

Reducing Methane Emissions From Rice Farming

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by ClimateRe

Pitch

Reducing Methane Emission While Enhancing Rice Farmers' Resilience to Climate Change

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<https://youtu.be/gkQj4V8VsAY>

The rice farmers are perceived as emitters of GHGs (mainly methane) which they are largely unaware of. Nepalese rice farmers bear the adverse effects of GHGs in terms of climate change felt in forms of erratic monsoon rainfalls, which is the main source of water for rice cultivation. Unpredictable and inadequate monsoon directly result in a rice yield decline, which is one of the reasons for an increasing trend of food imports in Nepal.

System of Rice Intensification (SRI) is a proven alternative rice growing method enabling rice farmers to cope with these adverse effects of climate change and actively participate in mitigating GHG emission. SRI relies on intermittent irrigating and draining of water to avoid anaerobic conditions and the subsequent emission of methane. Additionally, SRI is estimated to reduce fresh water use in rice cultivation by about 50%, reduce production cost and increase income for farmers which will enhance household food security.

The proposed project is located in the South of Nepal covering 55,000 ha. By changing the current rice growing (flooding) practice to the SRI method the climate resilience of more than 56,000 farmers will be increased and 500,000 tons of CO₂eq will be abated. Although, the SRI method is promising, key challenge is its wider adoption by farmers. Therefore, the program begins with creating social environment in the target communities, followed by closely supervised technical training and follow-up support during the entire rice growing season to enable them cope with the perceived risks and uncertainties while changing their age old practice.

Differently to other SRI projects, it does not rely on grants and funds, but instead the project will be developed as a carbon offset program. This will not only guarantee financial sustainability but will also increase prospects for a successful up-scaling to other parts of South-East Asia.



What actions do you propose?

Introduction

The research results indicate that globally rice field emit about 11% of the total methane. The estimated global emission for 2000 was 25.6 Tg/year. Practices such as draining rice field and applying rice straw offseason can reduce global methane emissions by 7.6 Tg/year (Yan et al., 2009).

In Nepal, rice is a staple food crop grown in 1.5 million hectares with a low average yields of 3 tons/ha and accounts for 32% of the total methane emission. In this context, it is important that the conventional rice growing method is replaced by an environment-friendly and socio-economically beneficial one. System of Rice Intensification (SRI) method is a promising option that significantly reduces methane emission, uses less water, minimizes cost of production and increases the yield. The SRI is a scientifically proven alternative rice growing method that is currently introduced in 28 countries world-wide. In conventional rice growing method, rice field is flooded with water during the growing season causing anaerobic condition and resulting in methane emission. In contrast, SRI method does not flood the rice field but maintains soil moisture keeping it well-drained and aerated that facilitates aerobic condition, thereby, reducing the formation of methane. Primarily, it focuses on developing strong root system and healthy soil conditions resulting in a robust plant physiology that is more adapted to adverse growing conditions.

The proposed project will promote System of Rice Intensification (SRI) in Nepal covering about 50,000 ha in 10 years. In this area the conventional rice growing method is practiced, producing an average yield of 3 tons/ha. Whereas, the research results of SRI method conducted by the District Agriculture Development Office (DADO - a government agency for agriculture) is 6.3 tons/ha while using about 50% less water.

Although SRI method is promising, the key challenge is its wider adoption by farmers. It requires a major 'change' in farmers' attitude and appropriate supports to cover the risk involved in the transition phase while adopting a new method, as rice farming is the livelihood base of the majority farmers. They need to learn not only new technical skills but also gain adequate experiences to master the new method.

Project implementation

The district coordinators implement and monitor the planned project activities, assisted by field assistants and leader farmers. The project activities include:

Awareness actions - to create an enabling environment for the introduction of new SRI method. Orientation on SRI method will be conducted in the project area prior to introduction of SRI method for farmers and all relevant parties, i.e. government agency like DADO, Non Government Organizations (NGOs), media personnel, local leaders and other relevant stakeholders. It intends to creating supportive environment and hence, prepare farmers in deciding for adopting SRI method.

Training - technical capacity building of farmers and their leadership role in the scaling up activities. In each district, field level trainings will be conducted for selected leader farmers at several stages of the rice growing season. Thereafter, the trained leader farmers will be further trained and mobilized for the scaling up of SRI method to peer farmer groups in their neighborhood.

Demonstration sites – trials plots for farmers to observe and compare the physiological differences between rice grown under SRI method and conventional method. Trial plots will be established in coordination with the Farmers groups, National Agricultural Research Council (NARC) and DADO. It will help farmer see and learn from the real field situation which is more convincing than abstract learning.

Monitoring of methane emission at specific sites in the rice fields and project activities. Regular data will be collected from both sample plots (SRI method and conventional method) during the entire rice growing seasons. This will provide reliable data to standardize methane emission level from rice fields for Nepal and to estimate total amount of methane reduced annually through SRI method.

Mass Information dissemination to other farmers in the project area. A weekly local FM radio program will broadcast relevant information on SRI method during the rice growing season (June - Sep and Feb - May). Additionally, posters and booklets will complement the information dissemination process.

Scaling up – to create demand for low carbon rice and to introduce the SRI method to other countries. Our target is to promote low carbon rice among large retailers (e.g. Walmart, Aldi, etc.) and large food companies using rice as ingredient (e.g. Mars, Nestle, etc.) to create additional demand.

Who will take these actions?

ClimateRe will coordinate and manage the project in collaboration with Department of Agriculture, farmer cooperatives and local implementing agency /NGO. ClimateRe will also be responsible to develop this project as a carbon offset program.

