Considering Biomass Removal Ratio of Cover Crop for Soil Carbon Balancing in Rice Paddy
(논토양에서 토양탄소 수지를 위한 피복작물의 생체량 제거비율 산정)

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Cover crop cultivation is strongly recommended to enhance soil carbon sequestration and quality and to produce animal feeding materials. In recent, most of the above ground biomass is removed from the field. While root biomass incorporation might be not enough maintain soil sequestration level and soil quality. This field study evaluated carbon balance determined by the carbon input and output during rice cultivation. The biomass combination was applied in paddy field at rates 0, 25, 50, 75 and 100 % of the total productivity (36 Mg ha\(^{-1}\)) on the fresh weight basis. Gross input of carbon (GIC) by the combination of cover crop was estimated to be 3.74-14.89 t ha\(^{-1}\) in different application level of cover crop treatments compared to 0.026 t ha\(^{-1}\) control (0 %) treatments, respectively. The cover crop application significantly (\(P \leq 0.05\)) increased \(\text{CH}_4\) and \(\text{CO}_2\) emission from soil and the \(\text{CH}_4\) and \(\text{CO}_2\) emission flux and cumulative \(\text{CH}_4\) and \(\text{CO}_2\) emission were proportionally increased due to increasing the rate of cover crop application. Therefore, the gross output of carbon through \(\text{CH}_4\) and \(\text{CO}_2\) were 0.954, 1.45, 2.79, 3.31, and 3.81 t ha\(^{-1}\) during rice cultivation respectively. As a result, C within farrow slice was sequestered at rates of 2.29, 4.66, 7.86, 11.07 and -0.927 t C ha\(^{-1}\) for 25, 50, 75, 100 and 0%, respectively, in mono-rice cultivation system. The loss of C increased linearly with increasing input of C in soil and it ranged from 2.3 to 11.07 t ha\(^{-1}\) in different treatments with maximum in 100% and minimum in 25% treatment. Application of cover crop combination can increase the amount of C input and storage in paddy soils. Therefore, it could be concluded that hairy vetch and barley combination was more effective in sequestering C than no cover crop.

Key words: Cover Crop, Methane, Carbon Dioxide, Carbon Sequestration

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