

Mulching, Leaf Colour Chart, Surface Seeding And Controlled Traffic Farming As Agronomic Practices For Maintaining And Enhancing Soil Fertility

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SUMMARY

The supply of organic matter to the soil through mulching and green manure is an important factor for maintaining and enhancing soil fertility “Feed the soil to feed the plant” is a basic principle of organic farming and gardening. The mulching material can result from crop residues or green manure crops. This provides feed for the soil life and mineral nutrients for plants. If legume crops are used as green manure, they can supply up to 200 kg ha⁻¹ nitrogen to the soil. This can result for rice in savings of mineral fertilizer of 50–75% (RWC-CIMMYT 2003). Left over material on the soil surface, the mulch reduces evaporation, saves water, protects from wind and water erosion, and suppresses weed growth. Green manure has significantly increased soil organic matter, soil health and crop growth. The *S. aculeata* produces the more biomass and was superior to other green manure crops. The leaf colour chart (LCC) is also a good eco-friendly cheap tool in the hands of small farmers to approximately optimize N use, irrespective of the source of N applied -organic, bio- or chemical fertilizers. Surface seeding is the simplest of all the crop establishment options. Seeds of wheat and other upland crops are broadcasted or seeded in rows using drum seeders on the surface without any disturbance of the soil. Controlled traffic farming results in better soil structure and higher yields

INTRODUCTION

Soil densities, porosity, texture, field capacity and soil moisture were influenced due to the green manure crops and tillage practices. The lowest bulk density (1.45 g cm⁻³) and particle density (2.48 g cm⁻³) were found in *S. aculeata* and deep tillage practice. The highest porosity (41.73%) and field capacity (24.24%) were also observed in *S. aculeata* and deep tillage practice. The incorporation of *S. aculeata* and deep tillage practice also showed the highest yield of T. aman and maize. Therefore, application of *S. aculeata* and deep tillage practice may be recommended as green-manure cultivation strategy in T. aman (*O. sativa*) and maize (*Z. mays*) cropping to maintain soil health and sustainable crop production (Salahin, *et al.*, 2013) (Table 1). Ali *et al.*, 2012 reported that green manuring of sesbania rostrata and legume crops (mungbean, cowpeas and lentil) produced significantly better grain yield of rice and wheat than the other crops (Table 2). Maximum paddy yield of 3.73 t/ha was produced by rice – wheat – sesbania cropping system followed by 3.57, 3.52, 3.40 and 3.39 t/ha produced by rice – wheat – mungbean, rice – berseem, rice – wheat – cowpeas and rice – lentil cropping systems respectively and these were statistically at par with each other. The other cropping patterns gave significantly lower yields. Rice - wheat system produce paddy yield of 3.34 t/ha. Sowing of sesbania rostrata increased rice yield by 12%, mungbean (7.2 %), Berseem (5.3 %), cowpeas (1.8 %) over the traditional rice – wheat cropping system. Leaf colour chart is being introduced to farmers through field researchers, extension staff and private sector agencies (Balasubramanian *et al.*, 2000). It was observed that 74 per cent of the farmers obtained equal or higher yields.

Main Body:

In case of surface seeding the treated seed (with Vitavax, 2.5 g kg⁻¹ seed) can be sown before or after the rice harvest depending on the soil moisture. The key to success is having the soil moist/ saturated during the initial stage as this facilitates seed germination and corking-in of roots into soil during root elongation stage. Mulching of surface seeded crops deters weed growth; keep the soil surface moist for long and delaying nitrogen application. In the Yangtze River Valley of China, seeds are sown after a pre-plant herbicide application and then covered with rice straw mulch. Controlled traffic farming restricts any traffic in the field to always the same tracks. Although these tracks are heavily compacted, the rooting zone never receives any compaction, resulting in better soil structure and higher yields. Through border effects, the area lost in the traffic zones is easily compensated for by better growth of plants adjacent to the tracks so that overall yields are usually higher than in conventional systems with random traffic (Kerr 2001). Obviously, controlled traffic farming is the ideal complement to zero-tillage or bed-planting systems. Also in conventional agriculture, controlled traffic provides advantages through

time and fuel savings since the resistance to soil tillage in the compaction-free rooting zones is significantly lower and traction is more efficient when tires work on compacted tracks (RWC-CIMMYT 2003). However, in this case, provision must be made either by GPS guidance or visible bed and furrow systems to limit tillage operations to the rooting zones and not to disturb the tracks.

Table 1 Yield of T. aman as influenced by various green manure crops

Treat.	T. aman 2010				T. aman 2011			
	Grain (t ha ⁻¹)	Straw (t ha ⁻¹)	Grain increase (%)	Straw increase (%)	Grain (t ha ⁻¹)	Straw (t ha ⁻¹)	Grain increase (%)	Straw increase (%)
G1	5.19a	5.43 a	35.5	33.7	5.09a	5.29a	46.26	33.3
G2	4.84b	5.07 b	26.4	24.9	4.54b	5.23b	30.46	31.7
G3	4.35b	4.58 c	13.6	12.8	4.32c	4.62bc	24.14	16.4
G4	3.83d	4.06 d	-	-	3.48c	3.97c	-	-
F value	20.93**	49.42**	-	-	26.9**	27.0**	-	-
CV (%)	12.34	3.70	-	-	3.81	8.01	-	-

G1= *Sesbania aculeata*; G2=*Mimosa invisa*; G3=*Vigna radiata*; G4= control.

* Significant at the 0.05 probability level; ** Significant at the 0.01 probability level; ns, not significant. Means followed by common letter do not differ significantly at 5%

Table 2 Effect of green manuring and legume crops on rice & wheat grain yield:

Yield (t/ha)			
Cropping System	Rice	Rabi Crops	Summer Crops
Rice – Wheat	3.34b	2.59b	-
Rice – Berseem	3.52a	28.50a	-
Rice – Lentil	3.39ab	0.71c	-
Rice – Canola	0.53c	3.21b	-
Rice – Wheat -Mungbean	3.57a	2.63b	0.78
Rice – Wheat - Cowpeas	3.40ab	2.69b	0.98
Rice – Sunflower	3.32b	-	1.08
Rice – Wheat - Sesbania	3.73a	2.81b	-
LSD	0.3163	1.073	NS

Means followed by common letter do not differ significantly at 5%

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