Sustainable management options for improved cassava-maize intercropping system and resource capture in southeastern Nigeria

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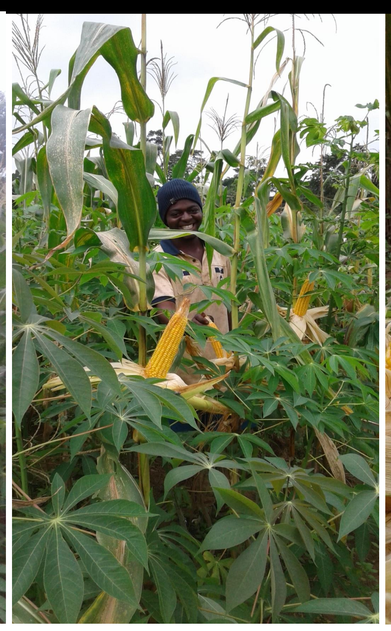

Introduction

Cassava-maize intercropping is commonly practiced in southern Nigeria. Maize provides food and income early in the season (~ 3 months) before the cassava harvest (~9-15 months later). However, both crops produce low yields (cassava <10 tha^{-1} and maize <1 tha^{-1}) in farmers' fields, while attainable cassava yields are >48 t ha^{-1} and maize yields are >5 t ha^{-1}.

Materials and Methods

Four experiments (RCBD) with 6 treatments (Table 1) replicated 4 times were established in farmers' fields in 3 contrasting environments of two agroecologies in Nigeria (Table 2). Maize variety was SAMMAZ 35, cassava variety was TME 419. Fertilizer was 0 (F0), 90:20:37 (F1) and 75:20:90 (F2) kg ha^{-1}. N:P:K was applied as follows: F1: basal 300 kg ha^{-1} N:P:K 15:15:15, plus two equal splits of urea at 3 & 5 weeks after planting (WAP); F2: 100% P (as TSP) plus three splits of urea and MoP at 4, 11 & 17 WAP.

Soil moisture at 20 cm soil depth was recorded daily every half hour with soil moisture probes connected to Decagon EM50 loggers. Starch content of freshly harvested cassava roots were determined insitu gravimetrically.

Table 1: Cassava, maize and fertilizer combinations

Factor/Treatment	T_1	T_2	T_3	T_4	T_5	T_6
Cassava density (plants ha^{-1})	12500	12500	12500	12500	12500	12500
Maize density (plants ha^{-1})	20000	40000	20000	40000	20000	40000
N:P:K rate (kg ha^{-1})	0:0:0	0:0:0	90:20:40	90:20:40	75:20:90	75:20:90

Table 2: Characteristics of experimental sites over 40 (1950 – 2000) years

	Agroecology	State/location	Mean annual temp. (° C)	Rainfall (mm yr^{-1})
1	Humid forest	Anambra 1	26.1 – 27.8	1,561 – 1,821
2	Humid forest	Anambra 2	26.1 – 27.8	1,341 – 1,561
3	Humid forest	Cross River	24.4 – 26.1	2,258 – 2,899
4	Derived savannah	Benue	22.9 – 24.4	1,136 – 1,341

Research objectives

To determine the effects of:

I. The different fertilizer regimes (F0, F1 and F2) on the growth and cob yield of maize and the fresh root yield of cassava,
II. maize planting density and fertilizer regime on soil moisture dynamics, and
III. N:P:K mineral fertilizer rates on starch content of fresh cassava roots.

Results

Maize number of marketable cob yield was higher at 40000 plant ha^{-1}. This was highest under F1 (18973 ha^{-1}) regime followed by F2 (15083 ha^{-1}). Marketable cob yield increased in the order F1 > F2 > F0.

Cassava root yield varied across location. Fertilizer (F2) consistently produced the highest fresh root yields across locations (Fig.1).

