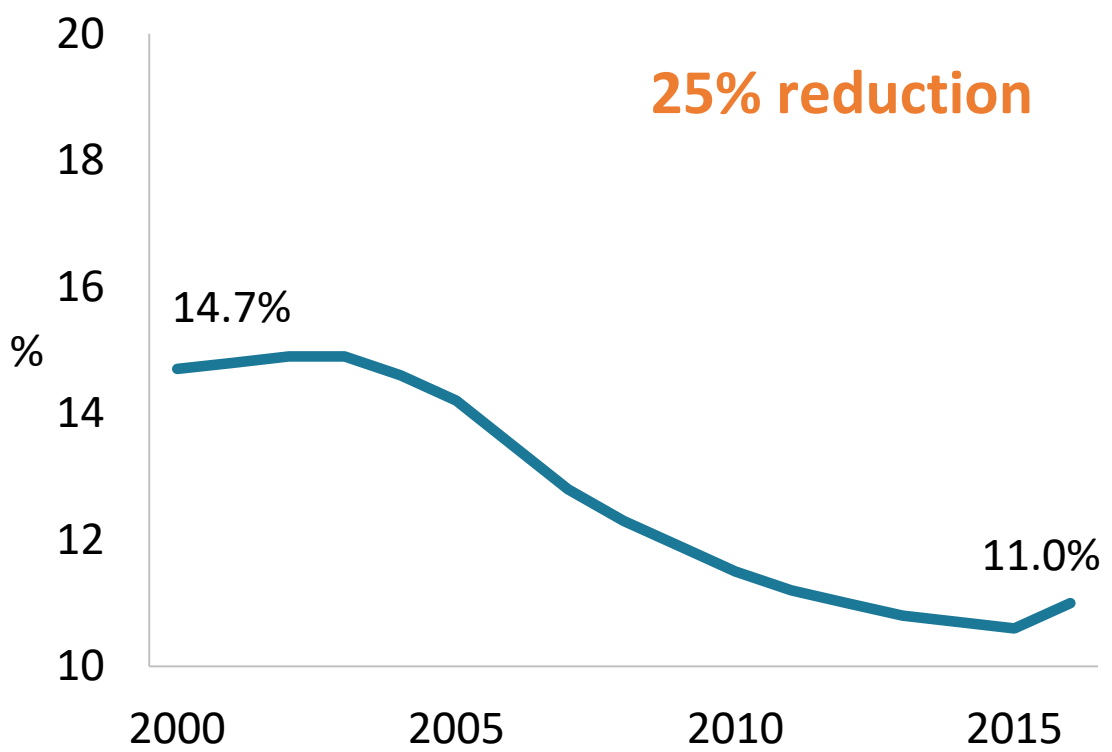
Many indicators of undernutrition show substantial improvements

Prevalence of child stunting



UNICEF, WHO, The World Bank, 2018

Prevalence of undernourishment



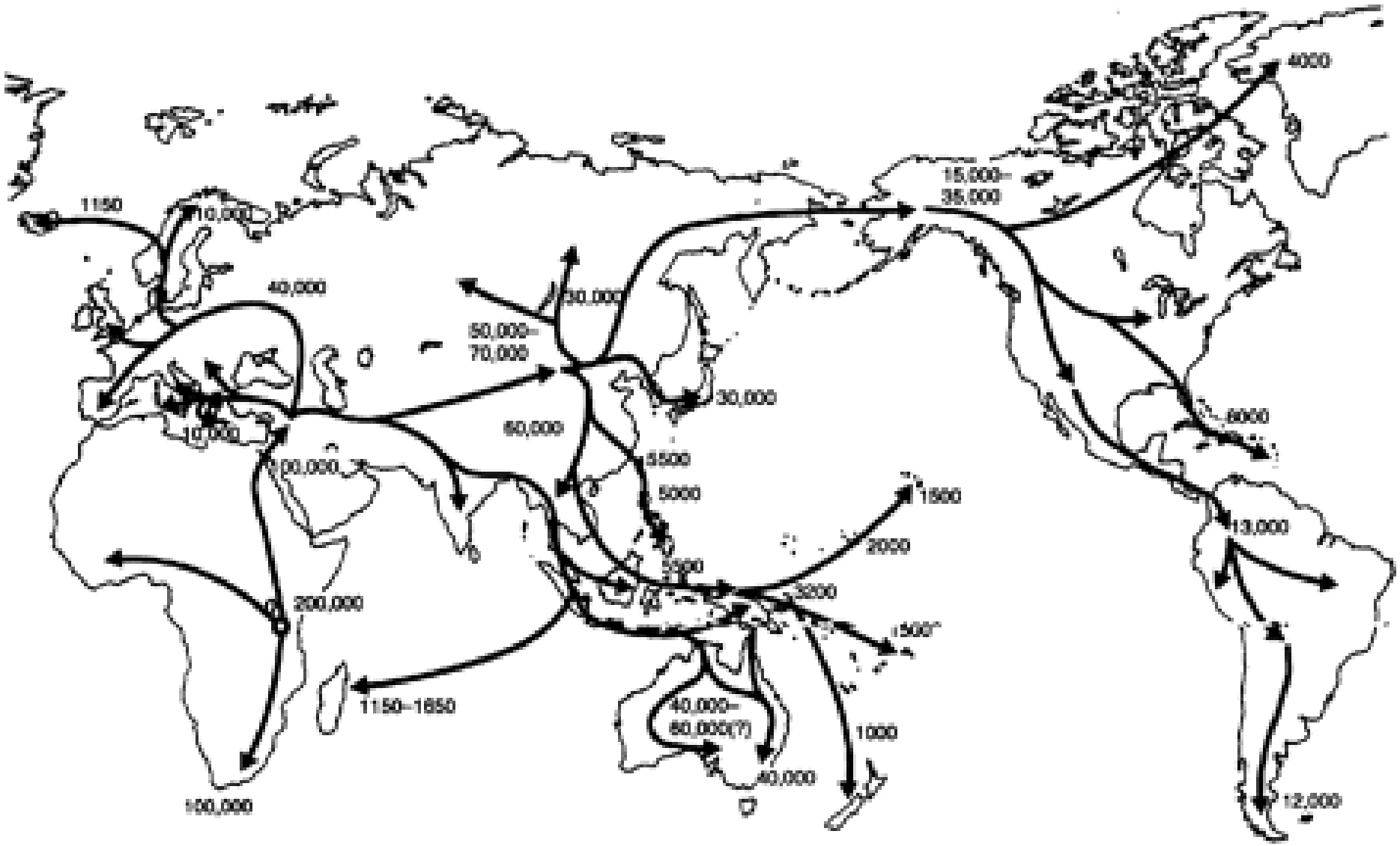
FAO, 2018

Climate change threatens these gains

Projections suggest multiple risks to nutrition and food security

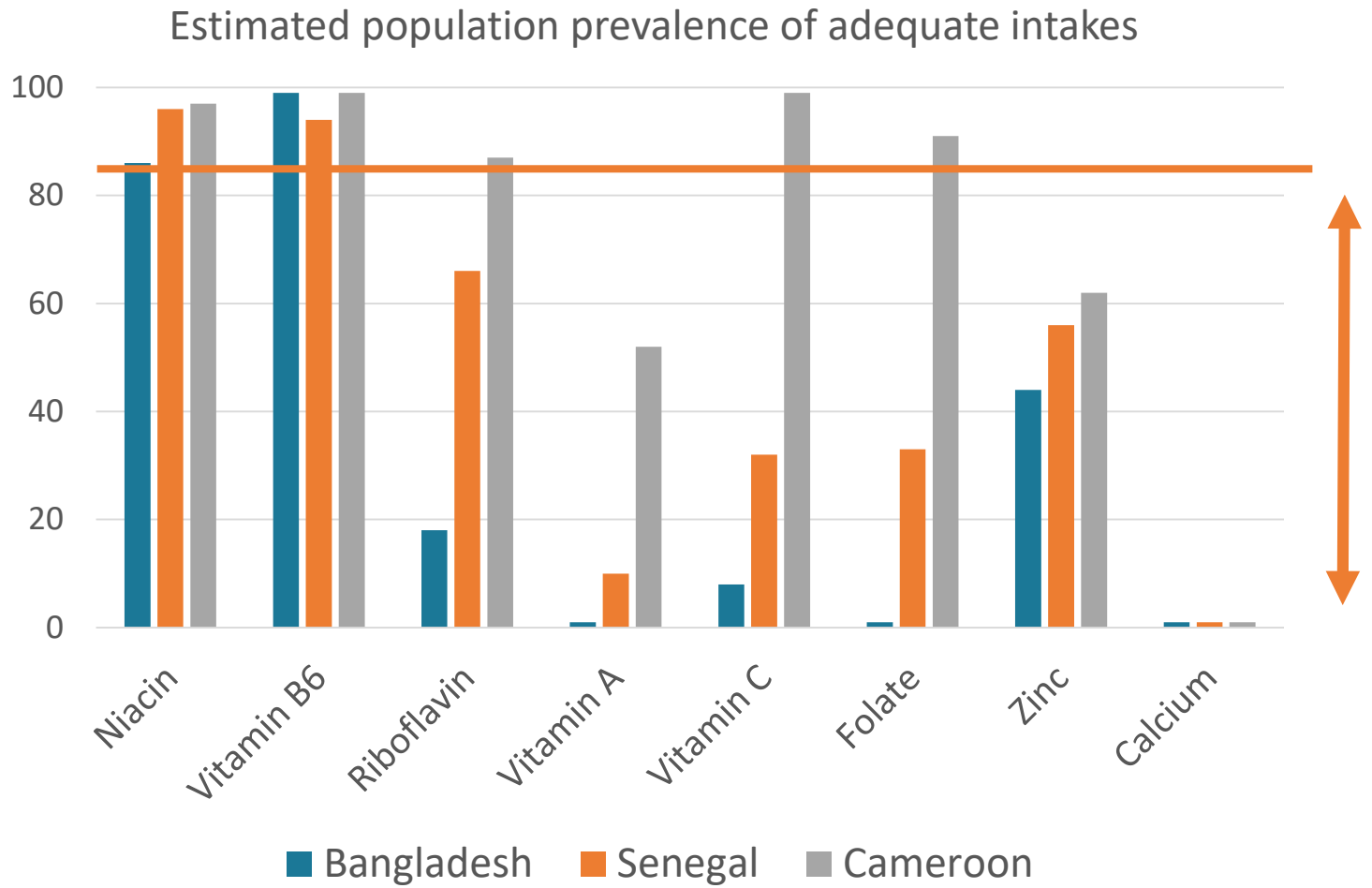
- Unpredictable, extreme weather events will lead to greater instability in our ability to produce food
- Shortage of calories in the food supply by ~2050
- Reduction in the nutrient quality of staple foods (ex. iron, zinc, and protein concentrations reduced) with elevated CO_2
- Elevation in infectious diseases, such as diarrhea, which are associated with malnutrition
- Increase in global food prices will make poor families even more vulnerable

A map of human resilience



Dietary diversity is essential for nutrition

Food supply does not meet nutrient requirements



Gap between what the food supply provides and the amount needed for the majority of people to meet their nutrient requirements.

