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Mutually beneficial agricultural development alliances:

Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss

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Global Food Systems seminar
November 10, 2016

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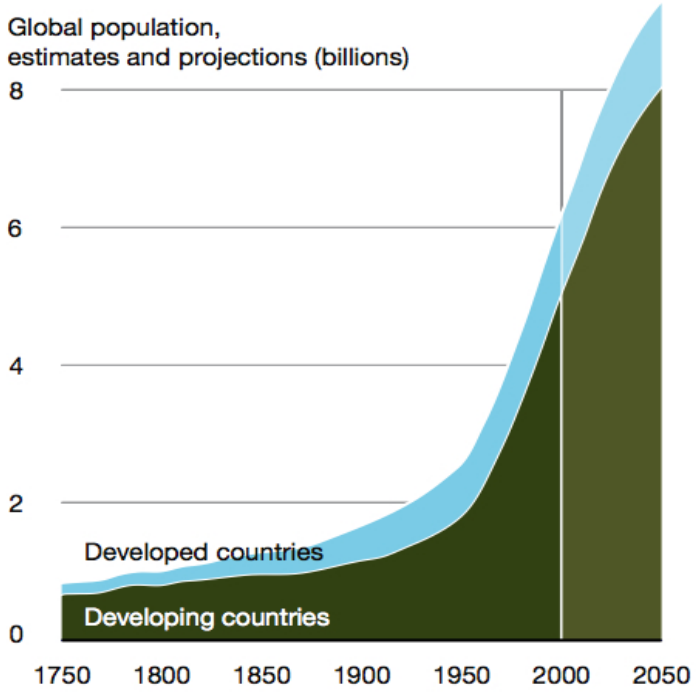
Photo: CIAT


Photo: VOA

The Perfect Storm



(UN, Population Division, 2007)

8.3 billion people by 2030

- 50% more food
- Less agricultural land
- Urbanization
- Climate Change

Agricultural development: *Africa*

80% of population is rural - smallholder farming.

Devastating production and postharvest constraints.

Africa has 60% of the world's uncultivated arable land

Africa has over ¼ of the world's arable land

Postharvest losses

- Losses in quantity and quality, including economic losses.
- Estimated ~1/3 loss in developing countries
- Scant evidence base – weak methodologies
- Many interventions available, off the shelf or used elsewhere
- Limited focus on gender – key for development
- Limited success and impact to date
- Tremendous promise to address food security

Moving potential interventions into use

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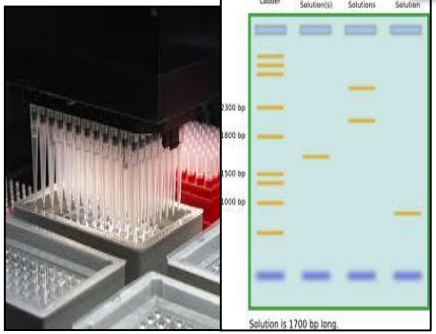
Biosciences



?

Farmers

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Securing the harvest *together*

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NARS priorities and strengths

KSU/USA expertise

Advanced research platforms (in country/region)

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Feed the Future

- U.S. government's global hunger and food security initiative led by USAID
- Targets 19 low-income countries in Latin America, sub-Saharan Africa and Asia
- Innovation Labs link knowledge and science at U.S. universities, the USDA and other public and private organizations with counterparts in the target nations
- Global Food Security Act

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USAID
FROM THE AMERICAN PEOPLE

www.feedthefuture.gov

Global Food Security Act: White House Summit on Global Development

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Building capacity abroad

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Fostering research and development leaders in developing countries

- >3500 students completed degrees through CRSP/Innovation Lab program as a whole
- Expanded capacity in:
    - Government
    - Regulatory
    - Academic/research
    - Development/extension
    - Private sector
- Can translate into preferred collaborations, trade, continued exchange of researchers, ideas and tools to improve agriculture here and abroad

Kansas AG SUMMIT
GROW SMARTER. GROW STRONGER. GROW KANSAS.

