Progress Report 2011
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Agriculture has always played an essential role in economic development. As we move into the 21st century, that role continues. With population and income growth, the need for food is likely to double in the next 30 years. And that increased supply needs to be achieved with no more, and hopefully less, impact on the environment.

One attractive means to potentially increase the effective supply of food is to ensure that food systems are most effectively linking agricultural production to consumers. Although the extent of loss varies by commodity, region, and agricultural system, reducing postharvest loss offers considerable potential for gain to society.

In 2011, the ADM Institute for the Prevention of Postharvest Loss was established at the University of Illinois, with the support of a generous $10 million gift commitment from the Archer Daniels Midland Company. During this first year of the Institute, we have collaboratively made significant progress in both creating the Institute’s organizational structure and goals and in initiating active research and outreach programs. The report which follows describes those activities and highlights key milestone attainment.

We hope that you find the contents of this report to be of interest. If you would like additional information, please feel free to contact me at 217/333-5115 or by email at postharvestinstitute@illinois.edu.

Sincerely,

Steve Sonka
Director
Since its inception in January, 2011, the ADM Institute for the Prevention of Postharvest Loss has set out to attract international attention to the issues surrounding postharvest loss and increase research efforts focused on loss reduction. In one year, we have made tremendous strides toward achieving this goal. The Institute has initiated research efforts in the United States, India, and Brazil; has presented and sponsored conferences worldwide; and has instituted efforts to attract faculty and students to apply their expertise to this important societal issue. Additional information regarding these and the other initiatives noted below is provided throughout the remainder of this report.

In the early months of the Institute, case studies were initiated in India focusing on crops and regions which are illustrative of the prevalent problems in postharvest loss. The titles and collaborating entities for the studies are:

- **Understanding Rice Losses, Tamil Nadu: Marketplace Literacy Project**
- **Baseline to Study the Value Chain of Maize in Rajasthan: Indian Society of Agribusiness Professionals (ISAP)**
- **Mapping the Production System and the Supply Chain and Study the Crop Losses of Black Gram in Maharashtra and MP: MART**
- **A Study on Pigeon Pea Postharvest Loss in Maharashtra: Maharashtra Hybrid Seed Company (Mahyco)**

Also, at this time, the Institute began its visioning processes. Results of this process include:

- Ratification of the Institute Vision Statement: to serve as an international information and technology hub for evaluating, creating and disseminating economically viable technologies, practices and systems that reduce postharvest loss in staple crops such as rice, corn, wheat, and oilseeds.
- Specification of the Institute’s four functions as to:
  - Conduct transformational R&D activities,
  - Establish strategic partnerships,
  - Establish a post-harvest loss website, and
  - Develop training courses.
- Definition of the four key themes that frame the Institute’s research portfolio:
  - Measurement and Technology Development
  - Systems Informatics and Analysis
  - Policy Analysis
  - Education, Training and Information Transfer

An organizational structure was crafted within the Vision process as a tangible means to achieve the purposes of the Institute. An internal Steering Committee, comprised of faculty from across campus, and an External Advisory Board, with leaders from around the globe and throughout the sector, have been formed. (continued)
By Fall, the Institute issued a Request for Proposals to targeted faculty at the University of Illinois. After careful consideration and discussions with the Steering Committee, interested faculty from across the campus were invited to propose research initiatives for the Institute. Ten proposals, with funding requests exceeding $4 million, were submitted and seven proposals were selected. Their areas of focus are:

- Appropriate Technology Development and System Integration for Post-Harvest Loss Prevention
- Concurrent Science, Engineering, and Technology for the Prevention of Postharvest Loss
- Education, Training and Information Transfer to Minimize Postharvest Losses – Scientific Animations
- Managing Grain Losses in Continuous Cropping Systems of the Tropics through On-Farm or Cooperative Storage
- Measurement, Documentation and Postharvest Processing for the Prevention of Postharvest Losses of Soybeans and Corn
- Supply Chain Policy and Strategy Analysis for Prevention of Postharvest Loss
- The nature of small landholder agriculture in the Brazilian states of Sao Paulo and Parana and implication for understanding post-harvest loss

The research awards total $2.1M with faculty represented in the Colleges of Liberal Arts, Business, Engineering, and Agriculture, Consumer and Environmental Science. Throughout the year, the institute has been working hard to form collaborations with entities around the world. The director of the ADM Institute spoke on “Innovations to Minimize Post Harvest Loss” at the Symposium on “Opportunities for Innovation in Indian Agriculture Sector” in Chicago, IL on October 4, 2011. The Institute has hosted international scholars and facilitated them getting to better know our students and faculty (Examples include: Rikin Gandhi, Chief Executive Officer, Digital Green, visited campus October 17, 2011; Ismael Roig, Vice President and President, Asia-Pacific (ADM), visited campus May 6, 2011; Rajeev Dar, Chairman, Indian Society of Agribusiness Professionals, visited campus August 25, 2011 and October 5, 2011 along with Dr. Satish Chandra, Director of Agricultural Extension).

The Institute will be participating in several conferences in 2012 including the 22nd Annual IFAMA World Forum and Symposium in China. Furthermore, relationships are being identified, defined and explored through the sponsored research projects and through the External Advisory Board relationships. At the Board’s inaugural meeting on February 6th, avenues for collaboration were discussed.

(continued)
Finally, the Institute has developed a robust website to present findings, updates, and periodic reports. The website is updated weekly with our publication, *PHL in the news*.

The following Progress Report presents more information on the progress the ADM Institute has made in its first year. The Report begins with an overview of the organizational structure. Thereafter, it is organized according to several key outcomes discussed and developed in discussions with ADM in the fall of 2010: harnessing research expertise, engaging students in research and project efforts, and advancing efforts to reduce postharvest loss.
Director

Steve Sonka is director of the Institute and an emeritus professor of agricultural management at the University of Illinois. At the University of Illinois, he was the first faculty member to hold the Soybean Industry Chair in Agricultural Strategy. His administrative responsibilities have included serving as the Vice Chancellor for Public Engagement and being the first Director of the National Soybean Research Laboratory, a multidisciplinary institution focused on furthering the effectiveness of soybean research. A co-founder of the Centrec Consulting Group, LLC, in Savoy, Illinois, he was a partner there for more than 20 years. An economist reared on an Iowa family farm, his scholarship emphasizes strategic change and decision making. An author or coauthor of over 200 publications, his international experiences include consulting and lecturing on every continent except Antarctica.

External Advisory Board provides strategic guidance and assistance to the Institute. The Board meets annually, and is comprised of members representing various academic, commercial, governmental and non-governmental institutions with strong interests and experience in postharvest loss issues.

