INTISARI

Pengelolaan sawah padi organik bersifat spesifik lokasi, mengandalkan sumberdaya organik lokal. Pupuk organik berperanan penting dalam menjaga kesuburan dan kesehatan tanah serta produksi tanaman. Namun, pengelolaan pupuk organik yang tidak tepat berakibat naiknya emisi gas rumah kaca. Penelitian ini bertujuan untuk : 1) Mengkaji praktek sistem pertanian sawah padi organik oleh petani, 2) Menentukan karakteristik emisi CH_4 (metana) dan N_2O (dinitrogen oksida) pada sawah padi organik dan 3) Merumuskan mitigasi emisi CH_4 dan N_2O pada praktek budidaya sawah padi organik berdasarkan potensi sumberdaya organik lokal. Penelitian dilaksanakan tiga tahap. 1. Mengkaji praktek sistem sawah padi organik dengan metode survey didukung analisis laboratorium. 2. Menentukan karakteristik, dengan mengukur emisi CH_4 dan N_2O pada sawah padi organik. 3. Percobaan mitigasi dengan perlakuan limbah biogas, kompos jerami, kompos kotoran sapi, kotoran sapi dibandingkan kontrol. Hasil penelitian menunjukkan sawah padi organik diusahakan pada tanah yang berkembang dari material alluvium hasil erupsi Gunungapi Merapi Muda. Air irigasi mengalir sepanjang musim tanam, asal bendung Sungai Opak. Ternak sapi merupakan sumber utama pupuk organik. Padi varietas Mentik Wangi beradaptasi pada kondisi sawah padi organik. Sawah padi organik telah tersertifikasi tiga kali, dengan kelembagaan yang mendukung dan melibatkan masyarakat sekitar dalam menjalankan aktivitasnya. Sumbangan gas rumah kaca sawah padi organik (CH_4 102,95 kg/ha/musim ; N_2O 0,67 kg/ha/musim ; GWP 2.773,41 kg CO_2-e/ha/musim ; GHGI 0,37 kg CO_2-e/kg gabah ; CER 4,63 kg C gabah/kg C-e) lebih tinggi dari pada sawah padi konvensional (CH_4 50,30 kg/ha/musim ; N_2O 0,53 kg/ha/musim ; 1.415,44 kg CO_2-e/ha/musim ; GHGI 0,16 kg CO_2-e/kg gabah ; CER 11,02 kg C gabah/kg C-e). Produktivitas sawah padi organik (7.492,70 kg/ha) lebih rendah dari pada konvensional (9.051,22 kg/ha). Sawah padi organik (ΔC 889 kg ; IS 1,14) lebih cenderung berlanjut dari pada konvensional (ΔC -2.023 kg ; IS 0,71). Perbaikan teknologi pengelolaan sawah padi organik diperlukan untuk meningkatkan produksi dan mengurangi sumbangan gas rumah kaca. Pemakaian limbah biogas (produktivitas 9.159,50 kg/ha ; CH_4 32,57 kg/ha/musim ; N_2O 0,63 kg/ha/musim ; GWP 1.001,99 kg CO_2-e/ha/musim ; GHGI 0,11 kg CO_2-e/kg gabah ; CER 15,52 kg C gabah/kg C-e ; ΔC 26 kg ; IS 1,01) terbaik untuk meningkatkan kualitas sawah padi organik. Terbaik berikutnya adalah kompos jerami (produktivitas 8.524,39 kg/ha ; CH_4 40,51 kg/ha/musim ; N_2O 0,71 kg/ha/musim ; GWP 1.224,33 kg CO_2-e/ha/musim ; GHGI 0,14 kg CO_2-e/kg gabah ; CER 11,80 kg C gabah/kg C-e ; ΔC 418 kg ; IS 1,07) dan kompos kotoran sapi (produktivitas 8.086,00 kg/ha ; CH_4 48,72 kg/ha/musim ; N_2O 0,73 kg/ha/musim ; GWP 1.435,54 kg CO_2-e/ha/musim ; GHGI 0,18 kg CO_2-e/kg gabah ; CER 9,55 kg C gabah/kg C-e ; ΔC 579 kg ; IS 1,09). Kontrol memberikan hasil yang kurang baik karena tunggak padi yang tidak difermentasi. Kotoran sapi perlu pengomposan untuk menghasilkan pupuk berkualitas dengan C/N yang lebih rendah. Pemakaian pupuk organik dengan C/N rendah (<25) menjadi pilihan untuk menaikkan hasil panen serta menekan emisi gas rumah kaca (CH_4 ; N_2O ; GWP ; GHGI ; CER) pada sawah padi organik.