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Feed the Future Innovation Labs

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At Kansas State University

USAID FROM THE AMERICAN PEOPLE

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Applied Wheat Genomics

Post-Harvest Loss Reduction

Collaborative Research on Sorghum and Millet

Collaborative Research on Sustainable Intensification

Total maximum Innovation Lab funding over five years = $102.2 million

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Reduction of Post-Harvest Loss Innovation Lab

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Focus countries:

Bangladesh, Ethiopia, Ghana, Guatemala

Funding:

- "Leader with Associates" Cooperative Agreement
- January 2014 – December 2018
- Amount: $8.5 million leader
  - *Potential associate awards of $15 million*
    - *$1.2 million to date*
    - *$1.45 million in the pipeline*

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Connecting our work to impact abroad

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Basic plant science | Application (products) | Farmer use

Kansas State University; other partners

African National Agricultural Research Systems

Innovation Labs

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Technical focus areas:

- drying
- storage

Losses: *physical (threshing), insect pests, mycotoxins*

Cross-cutting:

- capacity building (human and institutional)
- nutrition
- gender

Post-Harvest Loss Innovation Lab

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Nepal
Maize, peanuts, feed (livestock, poultry)

Afghanistan
Tree nuts, raisins, wheat

Bangladesh
Rice

Honduras
Maize

Guatemala
Maize

Ethiopia
Chickpea, maize, sesame, wheat

Ghana
Maize

Program Timeline

Human & institutional capacity building

Partnerships

Communications

Year 1: Partnership logistics, baseline surveys (practices, PHL losses, socioeconomic factors)

Feed the Future Indicators

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1) Short-term trainings → **3,895 participants** in training and workshops in FY2016

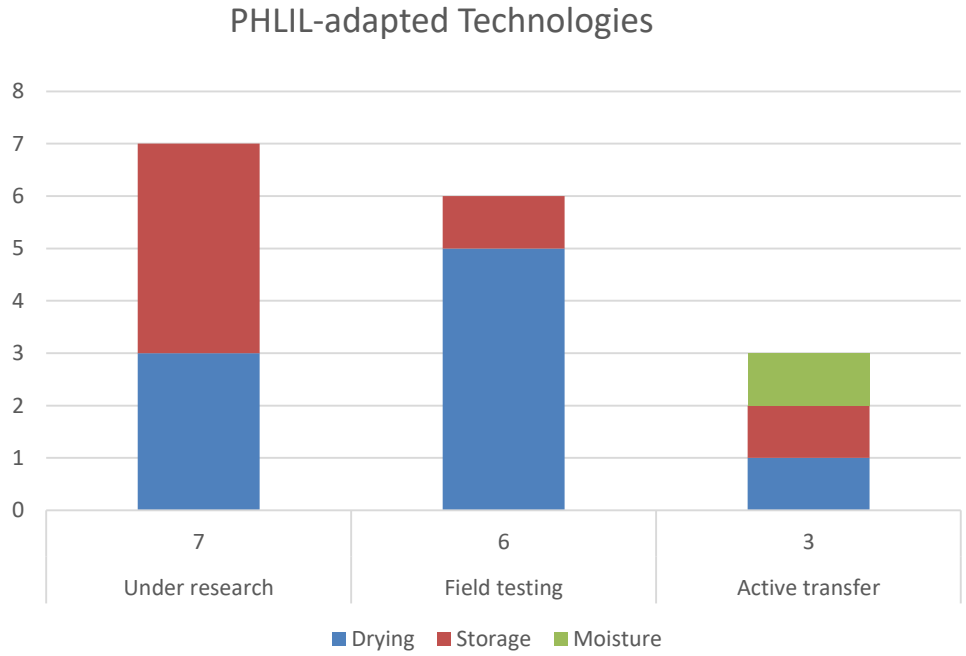
2) Long-term, degree-granting training → **18 graduate students** in focus countries and U.S. universities

3) Public-Private Partnerships → **7 public-private partnerships** formed with local and international businesses

4) Technology transfer (new technologies and new management practices) → **16+ technologies and management practices** designed, adapted and/or tested by PHLIL

PHLIL-adapted Technologies

- Drying
  - Solar Biomass Hybrid Dryer (Ghana)
  - STR Dryer (Bangladesh)
  - Solar Bubble Dryer
  - Cabinet Dryer (Ethiopia)
  - Modified biomass furnace dryers (Guatemala)
- Storage
  - Hermetic Bags – PICS, GrainPro, ZeroFly
  - Traditional bags
  - Metal and Plastic storage bins
- Moisture
  - EMC moisture meter



