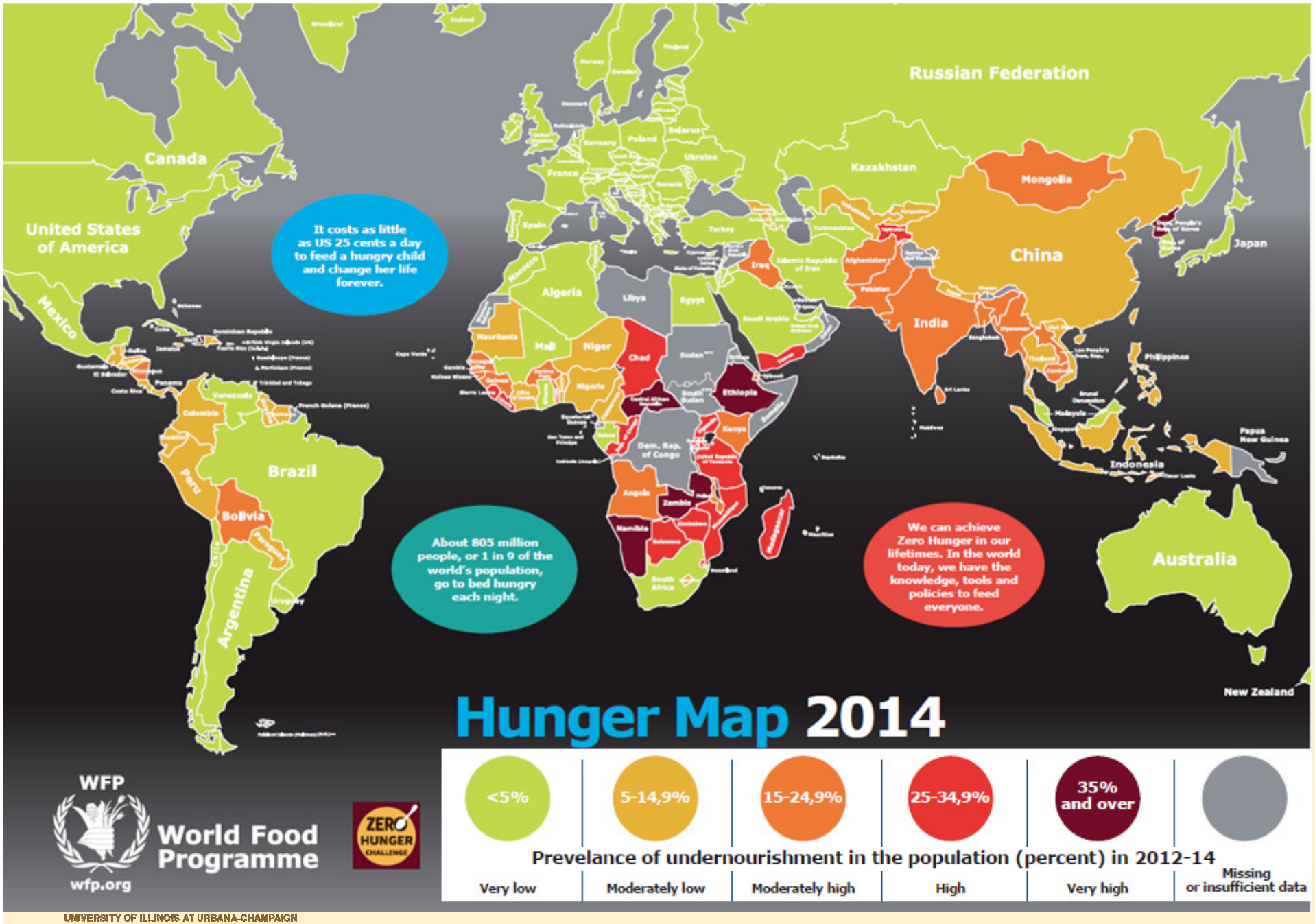


# Global Postharvest Losses and the ADM Institute at the University of Illinois

**Prasanta K. Kalita, Professor & Director**
**ADM Institute for the Prevention of Postharvest Loss**
**University of Illinois at Urbana–Champaign**

ADM Institute for the Prevention of Postharvest Loss
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN




UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Source: http://documents.wfp.org/stellent/groups/public/documents/communications/wfp268726.pdf

# *Feeding the World*

PHOTOGRAPHS BY GEORGE STEINMETZ

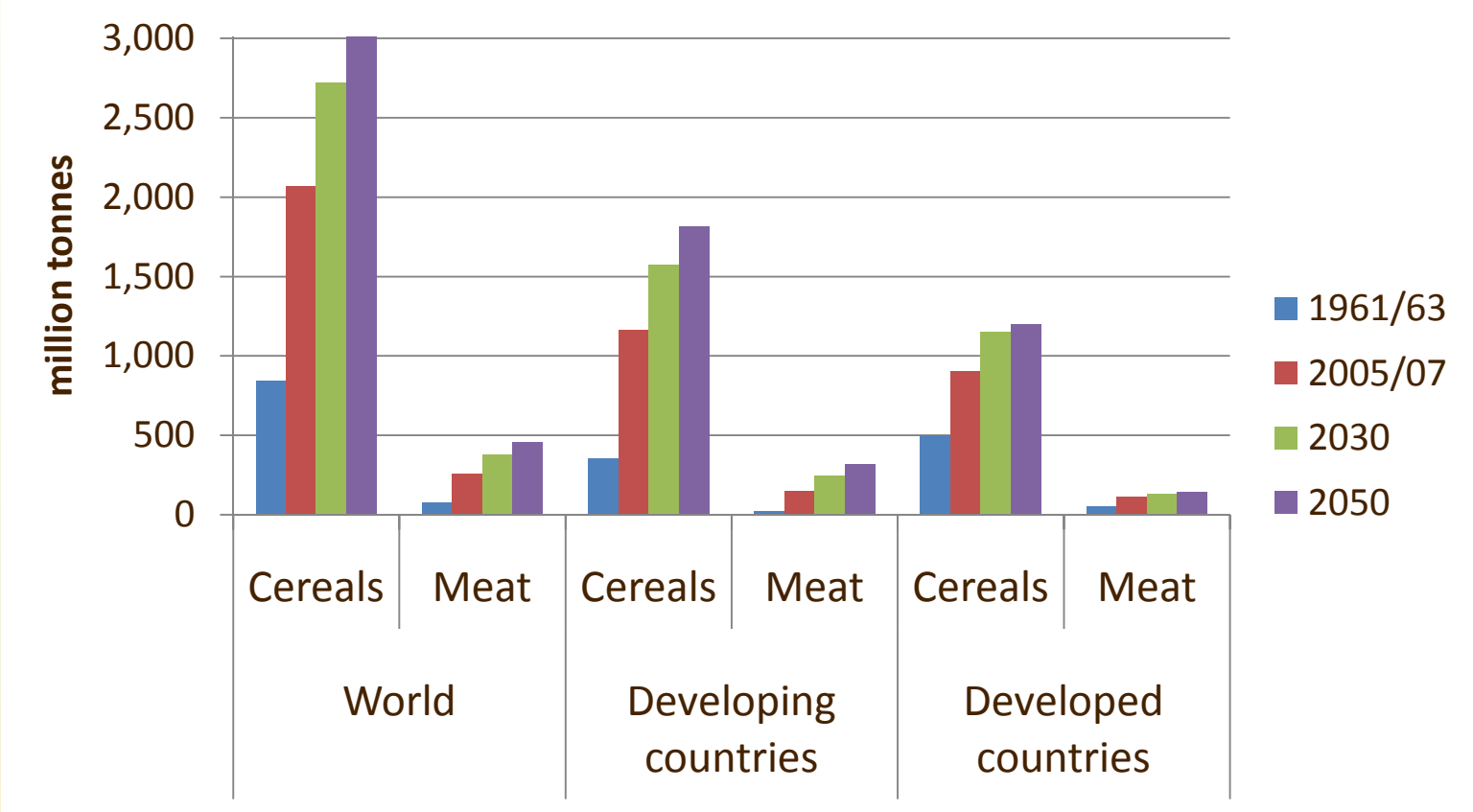
- *By 2050, we will need to feed two billion more people!*
- *Global Agricultural Production Needs to Increase by 60% over the Next 40 Years (FAO, 2012)*



