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

Hongda Chen, Ph.D.

National Program Leader, Bioprocess Engineering and Nanotechnology  
USDA National Institute of Food and Agriculture (NIFA)

National Academies of Sciences, Engineering and Medicine  
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.*

# Outline

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



[http://rsd.gsfc.nasa.gov/goes/pub/goes/050828\\_katrina.gif](http://rsd.gsfc.nasa.gov/goes/pub/goes/050828_katrina.gif)

# *“An Existential Threat”*





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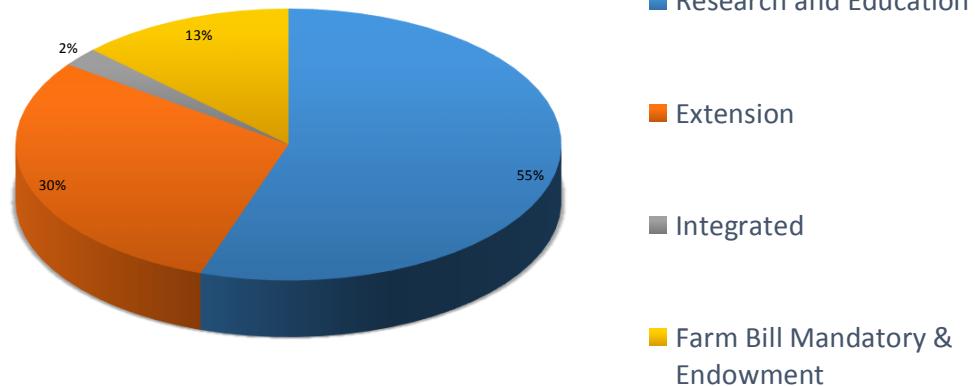
# *National Institute of Food and Agriculture (NIFA)*

## *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.*

NIFA FY2019  
\$1.70B



- **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**

**[www.nseafs.cornell.edu](http://www.nseafs.cornell.edu)**



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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!*

Hongda Chen

[hchen@nifa.usda.gov](mailto:hchen@nifa.usda.gov)

**202-401-6497**