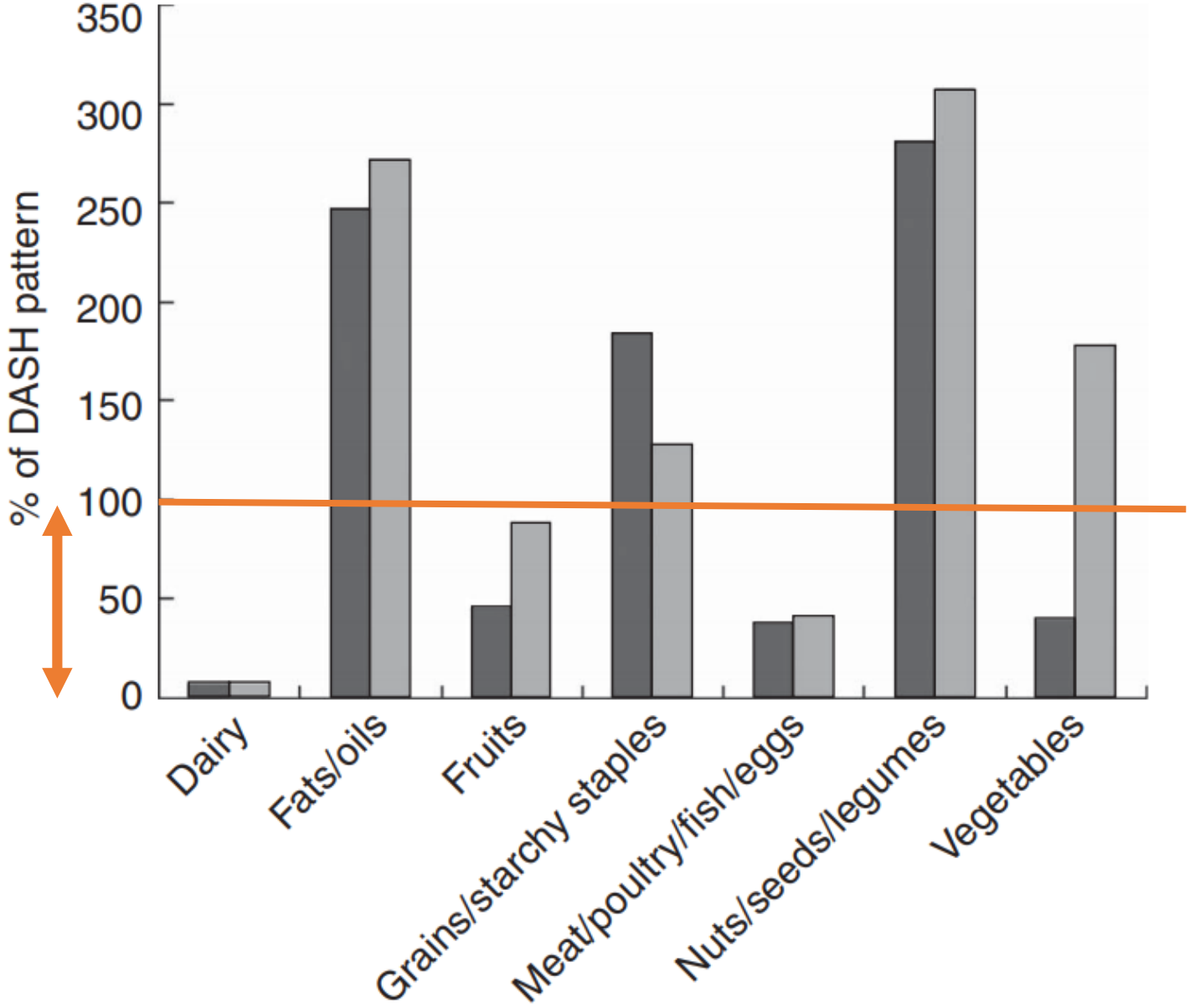
Arsenault, Hijmans & Brown, Food Security, 2015

Food supply does not allow for adequate dietary diversity

Cameroon

FAO Food Balance Sheet data

Gap between the food supply and what is needed for a healthy diet



Kuyper et al, PHN, 2017

Animal source foods for maternal & child nutrition

Nutrient	Meat	Milk	Eggs
Heme iron	+++	0	0
Total iron	+++	+	+
Zinc	+++	+	+
Vitamin A	+	++	+++
Riboflavin	++	+++	++
Vitamin B12	+++	++	++
Folate	+	+++	+
Calcium	0	+++	0
Health impacts	↑ Lean body mass	↑ child growth	↑ child growth

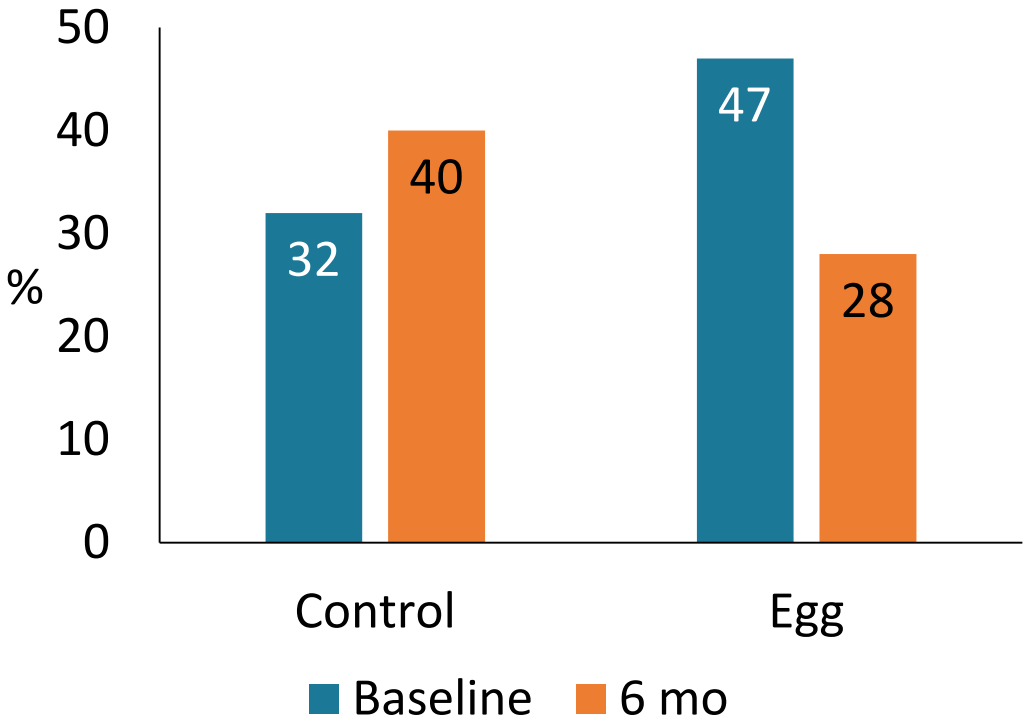
+ Relative contribution per kcal

Photo courtesy of SPRING

Allen LH, FNB, 2013

Association between animal source foods and stunted growth in children

Effect of eggs on stunting in a randomized trial among children 6-9 m old at baseline in Ecuador



Iannotti et al, Pediatrics, 2017

Association between animal source foods and child stunting in young children (18-23 mo olds)

Food group	Percentage point reduction in stunting
Any ASF	-4.0
1 ASF	-3.7
2 ASFs	-5.7
3 ASFs	-6.1
Grains/roots/tubers	Not significant
Legumes/nuts	Not significant
Fruit	-1.8
Vegetables	Not significant

Headey et al, Amer J Agr Econ, 2018

Fruits and vegetables

- Rich sources of carotenoids, vitamin C, folate, tocopherol, vitamin K, potassium and magnesium
- High in fiber
- Abundant phytochemicals that act as antioxidants and anti-inflammatory factors.
- Diets rich in fruits & vegetables are associated with lower risk of CVD, diabetes, and some cancers.

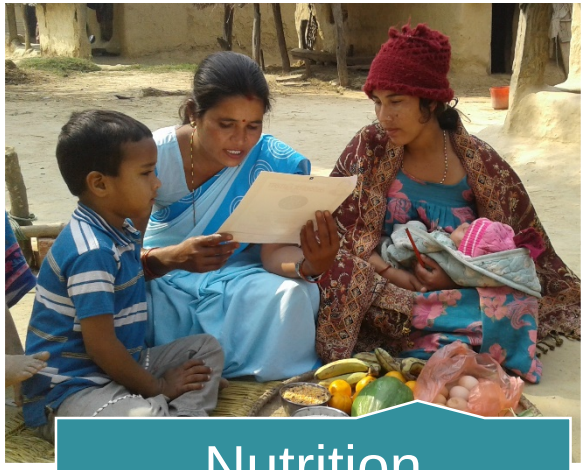
"The currently estimated number of bioactive phytochemicals is around 100,000 and a single plant-based meal might provide around 25,000 different phytochemicals ... The observed health effects associated with vegetable, fruit, berry, and whole grain consumption can likely be explained by the combined action of many different phytochemicals and other nutrients."

-Nordic Nutrition Recommendations, 2012

Legumes

- Lack saturated fats
- Rich in B vitamins
- Healthy carbohydrates: Rich in fiber and resistant starch, which is associated with improved gut health.
- High in protein, especially many essential amino acids
- Contain numerous phytochemicals that have antioxidant, anti-inflammatory, and antimicrobial properties
- But, contain phytates that limit iron and zinc absorption.
- Diets rich in legumes are associated with healthier body weight, improved lipid profiles, lower blood pressure and risk of CVD

Current large-scale approaches to address malnutrition



Nutrition education

Food fortification

Supplementation

Biofortification

If core set of nutrition interventions could be scaled globally, 1 million children's lives could be saved and 33 million fewer children would be stunted.

(Bhutta et al, Lancet, 2013)

Photo credits: Vikash Deuja/Save the Children; UNICEF; HarvestPlus

How should we act to position our food system to meet dietary requirements?

