In 2015, the ADM Institute for the Prevention of Postharvest Loss at the University of Illinois Urbana-Champaign, in collaboration with USAID-funded Feed the Future Innovation Lab for the Reduction of Postharvest Loss program at Kansas State University, funds a rice value chain focused PHL reduction research project to Bangladesh Agricultural University (BAU), Mymensingh.

The project encompasses three main components: i) mycotoxin detection, ii) appropriate drying and storage technologies, and iii) gender issues in postharvest loss prevention.

The loss of rice grain or seed due to mycotoxins development is a major concern in Bangladesh, and there is a demand for establishing a national database on mycotoxins production in rice grains. Our work in Bangladesh will help in forming the database through conducting a baseline survey on mycotoxins development in Boro paddy. We have already established laboratory facilities to conduct research on detection and remediation of mycotoxins at Bangladesh Agricultural University.

A comprehensive study was conducted during Boro 2014-15 in two districts in Bangladesh, Jessore and Mymensingh. It was observed that both mold and insect infestation was higher in grains stored at high moisture content. About 25% of paddy samples were found with aflatoxin levels higher than recommended (20 ppb). Currently, BAU faculty members are working to collect more mycotoxin data and also investigating their aflatoxin stability on grains before and after milling and boiling.

Most of the postharvest losses of grain crops happen during the drying and storage operations. Farmers in Bangladesh experience huge losses of paddy due to delayed or improper drying caused by inadequate knowledge and drying facilities. It is necessary to adapt drying technologies for paddy at small scale traders and farmers’ level to reduce postharvest losses and produce high quality paddy seed. Team of researchers at BAU successfully modified and tested a low cost STR dryer (0.5 ton capacity) for paddy drying. The dryer was able to reduce moisture content of paddy from about 22% to 10% in 4-5 hours with drying efficiency of more than 70%. The dryer was also found to provide uniform heating, which is necessary to maintain grain quality. Considering the issue of electricity shortage, the dryer was also successfully tested to work with diesel generator. This dryer can be locally manufactured in less than $400, and has significant potential to be adopted by smallholders. Currently, the BAU team is working to scale up the STR dryer at farm fields in Jessore and Mymensingh.

Like other developing countries, rice grains are mostly stored in porous gunny bags/sacs in Bangladesh. The most common traditional storage technologies used by the farmers were Gola, Dole, Motka, Dhari, Gunny/Plastic bag or sacks in Bangladesh. Under hot and humid weather, rice
A research team from various departments of the University of Illinois and three universities in Brazil (Universidade Federal de Viçosa, Universidade Federal de Goiás, and Federal University of Mato Grosso) are working on the research project “Measurement and Documentation of Brazilian Postharvest Loss”, funded by the ADM Institute.

During the first phase of the project, research activities were focused on determining the extent and economic cost of grain losses at three stages of the supply chain – harvest, transportation, and storage in the Mato Grosso and Goiás states in Brazil. A comprehensive study was conducted to estimate the harvesting losses during combine harvesting of corn and soybean. Eight and 11 different combines were tested for estimating losses during soybean and corn harvesting, respectively, in the states of Goiás and Mato Grosso. The combine losses for soybean ranged from 47.4 to 260.5 kg/ha (1.2% to 5.5% of yield), with header loss as the primary contributor.

In the case of corn, total combine losses ranged from 36.2 to 320.6 kg/ha (0.3% to 3.6% of yield). It was concluded that combine harvesting at high moisture (more than 14%) and at low combine ground speed can reduce shattering and stubble losses in soybean, two biggest losses during the harvesting. The careful operation (making needed adjustments) of combine by the operator can save about 2 bags/ha of soybean (operator hourly value of USD $238 to $277/h). As the part of the project, grain monitoring probes were developed to measure logistical aspects of grain handling and transportation conditions (temperature, relative humidity, and carbon dioxide levels resulting from grain respiration), and GPS data will be used to describe grain trailer and handling conditions, such as loading, transit, unloading, and waiting times at the farm and at storage facility. This data, along with harvest moisture content and grain classification, can be used to ascertain inefficient handling and transportation practices that lead to postharvest losses and recommendations for reducing these losses.

Field experiment involving storing high moisture soybeans in hermetic silo bags for three weeks at a farm in Sinop, Mato Grosso showed no reduction in soybean quality metrics from using this temporary storage in silo bags. An extension publication demonstrating temporary storage of corn, wheat, and soybeans in silo bags has been planned. The publication will be bilingual (Portuguese, English) or two versions will be produced.

A grain respiration measurement system was designed, fabricated and tested with low moisture soybeans. Experiments have been conducted to measure dry matter loss rates of soybeans over a wide range of moisture contents and temperatures - we anticipate experiments will be completed by December 2016 and data analyses and thesis will be completed by August 2017. Development of a grain monitoring probe to measure temperature, relative humidity, carbon dioxide levels and logistical information during handling and transportation of soybeans has been completed.

Researchers at Bangladesh Agricultural University hosted a workshop to discuss the project in September 2016. The picture at right is from the invitation.