

Postharvest Management Through IRRI Rice Postharvest Technologies

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Yangon, Myanmar

Presentation Outline

- Background on IRRI and Postharvest Unit
- Why is Postharvest Important?
- Leveling
- Harvesting
- Drying
- Storage
- Rice Quality
- Learning Alliance
- IRRI Rice Postharvest Activities in Myanmar

International Rice Research Institute

Los Baños, Philippines

Mission

Reduce poverty
and hunger,

Improve the
health of rice
farmers and
consumers,

Ensure
environmental
sustainability

Through
research
partnerships



Home of the Green Revolution

**Established in 1960 by the Ford and
Rockefeller Foundations**

IRRI's Postharvest Projects Framework

“Preventing losses and ensuring quality harvest for a better quality of life”

Goals

- *Contribute to food security*
- *Poverty reduction through value adding*

Objectives

- *Reduction of postharvest losses.*
- *Increasing farmers' incomes.*
- *Strengthening public and private extension systems.*
- *Policy dialogue for sustainable PH sector development*

Why is Postharvest (PH) important?



Losses during PH operations

- *Physical losses: 15—20% in SE Asia*
- *Quality losses (20-30%)*



Rice is a living product

- *Rice quality is best at harvest,*
- *Quality deteriorates over time if not properly handled*



Losses due to labour shortage

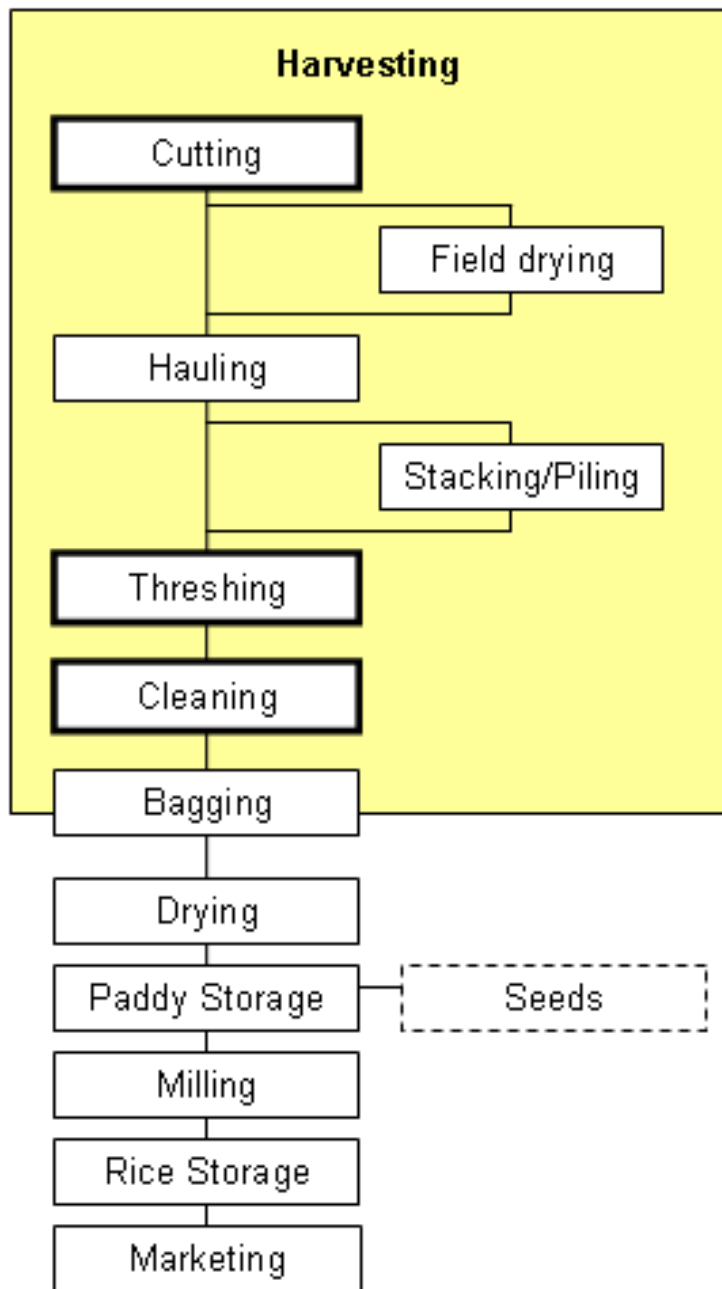
- *High cost of PH operations*
- *Delays in PH operations*



