OBSERVATIONS IN RELATION TO CATEGORY ASSESSMENT

RICE CULTIVATION METHANE AVOIDANCE

JANUARY 2026

1. Purpose of these observations

The Governing Board (the Board) of the Integrity Council for the Voluntary Carbon Market (ICVCM), when considering the assessment of methodologies related to rice cultivation methane avoidance identified that it would be beneficial to make available their observations for the purpose of supporting the future development of methodologies in this Category.

These observations are non-binding and do not impact or form any part of the Assessment Framework, Assessment Procedure, or any Decision (as defined under the Assessment Framework) and are published by the ICVCM for the purpose of information only.

The ICVCM may, from time to time, publish other observations for other Categories where it considers this may be useful for CCP-Eligible Programs and other stakeholders, and may update and revise its observations from time to time based on further assessment processes or information. Observations are not an exhaustive set of views of the ICVCM, and not all aspects addressed in assessment processes are included. No reliance may be placed on observations, as they are for the purpose of information only, and observations published are without prejudice to other ongoing assessments.

The Governing Board would like to express its gratitude to the experts and other stakeholders engaged in the assessment process who provided input to the ICVCM regarding this Category.

2. Category Details

When rice paddies are covered by water oxygen cannot penetrate the soil. This creates conditions that favour organisms that break down organic material (such as plant residues or soil organic carbon) anaerobically. This process generates methane (CH_4) which is released to the atmosphere primarily by transport through rice plants, but also by bubbles and diffusion through the soil–water interface. The annual quantity of CH_4 emissions from a given rice cultivation area depends on several factors, including the number and duration of cropping cycles, water management regimes before and during the cultivation period, and the application of organic and inorganic soil improvers. Additional influences include soil type, temperature, and rice cultivar[1].

[1] A rice cultivar is a specific variety of rice bred to perform well under certain growing conditions or to have particular qualities.

The rice cultivation methane avoidance category addresses these emissions by promoting a transition from traditional cultivation practices characterized by continuous flooding to alternate wetting and drying (AWD) practices. Changes in water management under AWD decrease anaerobic soil conditions and thereby lead to lower methane emissions from rice fields.

3. Observations relating to Rice cultivation methane avoidance methodologies

The Governing Board's observations regarding the assessment of rice cultivation methane avoidance methodologies against the ICVCM Assessment Framework and its Core Carbon Principles generally relate to additionality and robust quantification.

The methodology within this Category to which these observations relate is:

- Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation, v 1.0 applied under Gold Standard.

The remaining methodologies in this Category remain under assessment by the ICVCM.

3. Additionality

Additionality is a fundamental principle of the carbon market. Emission reductions from a rice cultivation project are considered additional if the project activities would not have occurred in the absence of carbon market incentives.

In regions where continuous flooding remains the prevailing practice, barriers to the adoption of alternate wetting and drying (AWD) persist. Continuous flooding is often an entrenched cultural practice that is difficult to change, and smallholder farmers may face financial constraints that limit their ability to adopt new practices. However, once AWD is established on a farm, often alongside complementary improvements such as enhanced fertilizer management, it is likely to become self-sustaining due to its agronomic and resource-efficiency benefits. ICVCM notes evidence that AWD is widely implemented in certain regions of China and, even in 2015, was also being adopted in parts of Southeast Asia[2]. This indicates that AWD may, in some contexts, become common practice relatively quickly and by means other than by carbon finance alone.

The Assessment Framework recognizes multiple pathways for demonstrating additionality and includes requirements that ensure transparent and robust demonstration of that additionality[3]. The Gold Standard Methodology for Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation, v1.0 allows several approaches for demonstrating additionality, including the use of Clean Development Mechanism (CDM) additionality tools and standardized approaches such as positive lists and activity penetration tests.

Among the additionality approaches provided under the Gold Standard methodology, only the activity penetration approach establishes a quantitative threshold for the share of rice cultivation area utilizing AWD within the defined reference region. The Governing Board decided that, currently, only this approach among those allowable under the methodology could reliably

[2] https://www.sciencedirect.com/science/article/pii/S0378429014003001

[3] Please refer to ICVCM Assessment Framework Criterion 8.1: Additionality Demonstration

ensure AWD projects would not have occurred in the absence of carbon market incentives and made this a condition for this methodology to become CCP Approved.

