Tropentag 2018: Global food security and food safety— The role of Universities

Improving productivity of orange-fleshed sweetpotato (*Ipomoea batatas* L. Lam) through intercropping with legumes and moderate phosphous application.

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1.0 Introduction

- Sweetpotato yield is adversely affected by poor soil fertility in Mozambique.
- Many smallholder farmers lack access to inorganic fertilizers to improve soil fertility and crop yield.
- Use of cattle manure to improve soil fertility is limited because very few people have domestic animals to supply manure.
- Intercropping sweetpotato with legumes and phosphorus fertilization has the potential to improve soil fertility and the productivity of sweetpotatoes.

1.1 Objectives

- To evaluate the effectiveness of sweetpotato-+ legume intercropping and phosphorus (P) fertilization on soil fertility, productivity and nutritional quality of an orange fleshed sweetpotato, variety Namanga bred for climatic conditions of Mozambique.

2.O Materials and Methods

2.1 Materials:

(1) Orange fleshed sweetpotato variety, Namanga. (2). Groundnut variety Bibiano Vermelho (3) Soybean variety Zamboane (4) Phosphorous (5) Urea (46% N) (6) Potassium sulphate

2.2 Experimental site

- Experiment was conducted at Umbeluzi research station (26^{0}03'S & 32^{O}15 'E); 12 m. a. s. l, 32 km southwest of Maputo in Mozambique in the 2013/14, 2014/15 and 2015/2016 growing seasons .
- Soils were analyzed before planting: 0.025% total Nitrogen (N), 220 mg kg^{-1} total phosphorus (P), 2.9 meq 100 g^{-1} total K, 23.2 meq 100 g^{-1} Cation exchange capacity (CEC) within 0-20cm depth of soil layer

2.3 The experimental design

- Design was a split plot
- Main plot treatment: (1) sole sweetpotato (sole SP), (2) sole groundnut(sole GN) (3) sole soybean(sole SB) (4) Sweetpotato + groundnut (SP+GN) (5) sweetpotato+ Soybean (SP+SB) (6) Soybean+ groundnut (SB+GN) (7) Sweetpotato + groundnut + soybean (SP+GN+SB)
- Subplot treatment: Three P levels (0, 20, 40 kg ha^{-1})
- Urea (50 kg N ha^{-1}) and K_2SO_4 (160 kg K ha^{-1}) applied uniformly across all treatments 20 days after planting.

2.4 Experimental layout

- Main plot had an area of 90 m^2 and each subplot had an area of 30 m^2.
- Sweetpoptat planted 90 cm between rows and 30 cm between plants
- Groundnut planted 45 cm and 25 cm inter row and in row spacing respectively
- Soybean planted 90 cm inrow spacing and 5 cm inrow spacing.

3.0 Measured parameters at the end of each season

- **Soil:** Total nitrogen (N), Total potassium (K), Cation Exchange capacity (CEC)
- **Plant:** Vine yield, Storage root yield, Percentage dry matter (%DM)

4.0 Results

4.1 Soil total N

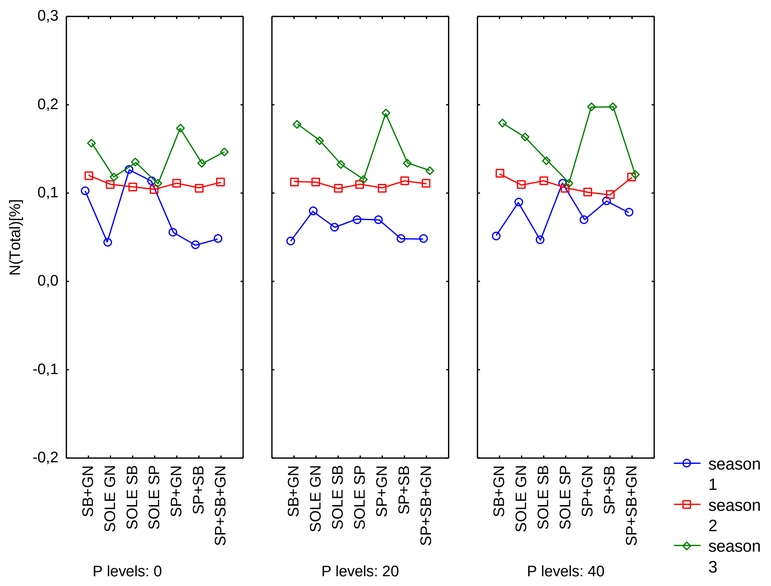

Figure 1. Percentage total soil N as influenced by intercropping sweetpotato , groundnut and soybean at three P fertilization levels at Umbeluzi research station in the 2013/14, 2014/15 and 2015/16 cropping seasons

