Sustainable Agricultural Mechanization for Integrated and Climate-Smart Straw Residue Management

Promoting mechanization-based solutions for integrated and climate-smart management of straw residue

CHALLENGE

The burning of straw residue after crop harvesting is a common concern, including in many least developed countries (LDCs) like Cambodia and Nepal. Apart from accelerated greenhouse gas emissions and air pollution, straw burning causes loss of soil carbon and micro-nutrients in the long term, while adversely affecting soil temperature, pH, moisture, organic matter and agricultural production and farmers' income. In order to address its adverse impacts, various approaches are being applied to sustainably utilize straw as fertilizer, fodder, base material and so forth. LDCs like Cambodia are also actively promoting conservation agriculture in which maintaining a permanent soil cover is an important agenda. However, the lack of suitable agricultural machinery is one of the main constraints. There is hence a need to test integrated straw utilization models through enhanced application of machinery in specific country contexts, and scale-up the innovative approaches identified via South-South and triangular cooperation.

TOWARDS A SOLUTION

The Centre for Sustainable Agricultural Mechanization (CSAM) of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), with the support of ESCAP's Environment and Development Division, is implementing the Regional Pilot Project on Mechanization Solutions for Integrated Management of Straw Residue in Asia and the Pacific to identify, test and promote an integrated model of straw management using agricultural machinery. The model contributes to relevant targets under SDG 2 (Zero Hunger) as well as SDG 1 (No Poverty), SDG 12 (Sustainable Production and Consumption) and SDG 13 (Climate Action), while addressing Priority 2 of IPoA (agriculture, food security and rural development).

NOMINATED BY

United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)

COUNTRIES/REGIONS/TERRITORIES

Cambodia, China, India, Indonesia, Nepal, Viet Nam

CONTRIBUTING PRIORITY AREAS OF THE ISTANBUL PROGRAMME OF ACTION (IPoA)

2, 6

SUSTAINABLE DEVELOPMENT GOALS TARGET(S)

1.4, 2.4, 12.2, 13.1

SUPPORTED BY

Ministries/Departments of Agriculture in target countries and other local partners, Ministry of Foreign Affairs of China through China-ESCAP Cooperation Programme

IMPLEMENTING ENTITIES

Centre for Sustainable Agricultural Mechanization (CSAM), ESCAP

PROJECT STATUS

Ongoing

PROJECT PERIOD

July 2018 – February 2023

URL OF THE PRACTICE

http://www.un-csam.org/taxonomy/term/166

Since launching the project in 2018, positive results have been obtained from the initial pilot countries (China and Viet Nam). The regional initiative has now leveraged the South-South and Triangular Cooperation modality and successfully secured additional donor funding to expand coverage to two LDCs (Cambodia and Nepal) in addition to Indonesia.

Prior to the launch of the Regional Pilot Project, CSAM provided preparatory support to Cambodia by co-organizing a regional workshop on mechanization for conservation agriculture[1] (in 2018 in Phnom Penh), followed by regional training[2] (in 2019 in Siem Reap) which highlighted the importance of permanent soil cover maintenance and crop residue management in the context of crop residue burning. Among the key outcomes of the training was the collaboration between international partners and the General Directorate of Agriculture of the Ministry of Agriculture, Forestry and Fisheries of Cambodia for the introduction and demonstration of an eco-friendly planter from India in Cambodia, namely the Happy Seeder. This was an important step towards promoting sustainable crop residue management in Cambodia through South-South cooperation.

The Regional Pilot Project has identified and tested a model to utilize straw as fertilizer, fodder, base material (e.g., for mushroom growing) and clean energy production in a circular manner to apply to the farming-livestock system while customizing the model for specific local conditions. The pilot in China is being implemented in Laixi in the Shandong Province in collaboration with China Agricultural University, local government agencies and a local farmer cooperative, while in Viet Nam the pilot has been implemented in Can Tho City in collaboration with the Sub-Institute of Agricultural Engineering and Post-Harvest Technology and local farmers. The main activities - including field experiments involving agricultural machinery, data collection and analysis, optimization of the machinery and technical patterns, and training for local farmers - have contributed to improving current practices and have provided an alternative to straw residue burning, thus supporting climate-smart agriculture. For instance, as of August 2021, the pilot in China has demonstrated the following ecological and economic benefits:

72 tons of wheat straw and 99 tons of maize straw were utilized as fertilizer rather than burning away last year at the 10-ha pilot site, thus successfully reducing an estimated 220 tons of carbon dioxide emission;
Over the same period, in comparison to the pre-intervention levels in 2018, maize and wheat yield increased by 509 kg/ha and 1,300 kg/ha, respectively, while the net income of the farmer cooperative under the various technical patterns increased by up to US$ 602/ha;
Soil Organic Matter increased from 2.1 percent in 2018 to 2.24 percent in 2021.

The good practices of the pilot in China were reported by the China Central Television (CCTV) in 2020. The Regional Pilot Project has also engaged India as a knowledge-sharing partner, where a regional study tour was organized in 2019 to demonstrate best practices and technologies for crop residue management to participants from Cambodia, Nepal and other countries.

The notable outcomes of the Regional Pilot Project, including sharing of good practices and knowledge among the pilot countries as well as Cambodia, Indonesia, Nepal, and India, have contributed to an integrated approach, with evidence-based project design that emphasizes effectiveness and sustainability, and mutual learning.

Building upon its success and positive results, as noted above, the Regional Pilot Project is now being expanded to two LDCs (Cambodia and Nepal) and Indonesia in 2021 with funding support from China, embodying the spirit of South-South cooperation. The initiative will sustain its outcomes by mainstreaming the integrated model of straw management by engaging pilot country partners and decision-makers, as well as testing and replicating the model in varied contexts and sub-regions, with a particular emphasis on LDCs.

1 https://bit.ly/33FdtHU
2 https://bit.ly/3A148Xf

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