<table>
<thead>
<tr>
<th>Chair</th>
<th>Former Chancellor, University of Illinois</th>
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<tbody>
<tr>
<td>Robert Easter</td>
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<tr>
<td>Usha Barwale-Zehr</td>
<td>Chief Technology Officer, Mahyco Seeds</td>
</tr>
<tr>
<td>Carlos Campabadal</td>
<td>Grain Industry Consultant, Asociación Americana Soys-IM</td>
</tr>
<tr>
<td>Ashok Gulati</td>
<td>Chairman, Commission for Agricultural Costs and Prices, Ministry of Agriculture, Government of India</td>
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<tr>
<td>Hans Joehr</td>
<td>Corporate Head of Agriculture, Nestle</td>
</tr>
<tr>
<td>Dirk Maier</td>
<td>Professor and Head, Department of Grain Science and Industry, Kansas State University</td>
</tr>
<tr>
<td>Domingo Lastra</td>
<td>Vice President, Business Growth, Archer Daniels Midland Company</td>
</tr>
<tr>
<td>Kent Miller</td>
<td>Director, Global Strategic Quality, John Deere</td>
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<tr>
<td>Steve Mills</td>
<td>Sr. Executive Vice President, Archer Daniels Midland Company</td>
</tr>
<tr>
<td>Arlene Mitchell</td>
<td>Deputy Director, Agricultural Development/Access and Market Systems, Bill &amp; Melinda Gates Foundation</td>
</tr>
<tr>
<td>Daniel Queiroz</td>
<td>Department of Agricultural Engineering, Universidade Federal de Viçosa</td>
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Steering Committee provides guidance and oversight of the Institute. The Committee is comprised of five University of Illinois members and an ADM representative.

<table>
<thead>
<tr>
<th>Andrew Alleyne</th>
<th>College of Engineering Ralph M. and Catherine V. Fisher Professor, COE Associate Dean for Research (sabbatical)</th>
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<tbody>
<tr>
<td>Sophi Martin</td>
<td>Manager of Research, College of Engineering Corporate Relations (participating for Andrew Alleyne)</td>
</tr>
<tr>
<td>KC Ting</td>
<td>Professor and Head, Department of Agricultural and Biological Engineering</td>
</tr>
<tr>
<td>Peter Goldsmith</td>
<td>Associate Professor and Interim Director of the Food and Agribusiness Management Program (FAM) Executive Editor, The International Food and Agribusiness Management Review (IFAMR)</td>
</tr>
<tr>
<td>Steve Mills</td>
<td>Senior Executive Vice President, Archer Daniels Midland Company (retired)</td>
</tr>
<tr>
<td>Udatta Palekar</td>
<td>Associate Professor of Business Administration and Director of the Supply Chain Management Program</td>
</tr>
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ADM Institute for the Prevention of Postharvest Loss | University of Illinois at Urbana-Champaign
Seven Funded Research Projects

The Institute has recently funded seven international research projects aimed at finding innovative ways to reduce postharvest loss. These projects are described in the following slides.
The ADM Institute for the Prevention of Postharvest Loss

Research Projects Recently Funded

Development and Selection Process

• Expand pool of interested & relevant faculty
  • Within and concurrent with visioning process
• RFP issued to targeted faculty
  • Considerable follow-up with Director and Steering Committee
  • Targeted faculty encouraged to reach out to collaborators
• Research teams submitted expressions of interest
  • Met with Steering Committee to review and shape proposals
• 10 proposals submitted, requesting $4 million in funding
• Steering Committee selected 7 proposals, totaling $2.1 million
Objectives

- To determine the extent and cost of harvest losses for soybean and corn farmers
- To measure the ambient conditions, temperature and airflow distribution, and carbon dioxide buildup during truck transport and within graneleiro storage and develop a CFD model to develop guidelines for proper handling, transportation, and storage
- To design, test and analyze costs of implementing alternate structures for on-farm storage
Measurement, Documentation and Postharvest Processing for the Prevention of Postharvest Losses of Soybeans and Corn

Methodology

- Travel to 10-15 farms across Jatia, Goias and Sinop, Mato Grosso to measure pre-harvest, combine header, and threshing/cleaning losses. Collect information about combines.

- Develop an instrumentation system (CFD – combined heat and mass transfer model) to monitor ambient conditions, temperature, humidity, airflow and carbon dioxide levels.

- Calculate the costs and do small scale field tests to determine feasibility of using alternate storage structures.

Outcomes

- Complete four publications and two literature reviews
  - Combine harvest loss
  - Use of advances in wireless systems for grain monitoring and graneleiros trucks
  - FCD simulation models for different aeration strategies and ambient conditions
  - Quality of corn grain stored in silo bags
  - Design, implementation and testing of low-cost aerated on-farm storage units
  - Cost analysis of phl

- Press releases

- Instructional materials

- Collaborations
In order to be more efficient at mitigating phl, the proposed measurements will point where the main losses seem to be happening.

The study will provide an important baseline for measuring improvements in grain quality during transport.

The impact of using better instrumentation and modeling conditions in graneleiros can be measured by a change in practice – the use of appropriate duct sizes and placement and increased operational efficiency.

The study will provide a storability index - highly useful storage data by location and year - to the CONAB data base.

The use of silos in Mato Grosso has not been tested; this study will determine the feasibility of this system in the region.
Education, Training and Information Transfer to Minimize Postharvest Losses – Scientific Animations Without Borders

Investigators: Barry Pittendrigh, Julia Bello-Bravo, Francisco Seufferheld, and Madhu Viswanathan

Objectives

- To develop a platform for educational materials that can be used to educate low literate learners involved in the postharvest process
- Produce educational materials that use highly detailed animations with voice overlaid in local languages and dialects
Methodology

- Identify known techniques that can dramatically reduce phl
- Issue two rounds of requests for videos in the first two years
- Prioritize 5-10 videos to be made each year with the following criteria:
  - Cover high impact topics
  - Well elucidated needs assessment
  - Techniques are displayed in a visual manner
  - In locations where there is a need to educate low-literate learners
  - Deployment strategy
  - Topics have broad appeal

Outcomes and Impact

- Production of videos in a diversity of languages that demonstrate techniques to reduce phl
- Develop a network of collaborators to deploy these videos
- Obtain data from assessments of the impact of these videos on acceptance, penetration, deployment approaches, and changes in behavior
- Ability to scale the project to other areas
- Publishable materials
- Develop novel synergies with other components of the ADM Institute
- Provide extension and outreach groups with educational materials that cause change in behavior
Supply Chain Policy and Strategy Analysis for Prevention of Postharvest Loss

Investigators: Kathy Bayliss, Dilip Chhajed, Mindy Mallory, Udatta Palekar

Objectives

• Identify and measure how institutions (government policies, market institutions and local norms) affect the efficiency of markets, the incentives facing supply chain participants, and the loss in crop quantity, quality and income

• Develop supply chain maps detailing the cause and effect relationship between policies and postharvest losses

• Develop tools for targeting phl interventions and develop a method to assess the effectiveness of these solutions in India

• Examine the effect of new infrastructure innovations (e-Choupal) and availability of spot market prices

• Develop a game-theoretic model to understand equilibrium investment decisions
Supply Chain Policy and Strategy Analysis for Prevention of Postharvest Loss

**Methodology**

- Targeting with Market Efficiency Studies
- Supply Chain Maps
- Incentive System
- Household Surveys

**Outcomes and Impact**

- White Papers discussing which interventions have the most potential for preventing phl
- Market Data: A cleaned and organized dataset for dissemination
- By identifying the geographic hotspots for post-harvest loss, understanding the incentives for good storage and marketing practices at the household level and among different actors along the supply chain, this project will inform stakeholders of actions which can be taken in terms of the political, cultural, and institutional environments to reduced post-harvest loss in targeted areas.
Appropriate Technology Development and System Integration for Post-Harvest Loss Prevention

Investigators:
Ximing Cai, Imad Al-Qadi, Khaled El-Rayes, Youssef Hashahs, Praveen Kumar, Wen-Tso Lui, Paramita Mondal, John Popovics, Junho Song, Dan Work, CEE, Mary-Grace Danao (ABE), Steven Eckhoff (ABE)