- Maintain or increase availability and equitable access to critical food groups
  - Animal source foods
  - Fruits and vegetables
  - Legumes
- Strengthen evidence-based nutrition education at all levels
- Fortify processed foods with nutrients that are unavailable in adequate quantities in the local food supply; provide supplements for vulnerable groups such as pregnant women or young children
- Minimize waste from farm to fork

How should we act to position our food system to meet dietary requirements?

- Invest in research
  - Optimize nutritional quality **along with** maximizing yield
  - Make food production systems more efficient and resilient, while minimizing impacts on the climate
  - Address gaps in our understanding of the nutritional quality of the food system over time, geography, and alternative production systems
  - Develop innovative methods of nutrition and health communication in the face of rapidly changing ways in which the public obtains its information
  - Strengthen the evidence base about what works to cost-effectively improve nutrition and health outcomes

Thank you

Contact:
cpstewart@ucdavis.edu

Combating the Impacts of Climate Change on Food Systems and Disease Issues at Multiple Scales

If you have additional questions or comments please connect with the panel at the conclusion of the Symposium

- Moderator: Christine Johnson, Associate Director, One Health Institute, School of Veterinary Medicine, UC Davis
- Ndola Prata, Associate Professor, School of Public Health, UC Berkeley
- Stephen Luby, Director of Research, Center for Innovation in Global Health, Stanford University
- Christine Stewart, Professor, Department of Nutrition, UC Davis

Lightning Talks: Success Stories at the Food-Health Nexus

Moderator: Terra Kelly, One Health Institute & UCGHI Planetary Health Center, School of Veterinary Medicine, UC Davis

- Courtney Crenshaw, Healing People, Places, and the Planet

- Federico Castillo, Analyzing health, land use, and agriculture through a multidisciplinary lens.

- David Wolking, Urban river interface disease

- Alisha Graves, Empowering Women Smallholder Farmers in the Sahel

Courtney Crenshaw, Healing People, Places, and the Planet

Healing people, places, and the planet

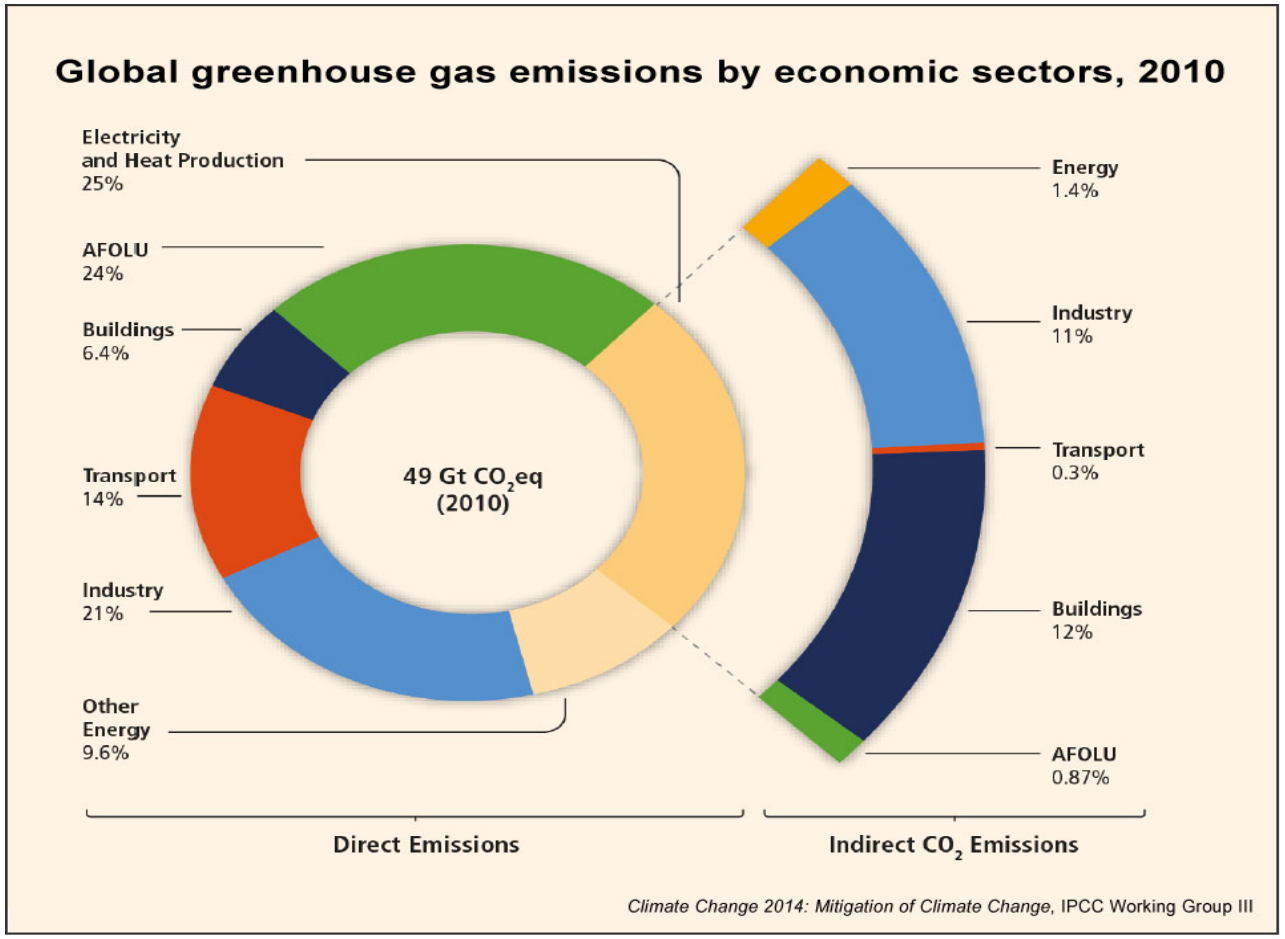
How health care is addressing climate change through market transformation

Courtney Crenshaw

CA Regional Coordinator

Healthy Food in Health Care, Health Care Without Harm

Climate & Food



Source: IPCC 2014 Report

- The food system is the largest energy consumer in US
- Agriculture and land use change is the **second highest** contributor to global greenhouse gas emissions after the energy sector
- The primary sources of GHG emissions from agriculture are:
  1. Meat and dairy production
  2. Manufacture and use of synthetic nitrogen fertilizers

1. Transition health care food service to a healthier dietary pattern that is less resource intensive and is protective of the environment and our finite resources.

1. Transform meat production systems away from an industrialized model towards scale appropriate, diversified, ecologically responsible production.

1. Empower health care facilities to employ population health management by building local food systems and creating access and affordability of healthy local food through their investments, purchasing, and operations.

Less Meat, Better Meat

The Big Picture

Our meat-rich diets are more costly than we realize. By moving away
meat intensive diets and choosing sustainable options when serving m
and poultry, we can collectively create a pathway to personal, commu
and global health. Consider these factors:

Antibiotic Resistance

80% of antibiotics sold in the U.S. are used for animal agriculture. Thi
equates to nearly 30 million pounds of antibiotics, annually. Most of th
antibiotics are routinely used for non-therapeutic purposes and are ava
able over-the-counter with no veterinary supervision. Many of these a
otics are also medically-important, like penicillin, and used to treat ill
in humans.

The overuse of antibiotics in animal agriculture threatens the efficacy
antibiotics in human medicine. The need to eliminate the routine use
antibiotics in animal agriculture is necessary to preserve the effectiven
of antibiotics and minimize the development of antibiotic resistant bac
This call to action comes from more than 300 leading medical organiz
tions, including the American Medical Association, the American Pu
Health Association, and the American Academy of Pediatrics.

Climate Change and Greenhouse Gases

From beginning to end, the lifecycle and common practices of industr
beef production produce the highest amount of greenhouse gas emissi
of any other food. Dairy and poultry production also emit a significant
amount of greenhouse gases, contributing to global climate change.

Air and Water Pollution

Large-scale meat production has a negative impact on water and air q
ity. Feedlots produce large manure lagoons with concentrated amoun
ammonia, phosphorus, and nitrogen, as well as dangerous microorgan
These wastes have been shown to run off into drinking water supplie
have destroyed wetlands, and led to fish kills. They also contribute to
air quality in local communities.

Chronic Disease

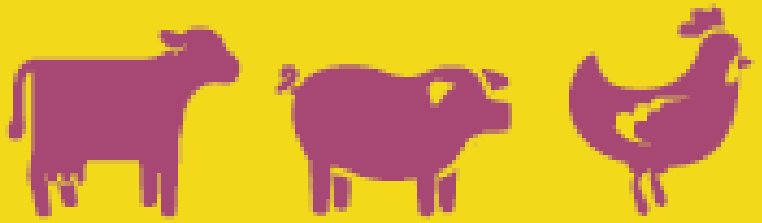
High consumption of meats and fats contribute to an increased risk of
cardiovascular disease, obesity, diabetes, metabolic syndrome, dement
and some types of cancer. Arsenic additives are used routinely in poul
and pork production to promote faster growth of the animals, yet arsenic
is a known carcinogen and poison.

Less Meat, Better Meat:

Reduce meat purchased by 10% per year OR achieve ultimate goal of an average 1.5 oz (.09375 lbs / meal) per meal served.

Increase by 5% per year or achieve ultimate goal of 20% of meat and poultry purchases raised without the routine use of antibiotics. (Meat = beef, pork, poultry and lunch meat; measure=lbs.)

