



United States Department of Agriculture
Research, Education, and Economics

Considerations for the Future of Animal Science

Dr. Catherine Woteki

United States Department of Agriculture
Chief Scientist
Under Secretary for Research, Education, and Economics

National Academies of Science
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Presentation Agenda

- 1 Livestock in Food Security – 2050
- 2 Benefits of Public Agriculture Research
- 3 Critical Research Needs – 2050
- 4 Opportunities
- 5 Summary



U.S. Agricultural Social-Ecological System



Political and Economic Conditions

Social-Ecological System

Ecological Processes

- Productivity
- Consumption
- Energy flow
- Nutrient cycling
- Disturbances & Resilience
- Species interactions
- Pollination & seed dispersal
- Animal movement
- Deposition & erosion
- Evolution
- Climate change

Ecological Components

- Individuals
- Populations
- Communities
- Soil
- Water
- Atmosphere
- Ecosystems
- Landscapes
- Watersheds

Integration

- Land/water/resource use
- Inputs, investments
- Resource depletion
- Planning
- Regulation
- Production
- Consumption
- Contamination
- Recycling, disposal
- Socio-ecological understanding
- Management practices
- Experimentation
- Adaptation
- Mitigation

Human Components

- Individuals
- Households
- Communities
- Institutions
- Enterprises
- Corporations
- Villages
- Cities
- Governments
- Non-gov't orgs
- Supranational bodies

Social Processes

- Demography
- Livelihood activities
- Materials & Energy Use
- Health-seeking well-being
- Communicating educating
- Science technology innovation
- Designing engineering building
- Economic development trade
- Socio-political organization
- Policies laws contracts
- Culture beliefs values
- Visioning missions
- Crises governance
- Power struggles

Large Scale Biogeochemical Conditions

Source: Climate Change and Agriculture in the United States: Effects and Adaptation, USDA, 2013



Food Animal Production **Sustainable Food Security - 2050**

- Livestock in Food Security – FAO 2011
 - Estimated population in 2050 – 9.15 billion
 - Meat consumed:
 - All meat 2010 – 268.7 million tonnes
 - All meat 2050 – 463.8 million tonnes
 - All dairy 2010 – 657.3 million tonnes
 - All dairy 2050 – 1038.4 million tonnes
- Critical role for meat and dairy in society
 - High quality nutrient dense protein source
 - Significant nutritional value – protein, calcium, B vitamins, etc
 - Vital role for milk worldwide - neonatal nutrition
 - Efficient conversion of forages to human food
- Critical role in sustainable integrated agriculture systems
 - Soil health and fertility
 - Carbon sequestration and green house gas mitigation
 - Enhanced forage production and utility



Food Animal Production **Public Agricultural Research**

- Creates extraordinary benefit to society
- Investment in animal sciences lagging
 - While sales of livestock and feed crops are higher than those for plants and fiber crops, public investment is higher for plant sciences than for animal sciences.
- Sustained long term investment required to fuel any ag productivity – including that for animals and their products

