CSAM's Regional Initiative on Integrated Straw Management

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Centre for Sustainable Agricultural Mechanization (CSAM)

- **Regional institution** of United Nations ESCAP hosted in China since 2003
- **Vision:** To achieve production gains, improved rural livelihood and poverty alleviation through **sustainable agricultural mechanization** for a more resilient, inclusive and sustainable Asia and the Pacific.
- Dedicated to promoting **international cooperation and partnership** in sustainable agricultural mechanization.
- Focusing on **Sustainable Development Goals** (SDG) 2 (Zero Hunger), SDG 1 (no poverty), SDG 13 (Climate Action), SDG 17 (Partnerships for the Goals)

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Concerns of Crop Residue Burning

Crop residue burning is a serious, **transboundary** concern in many countries in the Asia-Pacific region leading to:

- **Soil deterioration**: negative impact on soil nutrients, pH, moisture, organic matter, fertility
- **Environmental concerns**: Air pollution, transboundary haze, GHG emissions
- **Social impacts:** Public health hazard, transportation disruptions

→ Residue burning not aligned with sustainable intensification in agriculture

What are the reasons for straw burning?

To get rid of pests & diseases

High costs to collect, transport, store straw

Lack of labour to collect, transport, store straw

Lack of machinery to collect, transport, store straw

To fertilize the soil for next season

Any other reasons?

Alternate use of straw?

Use as fertilizer
(directly or as cow manure)

Use as fodder

Use as base stock for mushroom production

New energy resource
(briquette fuels, biogas production, carbonization fuel, gasification fuel, degradation and ethanol)

Use as industrial materials
(papermaking, building material, crafts production, xylitol production)

Any other uses?

What roles could agricultural machinery play?

It could provide sustainable solutions. We also 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

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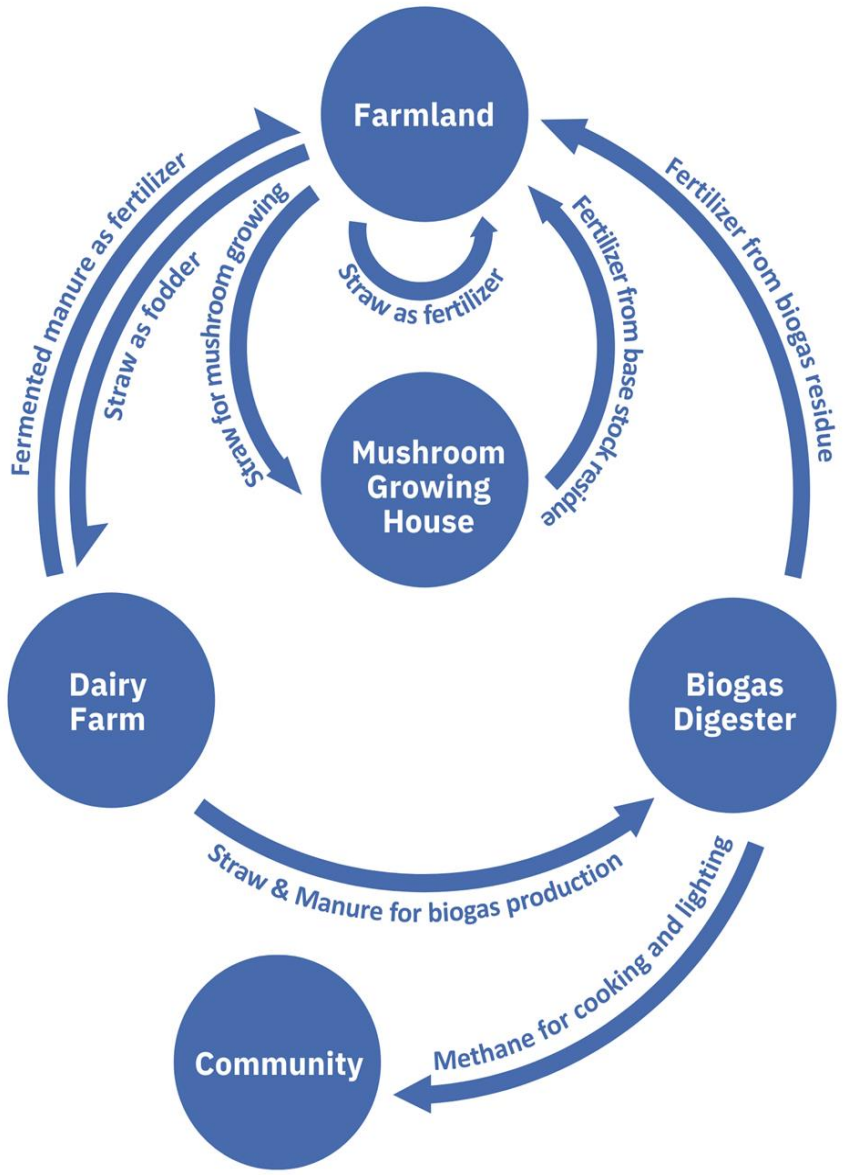

