

Whole Farm Soil Mapping

In the Mayfield subcatchment of the Peel - Harvey Coastal hotspot



ABOVE: Wylie Group Soil Map (Sulphur Status)

INSET: Daryl Robinson, one of the twenty two farmers in the Mayfield subcatchment of Peel- Harvey, to be involved in SWCC's whole farm soil mapping project (photo: Jenny Rowbottom)

PROJECT TITLE

Whole Farm Soil Mapping- In the Mayfield subcatchment in the Peel - Harvey Coastal hotspot

PROJECT DURATION

November 2012 - June 2013

BENEFICIARIES

Water ways and farmers within the Mayfield subcatchment

PROJECT LEADER
Jenny Rowbottom (SWCC)

PARTNERSHIP

Department of Food and Agriculture, Western Australia (DAFWA)

PROJECT MANAGER
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Department of Agriculture and Food



Background

Darryl has been the farm manager at Murray River Farms for the last five years; previous to that he was the farm foreman, so he knows the property well. The property is 1500ha of which 1100ha is farmed. Of this, 600ha is regularly fertilized. The property encompasses the low land in the Murray River valley and extends up into the scarp.

The farm runs 1100 steers, predominantly Angus. The steers are bought in as weaners, finished off on grass over a period of 9 - 10 months and sold in October – December. The steers average a weight gain of 1.5 – 1.6kg per day.

The pasture is a ryegrass/clover mix with both annuals and perennials. In addition, Graza oats are grown for grazing. To provide resilience against drought, hay is also produced, with 130ha of pasture hay and 70ha of oaten hay grown annually.

Whole Farm Soil Mapping in 2010/2011 – Results and interpretation

As the farm manager, Darryl introduced soil mapping for the property to rationalize the farm fertilizer programme. The first stage was to collect soil samples from each paddock and then collate soil samples from paddocks with similar soil type, so there could be soil from up to four paddocks analysed together.

Over the 2010/11 season, the fertilizer strategy on the 1100ha farmed land included an application of P, K and S fertilizer at 150kg/ha in March followed by urea at 85kg/ha in July and an NPK and S fertilizer at 178kg/ha in August. Lime was applied in 2009/2010 but not in 2010/2011. This is summarised in Table 1.

Table 1: Murray River Farms - Fertilizer Applications 2010/2011

	N	P	K	S
Fertilizer 1 3:1@150kg/ha over 600ha		10.95kg/ha	14.8kg/ha	8.4kg/ha
Fertilizer 2 - UREA10t over 120ha		38kg/ha		
Fertilizer HAYBURST 25t over 140ha	32.2kg/ha	4.5kg/ha	26.5kg/ha	16.4kg/ha
Amendment - Lime	None applied			

Although timely and convenient at the break of season, the strategy did not address the variability of nutrient status across the whole farm on a paddock by paddock basis.

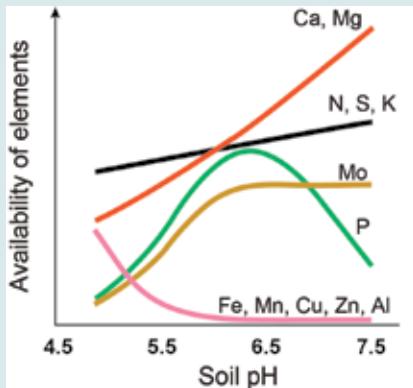
Outcomes from whole farm soil testing

The SWCC whole farm soil testing involved the testing of each paddock on the 1100ha farmed. In each paddock, 30 core samples were taken, following a diagonal transect (Fig 1); the transect position was influenced by soil type.

The soil analysis for each paddock was developed into traffic light maps for Phosphorus (P) at 80%, 85%, 90% and 95% production levels. 100% production occurs when the soil is optimally fertilised, where pH is optimum, where the most productive sward is grown, where weeds are controlled, where stocking rate is at the maximum, etc. Beef enterprises tend to run at 80 – 85% of the total pasture potential.



ABOVE - FIGURE 1: Murray River Farms - paddocks showing transects Red line = paddock boundary White line = diagonal transect of soil sampling.



The traffic light map for 85% production level for phosphorus was used by Murray River Farms. In addition maps for PBI (Phosphorus Buffering Index), pH, K and S status were provided. The maps are shown in Figure 3.

The traffic light system allows a very visual representation of the nutrient status and pH levels on the farm on a paddock by paddock basis. The colour red indicates low levels of nutrients or an unfavourable pH (too acidic in this case), and requiring action by the farmer. The low pH of the paddocks has the potential to 'lock' up nutrients, especially P. By addressing the pH, the availability of nutrient to plants can be maximised, this is shown in Figure 2.

Green indicates nutrient levels which will show no further response if more is added, or an acceptable pH level in the range of 5.5 – 6.5.

As a result of the whole farm soil mapping, the fertilizer strategy for Murray River Farm was modified.

The traffic light maps for P at 85% production level showed only two paddocks with P levels that needed an application. This resulted in only 30 ha of the 600 ha farmed area receiving P. The marginal P levels on some farm paddocks allowed for

minimum or no P to be applied in the 2011/12 season, but continued monitoring should be considered to ensure the P levels do not drop to levels below production requirements.

The traffic light map for Potassium (K) showed a greater degree of deficiency i.e. red and orange on the map.

Deficiencies in K are often associated with hay and silage paddocks where the final product is removed from the paddock; this is accentuated with sandy soils. These paddocks were targeted with a K fertiliser. In addition, Darryl tissue tested targeted paddocks as he felt the Nitrogen (N) response was not as good as he normally experienced. Based on the tissue test results, Hayburst or NKS32 were applied.

