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“Future Agriculture: Socio-ecological transitions and bio-cultural shifts”

Fertilization of Young Oil Palms in Nigeria: Effects on Growth, Production and Profitability of Plantations

Context: Oil palm in Nigeria and the world

- Most productive oil crop with yield potentials of 4-8 tons of oil per hectare
- Oil palm plantations are among the most profitable land uses in the humid tropics
- 17 million hectares worldwide (average yield 3.3t/ha) and 2 million in Nigeria (average yield 0.5t/ha) (FAOSTAT, 2013)
- 80% of Nigerian oil palm comes from smallholder plantations
- Little or no fertilizers are applied on such plantations and national average yields are 15% of the world average: Major yield gap affecting both productivity and profitability
- Using the data from a 7 year trial in Nigeria this study assesses the impact of organic and inorganic fertilization on the growth, production and profitability of young oil palm plantations.

Material and methods

- Field trial planted in May 2009 following a simple Fisher block design with 4 treatments (Fig 1), 6 replicates and unit plots of 25 palms of which the inner 9 were monitored.
- Trial planted at Ologbo Estate of Presco plc (Fig.1) with standard high yielding variety.
- Growth parameters measured every 6 or 12 months.
- Production records (Fresh Fruit Bunches) from the 4th to 7th year after planting and bunch analysis for Oil Extraction Rate at the end of the trial (NIFOR method, Corley & Tinker, 2016).
- Leaf nutrient contents analysis yearly from the 4th to 7th year after planting.
- Statistical analysis by ANOVA with Honest Significant Difference at 5%.
- Economic parameters averaged over the period relevant to each cost and return.

