Sutisa Pinitpaitoon 2012: Enhancing Productivity of Red Clay Soil for Maize Cropping by Organic Fertilizer Application in Combination with Mineral Fertilizers. Doctor of Philosophy (Soils), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Emeritus Professor Amnat Suwanarit, Ph.D. 171 pages.

Application of organic materials in crop production has been strongly encouraged in many places as a replacement for part or all of the mineral fertilizer, but often without due consideration to their quality and profitability. The objectives of the present study were to 1) determine economic and agronomic rates of organic manures applied to Pak Chong soil series for maize production 2) explore the possibility of developing a model for predicting optimum combined rates of organic manure and mineral fertilizers for maize; and 3) examine the effect of soil types and types of organic manure on maize response. Compost (with C/N ratio lower than 15) even at 7.5 t ha⁻¹ and after five repeated annual applications showed no consistent positive significant response in yields and N and K uptake of maize, though it increased cumulative shoot P uptake after 5 years. This lack of response was due to low N, P and K contents of compost. Moreover, a negative effect of low rates of compost was found on shoot N uptake and grain yields in year 1 which were attributed to short-term N immobilization. Stubble removal with or without mineral fertilizer reduced N balance of the soil and rendered N and P balances negative without mineral fertilizer application. Soil types, organic matter content of soil and nutrient content of organic manure are factors affecting response of maize to organic matter applied based on pot trial. Compost nutrient concentration, ratio of compost price to NP fertilizer price and level of organic matter of the soil were factors determining efficient combination of compost and mineral fertilizer in maize cropping. The Decision Support System for Agrotechnology Transfer (DSSAT) yield simulation and Seasonal Analysis module of DSSAT provided a framework whereby the suitability of compost as N fertilizer replacement for maize could be determined based on its nutrient composition, rate of application and price.

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Student's signature

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