Integrating technology packages

Success 1: novel/adapted drying technologies

Success 2: adapted storage technologies

Success 3: low cost moisture meter

Integrating approaches: Ethiopia

GrainPro Solar Bubble Dryer

Improved and traditional storage technologies

Integrating approaches: Guatemala

Drying and storage practices
John Deere Moisture meter/EMC moisture meter

Solar and
furnace dryers

Integrating approaches: Bangladesh

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STR Dryer

USDA-ARS
PHL Moisture Meter

Improved (vs. traditional) storage

Integrating approaches: Ghana

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USDA-ARS
PHL Moisture Meter

Solar biomass
hybrid dryer

Adapted storage technologies

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Photo: CIAT


Photo: VOA

Aflatoxin: a significant threat to food and nutritional security

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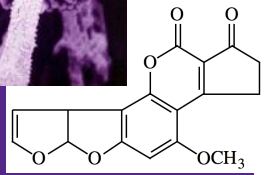
- **Mycotoxins** – toxic fungal metabolites
- **Aflatoxin** – produced by *Aspergillus* fungi
- ~**4.5 billion** people, **25% global** food supply
- Contamination of food and feed
- Humans and livestock are susceptible



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Aflatoxin: a significant threat to food and nutritional security

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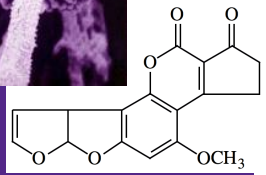
- **Chronic exposure**:
  - Causal: cancer
  - Correlated: stunting children's development, nutrient uptake, immunosuppression
- **Acute exposure**: death (e.g., Kenya outbreaks)



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Aflatoxin: a significant threat to food and nutritional security

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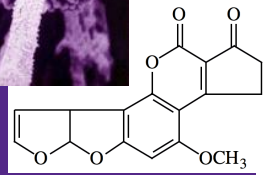
- Negative impact on agriculture, health, trade and environment
- Often undetectable/invisible



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DAILY NATION

Kenya alert over 2.3m bags of bad maize

SHARE BOOKMARK PRINT RATING

Farmers spread their maize to dry in Kibwezi. Researchers say spreading maize on the ground increases its contact with the soil, where the fungus that produces aflatoxins resides. Photo/FILE

By LUCAS BARASA
Posted Monday, May 31 2010 at 18:44

Mycotoxins confirmed across US during harvest

freeimages.com/Elizabeth Thompson | The Monday Mycotoxin Report from Neogen on October 5 highlighted new confirmed reports of mycotoxins in corn across the country.

Broad and expanding agriculture threats

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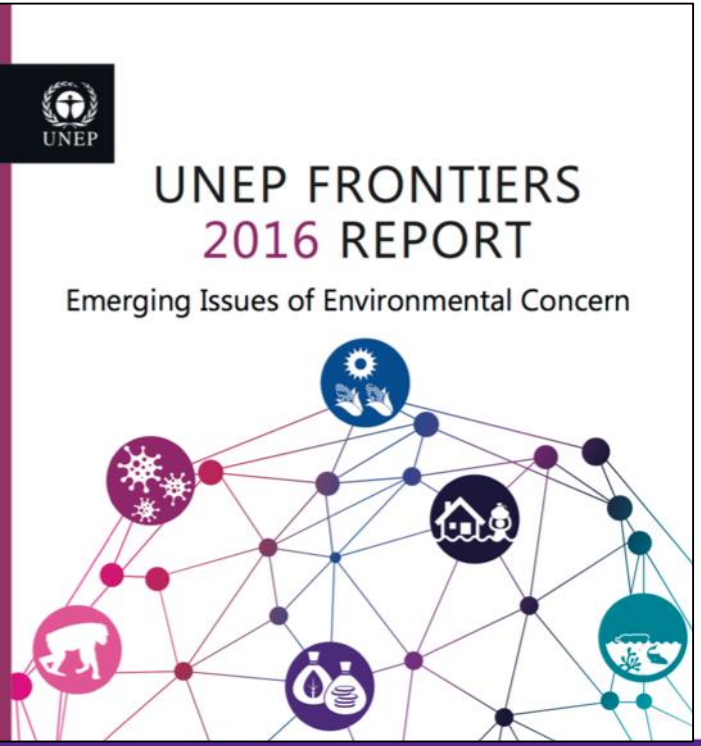