Balanced Menus: In only one year 38 hospitals had an aggregate meat reduction of 1,359,009.61 lbs. That equates to 21,093 Metric tons of Carbon Dioxide avoided, which is equivalent to:



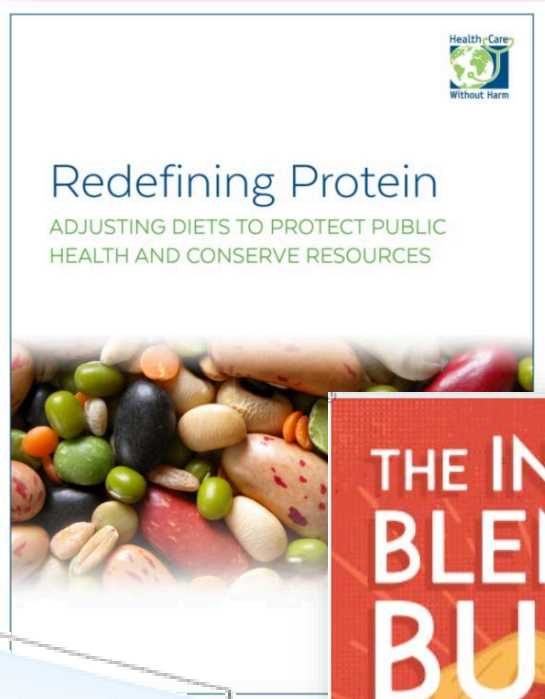
12,157 cows

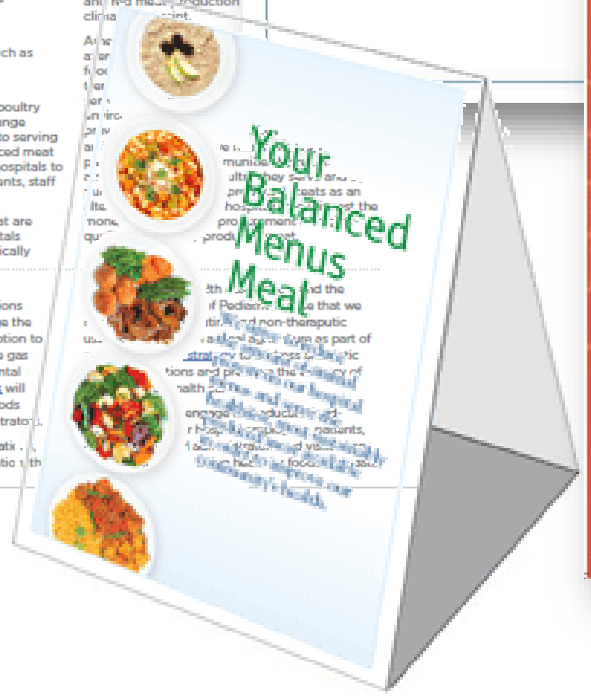
7,548 pigs

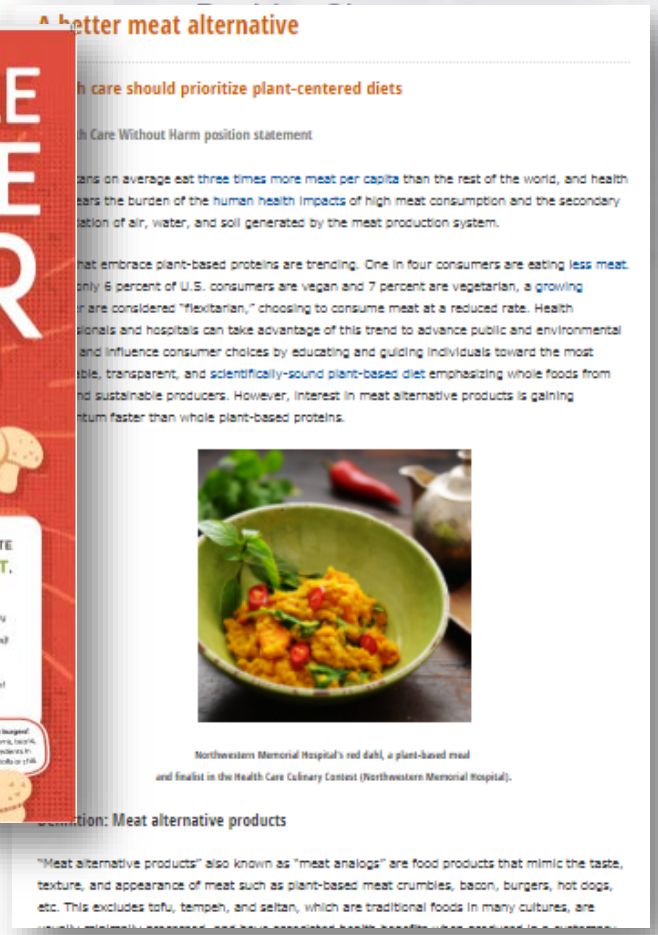
1,388 chickens

Today

Tools and Resources



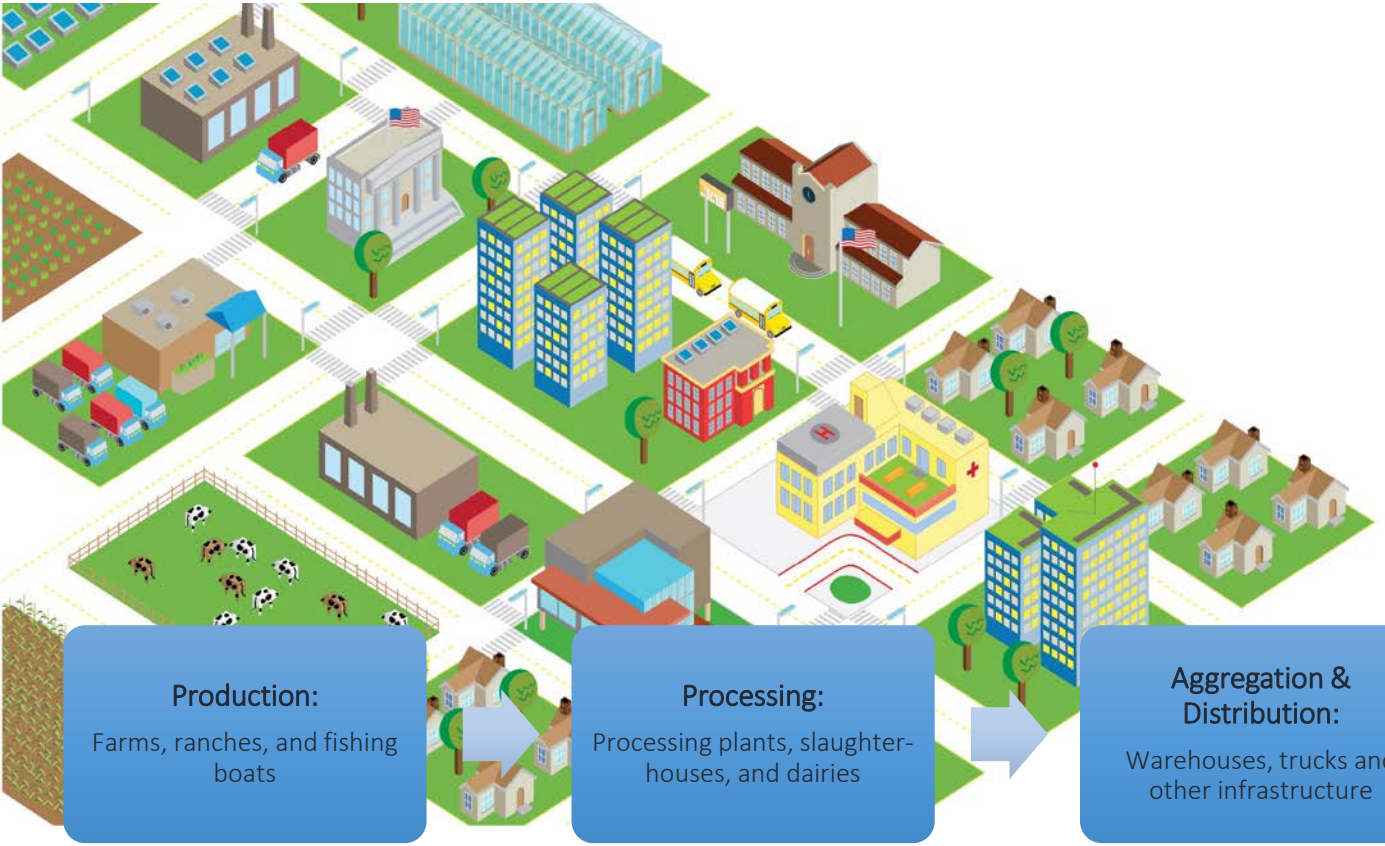




Project: Catalyzing Health Care Investment in Healthy Food Systems: Anchors in Resilient Communities

A Powerful Combination of Procurement and Investment to Build:

Community Health, Community Wealth, and Climate Resilience



Localize the Food Economy

- Aggregate anchor institution demand for regionally sourced, healthy food.
- Increase direct access to healthy foods in underserved neighborhoods.
- Create jobs for community residents.
- Increase markets for regional sustainable producers

Production: Farms, ranches, and fishing boats

Processing: Processing plants, slaughter-houses, and dairies

Aggregation & Distribution: Warehouses, trucks and other infrastructure

Retail: Grocery stores and markets

Food Services: Mobile food vendors and commercial kitchens

Berkeley
UNIVERSITY OF CALIFORNIA

College of Natural Resources

Federico Castillo, Analyzing health, land use, and agriculture through a multidisciplinary lens

Climate Change: Resilience in low and high income countries






UC MEXUS
ESTABLISHED 1980

PIMSA
PROGRAMA DE INVESTIGACIÓN EN MIGRACIÓN Y SALUD

UC GHI Planetary Health

1. Research Questions:

1. In Oaxaca, Mexico:

a) Given their limited resources, how do small coffee farmers adapt, if at all, to climate change?

b) How do community engagement (“Tequio”) impact climate change adaptation? Does it have any impact on community resilience?

2. In Imperial County, California:

a) What are the hidden costs of the impact of heat on agricultural labor?

b) Work plan designed to analyze a) above.

Oaxaca: sample

Sample size	123
Average family size	4.5 (min: 1, max: 12)
Education-head of household (average years in formal school)	2
Average number of family members by gender	
Head of household gender, percent	
Female	24.6
Male	75.4
Work for others	Yes: 44%; No: 56%
Farm size	1.1 ha.