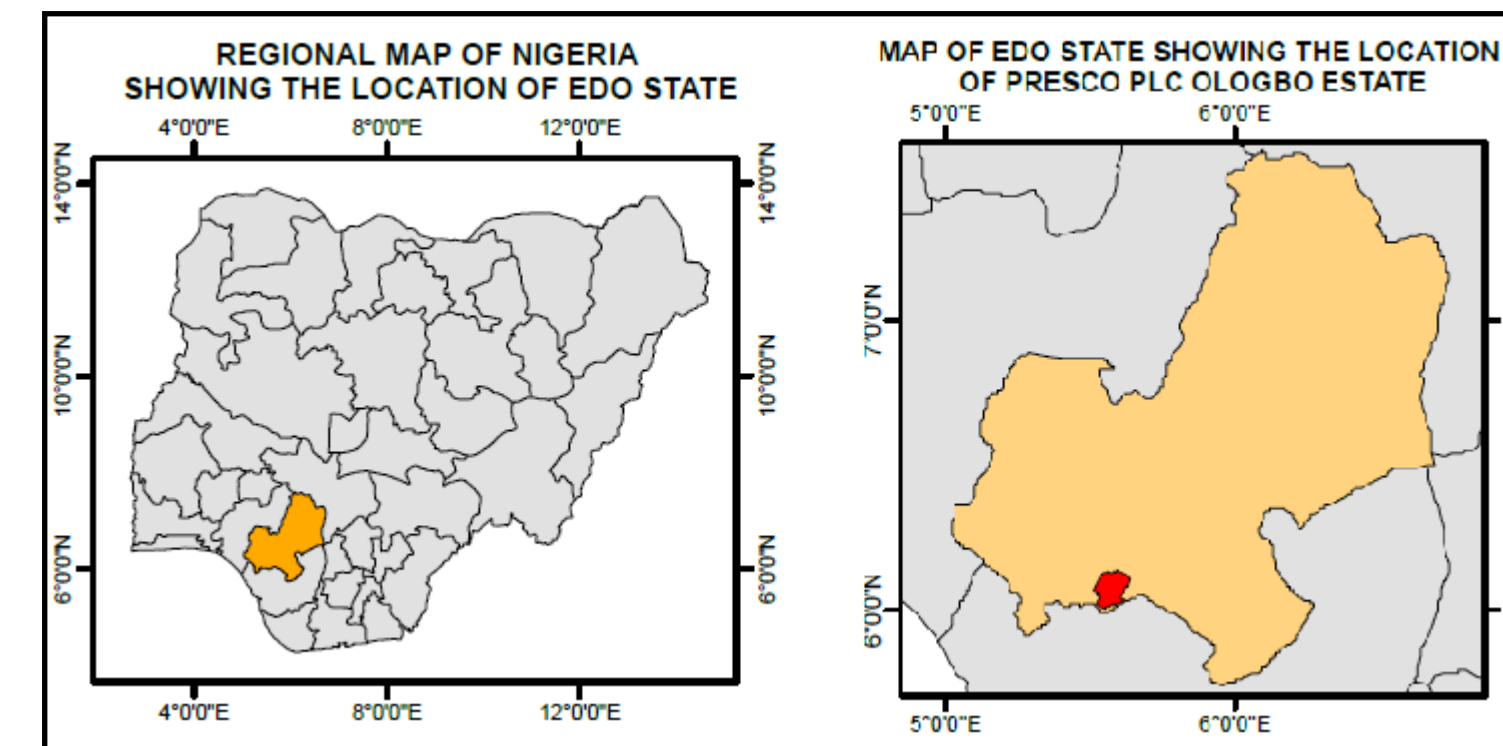


Figure 1: Map of Nigeria and Edo State showing the location of the Presco plc Ologbo estate where the trial was located

Treatment	Description	Fertilizers applied over trial duration					
		MOP		NPK		EFB	
		kg /palm	t /ha	kg /palm	t /ha	kg /palm	t /ha
T	Control without any fertilizer	0	0	0	0	0	0
C0.5	Half the standard plantation fertilization	2.25	0.32	4	0.57	0	0
C1	Full standard plantation fertilization	4.5	0.64	8	1.17	0	0
E	Application of EFB only (Empty Fruit Bunches, an organic mill by product)	0	0	0	0	1040	149