- At 0 kg P ha^{-1} sole SP had higher % total N than SP+GN, SP+SB and SP+SB+GN in 2013/14 season but in 2015/2016 season the intercropping treatments had higher total N

4.2 Total K

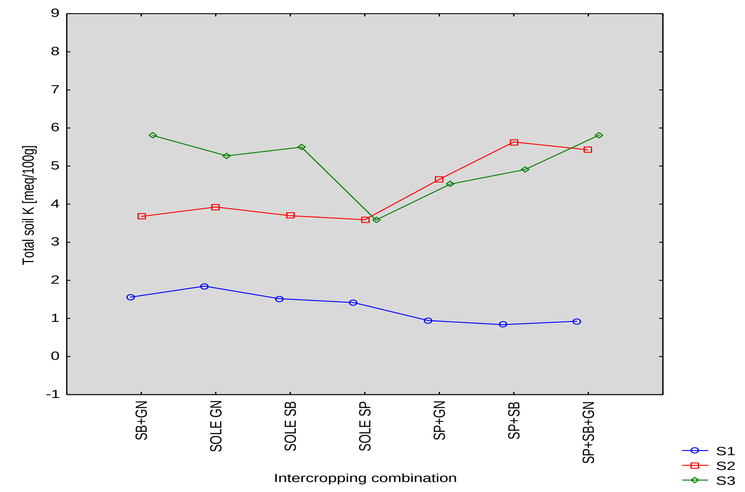

Figure 2. Effect of intercropping sweetpotato, groundnut and soybean on soil total K during 2013/14/ 2014/15 and 2015/16 growing seasons at Umbeluzi research station

- Sole SP treatment had the lowest soil total K compared to treatments with legumes by season 3

4.3 CEC

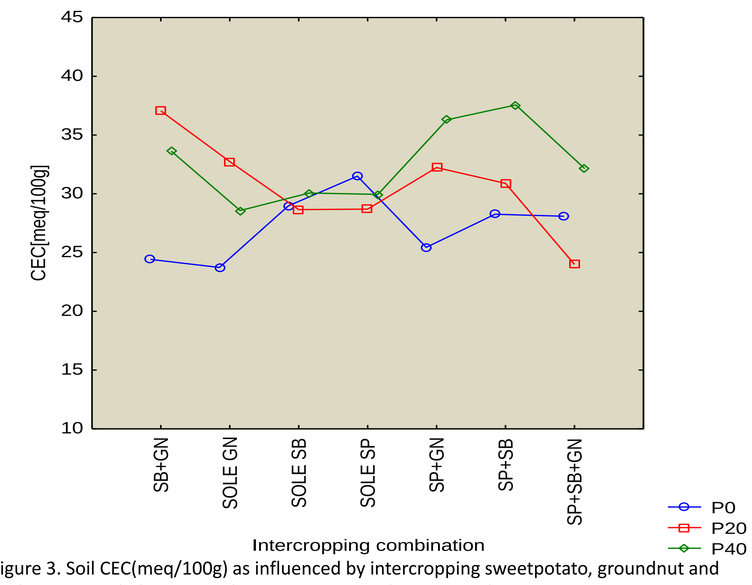

Figure 3. Soil CEC(meq/100g) as influenced by intercropping sweetpotato, groundnut and soybean at Umbeluzi research station in Mozambique over three growing seasons