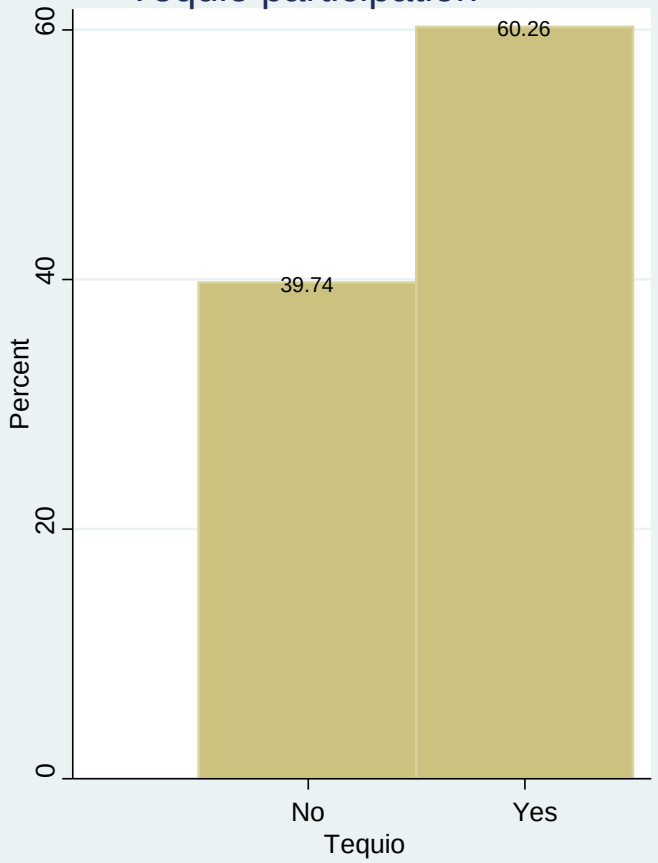
Production systems: contrast

Oaxaca

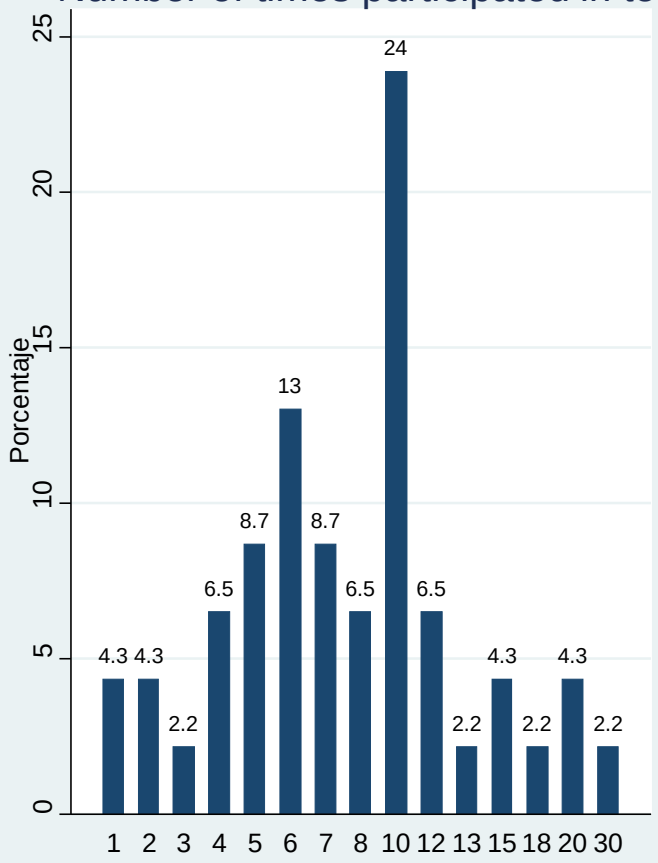
Costa Rica

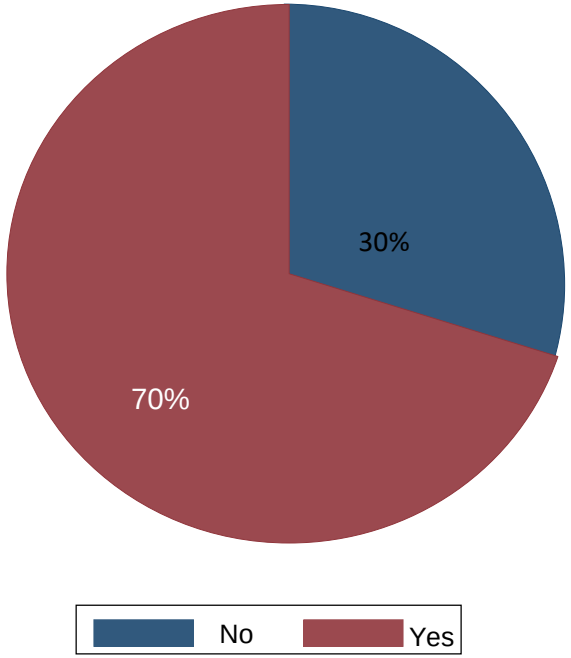
Community Participation: Tequio

Tequio participation

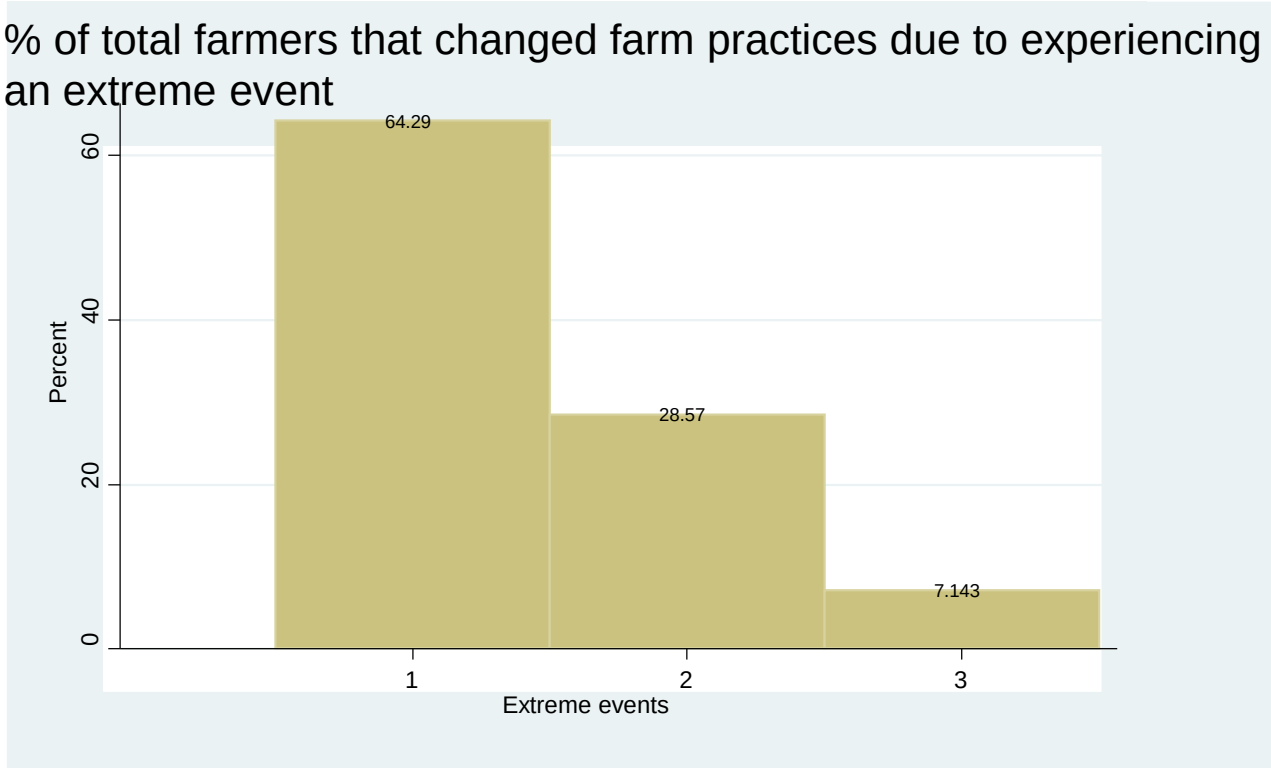


Number of times participated in tequio



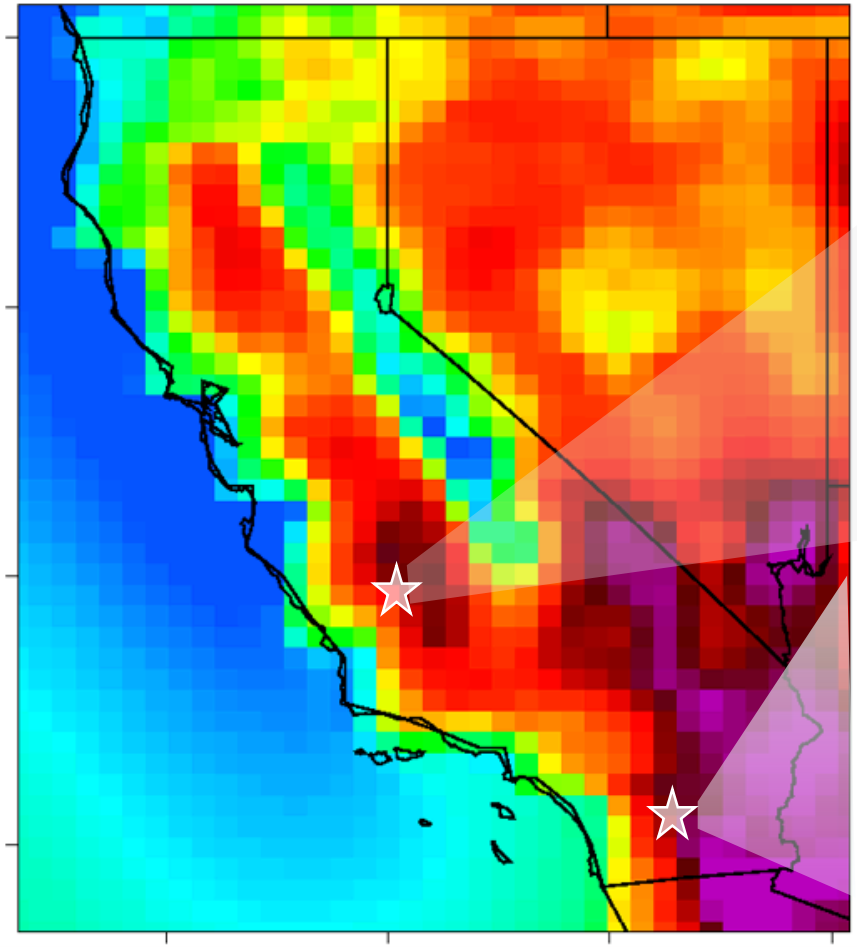


Number of extreme events experienced over the last ten years



- Percent of community members that participated in Tequio to deal with an extreme event impacting community infrastructure: 87%
- Percent of community members that participated in Tequio to help a community member cope with the impact of an extreme event occurrence: 55%

