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Sustainable Rice Farming: Unlocking Nigeria's Potential with System of Rice Intensification (SRI) by Abubakar Halilu Girei

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Summary

Traditional rice-growing practices in Nigeria contribute to water scarcity and greenhouse gas emissions. Continuous flooding of rice fields leads to inefficient water use and exacerbates environmental problems, including methane emissions and climate change. There is an urgent need to switch from these conventional practices to more sustainable alternatives, such as the System of Rice Intensification (SRI). Research shows that SRI offers significant advantages over conventional rice cultivation. It improves water-use efficiency by promoting intermittent irrigation and aerobic soil conditions, thereby reducing methane emissions and increasing rice yields. SRI practices contribute to environmental sustainability while improving farmers' livelihoods and food security. The policy brief proposes concrete recommendations to facilitate the adoption and scaling-up of SRI practices in Nigeria, such as policy support, financial incentives, capacity building, research and development, as well as monitoring and evaluation mechanisms.

Key messages

1. Water use efficiency. Switching to the System of Rice Intensification (SRI) in Nigeria can improve water use efficiency and maintain or increase rice yields in water-stressed areas.
2. Reducing greenhouse gas emissions. SRI cultivation in Nigeria reduces methane emissions from rice paddies and aligns with climate change mitigation objectives by promoting soil aerobiosis.
3. Improving productivity and economic benefits. SRI practices in Nigeria are improving rice yields, soil fertility and economic viability, benefiting food security and rural livelihoods.

Introduction

Rice cultivation is essential to Nigeria's agricultural sector. Yet conventional flooded farming methods pose sustainability problems, exacerbating water scarcity and methane emissions. With increasing pressure on water resources due to population growth and climate change, it is imperative to find innovative solutions. This research investigates the transition from conventional practices to the System of Rice Intensification (SRI) in Nigeria, to assess its feasibility and benefits in terms of improving water use efficiency, reducing greenhouse gas emissions and promoting socio-economic development, in line with Nigeria's commitments to sustainable development and climate action.

Continuous flooding (CF)

Alternate wetting and drying (AWD)

Methods

This research used a mixed-methods approach, combining quantitative and qualitative data collection methods to assess the feasibility and benefits of transitioning to the System of Rice Intensification (SRI) in Nigeria. The study began with a review of existing literature to gain a clear understanding of the subject and identify areas where further research is needed. Field surveys and interviews were conducted to gather primary data on current rice-growing practices and perceptions of SRI.

Quantitative data on water use, greenhouse gas emissions and rice yields were collected and analyzed using statistical techniques, while qualitative data from interviews and surveys were thematically analyzed to provide contextual understanding. The integration of quantitative and qualitative results strengthened the validity and reliability of the research findings concerning SRI adoption in Nigeria.

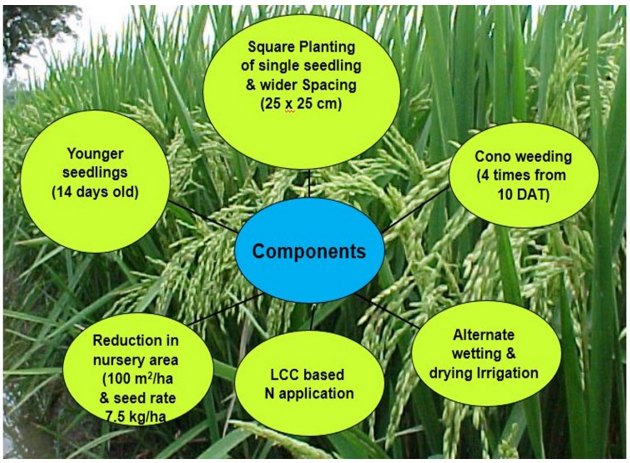

Figure 1: Components of System of Rice Intensification

Results

SRI practices significantly enhance water use efficiency compared to conventional flooded rice cultivation in Nigeria. On average, SRI reduces water requirements by 28% (Table 1), while maintaining or increasing rice yields making it a viable solution for water-stressed regions.