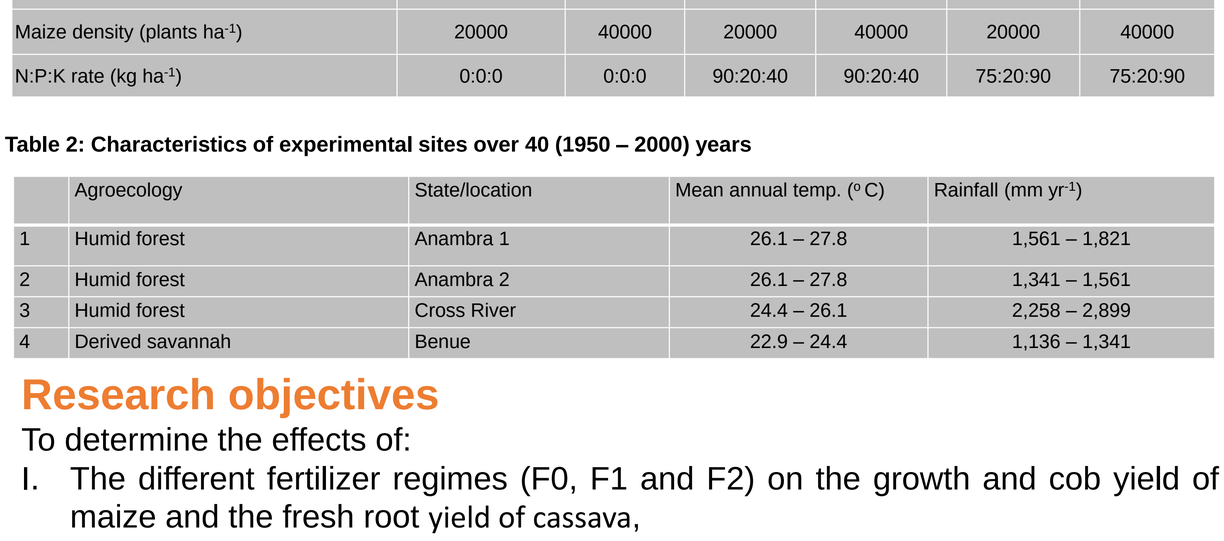

Figure 1: Effect of maize density and N:P:K application rates on cassava fresh root yield across 3 locations in Southern Nigeria

Soil water content was highest with F1 fertilizer regime under 40000 maize density (0.13 - 0.35 m^3/m^3), and was relatively stable over the 6 months observation period (Fig.2). This was closely followed by F2 regime under similar maize density (0.02 – 0.31 m^3/m^3). Under lower maize density (20000), F2 regime was better than F0 which had the least soil moisture content.

Starch yield was highest under F2 fertilizer regime. There were no differences between F0 and F1 regimes on starch yield (Fig.3).