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Circular Model for Straw Utilization

- **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:**
  - Sensitize stakeholders and **highlight economic & environmental benefits** of sustainable & integrated straw residue management
  - **Incentivize adoption** of sustainable mechanization solutions and encourage **adaptation** to match local needs

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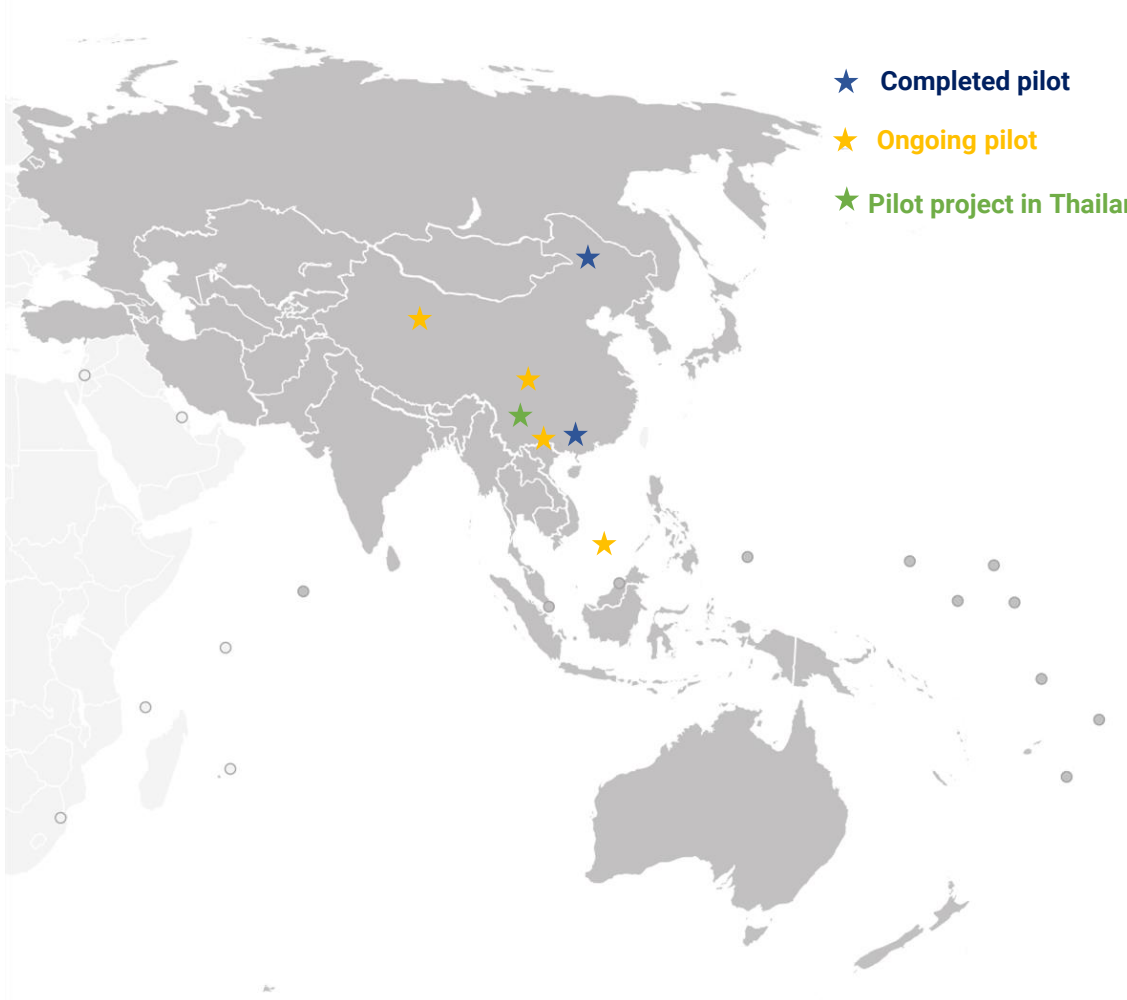
Pilot Projects on Integrated Straw Management



