Integrated and Circular Model of Straw Residue Utilization

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Burning of Crop Residue

• Crop residue (straw) burning is a serious concern in many countries of the Asia-Pacific region leading to:
  ➢ Negative impact on soil nutrients, pH, moisture, organic matter, fertility
  ➢ Air pollution, transboundary haze, GHG emissions
  ➢ Public health hazard, transportation disruptions

• Residue burning not aligned with sustainable intensification in agriculture

Picture courtesy: Tribhuvan University, Nepal
Straw in selected sub-regions

South and Southeast Asia generate an estimated >400 Mt of rice straw alone a year

<table>
<thead>
<tr>
<th>Crop</th>
<th>straw-grain ratio</th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Sri Lanka</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Grain</td>
<td>Straw</td>
<td>Grain</td>
<td>Straw</td>
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<tr>
<td>Rice</td>
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<td>Maize</td>
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<td>26.15</td>
<td>53.60</td>
<td>2.75</td>
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<tr>
<th>Crop</th>
<th>Straw-grain ratio</th>
<th>Indonesia</th>
<th>Vietnam</th>
<th>Myanmar</th>
<th>Thailand</th>
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<td>90.68</td>
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<tr>
<td>Wheat</td>
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<td>Maize</td>
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<td>18.51</td>
<td>37.94</td>
<td>5.19</td>
<td>10.64</td>
</tr>
</tbody>
</table>

Source: Status of Straw Management in Asia-Pacific and Options for Integrated Straw Management (CSAM, 2018)
Key reasons for Straw Burning

- Low perceived **economic value**
- **High cost** of straw collection, transportation and storage, partially caused by the shortage of rural labour
- **Lack of time** for straw to decompose before next seeding cycle
- **Lack of adequate machinery and techniques** to treat straw residue
- **Low awareness** of the impacts of burning on the environment, food security and health

*Picture courtesy: Tribhuvan University, Nepal*
CSAM Regional Initiative on Integrated Management of Straw Residue: Circular Model of Straw Utilization

Promoting application of agricultural machinery and practices for sustainable, circular use of straw residue as fertilizer, fodder, substrate for mushroom-growing, and biogas production

Priorities for country pilots (on wheat-maize system and extended to rice):

- Sensitize stakeholders and highlight economic benefits of sustainable & integrated straw residue management to farmers
- Incentivize adoption of sustainable mechanization solutions and encourage adaptation to match local needs
Pilot Project on Integrated Straw Management in China (wheat-maize system)

- Multi-stakeholder effort engaging research institutions (China Agricultural University), local government and local farmers cooperative
- Use of straw as fertilizer, fodder, new energy resource and substrate
- Positive outcomes (2019 to 2022):
  - Increase in soil organic matter
  - Increase in net income of farmers

Picture courtesy: China Agricultural University
Pilot Project on Integrated Straw Management in Viet Nam

• With Sub-Institute of Agricultural Engineering and Post-Harvest Technology
• Positive outcomes (2018 to 2019):
  ➢ Promoted ‘In-door mushroom growing technology’ applying a steam sterilizer and water supplying system
  ➢ Indoor mushroom growing technology demonstrated as superior to traditional/ outdoor method:
    ❖ Higher mushroom yield - rice straw using efficiency of approximately 26% compared to 13-15% in traditional method
    ❖ Lower production cost
    ❖ Higher mushroom quality
  ➢ Substrate after mushroom growing used as a natural fertilizer - considerably reduced application of chemical fertilizers and lowered production cost
  ➢ Improved porosity and fertility of soil & reduced negative impact on environment from straw burning

Picture courtesy: VIAEP
Regional Initiative Extended to New Pilots in Cambodia, Indonesia and Nepal in 2021

• **Approach** implemented:
  - Establishment of pilot sites
  - Field trials of machinery
  - Modification and adaptation of the machinery
  - Capacity building and community awareness sessions
  - Regional study tour for knowledge exchange

• **Pilot Model:**
  - In-situ and ex-situ utilization of straw (eg. as fodder and fertilizer) based on local needs
  - Machinery used: Minimum-tillage seeder, baler, direct seed drill, handy straw cutter...
Regional Knowledge Exchange

Integrated Straw Management Regional Study Tour, 7-10 November 2019, Ludhiana, India

Virtual Workshops and Demonstrations, 28 October 2020 & 25 October 2022, Laixi, China

Regional Study Tour on Mechanization Solutions for Straw Management, 21-27 November 2022, Thailand
16 March 2022

Good Practices in South-South & Triangular Cooperation in LDCs
Won the 2nd ESCAP Innovation Awards & the ‘best business pitch’ - Nov. 2022
Key Lessons and Takeaways

- Straw burning is a shared and transboundary concern in the Asia-Pacific – challenge for sustainable intensification, nature positive production and related SDGs

- Alternative uses of straw – supported by agricultural machinery - can provide sustainable solutions but we need:
  - Identification of context-specific alternatives
  - Community engagement and local champions
  - Local adaptation
  - Training and capacity building
  - Multi-stakeholder approach
  - Regional/international cooperation and exchange
Thank you