*More demand to feed livestock*

*Picture source: http://www.nationalgeographic.com/foodfeatures/feeding-9-billion/*

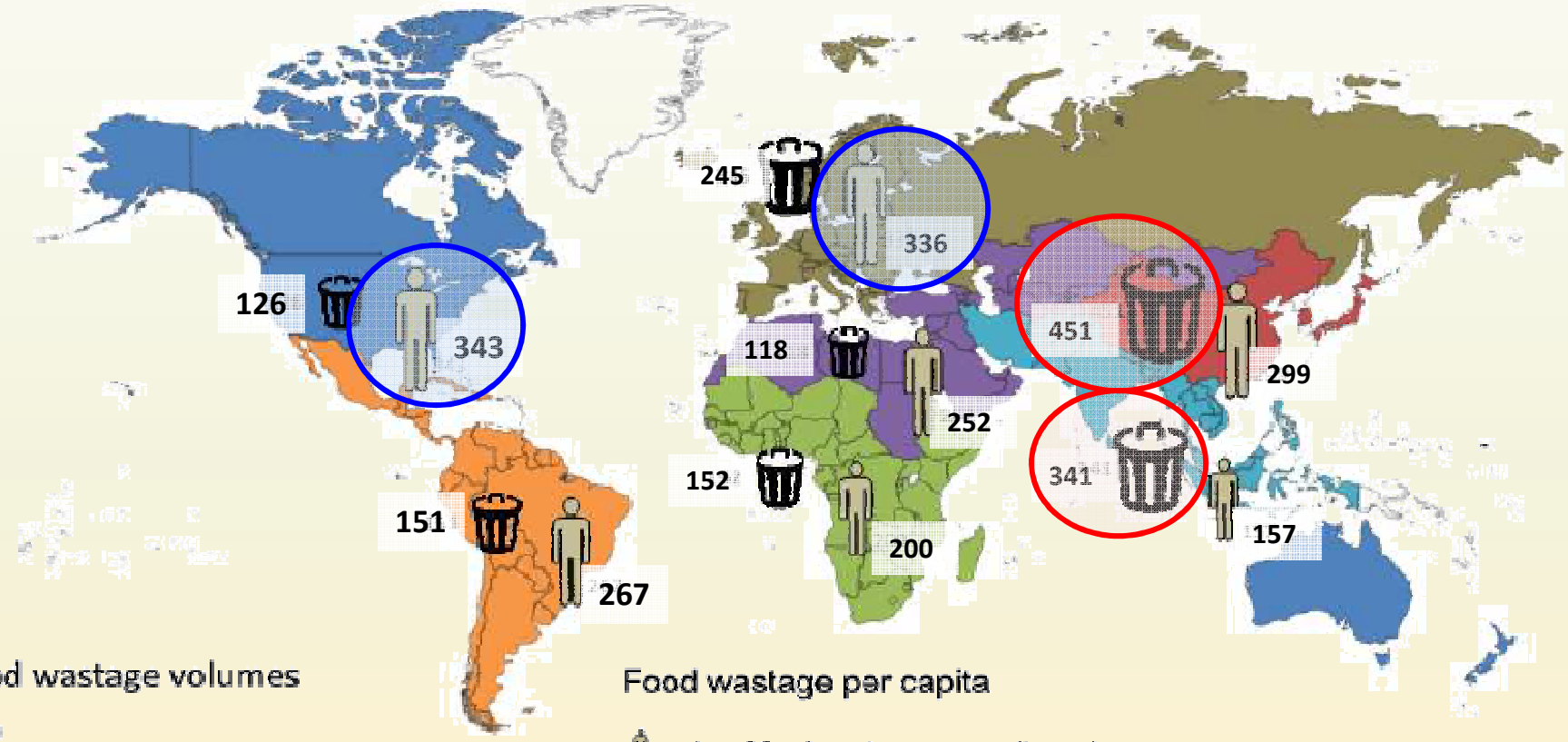
# Increasing Needs for Food



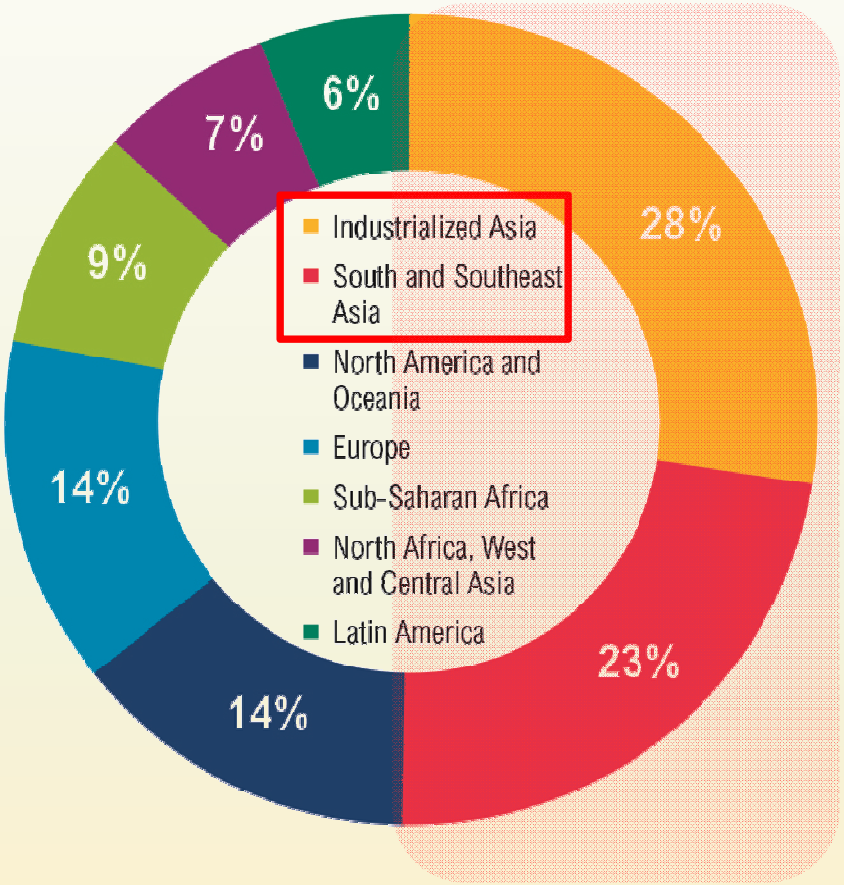

**Increase in *population*, *calorie supply* and *agricultural production***

# Worldwide Food Wastage Profile
## (FAO, 2013)

**Food Waste (Developed) v.s Food Loss (Developing)**



# PHL Varies By Region
## (World Resources Institute, 2011)



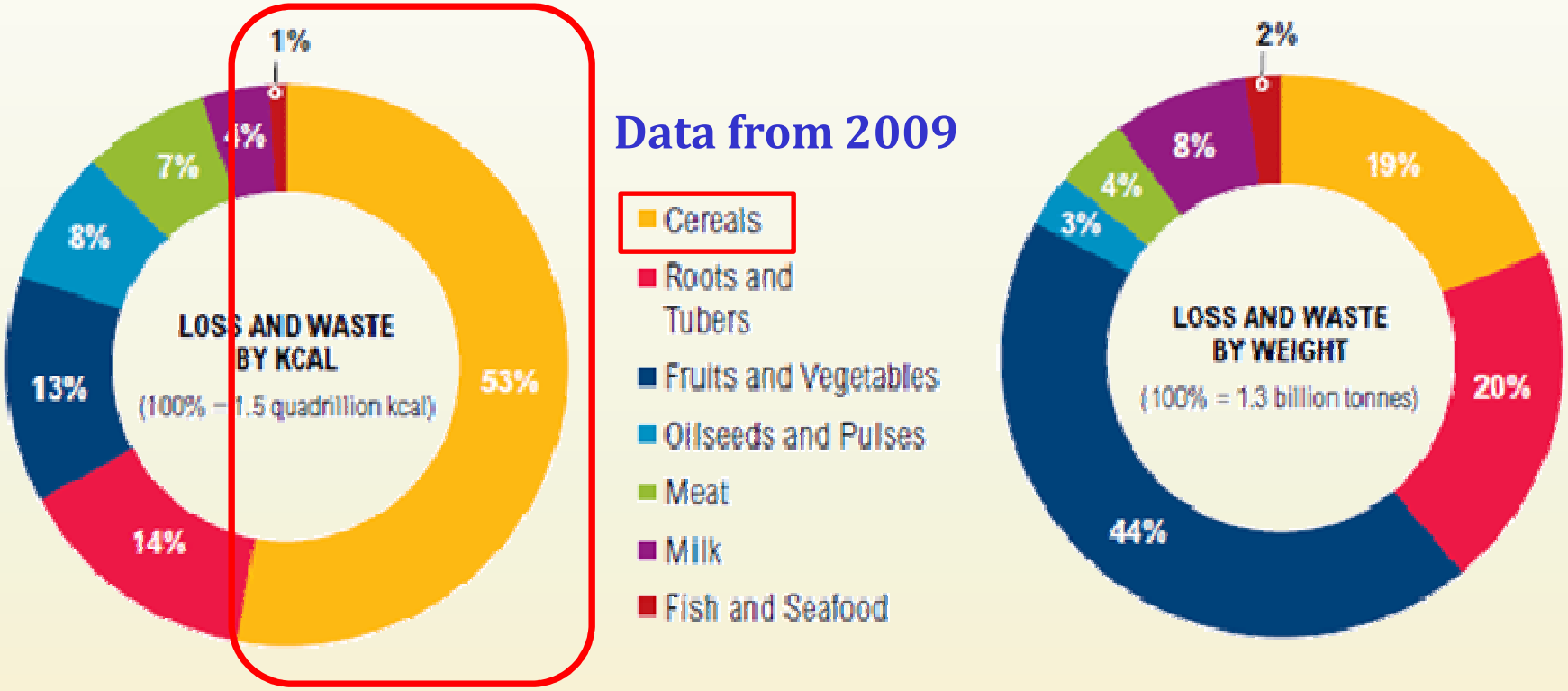