Best PH management practice

- *Minimized losses*
- *Maintained quality*
- *Reduced cost*

Post Production System



Postharvest Chain

To minimize losses along the PH chain rice must be...

- Harvested at the right time
- Threshed in the correct manner
 - Dried properly
 - Cleaned properly
- Stored and maintained properly
 - Milled efficiently

Benefits of leveling

- Increase crop yields-15%
- Water saving- 10%
- Reduction in weeds-40% in rainfed rice
- Improved timeliness of plowing, planting and harvest
- Improved uniformity of crop



4-wheel Tractor With a Laser Controlled Bucket

- The use of laser controlled equipment results in a much more level field
- 50% better than leveling using other techniques
- Demonstrated with PPDG in Myanmar in 2006, more trainings planned
- Usage: as a leveling service



Harvesting

Issues

- Harvesting losses
- Delays in operations
- Labour cost



When to harvest

Harvest rice when:

- 20-25% grain moisture
- 80-85% straw colored and
- the grains in the lower part of the panicle are in the hard dough stage
- 30 days after flowering



Mechanical reaping

Capacity: 2-4 ha/d

Advantages

- *Fast cutting*

Problems

- *Places crop in windrow back in the field*
- *Problem with lodged crop*
- *Complex cutter bar and conveying mechanism*



Combine harvesting

Features

- *Capacity: 1, 4-8 ha/day*
- *Combines cutting, threshing, cleaning and hauling*
- *Tracks for mobility in wet fields*

Advantages

- *High capacity*
- *Low total harvest losses*

Disadvantages

- *Requires relatively large field sizes*
- *Problem in terraced fields*



Threshing

Issues

- Threshing losses
- Delays in operations
- Labour cost



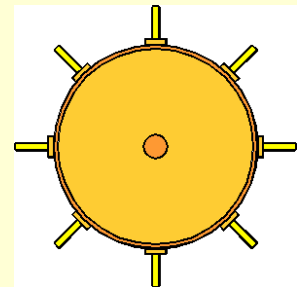
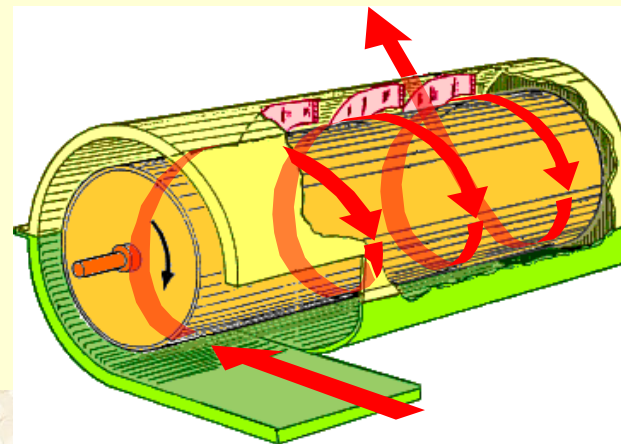
Axial-flow thresher

Capacity: 0.3-3t/h

- Threshing through impact
- Large range of sizes available
- With or without cleaner
- Truck mounted units

Advantages

- *Can thresh wet crop*
- *Compact*



**Peg tooth
threshing drum**

Cleaning and Grading



Issues

- Storage pests
- Energy needed
- Price/value addition

Oscillating Cleaner

Combination of fan and
oscillating sieves

Air delivered by fan
removes lighter
materials

Top sieves with large
holes remove larger
straw particles

Bottom sieves with
smaller holes remove
small seeds (e.g. weed
seeds)