The Governing Board encourages further methodological development to strengthen and refine additionality demonstration approaches for agricultural activities, taking into account regional adoption trends and evolving common practice.

3. Robust Quantification

The Gold Standard methodology provides multiple approaches for quantifying methane emissions, including the use of direct measurements, country-specific values, and IPCC global, regional, or country-specific default factors. Nikolaisen et al.[4] compared several available approaches for modelling CH_4 emissions and identified limitations across all methods considered.

In the context of this methodology, ICVCM views the application of an uncertainty deduction, together with limitations on project scale, as a reasonable and pragmatic approach to addressing the model quantification uncertainty. At the same time, CCP Eligible programs are encouraged, where feasible, to promote the use of country-specific emission factors and to support the continued development of more accurate and context-specific modelling or direct measurement approaches.

<u>Nitrous oxide (N_2O) emissions</u>

Regarding N_2O emissions, the Gold Standard methodology requires that all nitrogen inputs to be recorded in farm logbooks, which supports transparency around fertilizer use. Where nitrogen inputs (i.e. fertilizer) increase, the methodology applies default calculation methods to estimate any associated increase in N_2O emissions. Where nitrogen inputs remain unchanged, a separate default value is used to reflect the partially aerobic soil conditions associated with AWD. This latter situation is expected to be the most common.

These default values are based on the IPCC Guidelines (2019) and are intended to provide a practical and conservative way to account for potential N_2O emissions from fertilizer use, including synthetic fertilizers, organic amendments, and crop residues.

<u>On Soil Organic Carbon:</u>

Changes in water management practices such as alternate wetting and drying (AWD) may influence the dynamics of soil organic carbon (SOC) in rice paddy systems. AWD introduces periodically aerobic conditions into soils that are otherwise continuously flooded, which can modify the balance between carbon inputs (from plant residues and root growth) and carbon losses (through microbial decomposition). While many studies focus on GHG emissions such as methane and nitrous oxide, the effects of AWD on SOC are an important part of understanding the overall climate and soil health implications of water management practices.

The recent literature indicates that the impact of AWD on SOC is context-specific and variable, depending on factors such as soil type, climate, management practices, and the intensity and

[4] Frontiers | Modelling CH4 emission from rice ecosystem: A comparison between existing empirical models

frequency of drying events. In some long-term irrigation studies, water-saving practices including AWD have been associated with changes in SOC over time, although the direction and magnitude of these changes are not consistent across all environments and management regimes. These results reflect the complexity of soil carbon processes, where increased exposure to oxygen under AWD can enhance microbial decomposition of organic matter, but may also be balanced by changes in crop growth, residue inputs, or other management practices.

Importantly, the emerging evidence suggests that net SOC changes under AWD are not uniformly large or negative and can be influenced by broader agronomic practices. For example, integrated approaches that combine AWD with crop residue management, nutrient optimization, or soil amendments may support SOC retention while also reducing methane emissions. Being aware of this, the Gold Standard rule update to "Accounting of Soil Organic Carbon Loss Risk in Activities Applying Methodology "Methane Emission Reduction by Adjusted Water Management Practice in Rice Cultivation" aims to address this risk, requiring projects to adopt scientifically established management practices that result in no losses of SOC from project fields. Reviews of greenhouse gas impacts from AWD note that while methane typically decreases substantially, carbon dioxide and nitrous oxide fluxes vary, and comprehensive assessment of SOC and carbon dioxide (CO_2) effects remains an area where more data is needed.

Overall, SOC effects under AWD represent a source of uncertainty in the climate performance of rice water management practices. Given the current state of knowledge, these effects are best treated as context-dependent and accounted for where feasible in project quantification frameworks, while recognizing that SOC outcomes may differ across sites and management regimes. The Governing Board notes that continued research and field measurement may help further clarify the conditions under which AWD affects SOC and how these impacts interact with methane and nitrous oxide emissions.