Approaches to policy reforms to support expansion of SRI

Our framework aims to serve as an outline of optional mechanisms to support the upscale of climate-smart agriculture (CSA), with a focus on the System of Rice Intensification (SRI). First, policymakers must identify and prioritise the relevant barriers to CSA adoption within their countries’ agricultural sector, which we have paired with suggested policies that will aid a national or state government to overcome corresponding barriers. It is important to note that policies to overcome barriers work most effectively when implemented with training and education of SRI practices, and with effective stakeholder engagement to have meaningful and sustainable impacts from policy reforms. Governments must engage and collaborate with public and private partners, as well as farmers and farmer organisations, to implement sustained policies that achieve goals.

Here, a catalogue of examples from rice-producing countries is used to evidence the range of countries that are already taking positive steps in this direction. For example, various states in India are supporting small-scale farmers to convert to SRI practices, and the Tanzanian government has demonstrated effective actions that overcame irrigation barriers.

Policy categories to overcome current issues:
- **Methane emissions**
- **Water security**
- **Food security**
- **Fertiliser Prices**
- **Attitude and awareness** of farmers or policymakers to SRI can help overcome any of these challenges.

SRI-2030
<table>
<thead>
<tr>
<th>Barriers to SRI adoption</th>
<th>What policies can be used to support SRI?</th>
<th>Why do these policies support SRI?</th>
<th>Who has been implementing these policies well?</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low policy-maker interest</td>
<td>Incorporating SRI practices into <a href="https://www.ipcc.ch/sr15/"><em>Nationally Determined Contributions</em></a> (NDCs) to achieve targets for greenhouse gas (GHG) emission reductions. Targets should be specific and unconditional.</td>
<td>Incorporating SRI extension into environmental pledges will enable governments to achieve goals aligned with those required to mitigate global warming, such as the <a href="https://climateactionnow.org/methane-pledge"><em>Methane Pledge</em></a> resulting from COP26, alongside several other socioeconomic and environmental benefits.</td>
<td>The Vietnamese government included alternate wetting and drying (AWD) in its NDC, specifying two low-carbon rice production systems similar to SRI, alongside an aim of reducing the rate of burning of rice straw fields from 90% to 30%. The Government of Bangladesh plans to upscale AWD to 150,000ha of dry season rice fields, and reduce nitrous oxide emissions from fertilisers on 836,000ha crop land. Both mitigation actions can be achieved through upscaling SRI. Myanmar specifically mentions the use of SRI to reduce methane emissions but has not included any quantified measures.¹</td>
<td>The greatest limitation to the NDCs is the fact that some are conditional on financial availability. Additionally, India and China, the two large rice producers, do not have NDCs expressed as emissions percentage reductions, meaning there is no clear target for reductions to be evaluated.</td>
</tr>
<tr>
<td>Low water access and/or control for farmers</td>
<td>Improvement and expansion of participatory irrigation management systems</td>
<td>Not only do SRI practices require less water than conventional practices but improving participatory irrigation management systems will further increase water use efficiency and Tanzania has invested in improving irrigation systems in some areas, where improved traditional schemes have shown increased yields of up to 400 percent. 78 irrigation schemes around the country were invested in.²³</td>
<td>Projects to improve or expand irrigation management systems are likely to require several years for design, planning, and</td>
<td></td>
</tr>
</tbody>
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¹ [CCAFS Info Brief 21 NDCs](https://www.ccafs.cgiar.org/publications/ndc-issues-186)
² [https://www.icid.org/v_tanzania.pdf](https://www.icid.org/v_tanzania.pdf)
result in easier access to water for farmers to use AWD in areas with erratic rainfall. Rainfed agricultural regions that receive large proportions of the countries’ annual rainfall in a short period of time will struggle with AWD. Implementing drainage and storage systems to help communities control the volume of water on the field will increase farmer control of water on the field. Small-scale irrigation, such as solar pumps, allows farmers to have more control over irrigation of their fields in lowland regions where rainfall is unreliable and/or insufficient. Small-scale irrigation schemes have been shown to positively influence agricultural income, whilst also empowering farmers to adapt to climate variability.\(^4\) The Government of Tamil Nadu worked with the World Bank to invest in irrigation system modernisation, through the Tamil Nadu Water Resources Consolidation Project (WRCP) and the Tamil Nadu Irrigated Agriculture Modernisation and Water-Bodies Restoration and Management Programme (TN IAMWARMP). Under the latter project, over 5,000 tanks and irrigation supply canals were rehabilitated and modernised, and 2,800 water users’ associations were established, resulting in a 39% expansion of the fully irrigated area, which resulted in the area under high-value crops doubling.\(^5\)

<table>
<thead>
<tr>
<th>Lack of market incentive (environmental externalities)</th>
<th>Introduction of a Payment for Ecosystem Services (PES) scheme</th>
<th>Payments for Ecosystem Services are the most efficient economic mechanism to incentivise a transition to more environmental production systems. However, it is important to accurately estimate the opportunity cost of PES schemes, and to use evidence-based evaluation of the ecosystem services flow to ensure implementation, whereas implementing SRI as a technology alone is possible within a year. However, transferring irrigation control to farmers through participatory management systems significantly increases the success of SRI implementation.</th>
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Carbon markets are a form of PES scheme, where private partners pay farmers for reductions in GHG emissions resulting from implementation of SRI practices. Interventions were implemented in an integrated soil and water management strategy. The result was enhanced productivity of the land, and increased water yield and quality. However, because water quality monitoring was not included in the project it was unable to determine the effect of land management practice on water quality.