Dirty



Clean



Drying

Rice is harvested at 20% - 25% MC

Quality deterioration starts immediately after harvest

The wetter the grain the faster the loss of quality

Different MC for different purposes



Tips for better sundrying

Management

- *Layer depth of 4 cm*
- *Mixing every 30 minutes*
- *Monitor moisture content*
- *Monitor temperature*

Protection

- *Cover the grain when temperature rise above 50-60°C*
- *Cover during rain.*
- *Prevent contamination*
- *keep animals off the grain*



Use tools to improve sundrying

Low-cost seed dryer

Capacity	100-250 kg
Price	US\$ 150-200
Drying time	6-9h (initial MC of 22%)
Grain Quality	Good seed quality
Heater	Drying air temperature: 43°C Rice hull stove, 1-1.5 kg rice hull/h
Fan	Centrifugal fan, 3200 rpm 0.11 m ³ /s Electric motor, 220W
Advantage	Simple design, can be locally made, affordable, mobile
Disadvantage	Moisture gradient



Rice dryers in Myanmar

Features

- *Low cost (< US\$ 3,000 for dryer, blower, furnace)*
- *Increase head rice by 12–40% over sun-dried rice*
- *Minimizes physical loss (0.1%)*

Results

- **133** flat bed dryers installed, another 200 copies also built

Plans

- *New rice husk furnace with automatic feeding & ash removal*
- *Clean burning, low emissions (CO₂ neutral), no fly ash*



Results by 2012



Plans for 2013

Vietnamese type
Flat Bed Dryer transferred to
Myanmar, Lao, Cambodia



GRiSP Milestone 4.1.1.1. Dryers adapted to local conditions and produced in three countries.....

Myanmar

Partnerships for scaling out:

- Myanmar Rice and Paddy Traders Association - Extension
- Private manufacturer - Production
- Pioneer Postharvest Development Group (NGO) - Extension
- Myanmar Agricultural Services - Training



Outcomes:

- 133 Vietnam type dryers
- 200 copies (poorer performance)
- ~ 13,700 farmers used drying service
- ~ 5% higher income in dry season
- ~ 50% higher income in wet season
- 10,000 people trained on postharvest

Source: R. Flor, for publication

Need for follow-up:

- Introduce 2nd generation dryer
- Introduce improved rice husk furnace
- Capacity building in blower testing