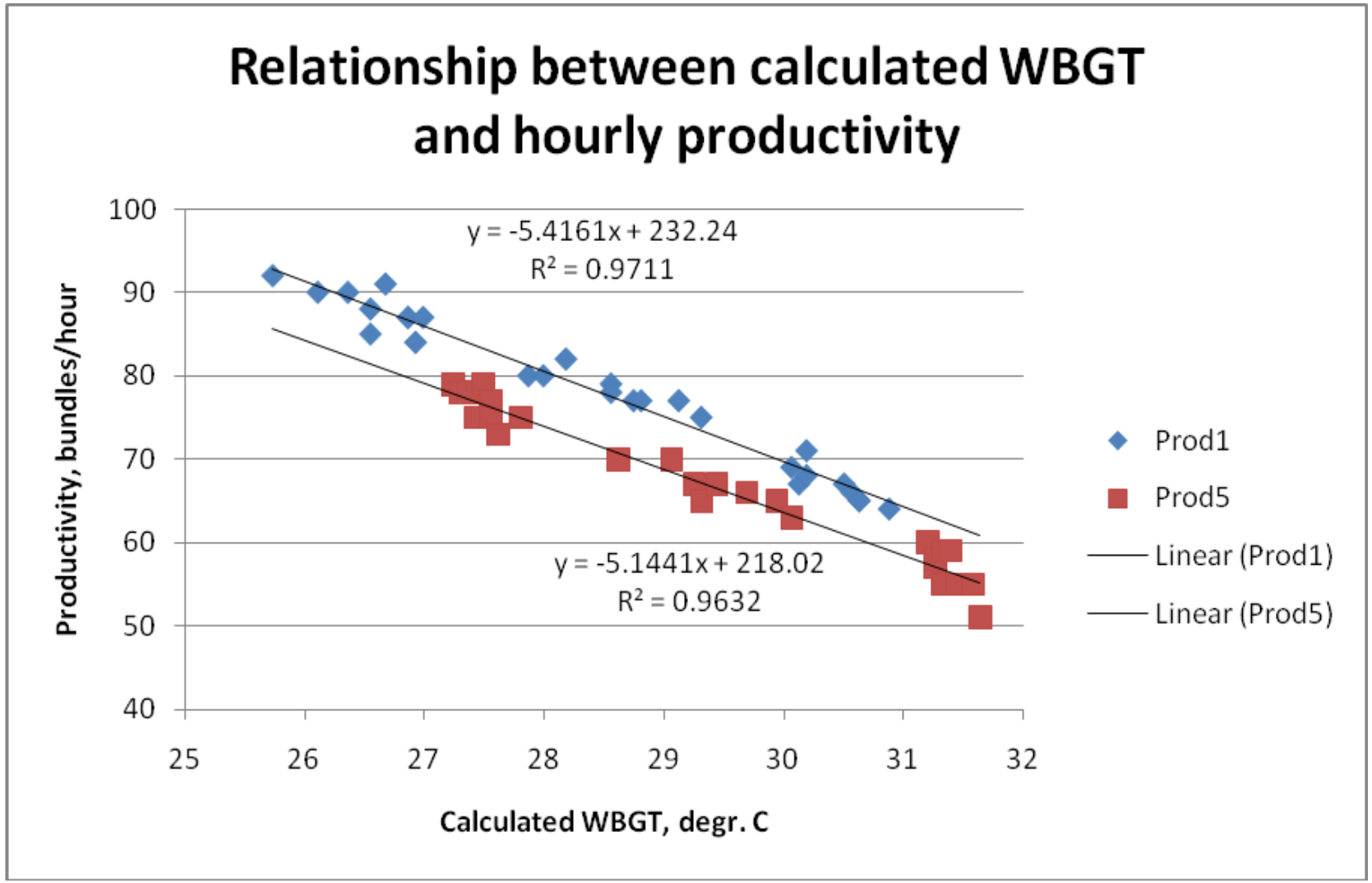
Heath and labor productivity: Imperial County

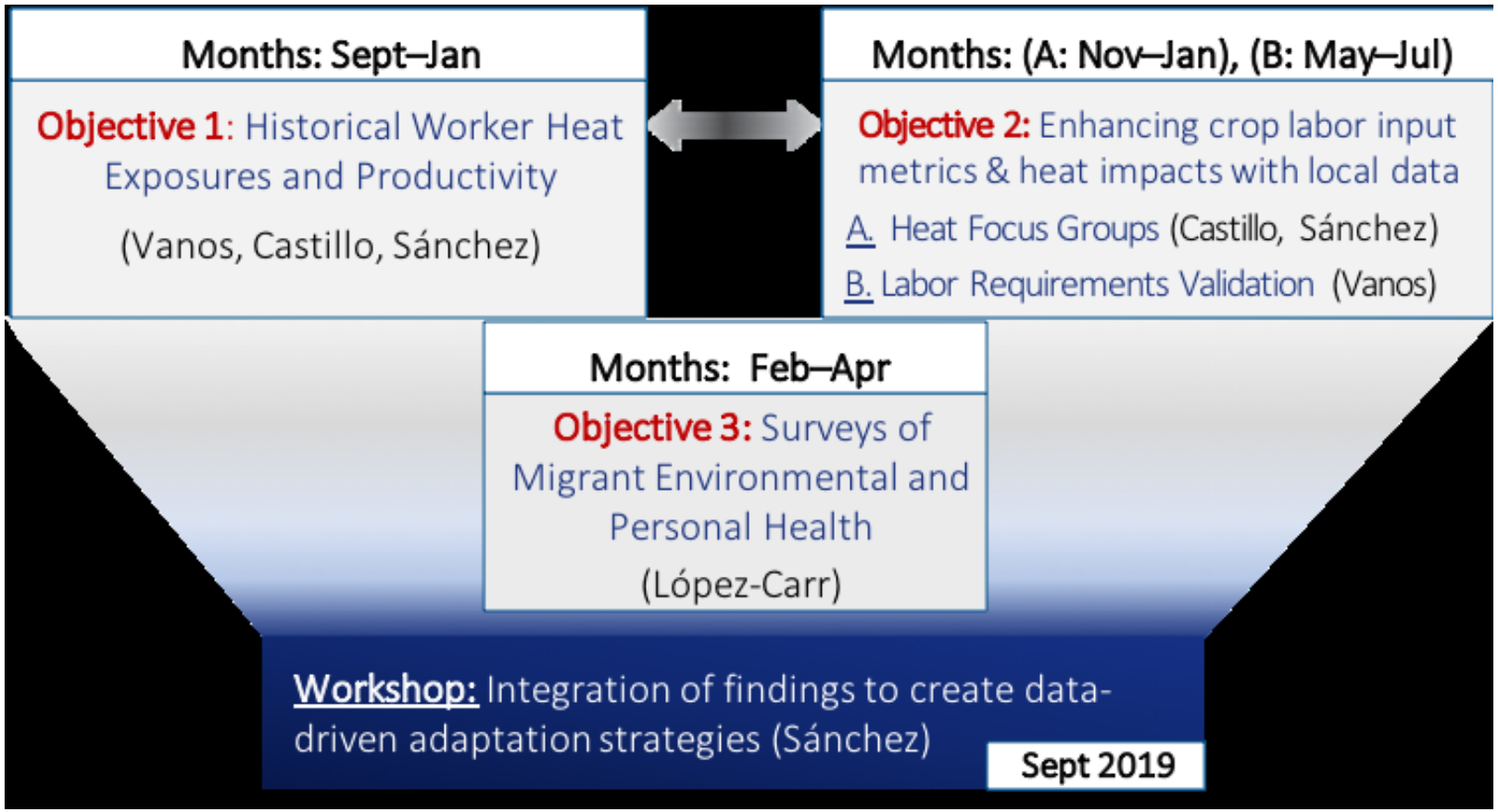


- ***2012 estimates: $42.6 billion in total commodities and $8.5 billion in gross profits***
- ***California accounts for 16% of US crop production & employs 450,000 people (US Dept. of Ag, 2014)***

Fresno County:
Pop'n Growth by 2060:[a] +525,000 (+56%)
Focus Crops:[b] grapes, melons, lettuce, sugar beets
Ag Prod'n:[c] $2.8 billion[c] (crops)
Total Ag. Labor Force:[d]
20,001–62,300

Imperial County:
Pop'n Growth by 2060:[a] +115,000 (+65%)
Focus Crops:[b] lettuce, melons, sugar beets
Ag Prod'n: $837 million[c] (crops)
Total Ag. Labor Force:[d] 20,001–62,300


Relationship between calculated WBGT and hourly productivity
y = -5.4161x + 232.24
R² = 0.9711
y = -5.1441x + 218.02
R² = 0.9632
Productivity, bundles/hour
Calculated WBGT, degr. C
100
90
80
70
60
50
40
25
26
27
28
29
30
31
32
Prod1
Prod5
Linear (Prod1)
Linear (Prod5)


Months: Sept–Jan
Objective 1: Historical Worker Heat Exposures and Productivity
(Vanos, Castillo, Sánchez)
Months: (A: Nov–Jan), (B: May–Jul)
Objective 2: Enhancing crop labor input metrics & heat impacts with local data
A. Heat Focus Groups (Castillo, Sánchez)
B. Labor Requirements Validation (Vanos)
Months: Feb–Apr
Objective 3: Surveys of Migrant Environmental and Personal Health
(López-Carr)
Workshop: Integration of findings to create data-driven adaptation strategies (Sánchez)
Sept 2019