A sustainable low-carbon rice project in Vietnam, known as 1 must, 6 reductions (1M6R) was piloted in 2012. The project aimed to bring together a range of stakeholders, including private and public partners, the Vietnamese government, farmers, and farmer organisations. Higher market prices for low-carbon rice were agreed with export companies, however buyers for the carbon credits are still being sourced. There is no update of further developments following this pilot.

<table>
<thead>
<tr>
<th>High up-front transition costs</th>
<th>Input subsidy and/or provision required to ease conversion to SRI practice, i.e., biofertilisers and machinery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Or</td>
<td>Some small-scale farmers may require subsidy support in order to acquire inputs for SRI, such as mechanical weederors small-scale irrigation pumps.</td>
</tr>
<tr>
<td>Government departments can work</td>
<td>Credit schemes can provide a range of benefits to rice farmers. The Government of Pakistan introduced a policy for small-scale farmers that provided credit for purchasing required inputs for SRI, including farm machinery and seed.</td>
</tr>
<tr>
<td>Access to rural credit in Bangladesh has been</td>
<td>Agricultural credit issues relate to the country or region, with the greatest issues typically resulting from credit accessibility, high transaction costs, low guarantees, and weak credit</td>
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7 [https://www.icid.org/v_tanzania.pdf](https://www.icid.org/v_tanzania.pdf)


| Provision of rural credit to support increased adoption of CSA technologies | with banks to provide loans to small-scale farmers to finance investments into additional inputs.  
<br>Merrey, D. J.; Lefore, N. 2018. Improving the availability and effectiveness of rural and “Micro” finance for small-scale irrigation in Sub-Saharan Africa: a review of lessons learned. Colombo, Sri Lanka: International Water Management Institute (IWMI). pp. 46. (IWMI Working Paper 185). | evidenced to improve rice yield, increase access to rented land, and enhance girl’s school enrolment among rural households. However, there are many examples of credit programmes that have demonstrated more negative repercussions than positive. It is therefore critical that policymakers design better financial products which can then be used to replace rural credit. For example, state governments in India have worked with the National Bank for Agriculture and Rural Development to coordinate with local banks to support farmers who adopt SRI.  
<br>Hossain, A., Malek, M. and Yu, Z., 2021. Impact of rural credit on household welfare: evidence from a long-term panel in Bangladesh, International Association of Agricultural Economists Working Paper 21-03. Japan. | Indonesia developed a guaranteed microfinance programme (KUR) for agriculture. Whilst there are benefits to this programme, there is evidence that men have a higher chance of accessing KUR than women.  
<br>Additional, most banks are hesitant to lend to farmers due to the uncertainty and fluctuation of food prices and low rates of repayments.  
<br>Modifying existing social protection programmes | Enabling poor households to retain and build up assets through social protection intervention allows investment of time and capital into alternative agricultural practices, such as SRI. Individual capital is subsequently strengthened through increased yields and higher prices.  
<br>Herliana, S., Sutardi, A., Aina, Q., Himmatul Aliya, Q. and Lawiyah, N., 2018. The Constraints of Agricultural Credit and Government Policy Strategy. MATEC Web of Conferences, 215, p.02008. | Malawian has implemented public works programmes to develop community assets such as soil conservation and irrigation infrastructure by providing short-term labour-intensive employment to encourage adoption of climate-smart agriculture. For example, the Malawi Social Action Fund is implemented nationally in a decentralised manner during the post-harvest period.  
<br>Modified social protection programmes may take a long time and a lot of political effort. |  
<br>Minimal social supports limit low-income households’ abilities to change agricultural practices | Modifying existing social protection programmes | Enabling poor households to retain and build up assets through social protection intervention allows investment of time and capital into alternative agricultural practices, such as SRI. Individual capital is subsequently strengthened through increased yields and higher prices.  
<br>Herliana, S., Sutardi, A., Aina, Q., Himmatul Aliya, Q. and Lawiyah, N., 2018. The Constraints of Agricultural Credit and Government Policy Strategy. MATEC Web of Conferences, 215, p.02008. | Malawian has implemented public works programmes to develop community assets such as soil conservation and irrigation infrastructure by providing short-term labour-intensive employment to encourage adoption of climate-smart agriculture. For example, the Malawi Social Action Fund is implemented nationally in a decentralised manner during the post-harvest period.  
<br>Modifying social protection programmes may take a long time and a lot of political effort. |
| Negative farmer attitude toward SRI | Promotion of SRI as an environmentally friendly agricultural practice | When a government promotes a new form of management, such as SRI, it allows governmental agencies to promote and support the extension of the practice. | The Indian government has been supporting and promoting SRI practices since 2004. Active political support seen in the Tripura state of India resulted in an expansion of SRI from <1,000 in 2005 to >160,000 in 2007.\(^{19,20}\) Bihar state in particular has demonstrated high adoption rates since SRI was first introduced. The Agriculture Director of the Magadh Division was one of the only policymakers present at one of the first demonstrations of SRI yields, and the high yields convinced them to bring their colleagues and superiors to the field. By the 2011-12 season, Bihar state had 355,00 hectares under SRI production.\(^{21}\) SRI can take a few years to produce the larger yields that are often promised. Also, if SRI is not implemented correctly, it is likely the full potential of yields would not be achieved at all. If this were to happen, rates of SRI disadoption would be higher and faith in the government would drop. |