- *1/4 to 1/3* of total produced food is lost or wasted (~ 1 Billion Metric Tons)

- Over half (51%) of the world's food loss and waste occurs in Asia



*Source:* WRI analysis based on FAO. 2011. *Global food losses and food waste—extent, causes and prevention.* Rome: UN FAO.

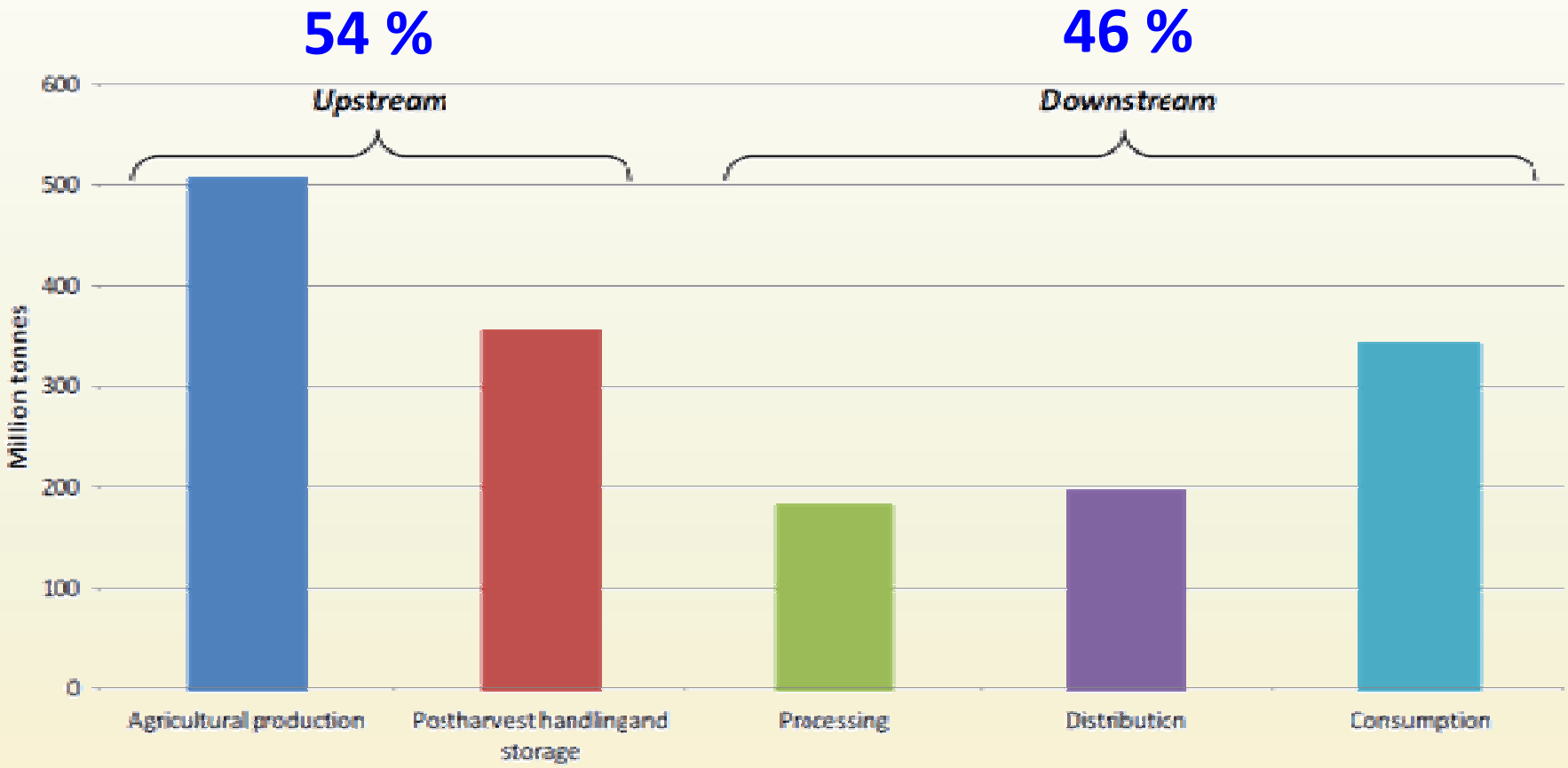
# PHL Varies By Commodities
## (World Resources Institute, 2011)



