BAU-STR Dryer: A Solution for Reducing Post-harvest Loss of Paddy in Bangladesh

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Dr. Md. Monjurul Alam, Principal Investigator  
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Outline of the Presentation

- Background
- Objective
- Materials and Methods
- Results
- Success Stories
- Scaling up
- SWABO Video
Background

- Bangladesh is an agriculture based country in which majority of the people earn their livelihoods from farming and agriculture-related activities.

- Paddy is the main staple crop of Bangladesh accounting for 76% of total cropped area and 95% of cereals production.

- Drying of paddy is a major problem in Bangladesh due to rain and gloomy weather in Boro (April – June) and short day and foggy weather in Aman (October – December) season.

- Sun drying is a traditional and common practice in Bangladesh.

- Improper or delayed drying leads to loss in grain quality, in addition to the estimated 14% postharvest loss which includes drying loss 1.56 to 5% (Bala et al., 2010).

- To reduce post-harvest losses and increase quality of storage paddy, it is necessary to adapt low cost drying technology for paddy at small scale farmers’ and traders level.
Bangladesh Agricultural University (BAU) adapted BAU-STR dryer with an objective to introduce an effective paddy drying technology alternative to traditional sun drying.

➢ To improve and investigate techno-economic performance of BAU-STR dryer at the lab and field level of Bangladesh.
Materials & Methods

**BAU-STR Dryer**

Pictorial View

Schematic View
# Materials & Methods

<table>
<thead>
<tr>
<th>Season</th>
<th>Place</th>
<th>Method</th>
<th>Treatment/Dryer capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boro 2015</td>
<td>Lab</td>
<td>BAU-STR dryer</td>
<td>$S_{300}$, $S_{400}$ and $S_{450}$</td>
</tr>
<tr>
<td>Aman 2015</td>
<td>Lab</td>
<td>BAU-STR dryer</td>
<td>BRRI dhan34, BRRI dhan49 and BRRI dhan62</td>
</tr>
<tr>
<td>Boro 2016</td>
<td>Lab</td>
<td>BAU-STR dryer</td>
<td>$S_{300}$, $S_{400}$, $S_{500}$ and $S_{600}$</td>
</tr>
<tr>
<td></td>
<td>Field</td>
<td>BAU-STR dryer</td>
<td>BRRI dhan28, Hybrid SL 8 and Taj</td>
</tr>
<tr>
<td>Aman 2016</td>
<td>Field</td>
<td>BAU-STR dryer</td>
<td>BRRI dhan49, Gutisorna and Punja</td>
</tr>
<tr>
<td>Boro 2017</td>
<td>Field</td>
<td>BAU-STR dryer</td>
<td>BRRI dhan28 (6 districts)</td>
</tr>
<tr>
<td>Aman 2017</td>
<td>Field</td>
<td>Open sun drying</td>
<td>10 m² out of 50 m² with 3 replication</td>
</tr>
</tbody>
</table>
Materials & Methods

Temperature sensor locations & Moisture sample collection points in BAU-STR Dryer

T- Temperature sensor; M-Moisture sensor; t – top; m – middle and b - bottom

Sensors setting at the Lab

Sensors setting at the field
Results

Temperature distribution in BAU-STR dryer during Aman 2015 season at laboratory

Vertical location

Horizontal location
Results

Change of moisture content in grain bin of BAU-STR dryer during Aman 2015 at laboratory.
## Results

**Technical performance of BAU-STR dryer**

<table>
<thead>
<tr>
<th>Season</th>
<th>Treatment</th>
<th>Drying air temp., °C mean±std</th>
<th>Initial moisture content %</th>
<th>Final moisture content %</th>
<th>Drying time hr</th>
<th>Drying rate % mc/hr</th>
<th>Drying efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boro (April-May)</strong></td>
<td><strong>S₃₀₀</strong></td>
<td>44.8±2.6</td>
<td>18.1</td>
<td>11.6</td>
<td>2.7</td>
<td>2.4</td>
<td>36.4</td>
</tr>
<tr>
<td></td>
<td><strong>S₄₀₀</strong></td>
<td>44.6±3.8</td>
<td>17.1</td>
<td>11.5</td>
<td>2.0</td>
<td>2.8</td>
<td>42.5</td>
</tr>
<tr>
<td></td>
<td><strong>S₅₀₀</strong></td>
<td>45.7±2.2</td>
<td>19.2</td>
<td>11.9</td>
<td>3.5</td>
<td>2.1</td>
<td><strong>48.8</strong></td>
</tr>
<tr>
<td></td>
<td><strong>S₆₀₀</strong></td>
<td>42.5±4.9</td>
<td>18.5</td>
<td>12.3</td>
<td>3.7</td>
<td>1.7</td>
<td>35.0</td>
</tr>
<tr>
<td><strong>Aman (Nov-Dec)</strong></td>
<td><strong>BRRI dhan34</strong></td>
<td>39.7±0.4</td>
<td>20.8</td>
<td>11.7</td>
<td>5.7</td>
<td>1.6</td>
<td>44.6</td>
</tr>
<tr>
<td></td>
<td><strong>BRRI dhan49</strong></td>
<td>40.4±0.9</td>
<td>21.5</td>
<td>11.7</td>
<td>5.0</td>
<td>1.8</td>
<td>48.7</td>
</tr>
<tr>
<td></td>
<td><strong>BRRI dhan62</strong></td>
<td>44.5±3.0</td>
<td>21.8</td>
<td>11.6</td>
<td>5.7</td>
<td>1.9</td>
<td><strong>54.5</strong></td>
</tr>
</tbody>
</table>
Drying loss of paddy in BAU-STR dryer

