

Instantaneous pH Measurement

Overview: Liming efficiency.



Instantaneous pH Measurement



AIM: This GRDC project is designed to assess the accuracy and practicality of using Instantaneous pH probes to test top soil and sub-soil pH. The project will answer the following questions:

Instantaneous pH Measurement

QUESTIONS:

1. How do instantaneous pH probes compare to glass probes?
 - a. 1:5 CaCl₂ Solution.
 - b. Inserted directly into soil (Direct Soil).
2. Effect of soil types.
3. Effect of soil moisture.
4. Sampling Density.
5. Can the Veris pH Detector be modified for testing at depth?

Instantaneous pH Measurement

What is Antimony?:

- Sb pronounced “AN-the-MOH-nee”.
- Element 51 in periodic table (Metalloid)

H	Metals, Nonmetals, and Metalloids																He																												
Li	Be											B	C	N	O	F	Ne																												
Na	Mg											Al	Si	P	S	Cl	Ar																												
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																												
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	S	Sb	Te	I	Xe																												
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																												
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	—	Uuq	—	—	—	—																												
<table><tr><td>Ce</td><td>Pr</td><td>Nd</td><td>Pm</td><td>Sm</td><td>Eu</td><td>Gd</td><td>Tb</td><td>Dy</td><td>Ho</td><td>Er</td><td>Tm</td><td>Yb</td><td>Lu</td></tr><tr><td>Th</td><td>Pa</td><td>U</td><td>Np</td><td>Pu</td><td>Am</td><td>Cm</td><td>Bk</td><td>Cf</td><td>Es</td><td>Fm</td><td>Md</td><td>No</td><td>Lr</td></tr></table>																		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu																																
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr																																

metals

metalloids

nonmetals

Instantaneous pH Measurement



What is Antimony:

- Used by Egyptians as eyeliner.
- Brittle
- Mohs Hardness - 3
- Highly toxic.
- Has a remarkable linear response to $[H^+]$ in solution.
- Used in medical for pH measurement.

Instantaneous pH Measurement

QUESTIONS:

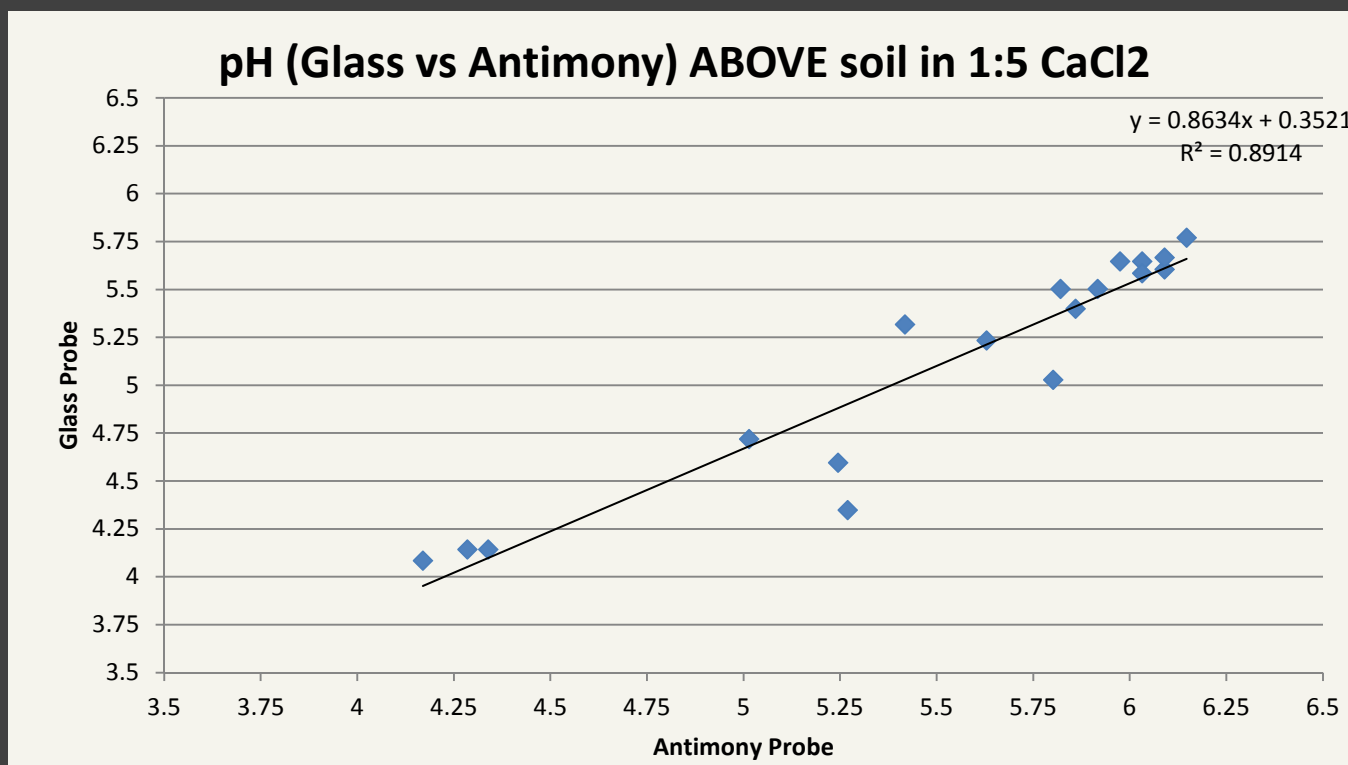
1. Glass bulb pH probes vs Antimony pH probes.
 - CaCl_2