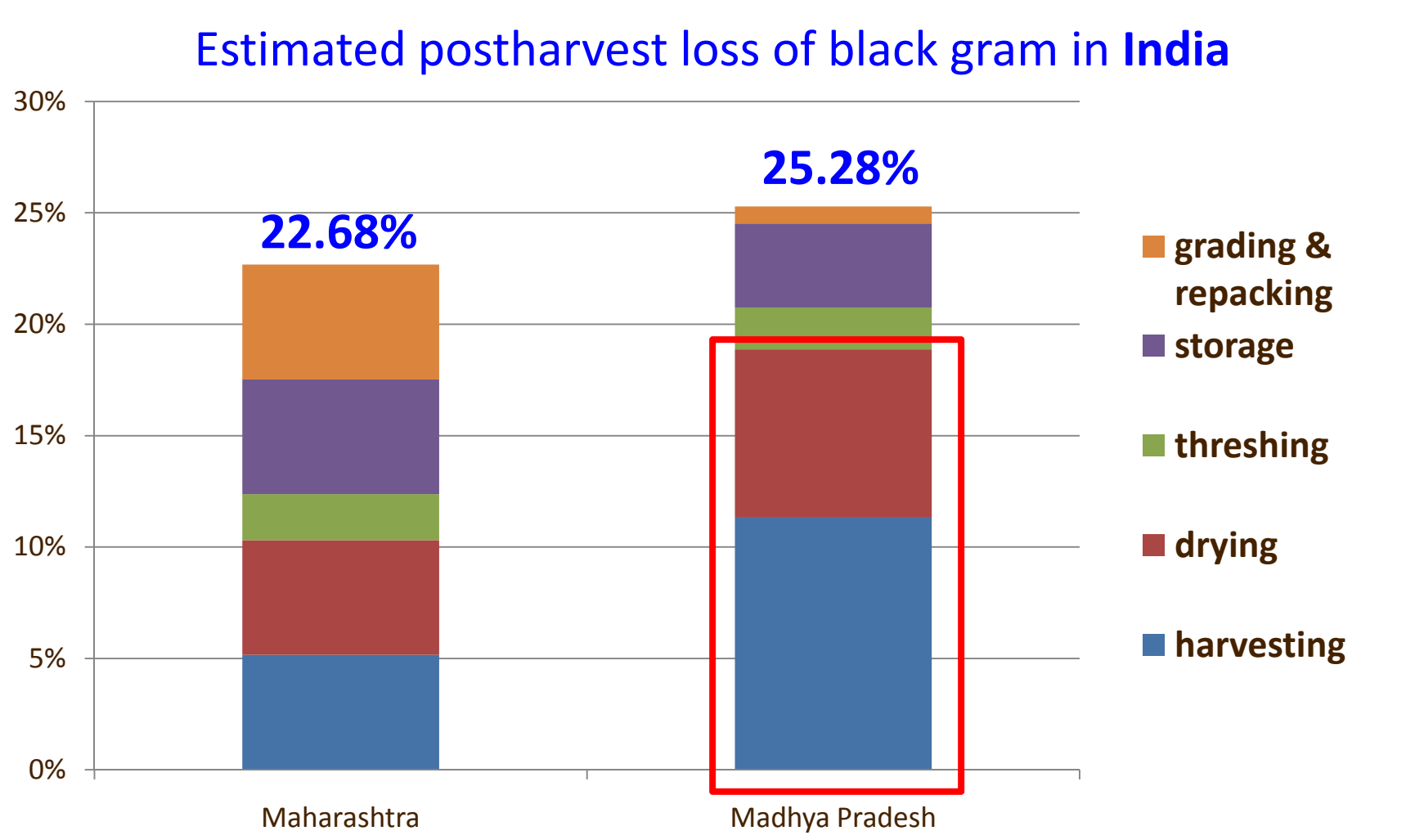



Source: http://www.wri.org/sites/default/files/reducing_food_loss_and_waste.pdf.

# PHL Varies by Supply Chain Phases (FAO, 2013)

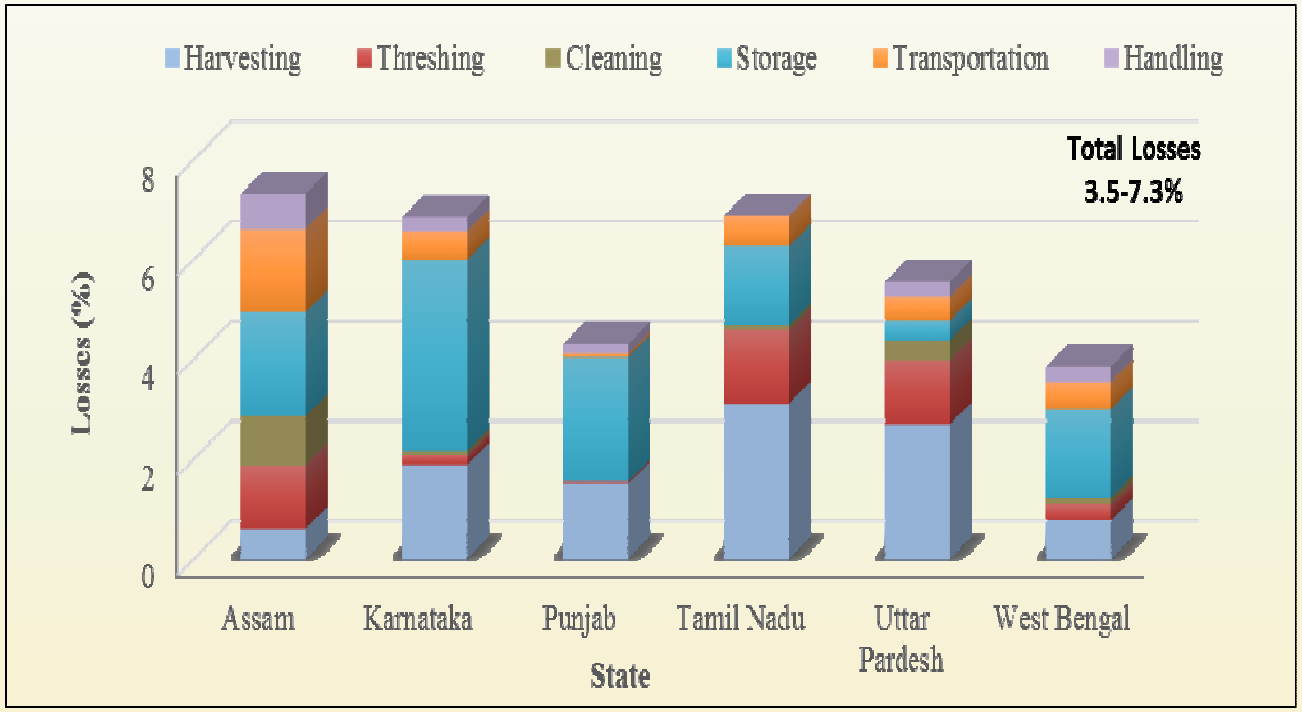


# PHL Varies Between States Within One Country (ADM Institute; 2012)



# PHL Varies Between States Within One Country

## Estimated postharvest loss of rice in India






Data Source: Kannan et al (2014) Assessment of Pre and Postharvest Losses of Important Crops in India

# Global Situation

| Developing | v.s | Developed |
|---|---|---|
| Small Holder Farmers (SHF) | | Large Farmers |
| High labor, Low capital | | High capital, Low labor |
| Food Loss | | Food Waste |





