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EFFECT OF ORGANIC CROP ROTATION
ON SOIL FERTILITY

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ABSTRACT

Studies of soil nutrient fertility status of the organic and conventional plots at the Flock House cropping and organic units, Bulls, were undertaken to investigate the effects of organic crop rotation system on soil chemical fertility. Soil samples (0-75 mm, 75-150 mm, 150-300 mm depths) were collected from two organic plots lying adjacent to conventional plots of identical soil type (Manawatu silt loam) in Autumn and Spring. The crop rotation plots were established in 1988. Soil samples were analysed for total C, total N, mineralizable N, extractable P (Olsen), exchangeable K, CEC and pH. Earthworm surface casts collected from the surface of these plots were also analysed for exchangeable K and CEC.

Results of this study showed that after seven years of conversion to organic management, there were significant quantitative increases in the soil nutrient levels at topsoil depth 0-75 mm. Organic plot number 3 (OP3), now under clover based pasture showed higher percent of organic C and N than the organic plot under continuous cultivation (OP5) and conventional plot (CP8). Mineralizable N was significantly higher in the soil of OP3 and the mean topsoil (0-75 mm) value increased from 104 to 139 μg g\(^{-1}\) (67%) from Autumn to Spring collected soils. Crop rotation under continuous cultivation resulted in decrease of mineralizable N from 90 to 30 μg g\(^{-1}\) (150%) from Spring to Autumn collected soils at depth 0-75 mm. Extractable soil P (Olsen) remained significantly high in CP8 in both Autumn and Spring seasons.
Soil Ca and Mg were significantly higher in the organic plots during Autumn but there was no significant difference observed in Spring collected soils. Exchangeable K levels were similar under both organic and conventional management system and generally showed higher amounts at topsoil (0-75 mm) as a result of mixing with earthworm surface casts which contained appreciably high amounts of K, Ca and Mg. Soil CEC was generally higher in organic plots.

Surface casting by earthworm was significantly higher (> 1000 casts m\(^{-2}\)) in OP3 as compared to 380 casts m\(^{-2}\) and 300 casts m\(^{-2}\) in OP5 and CP8 respectively. This coincided with greater a cation nutrient status observed in the Spring collected soil samples.

Organic management under different crop rotation system resulted in significantly variable levels of soil nutrient fertility. Seven years of crop rotation under the organic system was sufficient to maintain sustainable levels of soil nutrient fertility.
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