Soil amelioration pasture trial in the West Midlands Region

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Purpose:	To examine the pasture productivity and economic response to the application and incorporation of low rates of clay to pale deep sandplain over three years.
Location:	Badgingarra Research Station
Soil Type:	Deep pale sand
Rotation:	2009 Wheat; 2008 Lupins; 2007 Oats
GSR:	304mm

BACKGROUND

Historically, pasture options have been limited on the pale deep sands of the West Midlands region. These erosion prone sands are characterized by their low water and nutrient holding capacity and non wetting properties. Over the past 15 years economies of scale have allowed farmers to sow this country as part of their annual cropping program. However, recent dry summers coupled with lower growing season rainfall, high sheep price and high fertilizer prices has meant that:

a. Farmer’s are only cropping their most productive land; this involves leaving these sandpliain areas out of the cropping program.
b. There is more livestock pressure on these wind erosion prone sandplain areas, in particular sheep that trample stubbles and persistently camp on bare areas which further exacerbates the risk of wind erosion on fragile sandplain.
c. Farmers want pasture options for these long-term cropped pale deep sands.

Sub-tropical perennial pasture species have been widely adopted by farmers on pale deep sands of the West Midlands region, however, these sub-tropical perennials are a long-term investment and their flexibility as far as rotation and cropping is still being explored. To keep this flexibility in their farming systems many farmers are choosing to leave this wind erosion country bare or allow voluntary pasture species to grow (which increases weed burden). This scenario puts large areas of the WM region at greater risk of wind erosion.

In response to this situation WMG farmer’s wanted to explore the possibility of increasing pasture options for this deep sandplain country by improving the soil structure by applying and incorporating low rates of clay. WMG has developed a trial that examines the pasture productivity and economic response to the application (and necessary incorporation) low rates of clay to pale deep sandplain.

TRIAL DESIGN

Machinery: Calibrated broadacre spreader to spread clay; Rotary spader to incorporate relevant clay sections; Plot cone seeder to seed trial. Trial was mowed in November to ensure weed control for 2011.

Annual pasture details: Margarita serradella, Dalkeith subclover, Rose clover and Bartolo bladder clover seeded on 17th May 2010.

Fertilizer: **At Seeding:** 100 Kg/ha Superphos

Post: 150 kg/ha Super Potash 3:1

Herbicide: **At seeding:** 200ml/ha Talstar; 100 ml/ha Dominex

Post (7/7/10): 500 ml/ha Select + 0.01 L/ha Hasten (excluding Volunteer-control plots);

Perennials pasture details: Subtropical perennials mix (60% Gatton Panic; 10% Callide Rhodes; 10% Katambora Rhodes; 20% Bare signal grass) seeded at 4kg/ha on 30th August

Herbicide: **Pre- seeding** (10/8/10)**:** 2 L/ha Roundup (Perennials only)

Fertilizer: **At Seeding:** 80 Kg/ha Superphos

TRIAL LAYOUT

Species	5	6	4	1	2	3	2	5	6	3	1	4	1	4		6	2	5	3
Nil clay																			
Spader, 20cm																			
Spader, 30cm																			
Clay low rate (60 T/ ha)																			
Spader, 20cm																			
Clay high rate (120T/ ha)																			
Spader, 20cm																			
Spader, 30cm																			

Species 1- Margarita serradella
Species 2- Dalkeith subclover
Species 3- Rose clover
Species 4- Bartolo bladder clover
Species 5- Volunteer (control)