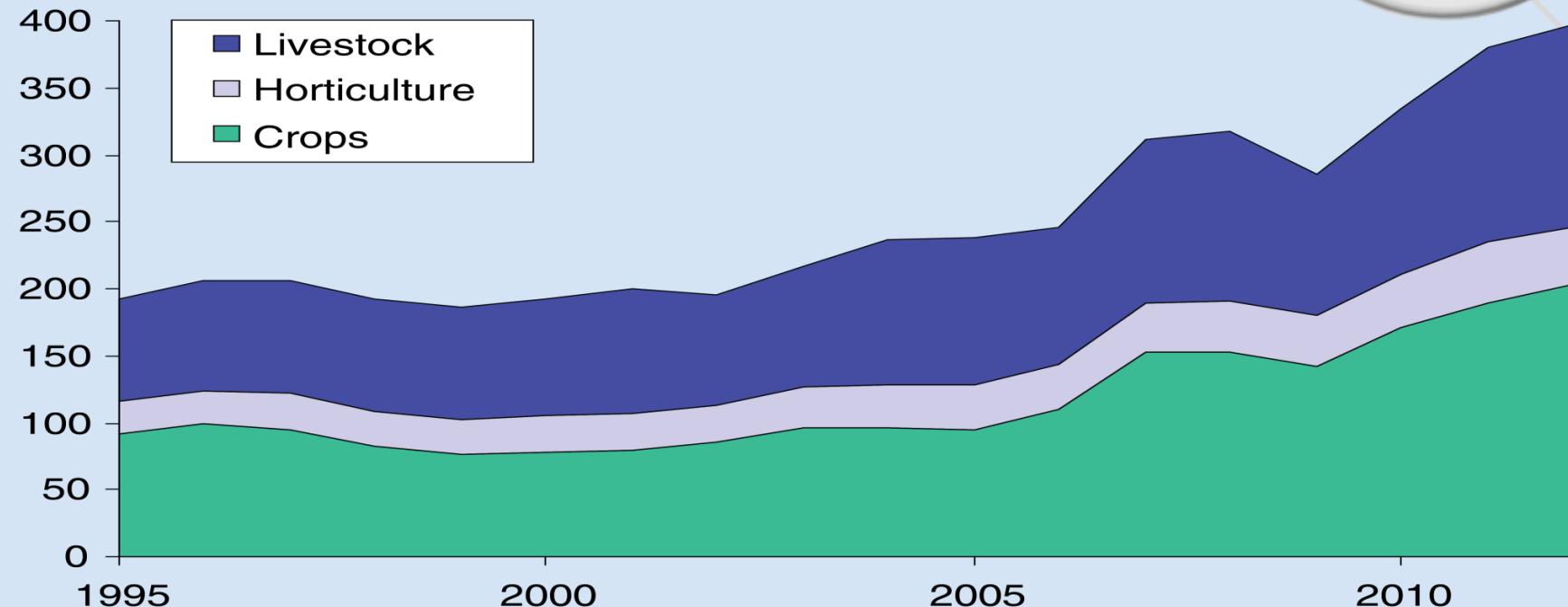


U.S. Food System



Value of U.S. agricultural production, 1995-2012

\$ billion



Farm value of U.S. agricultural production was \$397 billion in 2012.

