Integrated Management of Straw Residue – Policy and Implementation Needs

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Burning of Crop Residue

- Crop residue (straw) burning is a serious concern in many countries of ASEAN and 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 elements of agroecology such as recycling and resilience

*Picture courtesy: CSAM country partner*
Straw in Southeast Asia

Southeast Asia generates an estimated 210.10 Mt of rice straw alone a year

Source: Status of Straw Management in Asia-Pacific and Options for Integrated Straw Management (CSAM, 2018)
Why Do Farmers Burn Straw?

- No 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: ICAERD (Indonesia)
Policy and Institutional Issues

Overall
- Inadequate data on availability and utilization of straw resources
- Lack of incentives to farmers for management of crop residues to stop burning
- Inadequate farmers’ capacities for sustainable crop residue management practices
- Lack of dedicated crop residue management policy in most countries

In-situ crop-residue management (as natural fertilizer, mulch…)
- Insufficient financial support for residue management equipment and machinery
- Lack of incentives for entrepreneurs/service providers to offer straw management services at affordable price for farmers
- Lack of testing standards/facilities for machinery

Ex-situ crop-residue management (as fodder, biogas production, power generation…)
- Supply chain impediments and high infrastructure cost
- Lack of R&D and feasibility studies on ex-situ uses
Some Options for Policy and Institutional Action

- Enhancing **data** availability on crop residue generation, location-wise demand and utilization patterns
- Promoting **conservation agriculture practices** & related mechanization-based solutions
- Strengthening extension via large scale **demonstrations and training** to change negative attitudes and perceptions amongst farmers
- Strengthening **supply chains** and investment in needed **infrastructure** to make ex-situ crop residue management economically viable
- Evaluating **minimum support prices** (eg. for rice husk) and **price regulation** for biomass-based products which can compensate farmers for straw management costs
- Introducing **carbon-credit schemes** to benefit farmers who adopt conservation agriculture practices for carbon sequestration and GHGs mitigation
- Strengthening **laws & regulations** and their implementation for preventing and monitoring on-farm crop-residue burning
Implementation: 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)

- With China Agricultural University and local farmers cooperative
- Positive outcomes (July 2019 to Aug 2022):
  - 1,000 tons of wheat and maize straw sustainably utilized from 23 ha pilot demonstration site in 2022 amounting to an equivalent emissions reduction of 1,579 tons of CO$_2$ per year
  - Soil Organic Matter increased under different approaches (returning straw to the field, returning cow manure to the field and returning biogas slurry & residue to the field) by up to 11.4%
  - New formula for cattle fodder + kneading machine during ensilage process improved milk production by 3 ltr/day/cow, increasing value of milk produced by 160 USD/day for 100 cows
  - Increased net income under different approaches by up to 539 USD/ha

Pictures courtesy: CAU (China)
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
Regional Initiative Extended to New Pilots in Cambodia, Indonesia and Nepal (2021-2023)

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

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

- **Results:**
  - Increased farmers’ awareness
  - Identification of smallholder-friendly solutions
  - Strengthened local capacities

*Pictures courtesy: DAENgg (Cambodia), Gadjah Mada University (Indonesia)*
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
Good Practices in South-South & Triangular Cooperation in LDCs
Won the 2nd ESCAP Innovation Awards & the ‘best business pitch’ - Nov. 2022
Key Implementation Needs

- Alternative uses of straw – supported by agricultural machinery - can provide sustainable solutions for burning but we need:
  - Identification of context-specific options
  - Local adaptation
  - Community engagement and local champions
  - Training and capacity building
  - Multi-stakeholder approach
  - Field-level regional / international exchanges and cooperation
Thank you

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