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19 [http://sri.ciifad.cornell.edu/countries/india/IndiaArchives.html](http://sri.ciifad.cornell.edu/countries/india/IndiaArchives.html)
21 Verma, A. 2013. *SRI in Bihar: From one to 350,000 - The Role of Local Authorities.* Farming Matters. 42-44.
| Farmers demonstrate a negative attitude towards SRI or lack of knowledge of benefits | Capacity strengthening for communities implementing SRI through forming strong farmer-to-farmer (F2F) and extension worker networks | Farmer training and example fields allow farmers to understand the science behind the practices through seeing tangible results and learning from locals. F2F networks further increase community cohesion and social capital. | In 2003, Vietnam’s Plant Protection Department began SRI training sessions as part of its FAO-funded integrated pest management (IPM) programme. Farmer field schools (FFS) were used to deliver the training, which enabled farmers to trial SRI in experimental fields and witness the methodology in practice. FFS is an effective way for getting farmers started; its main virtue is promoting respect and cooperation. Farmers are empowered by FFS, and therefore take more initiative and responsibility. | Agricultural extension services that are not well trained in the required practices for effective SRI management will result in ineffective dissemination of SRI. |
| Implementation of yield protection schemes | Yield protection schemes for farmers implementing SRI practices encourage SRI uptake as farmers have a guarantee that SRI yields will match their previous average yield, or farmers will be reimbursed for the difference. | RIICE is a satellite imaging company that works with ministers and insurers across Asia. The government of Tamil Nadu is working with insurers to use RIICE technology for loss insurance schemes following natural disasters. A similar strategy can be used for yield protection schemes, whereby satellites are used to check SRI yields against previous yields from conventional practices. This way, farmers can be assured that if SRI does not work more effectively than conventional practices, A concern with yield protection schemes is that farmers may not take enough precaution against events caused by climate change if there is reassurance of repayment if yields fail. Additionally, implementing a verification system for |

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| Regional barriers to the uptake of SRI, such as low soil fertility, availability of machinery, organic matter, irrigation. | Research into SRI practices that are region-appropriate | A propellor for widespread uptake of practices is the adaptation to specific regions. SRI can be adopted by farmers from a wide range of agro-ecological biomes, but can require adaptations based on monitoring and evaluation of practices. Spreading knowledge and awareness of SRI practices requires a large extension worker network to support farmers in adopting the new practices. | Extension services typically act as a bridge between research and farmers. Investment in extension services, as seen by the Ministry of Agriculture and Fishery of Timor-Leste, is invaluable to upscaling SRI. The dissemination of technical knowledge from extension workers to farmers increases the speed of spread of new technologies, and supports farmers in the conversion from conventional practices.  

Vietnam also serves as a prime example of government agency aiding upscaling of SRI through research. The Department of Agriculture and Rural Development built awareness of SRI and identified regional promoters, whilst researching ways to adjust SRI practices to local conditions. Furthermore, the Plant Protection Department organised extension approaches, including FFS and F2F training. |

It is possible for research to be limited by the specificity within the context of the research, whereby research cannot be generalised or applied to other regions due to differences in soil composition, climate, rainfall, and other environmental factors. |

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27 ESA, 2022. *Sentinel-1 speeds up crop insurance payouts*. online  
28 da Cruz, C. J., 2016. Improving food security through agricultural development in Timor-Leste: experiences under 13 years of democratic government, *Food security in Timor-Leste through crop production*, Australia Centre for International Agricultural Research, 146, pp. 30-37  
| Low private sector participation | Removing restrictions on purchase, stocking, movement, and sales of certified SRI-grown rice to encourage private sector participation in agricultural marketing. | Increasing private sector participation in marketing of SRI-grown rice will encourage SRI adoption through raising awareness. | The Government of Tamil Nadu removed restrictions on the purchase, stocking, movement, and sales of 13 key crops and greater wholesale marketing outside restricted markets was allowed.\(^{30}\) | Private sector participation in marketing of SRI-grown rice must be supported by direct marketing, otherwise the market price for locally grown rice could be reduced. |

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