Objectives

• Investigate appropriate technology development and system integration for phl prevention with a focus on near-farm storage facilities, which cause a large portion of phl

• Develop innovative and appropriate technologies for phl prevention with all structural components in the supply chain of a particular commodity

• Design a resilient and reliable multi-echelon supply chain for a particular commodity

• Conduct sustainability assessment, including the technical, environmental, and socioeconomic aspects of the technology adoption and the design of the supply chain

• Make recommendations of solutions for two case studies in India and Brazil based on the technology development, system design and assessment
Appropriate Technology Development and System Integration for Post-Harvest Loss Prevention

Methodology

- Four stages of project activities:
  - Specific context appraisal
  - Assessment and deployment on one commodity in Haryana and Tamil Nadu, India
  - Assessment and deployment of one commodity in Brazil
  - Comparison and wrap-up

- Technologies to investigate include:
  - Cheap biological sensors for bacteria, insects, and fungi and physical sensors for moisture and temperature storages
  - Alternative cost-effective materials for storage construction based on available raw materials
  - Optimal storage design including size, site layout, use of limited resources, and innovative conveyance systems, storage and inlet and outlet systems

Appropriate Technology Development and System Integration for Post-Harvest Loss Prevention

Outcomes

- Affordable and effective technologies for adoption
- Comprehensive framework to explore optimal engineering solutions and infrastructure investment requirement to minimize phl
- Guidelines for integrated system design based on recommended structural and information technologies (risk and hazard report)
- Educational development (training courses and UIUC course update)
Appropriate Technology Development and System Integration for Post-Harvest Loss Prevention

**Impact**

- The deliverables of this project are expected to influence investment priorities of both public and private entities, which will lead to infrastructure improvement and operational efficiency and finally phl reduction.

- The impacts can be quantified by the amount of investments to particular technology adoptions and systems developments, the amount of phl reduction in the various components of the supply chain, and the conservation of resources (land, water, labor ...).

- The impacts may not be materialized during the project period, but can be predicted by data and modeling analysis.
Concurrent Science, Engineering, and Technology for the Prevention of Postharvest Loss

Investigators:
Luis Rodriguez, Yogendra Shastri, Yanfeng Ouyang

Objectives
- Develop the platform and modeling framework for using Concurrent Science, Engineering, and Technology (ConSEnt) tools to address the prevention of phl
- Build collaborative connections in India and Brazil for acquisition of country specific data on phl
- Develop and implement a web-based informatics foundation in the prevention of phl
- Perform targeted modeling and analysis for the prevention of phl
- Development of a web-based decision support system for the prevention of phl
Concurrent Science, Engineering, and Technology for the Prevention of Postharvest Loss

**Methodology**

- Develop collaborations in India and Brazil
- Informatics: Perform a literature review leading to the development of conceptual diagrams identifying the important components and inter-relationships within the agricultural systems
- Modeling and Analysis
  - Integrated Logistics Network Analysis
  - Agent-based Modeling and Analysis
  - Simulation and Stochastic Optimization Models
- Web-based decision support system integrates the database and the models

**Outcomes and Impact**

- Novel contributions in reduction and prevention of phl identified through the ConSEnT platform
- Comprehensive database, quantitative and semi-quantitative models, algorithms, and decision support tools
- Case specific recommendations for phl systems in Brazil and India
- A platform for integration of knowledge and exchange of data and ideas
- In the first two years, quantification of systemic performance measures (cost, material loss, efficiency, resilience…)
- After three years, implementation of analysis-based recommendations on real systems through collaborations with other focus areas to quantify improvements in real systems
The nature of small landholder agriculture in the Brazilian states of Sao Paulo and Parana and implication for understanding post-harvest loss

Investigators:
Mary Arends-Kuenning

Objectives

• Produce report about the nature of phl as it affects smallholders in the states of Sao Paulo and Parana, Brazil

• Key questions:
  • What grains do smallholders produce? To what extent do acreage choices depend on the susceptibility of grains to phl?
  • What is the extent of phl? At what stage of the supply chain does loss occur?
  • Who bears the cost of phl?
  • What are the transaction costs that prevent stakeholders from investing in technology that reduces phl?
The nature of small landholder agriculture in the Brazilian states of Sao Paulo and Parana and implication for understanding post-harvest loss

**Methodology**

- Interview smallholders, buyers who purchase grains from smallholders, traders, and retailers
- Develop a survey of smallholders in these states to include information about crop acreages, timing of harvests, contracts with buyers, access to credit, and general economic characteristics of the farmers’ household

**Outcomes and Impact**

- A report that will consist of a literature review of previous work on phl of smallholders in the region focusing on grains and sugar cane
- A report based on the in-depth interviews with the stakeholders along the supply chain
- A database of information from smallholders
- A research paper analyzing the data from the smallholders, focusing on marketing channel decisions and their implications for phl
- Measure the impact of reducing phl in this setting
Managing Grain Losses in Continuous Cropping Systems of the Tropics through On-Farm or Cooperative Storage

Investigators:
Peter Goldsmith and Altair Moura

Objectives

• Be the first to conduct economic research on grain loss under the increasingly common high temperature, high humidity, and high rainfall environments of tropical grain production

• Discover additional impacts of distances and the lack of accessible storage on phl in this climate
Managing Grain Losses in Continuous Cropping Systems of the Tropics through On-Farm or Cooperative Storage

Methodology

• Robust econometrics results linking weather and loss; distance and loss; storage and loss; harvest management and loss
• Create a systems model of the safrinha, loss, weather, distance interaction with maps highlighting spatial aspects of the problem
• Primary data collection of small panel of farms to measure loss, distance, harvest management, weather and equipment quality
• Descriptive case studies
• Other research methods are still being explored

Managing Grain Losses in Continuous Cropping Systems of the Tropics through On-Farm or Cooperative Storage

Outcomes and Impact

• Establish the ADM PHL Field Laboratory where ongoing systems research on loss would occur in five cooperative farms in Sinop, MT area.
• Initiate research and outreach partnerships among industry, producers, and Embrapa.
• Policy recommendation adoption by Aprosoya, the corn and soybean farmers association of Mato Grosso
• Establish a biannual conference on harvest loss and storage in MT at the Embrapa station

• The industry will have a better understanding of the sources of grain in low latitude environments. Specifically, the industry will have a better understanding of the impacts of the safrinha system grain loss, when subjected to high temperature, humidity, and rainfall environments.
• The industry will understand the linkage or the lack of a linkage between: inbound grain quality and storage loss, distance to storage/market and loss, harvest management and loss.
Four Case Studies in India

The Institute commissioned four research projects in India in early 2011. An overview of the projects and some preliminary findings follow.
ADM Institute Funded Case Studies in India

- Rice in Tamil Nadu
- Maize in Rajasthan
- Black Gram in MP (Madhya Pradesh) and Maharashtra
- Red Gram (Pigeon Pea) in Maharashtra

Rice in Tamil Nadu

Marketplace Literacy Communities

Empowering low-income communities through the marketplace

- Community to build literacy, skills, awareness of rights, and self-confidence needed to function in the marketplace.
  - Support roughly 100 self-help groups of 15-20 women each
  - Provide links to financial institutions
  - Provide assistance in maintaining financial records
  - Ongoing support for running enterprises

- Centrally located
  - Embedded laboratory in the rural south
  - Close to Chennai, South India
  - Network of small villages with a central town

- Partnerships:
  - Subsistence Marketplace Initiatives (UI)
  - Marketplace Literacy Project (USA)
  - Madura Micro Finance
Maize in Rajasthan
Baseline to Study the Value Chain
An ISAP-ADM Institute, Illinois Collaboration

- Background: India is the fifth largest producer of maize; maize production has increased dramatically in the last five decades.

