Optimal Fertilization for Oil Palm (Elaeis guineensis Jacq.) Plantations: Conclusions from a Long-Term Fertiliser Trial in Nigeria

Context: Oil palm in Nigeria and the world
- Most productive oilcrop with yield potentials of 4-8 tons of oil per hectare
- 21 million hectares worldwide (average yield 3.8 t/ha) and 4.1 million in West-Africa (average yield 0.7 t/ha) (FAOSTAT, 2016)
- Fertilization is a major yield gap and can represent 50% of plantation running costs
- Insufficient fertilization will underutilise the potential and limit productivity
- Excessive fertilization gives reduced economic return and risks of leaching
- Need to rationalize and optimize fertilization over large areas
- Use of reference fertilizer trials and annual leaf sampling for nutrient content as diagnostic tool for palm nutritional status

Material and methods
- A factorial replicated fertilizer trial started in 2000 on a field planted in 1997 and entering production
- 4 levels of potassium fertilization: 0, 1.5, 3 and 4.5 kg of MOP/palm/year
- 2 levels of phosphorus fertilization: 0 and 1 kg of TSP/palm/year
- 2 levels of magnesium fertilization: 0 and 1 kg of kieserite/palm/year
- Monitoring of bunch production for each season from July 2000 to June 2018
- Yearly leaf sampling for nutrient analysis

Results - Application for optimal fertilization in oil palm plantations

Figure 1: Map of Nigeria and Edo State showing the location of the Presco plc Ologbo estate where the trial was located

Figure 2: Evolution of the cumulative yield for treatments receiving K fertilizer as compared to the control

Figure 3: Evolution of the leaf K content for the different K treatments

Figure 4: Yield and leaf K content response to K fertilization and Mitscherlich curves

Results - Key findings:
1—K is the main nutrient for yield in the West African context. No effect from P and Mg on bunch production.
2—Cumulative yields are 14 to 18% higher with application of MOP
3—Leaf K content decreases with age for all treatments but stabilizes in time

Conclusions
- Reference fertilizer trials are an empirical basis for optimizing fertilization in oil palms and a guide to translate leaf nutrient contents into fertilizer recommendations
- Yield and leaf nutrient content response to fertilization will vary with soil climate and planting material
- Reference fertilizer trials should be set up whenever large areas are planted to ensure maximum and sustainable yields
- More research is needed to better understand the interactions between planting material, fertilization and leaf nutrient content so that fertilization can be optimized across a variety of production systems and areas

References