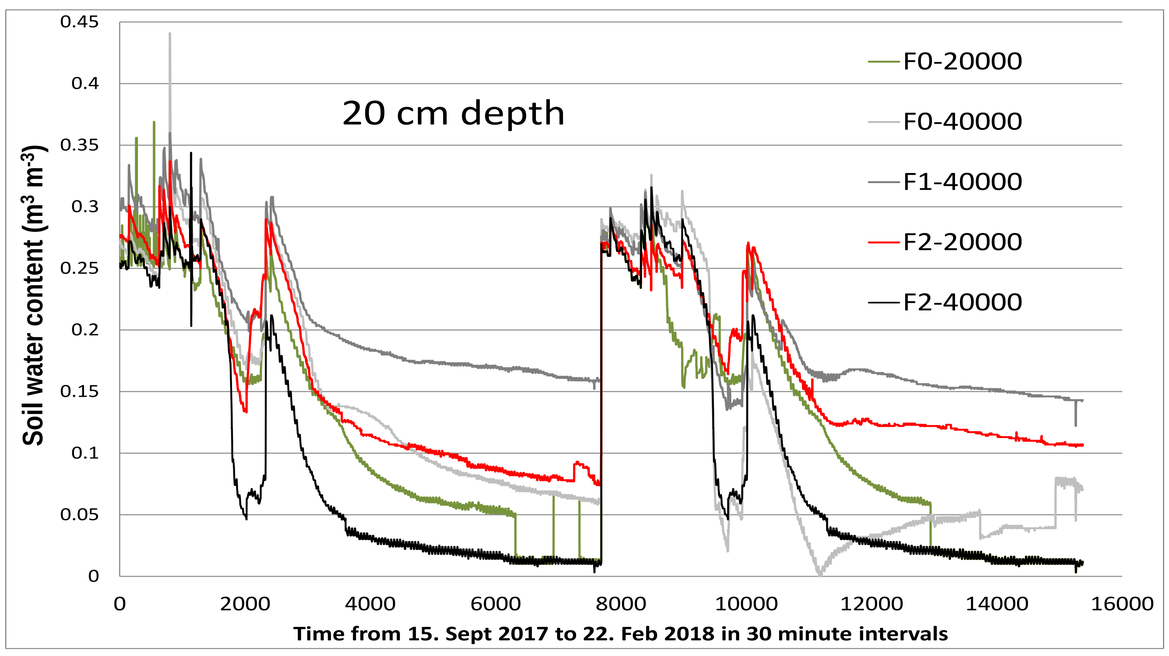

Figure 2: Effect of N:P:K fertilizer cassava fresh root starch content in cassava-maize intercropping systems in Southern Nigeria (Anambra1)

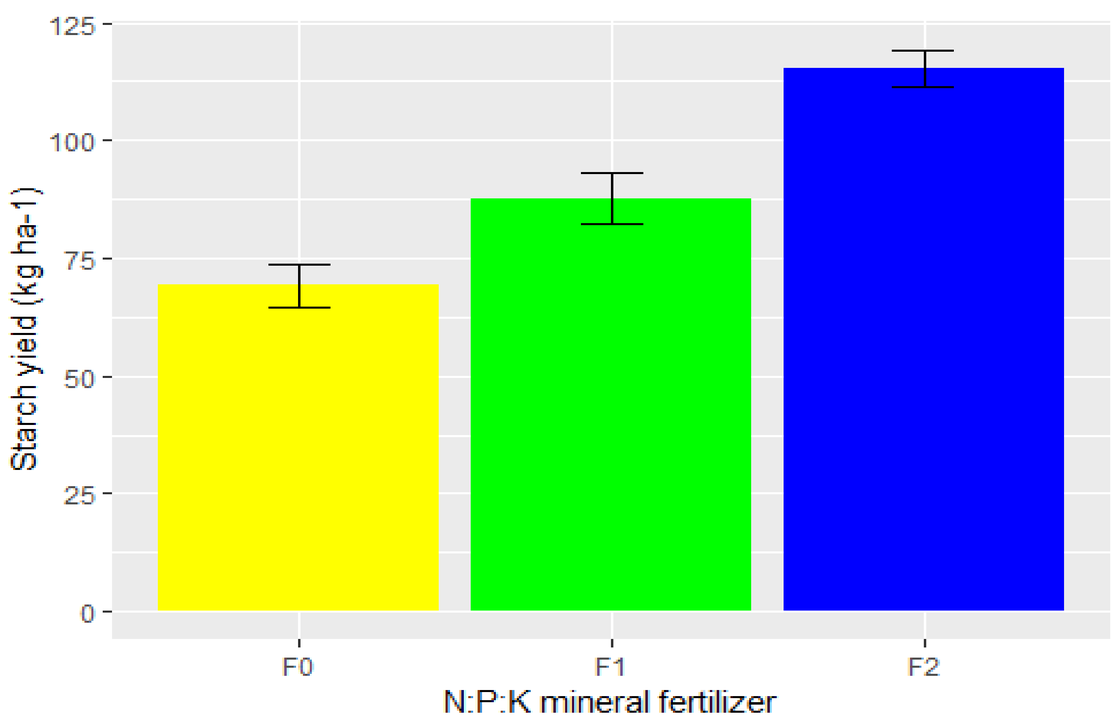

Figure 3: Effect of N:P:K fertilizer cassava fresh root starch content in cassava-maize intercropping systems in Southern Nigeria (Anambra1)

Conclusion

- Increasing maize density up to 40000 plants ha^{-1} combined with either F1 or F2 mineral fertilizer is a viable option to improve cassava-maize intercropping productivity.
- At 40000 maize density under F1 or F2 regimes, it is practicable to conserve soil moisture in cassava-maize intercropping systems.
- F2 regime better for increased cassava fresh root and starch yields.

Acknowledgement

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