Species 6- Subtropical perennials mix

RESULTS

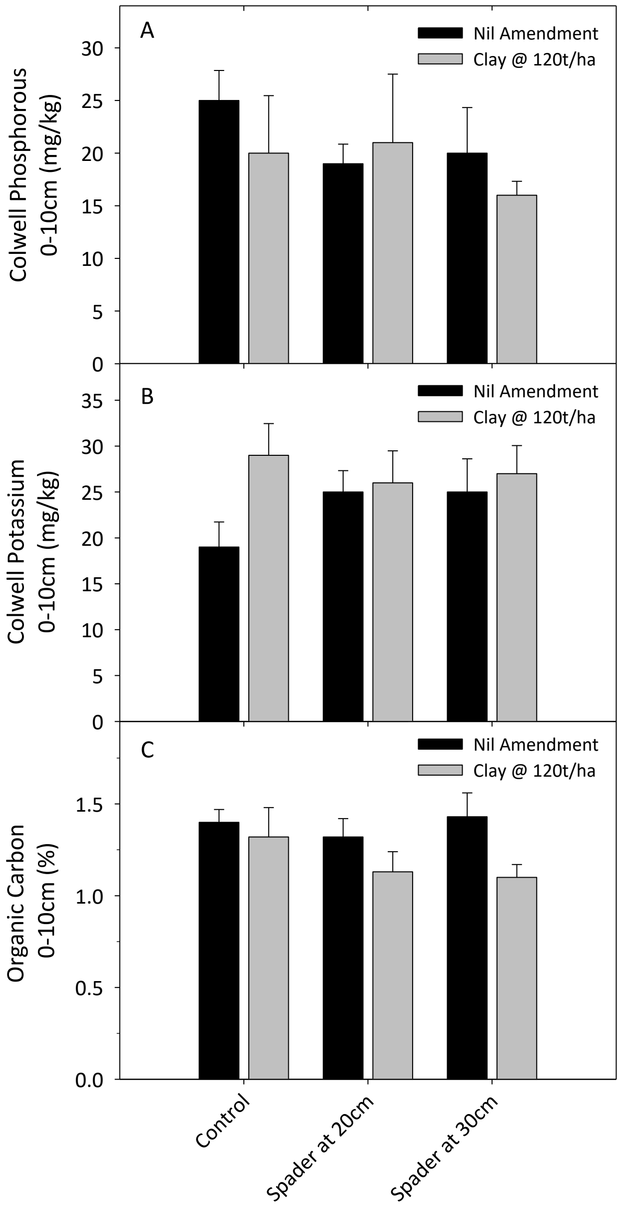

Figure 1. *Topsoil phosphorous (A), potassium (B) and organic carbon (C) levels in response to rotary spading at either 20 cm or 30 cm with or without the surface application of 120 t/ha clay-rich subsoil. Bars represent the standard error of the mean of 3 replicates.*

- Topsoil P levels were decreased by spading due to burial of the P-rich topsoil (Fig. 1A). The surface applied clay-rich subsoil has little P so in general addition of clay tends to dilute P levels (Fig. 1A). In this case the reduction in P is not large and is not likely to impact on early plant growth however it is recommended to test soils after spading to assess soil nutrient requirements.
- Potassium concentrations can often increase with depth so spading and lifting of the subsoil increased topsoil K levels (Fig. 1B). The surface spread subsoil contains some K (approximately 54 mg/kg) so addition of clay tends to increase K levels in the

topsoil (Fig. 1B), and increases K levels in the subsoil when it is incorporated using the spader (data not shown). The increase in K levels in the topsoil from 19 to 29 mg/kg is likely to be beneficial for plant growth.

- Rotary spading did not significantly change organic carbon levels in the topsoil (Fig. 1C) but addition of clay in combination with deep (30 cm) rotary spading did result in a decrease in organic carbon levels (Fig. 1C). Much of this decline is a result of the organic matter being moved deeper in the soil profile by spading. It should be noted that spading can also modify the soil pH profile through the mixing of layers with differing pH but in this instance the soil had no subsoil acidity with a pH range of 4.9-5.9 hence any changes in the pH profile due to spading would not greatly impact plant growth.
- Non-wetting effects were obvious in untreated areas (nil clay and nil spading) which was evidenced by patchy establishment of seeded varieties and the poor density and quality of volunteer pasture.
- Obvious visual weed control benefits in spaded strips, through burial of weed seed. However this also meant that spaded plots had less total coverage/ bio mass due to reduce volunteer pasture/ weed establishment.
- Visually, wetting ability of soil in treatments improved as clay rate increased and spading depth increased, this was evidenced by density and evenness of initial establishment in seeded varieties.
- The 120T rate of clay and 30cm spading gave best visual establishment across all annual varieties- these plots exhibited the most biomass and best quality feed of all seeded varieties.
- 60T and 120T clay rate (unincorporated) was effective in aiding establishment.
- Later in the season pasture establishment benefitted from weed control on the spaded plots

DISCUSSION

- The purpose of 2010 was to establish this long-term trial and baseline soils analysis
- Due to limited funding no formal monitoring took place and all results and analysis was visual.
- The Spader caused the trial area to be soft and as such sowing depth was compromised. Some furrows were partially collapsed, burying the seed even deeper. This cause patchy germination on the spaded area.
- Perennials did not germinate due to lack of spring and summer rain- these may need to be re-seeded in 2011.
- Unfortunately some of the treatments were affected by aphids, eg Dalkeith and to a lesser extent Bartolo Bladder clover and Rose Clover.
- Due to a very dry finish there appeared to be very poor seed set on all treatments.
- Low clay rates of 60T without incorporation was effective in aiding establishment of seeded varieties and could be an economic option for establishing annual pasture on poorer non-wetting sands
- The standout treatment of 120T clay and spading to 30cm may be an option worthy of consideration should livestock prices persist at current levels. This option produced high quality pasture which was a great improvement over the control and on a larger scale may sustain higher stocking rate and or growth rates.

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