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“Development on the margin”

Increasing Fertiliser Use Efficiency, Availability of Phosphorus and Crop Yield in Furrow Cultivation for Sustainable Agriculture on Sloping Land

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Abstract

This experiment aimed to improve sustainable crop production on sloping land using lime, organic-fertiliser, inorganic-fertiliser, and zinc foliar application in cultivated furrow system. The experiment was designed as a split-split plot in completely randomised design consisted of 3 replicates. Main plots were cultivated systems comprising conventional planting (CP) and cultivated furrow (CF). Sub plots were foliar zinc (Zn1) and no zinc (Zn0) applications. Sub-sub plots were applications of lime (L), organic fertiliser (OF), and inorganic fertiliser (IF) including control (no lime and no fertiliser). Lablab bean (*Lablab purpureus* L.) was grown after maize (*Zea mays* L.) during late rainy season – dry season. Soil properties were measured monthly during lablab bean growing, using conventional standard methods. The soil properties were bulk density (BD), particle density (PD), total porosity (TP), field capacity (FC), aeration porosity (AP), soil acidity (pH), organic matter (OM), extractable phosphorus and zinc (Ext.P and Ext.Zn). Crop developments were measured as plant height every month. Total dry biomass, seed yields, total phosphorus and zinc (Total P and Total Zn) in plant tissue were measured after crop harvesting.

The results showed that CF significantly gave better soil properties, crop growth and yields than CP. Foliar Zn application gave higher crop growth, total dry biomass, yields, and total plant P than without Zn application. There were interaction effects of cultivation practice and application of L, OF, and IF on Ext.P and crop growth. IF and OF application in CF gave the highest and 2nd high of Ext.P-values compared with either L or control. While, applying IF in CP gave the lowest Ext.P compared with either OF or L. This might be caused by loss of fertiliser through runoff and soil erosion. In addition, applying of OF and L tended to increase soil pH, OM, and Ext.P. This improvement led to significantly increased crop growth and yield. The result indicated that application of fertilisers, lime and foliar zinc spray in furrow cultivation were the best strategy for increasing fertiliser use efficiency and crop yield on sloping land.

Keywords: Furrow cultivation, phosphorus availability, sloping land