# Food Supply Chain: Rice as an Example (IRRI, 2011)

## Physical losses in TRADITIONAL postharvest chain



Cutting, handling
1-5%



Manual threshing
1-5%



Sun drying
3-5%



Open storage
5-10%



Village milling
20-30%



Small retailers




**In SE Asia, physical losses range from 15-25%.**




**Quality losses range from 10-30% (loss in value)**

Machine threshing
1-5%



Combine harvesting
1-5%



Mechanical drying
1-2%



Sealed storage
1-2%



Commercial milling
5-10%



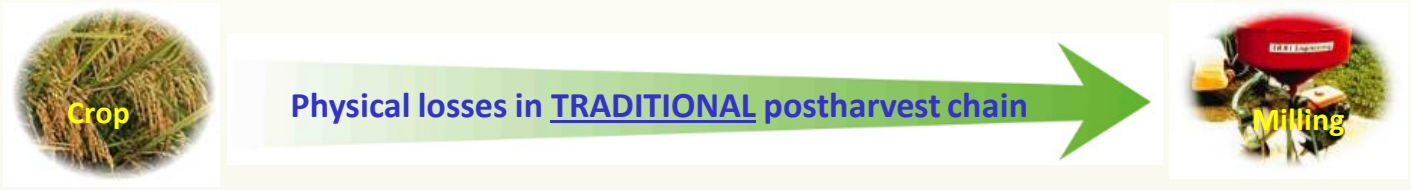
Large retailers

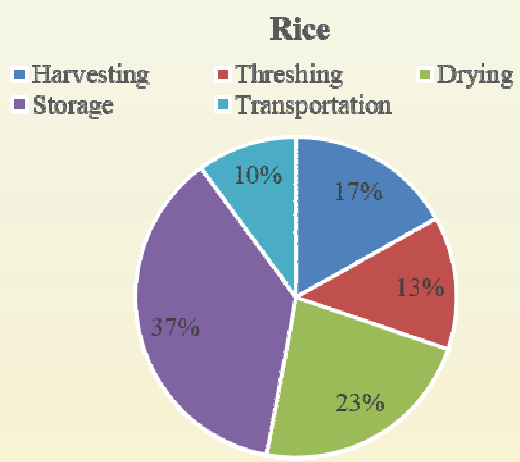


## Physical losses in MECHANIZED postharvest chain

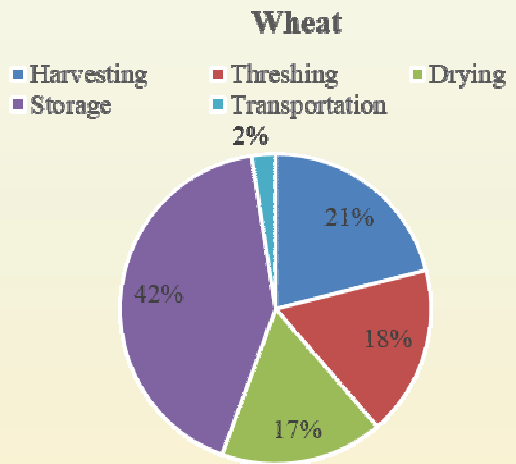
# PHL Varies by Crop

## Grain Losses in Food Supply Chain in Bangladesh

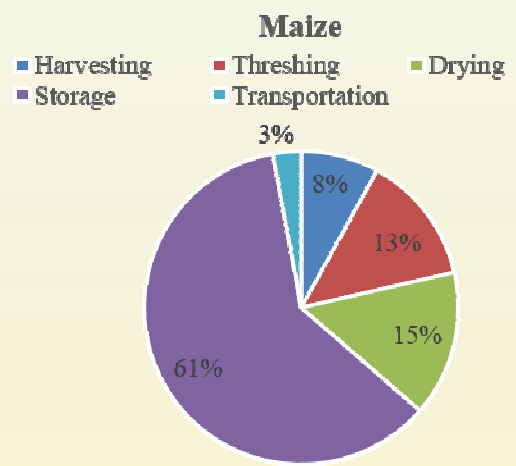



Total Losses
9.16-10.17%




Total Losses
3.62%




Total Losses
4.07%

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Data Source: Bala et al (2010) Post Harvest Loss and Technical Efficiency of Rice, Wheat and Maize Production System: Assessment and Measures for Strengthening Food Security

# Review: Post Harvest Supply Chain in Developing Countries

Man power



Harvesting



Basket and post



Storage

Open market



Marketing

Drying

Sun drying



Transportation



Bullock-cart

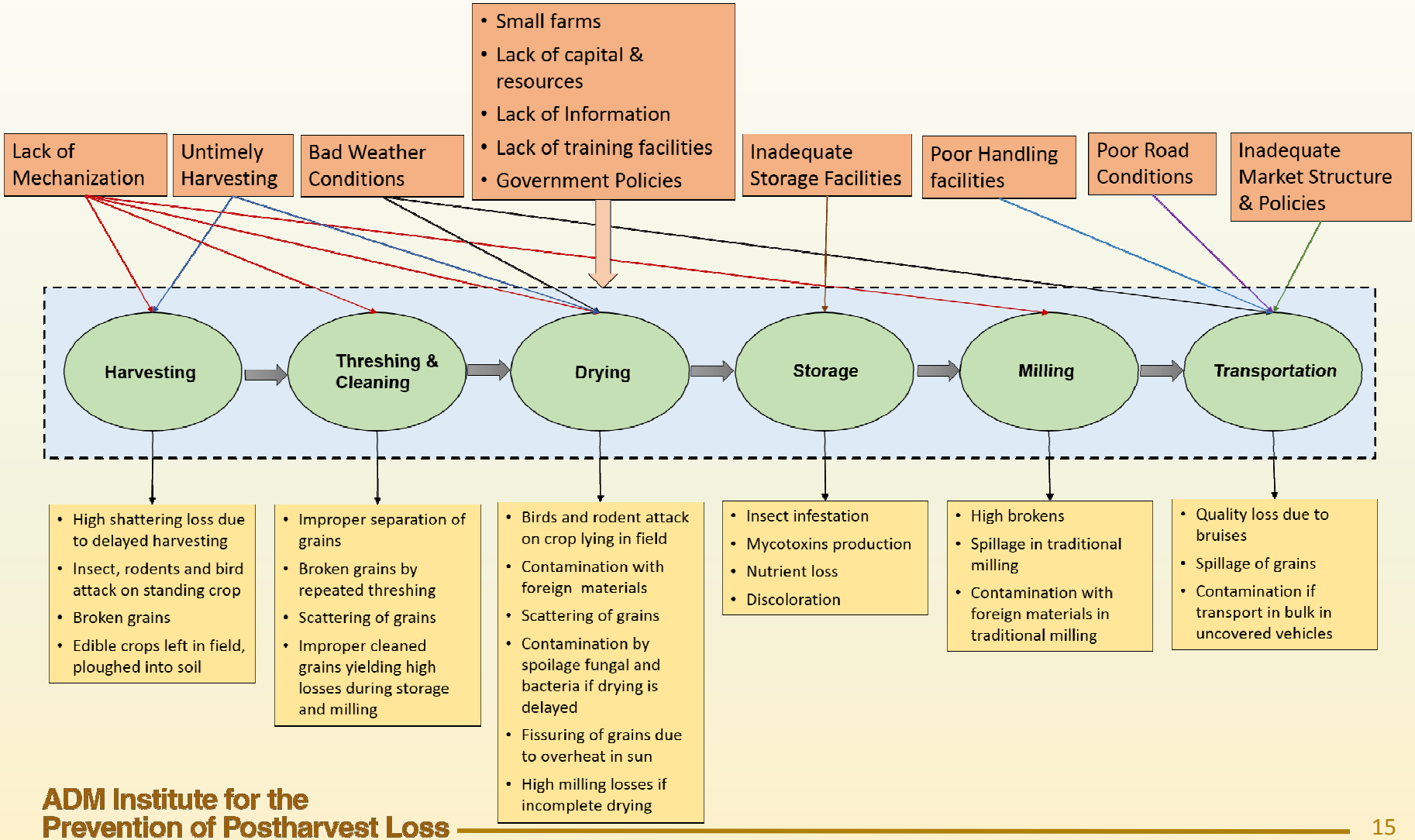
Boat





Truck

# Losses during supply chain of cereal crops in developing countries



# Reasons and Actions for PHL Prevention

***Investment*** required to reduce postharvest loss could be modest compared to the ***benefit***

With ***technological advances***, its conceivably more feasible and less expensive to address

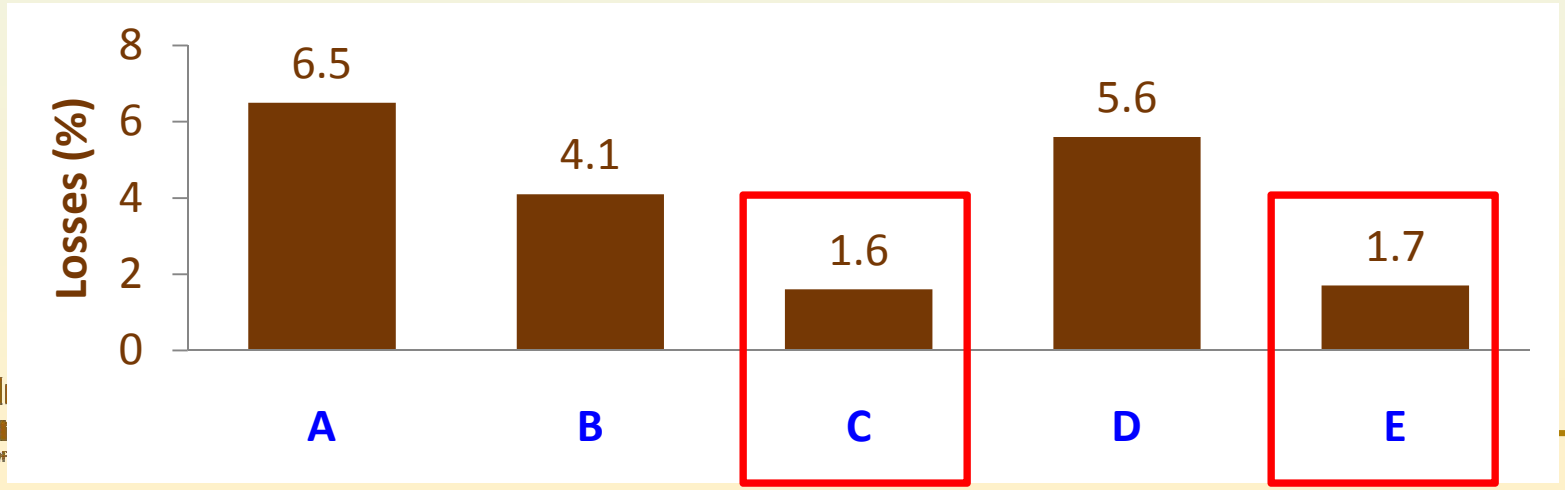
Arable land, water, and energy are in limited supply – reducing PHL can lessen pressure on ***scarce resources***

