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and Agriculture

BIOENERGY, CLIMATE,
AND ENVIRONMENTFOOD PRODUCTION
AND SUSTAINABILITY

YOUTH, FAMILY,
AND COMMUNITY

FOOD SAFETY
AND NUTRITION

INTERNATIONAL PROGRAMS



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Potential Research Interests and Future Needs in Space - USDA/NIFA Perspectives

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Committee on Biological and Physical Sciences in Space

Washington, DC, USA

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Disclaimer: The views expressed in this presentation are those of the presenter and not necessarily those of the US Government or the presenter's agency.



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Outline

- ***Grand Societal Challenges Facing Agriculture and Food Systems***
- ***Potential Research Interests and Future Needs in Space from USDA/NIFA perspectives***



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<http://rsd.gsfc.nasa.gov/goes/pub/goes/050828.katrina.gif>



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“An Existential Threat”



CLIMATE CHANGE



**LAND & WATER
CONSTRAINTS**



**INCREASING
URBANIZATION**



**ENVIRONMENTAL
DEGRADATION**



**CHANGING
INCOME & DIETS**



**CONFLICT &
MIGRATION**



**TRADE &
GLOBALIZATION**



**POSITIVE HEALTH
OUTCOMES**





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<http://www.usda.gov/wps/portal/usda/usdahome?navid=USDA150>



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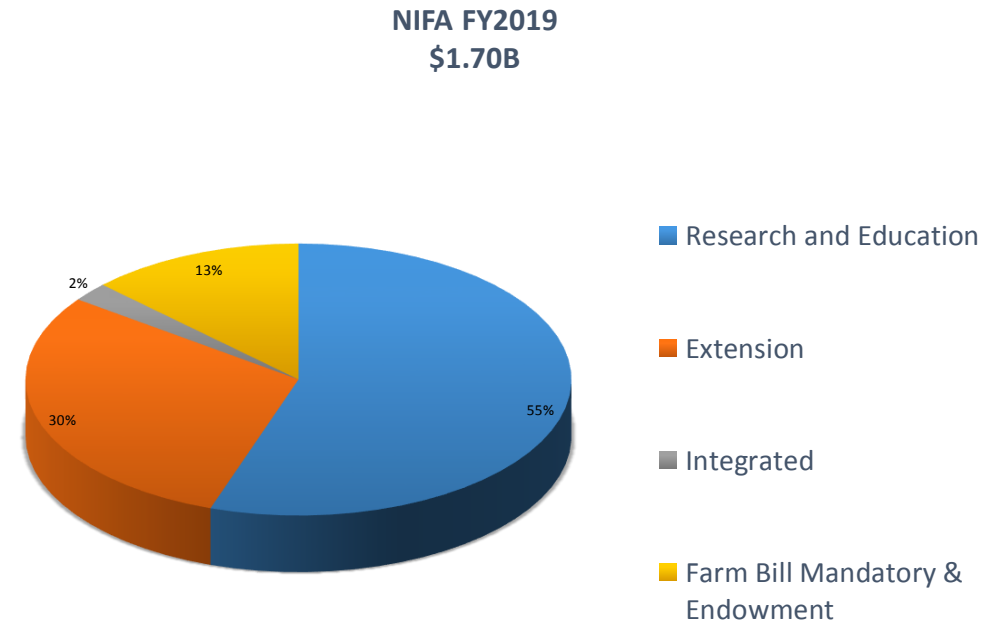
National Institute of Food and Agriculture (NIFA)

User Inspired Science Transforming Lives

MISSION: *Invest in and advance agricultural research, education, and extension to solve societal challenges*

VISION: *Catalyze transformative discoveries, education, and engagement to address agricultural challenges.*

- **STRATEGIC PLAN, FY2014 - FY2018**



**“We do not want science floating in the skies. We want to
bring it down and hitch it to our plows.”**

*(Anonymous Wisconsin farmer, from “One Hundred Years of Agricultural Research
at Cornell University”, 1987).*

**CSREES-National Stakeholder Strategic Planning Workshop
November 18-19, 2002
USDA, Waterfront Center
Washington, DC**

**Dr. Norman R Scott
Biological & Environmental Engineering
Cornell University
&
Dr. Hongda Chen
USDA/CSREES**

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Summary of Proceedings:

**FAST-TRACK ACTION COMMITTEE ON
THE UTILIZATION OF THE
INTERNATIONAL SPACE STATION (ISS)
AS A NATIONAL LABORATORY**

AUGUST 2013

PRODUCT OF THE
Committee on Science
OF THE NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

Food and Nutrition Sciences

- Sensory/Acceptability/Preference of Foods – Physiology and psychology – Novel foods and emerging processing technologies
- Extended Food Shelf Life (thermal sterilization, freezing, etc.)
- Functional Foods and Nutritional Countermeasures
- Food Safety – Detection and Intervention with minimal resources, Sanitizing food waste and water
- Fundamental Food Engineering Transport Phenomena
- Novel Food Technologies – 3D printing of food, packaging, etc.

Plant Production and Products

- Plant growth (V&F) to produce acceptable and nutritious foods
- Microbial load on crops. If too high, identify cleaning methods that don't interfere with ISS air and water environment.
- Controlled and simulated radiation exposure of seeds and other foods
- Soil chemistry, structure, microbiology, and interaction with root zone
- Biobased products, fuels, and biotechnology



Animal Production and Products

- Reproduction, animal health and diseases,
- Waste management and utilization under sustainability consideration,
- New mechanisms of producing animal proteins, and organismal physiomics under microgravity



Data Science and Precision Agriculture

- Precision, geospatial and remote sensor technologies for monitoring the food and agricultural production and decision making (the effects of environmental stresses, crop growth, invasive species, soil, water, dynamic distribution of natural and geo-resources)
- Robotics and Advanced Manufacturing

Education

- Example of prior collaboration with NASA: Ag in the Classroom / Ag in Space
- Education and research experience from secondary through graduate educations – STEA(griculture)M
- *Seed germination, plant biology, response to environmental/biotic/abiotic stresses, impact of environmental and climate change on physiology, biotechnology, agronomy, post-harvest physiology, gene expression, microbes/pathogens/pests, sensing and response mechanisms of plant roots, agrochemical use efficiency, carbon sequestration in controlled environments, entomology, etc.*



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Thank you!

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