

Project 2. Biogeochemical Cycling, Carbon Sequestration and Establishment of Nutrient Budget for Mango-Goat Farming System

Objective: To determine the physical properties and nutrient status of soils under mango-goat-crop mixed green farming system

Methodology

Soil analyses of the area was done prior to the start of the experiment in order to establish benchmark data on the nutrient status of the soil and to be able to determine the fertilization rate for the different crops to be planted. Soil profile characteristics of the area were also determined prior to the set-up of the experiment.

Mango trees were planted on the experimental site at a distance of 10 m x 10 m with 9 trees per plot. Other crops were also planted like rice, green pepper and mungbean following the different treatments:

T1 – 9 mango trees + 2 goats + rice-rice rotation

T2 – 9 mango trees + 2 goats + rice-green pepper rotation

T3 – 9 mango trees + 2 goats + rice-mungbean rotation

T4 – 9 mango trees + 3 goats + rice-rice rotation

T5 – 9 mango trees + 3 goats + rice-green pepper rotation

T6 – 9 mango trees + 3 goats + rice-mungbean rotation

T7 – 9 mango trees + 4 goats + rice-rice rotation

T8 – 9 mango trees + 4 goats + rice-green pepper rotation

T9 – 9 mango trees + 4 goats + rice-mungbean rotation

Organic fertilizer was applied to the soil at the rate of 10 t ha⁻¹ prior to planting. Rice, green pepper and mungbean were sprayed with vermitea at 15 days interval while mango trees were sprayed with vermitea at monthly interval.

During the flowering and harvesting stages of the different crops, chemical properties of the soils such as pH, organic carbon, organic matter, total nitrogen and available phosphorus were determined following standard methods of analyses for each chemical property.



Figure 1. Transplanting activity



Figure 2. Broadcast application of fertilizer



Figure 3. Green pepper planted in plots



Figure 4. Harvested green pepper fruits

Results and Discussion

Profile Description

The soil profile is composed of different layers, namely: Ap, Bt1, Bt2, Bt3 and Bc. The soil is dominated by clay from the topsoil up to the parent material. Bulk density is much higher in the plowed layer (Ap) and decreases with soil depth. When moist, the plowed layer is friable while the subsoil is firm to very firm (Table 1).

Table 1. Profile characteristics of the experimental area

Horizon	Soil type	BD (g cm ⁻³)	Consistency (moist)
Ap	Maligaya clay	1.40	Friable
Bt1	Maligaya clay	1.27	Firm
Bt2	Maligaya clay	1.33	Very fine
Bt3	Maligaya clay	1.25	Firm
Bc	Maligaya clay	1.07	Very friable

Soil Chemical Properties

The soil had an initial pH of 5.4 considered moderately acidic with very low OM content (< 1.0 %), very low N (below 0.01 %) and nil P content. With the application of 10 t ha⁻¹ organic fertilizer, analyses of the soil at flowering stage showed that soil OM increased with values ranging from 0.94 to 1.48% while N also increased (0.05 to 0.07%), however the values are still considered low. Soil P also increased with values ranging from 3 to 14 ppm, considered low to medium (Table 2).

Table 2. Some chemical properties of the soil as influenced by the different treatments at flowering stage of mixed crops

TREATMENT	pH	OC (%)	OM (%)	Total N (%)	Available P (ppm)
9 mango trees w/2 goats+rice - rice rotation	5.58	1.61	0.94	0.05	11.54
9 mango trees w/2 goats+rice – green pepper rotation	5.22	2.38	1.39	0.07	9.29
9 mango trees w/2 goats+ rice mungbean rotation	5.03	2.25	1.31	0.07	3.73
9 mango trees w/3goats+rice - rice rotation	5.02	2.37	1.38	0.07	3.43
9 mango trees w/3 goats+rice – green pepper rotation	5.03	2.54	1.48	0.07	13.14
9 mango trees w/3 goats+ rice mungbean rotation	5.06	2.21	1.29	0.06	13.67
9 mango trees w/4 goats+rice -	5.19	2.13	1.24	0.06	8.70

rice rotation					
9 mango trees w/4 goats+rice – green pepper rotation	4.60	2.21	1.29	0.06	4.62
9 mango trees w/4 goats+ rice mungbean rotation	4.87	2.26	1.32	0.07	12.48

Soil analyses done at harvesting stage of the mixed crops are presented in Table 3. Soil pH increased under the rice-mungbean crop rotation but it decreased under the rice-rice and rice-green pepper rotation. Soil OM, total N and available P also declined at harvesting stage which could be attributed to the mineralization of organic matter and also uptake of N and P by the crop.

Table 3. Some chemical properties of the soil of the different mango-goat-crop mixed at harvesting stage of mixed crops

TREATMENT	pH	OC (%)	OM (%)	Total N	Available P (ppm)
9 mango trees w/2 goats+rice - rice rotation	5.55	1.51	0.88	0.04	0.56
9 mango trees w/2 goats+rice – green pepper rotation	5.24	2.06	1.20	0.06	11.50
9 mango trees w/2 goats+ rice mungbean rotation	5.00	2.37	1.38	0.07	1.73
9 mango trees w/3goats+rice - rice rotation	4.92	1.85	1.08	0.05	1.38
9 mango trees w/3 goats+rice – green pepper rotation	4.86	1.90	1.11	0.06	1.20
9 mango trees w/3 goats+ rice mungbean rotation	5.03	2.01	1.17	0.06	0.32
9 mango trees w/4 goats+rice - rice rotation	5.37	1.77	1.03	0.05	0.27
9 mango trees w/4 goats+rice – green pepper rotation	4.77	2.18	1.27	0.06	4.07
9 mango trees w/4 goats+ rice mungbean rotation	5.48	2.63	1.53	0.08	4.59

Project 3 – Economics of Mango-Goat-Crop Mixed Green Farming System

Socio-economic assessment of the mango-goat-crop mixed farming system can not still be done because the project was only implemented in January and data are still insufficient.