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CIRCULAR ECONOMY BUSINESS CASE STUDIES IN SOUTHEAST ASIA

Loc Troi Group

An Giang Province, Vietnam
Agriculture
www.loctroi.vn
Analysis period: 2016-2023

Low-Carbon Transition in the Rice Sector

Business Spotlight

The Loc Troi Group (hereafter Loc Troi) is a leading Vietnamese agricultural company specialising in rice production, trading and exporting in the Mekong River Delta (MRD). Responding to increased competition from other key rice exporting countries, Loc Troi joined the Sustainable Rice Platform (SRP) in 2015 and conducted SRP standard pilot testing with 150 farmers covering nearly 500 ha in the MRD – the country's 'rice bowl' – during the 2016–2018 cropping seasons. The pilot showed that the total expenses for cultivating SRP rice were reduced by 9%, compared to traditional cultivation techniques.

Farmers adopting the SRP model, and applying alternate wetting and drying (AWD) techniques, saw 14% per ha higher net returns, which enabled reductions in water consumption and fertiliser use. Loc Troi pays a 1% price premium for SRP-produced rice; pesticide use and GHG emissions are reduced by 25% compared to non-SRP rice.

Building upon the achievements and lessons learnt from the pilot testing phase, Loc Troi increased investment in SRP rice cultivation because of the stable market for SRP rice globally and its economic and environmental benefits. Since 2018, SRP cultivation has expanded to include nearly 3500 farmers with a total cultivated area of over 11,500 ha in the MRD, and has achieved an average SRP score of 82%, which justifies the SRP level for '*working towards sustainable rice cultivation*'. Seeking third-party assurance for SRP rice in 2020 with the application of the SRP 100 verification programme, Loc Troi selected 13 farming households in the MRD with a cultivation area of approximately 100 ha. Loc Troi then became the first company in Vietnam to achieve a full SRP 100 score verified by Control Union over four consecutive years, 2020–2023. Loc Troi's adherence to the SRP standard is a leading example for the adoption of sustainable rice farming practices for the low-carbon transition of rice cultivation in Vietnam.

Keywords

Sustainable rice farming

Innovation

Production, End-of-life management, Resource circularity, Resource efficiency, Resource substitution

Context and baseline

Rice is the most important crop in Vietnam, which ensures national food security. Although Vietnamese rice holds competitive advantages in the world market, the grains often fail to meet strict quality standards. Improving quality in rice production will help the country further expand its market share, increase the profitability and sustainably of the rice sector, and improve livelihoods for many farmers.

The Sustainable Rice Platform (SRP) is an international multi-stakeholder initiative to improve resource efficiency, sustainability, and farmer and community well-being in the global rice sector.[1] SRP works through a multi-levelled approach, from increased farmer adoption of sustainable best practices in rice production to convening a global alliance of public and private sector stakeholders linking research, policy, production, trade, and consumption. Drivers for SRP adoption across the supply chain include: cost-savings measures (reduced fertiliser use and more efficient water management); price premiums to producers and retailers for SRP-certified rice; and increased global awareness of the need to mitigate greenhouse gas (GHG) emissions from rice cultivation. These drivers are increasingly making SRP-verified rice an attractive proposition for businesses and local communities.

Recognising the significant economic and social benefits of SRP application and the sizeable contribution of rice cultivation to agricultural GHG emissions, Loc Troi prioritises working towards sustainable agricultural development in its business mission. Loc Troi officially joined the SRP in 2015. The company piloted the SRP rice cultivation model with 150 farmers in the 2016 summer-autumn crop season, and expanded the programme to include approximately 3500 farmers in the MRD by 2023.

Innovation

The SRP standard for sustainable rice cultivation is the world's first voluntary sustainability standard that applies specifically for rice cultivation and its post-harvest management. The standard comprises 41 requirements structured under eight themes covering economy, environment and people. Full or partial adherence to the specified best practices generates a point score on a scale of 0–100. A score of 90 or above is considered '*sustainably cultivated rice*', whereas as scores between 33 and 90 are recognised as '*working towards sustainable rice cultivation*'. The SRP requirements are complemented by SRP's performance indicators, which is a set of 12 quantitative indicators used to monitor the impact when climate-smart best practices and other field interventions are adopted. Five of these indicators are specifically relevant to the circular economy transition, namely: productivity (rice grain yield), water-use efficiency, nutrient-use efficiency for nitrogen, nutrient-use efficiency for phosphorus, and GHG emissions. Each requirement in the standard is aimed at improving one or more of these SRP performance indicators.

