Appendix S1. Supplementary Materials

Influence of Tobacco Plant on Macronutrient Levels in Different Soil Textures

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The information presented here relates supplementary materials of each experiential site namely Sikonge, Urambo, and Tabora districts in Tanzania. The parameters of soil properties measured before and after experimentation with and/or without fertilizations differed significantly. Nicotine and total N increased significantly along a trend of uncultivated soils and in tobacco cultivated soils with and/or without fertilization. There was also a clear trend observed as an effect of tobacco cultivation on the decrease of soil pH, OC, P, S, Mg, and K. decreased significantly across tobacco cultivation situations. However, there was no significant effect of tobacco cultivation regime observed on the levels of Ca (Table S1).

Table S1. Soil properties of Sikonge site

Soil parameter	Time of experimentations		
	Soil before tobacco	Soil after unfertilized tobacco	Soil after fertilized tobacco
Soil pH	5.89 ± 0.00 a	5.44 ± 0.15 c	5.41 ± 0.05 c
Nicotine (mg kg^{-1})	0.01 ± 0.00 g	4.66 ± 0.34 c	13.13 ± 0.22 a
Organic carbon (%)	0.36 ± 0.00 a	0.30 ± 0.01 b	0.29 ± 0.01 b
Total N (%)	0.050 ± 0.00 cd	0.063 ± 0.00 b	0.073 ± 0.00 a
Available P (mg kg^{-1})	43.48 ± 0.00 b	34.80 ± 0.54 c	35.33 ± 0.38 c
Available S (mg kg^{-1})	9.12 ± 0.00 a	2.54 ± 0.02 e	2.75 ± 0.05 d
Ca (cmol (+) kg^{-1})	1.29 ± 0.00 g	1.55 ± 0.13 g	1.85 ± 0.05 g
Mg (cmol (+) kg^{-1})	0.29 ± 0.00 a	0.27 ± 0.01 ab	0.26 ± 0.01 b
K (cmol (+) kg^{-1})	0.53 ± 0.01 a	0.52 ± 0.01 ab	0.50 ± 0.01 b

Means along the row with different letter(s) differ significantly.

Results in Table S2 present the individual soil properties of Tabora site. Soil pH, OC, and total N were not significantly affected by tobacco cultivation. Other measured variables including nicotine, P, S, Mg, K, and Ca were affected by both tobacco cultivation and fertilization with undefined trend (Table S2).

Table S2. Soil properties of Tabora site

Soil parameter	Time of experimentations		
	Soil before tobacco	Soil after unfertilized tobacco	Soil after fertilized tobacco
Soil pH	5.49 ± 0.00 c	5.46 ± 0.00 c	5.45 ± 0.02 c
Nicotine (mg kg^{-1})	0.01 ± 0.00 g	2.29 ± 0.12 e	9.63 ± 0.14 b
OC (%)	0.16 ± 0.00 de	0.14 ± 0.01 e	0.17 ± 0.01 d
Total N (%)	0.040 ± 0.00 e	0.040 ± 0.00 e	0.053 ± 0.00 c
Available P (mg kg^{-1})	53.39 ± 0.00 a	14.21 ± 1.53 f	17.11 ± 0.36 e
Available S (mg kg^{-1})	8.09 ± 0.00 c	1.06 ± 0.02 g	1.21 ± 0.01 f
Ca (cmol (+) kg^{-1})	0.10 ± 0.00 de	1.09 ± 0.01 g	1.66 ± 0.01 g
Mg (cmol (+) kg^{-1})	0.24 ± 0.00 c	0.18 ± 0.01 d	0.22 ± 0.01 c
K (cmol (+) kg^{-1})	0.29 ± 0.00 c	0.20 ± 0.01 e	0.22 ± 0.01 de

Means along the row with different letter(s) differ significantly.

In Urambo site, the soil pH, OC, and Ca were not significantly affected by tobacco cultivation and fertilization. Results also indicated that nicotine, P, S, and Mg are significantly decreased by both tobacco and fertilization whereas K and N were only significantly decreased by fertilizer (Table S3).