Timeline

- 2018: Pilot project started in China
- 2019: Pilot project started in Viet Nam
- 2021: Pilot project started in Nepal (phase I)
  - : Pilot project started in Cambodia (phase I)

  2023: Pilot project started in Indonesia (phase I)
- 2024: Pilot project started in Cambodia (phase II)
  : Pilot project started in Indonesia (phase II)
  : Pilot project started in Nepal (phase II)
  : Regional workshop in China
- 2025: Pilot project starting in LAO PDR
  : Pilot project starting in Thailand

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Pilot Project on Integrated Straw Management in China (wheat-maize system) (2018-2022)

- Located in **Laixi, Qingdao, Shandong Province**
- **Multi-stakeholder effort** engaging research institutions, local government and local farmers cooperative
- **Use of straw as fertilizer, fodder, new energy resource and mushroom growing**
- **Positive outcomes**:
  - Increase in soil organic matter **over 0.2% in average** from initial value of 2.1 to 2.3%
  - Overall, the total **net incomes** from agricultural production at the pilot site were **increased by 2.7% to 9.5%**
  - **The mushroom production** was 162,000 kg/ha, its value was 178,200 USD/ha, and **the net income was 96,200 USD per ha.**

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Pilot Project on Integrated Straw Management in Viet Nam (2018-2019)

- Positive outcomes:
  - 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**

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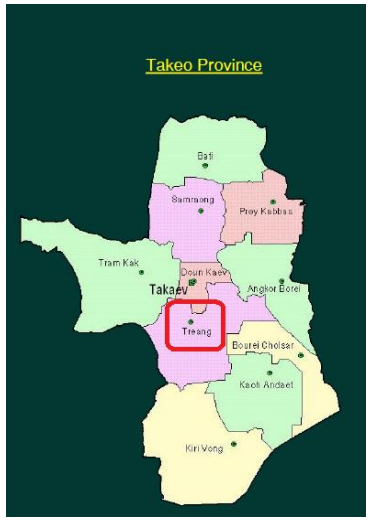
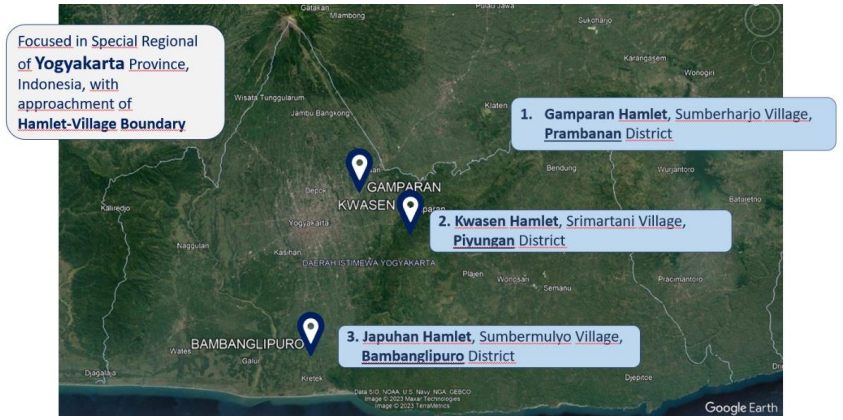
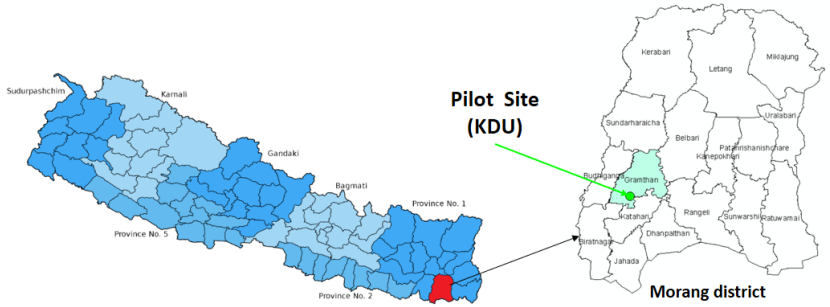
Pilot Projects on Integrated Straw Management in Cambodia, Indonesia and Nepal (2021-2023)