- Conduct a baseline survey to study the existing maize value chain in Rajasthan
  - Capture the movement of maize through various stages starting from the harvest up to processing
  - Map various intermediaries handling maize, their value addition, etc, in order to scientifically analyze losses incurred at various stages of maize handling

- 2500 farmers have pledged to work with ISAP under project SHARE for four years ensuring high quality data.

- ISAP will design a survey to be administered to respondent farmers, wholesalers, transporters, trader/aggregator, processors, stakeholders and institutions.

- The findings will form the basis for identifying the stages in the maize value chain where losses can be reduced and recommending appropriate technological interventions to minimize phl.

---

Black Gram in MP (Madhya Pradesh) and Maharashtra
Mapping the production system and the supply chain and study the crop losses of Black Gram

- India is the largest producer of black gram in the world, but domestic demand exceeds production.

- Maharashtra and Madhya Pradesh produce 20% and 13% of India’s total black gram production respectively.

- Study will
  - Understand the causes of crop loss
  - Map technologies currently available to prevent crop loss and reasons why they are not broadly adopted
  - Identify potential for new technologies and opportunities for innovations in black gram supply chain
Farmer Surveys on Postharvest Loss in India

Findings

<table>
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<tr>
<th>S.No</th>
<th>Stages and Factors</th>
<th>Loss % of yield</th>
<th>Loss (Kg/q)</th>
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<tbody>
<tr>
<td>1</td>
<td>Maturity stage</td>
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<td>2</td>
<td>Weather impact</td>
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<td>3</td>
<td>Harvesting</td>
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<td>4</td>
<td>Threshing</td>
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<td>5</td>
<td>Labour unavailability</td>
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<tr>
<td>6</td>
<td>Drying</td>
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<td>7</td>
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<td>Processing</td>
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<tr>
<td>10</td>
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<td>14.425</td>
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</tbody>
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Red Gram (Pigeon Pea) in Maharashtra

Farmer Surveys on Postharvest Loss in India
A study on pigeon pea postharvest loss

- India is the world’s largest producer of pigeon pea (75% of global production)

- The study: Conducted primarily in Maharashtra during August 2011 and focused on a random sampling of villages. Two villages were selected from each taluk with five farmers from each village participating in the study for a total sample of 30 villages and 150 farmers.

- Findings:
  - Average age of a farmer is 46; education levels of farmers increased with the size of the farm
  - Pigeon is being raised as a subsidiary inter-crop
  - Pigeon pea has a relatively high market price and is suitable to marginal farms
  - 30% of crop damages is due to shortage of labour
  - Most loss occurs at storage - clear need for construction storage facilities at the village level
Seed Research Projects

Early in 2011, eight research projects were funded to seed exploratory research on postharvest loss. The titles and short descriptions follow.
Department of Agricultural and Biological Engineering
Steve Eckhoff, Grace Danao and K.C. Ting
The Department of Agricultural and Biological Engineering (ABE) is currently in the process of compiling and assessing relevant literature on the severity of the postharvest losses in the target countries and on the costs of newer storage, handling technology. A wiki site was set up to allow researchers access to an online database of information and the resources that have been identified thus far are also available on the ADM Institute for the Prevention of Postharvest Loss website. During the spring 2011 semester, ABE graduate student Ning Wang worked with the Institute and with other graduate students to compile relevant data. ABE plans to distribute a white paper on their findings in fall 2011. ABE is also in the process of identifying potential partners in the targeted countries.

Department of Agricultural and Biological Engineering
Steve Eckhoff

and

Department of Electrical and Computer Engineering
Lynford Goddard
Steven Eckhoff and Lynford Goddard are working on a project titled “Distributed Wireless Monitoring of Carbon Dioxide Concentrations in Grain Bins.” The goal is to develop low-cost wireless sensors that can map out the local concentration of carbon dioxide (CO₂) in large volume grain bins. Microbial respiration can thereby be monitored via changes in the CO₂ concentration over time. The sensors will be slightly larger than the size of a corn kernel and able to be mass manufactured at a relatively low cost per individual sensor. The low cost and recoverability of the sensors will enable farmers and elevator managers to randomly distribute one hundred or more such sensors directly in the bin’s interior during bin filling for local distributed sensing.

Department of Agricultural and Consumer Economics
Pete Goldsmith
Pete Goldsmith is currently in the process of identifying potential collaborators in Brazil. Pete is planning a trip to Brazil in early June to meet with these potential collaborators to establish: research partnerships; operating processes and procedures; and the boundaries of the research activities.

Pete Goldsmith is also working on a project titled "Understanding PHL and On-Farm Storage in Mato Grosso: Liquidity, Transparency, Risk and Access to Capital." The research will study the issue of the undersupply of private on-farm and cooperative storage in developing countries. In particular, the working hypothesis is that the business, legal, and institutional environment in developing countries elevate risk and induce capital market failures associated with storage investments.

(continued)
Department of Agricultural and Consumer Economics
Rob Hornbaker
Rob Hornbaker is currently undergoing an extensive assessment project to determine the current level of preventable postharvest losses and to identify alternative scale appropriate technology for reducing postharvest loss. He is currently in the process of conducting a literature review to assess historical losses in India and will also do the same review for Brazil. The final deliverable of Rob Hornbaker’s work will include a white paper outlining the supply chain for at least one or two of the crops of interest in Brazil and India which will include initial estimates of the postharvest loss for the key stages of the supply chain.

Department of Agricultural and Consumer Economics
Mindy Mallory
Mindy Mallory has started two white papers on the policy implications on postharvest loss in both Brazil and in India. As a part of her research, she will identify policies that either help or hinder investment in postharvest infrastructure in the two countries.

Department of Business Administration
Udatta Palekar
Udatta Palekar is currently working on two projects. The first project is developing a hands-on technique to help analyze postharvest loss at a micro-level by repurposing a successful technique from Lean manufacturing. He is creating a process map that will help identify the sources of waste and plan for an improved future state process plan. One of Udatta’s undergraduate classes finished a group project on the agricultural supply chain in the spring 2011 semester. Udatta Palekar is also working on modeling the agricultural supply chain. This project considers more systemic causes of postharvest loss by studying the supply chain model in a game theoretic context.

Department of Computer Science
Tarek Abdelzaher
Tarek Abdelzaher is in the process of creating a pilot project to build an automated information collection and management service that allows a provider to prompt large groups of individuals to share data via their cell phones on selected issues of concern. He is using crowd sourcing to extract accurate information by involving the general population in data collection and feedback. By using this method, he should be able to improve awareness of bottlenecks, inefficiencies, and the causes of postharvest loss.

(continued)
Department of Civil and Environmental Engineering
Ximing Cai
Ximing Cai is in the process of investigating optimal engineering solutions and infrastructure investment required to minimize postharvest loss in crop quantity and quality. His group is modeling a large scale crop supply system including harvesting, handling, storage, processing, transportation and distribution in markets. The first area currently being investigated are the risks associated with physical, environmental and social factors and an assessment of the economic benefits and costs of technical options. The second area being investigated is a project to determine the multi-echelon supply chain design to reduce postharvest loss under stochastic and dynamic/seasonal demand.
Engaging Students

The Institute seeks to engage large numbers of graduate and undergraduate students in research and project efforts. We have achieved this goal by participating in curricular activities and funding small research projects. Many of these seed projects have evolved into full scale projects funded by the Institute. Several examples are listed in this section.