Table 1: Trial protocol and total fertilizer applied per treatment

MOP: Muriate of Potash (KCl)
NPK: 15-15-15

Results

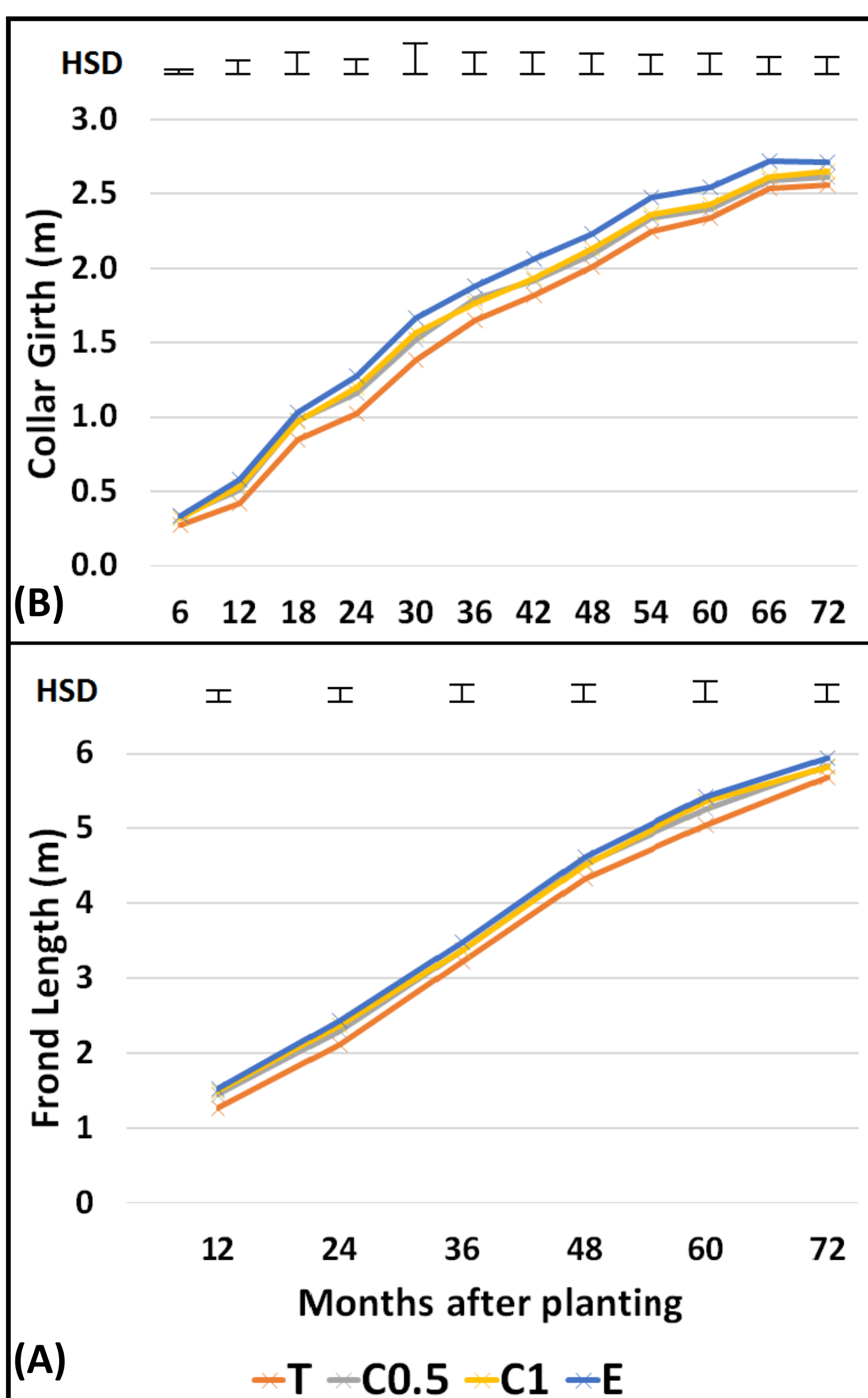


Figure 2: Effects on growth parameters (A) Collar Girth and (B) Frond Length

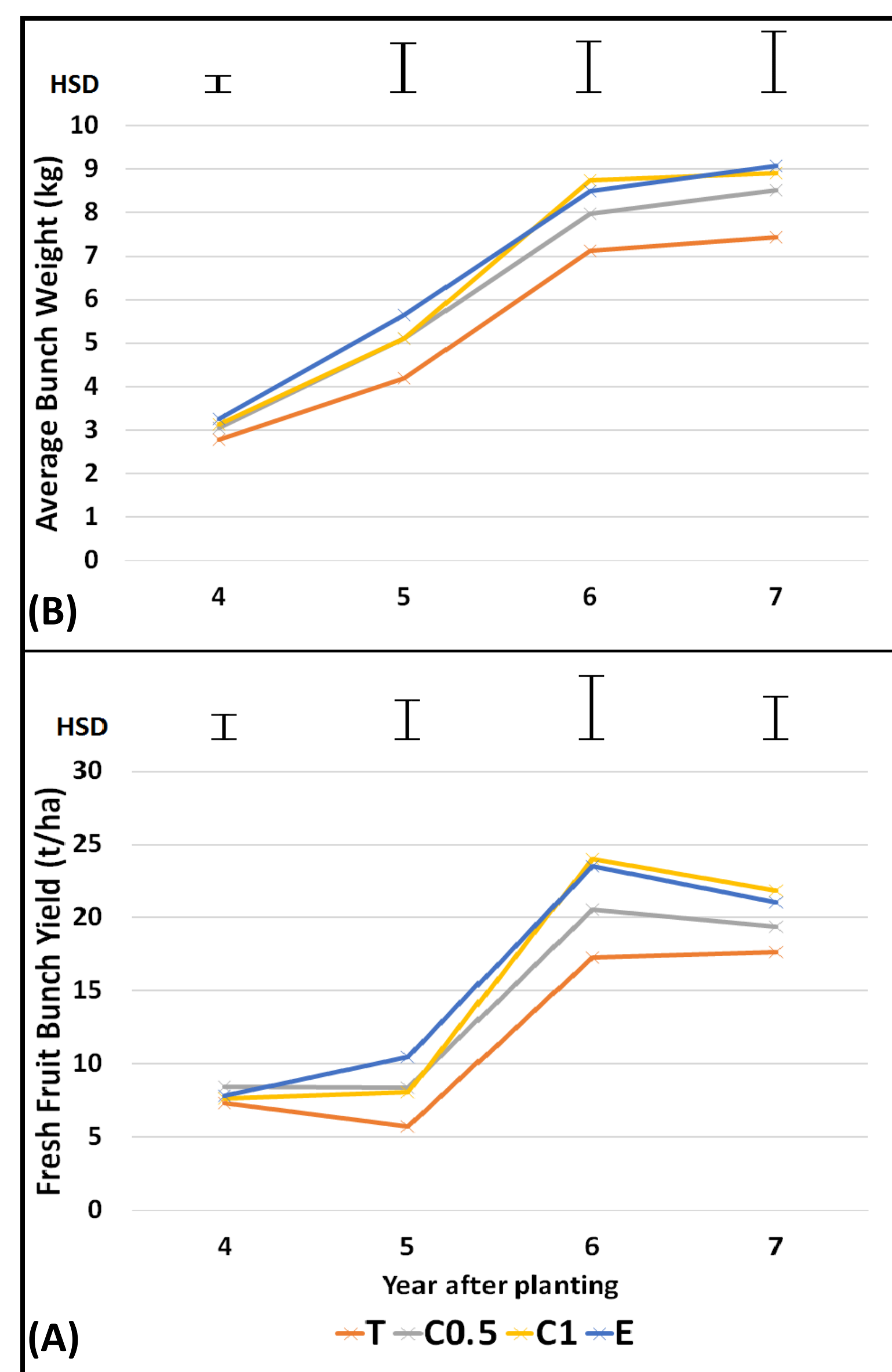


Figure 3: Effects on production parameters (A) Average Bunch Weight and (B) FFB/Ha

