（様式第３号）

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学 位 論 文 要 旨

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氏名：松本 卓也

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題目： SOIL PROPERTIES AND FERTILITY STATUS IN RELATION TO
CROP PRODUCTIVITY IN ARABLE LANDS OF TURKEY AND GUATEMALA
（トルコおよびグアテマラの農耕地における作物生産性に関連する
土壌特性と土壌肥沃度)

To provide basic soil information and discuss soil properties and crop productivity in arable lands of developing countries, soil properties and fertility status in relation to crop productivity in arable lands of Turkey and Guatemala were studied.

Soil properties and fertility status of 15 wheat fields in Adana province under Mediterranean climate were investigated. The soils in Adana province were classified into Luvic Calcisol, Haplic Leptosol, Calcic Vertisol, Haplic Vertisol and Haplic Arenosol. Calcic Vertisol was the dominant soil class among the study sites. These soil classes and their distribution were determined by climatic condition caused by the different elevation of the study sites as well as by topography. The important soil properties in terms of wheat cultivation were as follows. The level of available P in 12 sites was lower 30 mg P_2O_5 kg^{-1}, a lower limit proposed for wheat cultivation in Turkey. Exchangeable K in 12 sites was high enough without need for further K fertilizer application. DTPA extractable Zn of 13 sites was lower than 0.5 mg kg^{-1}, which is considered to be a critical value for Zn deficiency for wheat growth on calcareous soils.

Since the deficiency of P and Zn of soils could be a limiting factor for wheat growth in the present study area, further cultivation experiments related to these elements are needed.

Soil properties in Andosols of the western highland of Guatemala were investigated and evaluated in relation to maize productivity in comparison to the standard of soil diagnosis for Andosols in Japan to provide basic information. The soil samples were collected from maize field in 28 sites at the soil depth of 0 to 30 cm in 2008. Maize cultivation experiment was conducted with the same treatment of fertilizer application at 23 sites to discuss the influence of soil properties on maize productivity. The soils were characterized by sandy loam texture, acidic pH, low available P reflecting high phosphate sorption coefficient, low exchangeable Ca and Mg, and high exchangeable K. Cation imbalance derived from relatively low exchangeable Mg and high exchangeable K was observed. Maize yield of the cultivation experiment ranged widely from 0.75 to 6.39 Mg ha^{-1}. Principal component analysis summarized the soil properties into 4 components relating 1) organic matter and P sorption capacity, 2) soil texture, 3) exchangeable Mg and 4) P availability. Multiple regression analysis indicated that 1st component generally related negatively and 3rd and 4th components related positively to maize yield, and these three components explained as much as 49% of the total variance of maize yield. These results suggested that soil properties greatly influenced maize productivity and low phosphorus availability due to high phosphorus sorption coefficient and low exchangeable Mg to K ratio were the main constraints to maize cultivation in this region.