Kata kunci : CH_4, N_2O, sawah padi organik

ABSTRACT

Organic rice management is specific location, supported by local organic resources. Cow manure, cow manure compost, straw, straw compost and biogas wastes are local materials commonly used as organic fertilizer. Organic fertilizers play an important role in maintaining fertility and soil health and crop production. However, inappropriate management of organic fertilizer results in increasing greenhouse gas emissions. This research aimed to : 1) Assess the practices of organic rice field system by farmers, 2) Determine the characteristic of CH_4 (methane) and N_2O (dinitrous oxide) emission in organic rice field, and 3) Formulate a mitigation for CH_4 and N_2O emissions in practice organic rice field cultivation based on the potency of local organic resources. The study was conducted in three phase ; 1) Assessing the practice of organic rice field system with survey method supported by laboratory analysis, 2) Determine the character, by measuring the CH_4 and N_2O emission on organic rice field, and 3) Mitigation experiments with treatment : biogas waste, straw compost, cow manure compost and cow manure compared to control. The results of the research showed that organic rice field cultivated on soil that develops from alluvium material of young Merapi volcano eruption. Irrigation water flows throughout the growing season, from the Opak River dam. Cow livestock was the main source of organic fertilizer. Mentik Wangi variety adapted to the condition of organic rice field. Organic rice field has been certified three times, with social institution that support and involve surrounding communities in carrying out their activities. Contribution of greenhouse gases from organic rice field (CH_4 102.95 kg ha^{-1} $season^{-1}$; N_2O 0.67 kg ha^{-1} $season^{-1}$; GWP 2,773.41 kg CO_2-e ha^{-1} $season^{-1}$; GHGI 0.37 kg CO_2-e kg^{-1}grains ; CER 4.63 kg C grains kg^{-1}C-e) was higher than conventional rice field (CH_4 50.30 kg ha^{-1} $season^{-1}$; N_2O 0.53 kg ha^{-1} $season^{-1}$; GWP 1,415.44 kg CO_2-e ha^{-1} $season^{-1}$; GHGI 0.16 kg CO_2-e kg^{-1}grains ; CER 11.02 kg C grains kg^{-1}C-e). The productivity of organic rice field (7,492.70 kg ha^{-1}) was lower than conventional (9,051.22 kg ha^{-1}). Organic rice field (ΔC 889 kg ; IS 1.14) was a higher sustainability than conventional (ΔC -2,023 kg ; IS 0.71). Improved technology of organic rice field management was needed to improve production and reduce the contribution of greenhouse gases. The use of biogas waste (productivity 9,159.50 kg ha^{-1} ; CH_4 32.57 kg ha^{-1} $season^{-1}$; N_2O 0.63 kg ha^{-1} $season^{-1}$; GWP 1,001.99 kg CO_2-e ha^{-1} $season^{-1}$; GHGI 0.11 kg CO_2-e kg^{-1} grains ; CER 15.52 kg C grains kg^{-1}C-e ; ΔC 26 kg ; IS 1.01) was the best to improve quality of organic rice field. The next was straw compost (productivity 8,524.39 kg ha^{-1} ; CH_4 40.51 kg ha^{-1} $season^{-1}$; N_2O 0.71 kg ha^{-1} $season^{-1}$; GWP 1,224.33 kg CO_2-e ha^{-1} $season^{-1}$; GHGI 0.14 kg CO_2-e kg^{-1}grains ; CER 11.80 kg C grains kg^{-1}C-e ; ΔC 418 kg ; IS 1,07) and cow manure compost (productivity 8,086.00 kg ha^{-1} ; CH_4 48.72 kg ha^{-1} $season^{-1}$; N_2O 0.73 kg ha^{-1} $season^{-1}$; GWP 1,435.54 kg CO_2-e ha^{-1} $season^{-1}$; GHGI 0.18 kg CO_2-e kg^{-1}grains ; CER 9.55 kg C grains kg^{-1}C-e ; ΔC 579 kg ; IS 1.09). Control gave unfavourable results due to unfermented rice stumps. Cow manure needs to be composted to produce quality fertilizers with lower C/N. The use of organic fertilizer with low C/N (<25) was an option to increase yield and reduce greenhouse gas emissions (CH_4 ; N_2O ; GWP ; GHGI ; CER) in organic rice fields.

Key words : CH_4, N_2O, organic rice field