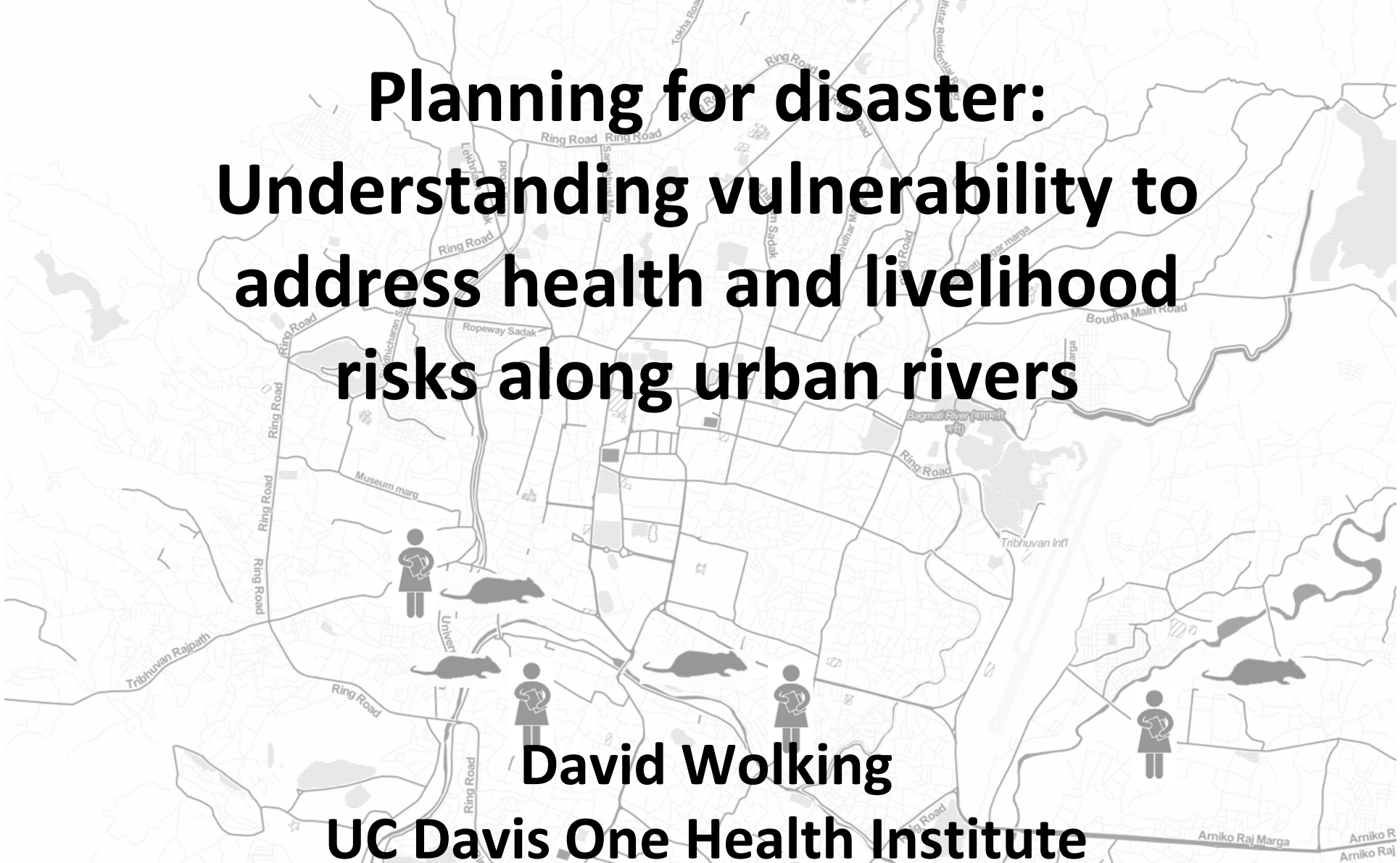
Final thoughts

- Community participation provides opportunities for communities to deal with the negative impact of climate change both in public and private lands in the agricultural sector in low income countries.

- The negative impacts of heat exposure should be analyzed for all stakeholders in the product supply chain: ag. workers, growers, society in general.

David Wolking, Urban River Interface Disease

Planning for disaster: Understanding vulnerability to address health and livelihood risks along urban rivers



David Wolking
UC Davis One Health Institute

Co-authors: Dibesh Karmacharya, Manisha Bista, Sulochana Manandhar, Bishwo Shrestha, Ajay Sharma, Shailendra Bajracharya, Tarka Bhatta, Santosh Dulal, Rajesh Rajbhandari, Pranav Pandit, Rima D Shrestha, Jonna Mazet, Tracey Goldstein, and Christine Johnson


Photo: Wasif Malik, Flickr

PREDICT/UC Davis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Orange Country Register


CBS Sacramento


Napa Valley Register

Contact: djwolking@ucdavis.edu

www.onehealth.institute www.predict.global

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WCS

EcoHealth Alliance

METABIOTA™

Smithsonian Institution

CENTER FOR MOLECULAR DYNAMICS - NEPAL

Berkeley School of Public Health

Alisha Graves, Empowering Women Smallholder Farmers in the Sahel

L'Initiative OASIS
ORGANISER L'AVANCEMENT DES SOLUTIONS AU SAHEL
ORGANIZING TO ADVANCE SOLUTIONS IN THE SAHEL

Empowering Women Smallholder Farmers in the Sahel

UC Davis, Sept. 10, 2018

Alisha Ann Graves, MPH, Founder, OASIS Initiative

A project of Venture Strategies for Health and Development & University of California, Berkeley

Gender gap in agriculture

While women comprise 43% of the agricultural labor force globally, they face...

A larger burden of unpaid work

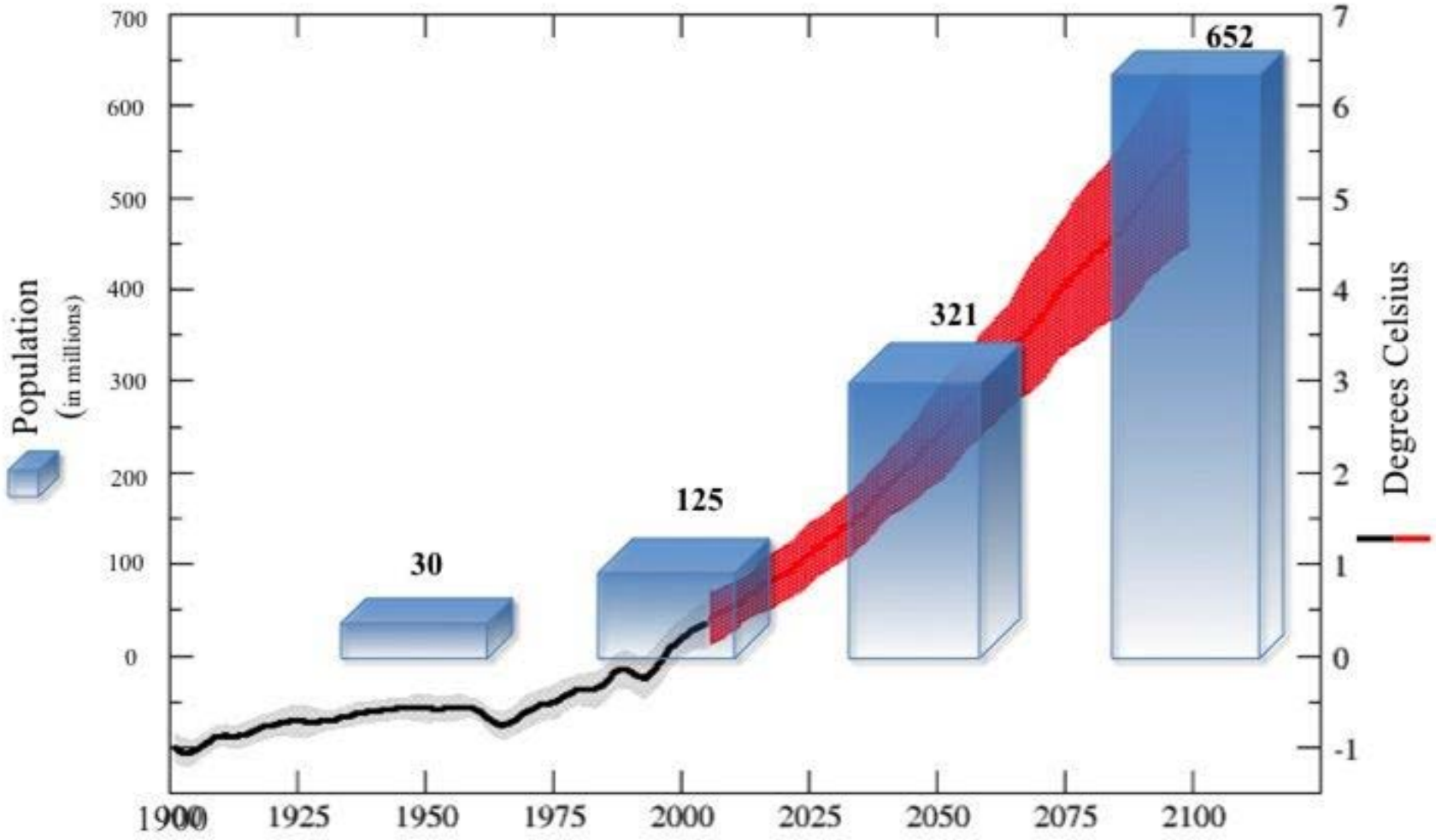
Lack of access to higher-paying jobs

Wage discrimination for the same work

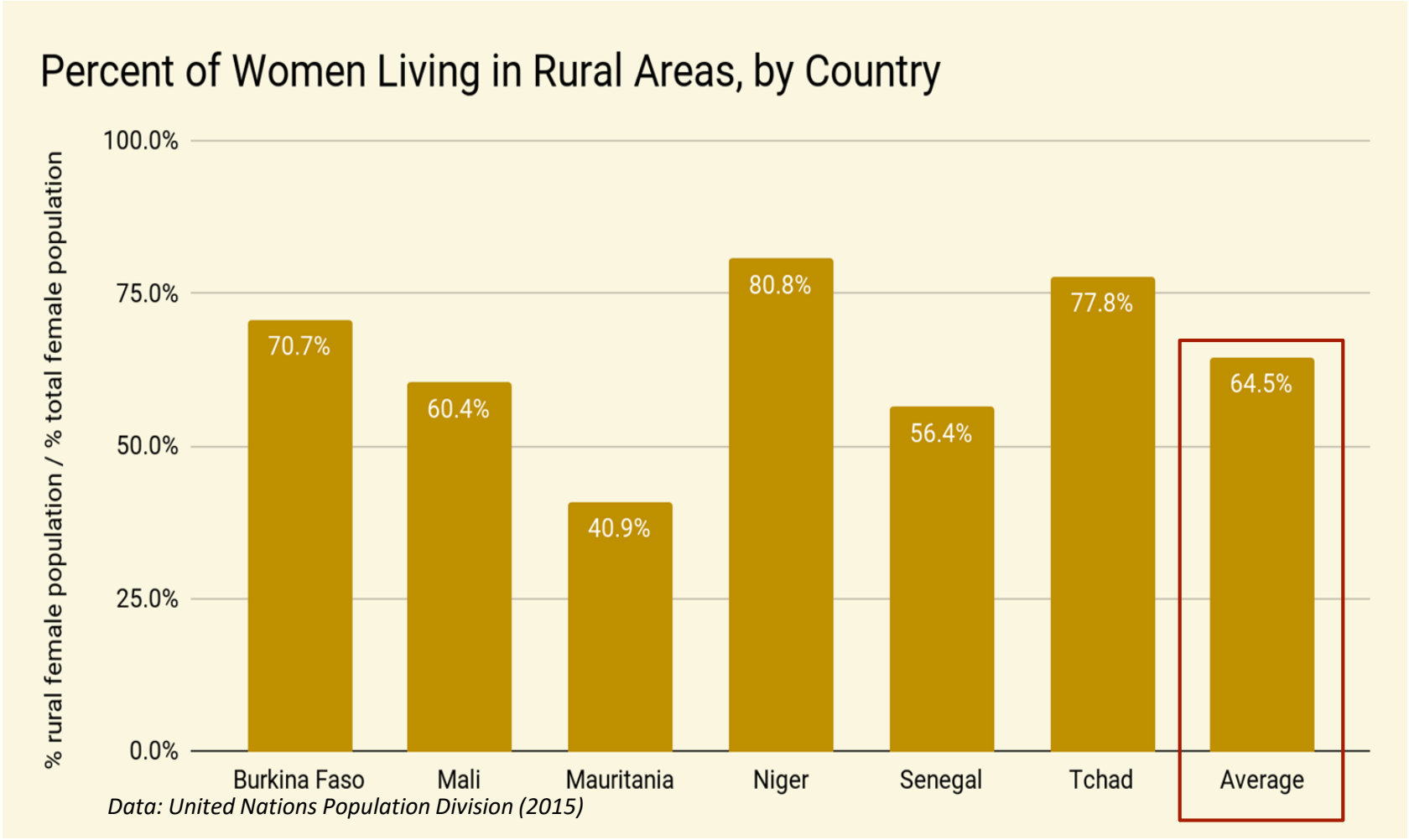
Source: "The Role of Women in Agriculture," Food and Agriculture Organization of the United Nations (2011)