- Student Involvement
- International Course Development
- BADM 380: Corporate Social Responsibility and the Multi-national Firm
- Engineering Sustainable Solutions to PHL
- Monitoring Carbon Dioxide in Storage
Student Involvement

The Institute makes every effort to involve students in its research efforts. In the first year, the following students have had an active role in researching, writing, and planning.

Rhett Farrell

Rhett Farrell is a Ph.D. student in Agricultural and Consumer Economics. His primary research interests include quality innovation in vertically linked agricultural markets and marketing systems in less developed countries. Rhett has recently worked on agricultural business development projects in Guatemala and the Dominican Republic and has professional experience in finance, accounting, and software development.

Ning Wang

Ning Wang is a second-year master’s candidate in Agricultural Biological Engineering at UIUC. His hometown, Shenyang, is the biggest city of northeastern China. Previously, he has studied in the area of biological engineering including microorganism, fermentation and separation during his undergraduate education. In the future, he would like to be a leading researcher in grain storage. He is also very interested in international food trade.

Grace R. Kenney

Grace R. Kenney is a senior in Urban and Regional Planning and is completing a certificate in Global Business Culture. Grace is the child of two former military officers, and spent over 12 years of her childhood in Japan, Turkey, and China. Due to such an upbringing, she has been exposed to both urban metropolises and countryside, developing and developed countries, and wishes to use her experience in future international development issues, particularly that of environmental and agricultural planning.

Corporate Social Responsibility and the Multi-national Firm

The ADM Institute presented a lecture in Business Administration. BADM 380 Course Description: Introduces the field of international business and management. Examines the economic, political, and legal environments of international business. Analyzes differences in financial management, marketing, and management practices for firms doing business abroad. “Corporate Social Responsibility and the Multi-national Firm: The ADM Institute” will be a course topic.
Funding Cooperative ABE and BADM Activity
Udatta Palekar, Madhu Viswanathan, Steve Zahos

SUMMARY
The ADM Institute will provide financial support to fund certain joint efforts between teams of students in the Agricultural and Biological Engineering (ABE) senior design Industry-Linked Capstone course, ABE469, and the Supply Chain Management (SCM) program in Business Administration (BADM). The intent is to develop practical and workable solutions to the problems being addressed by the ADM Institute by engaging students in these two programs in a multidisciplinary team experience. The time horizon for the efforts described herein is the spring semester of 2012. Pending evaluation of the findings resulting from two initial phases of activities, an expanded proposal will be prepared to implement a major joint design and business case effort that will begin in fall 2012. The initial focus will be on India. Engagement with students and faculty at agricultural universities in India will be cultivated.

DISCUSSION
In the first phase it is proposed that Steve Zahos, Senior Design Capstone Coordinator in ABE, attend the 46th Annual Convention of the Indian Society of Agricultural Engineers (ISAE) February 27-29, 2012 at G. B. Pant University in Pantnagar, India, for the purpose of making initial contacts with potential collaborators on the senior design project work. Some support for his expenses will be available from ABE469 education enhancement funds.

The second exploratory phase will be the sending of a team of students from the Supply Chain Management Program and ABE to India for a 10-day trip over spring break in March. The team will be accompanied by Professor Palekar, Associate Professor and Director of the SCM program, College of Business. There will be two students from ABE and a maximum of 8 students from the SCM program. One ABE student will be enrolled in the senior design course in the spring semester 2012 and one will be enrolling in the precursor course ABE430 in Fall 2012 and senior design in spring 2013. THE SCM students will range from sophomores to seniors. The cost for each participant is expected to be approximately $3,500 plus incidentals. A $500 Wertz scholarship is available for each student. In addition, the ABE students will have support through IPENG and the College of ACES. The exact amount of this support is not known yet. A very limited amount of partial support for the SCM students may also be available through SCM program funds. We would like to limit the out-of-pocket cost to each student to be around $1,000 but no more than $1500.

This exploratory trip will provide initial first-hand impressions, problem definitions and ideas for addressing the needs in the post-harvest supply chain. The initial trip will also help us devise a more concrete plan for future practicum/senior design activities in conjunction with the ADM Institute. It is believed that plan will facilitate the process for finding solutions with continuity of participants and best leverage the assets being supported.
Engineering Sustainable Solutions to Postharvest Loss

An interdisciplinary team led by Civil and Environmental Engineering Associate Professor Ximing Cai and comprised of students from Construction Management, Transportation, Construction Materials, and Hydrology and Hydraulic Engineering recently completed a literature review summarizing the concept of PHL, identifying current techniques to reduce PHL, and highlighting important gaps in existing PHL research.

The concept of PHL is summarized by the engineering team in terms of decrease in quantity by weight as well as the reduction in product quality from harvest to consumption. The team found that existing literature tends to emphasize quantitative loss in the context of developing countries; while loss due to product quality, which affects nutritive/caloric composition, acceptability to the consumer, and the edibility of a product, tends to be more prevalent in developed countries.

Stages of the supply chain identified in existing research on PHL indicate the potential for staggering levels of loss. The following table outlines recently published information on loss estimates for the Asia Pacific Region.

Internal and external factors leading to PHL are highlighted in the literature review. Broad areas encompassing internal factors are included in Table 1. Specific internal factors include handling at harvest; drying and transport; storage; primary processing (cleaning, classification, de-hulling, pounding, grinding, packaging, soaking, winnowing, drying, sieving, milling); secondary processing (mixing, cooking, frying, molding, cutting, extrusion); product evaluation and quality control; packaging; marketing and distribution; and consumer and post-consumer waste and disposal of food.

External factors identified in the literature include environmental factors such as climatic conditions (wind, humidity, rainfall and temperature) that contribute to loss by in-field falling as well as damage from mold and fungus, pests such as insects and rodents which contribute not only to quantity loss but also to quality loss through contamination. Other external factors include consumer intolerance of substandard foods, and socio-economic factors such as urbanization and increasing household affluence, which leads to a reduction of farm labor force and an increase in consumption of perishable commodities such as meat and produce by urban consumers. (continued)
Engineering Sustainable Solutions to Postharvest Loss (cont’d)

High impact measures to reduce PHL are summarized in the literature review with a focus on those most important to developing countries. Examples of these measures include considerably greater investment in formal markets to improve infrastructure and the capacity of agro-food supply chains, and a shift to the use of indigenous crops that are more suited to the local climate.

Implementing sustainable solutions through the entire food supply chain, as highlighted in the research, is crucial to the realization of a meaningful reduction in PHL. This will require large-scale investment in agriculture infrastructure, technology skills and knowledge, storage, transport, and distribution. A consideration of socio-economic factors, such as changes in demand in developing countries from a market based on starchy foods to one that depends more on meat and perishable produce, is also important to the sustainable reduction of PHL.

An integrated, sustainable, and resilient supply chain emerged as a critical missing component in the overall reduction of PHL over the course of the literature review process. Though biological and environmental factors, which contribute to PHL, are well understood and several technologies have been developed to reduce loss, the team discovered that other factors have inhibited progress. As current research indicates, inadequate marketing systems and transportation facilities, governmental regulation and legislation, unavailability of tools and equipment, lack of information, and poor maintenance of facilities and warehouses have hindered attempts to apply available knowledge and technology in the prevention of PHL.