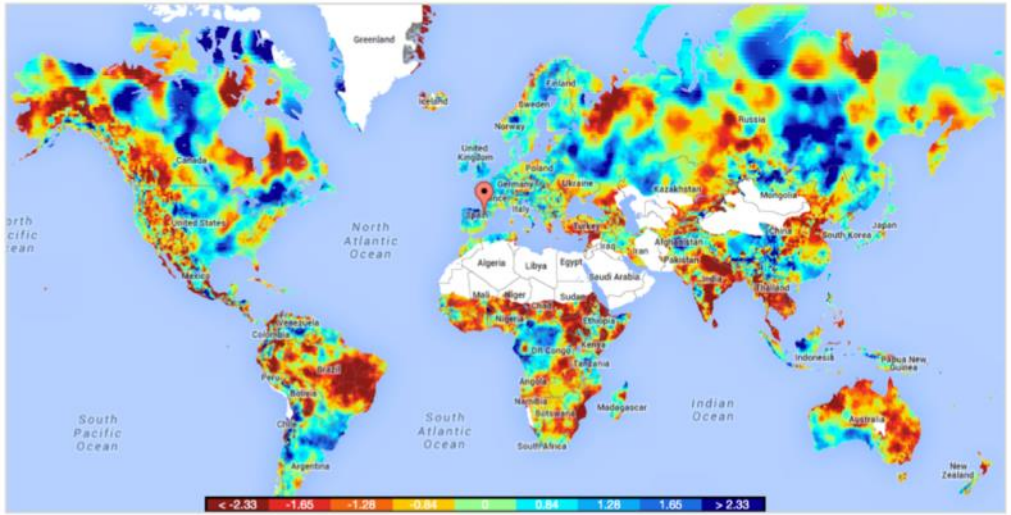

© SPEI Global Drought Monitoring
http://sac.csic.es/spei/map/maps.html

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Broad and expanding agriculture threats

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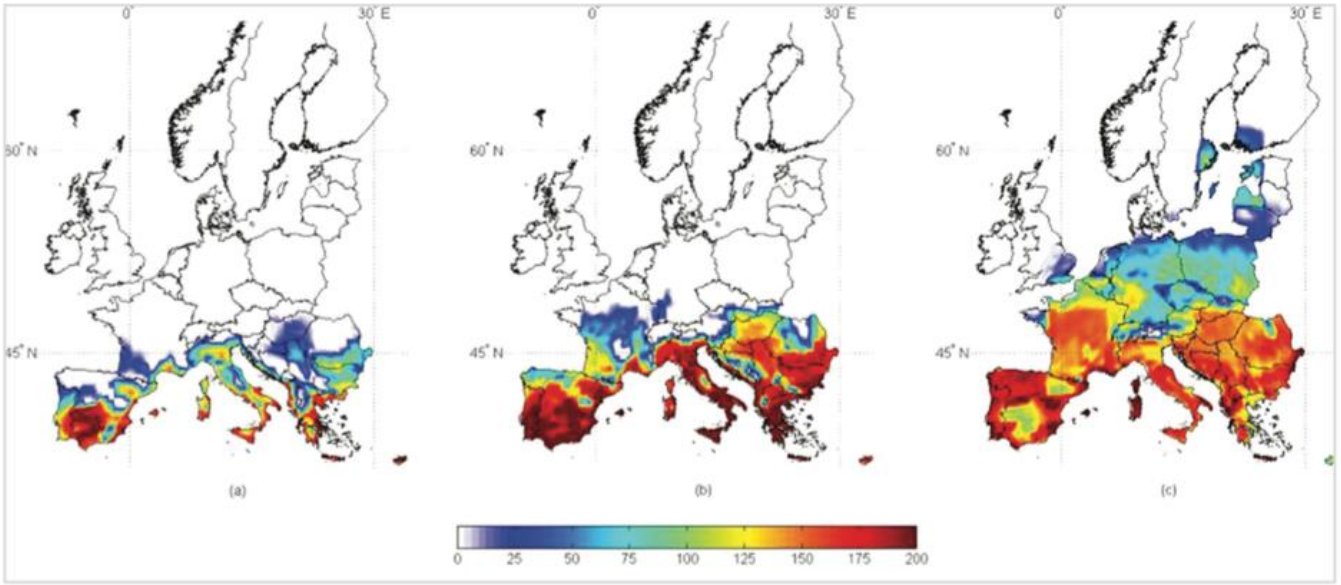
Risk maps for aflatoxin contamination in maize at harvest in 3 different climate scenarios, present, +2 °C, +5 °C



Source: Battilani *et al.* (2016)[21]
Material available under Public License, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4828719/

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The Innovation Labs - impact at home

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Why it matters:

- *Proactively working on a variety of **pests and diseases** before they hit the United States*
- *Gaining access to **germplasm** for future breeding use*
- *Stimulating demand and **opening trade opportunities** for U.S. producers*
- *Developing **technologies, varieties and methodologies** with direct application to domestic farm operations*
- ***Feedback to US private sector** on potential new markets for their technologies*
- *Exchange of the best and brightest **scientists** in the world*
- *Enhanced **national security** through development*