Pilot site locations







Cambodia (1 pilot site): Field at Agricultural Engineering Station, Sronger Commune, Treang District, Takeo Province

Indonesia (3 pilot sites): Gamparan Hamlet, Sumberharjo Village, Prambanan District; Kwasen Hamlet, Srimartani Village, Piyungan District; and Japuhan Hamlet, Sumbermulyo Village, Bambanglipuro Districts; Special Region of Yogyakarta Province

Nepal (1 pilot site): Field and Plant of Krishna Daana Udhyog (KDU), Gramthan Rural Municipality Ward Number 2, Morang District, Province No. 1

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Positive outcomes of the Pilots in Cambodia, Indonesia and Nepal (2021-2023)

- **Agricultural mechanization index was increased** at the pilot locations in Indonesia from 0 - 0.39 horsepower per hectare to 1.32 - 2.46 HP/ha, with accompanying benefits for overall productivity.
- In Nepal, application of the machinery led to **increase in the benefit-cost ratio** from 1.99 (control plot) to 2.59 (experimental plot) implying more profit for the farmers.
- Strong **community engagement and local ownership** of project results by key stakeholders was achieved leading to **increased awareness** of the local farming communities about the harmful effects of straw burning and their **strengthened capacities** to use agricultural machinery to address crop residue burning.
- **Reached a total of 443 farming community members**, among which 38% are women.

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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**

Study Tour on Integrated Straw Management in China, 19 to 24 June **2024**, **China**

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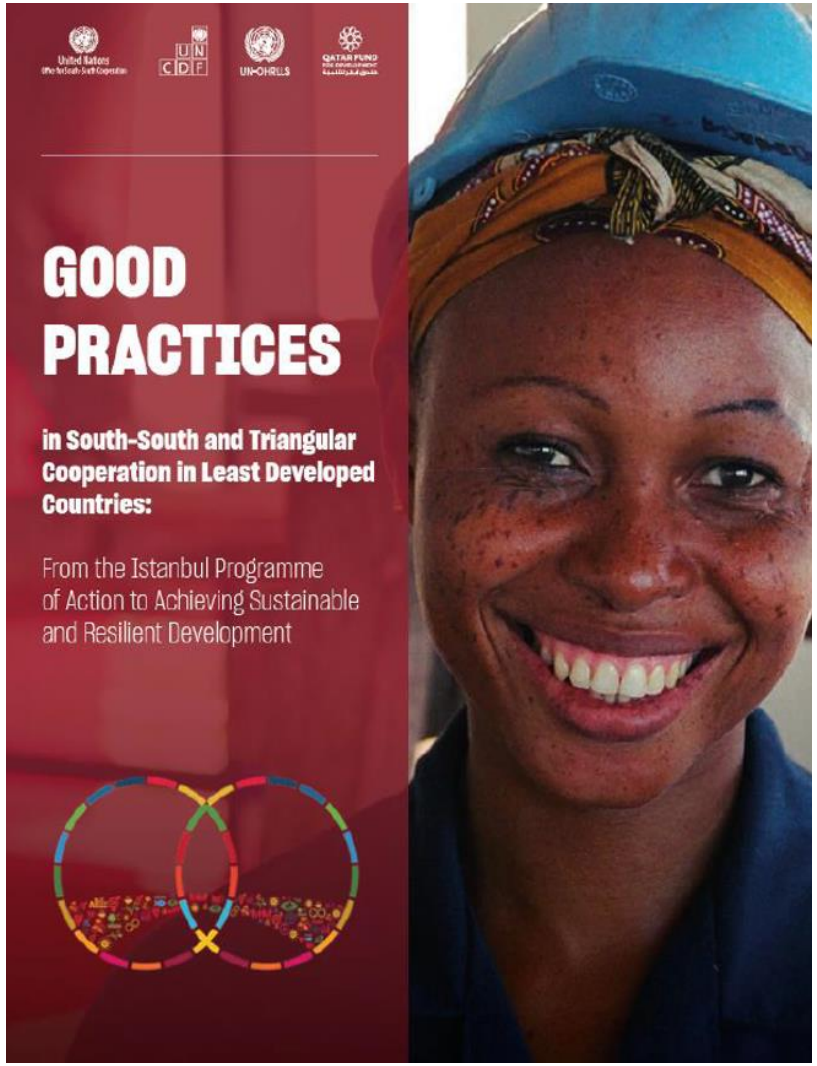
Acknowledges & Awards