Sun drying loss of paddy
## Results

Germination rate of BAU-STR dried paddy

<table>
<thead>
<tr>
<th>Season</th>
<th>Treatment</th>
<th>Sprouted seed, %</th>
<th>Dead seed, %</th>
<th>Abnormal seedlings, %</th>
<th>Normal seedlings, %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boro</strong> (April-May)</td>
<td><strong>S\textsubscript{300}</strong></td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td><strong>S\textsubscript{400}</strong></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td><strong>S\textsubscript{500}</strong></td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td><strong>S\textsubscript{600}</strong></td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td><strong>Sundry</strong></td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>87</td>
</tr>
<tr>
<td><strong>Aman</strong> (Nov-Dec)</td>
<td><strong>BRRI dhan34</strong></td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td><strong>BRRI dhan49</strong></td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td><strong>BRRI dhan62</strong></td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td><strong>Sundry</strong></td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>85</td>
</tr>
</tbody>
</table>
Rice quality of BAU-STR dried paddy

<table>
<thead>
<tr>
<th>Dryer</th>
<th>Treatment</th>
<th>Milling recovery, %</th>
<th>Broken rice, %</th>
<th>Head rice yield, %</th>
<th>Hardness, N</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAU-STR</td>
<td>BRRI dhan34</td>
<td>72.9±0.9</td>
<td>5.4</td>
<td>67.5</td>
<td>32.4</td>
</tr>
<tr>
<td></td>
<td>BRRI dhan49</td>
<td>72.8±1.4</td>
<td>6.8</td>
<td>66.0</td>
<td>28.8</td>
</tr>
<tr>
<td></td>
<td>BRRI dhan62</td>
<td>71.8±1.2</td>
<td>5.9</td>
<td>65.9</td>
<td>27.4</td>
</tr>
</tbody>
</table>
Drying of Paddy (Phase I)

Sun-drying to Mechanical drying

BAU-STR Dryer
- Capacity: 500 kg/batch
- Drying time: 4-5 hours/batch
- Market Price: USD 700
- Cost saved: 26% over sun drying
- Loss saved: 2.5-4.0%

Operating cost
- 0.74 Tk/kg (with electricity supply)
- 0.87 Tk/kg (with diesel generator)
- 1.0 Tk/kg (sun drying)

Payback period: < 1 year

Source: PHLIL-BD, 2017
Drying of Paddy (Phase II)

Sun-drying to Mechanical drying

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**BAU-STR Dryer (LPG)**

- **Capacity**: 500 kg/batch
- **Drying time**: 4-5 hours/batch
- **Market Price**: USD 850 (LPG + Modified blower)
- **Operating cost**
  - 0.99 Tk/kg (LPG + local blower)
  - 1.06 Tk/kg (LPG + imported blower)
  - 1.01 Tk/kg (Briquette + local blower)
  - 1.10 Tk/kg (Sun drying)
- **Payback period**: < 1 year

Source: PHLIL-BD, 2019
Md. Humayun Kabir
(A paddy seed trader of Atiti, Comilla)

--Motivated to acquire a BAU-STR dryer by television report

--Dried 2.5 ton of paddy seed in Aus, 2017 experimentally and later dried 4.0 ton of Aus paddy seed in 2018

--Found his business more competitive
Success Stories (Entrepreneur Development)

Locally made blower & Temperature Monitor
(Amin Electric; PHLIL-BD)
Scaling up

Local Workshop (Capacity building)
Field training and demonstration
DAE (ToT)
FAO - MMI (ToT)
Symposium
Machinery Fair
BAU-STR Dryer
Advanced Drying Lab
Tech Transfer (USA)
Tech Transfer (Nepal)
Tech Transfer (India)
Tech Transfer (India)
Postharvest Loss: Paddy Drying Using a BAU-STR Dryer in English (accent from USA)

https://www.youtube.com/watch?v=4Xi5gh-sLo4