Irrigation Practices	Level of water before irrigation	Total quantity of water applied (cm)
Intense Drying (AWD2)	Below 5cm	164.7
Mild Drying (AWD1)	Below 10cm	186.61
Traditional Continuous flooding (CF)	Just above soil surface	214.81

Table 1: Irrigation Depth per unit area (cm) applied to rice plots from Sowing to harvest, under three irrigation treatments (AWD2, AWD1 and CF) for three replicates

SRI practices lead to a substantial reduction in greenhouse gas emissions, particularly methane, compared to conventional rice farming methods (Figure 2). Methane emissions from SRI paddies are 16% lower (Figure 2), aligning with Nigeria's climate change mitigation goals and commitments under international agreements.

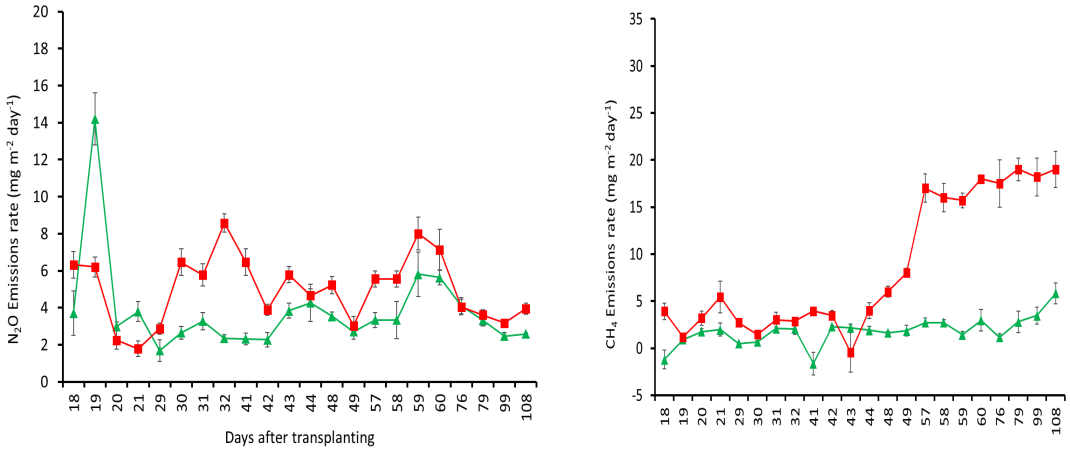

Figure 2: Fluxes of (a) CH_4, (b) N_2O under paddy field as affected by different irrigation methods for 108 DAT.

SRI adoption is shown to improve rice yields and soil fertility, resulting in higher productivity per unit of land area. Farmers practicing SRI experience 26.3% increase in rice yields (Table 2), translating into improved food security and economic well-being.

	NO: U-FG	1000-GWt	Paddy Yield
Irrigation	**(%)**	**(g)**	**(t ha^{-1})**
AWD	19.77a	38.76a	10.72a
CF	15.77b	32.49b	8.67b
SL	**(2.39)	NS	***(0.74)

Table 2: Effect of irrigation management on rice plant yield component

Conclusion

By adopting SRI practices, Nigeria can achieve a triple win: strengthening the sustainability of agriculture, conserving water resources and mitigating climate change, while improving the livelihoods and food security of its population. The time for action is now, and the evidence is clear. SRI offers a pathway to a more resilient, prosperous and sustainable future for the Nigerian rice sector. Policymakers, agricultural authorities and stakeholders must prioritize and support the widespread adoption of SRI in Nigeria's rice sector.

Recommendations for action

1. Encourage and support rice farmers to switch from conventional flooded rice cultivation to SRI practices.
2. Develop and implement financial incentives such as subsidies, grants and preferential loans to encourage the adoption of SRI by small-scale farmers and regions facing water scarcity and climate vulnerabilities.
3. Integrate the promotion of SRI into national agricultural and environmental policies, ensuring coherence and alignment with broader development objectives.
4. Foster collaboration between government agencies, agricultural extension services, research institutes, NGOs, farmer cooperatives and international development partners to support the adoption of SRI through knowledge-sharing platforms, farmer field schools and scaling-up initiatives with expertise and resources.

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