Rice Storage

Issues

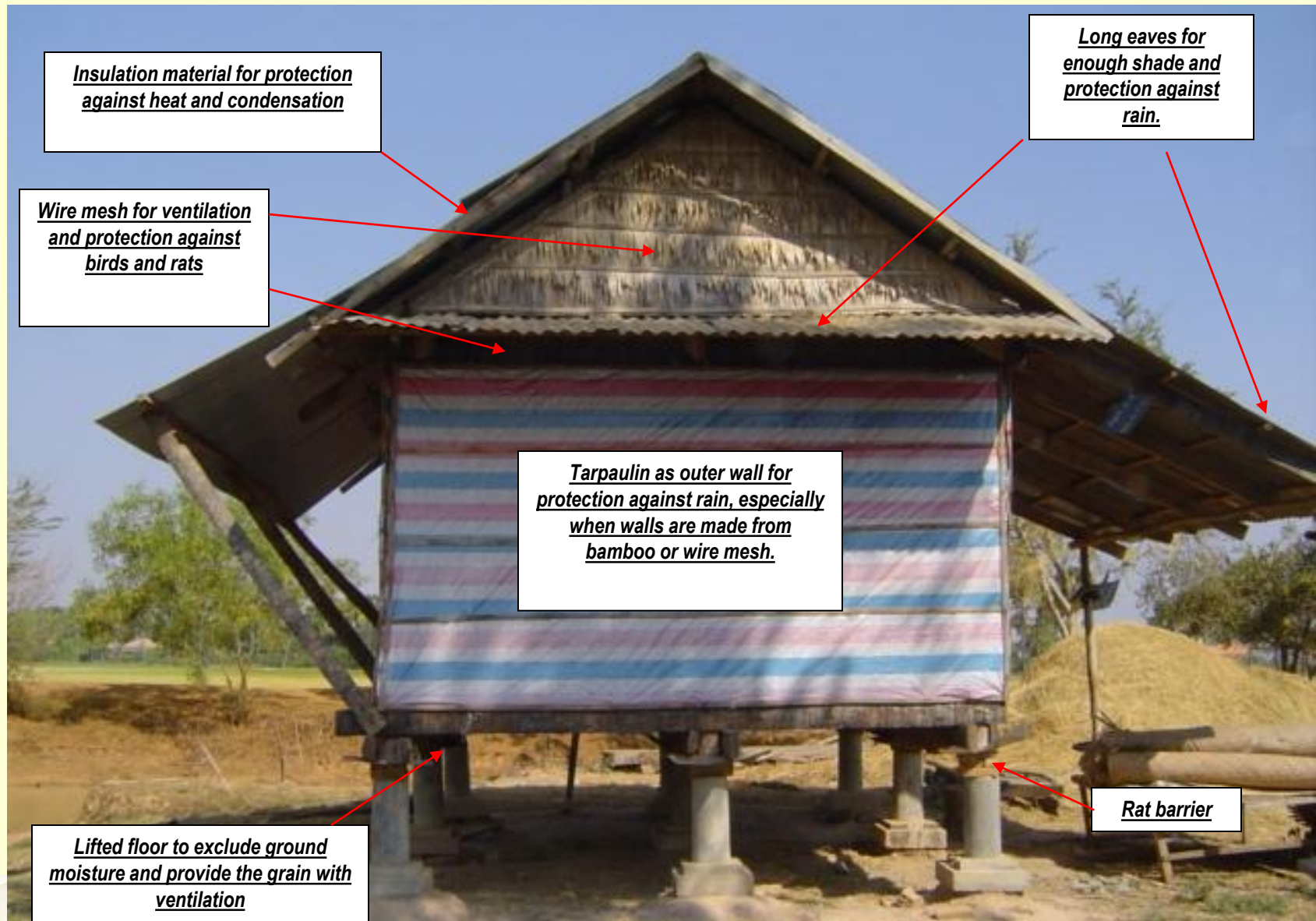
- Physical losses
 - Insects, birds, rodents
- Quality loss
 - Moisture adsorption
 - Discoloration, etc,



Storage Hygiene

- Keep storage areas clean.
- Clean storage rooms after they are emptied
- Placing rat-traps and barriers in drying and storage areas. Cats deter and help control rats and mice
- Inspect storage room regularly to keep it vermin proof.
- Inspect the stored seeds once a week for signs of insect infestation.