Department of Agriculture: The government support is vital to create supportive environment (including regulatory) for implementation and scaling up of SRI. District agriculture department office will also be responsible for promoting, and monitoring and evaluation after the project phases out.

Farmer cooperatives: Reaching to farmers through cooperatives will be more efficient and effective. And thus rice farmer cooperatives will be involved to practice SRI. For the project, existing farmer cooperatives will be promoted but new cooperatives will be formed if required.

Local NGOs: Local organization, will help in implementation of the project through capacity building, active interaction with the farmers, up scaling to other neighborhoods and monitoring and evaluation.

Where will these actions be taken?

The actions will be taken in Nepal. Total population of the country is 28 millions of which approximately 80 % of the rural population aged 15 and above is engaged in agriculture. Agriculture sector accounts for 35 % of the GDP (approx. USD 19 billions).

In Nepal rice is planted in an area of 1.5 million hectares. Rice is the main source of nutrition for Nepalese contributing of 50% calorie intake. An average person consumes 80 kg of rice in a year.

The pilot project will be on the lowland districts of central region, Nepal. It will be initiated in three adjoining districts Chitwan, Nawalparasi and Makwanpur. These are some of the major rice growing districts that have access to less than 50% irrigation. Climate in the majority of rice producing regions is sub-tropical to tropical that is ideal for summer rice that is highly influenced by Southeast monsoon that coincides with the critical rice growing period June to September when the most water is need. Consequently, the rice farmers rely heavily on unreliable monsoon rainfall; however, with the recent climate change monsoon is erratic that often results in crop failure or poor harvest causing widespread food shortage at the household level. Majority rice

farmers are rural subsistence small land landholders (average land size < 0.96 ha per family). In Nepalese subsistence farming system, family members are the main source of labor force for rice cultivation. The farmers grow wide varieties of rice both for consumption and for sale and any excess are sold for cash income.



The project can be up-scaled to other rice growing countries in Asia. Paddy rice cultivation accounts for 0.52 GtCO₂eq /year methane production (Smith et. al., 2014). Asia is the largest contributor and is responsible for 90% of global emissions. Emissions from rice cultivation is steadily increasing and if the current agriculture practices are not changed the annual contribution to global GHG anthropogenic emissions will increase by 0.4% each year.

How much will emissions be reduced or sequestered vs. business as usual levels?

The project, 55,000 ha of rice field converted into SRI method, will abate 500,000 tCO₂eq in a period of 10 years. After 10 years of the project, the project area will reduce 99,000 tCO₂eq methane every year.

What are other key benefits?

Compared to conventional rice growing method, SRI method has following benefits:

Environmental

- SRI method uses organic fertilizers instead of chemical fertilizers that could avoid both the emission of N₂O from rice fields and nitrate leaching into the ground water. It also promotes microbial activities and hence, improves the soil quality.
- SRI method avoids harmful chemical insecticides and pesticides, as the rice plants are more resistant to pests and diseases.
- Reduces pressure on fresh water use, as SRI method requires about 50% less water for rice cultivation than in conventional method.

Socio-economic

- Improves family food security through increased yield (>50%).
- Enhances farmers' income (>100%), as it yields higher and requires less production costs.
- Adaptation strategy against uncertain rainfall or drought condition, as SRI method requires about 50% less water.
- Avoids irrigation related conflicts that is common during rice growing seasons

Direct benefits projection for 10 years project		
	Amount	Units
1. Area covered	55'000	ha
2. People benefited	314'000	people
3. Rice yield increased	66'000	tons
4. Income earned through increased rice yield	13'759'000	USD
5. Amount of CO ₂ equivalent abated	508'000	tons
6. Revenues earned from sale of CO ₂ credit	2'540'000	USD

What are the proposal's costs?

Project costs

The estimated cost of the project is 1.5 million USD for 10 years and 9 months. It includes the cost for project implementation and coordination and for the accreditation as a CDM project (CDM UFCCC, 2016). Main project cost (560,000 USD) will be spent on capacity building and trainings of the farmers as well as institutional arrangement to raise farmers' capacity.

The proposed 10 years project will be developed as a CDM project which will co-finance the project through revenue generated from sale of CO2 credits. Hence, the project needs initial funding of approximately 450,000 USD for first 3 years and thereafter, the remaining 7 years will be financed through carbon revenue. The surplus of carbon revenues after completing 10 years project period will be used to launch new projects in other countries in South-East Asia. Based on the expected price of CO2 at 5 USD/ton on the voluntary carbon market, we assume that we will be able to generate 2.5 million USD revenue.

Main drawbacks of SRI

- Labor intensive, required greater skills and drastic change of farming practices
- Possibility of increased pests

(Uphoff & Fernandes, 2011)

Time line

The project preparation of 9 month will start in April 2017 and will end in December 2017. Field implementation will start in January 2018 and will end in December 2027.

Project timeline											
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
	SRI plantation										
Proposed actions	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Awareness actions	[Green bar from Year 1 to Year 10]										
Training	[Green bar from Year 1 to Year 10]										
Demonstration sites	[Green bar from Year 1 to Year 4]										
Monitoring of methane emission	[Green bar from Year 1 to Year 4]										
Mass Information dissemination	[Green bar from Year 1 to Year 4]										
Scaling up	[Green bar from Year 5 to Year 10]										
Project summary										Total	
New area covered each year (ha)	1000	6000	6000	6000	6000	6000	6000	6000	6000	6000	55000
Emission reduction (tons CO2eq)	1800	12700	23600	34500	45400	56200	67100	78000	88900	99800	508000

Related proposals

- [Efficient water and fertilizer use towards yield increases and mitigation of GHG](#)
- [Unleashing the climate-smart potential of Africa's forgotten rice](#)

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