

Soil Quality Assessment Under Conservation Agriculture Production Systems in the Philippines

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Objective

To determine and analyze the variability of selected soil quality parameters under Conservation Agriculture Production Systems (CAPS) in the Philippines.

Materials and Methods

This study was conducted at the Sustainable Agriculture and Natural Resources Management (SANREM) research site in Claveria, Misamis Oriental, Philippines. Six CAPS treatments in the form of cropping patterns with different cover crops including plow-based system serving as the control were established and replicated four times and were laid out in a randomized complete block design in a typical upland agricultural producing area in the said site. Subplots in each treatment were also established to represent two fertility levels.

Table 1. The CAPS treatments

	Cropping pattern
T1	Arachis Pintoi + Maize- Arachis pintoi + Maize
T2	Maize + Stylo - Stylo fallow
T3	Maize+cowpea - Upland rice +cowpea
T4	Maize+Rice bean-Maize+Rice bean
T5	Cassava + Stylo
T6	Maize-maize (conventional plow-based) (control)

Table 2. The fertility levels

	Fertility Level
Fo	120-60-60 for N, P ₂ O ₅ , K ₂ O
F1	60-30-30 for N, P ₂ O ₅ , K ₂ O



Figure 1. The SANREM Research Site in the Philippines



Figure 2. Soil sampling and TDR measurement

Results

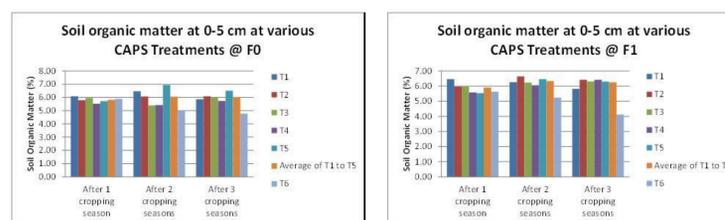


Figure 3. Soil organic matter at 0-5 cm at various CAPS treatments at Fo and F1

Table 3. Summary of regression analysis for soil organic matter at 0-5 cm for all CAPS treatments at Fo

Treatment	Regression Equation	R ²
T1	$y = 8E-05x + 6.2278$	0.006
T2	$y = 0.0028x + 5.6285$	0.573
T3	$y = 0.0008x + 5.583$	0.275
T4	$y = 0.0004x + 5.4106$	0.365
T5	$y = 0.0004x + 6.2309$	0.051
T6	$y = -0.0012x + 5.6129$	0.455

Table 4. Summary of regression analysis for soil organic matter at 0-5 cm for all CAPS treatments at F1

Treatment	Regression Equation	R ²
T1	$y = -0.0013x + 6.441$	0.875
T2	$y = 0.001x + 6.1215$	0.666
T3	$y = -0.0024x + 6.8338$	0.377
T4	$y = 0.0021x + 5.8558$	0.495
T5	$y = 0.0026x + 5.4825$	0.885
T6	$y = -0.0017x + 5.5632$	0.504

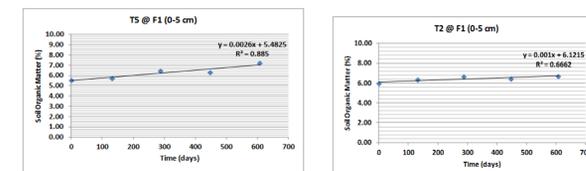


Figure 4. Soil organic matter vs. time for the best CAPS treatments T5 and T2

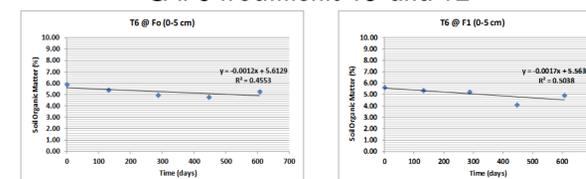


Figure 5. Soil organic matter vs. time for the conventional plow-based treatment T6

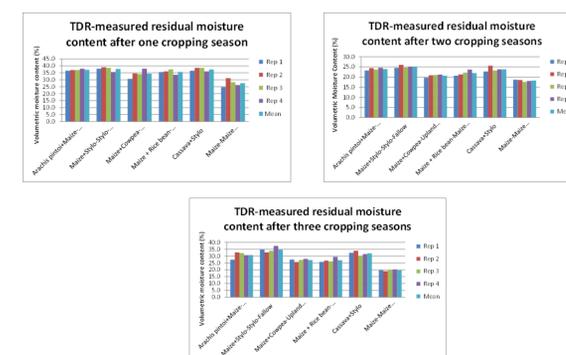


Figure 6. TDR-measured residual moisture content at various CAPS treatments

Conclusion

Results showed that the soil organic matter for all CAPS treatments (T1 to T5) was generally higher than under T6 (plow-based) after three years of cropping. Treatment T2 (Maize+stylosanthes guianensis-stylosanthes guianensis-fallow) exhibited the highest soil organic matter at the uppermost soil layer (0-5 cm). Linear regression analysis showed that the soil organic matter at the uppermost soil layer under plow-based system declined over time for both fertility levels. Under a high fertility level, the soil organic matter at the uppermost layer for all CAPS treatments T1 to T5 all exhibited a positive change over time, with T2 exhibiting the highest rate of increase. Under a moderate fertility level, the soil organic matter for CAPS treatments increased over time with T5 (cassava+Stylosanthes guianensis) exhibiting the highest rate of increase. Analysis of variance of the residual moisture showed that the plots under conservation agriculture have significantly higher residual moisture content than under plow-based system ($\alpha=5\%$) after a number of cropping seasons with CAPS treatment T2 exhibiting the highest residual moisture content value.



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