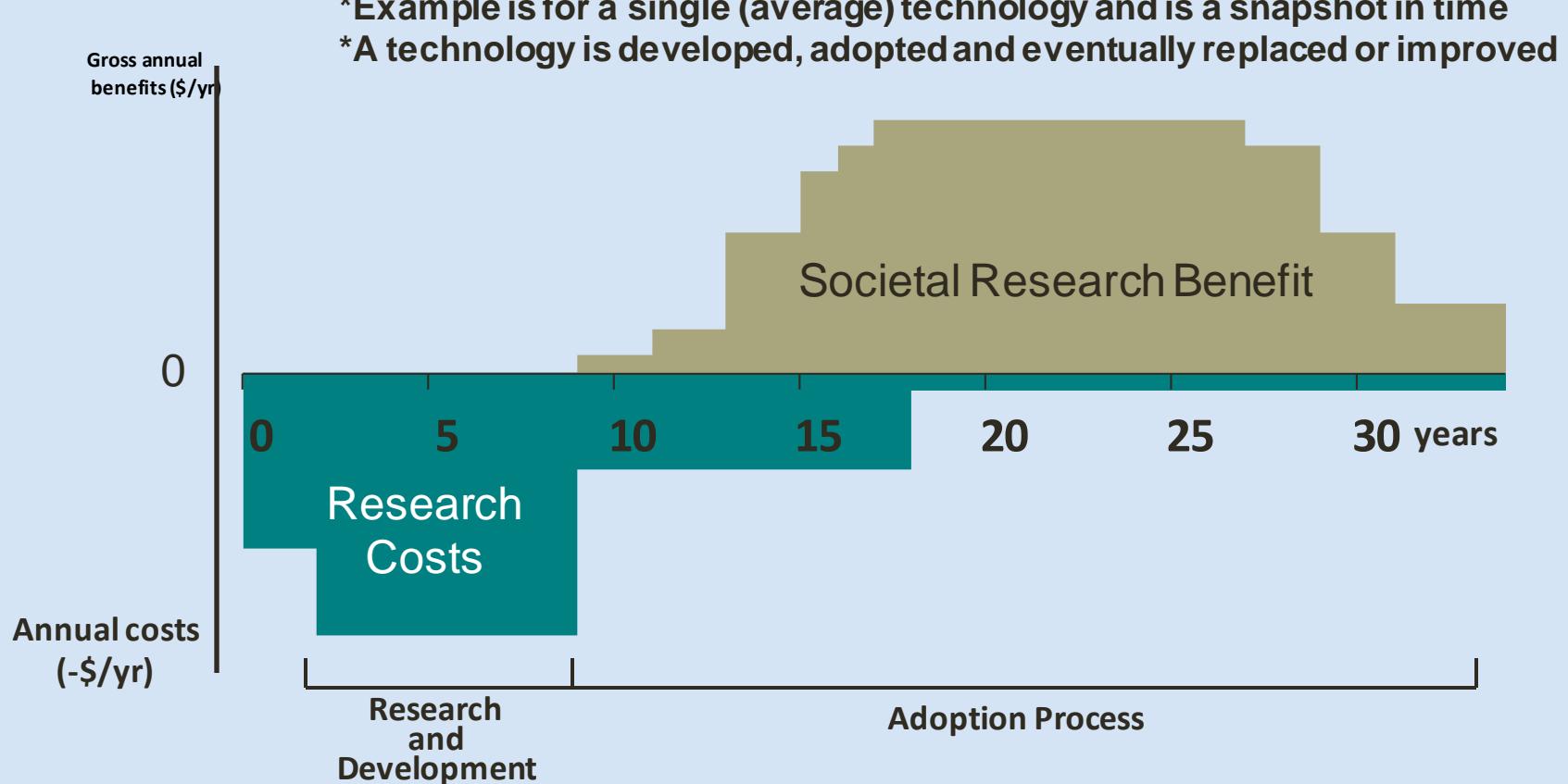
Source: USDA, Economic Research Service calculations using data from ERS and USDA, National Agricultural Statistics Service, Quick Stats Database and various reports.



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Research Costs & Benefits Over Time



Adapted from: Alston, Norton and Pardey, 1995 USDA - ERS



Global Considerations/Challenges

- Population growth and food security
 - Increasing demand for protein as developing countries transition
- Importance of animal agriculture and related industries to the US economy
- Urgent need to address emerging issues and unprecedented challenges – One Health perspective
- Inadequate infrastructure and decreasing pool of expertise
- Low current investment in research, education and extension is at historic low.



Food Animal Production Critical Research Needs - 2050

- Integrated production systems
 - Animal production – tenets of sustainability
 - Improved and optimized animal production systems
 - Integrated crop – forage – animal systems
 - Improved pasture and forage yield, quality, environmental efficiency and resiliency
- Animal health and well-being
 - Prevention versus treatment
 - Role of health in sustainable production systems
 - Relationship between health, longevity, well-being and productivity
 - Numerous critical issue both domestically and internationally
 - One Health
 - Zoonotic diseases, emerging diseases, catastrophic effects
 - AMR – antimicrobial resistance



Opportunities Abound

- Relative value and impact of public research sector is growing
 - Excellent at basic and translational research
 - Provide answers and solutions
 - Dramatic improvements in production and efficiency
 - Building powerful connections – NSF, NIH, Industry, International, NGOs, others
- Continually hitting home runs!
 - H1N1, food safety, nutrition, and more ...
 - Genomic breeding values in Holsteins, genomes of cow, chickens...
 - Exploring the animal biome
- Will require continued long term and increased investment
 - Must expand the research base including new talent
 - Must expand the research infrastructure - resources
 - Must prioritize animal science research and development



There are many challenges

- Agriculture Act of 2014 and President's budget for 2015 provide additional resources and new ways of working
- We look forward to your examination of these issues
- It is time for this work to go forward
- **THANK YOU**