Cassava root yield response to tillage intensity, planting density and fertilizer across south western Nigeria

Introduction

Cassava is growing in importance in Nigeria as food security and industrial crop. Current yields are low, while production costs are high. Tillage, weed control and fertilizer are the main cost factors. Low planting density may be a cause of low yields. To provide agronomic recommendations targeted at reducing production costs, while increasing yields, the effects of tillage intensity, fertilizer application and increased plant density were tested in about 50 farmers’ fields in south western Nigeria over two years.

Materials and Methods

Trials were established in Oyo and Ogun states of western Nigeria creating a north south gradient (Fig. 1). In 2016 tillage treatments imposed in each field were zero, single and double disc ploughing, followed by ridging (soil shaping) versus leaving the soil flat (Fig. 2). Fertilizer application was NIL versus 75:20:90 kg ha⁻¹ NPK, plant density (PD) was 10000 versus 12500 ha⁻¹ (Fig. 3). In 2017 plant density was kept at 12500 ha⁻¹ and double ploughing was eliminated. Due to the risk of poor weed control introducing bias, a pre and post emergence herbicide application was compared with the farmers’ choice of weeding. Crops were harvested at 12 months after planting (MAP). Yields are expressed as fresh raw roots.

Results and Discussion

In 2016, double ploughing (16.94 Mg ha⁻¹) had no advantage over single ploughing (15.67 Mg ha⁻¹), zero plough produced 12.61 Mg ha⁻¹ (Fig. 4, p<0.004). Ridding increased yield significantly by 2.21 Mg ha⁻¹ and 2.66 Mg ha⁻¹ after single and zero ploughing, respectively, yet caused no change in double plough (Fig. 4). Increasing plant density had a significant effect (+ 1.58 Mg ha⁻¹) and fertilizer application increased yields by 4.40 Mg ha⁻¹ across tillage treatments.

In 2017, single ploughing increased yields by 5.54 Mg ha⁻¹, ridging by 1.66 Mg ha⁻¹ and fertilizer application increased root yields by 2.0 Mg ha⁻¹ (Fig 5). The use of herbicides instead of farmers choice of weed control (manual weeding) had no significant effect on cassava yields, yet reduced costs.

Conclusion

The root yield response to tillage was strongly dependent on the yield attained without tillage. At yields <10 Mg ha⁻¹ tillage did not affect yields; as of >10 Mg ha⁻¹ yield increases by ploughing and ridging were attained. These information is combined into a decision support tool to allow farmers estimate the benefits possible with increased tillage intensity through increased yields or reduced tillage through cutting costs.

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