Scalable straw management options for improved farmer livelihoods, sustainability, and low environmental footprint in rice-based production systems

(Rice Straw Management Project)

An overview on the project presented during the Rice Straw Field Day

30 April 2016
Battambang, Cambodia
Rice residues in Asia

Annual production 2008:

- Rice straw: 
  \[
  \approx 623 \text{ Mt rice straw} \approx 125 \text{ Mt rice husk} \\
  \approx \text{ equal to paddy yield} \approx 20\% \text{ of paddy} \\
  \approx 300 \text{ Mt burned}
  \]

- Rice husks: centrally collected at the mills, already dry, easy to handle.

Rice straw:
- distributed over a large area, often still slightly green at harvest, often moist, difficult to handle.

Rice husks:
- centrally collected at the mills, already dry, easy to handle.
Combine harvesting, a game changer

Harvesting services

- Small rice combines with 2-2.5m cutting width, 4 ha/day, rubber tracks for mobility

Rapid adoption in SE Asia, by Dec 2014

- Vietnam: 8,000 – 10,000 units
- Cambodia: > 6,000 units
- Philippines: several hundred
- Indonesia: Rapid adoption on outer islands

Why do farmers adopt?

- Labor shortage
- Cost of traditional harvesting 250-280 US$/ha
- Timeliness, better quality, reduced losses

Chinese combine converted into bag carrier, Long An, Vietnam
Driven by labor shortage, high harvesting cost

- Rapid introduction of combines harvesters
- Straw left in the field
- Short turnaround times – lack of technologies for straw management
- Field burning increased
- In intensive systems 60-80% of straw burned

Some provinces in Cambodia and Vietnam now completely combine harvested
Straw Utilization

Problems

• Straw left in the field
  - Price increased from 20 to 80 US$/t in Vietnam in 2013

• Increased field burning of unused straw
  - 80% in Mekong Delta, Philippines
  - 40% in Red River Delta
  - 20% in India

• Negative impacts
  - Pollution, health issues
  - GHGE: CO₂, Methane, N₂O
  - Lost value adding opportunities

• Burning is banned, but
  - Weak implementation
  - No alternatives
  - No monetary incentives for non-burning

Field burning of straw (Photo: NLU, Vietnam)
Problem Analysis

Increased field burning of rice straw

- Low incomes from rice farming
- High ecological footprint of rice production
- Health affected by pollution

Unsustainable rice straw management

- No value adding from straw
- Combine harvesters cut too high
- Combines leave straw spread in the field
- Straw is not used in the field
- Discouraging field burning not implemented
- Little knowledge about "cost of burning"

- Intensification with 2 or 3 rice harvests/year
- Crop rotations with high value crops

- Lack of technologies for straw processing
- Little awareness of products from straw
- Lack of value chains for straw products
- Increased use of combine harvesting
- Manual collection is too expensive
- Short turnaround time prevents decomposition
- Lack of options for other on-field management
- "Farmers don't have a choice"
- Effect on health and environment not known
Potential Sustainable Rice Straw Management Options

Questions

1. How does a newly introduced straw management method affect crop production, input needs etc.
2. Emissions / sustainability along the whole chain
3. What technical solutions exist, transferability
Optimize incorporation

Rice straw management

Land preparation

Completely removal
Partially removal
Incorporated to the soil
Burned in the field

Harvesting and post harvest

Grain
Rice hull
Rice straw

Crop establishment

Laser leveling
Tillage
Transplanting
Direct seeding
Dry seeding

Crop care

Water management
Fertilizer management
Pesticide management

Effects on soil

GHG emission
Nutrient balance
Carbon balance

Non-energy
But:

"No comprehensive effort yet compares different straw management options with regard to GHGE, energy balances, economics and value-adding opportunities, and agronomic implications using a holistic approach in the context of fostering more sustainable rice production."
The New Project

Title: Scalable straw management options for improved farmer livelihoods, sustainability, and low environmental footprint in rice-based production systems

Project duration: 3 years, started in February 2016

Countries: Philippines, Vietnam, Cambodia

Satellite countries: Thailand, India

Donor: BMZ

IRRI (International Rice Research Institute)

CGIAR (Consultative Group on International Agricultural Research)
**Objectives**

The *goal* of the project is to improve livelihoods of farmers by fostering sustainable rice straw management that adds value to their rice crop and to reduce the environmental footprint from rice production systems.