Due to market liberalization, need careful ***public action*** to help the ***private sector*** rather than crowd it out

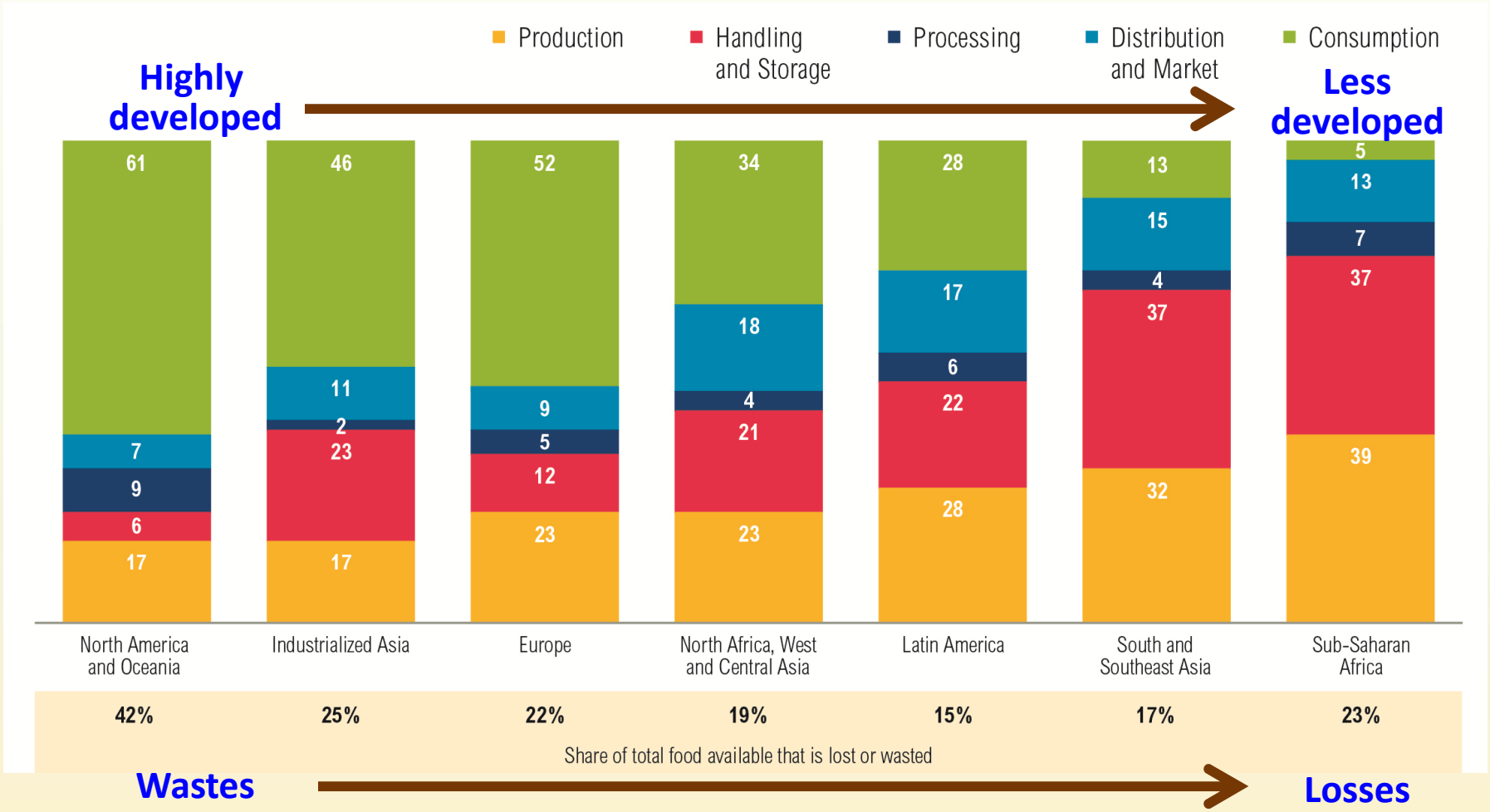
# Asia – Wheat Survey in China
## (*RCRE, 2014; funded by ADMI*)

- Survey subject: ~ 900 wheat farmers in *Henan Province*
- Losses estimate: *Harvesting > 1.6%*, drying 0.1%, storage 0.31%
  processing 0.1%, transportation 0.1%
- Loss factor in harvesting stage: **mechanical level** and **harvesting time**
- Harvesting losses were underestimated → **scattered losses** were ignored
- Further investigation in *Lan Kao Xian*, *Henan Province*

**A: regular setting**
**B: reducing combine speed**
**C: best harvesting time**
**D: different wheat variety**
**E: high performance combine**



# Worldwide PHL Status
## (World Resources Institute, 2011)






*Source:* WRI analysis based on FAO. 2011. *Global food losses and food waste—extent, causes and prevention.* Rome: UN FAO.

# Potentials of PHL Prevention in Developing Countries

**Knowledge and awareness** of PHL technologies

Cost-effectiveness of **machine usage** (small/medium/large size)

Better **infrastructure (drying and storage)** and **logistics (transportation)**

**Connections** between farmers, public and private sectors

**Investment** in research, education and extension services

# Overall Possible Approaches For Reducing Food Losses and Wastes (World Resources Institute, 2013)

| Production | Handling and Storage | Processing and Packaging | Distribution and Market | Consumption |
|---|---|---|---|---|
| **Facilitate donation of unmarketable crops** | **Improve access to low-cost handling and storage technologies (e.g., evaporative coolers, storage bags, metal silos, crates)** | Re-engineer manufacturing processes | **Facilitate increased donation of unsold goods** | **Facilitate increased donation of unsold goods from restaurants and caterers** |
| Improve availability of agricultural extension services | Improve ethylene and microbial management of food in storage | Improve supply chain management | **Change food date labeling practices** | **Conduct consumer education campaigns** |
| Improve market access | Introduce low-carbon refrigeration | Improve packaging to keep food fresher for longer | **Change in-store promotions** | **Reduce portion sizes** |
| Improve harvesting techniques | Improve infrastructure (e.g., roads) | | Provide guidance on food storage and preparation to consumers<br>Improve inventory systems | Ensure home economics taught in schools, colleges and communities |

**Low cost technologies and infrastructure**

**Labeling practices and donating unsold goods**

**Focus more for:** **Developing** **Developed**



Source: http://www.wri.org/publication/reducing-food-loss-and-waste

# Agenda

- Food security/sustainable development challenges
- The "complexities" of postharvest loss (PHL)
- Worldwide PHL status
- ***Overview of the ADM Institute***

# Mission of ADM Institute

To be an international information and technology hub

To encompass technologies, practices and systems

To focus on staple crops in key agricultural domains

# ADM Institute Continuation – Looking at Where We Started

**The ADM Institute was founded to be a hub for R&D, education, and outreach on postharvest loss prevention**

1. Conduct **transformational R&D** activities to reduce PHL

2. Establish strategic partnerships to build a **global network**

3. Establish PHL website & means of **rapid information dissemination**

4. Develop **training courses** on best practices & technology

# R&D ADM Institute Funded Projects

In 2012, the ADM Institute funded $2.1 million in multi disciplinary research focused around four cross-cutting themes