(continued)

Civil and Environmental Engineering Literature Review Team

Pictured L-R: Yun Bai, Moatassem Abdullah, and Michelle Miro.

Not pictured: John Michel, Ahmed Abdelmohsen, Ximing Cai
Areas in which further research is needed include the benefits of pre-cooling technology and its effect on PHL; how improvements to the supply chain, such as on-farm technologies, central storage, vehicles and transport in Brazil, Russia, India and China would affect PHL; and additional comprehensive studies on PHL loss for a single commodity supply chain or for the supply chain in a single country.

Important research areas and related questions highlighted by the team include:

- **Strategic supply chain design:** How do we increase the reliability of supply chain design considering probabilistic characteristics of external factors such as adverse weather conditions, storage/processing facility failures, insect pests, and transportation infrastructure failure?
- **Harvest:** How can farmers better predict optimal harvest time?
- **Handling:** How can contamination and damage be reduced in processing?
- **Storage:** How can storage structures better withstand negative environmental effects, and how can bio-deterioration in storage be reduced?
- **Transportation:** What is the optimum transportation method and network to reduce post-harvest loss while minimizing cost of technologies?
Monitoring Carbon Dioxide in Storage

A team of graduate students working under the direction of Steven Eckhoff, Professor of Agricultural and Biological Engineering, and Lynford Goddard, Assistant Professor of Electrical and Computer Engineering, are developing a low-cost laser-powered fiber optic sensor designed to measure levels of carbon dioxide (CO₂) in grain storage bins.

The presence of elevated CO₂ levels in grain storage facilities is commonly the result of respiration by insects and microbial life forms such as mold and fungus, which can cause significant loss in grain weight and quality. The presence of fungus can also lead to the generation of mycotoxins, toxic metabolites which cause serious health problems in consumers.

The common approach to monitoring grain in storage for the presence of insects and microbial life is the use of thermal cables in order to detect increases in temperature, which results from insect and microbial respiration. However, this method is limited by the low thermal diffusivity of bulk grain.

Temperature measurement alone is not sufficient for effectively detecting insect and microbe respiration due to infestation, which is a major problem in tropical regions. Recent research has found that monitoring the head space of a bin with a CO₂ sensor can lead to earlier detection of microbial or insect degradation of the grain. However, the system only gives an average concentration that is complicated by convective mass transfer in the head space. Ideally, a sensor system would give a spatial indication of where deterioration is occurring.

(continued)
In order to determine the accuracy of imbedded CO$_2$ sensors relative to thermal sensors, the engineering team conducted tests with commercially available battery operated wireless CO$_2$ sensors in a mock storage bin of 0.3 meters in diameter and 3.4 meters in height. The storage bin was filled with eight bushels of corn (448 pounds), and sensors were placed in the center of the bin at depths of 1.2 and 2.4 meters as well as at the bottom and the top of the bin.

A known concentration of CO$_2$ was injected into the center of the bin at a height of 0.6 meters, and a thermal-resistance was placed at the same location to generate heat. CO$_2$ readings were collected wirelessly, and thermal couples were installed to monitor temperature changes in the grain storage bin. The results of this study confirmed that CO$_2$ measurements were more effective than thermal sensing in indirectly detecting spoilage.

While wireless CO$_2$ monitoring systems are commercially available, the high cost of these devices prohibits smallholder and marginal farmers from investing in such technology. In addition, the transmission range of currently available CO$_2$ monitoring systems installed inside the grain bin may restrict their usage to surface or near-surface measurements.

The experiment outlined will be repeated with a laser-based fiber optic CO$_2$ sensor developed by the Illinois engineering team to determine how accurately it measures CO$_2$ levels in comparison with commercially available devices.

This new sensor, which is nine inches in length with a diameter of nine millimeters, is constructed with two internal lenses and a fiber cable adapter on each end. The sensor is pulled to various locations inside the grain bin using the fiber tether, providing a spatial indication of where deterioration is occurring. This sensor is designed to sweep through the light absorption range of CO$_2$ in order to more accurately detect concentration and diffusion.

(continued)
Monitoring Carbon Dioxide in Storage (cont’d)

A separate reference cell filled with CO₂ is placed outside the bin and allows the operator to determine when the laser reaches an intensity level at which light will be absorbed by CO₂.

The research team’s objective is to develop low-cost embedded sensors that can map out regions of insect or microbial activity inside grain bins by quantifying the local concentration of CO₂. It will be possible to collocate these CO₂ sensors with temperature sensors in most applications. Microbial and insect respiration can be monitored via changes in CO₂ concentration over time and location.

Expected outcomes from development of the CO₂ sensor include providing a lower cost option for smallholder and marginal farmers, reducing PHL due to insect and microbe infestation, and reducing health risk to consumers from mycotoxins produced by fungus.

*Graphic of the device created by the team of graduate students working under the direction of Steven Eckhoff, Professor of Agricultural and Biological Engineering, and Lynford Goddard, Assistant Professor of Electrical and Computer Engineering.*
Outreach

The ADM Institute is strategic in advancing its mission, vision, and goals in an effort to reduce postharvest loss. Participating in conferences and symposiums, producing and publishing news articles and research papers, and maintaining a robust website are some of the ways in which the messages, brand and image of the Institute are promoted. Examples of these types of outreach activities are included in this section with selected news media announcements about the Institute.

- Conferences and Symposia
- Press
- Publications
- PHL in the News
- Periodic Reports
- Website
CONFERENCES AND SYMPOSIUMS

2011
- Innovative Solutions for Reducing Post Harvest Losses, World Bank invited presentation, Washington, DC
- Opportunities for Innovation in Indian Agriculture Sector, Plenary address and symposium co-sponsor with Indian Consul in Chicago

2012
- Keynote address and sponsor of symposium session on postharvest loss at the Indian Society of Agricultural Engineering Annual Convention and International Symposium, Pantnagar, India
- Plenary address at the 22nd Annual World Forum of the International Food and Agribusiness Management Association, Shanghai, China
- Keynote address; Annual meeting of the Brazilian Agricultural Engineering Society
Postharvest Loss Institute focusing on cutting waste

By TIM ALEXANDER
Illinois Correspondent

The University of Illinois’ new ADM (Archer Daniels Midland Co.) Institute for the Prevention of Postharvest Loss, established with a $10 million grant from the company, will focus its initial efforts towards reducing world hunger in India and Brazil, according to Steven Sonka, Uol professor of agricultural management.

“(ADM’s) gift is a very large and generous gift, and the problem is enormous,” said Sonka, reflecting on the challenge the fledgling enterprise faces in identifying and reducing causes of postharvest losses that measure millions of metric tons of grains and oilseeds each year to pests, disease, mishandling and other factors.

With global population expected to reach 9.2 billion by 2050, preserving more of the Earth’s bounty of crops is fundamental to feeding the world, according to Patricia A. Woertz, ADM chair, CEO and president.

“This institute will help farmers around the world through training, tools and technologies that can help eliminate pests and disease, enable more efficient grain storage and handling, prevent soiloa and improve crop quality overall,” she stated. The initiative, announced Feb. 20, is funded through the “Strong Roots” branch of the company’s “ADM Cares” program, a corporate social investment initiative which examines problems and solutions pertaining to global agriculture.