The *purpose* is to (1) assess different straw management options including their value adding potential and environmental footprint (2) provide information and training to farmer intermediaries including NARES for encouraging and advising farmers to use best straw management practice, and (3) provide information to policymakers for creating an enabling environment for best-practice straw management.
Sustainability Analysis

Environmental & Health
- Resource Consumption
- Emissions (air, water & land)
- Ecological Impacts
- Health Impacts

Traditional LCA

Economic
- Production Costs
- Transportation Costs
- Consumer Cost of Goods
- Environmental Clean-Up Costs to Society
- Community Health Costs
- Brand Value

Social
- Job Creation / Stability
- Availability of Goods
- Employee Injuries
- Wages of Employees
- Age of Employees
- Working Conditions
- Equity & Opportunities

Five Project Outputs

Three dimensions of sustainable rice production: Environmental, economic, and social sustainability

O4: Methodologies for and results from Sustainability Assessments for promising rice straw management options

O5: Communication strategies for dissemination

Product group 1:
- Methodologies
- Protocols, Tools (Spreadsheet models)
- Policy recommendations

Product group 2:
- Best practice management
- Technologies

O2: Carbon Footprint Analysis of alternative rice straw management against baseline GHGE from straw burning, field level

O1: Innovative technologies, management options and farmer business models for rice straw management

O3: Carbonization of straw (bio-char) as a pioneering approach for lowering footprints and increasing incomes

Activities in Cambodia
Beneficiaries

Primary: Farmers will benefit from increased returns from rice harvests and a healthier environment.
Secondary: The rural population will benefit from a healthier environment.

Direct clients

Researchers and extension staff from NARES; decision– and policymakers

Partners for implementation of research

Nong Lam University, Ho Chi Minh City, Vietnam
Royal University of Agriculture and Don Bosco, Cambodia
Philippine Rice Research Institute, Philippines
Universität Hohenheim, Germany
Lehner GmbH with own funding
CCAFS Flagship Projects with own funding: FP 1.3 on Climate–smart Villages FP 4) and FP 4 on Policy Information and Responses
Climate and Clean Air Coalition (CCAC) component with own funding

Partners for piloting and dissemination (with own funding)

IRRI platforms engaging with national extension systems, Closing Rice Yield Gaps in Asia (CORIGAP), Consortium for Unfavorable Rice Environments (CURE), Agricultural Research and Development (ATWGARD)
National initiatives developing sustainable rice production systems (VietGAP, Thai Q–Mark) Sustainable Rice Platform (SRP)
Vietnam Rice Straw Learning Alliance Partners (CORIGAP)
Dinh Thanh Agricultural Research Center (DTARC) of the An Giang Plant Protection Joint Stock Company in Vietnam
Better Rice Initiative Asia (BRIA)
Private Sector for field demonstrations, equipment ....
Major Envisioned Activities in Countries

• Philippines
  – IRRI: replicated field trials, carbonization trials, GHGE measurements
  – PhilRice: To be discussed
  – Demonstrations on BRIA sites

• Vietnam
  – Piloting of business models, adaptive research in CORIGAP sites
  – Demonstrations on BRIA sites

• Cambodia
  – Field testing, demos on Don Bosco Rice Demo Farm,
  – Other partners (MAFF, climate smart villages…..)?

• Thailand, India and Indonesia
  – Satellite countries, information exchange
**Field Day**

- Demonstrate some technologies for straw management

- Present some initial findings from straw management research in Vietnam and IRRI

- Collect ideas from participants about straw management in Cambodia

- Collect ideas about adaptive research activities