Treatment	Cumulative FFB yield (t/ha)	Oil Extraction Rate (%)	Cumulative Oil yield (t/ha)	% added profit from fertilization*
T	47.97	29.8	14.3	
C0.5	56.75	29.4	16.7	13.4
C1	61.65	27.7	17.1	12.9
E	62.85	28.0	17.6	13.0

*Taking into account the costs of fertilizer, transport and application

Table 2: Cumulative ffb and oil yields and gained profit from fertilization

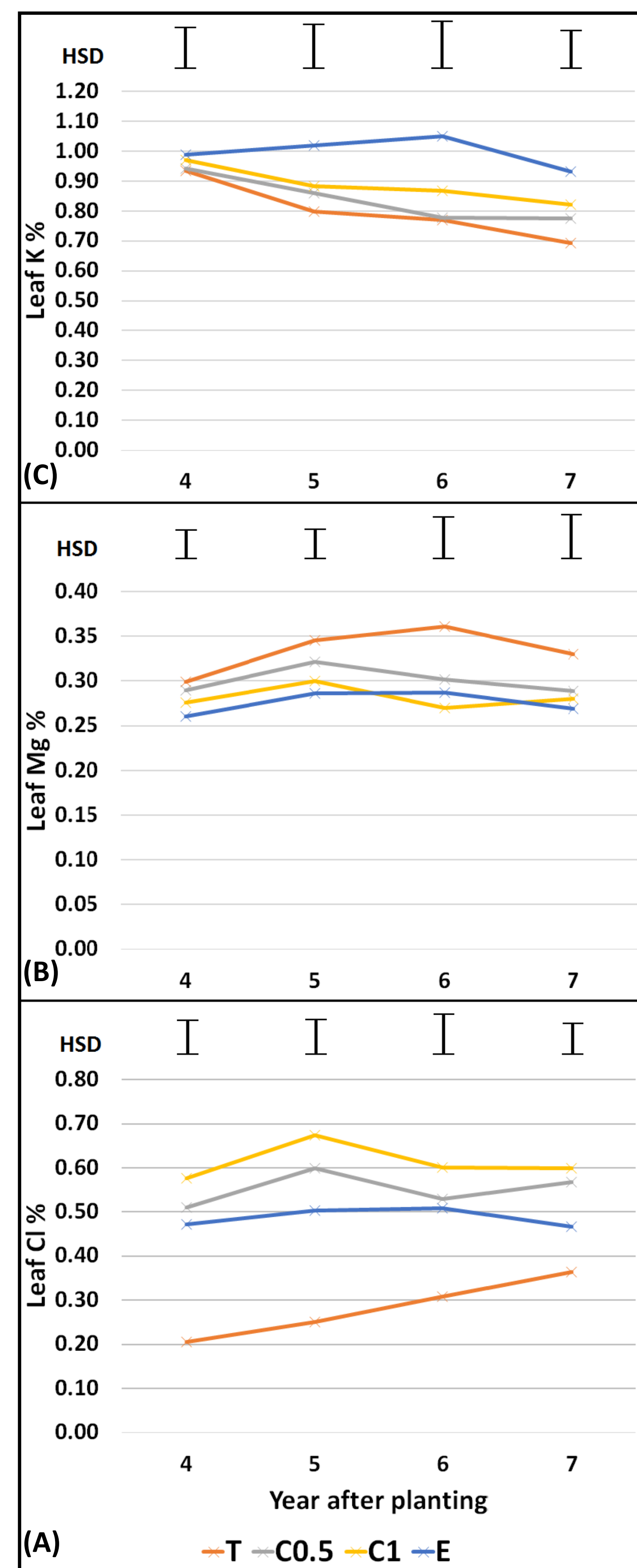


Figure 4: Effects on nutritional parameters (A) Leaf K%, (B) Leaf Mg% and (C) Leaf Cl%

Conclusions

- Fertilization is essential to optimize production and profitability of young oil palm plantations thus making palm oil production more sustainable.
- Organic mill waste (EFB) has a similar effect as inorganic fertilizer on both parameters but has limited availability.
- Despite the extra costs of fertilization the economic benefits occur within the first years of production.
- Rational and adequate fertilization remains important throughout the crop cycle (25 to 30 years) to sustain soil fertility, high productivity and economic profitability in the long term. More collaborative research is ongoing to optimize the use of organic mill waste and inorganic fertilizer further.

References

Corley, R.H.V. and Tinker, P.B., 2016. The Oil Palm 5th edition. Wiley and Sons, Ltd.
FAOSTAT, 2013

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