Themes and requirements in the SRP standard for sustainable rice cultivation[2]

FARM MANAGEMENT	PREPLANTING	WATER USE	NUTRIENT MANAGEMENT
• Crop calendar • Recrod keeping • Training	• Heavy metals • Soil salinity • Land conversion and biodiversity • Invasive species • Leveling • Pure seed quality	• Wate management • Irrigation system at community level • Inbound water quality • Groundwater extraction • Drainage	• Nutrient mangement (organic and/or inorganic) • Organic fertilizer choice • Inorganic fertilizer choice
INTEGRATED PEST MANAGEMENT	**HARVEST AND POSTHARVEST**	**HEALTH AND SAFETY**	**LABOR RIGHTS**
• Weeds • Insects • Diseases • Molluscs • Rodents • Birds	• Timeing of harvest • Harvest equipment • Drying time • Drying technique • Rice storage • Rice stubble • Rice straw	• Safety instructions • Tools and equipment • Training of pesticide applicators • Personal protective equipment • Washing and changing • Applicator restrictions • Re-entry time • Pesticide and chemical storage • Pesticide disposal	• Child labor • Hazardous work • Education • Forced labor • Discrimination • Freedom of association • Wages

1 See: https://sustainablerice.org/

2 https://sustainablerice.org/wp-content/uploads/2022/12/NO-202308-ST-EN-SRP-Standard-for-Rice-Cultivation-V2.2.pdf#page=18&zoom=100,34,137

Relevant to the circular economy, Loc Troi in its commitment to the SRP specifically promotes the improved irrigation regime, along with integrated pest management (IPM) and crop residue management as innovations in rice cultivation.

Alternative Wetting and Drying (AWD) irrigation. Rice cultivation emits methane and nitrous oxide, both potent GHGs, during the submerged or wet periods of the growing cycle. The flooded soils of rice paddies provide an ideal environment for methane-producing bacteria, which can be minimised by shortening the duration of and extent to which rice paddies are flooded during cultivation. Single drawdown of water during the midseason and AWD are two techniques for reducing or interrupting inundation and the associated anaerobic conditions under which methane is formed. This technique helps to reduce methane emissions by allowing the fields to be vented (or replenished with oxygen) when water is withdrawn during the growing period of the rice plant.

Integrated Pest Management (IPM) is an ecosystem management approach to keep pest populations below economically damaging levels while minimising hazards to humans, animals, plants, and the environment. A combination of techniques such as use of resistant varieties, conservation of natural enemies through habitat modification and minimisation or avoidance of pesticide application, and modification of cultivation practices achieves this result. The farmers are instructed to spray appropriate and type-specific pesticides at the right time and at the right dose. To monitor and control rice cultivation, farmers must keep a diary of activities undertaken, which helps farmers protect and improve their yield more effectively with lower costs.

Crop residue management. Rice cultivation generates considerable quantities of rice straw in each cycle. In many rice-growing areas of Vietnam, especially in the MRD, farmers burn rice straw after harvesting to clear the land of crop residue and prepare for the next growing cycle. However, this is not a sustainable practice because of nutrient loss and air emissions (smoke, soot, CO_2) which have a detrimental impact on air quality. Incorporating rice straw into the soil can solve the environmental pollution caused by burning straw. As a multi-purpose renewable resource, straw is rich in nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and organic matter, and returning straw to the soil can reduce chemical fertilisers use while effectively ensuring high and sustainable soil productivity. Because of the environmental impact of burning straw and the importance of quick turn-around times between crops, there is a need to hasten the decomposition of the rice straw before it is incorporated into the soil. Trichoderma is a beneficial microorganism which can foster rice straw decomposing and be used as an alternative to burning for field clean-up. After harvesting the rice, the rice straw in the field is sprayed with Trichoderma probiotics before being ploughed into the soil. The straw will then gradually decompose into organic fertilisers that provide nutrients for the soil and the next rice crop.

Circular Economy impact

Application of the best practices included in the SRP standard in rice cultivation contributes to circular economy through improved use-efficiency of fertilisers and water, and reduced generation of agro-residue waste, i.e. through resource efficiency in rice cultivation. Moreover, the recovery of nutrients and organic material from the rice straw contributes equally to resource circularity (value recovered from previously discarded rice straw) and (partial) resource substitution (of chemical fertilisers with an organic alternative).

These practices contribute significantly to minimise the generation and release of GHGs into the environment. The SRP-produced rice is effective in reducing the GHG emissions (combination of methane and nitrous oxide) from rice production by 25% compared to non-SRP rice through the synergy of:

- **Application of AWD practice** controls the use of water properly to reduce the amount used after planting (thus less energy will also be used for irrigation), and limits the soaking time of the field (anaerobic environment), thereby reducing GHG emissions, especially CH_4 and N_2O in the rice-branching stage.
- **Effective IPM** helps reduce pesticide and fertiliser use by 25% and thereby contributes to reducing N_2O emissions.
- **Crop residues.** Returning straw to the soil is good practice for alleviating the environmental pollution caused by the air emissions from burning rice straw after harvest. Trichoderma-based compost activator is used widely for crop residue management at Loc Troi to accelerate the decomposition process that enables incorporation of composted rice straw into the soil.

