Transforming African Agriculture 1967 - 2017

# Yield Responses in Cassava - Maize Intercropping **Across Diverse Environments in Southern Nigeria**

Christine Kreye<sup>1</sup>, Charles Chigemezu<sup>2</sup>, Ejalonibu Shola<sup>2</sup>, Thanni Bolaji<sup>3</sup>, Rebecca Enesi<sup>1</sup>, Stefan Hauser<sup>1</sup>, Abdulai Jalloh<sup>1</sup>, Adeyemi Olojede<sup>2</sup>, Omolara Onasanya<sup>3</sup>, Innocent Onyekwere<sup>2</sup>, Pieter Pypers<sup>4</sup>, Felix Salako<sup>3</sup>, Mark Tokula<sup>2</sup>, Bernard Vanlauwe<sup>4</sup>

## Introduction

Within the project African Cassava Agronomy Initiative (ACAI), we asked our partners working at the base with farmers for their priority agronomy questions in cassava. One was cassava intercropping with maize, a common combination in southern Nigeria. There was a need to increase cassava as well as maize productivity. Thus, for the 2016 crop, we tested step wise intensification options to provide decision support for site specific situations. We assumed low planting densities of cassava and maize (10 000 and 20 000 plants ha-1 respectively) without fertilizer application as control. From here, we increased planting densities to 12 500 and 40 000 cassava and maize plants ha<sup>-1</sup>, followed by fertilizer application targeting the maize crop, and lastly fertilizer application targeting specifically cassava. These 4 plots were planted in farmers' fields (Figure 1).

# **Preliminary conclusions**

Yields for maize and cassava were very variable without apparent relationship between the fertilizer effects in F1 and F2 and the maize crop performance without fertilizer application (D) (Figures 3 and 5).

AGA

| Density - D<br>12.5K Cassava<br>40K Maize<br>not fertilized<br>Current - CP<br>practice<br>10K Cassava<br>20K Maize<br>not fertilized |  | Fertilizer1 - F1<br>12.5 K Cassava<br>40K Maize<br>N/P/K: 90/20/37 kg/ha<br>basal NPK<br>+ 2 splits urea                                |  |
|---|--|---|--|
|   |  | Fertilzer2 - F2<br>12.5 K Cassava<br>40K Maize<br>N/P/K: 75/20/90 kg/ha<br>3 WAP NPK<br>+ 6WAP urea<br>+ 10 WAP urea/MoP<br>+16 WAP MoP |  |

Figure 1. Layout of 3 intensification steps for cassava - maize intercropping

1) Increasing planting densities without fertilizer application (Figures 2 and 4)

- for maize, cob numbers increased in most cases, but not dramatically
- for cassava, in only about 50% of the cases was root yield increased
- => not necessarily recommendable
- => careful check of costs and returns needed
- 2) Application of NPK and urea splits to the maize crop (Figures 2 and 4)
  - for maize, cob numbers increased in most cases
  - for cassava, yield also increased in most cases
  - => NPK application at planting of maize is likely recommendable when maize plays an important role
  - => the cassava targeted fertilizer regime will likely reduce maize yield and cannot be recommended in its current form

# ... and next steps

#### Site specific conditions - biophysical

• Use statistical modelling to understand which site specific conditions allow for intensification by increasing plant densities and/or application of fertilizers

#### **Site specific conditions - economical**

- Assess the availability of fertilizers
- Assess expected costs of additional inputs (especially fertilizers) and expected prices of the produce (especially maize cobs which are often sold fresh and are an important source of cash early in the cropping season)

## **Results - Maize**



**Figure 2.** Cumulative frequency distributions for the effect of each intensification step on cob numbers m<sup>-2</sup>: 1) increase in planting densities, 2) targeting fertilizer at maize at high planting densities, 3) targeting fertilizer at cassava, 4) confirming effect of higher planting density and targeting fertilizer at maize over the control (CP; low density, no fertilizer); red lines indicate 95% confidence limits.

### **Results - Cassava**



**Figure 4.** Cumulative frequency distributions for the effect of each intensification step on fresh cassava root yield (t ha<sup>-1</sup>): 1) increase in planting densities, 2) targeting fertilizer at maize at high planting densities, 3) targeting fertilizer at cassava, 4) confirming effect of higher planting density and targeting fertilizer at maize over the control (CP; low density, no fertilizer); red lines indicate 95% confidence limits.



**Figure 3.** Boxplots of cob numbers m<sup>-2</sup> for each treatment (left) and effect of fertilizer application to maize (green circles) and cassava (orange circles) on cob numbers m<sup>-2</sup> against cob numbers m<sup>-2</sup> in the D plot (high density, no fertilizer).



**Figure 5.** Boxplots of fresh cassava root yield (t ha<sup>-1</sup>) for each treatment (left) and effect of fertilizer application to maize (green circles) and cassava (orange circles) on fresh root yield (t ha<sup>-1</sup>) against cob numbers m<sup>-2</sup> in the D plot (high density, no fertilizer).

www.iita.org

www.cgiar.org





<sup>1)</sup> International Institute of Tropical Agriculture (IITA), Nigeria, <sup>2)</sup> National Root Crops Research Institute (NRCRI), Nigeria <sup>3)</sup> Federal University of Agriculture Abeokuta (FUNAAB), Nigeria, <sup>4)</sup> International Institute of Tropical Agriculture (IITA), Kenya