# R&D Jointly Funded Collaborations

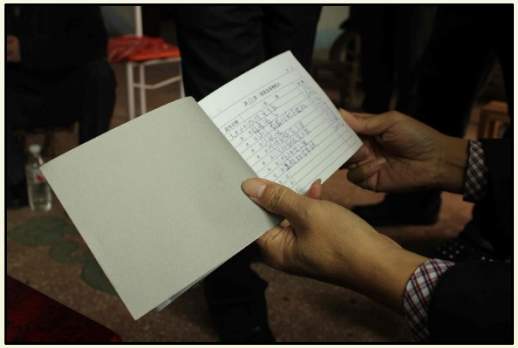
USAID **Feed the Future Innovation Lab** for the Reduction of Post-harvest Loss

- **Matching: USAID, Kansas State University**
- Co-leading with Kansas State University
- Integrate stakeholders along the supply chain for technical, economics, and behavioral interventions of loss reduction
- *Area Focus: Bangladesh, Ghana, Ethiopia, and Guatemala*



Wheat Survey with **Research Center for Rural Economy** (RCRE) of China

- **Matching: Network connection to 600 farmers**
- Conducting survey of wheat postharvest losses in Henan, Province, China; comparison of measured and estimated losses
- *Area Focus: China*



**Community Development** Projects in East India

- **Matching: Government of India Ministry of Information Technology**
- Loss assessment, technology introduction, and value chain development projects
- *Area Focus: East India, Bihar, Orissa*



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# R&D Externally Funded Projects

**Rockefeller Foundation** Waste and Spoilage in the Food Chain Development Initiative

- Scaling up promising solutions
- Issues, challenges, skills, and capabilities for smallholder farmers on waste & spoilage
- *Area Focus: Asia and Latin America*



**Asia Pacific Economic Cooperation (APEC)** Survey on Post-harvest Losses for Grain and Fisheries

- Conducting baseline survey for PHL of rice or other identified grain in 21 countries
- Supports "APEC Food Security Roadmap Towards 2020"
- *Area Focus: APEC countries*



# Activities and Collaborations



3+ YEARS

200+ STUDENT SPONSORSHIPS





30+ RESEARCHERS

60+ COLLABORATORS



20+ PROJECTS & EVENTS



In nearly 4 years of establishment, the ADM Institute has quickly become a **well-recognized thought leader** with demonstrated impact.

# Building a Global Network




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This map represents **ADM Institute project sites through 2014**, including funded research, student trips, and other engagements.

# Establishing Partnerships









































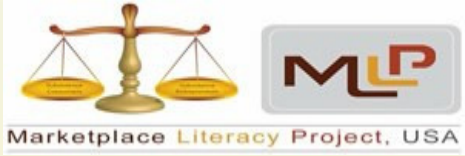






























# Reduction of Postharvest Loss through Community Participation in Bihar, India

Collaboration of **Bihar Agricultural University**, Sabour (BAU), **Rajendra Agricultural University**, Samastipur (RAU) and the **University of Illinois at Urbana-Champaign (UIUC)**

***Launched in January, 2015***




**Objectives:**

- Baseline household survey to assess the cultural, technological and economic aspects of PHL in Bihar
- Identify and evaluate the technology interventions
- Survey the desired crop characteristics requirement by the end-users
- Developing information and communication technology (ICT) methods to facilitate the evaluation and dissemination of the interventions





## ITRA

*ADMI helped RAU and BAU to develop a PHL Reduction proposal for the Information Technology Research Academy (ITRA) in the focus area of of "IT Based Transformation in Indian Agriculture and Food"*

# International Training, Technology Demonstration and Development Site

January 2015 – The ADM Institute launched a project in Bihar, India, to address postharvest losses of wheat, corn, rice, and lentils in four communities.

Bihar is among states with lower agricultural productivity, and promoting agricultural development in the region is one of the country's top priorities.

Organizations with strong interest to support are: the Government of India, Bill & Melinda Gates Foundation, John Deere, USAID, and others

Local partners, especially women and minorities, are directly involved in decision-making and research activities.

The ADMI Village will become a global "Community of Practice", inviting support from national and international organizations for scaling-up and replication.



Local partners include two agricultural universities, the Indian Council of Agricultural Research, and women farmer self-help groups.

## The ADMI Village

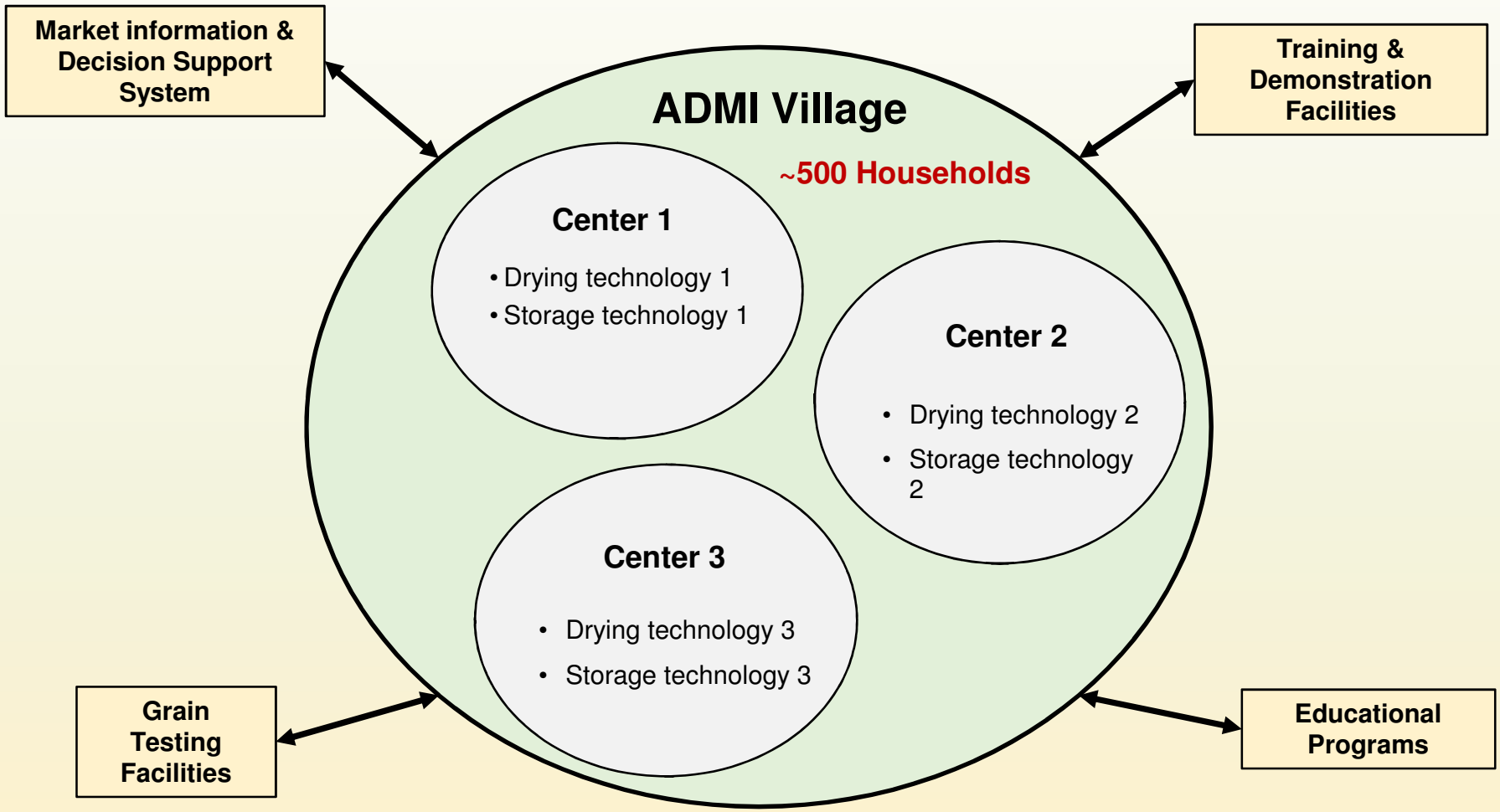
The ADMI Village will be the main hub for postharvest research and training in South Asia for helping stakeholders in India and other developing countries .

