IPNI PROJECT BRAZIL-60

Sustainable Production Systems Under No Till in The Cerrado of Brazil – Maranhão

REPORT #1

Season 2012-2013

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Rationale

Continuous cultivation of lands under the same monocropping systems tends to promote soil degradation and increases the incidence of crop diseases, pests, and weeds, which in turn, reduces the crop yield potential. This is a long-term research project looking into various aspects of sustainable agricultural systems. The project gives emphasis to crop rotation and other alternatives to generating long-term profitability. This is believed to be instrumental to many farms located throughout the Brazilian Cerrado region. Part of this project is dedicated to the study of soil fertility management under these sustainable agriculture systems. One experiment containing eight different cropping systems was initiated in 2012 and general results for the first year will be available late in 2013.

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Material & Methods

Location

Project is located at Maranatha Farm in Balsas-MA (8°1'40" S and 46°11'10" W) in an Oxisol.

Treatments

This project is composed by 8 treatments regarding crop rotation, as presented in Table 1, and a N rates are tested for maize (0, 100, and 200 kg/ha for maize 1st crop, and 0, 50, and 100 kg/ha for maize 2nd crop) in order to build a yield response curve. Field trial design is a complete randomized bloc with three replicates. Plots are 27 meters long by 10 meters wide. Maize

Table 1. Treatments compared in Brazil-60 project.

T#	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Observation
1	S	S	S	S	S	S	Monoculture + tillage
2	S	S	S	S	S	S	Monoculture
3	S/m	S/m	S/m	S/m	S/m	S/m	Cover crop effect 1
4	S/M2	S/M2	S/M2	S/M2	S/M2	S/M2	Regional standard cropping system (minimum rotation)
5	S/c	S/b	S/C	S/Sor+b	S/c	S/ Sor+b	Cover crop effect 2
6	S/M2+b	S/c	S/M2+b	S/c	S/M2+b	S/c	Cover crop effect 3
7	S/M2+c	S/M2+b	C/M2+b	S/M2	b+c	S/M2	Cover crop effect 4
8	S/C	M1+b	S/c	C/Sor+b	S+M2+b	M1+b/c	Sustainable suggested cropping system (maximum rotation)

Crops: S, soybean (Glycine max); M1, maize 1st crop (Zea mays); M2, maize 2nd crop (Zea mays); C, cowpea beans (Vigna unguiculata); Sor, sorghum (Sorghum bicolor); m, pear millet (Pennisetum glaucum); b, brachiaria grass (Brachiaria ruziziensis); c, crotalaria (Crotalaria spectabilis);
Monoculture + tillage: treatment for comparison versus all other treatments under no-till.

General information

Soybean (NA8015RR) was seeded Nov 15th, 2012, and harvested Feb, 22, 2013. Maize 2nd crop (AG7088PRO2) was seeded Mar 9th, 2013, and harvested Jul 11th, 2013. Cowpea beans was seeded Mar 9th, 2013, and harvested May 30th, 2013. Soybean fertilization was basically 250 kg/ha of 03-37-03 (plus micros) at seeding and 200 kg/ha of KCl at 20 days after emergence.

Results

Table 2 presents the results of plant height, seed weight and grain yield of soybean in response to the crop rotation systems studied. The season 12/13 was the first year of this project, so no effect of the crop rotation was expected. Nevertheless, a linear response curve was obtained to maize 2nd crop grain yield in response to the N rates applied, as presented in Figure 1.

Table 2. Plant height, seed weight, and grain yield of soybean in response to the crop rotations systems, season 12/13 (year 1).

T#	Plant Height	Seed Weight	Grain Yield
	cm	g/1000	kg/ha
1	62.0	170.7	2,737.5
2	62.3	166.3	2,762.7
3	62.7	160.0	2,744.0
4	61.7	162.0	2,970.5
5	63.3	167.7	2,849.8
6	63.0	165.3	2,833.0
7	64.0	163.0	2,994.6
8	62.0	170.7	3,021.8
Average	62.6	165.7	2,864.2
C.V. (%)	2.61	3.28	6.61
P>F	0.74	0.11	0.35

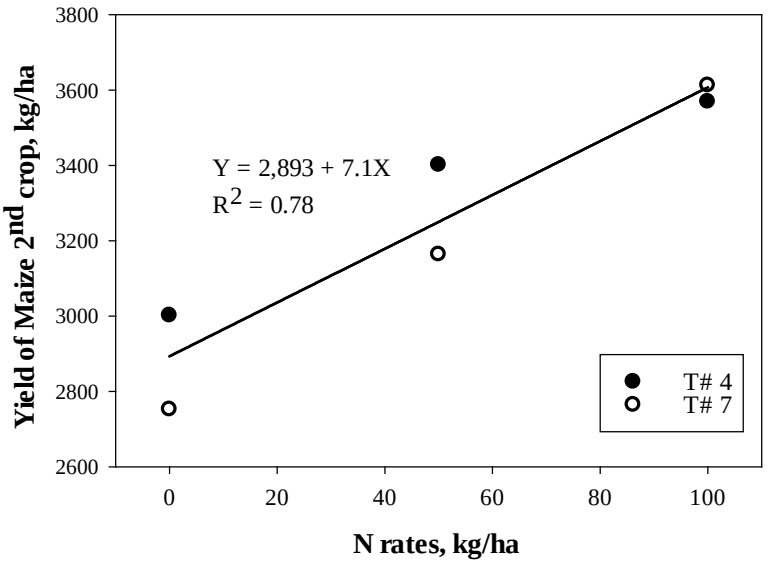

Figure 1. Grain yield of maize 2nd crop in response to N application.

Final Considerations

The average grain yield of soybean and maize 2nd crop is below the national average and may represent a local challenge to increase yield due to weather and soil conditions. As this is a long term project regarding crop rotation aiming to sustainable cropping systems, relevant results may arise in the following years. Nitrogen seems to be a key nutrient to increase grain yield for the whole cropping systems.