Table S3. Soil properties of Urambo site

Soil parameter	Time of experimentations		
	Soil before tobacco	Soil after unfertilized tobacco	Soil after fertilized tobacco
Soil pH	5.87 ± 0.00 ab	5.81 ± 0.02 ab	5.70 ± 0.05 b
Nicotine (mg kg^{-1})	0.02 ± 0.00 g	1.19 ± 0.06 f	3.31 ± 0.19 d
Organic carbon (%)	0.25 ± 0.00 c	0.25 ± 0.00 c	0.24 ± 0.01 c
Total N (%)	0.040 ± 0.00 e	0.043 ± 0.00 de	0.053 ± 0.00 c
Available P (mg kg^{-1})	44.41 ± 0.00 b	22.43 ± 0.16 d	21.24 ± 0.61 d
Available S (mg kg^{-1})	8.19 ± 0.00 b	1.16 ± 0.04 f	1.20 ± 0.03 f
Ca (cmol (+) kg^{-1})	0.40 ± 0.00 g	1.58 ± 0.03 g	1.77 ± 0.04 g
Mg (cmol (+) kg^{-1})	0.26 ± 0.00 b	0.25 ± 0.01 c	0.25 ± 0.02 c
K (cmol (+) kg^{-1})	0.25 ± 0.00 c	0.24 ± 0.00 cd	0.22 ± 0.01 de

Means along the row with different letter(s) differ significantly.

Results indicated that leaf nicotine concentration and dry leaf yield decreased significantly with experimental sites in the order Sikonge > Tabora > Urambo. The green leaf yield followed a decreasing trend of Sikonge > Tabora = Urambo. Fertilization resulted in a significant increase in leaf nicotine concentration and tobacco dry and green leaf yields. Interactions between experimental sites and fertilization or unfertilized conditions were significant (Table S4).

Table S4. Leaf nicotine and tobacco leaf yield from three sites (Sikonge, Tabora, and Urambo)

	Leaf nicotine (%)	Green leaf yield (kg ha^{-1})	Dry leaf yield (kg ha^{-1})
Sites:			
Sikonge	2.85 ± 0.36 a	10522.92 ± 2996.12 a	1117.11 ± 287.95 a
Tabora	2.36 ± 0.23 b	7060.65 ± 1873.49 b	749.07 ± 208.64 b
Urambo	2.10 ± 0.24 c	6287.73 ± 1994.81 b	614.58 ± 201.38 c
Treatments:			
Unfertilized tobacco	1.82 ± 0.07 b	2892.59 ± 360.76 b	311.39 ± 51.89 b
Fertilized tobacco	3.05 ± 0.16 a	13021.60 ± 1079.90 a	1342.45 ± 108.29 a
2-WAY ANOVA F-statistics			
Site (S)	129.55***	45.95***	55.61***
Treatment (T)	979.48***	695.05***	655.09***
S × T	26.07***	18.31***	9.48**

Means in each column with different letter(s) differ significantly.

Fertilizers applications significantly increased leaf nicotine concentrations and tobacco green and dry leaf yields in Sikonge site (Table S5).

Table S5. Leaf nicotine concentrations and tobacco leaf yields of Sikonge site

Cultivation type	Leaf nicotine (%)	Green leaf yield (kg ha^{-1})	Dry leaf yield (kg ha^{-1})
Unfertilized tobacco	2.04 ± 0.02 d	3826.85 ± 184.96 c	477.69 ± 72.28 c
Fertilized tobacco	3.67 ± 0.01 a	17218.98 ± 109.96 a	1756.53 ± 22.36 a

Means in each column with different letter(s) differ significantly.

Fertilization resulted in a significant increase in leaf nicotine concentrations and tobacco green and dry leaf yields in Tabora site (Table S6).

Table S6. Leaf nicotine concentrations and tobacco leaf yields of Tabora site

Cultivation type	Leaf nicotine (%)	Green leaf yield (kg ha^{-1})	Dry leaf yield (kg ha^{-1})
Unfertilized tobacco	1.85 ± 0.03 e	2986.11 ± 564.34 cd	289.82 ± 27.61 d
Fertilized tobacco	2.87 ± 0.03 b	11135.19 ± 793.48 b	1208.33 ± 77.33 b

Means in each column with different letter(s) differ significantly.

Application of fertilizers significantly increased leaf nicotine concentrations and tobacco green and dry leaf yields in Urambo site (Table S7).

Table S7. Leaf nicotine concentrations and tobacco leaf green and dry yields of Urambo site

Cultivation type	Leaf nicotine	Green leaf yield	Dry leaf yield
	(%)	(kg ha^{-1})	(kg ha^{-1})
Unfertilized tobacco	1.57 ± 0.04 f	1864.81 ± 490.00 d	166.67 ± 42.43 d
Fertilized tobacco	2.62 ± 0.09 c	10710.65 ± 306.59 b	1062.50 ± 18.37 b

Means in each column with different letter(s) differ significantly.