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Understanding Variability in Maize Yield and Profitability under Fertiliser Microdosing Technology in Farmers’ Fields in Northern Benin

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Abstract

Fertiliser microdosing is currently promoted in semi-arid areas of sub-Saharan Africa as a means to increase crop productivity, profitability and resource use efficiency. However, little is still known regarding the main management and environmental factors that govern yield response to this technique in smallholder farmers’ fields. In this study, the performance of two microdosing options applied alone [(M1, 23.8 kg N ha⁻¹, 4.1 kg P ha⁻¹ and 7.8 kg K ha⁻¹ and M2 (33.1 kg N ha⁻¹, 8.2 kg P ha⁻¹ and 15.6 kg K ha⁻¹)] or combined with hill-placed manure at 3 t ha⁻¹ was evaluated on maize yield at 18 sites in 2014 and 32 sites in 2015. These four treatments were compared to an unfertilised control and broadcast recommended rate (RR, 76 kg N ha⁻¹, 13.1 kg P ha⁻¹, and 24.9 kg K ha⁻¹). We observed a strong positive response for all of the sites to both M1 and M2, which significantly increased maize grain yields by 1143 and 1232 kg ha⁻¹, respectively, compared to the unfertilised control (1069 kg ha⁻¹). Overall, there was no significant difference in yields between microdosing alone and RR in both seasons. Combining microdosing and manure resulted in higher yield responses (by 1911 and 2066 kg ha⁻¹ for M1 and M2, respectively). There was a large variability in yields among farmers, from 512 to 1687 kg ha⁻¹, 976 to 4006 kg ha⁻¹ and 1513 to 4733 kg ha⁻¹ for the control, unmanured and manured fertilised plots, respectively. This variability can be explained by the total rainfall, weed pressure, and the topsoil characteristics (pH, clay content, Exch-K and Mg and organic C). Applying microdosing alone or combined with manure was economically profitable for more than 80 % (VCR=2), while only 58 % achieved a VCR of 2 under the RR treatment. The results indicate that fertiliser microdosing is better adapted to the realities of smallholder farmers than the RR while still ensuring very significant yield increases and economic benefits. However, there is a need to evaluate this technology in a larger zone and number of farms to better predict crop responses and for a widespread adoption.

Keywords: Fertiliser microdosing, maize yield response, management and environmental factors, northern Benin, profitability

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