Granary improvements



Hermetic sealed storage systems



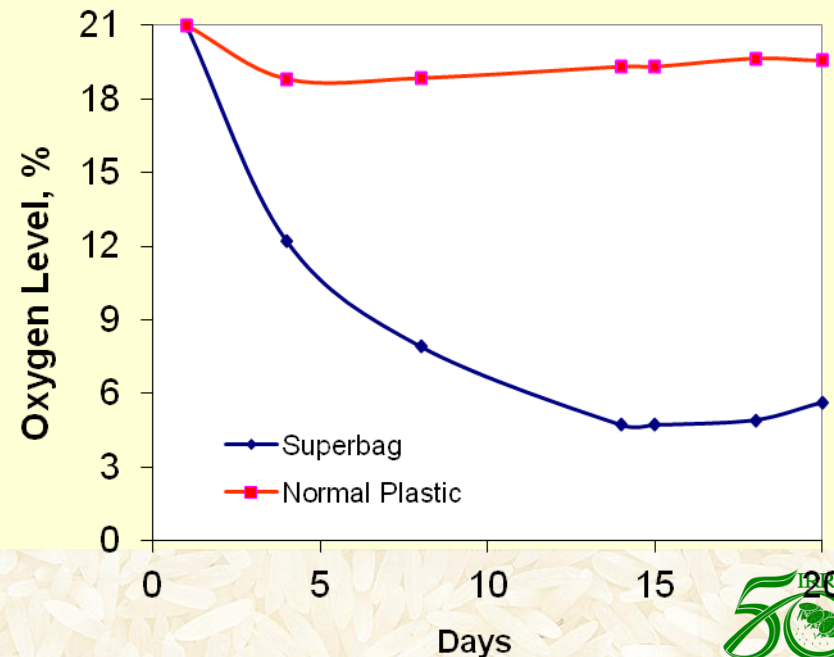
5 t Cocoon



50 kg "Super bag"

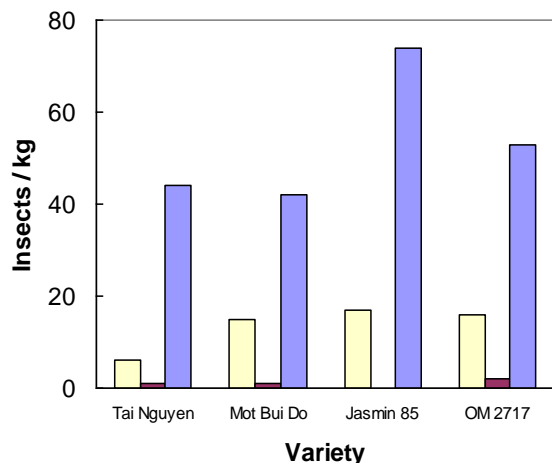
Principle

- Special plastic - low oxygen permeability
- Biological activity reduces oxygen level quickly
- Insects die at low oxygen level
- Plastic prevents moisture adsorption



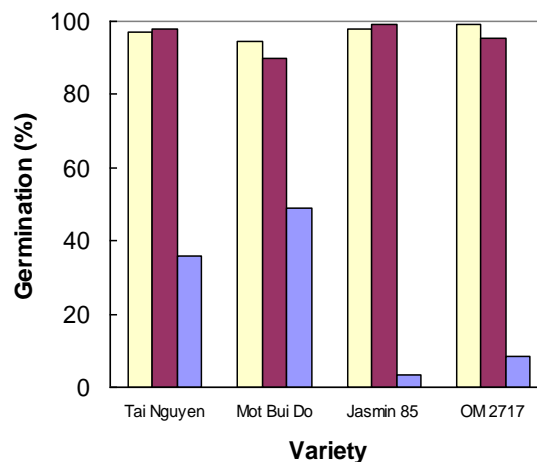
Benefits of Hermetic Storage

Insect control



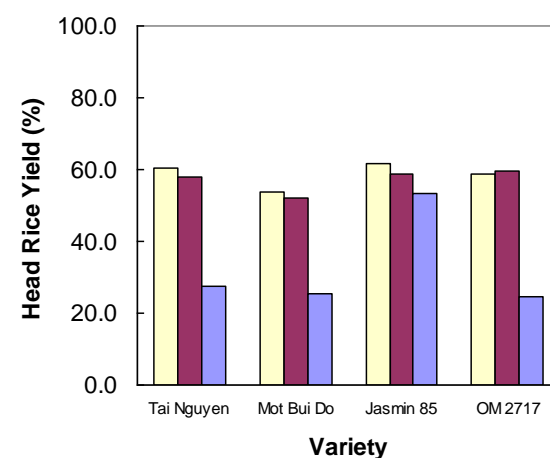
No pesticides / fumigation
(farmers often store inside the house to avoid theft)

High germination rates



Farmers in SE Asia use around 80% own seeds and use high seed rates to compensate for low germination -> **more grains to sell**

Higher milling returns



More grain to sell
Also controls moisture content -> protection from mycotoxins

Initial sample



After 8 months hermetic storage



After 8 months traditional storage

Rice Quality

Rice quality is a combination of physical and chemical characteristics based on user preference



Paddy quality



Seed quality



Milled rice quality

Physical Q. Chemical Q.

