

CORRELATION BETWEEN VETIVER ROOT BIOMASS WITH SOIL ORGANIC CARBON AND CO₂ EMISSION IN AGRICULTURAL AREA OF SOUTHERN PART OF THAILAND

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ABSTRACT

The relationship and correlation of Vetiver root biomass with soil organic carbon and CO₂ emission in agricultural area of southern part of Thailand was studied and carried out at Land Development Station, SuratThani province in year 2008-2010. And the objectives of this experiment are compare root growth and biomass of 6 ecotypes of Vetiver grass, changes of soil organic carbon and CO₂ emission from surface of soil, estimate correlation between such factors for study changes of soil carbon stock. The experimental design was randomized complete block design (RCBD) consisting of control as no Vetiver planted compare with 4 ecotypes of *Chrysopogon zizanioides* and 2 ecotypes of *C. nemoralis*. The result showed that Vetiver root length of 6 ecotypes were not different and the average root length is 54.06-58.60 cm but the root length at 8 months rather constant throughout of 24 months of this experiment. The biomass of root changes in the same trend of root length, and the root biomass at 8 to 24 months are not increase and sharply different. That means both of root length and biomass after 8 months is not change throughout of 24 months. The average organic carbon content in root is in range 3.98-5.16 t/ha, and PraratChatan ecotype has the highest average organic carbon content as 5.16 t/ha. The organic carbon content in root at 8 months are significantly different between 6 ecotypes but are not different in 12, 16, 20 and 24 months. Soil bulk density has trend to increase along the depth of soil from 15 to 50 cm that mean soil compaction increase when soil depth increase. Plantation of Vetiver in this soil clearly encourages the decreasing of bulk density, and soil bulk density has highly correlation with root biomass in negative relation as $Y = -1.629X + 2.774$ ($R^2 = 0.77$). In another view the soil bulk density is the one factor to regulate root length and biomass because of soil compaction. The soil organic carbon content in the surface (0-15 cm) is higher than in the deeper layer of this soil (15-30 and 30-50 cm). Plantation of Vetiver clearly encourage in increasing soil organic carbon, especially in level 15-30 and 30-50 cm of soil depth. Correlation between soil organic carbon with CO₂ emission from soil surface indicated in positive relation as $Y = 329.2X + 92.06$ ($R^2 = 0.734$). This relation showed that increasing amount of soil organic carbon has promoted CO₂ emission from surface of such soil. Moreover, correlation between root biomass with CO₂ emission as $Y = 30.36 + 276.0$ ($R^2 = 0.736$). Assessment of carbon stock in soil where planted 6 ecotype of Vetiver with no planted, and the result showed that amount of soil carbon stock is loss in no Vetiver planted as -4.19 t/ha. But amount of carbon stock increased as +2.44 to +6.38 t/ha where Vetiver are planted, especially in PraratChatan ecotype can increase the highest soil carbon stock as 6.38 t/ha. And the high correlation between root biomass with amount of carbon stock was found in positive relation as $Y = 0.703X + 2.641$ ($R^2 = 0.832$).

Keyword: Vetiver grass, root biomass, soil organic carbon, soil carbon stock, CO₂ emission, correlation