Instantaneous pH Measurement

QUESTIONS:

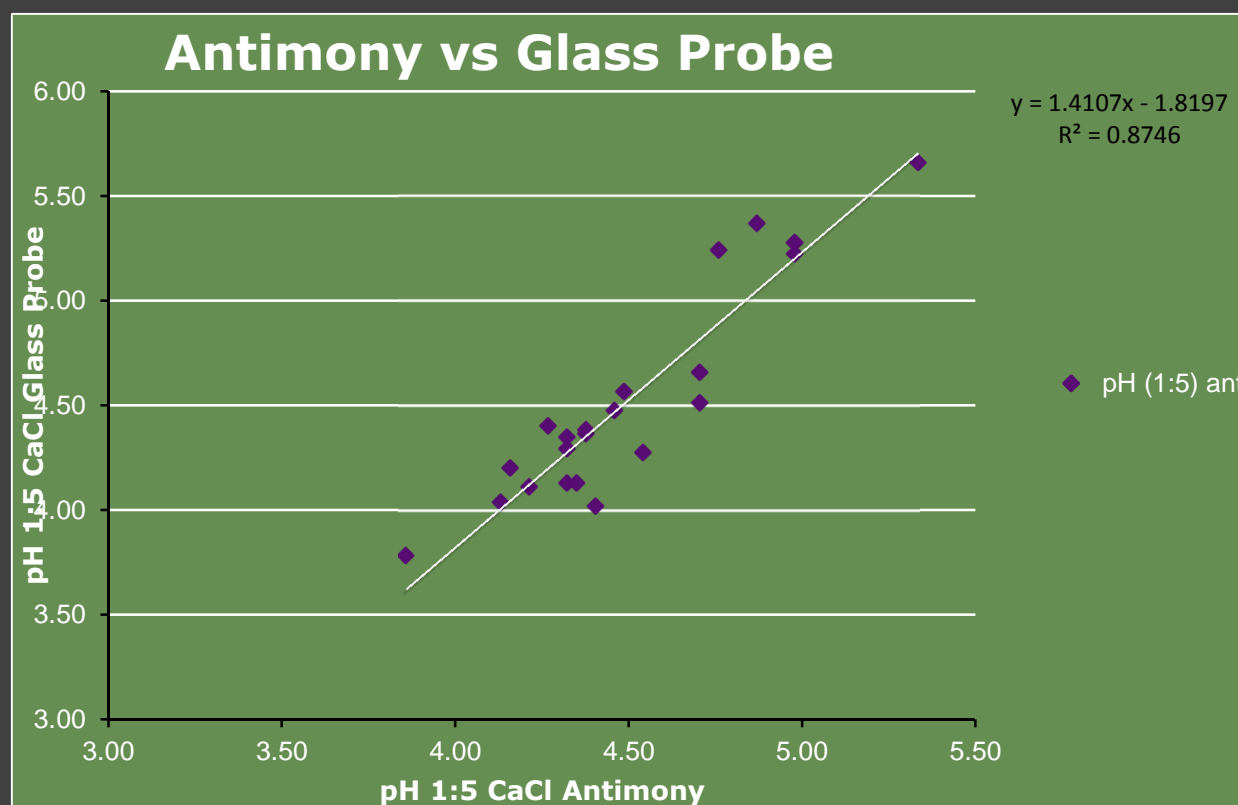
1. Glass bulb pH probes vs Antimony pH probes.
 - CaCl₂