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K-State & College of Agriculture

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Strategically positioned:

- *World-class **leaders** in research and extension*
- *Strong **international exposure** for Kansas and K-State*
- *Equips **Kansas agriculture** to be forward looking and responsive to potential threats (pests, diseases, food safety issues)*
- *Expands pool of potential **faculty and collaborators***
- *Makes us more competitive for **development agency funding***
- *Becoming known by the USAID and US international development community*

K-STATE
Research and Extension

Potential for expanded collaboration

Relevant capacity across KSU (eg, Food Safety)

Interest in pioneering new models for international development – Land Grant system

Expanding our reach beyond current beneficiaries (eg, Global Campus)

Improving technology transfer, for benefit in Kansas, USA and abroad

Program Partners

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Universities
Bahir Dar University (Ethiopia)
Bangladesh Agriculture University (Bangladesh)
Fort Valley State University (USA)
Hawassa University (Ethiopia)
Kansas State University (USA)
Kwame Nkrumah University of Science and Technology (KNUST) (Ghana)
Mekelle University (Ethiopia)
Oklahoma State University (USA)
South Carolina State University (USA)
Universidad del Valle (Guatemala)
University of Kentucky (USA)
University of Nebraska – Lincoln (USA)

Government Agencies
Ministry of Agriculture, Irrigation and Livestock (Afghanistan)
Savanna Agricultural Research Institute/Council for Scientific Research (Ghana)
US Agency for International Development (USAID)
USDA-ARS Center for Grain and Animal Health Research (USA)

International Agencies
Ghana Agriculture Technology Transfer (ATT) (Part of IFDC)
ADVANCE (Ghana)
SPRING (USAID)

- Archer Daniels Midland Company (ADM) (Illinois, USA)
- Agri Commercial Service Ltd. (Ghana)
- GrainPro (Massachusetts, USA)
- Helica Biosystems (California, USA)
- Hiwot Agricultural Mechanization P.L.C. (Ethiopia)
- John Deere (USA)
- Pens Food Bank Enterprise (Ghana)
- Romer Labs (Austria)
- Vestergaard Frandsen (Switzerland)
- Woods End Labs (USA)

- ADM Institute for the Prevention of Postharvest Loss at the University of Illinois (USA)
- Compatible Technologies International (USA)
- Partners in Food Solutions (USA)
- Practical Action (Bangladesh)
- SHARE Guatemala (Guatemala)

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PHLIL Team

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Kansas State University

Dr. Jagger Harvey – Director
Dr. John Leslie – Afghanistan project leader
Dr. Bhadriraju Subramanyam – Ethiopia project PI; Research/ Environmental Issues Coordinator
Dr. Carlos Campabadal – Guatemala project PI; grain drying, storage facilities and equipment
Dr. Sajid Alavi – co-PI Ethiopia; drying
Dr. Nina Lilja – Gender co-Coordinator, strategic input to the program
Dr. Gordon Smith – co-PI; Bangladesh project; technology transfer
Dr. Shannon Washburn – Kansas State University: Engagement Coordinator
Dr. Jason Ellis – Kansas State University: Engagement team
Dr. Jonathan Ulmer – Kansas State University: Engagement team
Dr. Brian Linshield – Kansas State University: Nutrition lead
Dr. Cindy Shuman - OEIE
Dena Bunnel – Program Coordinator; Communications
Catherine Hickman – Business Finance Specialist
Ben Claar - PieStar

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PHLIL Team

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University of Illinois – Urbana Champaign – ADM Institute for Post-Harvest Loss
Dr. Prasanta Kalita – co-PI; PI Bangladesh project
University of Nebraska - Lincoln
Dr. Andreia Bianchini-Huebner–Guatemala project co-leader; mycotoxin contamination prevention
Oklahoma State University
Dr. George Opit – Ghana project PI; stored product insects and pests
USDA-ARS Center for Grain & Animal Health Research
Dr. Paul Armstrong – EMC Moisture Meter lead
Dr. Floyd Dowell – Engineering Research Unit Leader
South Carolina State University
Dr. Rizana Mahroof – Ethiopia project co-leader; stored product pest management
Fort Valley State University
Dr. George Mbata – Ghana project; monitoring of pest populations
University of Kentucky
Dr. Sam McNeill - Ghana project co-leader; grain drying, storage facilities and equipment
Dr. Cheryl O'Brien – San Diego State University: Gender lead

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Thank you

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