Effect of mulching on soil organic carbon sequestration in forage crops for mitigating climate change

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INTRODUCTION

- Today's changing lifestyle has a huge impact on the environment and also has an effect on climate change.
- Agriculture has a dramatic capacity to sequester carbon dioxide and worldwide soil is one of the largest reservoirs, where carbon could be restored.
- Farming forage crops has a dramatic capacity to sequester CO2 (Sundaram *et al*., 2012) from atmosphere.
- Mulching is one of the most sustainable approaches in sequestering C and has potentiality of reducing greenhouse gas emissions from soil by increasing its soil organic matter content (Jordán *et al*., 2010).
- Hence, in the present study cultivation of forage crops was assessed for soil C sequestration in different mulching for mitigating climate change.

MATERIALS & METHODS

Location: Central Research Farm, Gayeshpur, BCKV.

Soil: Sandy loam soil and neutral in nature.

Year of study: Kharif 2010 to summer 2013

Design: Split-plot with three replications.

Main plot treatments (Perennial forage crops):

P1- *Brachiaria brizantha*, P2- *Panicum maximum* and P3- *Setaria anceps*

Sub plot treatments (Mulching):

M1- no mulch, M2- soil mulch and M3- live mulching with legumes. In live mulch plots rice bean, berseem and cowpea were grown in *Kharif, Rabi* and Summer seasons respectively.

Calculation:

Carbon stock (Mg/ha) = [Area (m^2) x SOC (%) x Soil Bulk Density (g/cc) x Soil Sampling Depth (m)]/100.

C sequestration rate (Mg/ha/year) = [Final SOC (kg/ha) - Initial SOC (kg/ha)] /Years.

RESULTS

Fig: Comparison between the carbon present before cultivation and after harvest (mean value) of different forage crops & mulching (error bars indicate standard error)

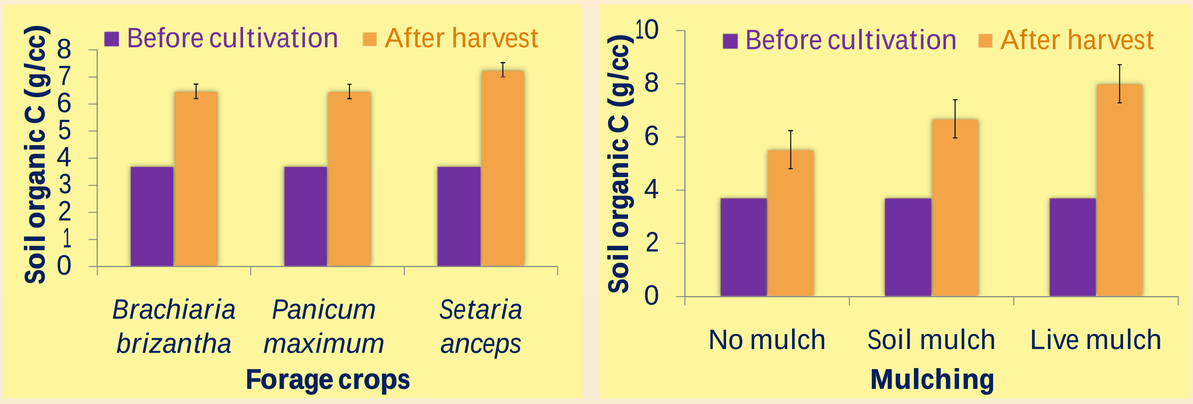

Table 1: Influence of different forage crops and mulching on carbon stock and carbon sequestration rate

Crops	Mulching			
	No mulching	Soil mulching	Live mulching	Mean
	Carbon stock (Mg/ha)			
Brachiaria brizantha	21.81	31.99	35.54	29.78
Panicum maximum	27.22	28.20	32.33	29.25
Setaria anceps	29.73	32.20	39.81	33.91
Mean	26.25	30.80	35.89	
	Crops	Mulching	Crop x Mulching	
CD at 5%	3.77	3.82	NS	
	Carbon sequestration rate (Mg/ha/year)			
Brachiaria brizantha	1.83	5.22	6.41	4.49
Panicum maximum	3.63	3.96	5.34	4.31
Setaria anceps	4.47	5.29	7.83	5.86
Mean	3.31	4.83	6.52	
	Crops	Mulching	Crop x Mulching	
CD at 5%	1.26	1.27	NS	

Table 2: Variation in SOC content across treatments and cropping systems in Gayeshpur, Nadia, West Bengal (Mandal *et al*., 2007)

Cropping system	Carbon stock (Mg/ha)		Carbon sequestered (Mg /ha)	
	NPK	NPK+FYM/ compost	NPK	NPK+FYM/ compost
Rice-Mustard-Sesamum	39.17	40.18	1.88	2.89
Rice-Fallow-Berseem	31.68	36.14	1.23	5.69

CONCLUSIONS

- Agricultural soils and land studied in the present research has the impending nature to restore carbon and in the study area incorporation of live mulching with legumes in *Setaria anceps* resulted in highest SOC stock which in turn support higher carbon sequestration rate in experimental region.
- Rates of carbon gain based on crop management practices are expected to provide an accurate basis for carbon sequestration initiatives in climate change mitigation.

References:

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