水田でのメタン発酵消化液の施用によるメタン排出促進は間断灌漑で相殺できる

Multiple drainage can cancel out the enhancement of methane emission by biogas effluent application in a rice paddy

ベトナム・メコンデルタの水稲三期作では、牛糞由来のメタン発酵消化液の肥料利用によって、化学肥料施用よりもメタン(CH_4)排出量が三作の平均で19%増加する（図1）。しかし、消化液施用に間断灌漑(表1) を組み合わることで、現地慣行である化学肥料と常時湛水の組み合わせと比べて、籾収量やわら収量を減らすことなく、CH_4排出量を11～13%、一酸化二窒素(N_2O)排出量を35～54%それぞれ削減できる（図2）。その結果、CH_4とN_2Oの合計排出量をCO_2等価に換算した地球温暖化係数(GWP)や、GWPを籾収量で除して求めた収量あたりGWPも、提案する消化液と間断灌漑の組み合わせによって削減できる 。

In a triple-rice cropping system in the Mekong Delta, Vietnam, the application of cattle biogas effluent as fertilizer increased CH_4 emission by 19% relative to synthetic fertilizer application (Fig. 1). Combining multiple drainage (Table 1) with the biogas effluent reduced CH_4 emission by 11–13% and N_2O emission by 35–54%, without loss of rice yields, relative to the conventional practice with synthetic fertilizer and continuous flooding (Fig. 2). As a result, the Global Warming Potential (GWP), CO_2-equivalent of combined CH_4 and N_2O emissions, and grain-yield-scaled GWP were also reduced by the proposed combination practices.

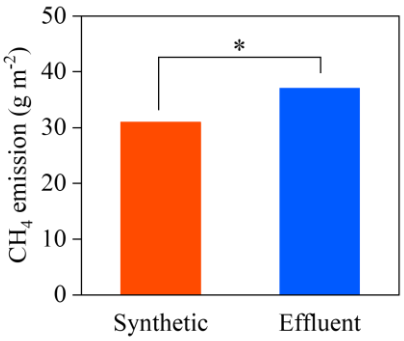

図1　化学肥料と消化液施用からのCH_4排出量
Fig. 1. CH_4 emissions from synthetic fertilizer application and biogas effluent application
Statistically significant difference at $p < 0.05$ by ANOVA.

表1　用いた二つの間断灌漑方法
Table 1. Two methods tested (Multiple drainage practices)

Practice	説明	Explanation
AWD	日本型の中干し＋日数を指標とした間断灌漑	A water-depth-dependent irrigation method
MiDi	田面水深を指標とした間断灌漑	A day-number-dependent irrigation method

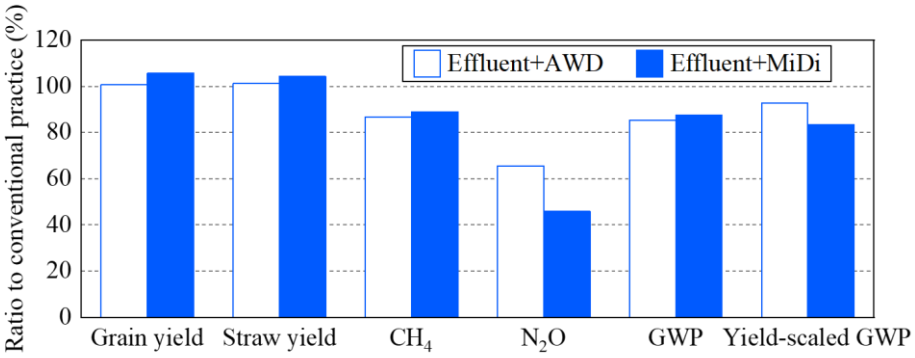

図2　化学肥料＋常時湛水の慣行管理と提案管理の比較
Fig. 2. Comparisons between the proposed combination practices, biogas effluent with AWD or MiDi, and the conventional practice with synthetic fertilizer and continuous flooding

Reference: Minamikawa K et al. (2021) *Agriculture, Ecosystems and Environment* 319: 107568

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