“ADM leadership has publicly noted that postharvest waste is at high levels in some crops and in some countries. If we can reduce the waste, it will provide more food,” said Sonka.

Institute members will be added in the coming weeks, though their initial agenda is already defined.

“In particular, this institute will focus on staple crops such as corn, soybeans and wheat. We will be working with small-holder agriculture, not giant agricultural combines. We’ll be looking in developing countries, particularly where a lot of harvesting is done by hand,” Sonka explained.

“We have selected India and Brazil as our first targets because of their importance in terms of having large, small-holder agriculture segments and also because we have existing ties we will draw from.”
The next few months will be devoted to studying past data and crafting a more well-defined mission statement before the Institute begins fieldwork as early as in the fall, Sonka said. Foremost experts in their fields employed by several departments of the university will spearhead the research.

“We have faculty from our College of ACES (Agricultural, Consumer and Environmental Sciences), our College of Business and College of Engineering (involved),” Sonka said.

“This is a global problem, but the characteristics are very local. Postharvest waste depends on socioeconomics but also climatic conditions. Our goal is to contribute to the more rapid identification and implementation of approaches that will help to reduce postharvest loss. Methods and processes are at the heart of this, and we hope to contribute to developing improved and appropriate methods and processes.”

K.C. Ting, head of U of I’s Department of Agricultural and Biological Engineering for the College of ACES, said reducing crop waste in developing countries relies on site-specific approaches.

“We need to find the appropriate technologies for developing countries. Many of our solutions to these problems are technology- and facility-sensitive, but in developing countries you have to provide solutions that match the local environment,” according to Ting. “The real challenge is to address and solve their problems in a way, and at a cost, that can be delivered to those producers within their infrastructure.”
ADM, U of Ill. start new food-waste research

By DAVID MERCER, Associated Press
Wed Jan 19, 5:58 pm ET

URBANA, Ill. – Farmers in Argentina have found that simply using jumbo plastic bags can help protect their harvested corn from the elements before it's sold and heads for processing.

Measures like that — which could cut down on the millions of pounds of grain that spoil or otherwise go to waste each year — will be the focus of a new effort at the University of Illinois to find ways to help feed the developing world.

Archer Daniels Midland CEO Patricia Woertz and university officials announced plans Wednesday for the new ADM Institute for the Prevention of Postharvest Loss at the university's campus in Urbana. ADM plans to spend $10 million over the next five years on the effort.

"There are existing technologies today that we know are not being implemented in developing countries," University Vice Chancellor Steve Sonka, who will lead the institute, said in an interview. "We need to know why."

The United Nations estimates that 10 to 15 percent or perhaps more of the world's grain goes to waste each year. At the same time, roughly a billion people around the world don't have enough to eat — ADM cited University of Illinois research that indicates the wheat and rice lost around the world in 2007 could have fed about 380 million people.

"Clearly, preserving what is already grown is fundamental to feeding the world, and to making the most of the land, water, energy and other inputs already used to grow crops," said Woertz.

ADM, based 50 miles southwest of the university in Decatur, is one of the largest processors of corn, soybeans and other grains in the world.

The new institute will start work by trying to find and develop easy-to-use technologies like the corn bags in Argentina, studying why they're not being used in the developing world and figuring out to put them to work there, Sonka said.

"What's being done and what are the impediments?" Sonka said. "Just assessing the current situation in a rigorous fashion."
ADM, U of Ill. start new food-waste research (continued)

Then he anticipates using the money to put researchers to work and getting the technology to the farmers and others who can put it to use. He isn't sure how many people he will need.

The institute also plans to work with similar efforts at schools like the University of California-Davis, where research focuses on wasted fruits and vegetables, Sonka said. He also hopes to work with government agencies and other groups around the world.

While ADM's commitment to the institute lasts five years — at $2 million a year — Sonka hopes the work attracts attention and funding from governments and other companies.

"We believe this is a topic that has legs," he said.
ADM funds new postharvest institute

Archer Daniels Midland Co. announced a $10 million grant to establish the ADM Institute for the Prevention of Postharvest Loss at the UI. The global institute will work with farmers in the developing world to help preserve millions of metric tons of grains and oilseeds lost each year to pests, disease, mishandling and other factors.

“By the year 2050, global population is expected to reach 9.2 billion, and the demand for agricultural products is expected to double,” said Patricia A. Woertz, ADM chairman, CEO and president. “Clearly, preserving what is already grown is fundamental to feeding the world. This institute will help farmers around the world through training, tools and technologies that can help eliminate pests and disease, enable more efficient grain storage and handling, prevent spoilage, and improve crop quality overall.”

Steve Sonka, vice chancellor for public engagement, will serve as the global institute’s faculty director.

“ADM’s widely recognized expertise in crop storage, transportation and handling will no doubt prove valuable to our global institute as we work to advance the real-world applicability of promising research findings,” Sonka said.

Sonka will work with researchers in the College of Agricultural, Consumer and Environmental Sciences and in other colleges to develop research projects to solve postharvest problems.

The department of agricultural and biological engineering is one of the units in ACES and the College of Engineering that will work closely with the new institute. K.C. Tng, the head of the department, said: “We need to find the appropriate technologies for developing countries. Many of our solutions to these problems are technology and facility intensive, but in developing countries you have to provide solutions that match the local environment. The real challenge is to address and solve their problems in a way, and at a cost, that can be delivered to those producers within their infrastructure.”

The costs of feeding the world’s hungry will be addressed by researchers in the department of agricultural and consumer economics in ACES.

“Assessing the economic costs of quality and quantity losses along the relevant supply chains will be essential in developing low-cost sustainable solutions for improving handling, processing and storage,” said Paul Ellinger, a professor and the head of agricultural and consumer economics. “Economic feasibility assessment of viable solutions combined with training materials for producers and handlers will also be essential to maintain sustainable outcomes.”

Funding for the new institute will be provided by ADM Cares, a corporate social-investment program.

Julia Bello-Bravo, University of Illinois at Urbana Champaign, Illinois, USA; Francisco Seufferheld, University of Illinois at Urbana Champaign, Illinois, USA; Laura D. Steele, University of Illinois at Urbana Champaign, Illinois, USA; Tolulope A. Agunbiade, University of Illinois at Urbana Champaign, Illinois, USA; Daniel Guillot, Universidad Nacional de Cuyo, Mendoza, Argentina; German Cutz, University of Connecticut, Connecticut, USA; Barry R. Pittendrigh, University of Illinois at Urbana Champaign, Illinois, USA.

The Institute will publish a Compendium Report in the coming months. The report is in the editing phase.
Beginning in July 2011, the Institute has produced and disseminated an electronic news update called *Postharvest in the News*. "In the News" is published weekly and contains recent PHL information from newspapers, blogs, websites and other media. It is published online and disseminated to a broad audience via email. This is the most recent “In the News”. 
The Institute has published three Periodic Reports available at http://postharvestinstitute.illinois.edu/reports.html. Below is the first page of the February 2012 issue.
Website

The ADM Institute for the Prevention of Postharvest Loss website is informational, robust and current. The website is updated weekly with newsletters, current events and research developments. Following are screenshots of sections of the website.
Issues

The World Bank issued an updated poverty brief (August 2009) which estimated that in 2004 there were 1.4 billion people living below the international poverty line - defined as US$1.25 per day. At these poverty levels, the reality for addressing hunger will focus on staple crops that provide key energy and protein requirements. Wheat, corn and rice are staple crops that provide 60% of the world’s food energy intake, according to FAO. Oils and seeds are also an important source of energy in the human diet. The focus of research efforts internationally on postharvest loss prevention for corn, wheat and oils and seeds are based on two key elements:

1. Impacting broader societal issues requires a focus on staple crops that serve as the primary nutritional sources to meet energy and protein requirements for low income populations; and
2. Postharvest loss in developing countries is much higher than in the US; investment in reducing crop losses internationally would have a much greater impact on efforts to reduce hunger than investment in reducing domestic losses.

