行政院國家科學委員會專題研究計畫　成果報告

子計畫：台灣地區現行耕作制度對水稻田和旱田甲烷氣體排放減量之影響

計畫類別： 整合型計畫
計畫編號： NSC92-EPA-Z-041-001-
執行期間： 92 年 04 月 01 日至 92 年 12 月 31 日
執行單位： 嘉南藥理科技大學環境工程與科學系(所)

計畫主持人： 劉瑞美
共同主持人： 陳文雄，陳世雄

報告類型： 完整報告

處理方式： 本計畫可公開查詢

中　華　民　國 93 年 2 月 3 日

中文摘要

本子計畫與其他子計畫共同進行探究「台灣地區現行耕作制度對水稻田和旱田甲烷排放減量之影響（I）」，分別於台灣北部（桃園區農業改良場，主要由子計畫三負責），中部（台南區農業改良場嘉義分場，主要由子計畫二負責），與南部（高雄區農業改良場旗南分場，主要由子計畫三負責）等農業試驗單位，進行現行不同耕作制度對水稻田和旱田甲烷排放減量之影響。希能由不同耕作制度對水旱田溫室氣體排放量之影響研究中，獲致合理的田間管理技術，提供農業栽培下良好之溫室氣體減量技術，透過農政單位之宣導與推廣，有效將減量技術落實於我國之田間管理上。所進行之三種耕作制度為水田-水田、水田-旱田、旱田-旱田。在 2003 年第二期稻作之結果顯示，台灣北部之水田-水田、水田-旱作與旱田-旱田制度之土壤甲烷排放係數為 59.6、0.29 與 0.39 kg ha^{-1} $season^{-1}$；而台灣中部之水田-水田、水田-旱作與旱田-旱田制度之土壤甲烷排放係數為 143.2、19.6 與 0.56 kg ha^{-1} $season^{-1}$；台灣南部之水田-水田、水田-旱作與旱田-旱田制度之土壤甲烷排放係數為 0.05、0.04 與 0.001 kg ha^{-1} $season^{-1}$，各試驗處理中以水田-水田連作區有較大的甲烷釋出通量。農田土壤 CH_4 之釋出以水田－水田耕作制度最多，以旱田－旱田最少，其排放量與土壤氧化還原狀態、植物生長狀態有極密切關係。經數次不同耕作系統下水-旱田之甲烷排放資料之分析與統計，耕作制度對農田土壤甲烷釋出有極大之影響，利用輪作制度可降低農田土壤之甲烷排放量，藉由排放量與栽培管理對農業生產影響之比較，可提供研擬農業部門溫室氣體減量技術之參考以助尋求農業耕作體系之甲烷減量對策。

關鍵詞：水田、旱田、甲烷、耕作制度、釋放、減量

Abstract

This subproject 2 will cooperate with the subproject 3 to determine methane emission under the current cultivation systems in order to provide the successful mitigation strategies from paddy and upland fields in Taiwan area. The current cultivation systems in the test fields, including paddy - paddy, paddy - upland, upland – upland, and the test fields are located in northern Taiwan （Tao-yuan District Agricultural Improvement Station, mainly conducted by subproject 3）, central Taiwan （Chia-yi Branch Station of Tainan District Agricultural Improvement Station, mainly conducted by subproject 2）, and southern Taiwan （Chi-nan Branch Station of Kaohsiung District Agricultural Improvement Station, mainly conducted by subproject 3）. The approach will provide the data for the studies of global change and agricultural production, it is therefore necessary to explore much more effective mitigation strategies following a better understanding of the processes involved in methane emission from agricultural cultivation. The preliminary results of this study showed that the CH_4 emission flux from three test soils was the highest under paddy – paddy cultivation system, and the lowest under upland – upland cultivation system; and the CH_4 emission flux was strongly dependent on soil redox condition and plant size. The seasonal methane emission in the second crop season in northern Taiwan with the cultivation systems of paddy-paddy, paddy-upland, and upland-upland were 59.6, 0.29 and 0.39 kg CH_4-C ha^{-2} $season^{-1}$, 143.2, 19.6 and 0.56 kg CH_4-C ha^{-2} $season^{-1}$ in the central Taiwan, and 0.05, 0.04 and 0.001 kg CH_4-C ha^{-2} $season^{-1}$ in the southern Taiwan, respectively. It was shown that rotation cultivation system should significantly inhibited production and emission of methane in the rice cultivation. Successful mitigation strategies for greenhouse gases require overall understanding of agricultural management on fluxes of greenhouse gases. The suggestions of methane mitigation for rice cultivation will be further discussed after all the sampling and analysis of greenhouse gas are estimated. The investigation will provide the data for estimation of the mitigation potentials in agricultural systems in Taiwan.

Keywords：Paddy, Upland, Methane, Cultivation system, Emission, Mitigation