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Integrated Soil Fertility and Plant Nutrient Management in Tropical Agro-ecocystems: A review

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ABSTRACT

The most pressing development challenge for Ethiopian agriculture is land degradation and the associated decline in soil fertility for sustainable crop and livestock production. The problem is aggravated by soil erosion, nutrient mining, competition for biomass for multiple uses, limited and low application of inorganic fertilizers, and limited capacity of farmers to recognize the decline in soil quality and its consequences on agricultural productivity. Integrated soil fertility management (ISFM) is an approach that would improve crop yields while preserving sustainable and long-term soil fertility through the combination of judicious use of fertilizers and recycling of organic resources, responsive crop varieties and improved agronomic practices, which would minimize nutrient losses and improve the nutrient use efficiency of crops. Studies conducted on soil fertility and nutrient management in Ethiopia under on-station and on-farm conditions showed that the combined application of inorganic and organic fertilizers significantly increased crop yields compared to either input. Yield benefits were more apparent when fertilizer application was accompanied by crop rotation, green manuring and crop residue management. For instance, the combined application of farmyard manure and NP fertilizer significantly increased wheat and faba bean grain yields by 50-100% over the control. Crop rotation with grain legumes increased cereal grain yields by up to 200%. Although organic residues are key inputs for soil fertility management, ~85% of the crop residues are used for livestock feed and energy and hence the need for increasing biomass to satisfy these competing demands. The main incentive influencing farmers' decisions in adopting ISFM practices is whether the economic benefits outweigh the costs. The success of ISFM also depends on the concerted efforts of research and development institutions in providing technical support, technology adoption, dissemination and creating market incentives for farmers to use external inputs.
Keywords: crop yield, food security, integrated soil fertility management, organic sources, nutrient use efficiency, sustainability

INTRODUCTION

The adoption of climate-smart agriculture would enhance productivity and incomes of farmers while contributing to overcome the negative effects of climate change (FAO, 2016). Food insecurity is becoming a recurrent challenge affecting livelihoods and socio-economic developments in Ethiopia. Increasing climate variability, accompanied with soil fertility decline, decreasing land holdings and low crop and livestock

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