Bean Yield as affected by Mulch from different Crops Residues

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No till or direct drilling the seed of the annual crops between stubble of previous crop has become a common practice and a viable mean toward agricultural sustainability in Savannah region of Brazil. This cultural practice is replacing the traditional land preparation and it is estimated to occupy four million-hectare. Farmers perceive that practicing this no till system increase gradually the yield of many annual crops. Many factors can be attributed to the gradually increasing yield, e.g., increased the water retention capacity, improved the physical, chemical and biological properties of the soil. This improvement is the result of many years of research and fine tuning the crop rotation with annual crops, the timing of herbicide applications, and the practice of minimum disturbance the soil surface. Another important component of this system is the soil surface protection through mulching. Certain grasses such as *Brachiaria* reduced the incidence of white mould in bean have been reported. On the other hand under the tropical condition the mulch is rapidly decomposed, hence its protecting effect is shorter than the most annual crop cycle. The main objective of this experiment was to evaluate the mulch and mulch combination from crop residues of several species for better soil surface protection is.

The experiment was carried out in the farm at Santa Helena - GO, Brazil, practicing no till farming for 12 year and cultivating three crops per year. As basal fertilizer treatment was 200 kg ha^{-1} of complete fertilizer 8-20-20. Side dressing with 100 kg ha^{-1} with ammonium sulfate was done at 20 days after emergence. Crop protection was limited to prevent the mite attack. The experimental design is a completely randomized design with four replications and the net plot size was 8 m^2. Eight different mulches, composed of crop residues from previous crops were: a. maize, b. rice, c. sorghum, d. soybean, e. *Brachiaria brizantha*, f. sorghum in combination with *Brachiaria*, g. soybean and h. maize in combination with *Brachiaria*. These treatments of different mulches were available at the farm. The large strips of 400 m^2 with different combinations of mulch were sprayed with systemic herbicide (gliphosate) 7 days before planting with bean cv Perola. Immediately after planting, the field was sprayed with contact herbicide (paraquate), to reduce the weed development after disturbing the soil surface during drilling the seeds. The soil was highly fertile as shown by the chemical characteristics in the Table 1.

High bean yield was obtained from plots where the mulches derived from residues of *Brachiaria* or *Brachiaria* in combination with other crops, except with sorghum (Table 1). Planting bean on mulch derived from any annual crops gave the lowest yield. The yield increase was related to the increase of pods per plant, however no increase were observed in hundred seed weight and number of seeds per pod.

The results of this study show that *Brachiaria*, the most common fodder crop in Brazil, serve as the best component for mulching. Integration of annual crop production and animal husbandry is a viable practice under Brazilian condition. Furthermore intercropping the *Brachiaria* into the annual crop also lead to an efficient system for establishing a good pasture in a short time. Further research is needed to determine the quantity of Brachiaria seed can be planted without reducing the annual crop yield or use herbicide to suppress the excessive growth of the grass.

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Table 1- Soil chemical characteristics of the experimental site at Santa Helena de Goiás - GO, Brazil

Soil depth (cm)	pH (water)	$mmol_c\ dm^{-3}$			$mg\ kg^{-1}$					$g\ kg^{-1}$
		Ca	Mg	Al	P	K	Cu	Zn	Mn	O.M.
0-20	5.9	52.1	21.7	0.80	29.10	164.8	2.6	7.53	61.2	25.3

Table 2 - Effect of different mulch composition derived from previous crop residues on bean yield at Santa Helena de Goiás - GO, Brazil.

Source of mulch (previous crop)	Final plant population (plants/m)	Pods/plant	Yield ($kg\ ha^{-1}$)
Soybean + *Briachiaria*	12.2 b*	16.5 a	3215 a
Maize + *Briachiaria*	14.2 a	16.7 a	3150 ab
Briachiaria	13.0ab	16.2 ab	2839 abc
Maize	14.2 a	10.2 ab	2555 bcd
Sorghum + *Brachiaria*	14.7 a	9.9 ab	2394 cd
Soybean	11.3 b	11.6 ab	2278 cd
Sorghum	13.9 a	9.4 b	2092 d
Rice	14.2 a*	14.5 ab	2035 d
CV(%)	6.9	29.3	12.74
LSD 5%	1.72	7.09	604.1

* The means in the same column followed by the same letters are not significantly different at $P < 0.05$.