Given the large quantity of these staple crops produced globally, reductions in postharvest loss can significantly increase available supplies. The Institute will leverage this prior research while assessing current postharvest loss challenges in Brazil and India, and also explore opportunities for utilizing advances in technology. Faculty at Illinois will bring their knowledge of these crops and relevant supply chains to the Center and expand research efforts through key partnerships with both U.S. and international universities, NGOs and government. ADM has extensive expertise in these crops, and leveraging existing and developing partnerships in India and Brazil will allow for more timely advances in assessments and research efforts.

Research

Current Research Updates

Department of Agricultural and Biological Engineering
Steve Eckhoff, Grace Danao and K.C. Ting

The Department of Agricultural and Biological Engineering (ABE) is currently in the process of compiling and assessing relevant literature on the severity of the postharvest losses in the target countries and on the costs of newer storage, handling technology. A wiki site was set up to allow researchers access to an online database of information and the resources that have been identified thus far are also available on the ADM Institute for the Prevention of Postharvest Loss website. During the spring 2011 semester, ABE graduate student Ning Wang worked with the Institute and with other graduate students to compile relevant data. ABE plans to distribute a white paper on their findings in fall 2011. ABE is also in the process of identifying potential partners in the targeted countries.

Department of Agricultural and Biological Engineering
Steve Eckhoff

and

Department of Electrical and Computer Engineering
Lynford Goddard

Steven Eckhoff and Lynford Goddard are working on a project titled “Distributed Wireless Monitoring of Carbon Dioxide Concentrations in GrainBins.” The goal is to develop low-cost wireless sensors that can map out the local concentration of carbon dioxide (CO2) in large volume grain bins. Microbial respiration can thereby be monitored via changes in the CO2 concentration over time. The sensors will be slightly larger than the size of a corn kernel and able to be mass manufactured at a relatively low cost per individual sensor. The low cost and recoverability of the sensors will enable farmers and elevator manager to randomly distribute a hundred or more such sensors directly in the bin’s interior during bin filling for local distributed sensing.
Resources

Below are links to categories within the master list of all postharvest loss resource material collected. More information coming soon.

- Literature
- Databases
- Tools
- Projects
- Videos
- Events

Outreach

Presentations

"Opportunities for Innovation in Indian Agriculture Sector"
October 4, 2011. Presentation given at in Chicago, IL, by Steve Sonka (PPT)

This event highlighted recent and potential innovations in production practices, efficient use of water, farm financing, minimizing post harvest loss, and Indian food systems. Speakers and panelists included representatives from various agencies of the Government of India, researchers and faculty from the University of Illinois and Michigan State University, and corporate representatives from major agricultural and technology firms in the US and India.

"Innovative Solutions for Reducing Post Harvest Losses"
September 20, 2011. Presented at the World Bank by Pradeep Khanna (PPT)

This presentation was given at the conference titled "Improving Food Security by Reducing Post-Harvest Losses" held at the World Bank. The conference was hosted by The Partnership to Cut Hunger and Poverty in Africa and Agriculture and Rural Development Department of the World Bank, in collaboration with Abt Associates, Inc. and GrainPro.

Article Related to the ADM Institute

The ADM Institute held the first External Advisory Board Meeting on February 6, 2012. This section lists the members and agenda for the meeting.

**External Advisory Board Members**

- **Chair** Robert Easter  
  Former Chancellor, University of Illinois
- Usha Barwale-Zehr  
  Chief Technology Officer, Mahyco Seeds
- Carlos Campabadal  
  Grain Industry Consultant, Asociación Americana Soys-IM
- Ashok Gulati  
  Chairman, Commission for Agricultural Costs and Prices, Ministry of Agriculture, Government of India
- Hans Joehr  
  Corporate Head of Agriculture, Nestle
- Dirk Maier  
  Professor and Head, Department of Grain Science and Industry, Kansas State University
- Domingo Lastra  
  Vice President, Business Growth, Archer Daniels Midland Company
- Kent Miller  
  Director, Global Strategic Quality, John Deere
- Steve Mills  
  Sr. Executive Vice President, Archer Daniels Midland Company
- Arlene Mitchell  
  Deputy Director, Agricultural Development/Access and Market Systems, Bill & Melinda Gates Foundation
- Daniel Queiroz  
  Department of Agricultural Engineering, Universidade Federal de Viçosa
ADM Institute for the Prevention of Postharvest Loss
External Advisory Board Meeting
(February 6 - 7, 2012 ~ Union League Club, Chicago Illinois)

Agenda

**Monday, February 6th**  Union League Room on the 5th floor (Also referred to as the boardroom)
10:00  Convene/Introductions
10:30  Rationale for PHL Institute; ADM perspective
11:00  What do we know about PHL today?
12:00  Group lunch in Union League Club
1:00  Group discussion of post harvest loss issues
     Board members share thoughts first
     Discussion among entire group
2:00  Overview of ADM Institute progress to date
     *In this session we will have a mix of presentations and discussion until 4:15
     (We will take a 20 minute break around 3:00 pm)
     Organization development activities conducted in 2011
     Case study efforts in India
     Mato Grosso soybeans and Aprosoja (Goldsmith)
     Presentation of seven research projects recently funded
     *For each project, we will have a short video with a project Principal Investigator, followed by
     discussion led by a Steering Committee member

Additional activities/initiatives

Undergrad practicum projects in India
Brainstorming session with similar US Land-Grants, fall 2012
Community of Practice effort in Africa
Agricultural Innovation in India
     Chicago conference, October 2011
     Delhi conference, fall 2012
Conference presentations
     Indian Society of Agricultural Engineers, Feb 2012
     Brazilian Society of Agricultural Engineers, July 2012
     Int’l Food and Agribusiness Management Association, June 2012
Other topics to be identified

4:15  Discussion of selected overarching concepts
     Resource scarcity
     World Economic Forum’s New Vision for Agriculture
     Innovation ecosystems

5:00  End of day

Dinner at restaurant outside of Union League Club, within walking distance of ULC
ADM Institute for the Prevention of Postharvest Loss
External Advisory Board Meeting
(February 6 - 7, 2012 ~ Union League Club, Chicago Illinois)

**Agenda—Day Two**

**Tuesday, February 7th**  Union League Room on the 5th floor
8:00   Key questions for the day
    Crafting the ADM Institute thought paper
    Collaborative opportunities that should be pursued in Months 14-36

8:15   The ADM Institute thought paper:
Given the overarching concepts and what we know about post harvest loss, what are the key points that should be included in section 3 of the paper, **Implications for the ADM Institute for the Prevention of Postharvest Loss**?

8:30   Breakout sessions
9:30   Larger group discussion of ideas
10:15  Break
10:35  Collaborative opportunities that should be pursued in Months 14 – 36
    High priority topics of opportunity across key dimensions
    Commodity type
    Geography
    Prospects for collaboration

11:30  Closing thoughts
12:00  Lunch in Union League Club