

# Integrated and Circular Model of Straw Residue Utilization

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# Burning of Crop Residue



*Picture courtesy: Tribhuvan University, Nepal*

- 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

# Straw in selected sub-regions

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

Crop	straw-grain ratio	India		Bangladesh		Nepal		Sri Lanka	
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
Rice	1.28	108.8	139.26	34.57	44.25	4.95	6.33	4.50	5.76
Wheat	1.38	96.6	133.30	1.30	1.79	1.57	2.16	/	/
Maize	2.05	26.15	53.60	2.75	5.63	2.20	4.50	0.24	0.48

Crop	Straw-grain ratio	Indonesia		Vietnam		Myanmar		Thailand	
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
Rice	1.28	70.84	90.68	44.07 <sup>a</sup>	49.59 <sup>b</sup>	26.42	33.82	32.62	41.75
Wheat	1.38	-	-	-	-	0.186	0.256	0.0015	0.00028
Maize	2.05	18.51	37.94	5.19	10.64	1.60	3.28	4.87	9.98

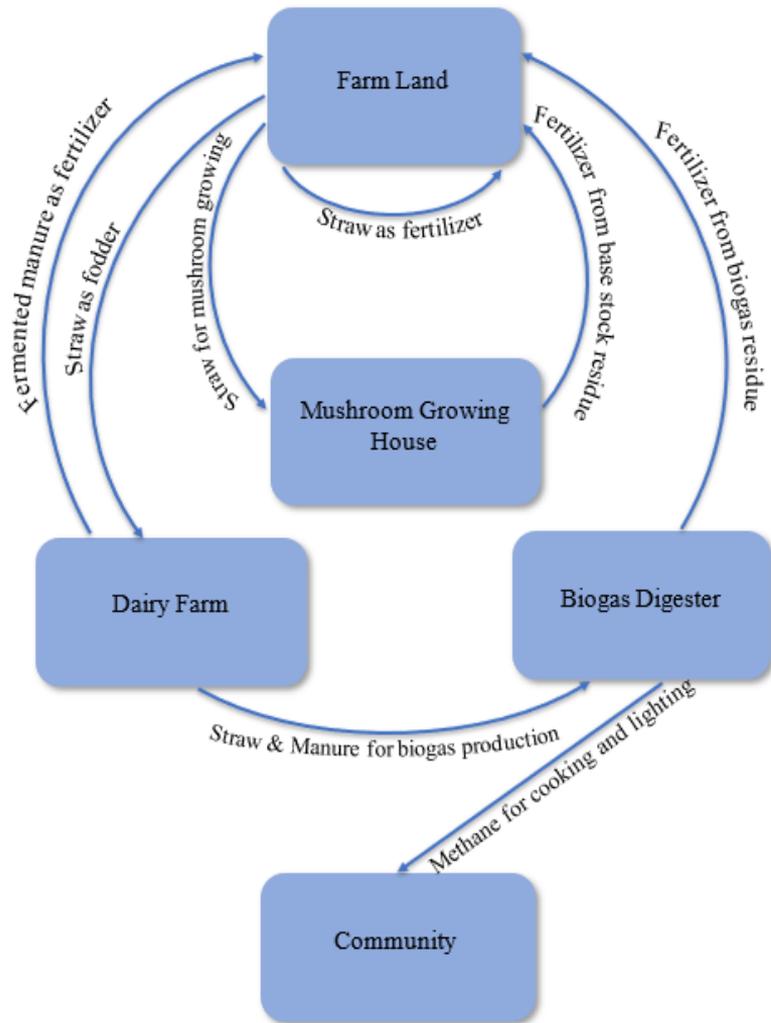
Source: Status of Straw Management in Asia-Pacific and Options for Integrated Straw Management (CSAM, 2018)

# 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...



*Picture courtesy: DAENgg*

# 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



## 2nd ESCAP Innovation Awards

### Micro Innovations

Automated Stakeholder Management System with Power Platform (TIID)

Winner

Automated Communications Log (DA)

Interactive Data Science Widgets for E-Learning (SIAP)

### Publications

Social Outlook for Asia and the Pacific 2022 (SDD)

Winner

The Aral Sea Storyboard (IDD)

Elevating the outreach of the 'Economic and Social Survey of Asia and the Pacific' (MPFD)

### Stakeholder Engagement

Engaging virtual field demonstrations & workshops with the use of drones and comms agencies (CSAM)

Winner

APFSD Youth Challenge & Event (Innovation Team)

Creating dynamic IGAs and effective engagement through Speed dating, World Café setups & sp groups (SD)

### Interactive Data Portals

Asia-Pacific Risk and Resilience Portal (IDD)

Winner

### Processes

AI Business Process Automation (DA)

Winner

Won the 2nd ESCAP Innovation Awards & the 'best business pitch' - Nov. 2022

**Solution**

Livestreaming the on-site agricultural machinery demonstration

The screenshot shows a Zoom meeting interface. On the left, a presentation slide titled "Solution" displays the text "Livestreaming the on-site agricultural machinery demonstration" over a background image of a farm with tractors. On the right, a video feed shows a woman with glasses speaking. Below the video feed is a Zoom control bar with icons for mute, video, chat, and other functions.

# 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