Instantaneous pH Measurement

QUESTIONS:

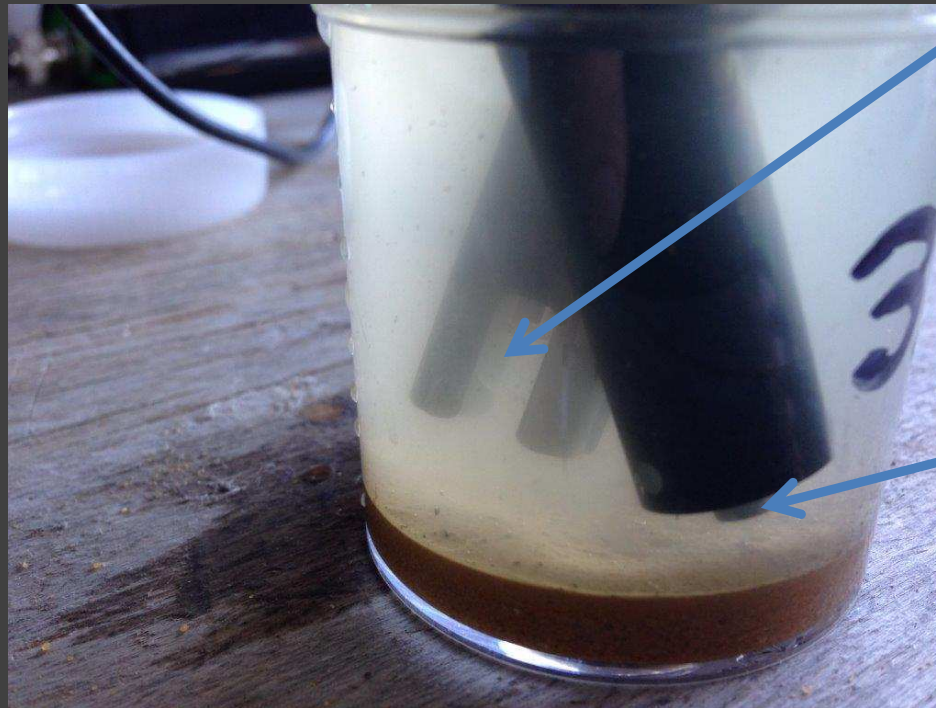
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 - CaCl₂



Instantaneous pH Measurement

QUESTIONS:

1. Glass bulb pH probes vs Antimony pH probes.
 - CaCl_2



Traditional glass bulb pH probe:

Antimony pH probe:

Instantaneous pH Measurement

QUESTIONS:

1. Glass bulb pH probes vs Antimony pH probes.
 - CaCl_2
 - Direct Soil

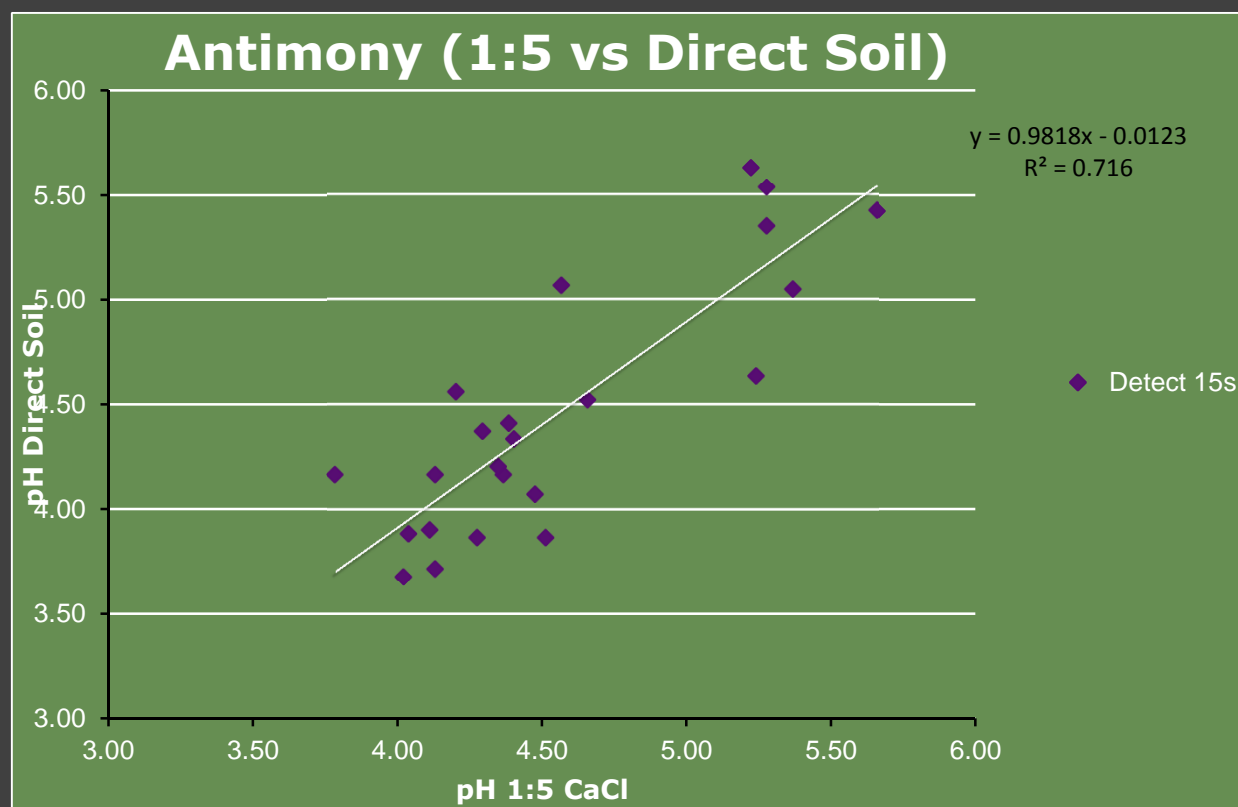
Process.

- Map out sample sites.
- Take sample paddock
- Measure 1:5 sample for some of those sites.
- Use 1:5 samples to scale the Direct soil measurements
- Create pH Map.

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QUESTIONS:

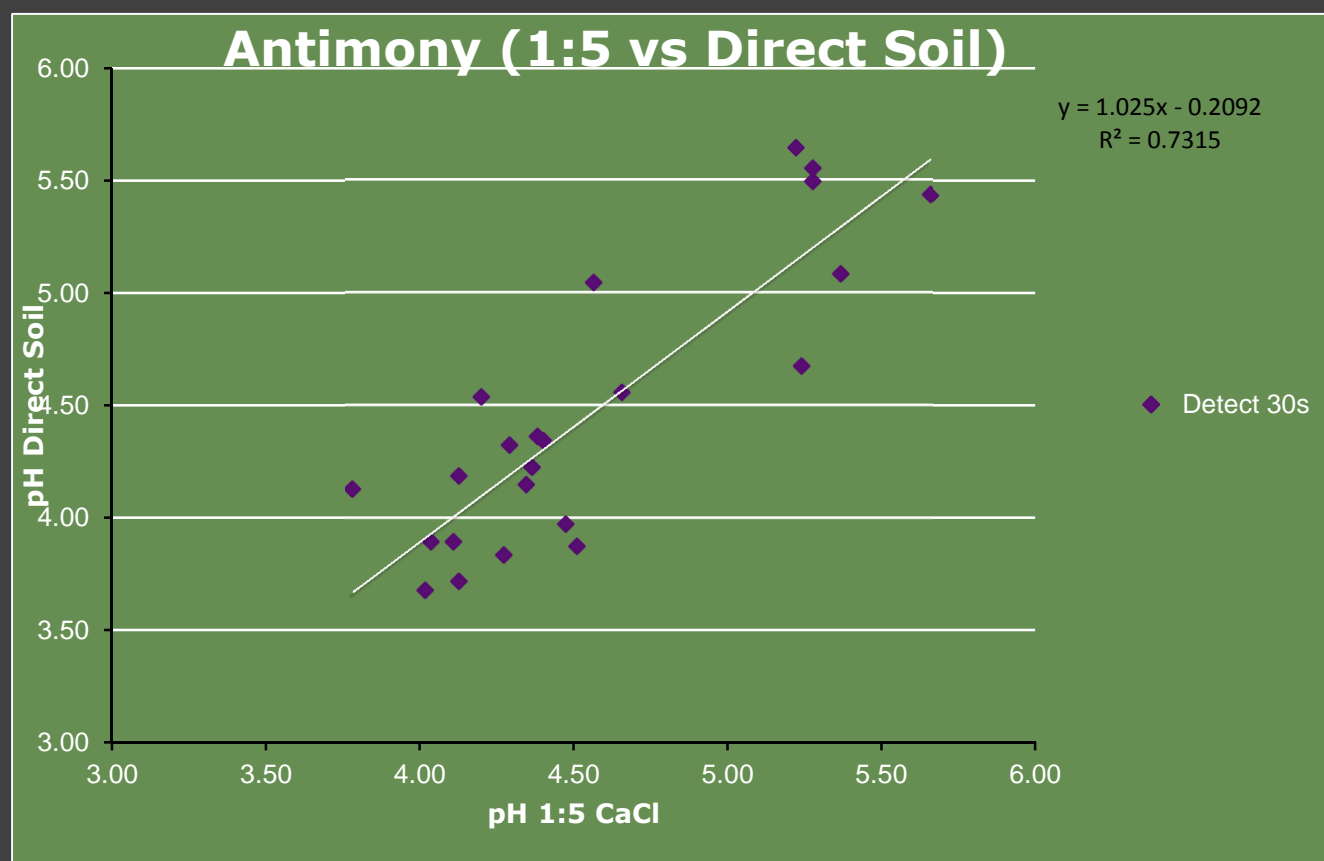
1. Glass bulb pH probes vs Antimony pH probes.
 - Direct Soil (15sec)



Instantaneous pH Measurement

QUESTIONS:

1. Glass bulb pH probes vs Antimony pH probes.
 - Direct Soil (30sec)



Instantaneous pH Measurement

QUESTIONS:

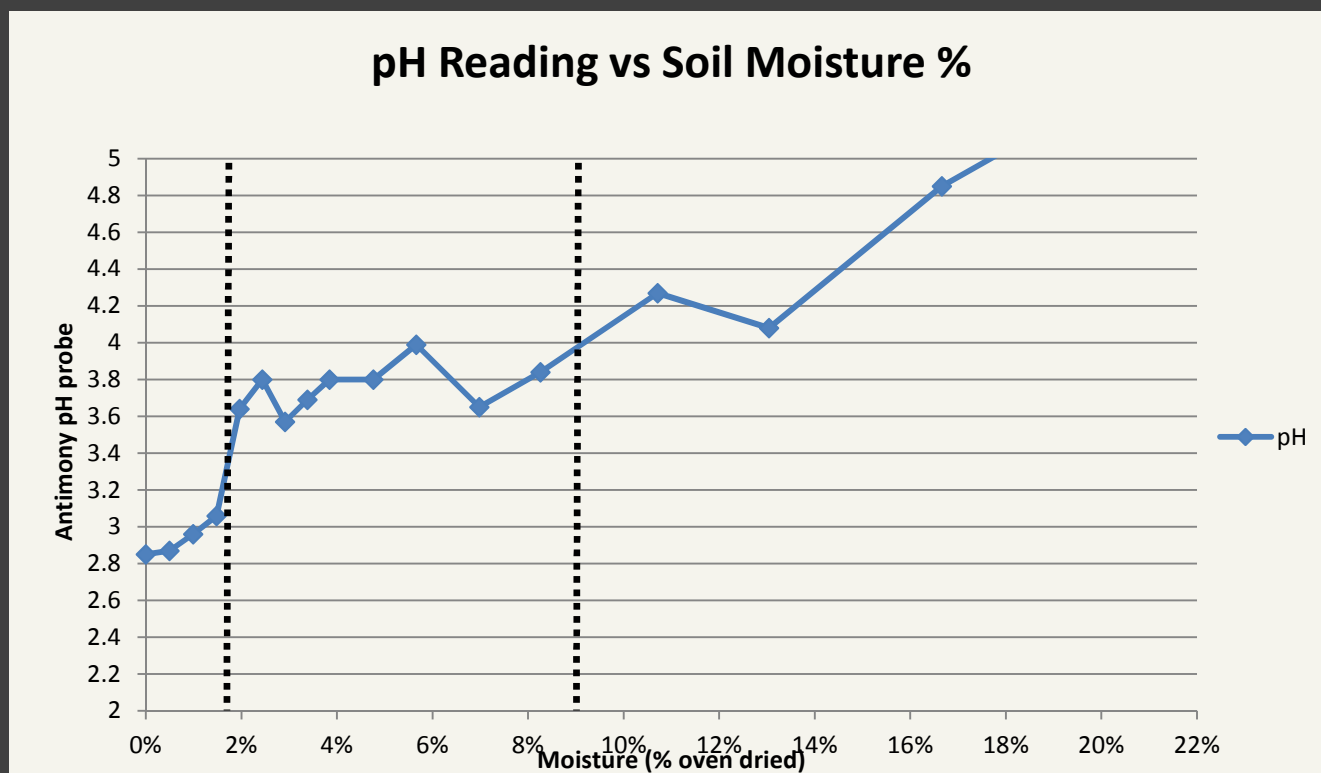
1. Glass bulb pH probes vs Antimony pH probes.
 - Direct Soil

Comparison	R2
Glass vs Ant (1:5)	0.87
Glass vs Ant (15sec)	0.72
Glass vs Ant (30sec)	0.73
Glass vs Ant (60sec)	0.75
Glass vs Ant (120sec)	0.75
Glass vs Ant (240sec)	0.77

Instantaneous pH Measurement

QUESTION:

2. Different soil type effects.
3. Soil moisture interactions. pH = 4.12 (1:5 CaCl Solution)



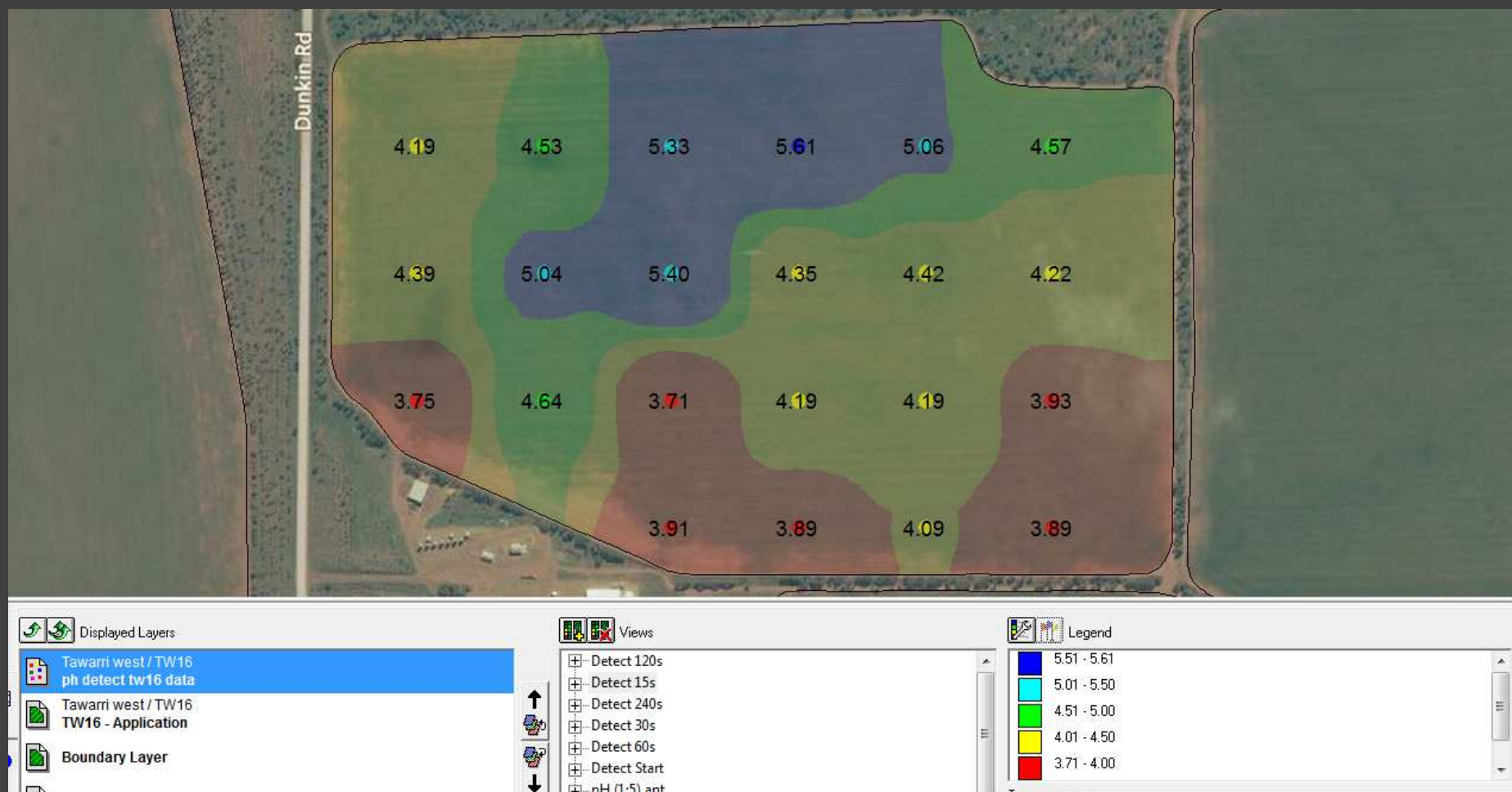
Instantaneous pH Measurement

QUESTIONS:

1. How do instantaneous pH probes compare?
 - a. Traditional method 1:5 CaCl₂ Solution.
 - b. Inserted directly into soil (Direct Soil).
2. Effect of soil types.
3. Effect of soil moisture.
4. **Sampling density.**
5. Can the Veris pH Detector be modified for testing at depth?

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Lime Application Map



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Lime Application Savings

	Zone	Area (ha)	pH (CaCl)	Rate (t)	Lime (t)
Blanket Apply	1	58	4.52	2	116
Zone Applied	1	11.43	5.29	0	0.0
	2	10.99	4.59	1	11.0
	3	22.16	4.23	2	44.3
	4	13.42	3.86	3	40.3
	Total	58		1.65	95.57
					82%

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QUESTION:

Can the Veris pH Detector be modified for testing at depth





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Planfarm Hydraulic Soil Corer & pH Trailer:





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Planfarm Hydraulic Soil Corer & pH Trailer:





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Thank You



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Planfarm Hydraulic Soil Corer & pH Trailer:





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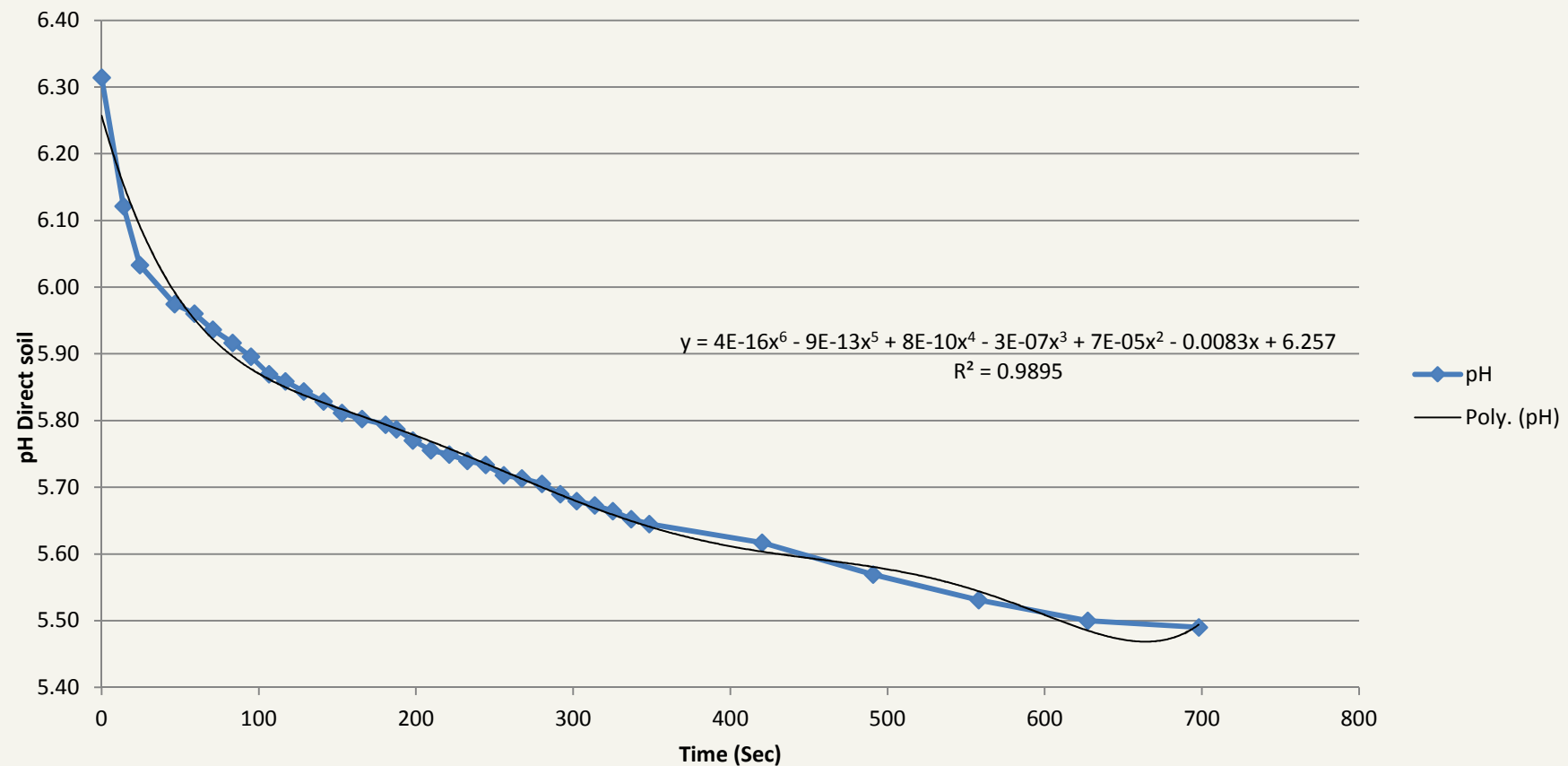


Instantaneous pH Measurement

Question:

- Response Time.

Response Time - Direct Soil



Instantaneous pH Measurement

Questions:

1. Soil moisture.

% Moisture (Theta Probe vs Oven Dried Moisture)