CSAM's Regional Initiative on Integrated Straw Management was selected as one of the good practices in South-South and Triangular Cooperation in LDCs in 2022

Won the 2nd ESCAP Innovation Awards & the 'Best Business Pitch' in 2022

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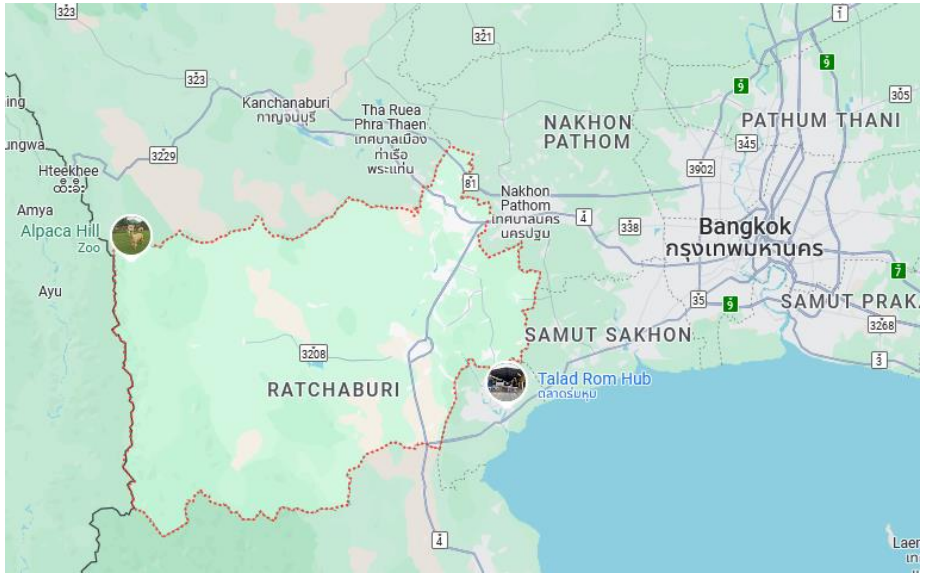
Pilot Project in Thailand

Purpose: to test, adapt and demonstrate mechanization-based solutions for integrated management of crop residue and strengthen stakeholder capacities through the establishment of a pilot demonstration site

- **Partnership:** ESCAP-CSAM and DOA of Ministry of Agriculture and Cooperatives, Thailand
- **Time frame:** July 2025 to June 2026
- **Focus on**: rice straw and sugarcane trash burning
- **Place:**

  Central plain: Ratchaburi Province

  Northern and the Northeastern plains



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What we will do

- Apply agricultural mechanization for managing crop residue in rice and sugarcane production
- Apply the data from the testing and evaluation of agricultural machines
- Conduct a feasibility study by incorporating microbial technology and developing a prototype for crop residue processing system
- Create a network
- Collect data from two other areas in Thailand, the Northern and the Northeastern plains

We are expecting to achieve

- To find problems, constraints and best practices
- To help formulate policy recommendations and guidance for researchers and manufacturers
- To raise the awareness and disseminate knowledge of mechanization in reducing rice and sugarcane trash burning in Thailand

ASEAN Guidelines on Reducing Crop Burning

Adopted in 2024 by ASEAN Ministers on Agriculture and Forestry (AMAF) as a comprehensive framework for promoting appropriate sustainable agricultural practices that will contribute to minimizing air pollution, protecting public health, preventing soil and landscape degradation, mitigating climate change impacts caused by the burning of agricultural residues, and improving livelihoods.

Sustainable Agriculture Practices	Knowledge and Skills of Stakeholders	Research and Technological Innovation	Planning for Policy Systems	Co-Benefits on Prospects/ Market for SA Practices
• Adoption of practical alternatives • Site specific interventions • Learning sites	• Tailored programs • Mixed learning methods • Skilled extension workers	• Solution-based researches • Knowledge platforms • User-friendly technologies	• Policy framework • Institutional system • Stakeholder collaboration	• Consumer awareness • Incentivizing sustainability • Infrastructure support

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Q & A Session

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THANK YOU

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