Business and market impact

The circular economy innovations deliver financial, environmental and social benefits for Loc Troi and the rice farmers in its supply chain through an average increase in net return per ha of SRP rice cultivation of 14% compared to non-SRP rice. This is the combined result of a 2% increase in total revenues per ha and a 1% increase in productivity; a 23% reduction in pesticide expenses and a 5% reduction in fertiliser costs; and a 7% decrease in water consumption costs due to efficient irrigation practices, resulting in a 9% reduction in total production costs per ha. Moreover, the SRP-produced rice achieves a 1% price premium for the farmers.

Stakeholders

The new rice farming method of SRP brings benefits not only to Loc Troi but equally to the stakeholders. Farmers appear to be more consistently positive about continuing to apply the new method due to its multiple benefits, including reduced expenditures, reduced labour requirements, improved quality and yields, increased net return from SRP cultivation, and price premium. They also benefitted from training on IPM to facilitate the correct application of these practices.

Because the Government of Vietnam included, in the unconditional National Determined Contributions (NDC) for the Paris Climate Agreement, the increased use of AWD irrigation and systems of rice intensification between 2021 and 2030 to achieve sizeable GHG emission reductions, approximately 1 million ha in Vietnam would need to be converted from traditional rice cultivation to SRP rice to achieve a net emission reduction of 50.46 $MtCO_{2eq}$[3] in the country. Loc Troi received encouraging support (information, technical assistance, R&D, capacity building, trainings etc.) from the local government and development partners for SRP application.

Financing for Loc Troi's scale-up of the SRP model included USD 5 million funded by the Canadian government through the International Finance Corporation (IFC) in partnership with the International Rice Research Institute (IRRI) under the Sustainable Rice Production programme in Vietnam.

Implementation

SRP rice cultivation at Loc Troi was implemented in three phases, namely pilot testing, scaling up, and selective application of the 100 SRP score programme verified by a third party.

The pilot-testing phase of SRP rice at Loc Troi started in 2016 in the MRD during the 2016–2018 crop seasons with 150 farmers covering nearly 500 ha in the An Giang, Kien Giang and Dong Thap provinces in the MRD. The SRP score assessed as 64% before the SRP implementation and reached 82% by the end of 2018, attaining the SRP level of '*working towards sustainable rice cultivation*'.

The scaling-up phase continues to build upon the achievements and lessons learnt from the pilot testing phase. Loc Troi is increasing its investment in SRP cultivation model due to the stable market for SRP rice globally and the economic and environmental benefits that result from following the model. By 2023, it expanded the programme to include nearly 3500 farmers across an area of over 11,500 ha in the six MRD provinces of An Giang, Kien Giang, Dong Thap, Long An, Bac Lieu, and Soc Trang. Currently this 11,000+ ha area has been qualified as '*working towards sustainable rice cultivation*' with an SRP score of 82%.

For both phases, the assessment was carried out internally by Loc Troi without external verification by independent third-party. The internal assessments covered all elements of the SRP Standard, including the Internal Management System (IMS) Standard.

In seeking third-party assurance for SRP rice (verification), Loc Troi selected 13 farming households in two provinces of An Giang and Dong Thap in the MRD with a cultivation area of approximately 100 ha for the application of the SRP 100 verification programme. As required, the assessment was undertaken by Control Union, which is independent of the producer or producer group

3 Million Tonnes of carbon dioxide equivalent; 1 tonne is equal to 1000 kilograms.

being assessed. Achieving 100% SRP standards requires full compliance with the requirements of the standard. Loc Troi has maintained and successfully been re-certified in four consecutive years from 2020 to 2023, further confirming the commitment of the Loc Troi Group to collaborate with farmers on the path of sustainable rice cultivation.

During the SRP implementation process, the following barriers were encountered by Loc Troi in developing and implementing circular economy solutions, in particular:

- The SRP standard for sustainable rice cultivation has 41 requirements that require technical knowledge and skills to understand and adopt the necessary best practices, and they posed a challenge for smallholder farmers, which Loc Troi addressed with its training and farm-level support.
- SRP is not yet a widely recognised brand value in the commercial rice industry or within rice growing communities, which limits interest in adopting SRP methods.

Takeaways

- Sustainable rice production directly reduces GHG emissions in rice fields, and contributes to meeting Vietnam's Nationally Determined Contributions (NDCs) for GHG mitigation under the Paris Climate Agreement.
- Smallholder farmers can achieve social and economic benefits when following SRP practices because of the reduced consumption of fertilisers combined with efficient water irrigation and drainage practices, as well as other cost-saving measures. These benefits may allow SRP models to more quickly commercialise without requiring significant financial support in the initial transition phase.
- A high-potential consumer demand for sustainable rice production with its benefits across the supply chain can make SRP an attractive, bankable investment for businesses, farmers and investors.

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