- Highest CEC was achieved by SP-SB intercropping at 40kg P ha^{-1}

4.4 Sweetpotato Vine yield

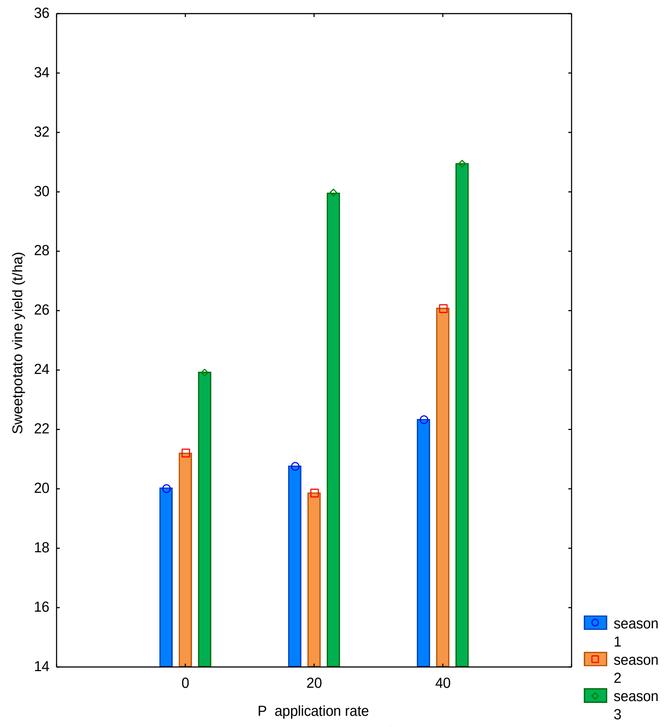

Figure 4. Sweetpotato vine yield (t/ha) as influenced by phosphorus application rate at Umbeluzi research station over three growing seasons

- Phosphorus fertilisation at 40 kg ha^{-1} produced highest vine yield.

4.5 Total storage root yield

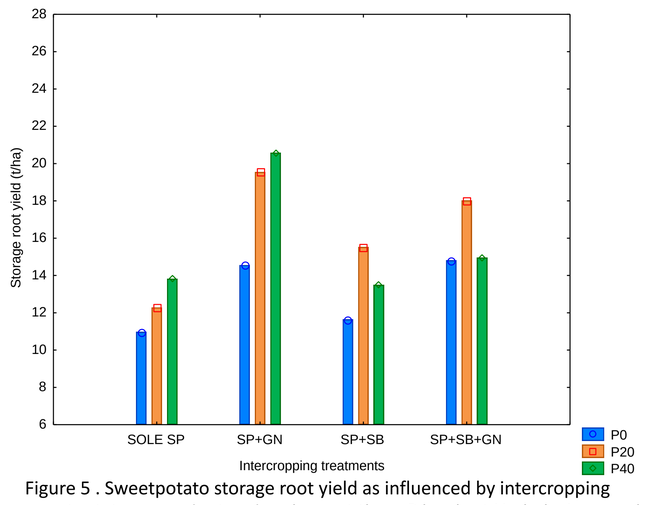

Figure 5 . Sweetpotato storage root yield as influenced by intercropping sweetpotato, groundnut and soybean at three P levels at Umbeluzi research station in Mozambique.

- SP+GN intercropping at 40 kg P ha^{-1} had highest storage root yield but no difference with same combination at 20 kg P ha^{-1}

4.6 Dry matter content

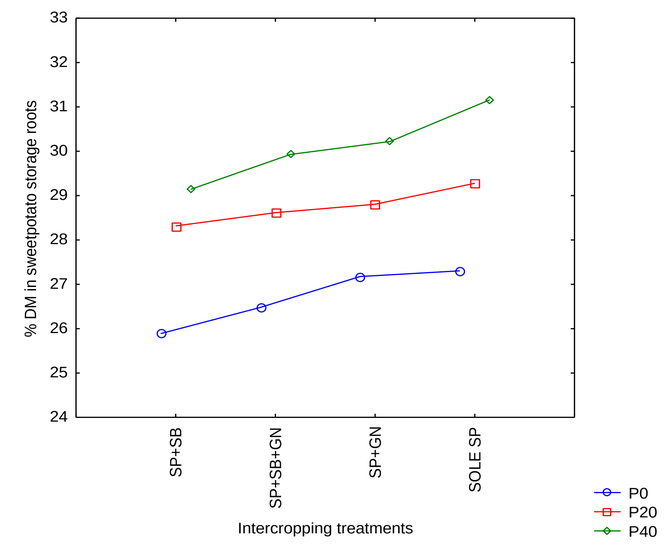

Figure 6. Dry matter content on sweetpotato storage roots as influenced by intercropping sweetpotato, groundnut and soybean at three P fertilization levels at Umbeluzi research station in Mozambique

- Highest % DM content in SP roots at 40 kg P ha^{-1} in all treatments

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(2) ETH Zurich World Food system center and Swiss-African research cooperation (SARECO).

5.0 Conclusion

1. Phosphorus fertilisation is important for attainment of high storage roots, vine yield and dry matter content in sweetpotato.

2. Sweetpotato-legume intercropping is important for achieving high vine and storage root yield in sweetpotato as well as improving soil nutrients status and CEC

6.0 Recommendations

Farmers are recommended to intercrop sweetpotato and groundnut with additional 20 kg P ha^{-1} for those with fertilizers access for high yield and maximum N fixation