東南アジアにおける肉牛からの消化管発酵由来メタン排出量の推定

Prediction of enteric methane emission from beef cattle in Southeast Asia

これまでJIRCASおよび共同研究機関がタイおよびベトナムにおいて測定してきた、肉牛（写真1）からの消化管発酵由来メタン測定結果（計332例）を用いてメタン排出量推定式を検討したところ、表1のような、摂取量、飼料化学成分あるいは消化率を独立変数とする推定式が得られた。飼料中の粗飼料比率によって牛を低粗飼料群、中粗飼料群および高粗飼料群に分類すると、いずれの群もIPCCガイドライン（2006年版）における穀物を多給されていない牛での既定値（6.5%）よりも高く、規定値を用いて排出量を推定する場合、排出量を過小評価する可能性がある。

JIRCAS and collaborative institutions in Thailand and Vietnam have carried out measurements of methane emission from enteric fermentation in cattle (Photo 1) using a ventilated respiration apparatus equipped with a head hood. Several estimation equations for methane emission were obtained using feed intake, chemical composition, or digestibility from individual data (n = 332) collected during the period 2005–2015 (Table 1). Mean methane conversion factors (MCF) of cattle group in our dataset were higher than default MCF by the Intergovernmental Panel on Climate Change (6.5 ± 1.0%) for cattle, excluding fattening cattle fed diets containing 90% or more concentrates.

写真1 メタン排出量測定を実施した牛品種
Photo 1. Cattle breeds used in measuring methane emissions

表1 メタン排出量およびメタン変換係数の推定式
Table 1. Regression equations for predicting daily methane emission and methane energy as a proportion of gross energy intake in cattle

		RMSE	R^2
(1)	CH4 = 22.67×DMI − 3.73×EE + 23.32	18.64	0.783
(2)	CH4 = 22.71×DMI + 8.91	19.36	0.766
(3)	MCF = −0.782×DMIBW − 0.436×EE−0.073×CP + 0.049×DMD + 8.654	1.348	0.391

CH4, daily methane emission (g/day); MCF, methane conversion factor expressed as methane energy as a portion of gross energy intake (J/100 J); DMI, dry matter (DM) intake (kg/day); EE, ether extract content (% DM); CP, crude protein content (% DM); NDF, content of neutral detergent fiber (% DM); DMD, DM digestibility (%); DMIBW, DMI per BW (kg/100 kg); RMSE, root mean square error.

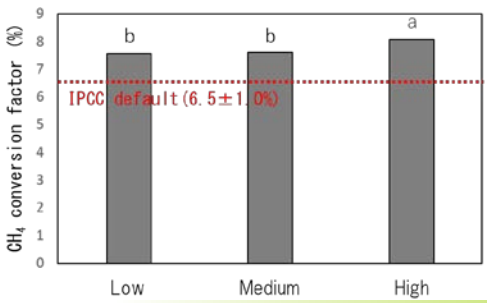

図1 粗飼料比率（乾物ベース）別のメタン変換係数

Fig. 1. Methane conversion factors in cattle by roughage proportion groups. Cattle were separated by roughage proportion (DM basis) into Low roughage (≤0.33 kg/kg), Medium roughage (0.34–0.67 kg/kg), and High roughage (≥0.68 kg/kg) groups. Dashed line shows default methane conversion factor for cattle excluding feedlot fed cattle. $^{ab}P<0.05$

国立研究開発法人 国際農林水産業研究センター
〒305-8686 茨城県つくば市大わし1-1
Japan International Research Center for Agricultural Sciences
1-1 Ohwashi, Tsukuba, Ibaraki, 305-8686 https://www.jircas.go.jp/