Rice Postharvest Quality Kit

Grain shape and size

Color

Chalkiness

Bulk density

Moisture content

Grain purity

Damaged & Immature grains



Learning Alliance

Philippines

- *Agusan del Norte*
- *Agusan del Sur*
- *Bohol*
- *Camarines Sur*
- *Activities in other sites (e.g. Rice husk furnace)*
- *Major focus: Hermetic storage verification, reversible flow dryer piloting*

Cambodia

- 6 Provinces: Battambang, Kampong Thom, Kampot, Prey Veng, Pursat and Takeo
- 10 villages each province
- Major focus: Business models for dryer, combine, hermetic storage

Vietnam

- 5 regions, several sites in each region
- Major focus: Documenting business models identified in previous phase

Cambodia Learning Alliance

- Conducted widespread PH training and village inception meetings in 44 villages in 6 provinces.
- Over 10,000 Super bags given out for farmers to trial.
- Identified support needs for contract combine harvesting as a business model.
- Piloted mechanical dryers with farmers, millers, seed companies.



Vietnam - Learning Alliance

5 regions:

- Region 1 (north): **hermetic storage services** w/ food processor partner
- Region 2 (north-central): **flatbed dryer** with farmer/seed grower
- Region 3 (central): Contract services for **laser leveling**
- Region 4 & 5 (Mekong) investigating proposed **joint-stock company** for integrated processing



Philippines

Postharvest Learning Alliance

- Piloting *hermetic storage* amongst seed growers and seed sellers.
- **4 Provinces:** Bohol, Camarines Sur, Agusan del Norte, Agusan del Sur
- Trainings on Postharvest Management
- *Hermetic storage trials* initiated (so actors learn about constraints, needs, and next steps).



Future Activities

- Assessment of and support to local thresher manufacturing industry, 2013
- Postharvest value chain assessments in project villages, 2013
- Establishment and facilitation of PH Learning Alliance

IRRI Rice Postharvest Management Activities in Myanmar

Improving livelihoods of rice-based
rural households in the lower region
of the Ayeyarwady delta

1. Training on Postharvest Management for Improved Quality of Rice Grain and Seeds

- Conducted in Bogale in November 5-7, 2012
- 42 participants (NGO, DoA, technicians, farmers, traders and millers)



Dr. Myo discusses the importance of measuring MC



Rice quality evaluation using the Postharvest Quality Kit



Flatbed dryer demonstration



Setting-up of 5-ton capacity hermetic storage cocoon



Visit to local rice mill



Awarding of Certificates



2. Set-up of Storage Trials Comparing Ordinary Bag, Pioneer Bag and IRRI Super Bag

- Conducted in two sites in Bogale on November 22-23, 2012
- Parameters tested were the following – weight, moisture content, insect count, discoloration and germination rate

How to use the IRRI Moisture Meter



GRET agronomist explains the digital weighing scale



Discussion on advantages of hermetic storage



Setting-up of the storage trials



Farmer U Han Aye poses with one of his storage trial bags



3. Set-up of storage trials and 1-ton capacity hermetic cocoon for pilot testing

- Conducted in Labutta on November 27, 2012
- Parameters tested were the following – weight, moisture content, insect count, discoloration and germination rate

How to use the Postharvest Quality Kit



Setting-up of the storage trials



Setting-up of the 1-ton capacity hermetic cocoon



Mercy Corps technician records weight of grains going into the cocoon



Sealing of the cocoon



Installation of rodent guards



Farmer U Tun Myint with IRRI staff and Mercy Corps field technicians



4. Future Activities

- Set-up 1-ton capacity hermetic cocoons in 3 townships by 2013
- Establish PH trials in 3 townships by 2014
- Establish supply chains for postharvest technologies in 2 townships by 2014

Acknowledgments

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GRET and Mercy Corps for the boats used to go to the sites in Bogale and Labutta

Rice
Science
for a Better
World

IRRI