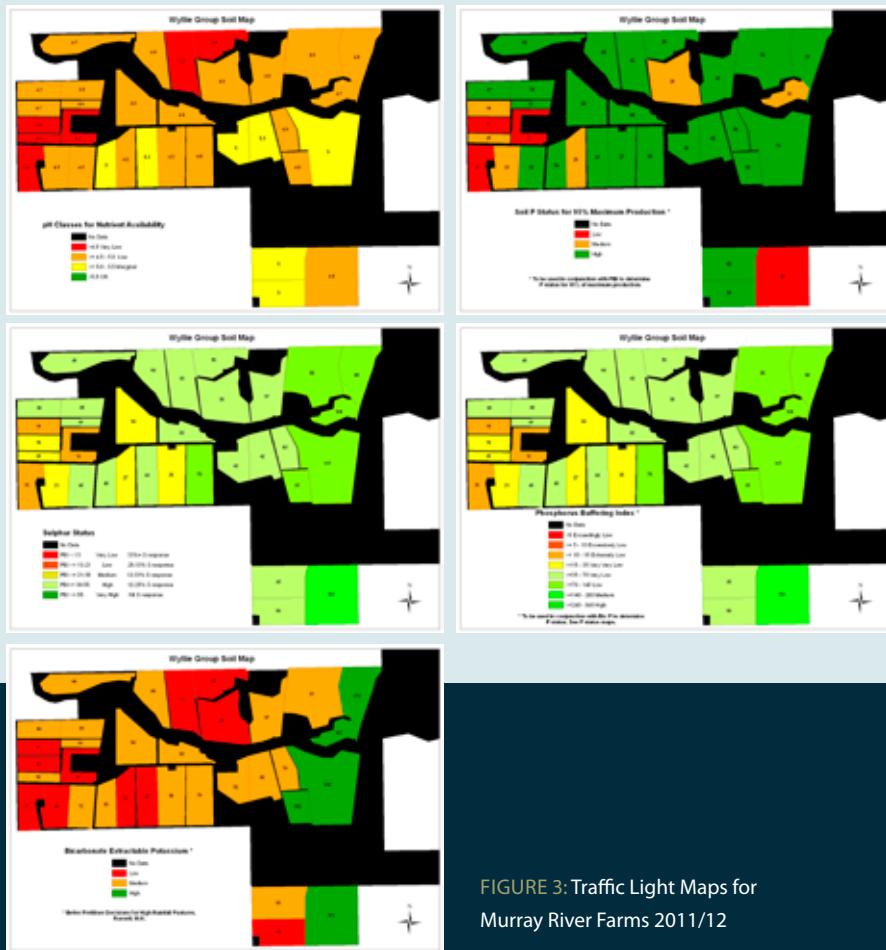
All of the paddocks demonstrated a pH below the recommended benchmark of pH of 5.5. Lime was applied in the 2011/12 season at 1.8t/

ha over 600ha. The fertilizer, lime applications and costings for before and after whole soil mapping are summarized in Table 2.

For the 2011/12 season, the application of P was reduced; significantly reducing costs (see Table 2). More importantly the application of P was targeted to specific paddocks on a needs basis.

Darryl intends to continue whole farm soil mapping as he believes it demonstrates the need for variable nutrient application on a paddock by paddock basis. Whole farm soil mapping also allows targeting of applications depending on enterprises i.e. hay vs. grazing paddocks.

Darryl's word of warning: a range of important nutrients are combined with 'super', namely K and sulphur (S); if the 'super' application is reduced, be careful not to compromise on the S and K.



ABOVE - FIGURE 2: Gazey C & Davies S (2009) Soil acidity: a guide for WA farmers and consultants, Bulletin 4784, Department of Agriculture and Food, Western Australia.

FIGURE 3: Traffic Light Maps for Murray River Farms 2011/12

K is important especially if the paddock is used for hay or silage production. In addition, use of N by the plant is affected by the sulphur status of the plant; a deficiency of S can affect the uptake of nitrates. To counteract this effect, Darryl applied NKS32 in 2011/2012.

A final and important aspect of strategic fertilizer applications is the reduction of nutrient loss entering waterways due to nutrient overload in soils and associated runoff. Reducing run off has the potential to improve water quality as well as long term sustainability of the farm business and productivity.

The Whole Farm Soil Mapping Project addresses the Caring for our Country and the South West Regional Natural Resource Management Strategy (2012 - 2020) targets to reduce the fertilizer and nutrient run off in to water ways through implementation of best practice fertilizer management on farms, as recommended in the Peel - Harvey Water Quality Improvement Plans (WQIP).

Table 2: Summary of Fertilizer, Lime and costings before and after Whole Soil

Mapping at Murray River Farms

2010/2011 Season						2011/2012 Season					
Fertilizer	Total N	Total P	Total K	Total S	Cost(\$)	Fertilizer	Total N	Total P	Total K	Total S	Cost (\$)
SUPER PHOS 3:1 150kg/ha over 600 ha		11kg/ha	15kg/ha	13kg/ha	\$45 810	SUPER PHOS 5:1 5t over 30ha		13kg/ha	14kg/ha	14kg/ha	\$2 145
HAYBURST 25t over 140ha	32kg/ha	5kg/ha	2kg7/ha		\$14 700	MURIATE OF POTASH 4t over 20 ha			99kg/ha		\$2 928
UREA 10t over 120ha	38kg/ha				\$5 600	HAYBURST 250kg/ha	36kg/ha	5kg/ha	30kg/ha		\$13 000
Lime	None Applied					NKS 32 150kg/ha					\$10 000
Total Cost					\$66 110	LIME 110t/600ha	1.8t/ha				\$23 000
						Total Cost					\$51 073



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