The ADMI Village will further focus and expand activities of postharvest loss prevention research, education & training, gender and minority development in agriculture, and other related issues.

Four communities are participating in the project, and the most successful one will be selected for establishment as an "ADMI Village".

The selected community will involve 100-200 farms and will be well-connected to roads and infrastructure.

# ADMI Village



# Feed the Future Postharvest Loss Reduction Innovation Lab: Bangladesh

FEED THE FUTURE The U.S. Government's Global Hunger & Food Security Initiative

USAID FROM THE AMERICAN PEOPLE

ADM Institute for the Prevention of Postharvest Loss UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

KANSAS STATE UNIVERSITY

BAU

**Objectives:**

- **Mycotoxin production** in paddy during postharvest operations: *Capacity building for moisture measurement and Mycotoxin detection*
- Identification and testing of appropriate **drying technologies** for paddy
- Identification and testing appropriate paddy **storage technologies** for farm households



*Aspergillus*'s mold on rice seed



Hohenheim Solar Bubble Dryer





Hermetic storage grain bags

# Example of U.S. and Brazil Collaboration

UFV

UFMT SINOP

①*Developed partnerships*



② *Measured harvest losses (3 Brazilian states)*



③ *Gathering information on storage conditions*



④ *Gathering information on tracking trucks*



⑤ *Identified farm for our silo bag feasibility test in June*

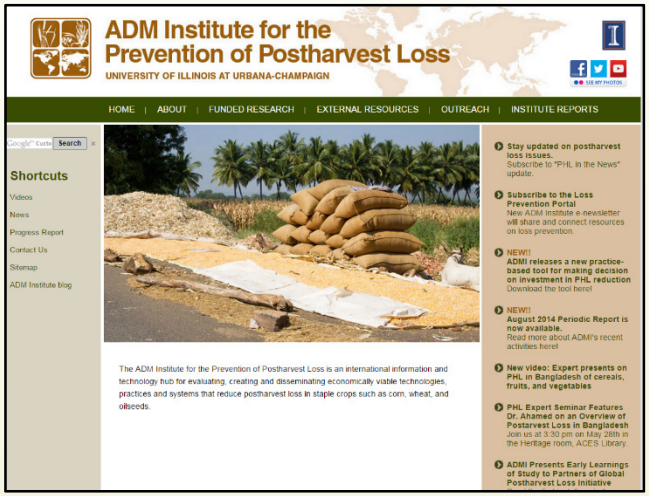
Conab
Companhia Nacional de Abastecimento

INPE
Instituto Nacional de Pesquisas Espaciais

⑥ *Gathering climate data for storability risk calculations*

# Rapid Information Dissemination: Communications Toolkit

## Websites







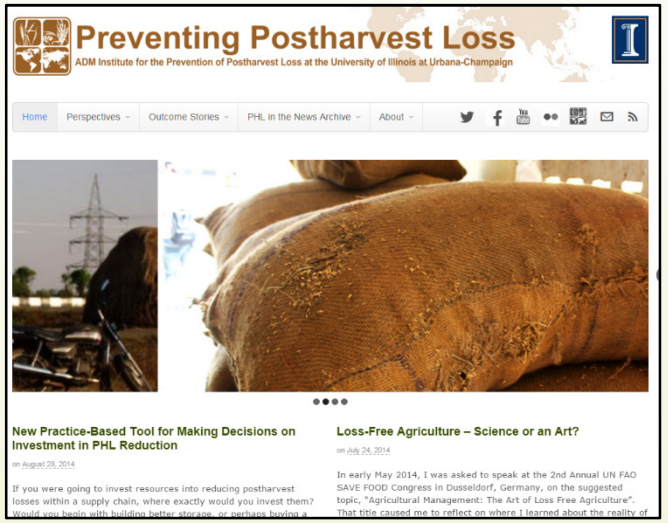
## Newsletters







## Blog & Social Media






# Training on Technology & Best Practices

Scientific Animations Without Borders (SAWBO) - **Six extension videos on PHL** Prevention




- Animated videos that can be produced at low cost and deployed rapidly via mobile technology
- Applicable to local language, dialect, and context




**Experts convening** on "Postharvest Loss Metrics, Measurement, and Mitigation: Resolving Unmet Needs"

- Co-hosted with the Bill & Melinda Gates Foundation
- Convened 35 leading public, private, and philanthropic leaders for day and half workshop

# Training on Technology & Best Practices

## *FREE ONLINE COURSE ON*

## FUNDAMENTALS OF POSTHARVEST LOSS PREVENTION

**February 2–27, 2015**





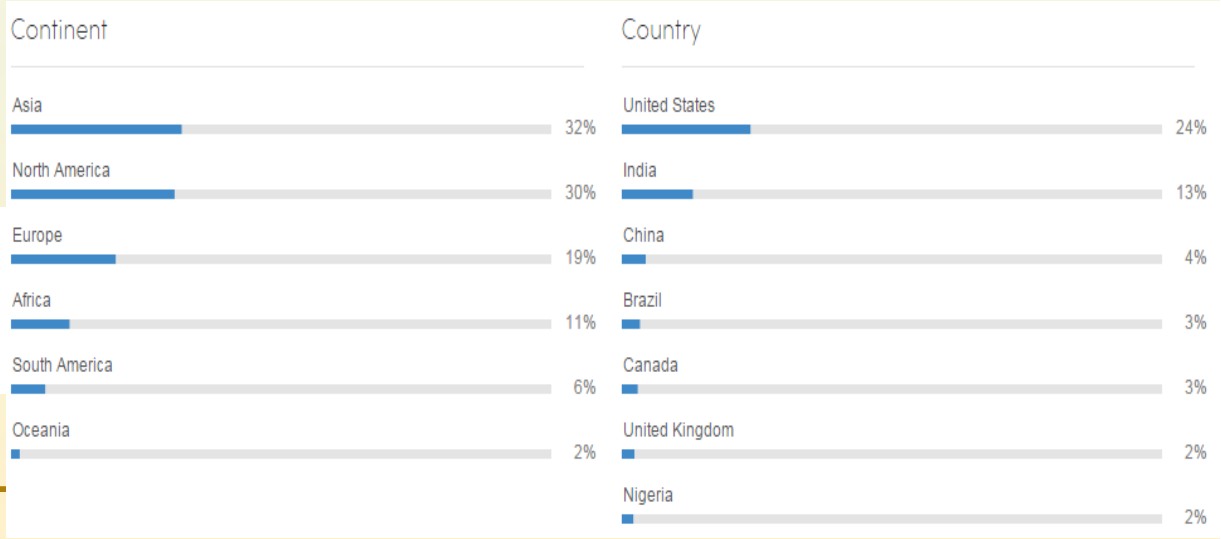
## Topics Covered

- Overview of global postharvest losses
- Major causes and encounters of postharvest loss during supply chain
- Challenges and opportunities of postharvest loss prevention from technical, economic, social and policy perspectives
- A network of global partners working on PHL reduction

**3,922**
total learners joined

**154**
different countries

**1,924 (49%)**
from emerging economies




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# Training on Technology & Best Practices

## *October 4-7, 2015, Rome, Italy*

## First International Congress on Postharvest Loss Prevention

*The congress will assess the challenges associated with postharvest loss within the framework of metrics and measurements that will enable development of better tools and interventions to prevent losses for smallholders in developing countries.*

- **Objective:** Form a high-level coalition among stakeholders to create a roadmap for postharvest loss prevention by formulating needs and plans for future actions towards a global consensus on measurement




- Network opportunity for diverse professions:
  - Invited speakers and technical sessions
  - Poster session
  - Panel discussions
  - Roadmap building



# ADM Institute for the Prevention of Postharvest Loss

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

**E-mail: pkalita@illinois.edu**

**Website: http://postharvestinstitute.illinois.edu**