Sahel is Arabic for *shore*

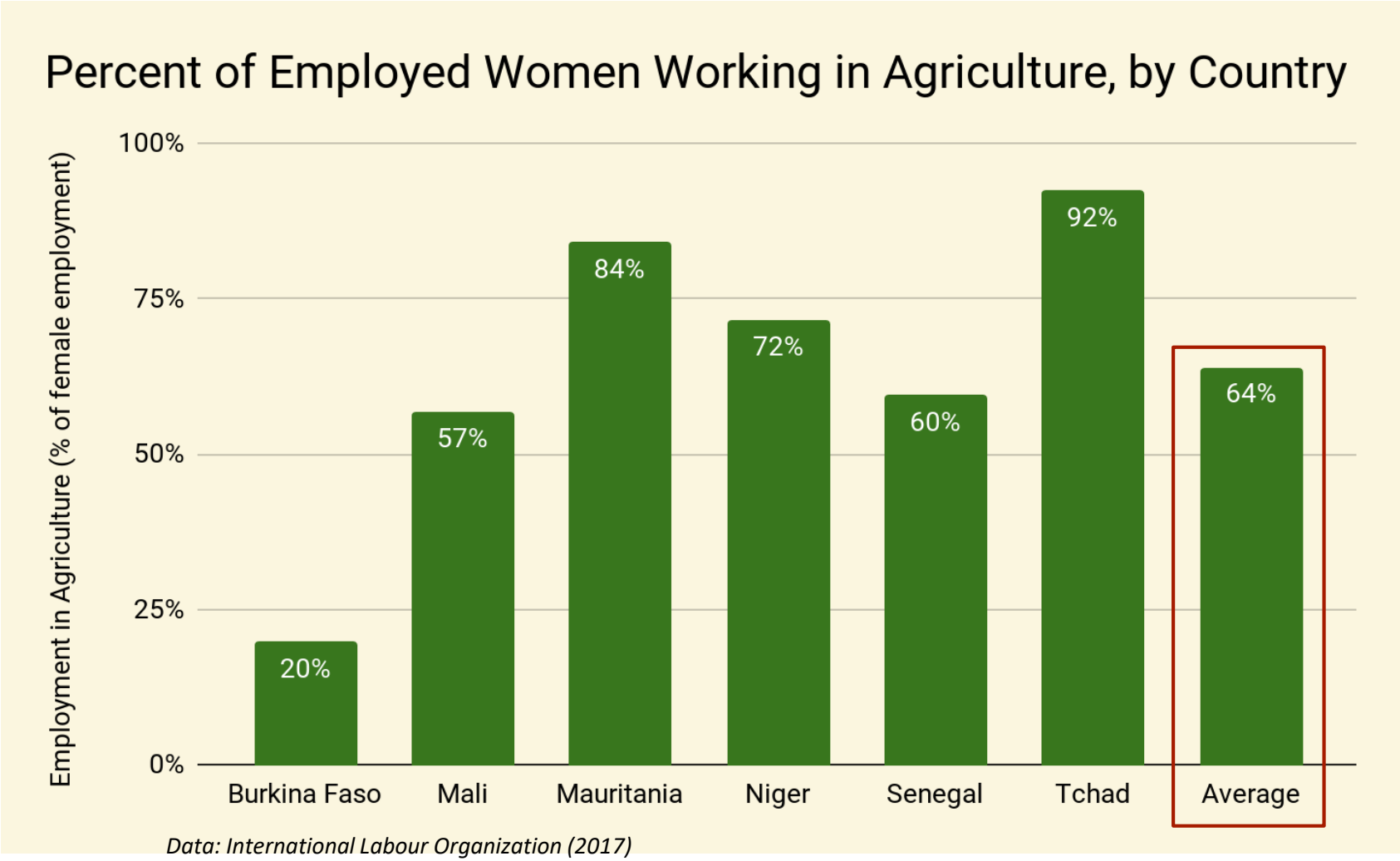
Projection for Changes in Temperature and Population in the Sahel



Sources: United Nations Population Division (medium projection), Intergovernmental Panel on Climate Change (IPCC) RCP 8.5



The majority of women in the Sahel live in rural areas, which are typically lower income than urban counterparts



While the percentage varies widely, on average the majority of employed women in the Sahel work in agriculture

Voluntary family planning improves nutrition and food security through:

Slowed population growth

Female economic empowerment

Reduced maternal risk factors for childhood malnutrition

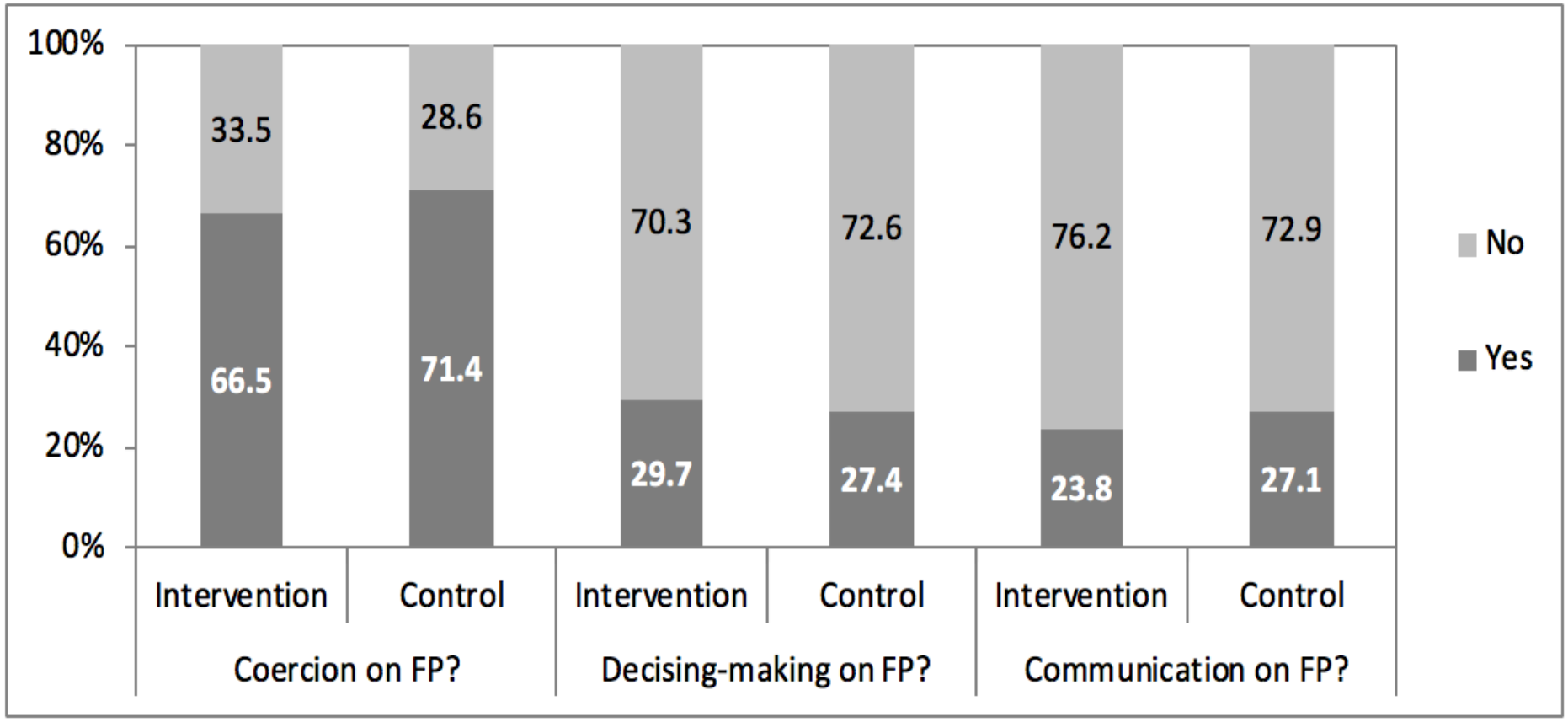
Room to Grow

Background: In Niger, gardens are emerging as a vibrant and vital place for women to meet, grow nutritious food, and generate income.

Purpose: test a proof of concept for an integrated approach to women's empowerment, FP and nutrition

Evaluation: difference-in-differences estimation to compare intervention and control gardens.

Reproductive Autonomy
Preliminary findings from "Room to Grow" Niger



Shifting roles in agriculture
Preliminary findings, cont.

women are increasingly being asked to help feed and maintain the household - traditionally man's role

→"slippage" of responsibilities from men towards women as food providers, without any recognition of women's new role, straining both men and women

→ could be an opportunity to promote women's empowerment via vegetable production, managed by individuals or by women's collectives in market gardens.

L'Initiative OASIS
ORGANISER L'AVANCEMENT DES SOLUTIONS AU SAHEL
ORGANIZING TO ADVANCE SOLUTIONS IN THE SAHEL

A Sahel where all girls are educated and free from early marriage, where all women are free to choose the timing and number of their children, and where everyone has enough to eat

Learn more

oasisinitiative.berkeley.edu

oasis@berkeley.edu

Lightning Talks: Success Stories at the Food-Health Nexus

If you have additional questions or comments please connect with the panel at the conclusion of the Symposium

Moderator: Terra Kelly, One Health Institute & UCGHI Planetary Health Center, School of Veterinary Medicine, UC Davis

- Courtney Crenshaw, Healing People, Places, and the Planet
- Federico Castillo, Analyzing health, land use, and agriculture through a multidisciplinary lens
- David Wolking, Urban river interface disease
- Alisha Graves, Empowering Women Smallholder Farmers in the Sahel

Key Ideas and Outcomes from Afternoon Sessions and Wrap Up

- Facilitator, Sarah Rubin, Outreach and Engagement Coordinator, California Department of Conservation

Instant Polling Questions for Participants

- **Meeting Sift – informal, real time polling**

Please Participate

1. open smartphone browser
2. go to **sift.ly**
3. enter participant code **change**

GLOBAL CLIMATE ACTION SUMMIT
AFFILIATE EVENT

Managing Lands in a Changing Climate to Improve Agricultural Resilience, Food Security, and Health

THANK YOU FOR ATTENDING

Reception immediately follows (for those who pre-registered)

Posters available for all to view and ask questions

State of California
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