



More Rice, Less Gas: How Kerala's Paddy Fields Could Fight Climate Change

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When you think of rice in Kerala, you probably picture the emerald paddy carpets of Kuttanad, the rhythmic splash of farmers planting seedlings at dawn, and Onam feasts centered on steaming rice. What most people don't realize is that rice paddies are also a major source of a powerful short-lived greenhouse gas: methane (CH₄). Flooded rice systems comprising irrigated, rainfed, and deepwater rice emit significant amounts of methane (CH₄), a potent GHG that contributes to global warming. Methane from rice fields is generated by microorganisms that decompose organic substances secreted by rice roots. These root exudates are released by rice and other plants to nourish soil microbes, which in return enhance plant growth by making nutrients more available for uptake. Globally, flooded rice fields account for roughly 10 to 12 per cent of anthropogenic methane emissions, a gas that traps heat far more strongly than CO₂ in the near term. Reducing methane from rice can therefore cool the climate quickly while we tackle longer-term CO₂ cuts.

A surprising solution hiding in the plant

Until recently, most efforts to reduce methane from rice farming centered on improving field management practices. However, researchers in China found that certain rice varieties naturally release fewer chemical compounds that encourage methane-producing microbes and more compounds that actually suppress them. One such variety, called SUSIBA2, was found to produce less of a substance named fumarate (which feeds methane-forming microbes) and more ethanol, which helps block methane production. Building on this discovery, the team used traditional breeding methods (not genetic modification) to cross a high-yielding rice with a low-methane-emitting one. The result was a new line called LFHE (Low-Fumarate, High-Ethanol) rice, which in field trials across China produced around 70.00 per cent less methane while maintaining excellent yields.

Why Kerala should pay attention

Kerala's rice sector is small but culturally and ecologically vital. According to the statistics published for 2023-24 by Directorate of Economics & Statistics, Kerala, paddy area and production have been declining in recent years, the state recorded a notable drop in cultivated area and production compared to earlier years. Protecting and improving existing paddy lands (especially lowland systems like Kuttanad) will therefore be central to food security and livelihoods. At the same time, Kerala's monsoon dominated water-rich fields are exactly the kind of environment where methane forms readily and making the state a strong candidate for methane focused interventions.

Two routes that work together

There are two complementary strategies with immediate promise for Kerala farmers:

1. Breed and test low-methane rice locally: The LFHE style approach demonstrates that breeders can select for root exudate profiles that reduce methane while keeping yield. But

varieties developed in China or Sweden must be tested and adapted for Kerala's soils, climatic patterns, pests, and grain quality preferences. Kerala Agricultural University already maintains and releases many regionally suitable rice varieties (popular names include *Uma*, *Jyothi*, *Sabari* and others), a natural partner for on-farm trials to combine low-methane traits with local adaptation.

2. Use water-saving, methane-cutting practices (AWD /SRI/ DSR): Alternate Wetting and Drying (AWD), periodically draining the field rather than continuous flooding reliably reduces methane emissions (many studies report 30 to 70 per cent reductions depending on how AWD is done) while saving water. A practical way to implement AWD without yield loss is to monitor the depth of ponded water on the field through the use of a field water tube or pani pipe. A perforated field water tube or pani pipe can be used for irrigation scheduling by 2.5 cm monitoring the fall in water depth inside the pani pipe. Two weeks after transplanting, the field is left to dry out. The irrigation interval under AWD can vary between 2 to 10 days. When the water level drops to 15 cm (up to sixth hole) below the soil surface, irrigation should be applied to re-flood the field to a ponded water depth of about 5 cm. Hence the field is alternately flooded and dried. Allowing the field to drain permits aeration of the soil and halts the production of CH₄, thus reducing the total quantity of CH₄ released during the growing season.

Similarly, System of Rice Intensification (SRI) and direct-seeded rice (DSR) methods reduce the time soils are anaerobic and so cut methane. SRI is a method that helps farmers grow more rice using less water and fewer seeds. It involves planting younger seedlings with wider spacing and keeping the soil moist instead of continuously flooded. This practice improves root growth, increases yield, and reduces methane emissions from paddy fields. DSR means sowing rice seeds directly into the field instead of transplanting seedlings. It saves water, labor, and time while also helping to lower methane emissions compared to traditional flooded rice farming. These practices are already known and have been piloted across India, including Kerala; combining them with low-methane varieties multiplies the benefit.

Practical pathway for Kerala (a suggested roadmap)

- 1. Pilot trials in priority landscapes.** Start multi-season smallholder trials combining promising low-methane genetics (import lines or trait donors) with local high-performing varieties (KAU germplasm) in Kuttanad, Palakkad and Thrissur, which are the major paddy belts. In this monitoring of yield, grain quality, pest resistance and CH₄ emission can be investigated.
- 2. Scale water-smart practices.** Train farmer groups in AWD and SRI using simple field water tubes and demonstrations; these are low-cost and often increase water productivity. Link demonstrations to existing extension, FPO and SHG networks.
- 3. Measure and incentivize.** Establish a field monitoring protocol (GHG measurements or proxy methods) and explore state or carbon-market incentives for verified low-emission paddy management. This could attract climate finance and give farmers a premium for climate-smart rice.
- 4. Protect farmer income and taste.** Any new variety must match Kerala consumer preferences (cooking quality, taste, milling recovery). Partner with local millers and procurement agencies to ensure market acceptance.

Conclusion

Kerala doesn't have to choose between rice and climate goals. By marrying modern plant breeding that targets methane-influencing root chemistry with practical water management and locally tested varieties from institutions like KAU, the state can keep its paddy landscapes productive, culturally vibrant, and climate-friendly. A low-methane trait that performs well in one climate or soil may fail under Kerala's unique pest/disease or hydrology conditions. Field testing over several seasons is non-negotiable. Some water management changes can reduce CH₄ but increase nitrous oxide (N₂O), another potent GHG. Net global

warming potential must be considered. Some water management changes can reduce CH₄ but increase nitrous oxide (N₂O), another potent GHG. Net global warming potential must be considered. However, with timely trials, farmer engagement and policy nudges, Kuttanad's mirror-like fields could become quiet climate champions producing rice, not excess greenhouse gas.